



# NGK REPORT 2020



**NGK INSULATORS, LTD.**

# Surprising

## The Amazing World of Ceramic Technology

The NGK Group's unique ceramic technology has been bringing society revolutionary products for over a century. We will continue to provide the world with new value through ever more amazing products.

# Ceramics.



## ➤ Mobility



## ➤ Energy



## ➤ Information Technology



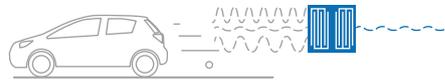
## ➤ Industry





Value proposition > **Cleaner exhaust**

We provide automobile manufacturers around the world with products for exhaust purification. These include HONEYCERAM® ceramic substrates, which carry a catalyst that detoxifies vehicle exhaust; gasoline particulate filters (GPFs), which remove particulates from gasoline-powered vehicle exhaust; and nitrogen oxide (NOx) sensors, which measure NOx concentrations in exhaust in real time.



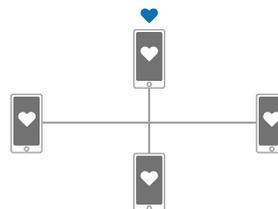
Value proposition > **Convenient, efficient electricity**

We provide batteries that support the evolution of IT and the spread of renewable energy. Examples are the EnerCera® battery, an ultra-compact, ultra-thin lithium-ion rechargeable battery ideal as a power source for IoT devices; and NAS® batteries for megawatt-class storage systems boasting large-capacity, high-energy density, and long service life.



Value proposition > **Contributing to IT's next generation**

We drive IoT and 5G evolution with products leveraging our unique ceramic technology. Examples include bonded wafers for surface acoustic wave (SAW) filters, which give higher performance to the smartphone components that select radio waves of a certain frequency; gallium nitride (GaN) wafers, which increase laser output and help realize 5G communication; and ceramics used in semiconductor manufacturing equipment, which are indispensable to the semiconductor production processes.



Value proposition > **Boosting efficiency at industrial sites**

NGK machinery and devices in a wide range of fields empower the work sites at the heart of today's industry. We make everything from kilns for manufacturing positive electrode material for lithium-ion batteries, to pumps and valves, and even low-level radioactive waste treatment systems.



## NGK Group Philosophy

### Our Mission

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**Enriching Human Life  
by Adding New Value to Society.**

### Our Values

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- |                              |   |
|------------------------------|---|
| <b>Quality of People</b>     | <b>Embrace challenges and teamwork.</b> |
| <b>Quality of Product</b>    | <b>Exceed expectations.</b>             |
| <b>Quality of Management</b> | <b>Social trust is our foundation.</b>  |

Visit the “About NGK” section of our website to read the NGK Group Philosophy.

<https://www.ngk-insulators.com/en/info/governance/>

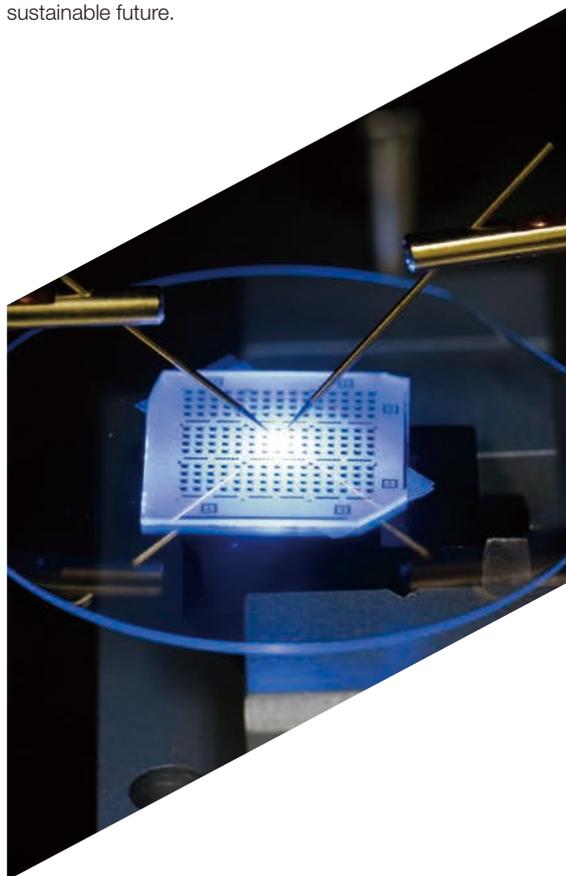
The NGK Group Philosophy is a signpost that guides every employee of the NGK Group. Formulated in 2019 to mark our 100th anniversary, it encompasses our desire to use our proprietary ceramic technology to contribute to future energy, environmental protection, and industrial progress, and to help people around the world live a happy, comfortable life.

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Message from the President

## Unique ceramic technology for a future of coexistence between environment and humanity

The current spread of the novel coronavirus has caused an abrupt slowdown in the global economy, having a significant impact on the NGK Group's business performance. Nevertheless, we must not halt our progress. Placing utmost priority on ensuring the safety of employees and their families and infection control, we will take advantage of our unique ceramic technology to provide products that exceed society's expectations and continue growing to create a sustainable future.



NGK Group Research and Development

## Embracing challenges with tenacity and a dedication to discovering technologies that will change the world

The new product development period lasts anywhere from three to more than 10 years, but we do not give up, even on research that takes a long time to bear fruit. A culture that makes it easy to embrace such challenges is the strength of the NGK Group's approach to R&D.



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## Value Creation by the NGK Group

The unique ceramic technology we have built up over more than 100 years is the foundation of the NGK Group's value creation.

This technology is the root of high-quality products through which we aim to realize a future where people live in harmony with the environment.



## Taking on Social Challenges

# Social challenges



1900

Spread of electricity



1930

Advance of the chemical industry



1950

Rapid economic growth



1970

Challenge of purifying automotive exhaust

1919

NGK Insulators, Ltd. is established to produce special high-voltage insulators in Japan

1931

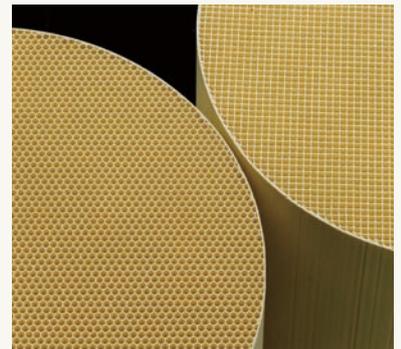
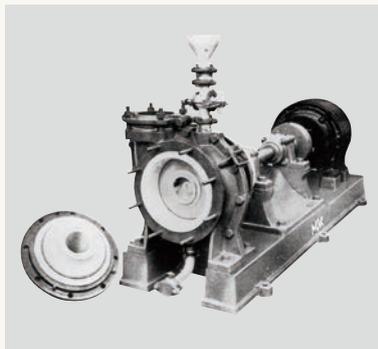
First deliveries of acid-proof pumps are made

1958

Production and sales of beryllium copper begins

1976

Production of HONEYCERAM®, a honeycomb catalyst substrate for controlling automotive emissions, begins

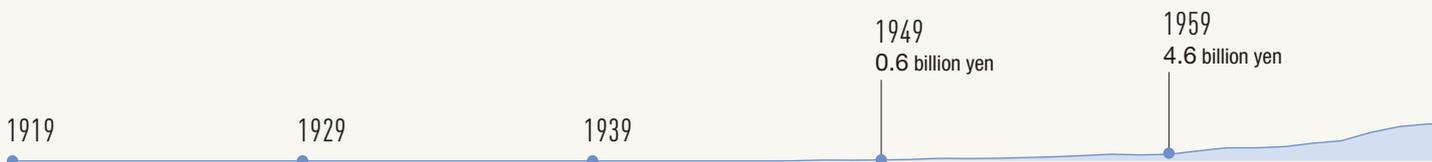


## Our solutions

### Diversifying to meet the changing times

NGK was founded in 1919 to build the power transmission infrastructure that was becoming increasingly necessary as electricity use spread throughout Japan. Since then, we have used our unique ceramic technology in our continuing efforts to develop and provide products that support social foundations while preserving the environment.

We will go on striving to expand the possibilities of ceramic technology as we aim to profit from our business and contribute to environmental preservation and a better society for everyone.





1990

The dawn of the IT revolution



2000

Spread of renewable energy



2019

Spread of IoT

1996

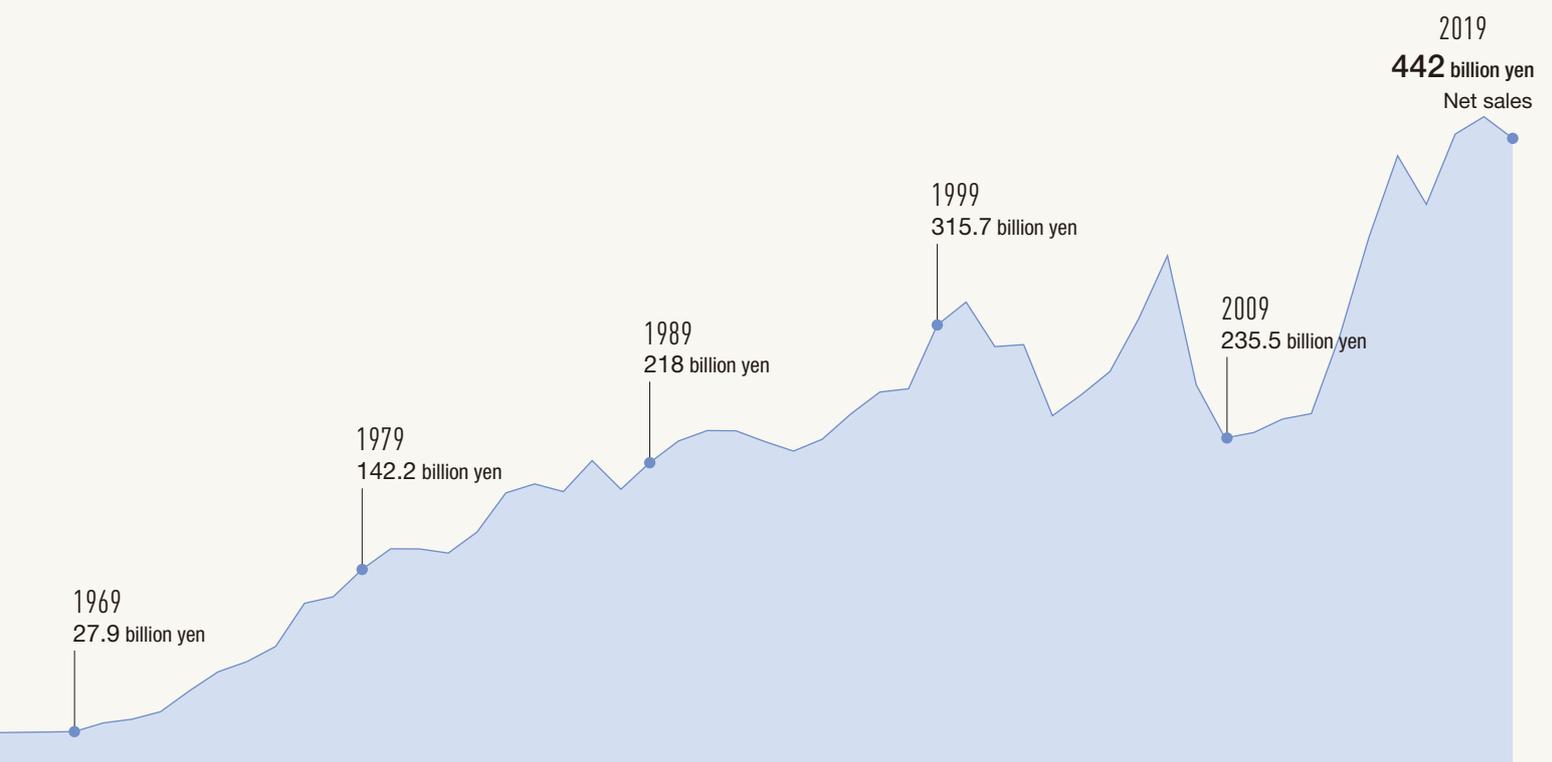
Mass production of ceramics for semiconductor manufacturing equipment begins

2003

Mass production of NAS<sup>®</sup> batteries begins

2019

EnerCera<sup>®</sup> lithium-ion rechargeable battery is commercialized



## Global Network

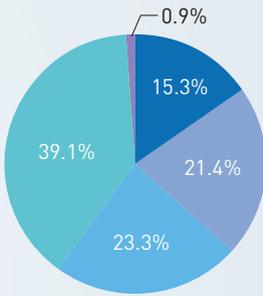
# Serving customers in around 20 countries and regions

With production and sales bases in approximately 20 countries in regions including North America, Europe, and Asia, our global network brings customers high-quality products made using state-of-the-art technologies.

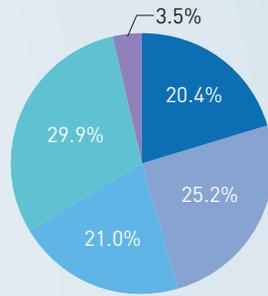
We will continue to expand across the globe and help make the world better.



Distribution of employees



Distribution of net sales



■ North/Central America 
 ■ Europe 
 ■ Asia 
 ■ Japan 
 ■ Others

**Number of employees**  
 (down 0.6 % year-on-year)  
 Note: Full-time regular employees.

**20,000**

**Consolidated net sales**  
 (down 4.6 % year-on-year)

**442 billion yen**

**Consolidated subsidiaries**

**55**

## Europe

Employees > 4,288

Net sales > 111.6 billion yen

## Asia

Employees > 4,661

Net sales > 92.6 billion yen

## Japan

Employees > 7,814

Net sales > 132.2 billion yen

## Message from the President



# Unique ceramic technology for a future of coexistence between environment and humanity

My heart goes out to all those affected by COVID-19. I would also like to express my sincere respect and gratitude to medical professionals and all the other people who are supporting our society.

The current spread of the novel coronavirus has caused an abrupt slowdown in the global economy, having a significant impact on the NGK Group's business performance.

Nevertheless, we must not halt our progress. We strive to ensure the safety of employees and their families and prevent the spread of infection. With this as our top priority, we will take advantage of our unique ceramic technology to provide products that exceed society's expectations and continue growing to create a sustainable future.

NGK Insulators, Ltd.  
President



Commemorating 101 years in business

## Look into the future and set a goal to realize the NGK Group Philosophy

Last year, on the occasion of its 100th anniversary, the NGK Group took a new look at its philosophical framework and established the NGK Group Philosophy. In the 101st year, we would like to define the Group's goals and work on formulating a new business vision.

Large-scale investments we had carried out over the past four years have been mostly completed. The path for the business expansion of existing products has been laid out, and new products with good prospects are beginning to emerge in each business. We already know what needs to be done in the 2020s. Now, the NGK Group must develop a vision looking into the future beyond that.

The new vision will focus on the ways we can achieve coexistence between environment and humanity, based on which we aim to resolve diverse social issues through the effective use of our technologies and create new value.

The reduction of CO<sub>2</sub> emissions is an important global challenge, and investors consider ESG initiatives as part of corporate responsibility. Society 5.0, an initiative promoted by

the Japanese government, advocates a people-centered society and encourages companies to drive reforms. The concept of achieving coexistence between environment and humanity took shape as we examined the ideal state as a company based on this trend.

Nonetheless, coexistence between environment and humanity is no easy feat. In order to create a future where people coexist with the rich natural environment, we must further improve ceramic technology as our strength and resolve diverse social issues through innovative solutions. To this end, we need to drive transformation and growth through the Group's collective efforts.

Therefore, since the end of 2019, we have been holding discussions with the management team, outside directors, and younger employees to formulate a new vision. I constantly think about contributions we can make to society by believing in the future of ceramics and further evolving our unique technology.

## Message from the President

COVID-19

### Sustaining business activities while prioritizing human life

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Meanwhile, when I look at the current global situation, COVID-19 remains rampant. I am afraid that a great number of people are now living with fear in their hearts.

The NGK Group has positioned preventing the spread of COVID-19 as an important crisis management issue and launched the Business Continuity Plan (BCP) Countermeasures Headquarters to gather information. Under the three policies, namely priority on human life, cooperation with the government and collaboration with local communities, and the achievement of sustainable business activities, we are looking into various measures for business continuity while placing utmost priority on ensuring safety and preventing the spread of the virus.

Specifically, in back-office departments, employees are encouraged to switch over to staggered commuting and telecommuting to the greatest extent possible, while in production lines, measures are taken to reduce

people-to-people contact such as by installing vinyl curtains and using face shields in some sections. The shift to telecommuting proceeded relatively smoothly as we had been working to establish a network environment such as by introducing new software. There are more departments now taking this opportunity to review conventional work patterns to improve operational efficiency.

COVID-19 has also had an impact on the Group's respective businesses, forcing some production sites in Europe, North and Central America, and Asia to suspend operations or reduce factory utilization. A number of major markets have been affected in terms of demand. Nonetheless, we anticipate a recovery in demand from a medium- to long-term perspective. Therefore, we will focus on the creation of new products for the future while flexibly addressing the immediate drop in demand.

Business risks

### Strengthening the management system for diversified business risks

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We categorize business risks that are considered significant from a management perspective, including COVID-19, into those related to the business environment, strategies, and internal factors respectively and review them on a continual basis.

In the automotive-related business, changes in demand may be anticipated in the future due to internal combustion engine vehicles (ICEVs) gradually being replaced with non-ICEVs such as electric vehicles (EVs) and fuel-cell vehicles (FCVs). However, for the time being, the ICEV market is expected to further expand with tightened exhaust regulations, and therefore, we are anticipating business growth through an

increase in new and high-performance products. In the Chinese market, which is growing in importance, although Chinese competitors are expected to become more active, we will continue to strengthen our competitive edge with capabilities to provide technologies that preemptively address environmental regulations and through a steady supply of products.

As global business expansion proceeds, in order to minimize the impact of diversified business risks, the NGK Group is working to strengthen risk management. We will improve the risk management system to further reinforce our management base.

Business overview

### Production capacity up to 2023 has been secured; focusing on the dissemination of new products

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Now, I would like to give an overview of the NGK Group's respective businesses.

In the automotive-related business, fiscal 2019 results were affected by a number of factors. In China, an economic slowdown began in the automotive market from late 2018 and the introduction of environmental regulations for large vehicles was later than anticipated. In Europe, diesel vehicle sales dropped further and resulted in lower-than-anticipated demand. However, the prospect that the number of ICEVs will continue to increase until 2030 remains the same. We are

proceeding with the development of high-performance products that can address new exhaust regulations.

Due to large-scale capital investments that we have been carrying out since fiscal 2016, production capacity up to fiscal 2023 has been secured. Although there are factors such as recent depreciation cutting into profits, we hope that success in our other businesses can offset a drop in demand in the automotive market.

In the semiconductor-related business, investments for the Internet of things (IoT), artificial intelligence (AI), and the 5G next-generation communication standard show a trend of expansion, based on which we are assuming that they will continue to increase. We will maximize the use of a new factory in Tajimi City, Japan, which began operation in October 2019, to raise production efficiency and increase our earning capacity. Moreover, we will work on the development of next-generation products for higher-performance semiconductor manufacturing equipment.

With regard to the power-related business, the Power Business was renamed the Energy Infrastructure Business in 2020. In addition to existing power system insulators and NAS® batteries, zinc rechargeable batteries for utility customers have been added to the product lineup. In comparison to lithium-ion batteries, zinc rechargeable batteries provide greater safety, which allowed them to eventually acquire the world's first UL verification mark\* in the storage battery field. We will continue with their development and sales expansion. In order to ensure access to low-cost, reliable energy for everyone, we will not only support the stable supply of electricity, but also expand the possibility of its efficient use, thereby establishing a business that can contribute to social infrastructure.

In the electronics-related business, samples of EnerCera® lithium-ion rechargeable batteries have been shipped to more than 200 companies inside and outside of Japan. These batteries were commercialized in fiscal 2019. We are promoting the assessment of these products for use in IoT devices including smart cards and smart keys for automobiles. We are also strengthening our marketing forces and working on cost reduction in an attempt to promptly generate sales and profits.

In fiscal 2019, the Advanced Device Components Division was launched under the Electronics Business to handle all promising new products such as the EnerCera battery, bonded wafers, and gallium nitride (GaN) wafers. Bonded wafers are

used as substrates for electronic devices, which are incorporated in products like smartphones. Against the backdrop of the spread of mobile communication speed enhancement technology, they are expected to achieve reliable growth in the future. GaN wafers are high-performance wafers that will improve an LED's luminous efficacy and enable the higher output of semiconductor lasers. In anticipation of their application to power semiconductors, which constitute a large market, we have also established technology to create bigger 6-inch types.

All these products were developed based on our own technologies, such as crystalline orientation control, ultra-high-precision polishing, wafer bonding, and liquid-phase crystal growth and deliver unrivaled high performance. These businesses have a promising future in that customers approach us with potential new applications or we discover application needs that we have never thought of.

\* The UL verification mark signifies a high level of safety, backed up by a rigorous safety testing and evaluation process carried out by Underwriters Laboratories (UL), a third-party safety science organization in the U.S. Valid until the end of October 2020.



## Message from the President

ESG

### Consolidating relevant matters to be discussed by the ESG Committee and promoting them as Group policy

In fiscal 2019, in order to consolidate discussions related to the environment, society, and governance, we launched the ESG Committee, which established a structure for discussing ESG initiatives, including the Fifth Five-Year Environmental Action Plan that will start from fiscal 2021, among senior management and promote them as part of the Group policy.

In the Fourth Five-Year Environmental Action Plan, which will be completed in fiscal 2020, target values have already been achieved in terms of the reduction of discarded materials and recycling. However, the target achievement in terms of CO<sub>2</sub> emission intensity of sales has been difficult due to our expanded scale of production. We are likely to focus on actions to combat climate change in the next plan. In order to achieve targets, we will continue to improve the structure to enable the development and introduction of production technologies that will help reduce the environmental impact and to facilitate the dissemination of products and services.

In February 2020, we endorsed the recommendations made by the Task Force on Climate-related Financial Disclosures (TCFD). We, as a responsible party, will work to realize a sustainable society and strive to disclose and enhance related information.

With respect to the social aspect, we will concentrate primarily on job satisfaction reforms. I have been persistently communicating to our employees the importance of pursuing our essence, because I would like them to spend time on what is truly necessary and perform higher-value-added work. Since

the start of my tenure as president, I have been personally visiting each workplace and asking employees what they are focusing on and what they are doing to solve problems. With each passing year, I have seen positive changes in the attitudes of both department heads and employees. We will also further enhance corporate systems to be a company where each employee can actively engage in work without any worries and deliver higher-quality performance.

The NGK Group has shown respect for employees' diversity and designed our human resource system to meet the needs of the times. In April 2020, we established the HR Committee as an organ for cross-sectoral discussion of corporate activities that respect human rights and human resource issues that should be addressed by the Group as a whole. Concurrently, we also launched the Diversity & Inclusion Department.

With regard to governance and compliance, we will promote honest business activities. In the past, the NGK Group caused problems that must never be repeated, including an anti-trust law violation and a non-conformity in the testing procedures of insulators and related products. It is important to never repeat these problems, and to this end, we must foster a culture where each employee strictly follows routines and rules as they are required. We are currently carrying out initiatives such as holding compliance seminars at Group company sites in an effort to instill this attitude in every employee.

Post-COVID-19

### Be ingenious by adopting new work styles

The global economy has suffered an unprecedented level of damage due to the effects of COVID-19. Looking back on the past, infectious diseases have had a considerable impact on society in the long history of the world. Considering these historical facts, we may have to prepare for the long haul. In the future, I believe that a variety of measures including vaccines will be implemented and new values and technologies suited to the post-COVID-19 era will be developed. The NGK Group will continue to look into various measures while placing utmost priority on ensuring safety and infection control.

The current catastrophe significantly reframed my attitude toward the environment. While keeping in mind a future of coexistence between environment and humanity, we have up to this point viewed the environment with a focus on CO<sub>2</sub> emissions reduction such as in the form of global warming countermeasures, and examined the effective use of the NGK Group's strengths and other initiatives. However, due to the spread of COVID-19, we confronted the reality that we are fighting an invisible threat every day. This reminded me that we

are always living side by side with nature. Thinking about how we should approach lifestyles in harmony with nature will broadly lead us to discuss what the company can do for society in 10, 20, or 100 years into the future. Toward the formulation of a new vision, we will redefine environmental protection in a broader context and clarify the direction to take as the NGK Group.

As we undergo social changes, our work styles have also shifted significantly. New working methods such as telecommuting and web conferencing have become ubiquitous, which I believe provided us with an opportunity to determine how essential each task is by spending time on thinking about contributions that each of us can make to the team and then discussing such ideas with them. Currently, we are internally gathering and summarizing feedback on changes that we have experienced and what we have felt throughout this calamity. We will be holding discussions on new work styles suitable for the NGK Group.

When I think of change, I value the idea of being ingenious. In the world, the word “innovation” is casually mentioned; however, in order to change the world, the accumulation of research activities over an extended period of time and the repetition of the trial and error process to develop ingenuity are crucial. This ingenuity stems from findings and inspirations, based on which we shall work toward materialization. Products are the fruit of these steady efforts, and there is no silver bullet

that allows us to reach a goal in a single bound. Work is meaningful only because we spend time on the process. I believe that the least I can do is to create a pleasant working environment where each employee can exercise their ingenuity.

In order to create a future of coexistence between environment and humanity, we will continue to pursue unrivaled ceramic technology with ingenuity and keep growing as a company capable of contributing to society.



## Responding to the COVID-19 Pandemic

# Working together to overcome a new challenge while putting respect for human life first

Based on the policies and priorities outlined in our basic business continuity plan (BCP), we are developing and implementing measures to combat the spread of COVID-19. In keeping with this plan, the president sent a direct message to NGK Group employees explaining how we will take employee safety into account while dealing with the virus.

<p><b>Priority 1</b></p> <p><b>Respect for human life</b></p>	<p><b>Priority 2</b></p> <p><b>Cooperation with government and regional policies</b></p>	<p><b>Priority 3</b></p> <p><b>Maintenance and continuation of business activities</b></p>
<p>Our top priority is the safety of the Group's employees and their families. We also place great importance on the safety of our customers and business partners.</p>	<p>In addition to cooperating with the response plans of national and local governments and regions, we will place actions taken on behalf of society as a whole above our business activities.</p>	<p>We will fulfill our social responsibility by maintaining and continuing our business activities and by minimizing the economic losses sustained by the Group.</p>

### Message from the President

Dear Employees,

I am sure that you are suffering greatly from the anxiety caused by the current COVID-19 pandemic. I sympathize deeply with the challenging conditions that all of you, your families, and your friends are now facing. Here in Japan, the rate of infection is also on the rise. No one knows what the future holds, and we, NGK, have been struggling to keep up with a situation that changes day by day. Nonetheless, our principle remains clear and unchanged: to put "Health first, safety first." Our top priority is the health and safety of you and your families, our business partners, and all related parties, and we are taking necessary measures to ensure that health and safety. We are not completely sure how much we can help because each country has its own government-enforced restrictions, and global logistics are greatly disrupted. However, we will do anything we can to support you. We are committed to working together with you to overcome this difficult situation. Lastly, I sincerely hope that this crisis is resolved so that we can meet and speak again soon. You are not alone; we are on your side. Sincerely Yours,

April 3, 2020 *Taku Oshima*

### Structure

We formed a task force on February 28 as the pandemic was spreading, and we put our BCP into action on April 20 as part of a groupwide effort to implement associated measures.

Page 49 (Risk management framework chart)

### Main Measures Involving Work Responsibilities, Production Sites, and Welfare Facilities

#### ■ Telework

- Employees of back-office departments were instructed as a rule to work from home following the government's emergency declaration.
- Since the declaration of emergency was lifted, we have adjusted how often employees come in to work at the office based on infection levels.

#### ■ Restrictions on business travel

- In principle, business travel was forbidden in April.
- Starting at the end of May, we placed restrictions on the destinations to which employees could travel based on infection levels.

#### ■ Dispersion of workplaces

#### ■ Recommendation to workplaces to adopt flextime and staggered shifts

#### ■ Production sites

- We have required employees to wear face masks, face shields, and gloves, among other measures.
- Employees are required to take their temperature at the start and end of work each day and to report their physical condition.
- Sharing of protective gear is prohibited.
- Vinyl curtains have been installed.
- Handing off of work between day and night shifts is now being done in writing.
- Switches and control panels are being disinfected.



#### ■ Welfare facilities

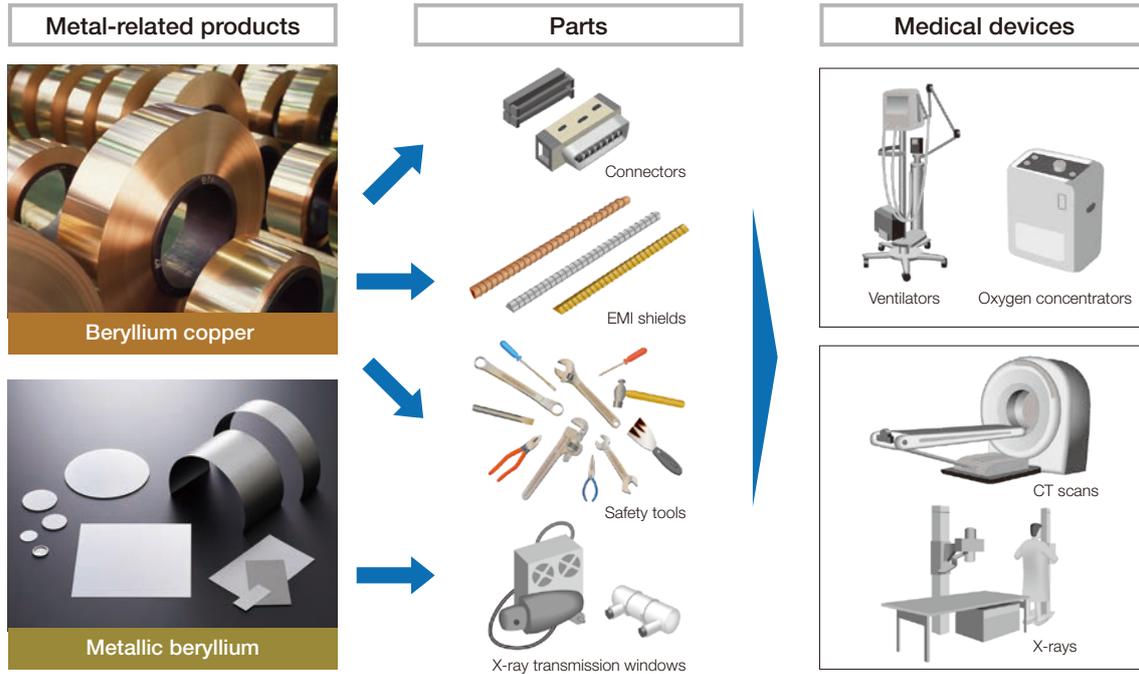
- Meal times in the cafeteria are being staggered, and employees are required to practice social distancing. Acrylic sheets have been installed.
- Some facilities have been temporarily closed.

## Contributions to Society

### Product: Beryllium Copper Products

Our beryllium copper alloys offer high strength and excellent springiness that rival special steel while taking advantage of the favorable properties of copper, allowing

them to make a positive contribution as materials for medical devices used in treating COVID-19, which are required to deliver high reliability and compact size.



### NGK Ceramics Europe Donates Masks

As the COVID-19 pandemic spread in Belgium, NGK Ceramics Europe supplied 8,000 masks it had stockpiled in response to a request from the regional government in Baudour, where the company is headquartered. The

company received a letter of gratitude from the government expressing thanks for helping prevent an early collapse of the healthcare system.

### NGK Science Site

Reflecting our desire to help people have fun while they were requested to stay at home, we created special pages featuring experiments and projects that are easy to do at home without the need to purchase any supplies and published them as “Experiments at Home Series” on the NGK Science Site, part of the NGK website. NGK is doing everything it can to help children whose schools have been closed due to the COVID-19 pandemic explore science and have fun at home in an effort to support their studies.

The NGK Science Site features content planned and created by NGK with the goal of communicating the fun of science to children.

The website has introduced more than 270 experiments since it was created in 1997, and it has

attracted many visitors who enjoy conducting experiments with everyday items.

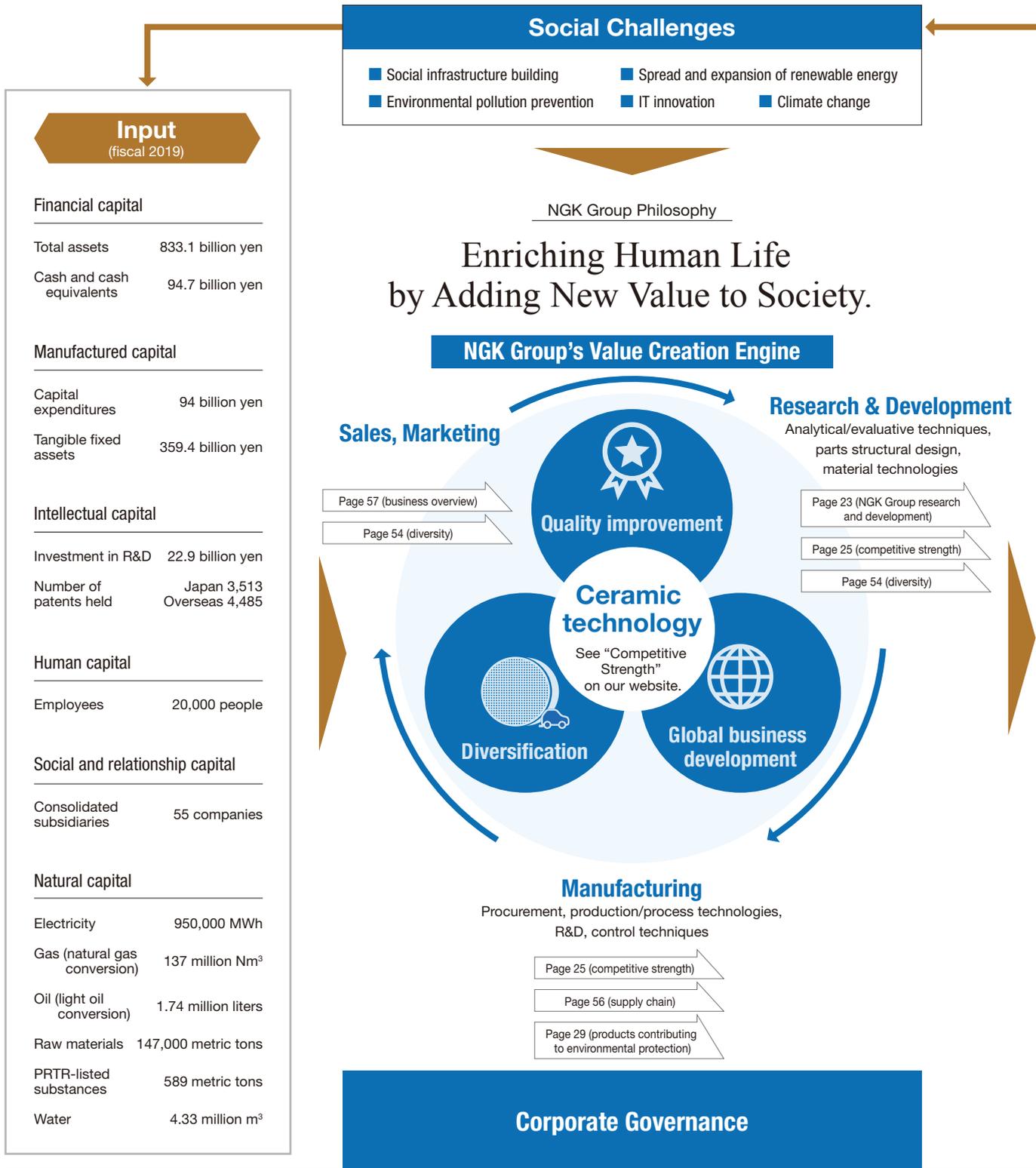


[https://site.ngk.co.jp/feature/stay\\_home/](https://site.ngk.co.jp/feature/stay_home/)  
(Site is only in Japanese)

## Creating Value

# Using advanced ceramic technology to create value and address social challenges

The NGK Group uses its advanced ceramic technology to bring the world unique product lineups in the energy, ecology, and electronics sectors. By creating new value for customers, we help society solve its problems.



## Output

### Ceramic Products Business Group



Gasoline particulate filters (GPFs)

### Process Technology Business Group



Ceramics for semiconductor manufacturing equipment

### Electronics Business Group



EnerCera® lithium-ion rechargeable batteries

### Energy Infrastructure Business Group



NAS® batteries

## Results (fiscal 2019)

### Consolidated net sales

442 billion yen

### Net income attributable to owners of the parent

27.1 billion yen

### ROE

5.8%

### Total sales of products contributing to environmental protection

259.9 billion yen

### Social contribution spending

0.24 billion yen

### Avoided NOx emissions

4 million metric tons per year

Note: Assumes exhaust systems are equipped on new automobiles that do not have equivalent systems.

## Values Provided by the NGK Group

### Supporting Social Infrastructure



#### Ensure access to affordable, reliable, sustainable, and modern energy for all

- Insulators are indispensable to stable power supply
- NAS batteries allow stable supply of renewable energy



#### Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation

- Ceramics used in electronics make ICT cheap and ubiquitous
- Ceramics used in semiconductor manufacturing equipment let the semiconductor industry be the foundation for modern daily life
- Metal-related products are widely used in mobile phones, automobiles, industrial equipment, and other devices that undergird modern life
- Lithium-ion rechargeable batteries contribute to the dissemination of next-generation products such as IoT devices and smart cards

### Protecting the Environment



#### Ensure access to affordable, reliable, sustainable, and modern energy for all

- Ceramics for purifying automobile exhaust make exhaust gas clean, thus enabling clean usage of fossil fuels



#### Take urgent action to combat climate change and its impacts

- NAS batteries aid in the fight against climate change by allowing stable supply of renewable energy



#### Conserve and sustainably use the oceans, seas, and marine resources for sustainable development

- Ceramic membrane filters purify wastewater to prevent marine pollution

### Improving People's Lives



#### Ensure healthy lives and promote well-being for all at all ages

- Ceramics for purifying automobile exhaust make exhaust gas clean



#### Ensure availability and sustainable management of water and sanitation for all

- Ceramic membrane filters provide highly safe water
- Ceramic membrane filters purify wastewater



#### Make cities and human settlements inclusive, safe, resilient, and sustainable

- NAS batteries enable innovation in urban energy management for the creation of sustainable cities

NGK Group Research and Development

# Embracing challenges with tenacity and a dedication to discovering technologies that will change the world

## R&D Policies

### ■ Developing ever more advanced technologies and continually creating new products

The basic policy of Corporate R&D is to develop ever more advanced material and process technologies with a focus on fine ceramics while continually creating new and competitive products. We believe that the key is to quickly identify promising seeds and intensively allocate resources to them. We monitor trends and strive to discern market needs. We are stubbornly committed to developing distinctive technologies with the potential to change the world, and we tenaciously embrace the challenges of doing so, a process that sometimes takes more than 10 years. Then we take advantage of our technological strengths in the form of crystalline orientation control\*1, multi-ceramics lamination\*2, and hydrothermal synthesis\*3 to consistently create and supply novel products.

The new product development period lasts anywhere from three to more than 10 years, but we do not give up, even on research that takes a long time to bear fruit. The Development Committee briefs management every year on long-running development projects and seeks a decision on whether to continue them, but in the words of President Oshima, "R&D means embracing the challenge of the impossible." A culture that makes it easy to embrace such challenges is the strength of the NGK Group's approach to R&D.

\*1 Crystalline orientation control technology: Technology for eliciting high performance by aligning crystallographic grain orientation in ceramics, which consist of large numbers of grains (i.e. polycrystalline ceramics).

\*2 Multi-ceramics lamination technology: Technology that laminates different ceramic materials together and then fires them to harden them into a single structure.

\*3 Hydrothermal synthesis technology: Technology for forming ceramics in hot water at high pressure, instead of firing them at high temperature to harden them.

## Recent Results

### ■ Developing a new generation of the EnerCera® battery that can withstand harsh, high-temperature environments

Corporate R&D has succeeded in commercializing four new products over the last five or six years. These products are bonded wafers for SAW filters, a microlens for ultraviolet LEDs, gallium nitride (GaN) wafer for laser light, and the EnerCera lithium-ion rechargeable battery. All of the new products are moving onto a growth trajectory. In particular, Corporate R&D has been working with the EnerCera division established last year to market the EnerCera battery on the back of expectations that it would see a variety of uses in a broad range of fields.

We believe that the marketing approach the NGK Group has used for products in the past, specifically visiting particular customers to seek their input, is no longer adequate. Instead, we are approaching and contacting a wide range of latent customers, for example by placing ads in specialized magazines, creating

minisites featuring products, and publishing email newsletters. As expected, we are receiving a large amount of input and suggestions from customers in a variety of industries worldwide, and this response is both motivating and encouraging. It has provided a clear view of what the market requires.

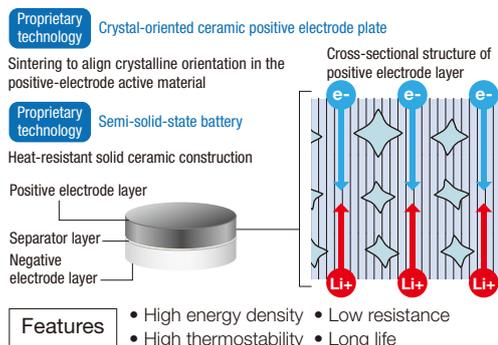
Based on the information we have received, we are currently developing a new generation of the EnerCera battery that can withstand even more demanding, high-temperature environments. Power supplies for sensors installed in automobile tires and backup power supplies used for automated industrial equipment are being called upon to withstand ever-higher temperatures. We have begun shipping samples, and we plan to start mass production in the near future.

## Distinctive Technologies

### Delivering small, high-capacity, high-power batteries with high thermal resistance Crystal-oriented ceramic positive electrode plates and semi-solid-state batteries

The superb performance of the EnerCera battery is achieved by its unique crystal-oriented ceramic positive electrode plate. Unlike the positive-electrode active material in conventional lithium-ion batteries, in which the crystalline orientation is disorganized, the EnerCera battery's ceramic positive electrode plate has uniformly oriented crystals thanks to our proprietary sintering technology. By allowing lithium ions and electrons to move linearly at high speed inside the active material, this technology has allowed us to deliver small, high-capacity, and high-power batteries.

Additionally, normal electrodes contain organic binders and conductive agents to improve the flow of electricity. These substances are susceptible to heat, which imposes limits on the battery's thermal resistance. On the other hand, the EnerCera battery's positive electrode plate does not contain such substances. Furthermore, use of our proprietary semi-solid-state battery design that laminates the positive electrode plate, ceramic separator, and negative electrode plate together into a single structure that contains a small quantity of electrolyte facilitates high thermal resistance.





## Towards the Future

### ■ Striving to realize a safe, high-performance all-ceramic battery (all-solid-state battery)

The goal of Corporate R&D is to create new value and develop new products on an ongoing basis. First, over the next two or three years, we plan to commercialize zinc rechargeable batteries and large ceramic membranes for CO<sub>2</sub> separation.

The zinc rechargeable battery is a battery with high performance on par with lithium-ion batteries whose most noteworthy feature is an extremely high level of safety, which results from the use of a nonflammable water solution as the electrolyte. This newly developed product from the NGK Group acquired the world's first-ever UL verification mark\*<sup>4</sup> in the battery energy storage field after UL, a third-party organization, verified a high level of safety due to the lack of thermal runaway and ignition. It can also be used in place of lead-acid batteries, which have been used as backup power supplies in industrial applications. We are currently working with Shimizu Corporation to demonstrate a "peak cut" application that uses electricity stored during off-peak hours to power devices during the day on Seikei Gakuen's campus, where the product's ability to reduce power costs are being checked.

Large ceramic membranes for CO<sub>2</sub> separation are used to separate, recover, and re-inject CO<sub>2</sub> that has been injected under pressure to lower the viscosity of crude oil in oil extraction. A demonstration will begin in Texas in the U.S. during fiscal 2020. We plan to commercialize the product, which has the potential to help realize carbon neutrality, within two to three years. We will

also begin working to develop the technology further so that it can be used to separate CO<sub>2</sub> directly from factory exhaust and other emissions. This effort may take some time, but we are excited by the future possibilities.

We are also working to develop GaN wafers further at the same time. Although the current product has a wafer diameter of 2 inches, we believe that we can increase that to 4 to 6 inches ahead of competitors thanks to improvements in crystal growth technologies. We have already begun shipping samples, and we plan to commercialize the product for use in power semiconductors after several years.

We are also working to develop an all-solid-state battery as a project that will hopefully bear fruit in five to six years. Researchers in the field are already approaching commercialization of a battery that uses a sulfide electrolyte, but sulfides react with moisture in the air to produce hydrogen sulfide, which is a deadly poison. We are working to create an all-ceramic battery that uses safer oxide ceramics. Since oxide ceramic electrolytes are characterized by low ion conduction, there are few examples of related development worldwide. However, we are striving to develop the kind of safe, high-performance battery that only the NGK Group could create by advancing the technology used in the EnerCera semi-solid-state battery.

\*<sup>4</sup> The UL verification mark signifies a high level of safety, backed up by a rigorous safety testing and evaluation process carried out by Underwriters Laboratories (UL), a third-party safety science organization in the U.S. Valid until the end of October 2020.

### Tsutomu Nanataki

Director and Senior Vice President;  
Group Executive, Corporate R&D,  
Development Committee Chair



## Competitive Strength

# Making ceramics is like putting together a complex jigsaw puzzle

From its very beginning, the NGK Group has sought to reexamine conventional ceramic manufacturing practices in light of the latest science and technology in order to help it identify the optimal combination of process conditions for each of its products. And after nearly 100 years, this pursuit of optimization has accrued a wealth of technology and expertise from which the NGK Group draws its competitive strength.

Ceramic manufacturing is patient, methodical work, which requires you to blow life into inanimate material that is hard and brittle.

There are three stages by which raw materials become products, and each requires advanced technologies.

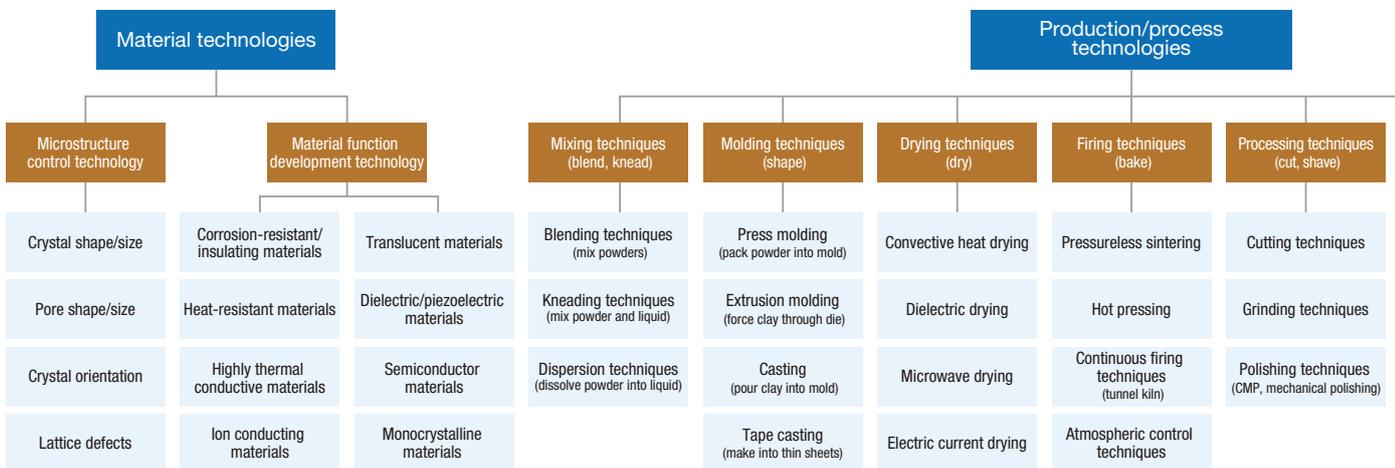
- 1 **Selecting and blending the raw materials on which the product is based: Mixing and kneading**
- 2 **Molding the product: Shaping**
- 3 **Firing the product so as to realize the optimal crystalline structure: Baking**

Particles of the powdered raw materials that form ceramics have a diameter of just 1/1,000 of a millimeter. If the particles are too large, it will take too long to fire them, and if they are too small, they will exhibit cracking and variability. If particles of different sizes are mixed together, distortion may result. The optimal raw materials must be chosen from tens of thousands of possibilities and blended together.

The blended raw materials are molded using a method that suits the shape of the product and fired in a kiln. Upon firing, the particles of raw materials fuse together and contract, causing finished products to shrink by about 25% for insulators and about 10% for HONEYCERAM®. The key priority is to create uniform, appropriate gaps between powder particles during the molding stage. Failure to do so will result in variability in how the product shrinks when fired, causing its shape to change. Temperature distribution in the kiln is also important. The powdered raw materials harden to create minuscule crystals, and the structure of these crystals determines a ceramic product's characteristics. That crystallization process is influenced by the temperature and duration of the firing process. If temperature variations inside the kiln create differences in how firing proceeds, the finished product will not be uniform.

In this way, high-performance ceramic products can only be produced if a variety of conditions are satisfied at every stage of manufacture. It is like a complex jigsaw puzzle. The breadth of accumulated technologies and expertise is the source of the NGK Group's competitive strength.

### Core Technologies of the NGK Group



## Embracing the challenge of developing new products by inheriting and improving distinctive technologies

I have been involved with developing the ceramic electrode plates that lie at the heart of the EnerCera® lithium-ion rechargeable battery. Currently, I am working to develop mass-production processes and more advanced material technologies. My goal is to create materials with even higher capacity and greater durability and thermal resistance.

The NGK Group's distinctive technologies—crystalline orientation control technology and multi-ceramics lamination technology—made it possible to develop the EnerCera battery. These technologies emerged during the study of piezoelectric materials that could control the flow of ink when the NGK Group was developing piezoelectric micro-actuators for use in inkjet printers more than 20 years ago. We accumulated expertise as we were applying the technologies to various products, and they were incorporated into the development of the EnerCera battery, which I was a part of.

NGK's organizational culture, one that encourages to never to give up, underpinned this long-term development program. Every day I see how this environment helps us consider how a technology can be taken advantage of in other ways, even if it does not yield results immediately in the form of a product. For example, the extrusion molding technology and thin-film technology used in HONEYCERAM originated decades ago, but even today engineers continue to refine associated knowledge. The process of inheriting and improving technologies in an unbroken chain from those who came before us leads directly to the development of leading-edge products.

I believe that not only tenacious effort, but also connections to a variety of people are important. If we were to list them all, the technologies we handle comprise more than 100 fields, and no single person can grasp them all. However, the NGK Group has not only a base of accumulated technologies, but also many talented engineers. I often gain hints from people with

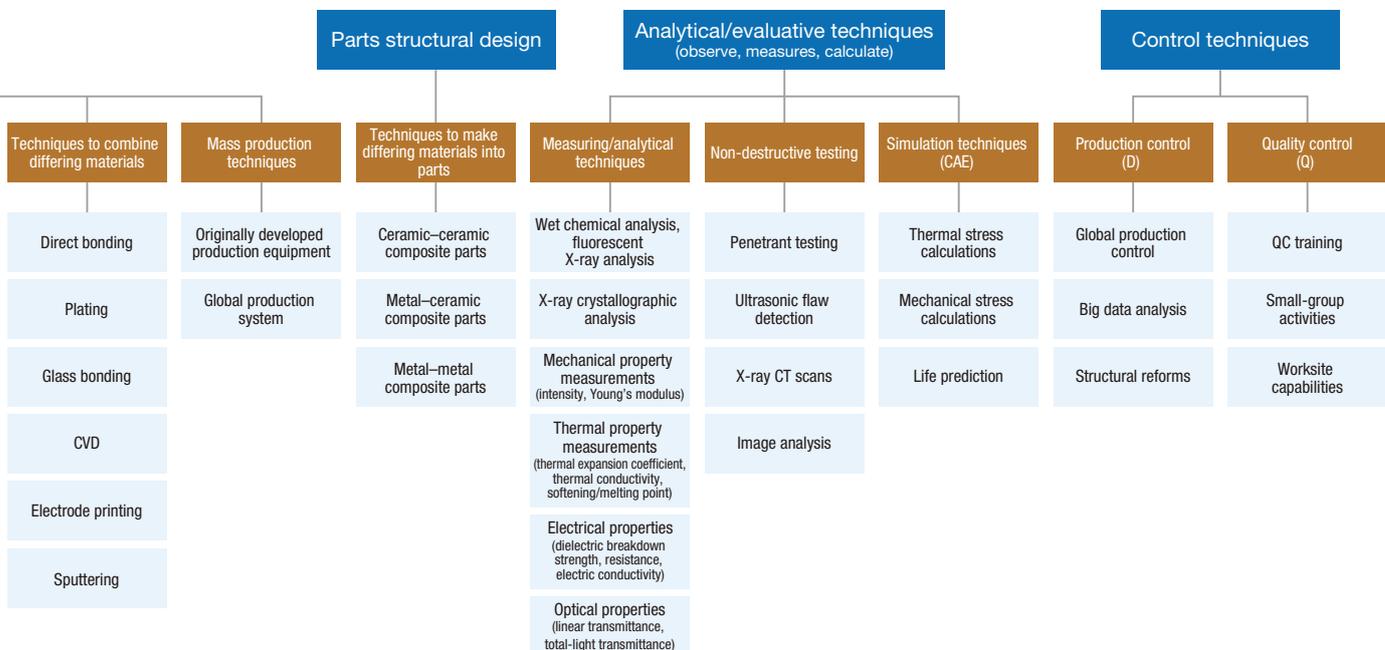
specialized knowledge in different fields, and I am fast to seek advice since it helps me refine ideas in my development work. This approach proved useful in the development of the EnerCera battery, too.

After studying the basics of metals, ceramics, and other materials during my student days, I joined NGK in 2008 because I wanted to be involved with developing new materials from the beginning. Since that time, I had been eager to show my family and friends a product that I helped develop, and that dream finally came true with the EnerCera battery.

Going forward, I hope to be involved in developing a completely new technology. I want to come up with a technology that will become a major source of revenue for NGK, for example by combining ceramic technology with recycling and effective resource use.



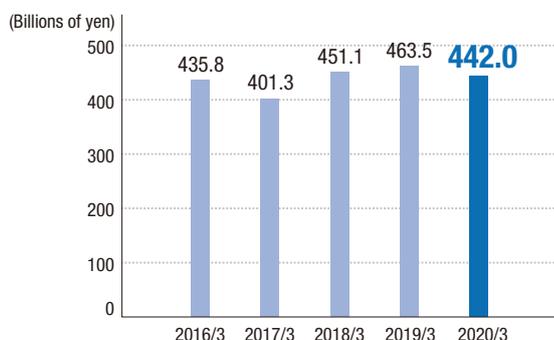
**Naoto Ohira**  
Senior Engineer, CCD Project, Corporate R&D



## Overview of Business Results and Management Policies

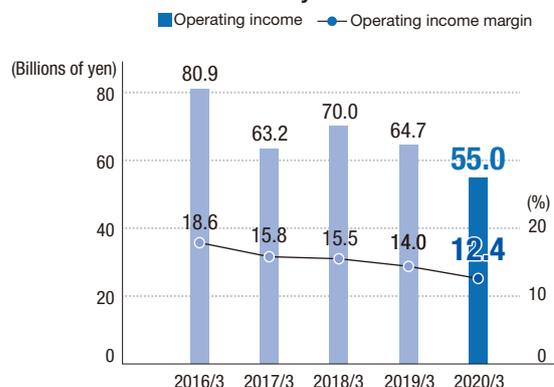
### Net Sales

442.0 billion yen 



### Operating Income, Operating Income Margin

55 billion yen 



## Overview of Business Results for the Fiscal Year Ended March 2020

### Power Business

Insulator demand fell in Japan and overseas. Losses shrank due to factors including a reduction in expenses associated with closures of overseas bases.

### Ceramics Business

Net sales remained largely unchanged from the previous fiscal year as declines in automobile production and sales volume combined with a strong yen to offset growth in gasoline particulate filter (GPF) demand due to governments' adoption of stricter exhaust regulations. Profits fell due to factors including an increase in depreciation and amortization.

### Electronics Business

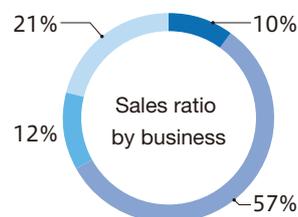
Revenue fell as profits rose slightly, reflecting a decline in ceramic package quantity and sluggish performance by Soshin Electric.

### Process Technology Business

Revenue and profits fell compared to the previous fiscal year due primarily to decline in demand for semiconductor manufacturing equipment products.

### Extraordinary Losses

The NGK Group recognized an impairment loss on fixed assets totaling 12.6 billion yen during the fiscal year ended March 2020 (including a 9.7 billion yen loss in the subsidiary manufacturing automotive ceramics in Thailand and a 2.2 billion yen loss in the package business). (During the fiscal year ended March 2019, the NGK Group recognized a fixed-asset impairment loss of 10.9 billion yen and a loss on business subsidiaries and associates of 3.0 billion yen.)



## Targeted Management Indicators and Capital Policy

Regarding the return on invested capital (ROIC), the key management indicator relevant to ROE, which is an important indicator of business performance, the NGK Group promotes management with a focus on capital efficiency. Towards a medium- to long-term target ROE of at least 10%, we will implement a capitalization strategy that is conducive to a sustained enhancement of corporate value by accommodating changes in business risks. In addition to reducing capital costs through communication with shareholders and investors, the NGK Group will secure earnings beyond capital costs by utilizing ROIC for business planning and decision-making processes for capital

investment, using business resources to expand core businesses and reduce their costs, and investing efficiently in development and new businesses.

In addition, we will take a proactive approach to shareholder returns by referring to key indicators including the dividend payout ratio and the dividend on equity (DOE) ratio. Through these measures, while seeking to maintain financial soundness, we will aim to maintain good levels of profitability measured by ROE, capital turnover, and financial leverage consistent with our business strategies.

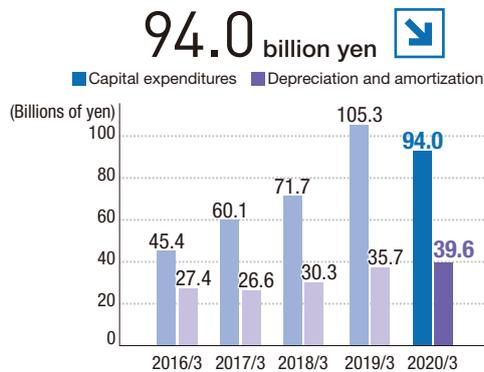
## Dividend Policy

NGK places a high priority on the interests of shareholders and positions continuous improvement of corporate value and return of profits as one of the most important management policies. NGK regards return on equity (ROE) that exceeds the cost of capital as an essential medium- to long-term goal for its major management indicators and is working to make improvements by using the NGK version of ROIC (calculating operating income, equipment, inventory, and accounts receivable by product), which can be managed by each business segment. NGK pays cash

dividends with a dividend rate of 3% on net assets and a consolidated dividend payout ratio of approximately 30% over the medium term. This takes into consideration the management of net assets in line with changes in business risks and the linkage to business results (ROE) for approximately three years, as well as cash flow forecasts and other factors.

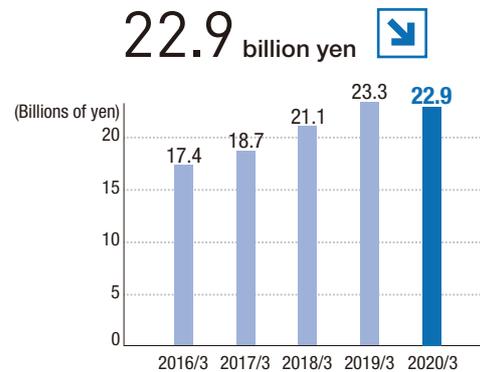
Meanwhile, NGK plans to utilize retained funds primarily to extend its existing core business and capital expenditures in new business projects, with a view to enhancing its corporate value.

## Capital Expenditures, Depreciation and Amortization



During fiscal 2019, the NGK Group made overall capital expenditures totaling 94.0 billion yen, with a focus on production equipment related to automotive-related ceramic products and semiconductor manufacturing equipment. We expect large-scale capital expenditures to decrease gradually after having peaked in fiscal 2019, and we will work steadily to recover those expenditures during fiscal 2020 and beyond.

## R&D Expenses

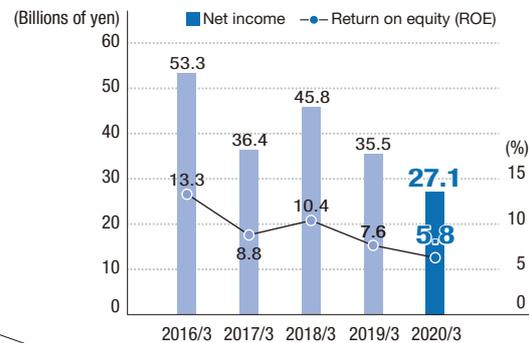


NGK strives to invest 4% to 6% of net sales in R&D, where spending totaled 22.9 billion yen (5.2% of net sales) in fiscal 2019. Going forward, we will strive to ensure that at least 30% of consolidated net sales comes from new products. We have set a company-wide “Keep up 30” goal to maintain this percentage in the future and are focused on creating new products and businesses based on the input of R&D funding.

## Return on Equity (ROE), Net Income Attributable to Owners of the Parent

ROE in fiscal 2019 was 5.8% (down 1.8 points compared to the previous fiscal year), reflecting a decline in operating income as well as an impairment loss due to factors such as the COVID-19 pandemic. Although that figure falls below our target of at least 10%, we will continue work to maintain and improve this indicator.

ROE **5.8%**  Net income **27.1 billion yen** 



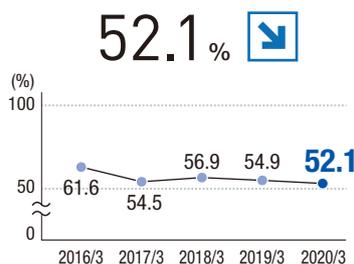
### Profit Margin

This figure is calculated by dividing net income attributable to owners of the parent by net sales. In fiscal 2019, the decline in profit exceeded net sales due to factors such as an impairment loss, pushing the profit margin to 6.1% (down 1.6 points compared to the previous fiscal year).



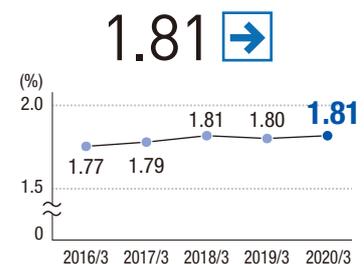
### Asset Turnover

This figure is calculated by dividing net sales by the average of net assets at the beginning and end of the fiscal year. In fiscal 2019, asset turnover was 52.1% (down 2.8 points compared to the previous fiscal year) due primarily to the effects of a decline in net sales.



### Financial Leverage

This figure is calculated by dividing the average of net assets at the beginning and end of the fiscal year by average net worth\*. In fiscal 2019, financial leverage was 1.81 (up 0.01 points from the previous fiscal year).

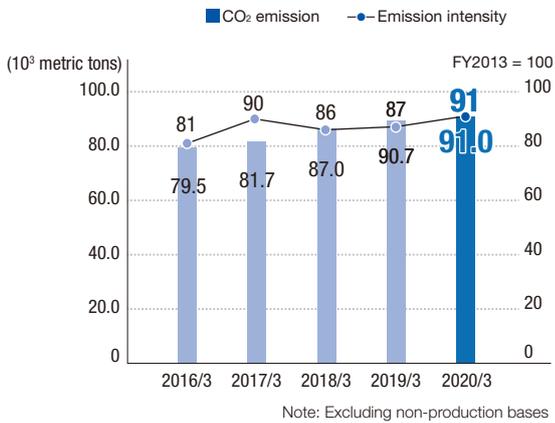


\*Average at the beginning and end of the fiscal year

## Non-Financial Highlights

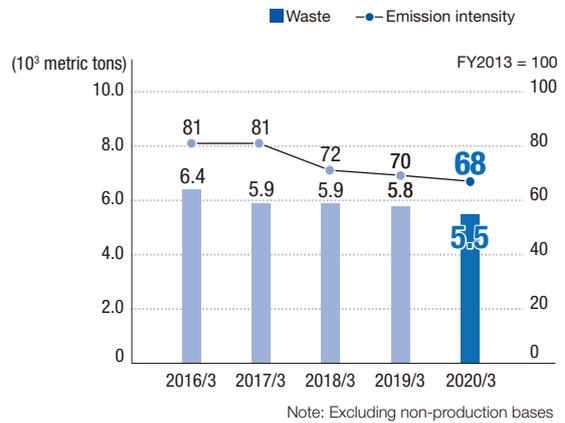
### CO<sub>2</sub> Emission Intensity of Sales

CO<sub>2</sub> emission  
**910,000** metric tons 



### Waste Intensity of Sales

Waste  
**55,000** metric tons 



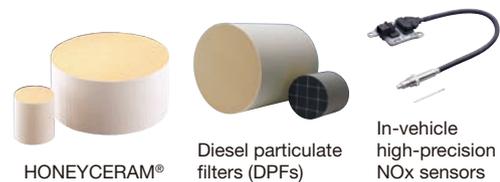
### Environmental/Social Contribution through Products

We in the NGK Group believe that our business is in itself a means to making the world's environment and society better. We aim to decrease environmental impact by promoting the further spread of products contributing to environmental protection.

Definition of NGK products contributing to environmental protection:

- 1) Certified or awarded by third-party institutions
- 2) Control or reduce impact on the Earth's environment
- 3) Reduce impact on the local environment

#### Automotive Exhaust Purification



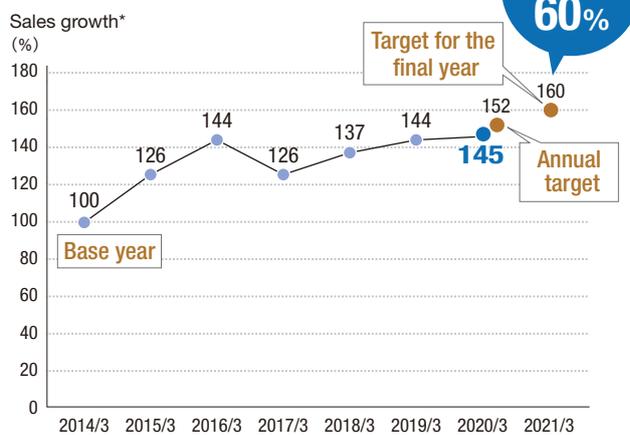
#### Contributing to the Spread of Renewable Energy



#### Safe Treatment of Low-level Radioactive Waste



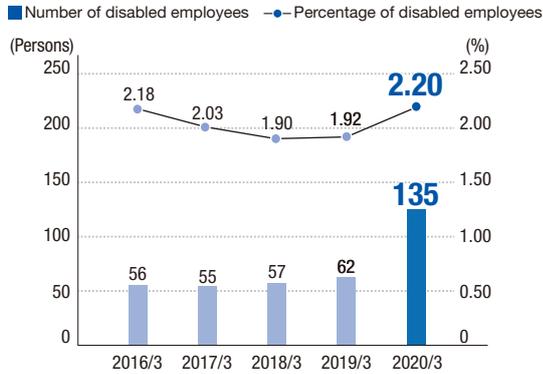
#### Sales growth for products contributing to environmental protection (NGK Group)



Number of Disabled Employees,  
Percentage of Disabled Employees

Number of disabled employees **135** 

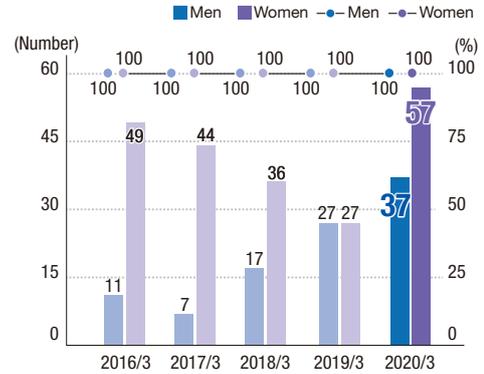
Percentage of disabled employees (NGK) **2.20%** 



Number of Parental Leave Takers, Retention Rate

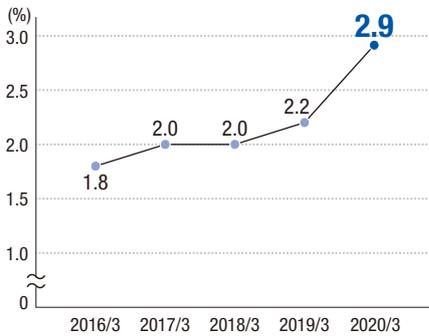
Number of parental leave takers **94** 

Retention rate (NGK) **100%** 



Percentage of Women Managers (NGK)

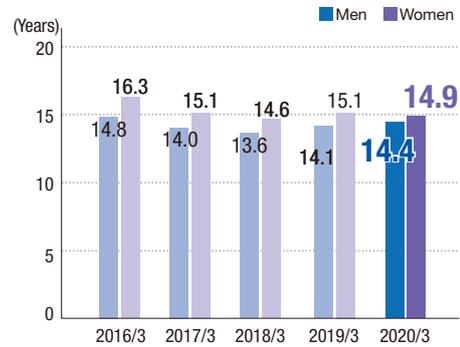
**2.9%** 



Average Duration of Continuous Employment (NGK)

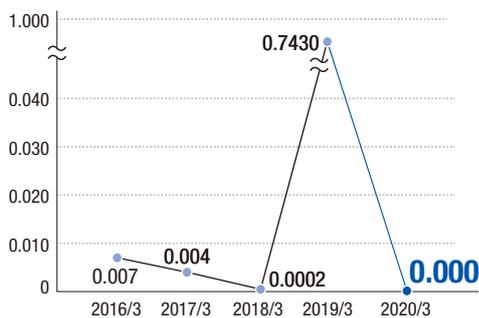
Men **14.4 years** 

Women **14.9 years** 



Severity Rate (Number of Lost Work Days per 1,000 Work Hours) (NGK)

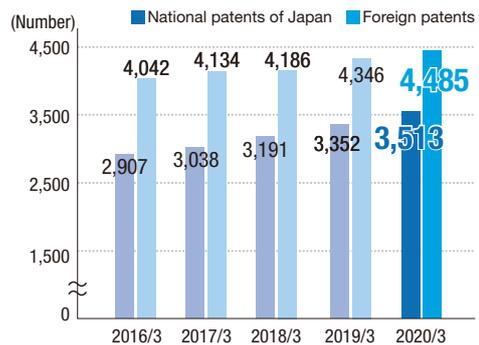
**0.000** 

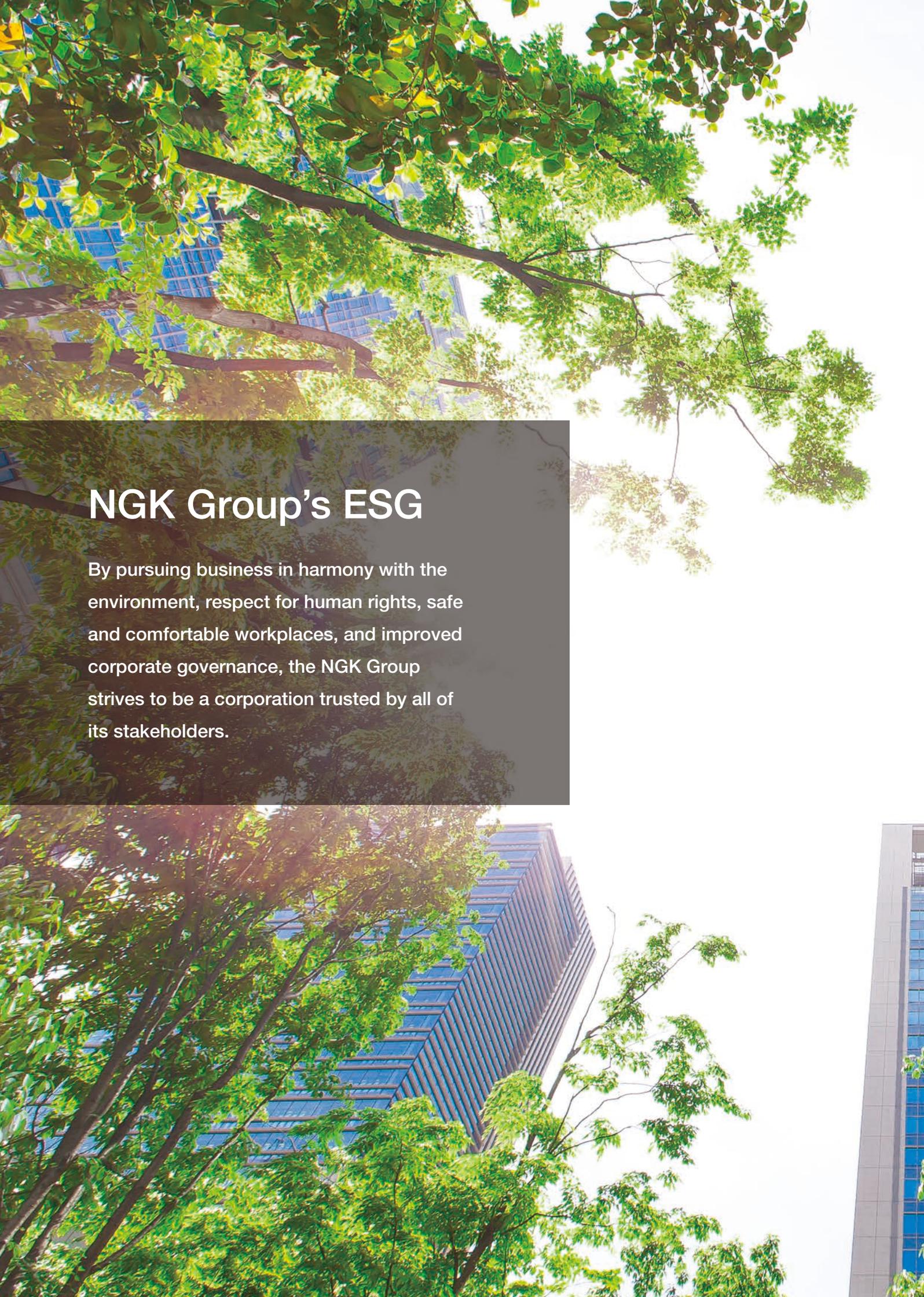


Number of Patents Held

National patents of Japan **3,513** 

Foreign patents **4,485** 





# NGK Group's ESG

By pursuing business in harmony with the environment, respect for human rights, safe and comfortable workplaces, and improved corporate governance, the NGK Group strives to be a corporation trusted by all of its stakeholders.



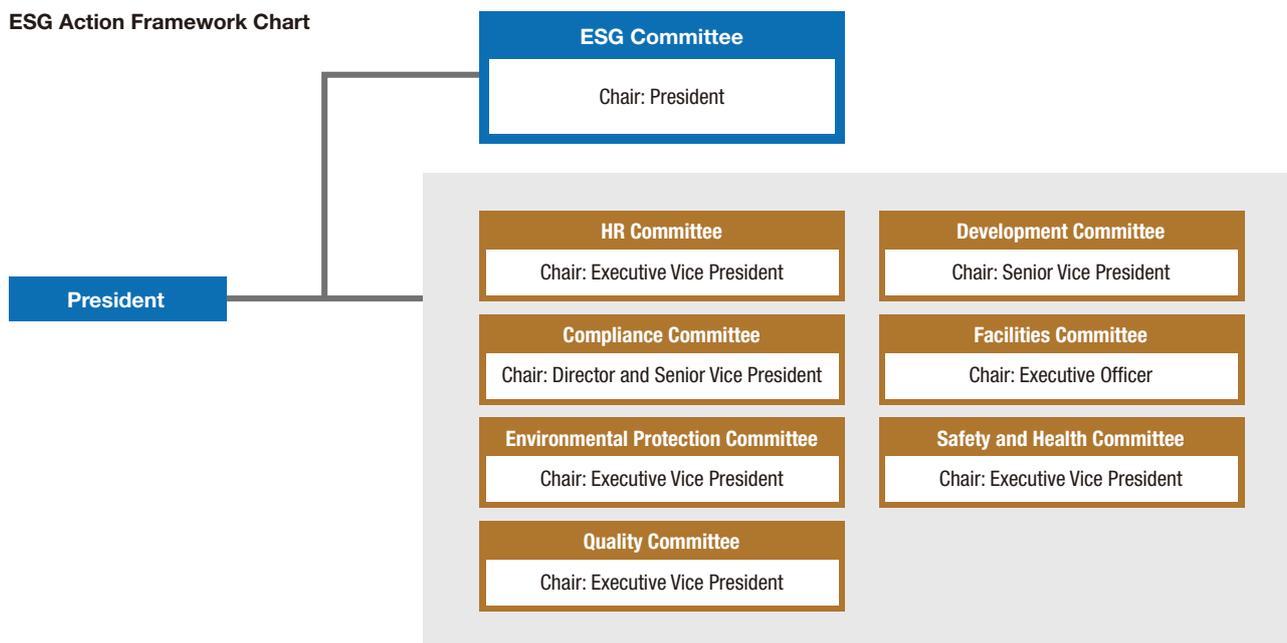
## ESG Management

To help realize the Sustainable Development Goals (SDGs) adopted by the United Nations, the NGK Group seeks to provide new value to society with our unique technology, thus contributing to the realization of a sustainable world and winning positive expectations and trust among society. All those who work in the NGK Group respect human rights and comply with the law by acting on a foundation of fair values and internationally recognized norms of judgment.

### ESG Action Framework

In April 2019, the ESG Committee was established with the president serving as its chair. In line with the Group Philosophy, this committee deliberates on management issues pertaining to ESG. In fiscal 2020, other NGK committees discussed ESG issues in their functions.

ESG Action Framework Chart



### Fiscal 2019 ESG Committee Achievements

Session	Date	Agenda
1st	April 11, 2019	<ul style="list-style-type: none"> <li>Formulate basic concept of ESG Committee</li> <li>Analyze other companies' trends</li> </ul>
2nd	July 4, 2019	<ul style="list-style-type: none"> <li>Plan environmental, quality, health and safety, and compliance activities</li> <li>Analyze ESG corporate rankings</li> </ul>
3rd	September 25, 2019	<ul style="list-style-type: none"> <li>Discuss risk management issues</li> <li>Plan community service activities</li> </ul>
4th	December 18, 2019	<ul style="list-style-type: none"> <li>Make long-term environmental plan</li> </ul>
5th	March 19, 2020	<ul style="list-style-type: none"> <li>Step up risk management</li> <li>Plan ESG information disclosure</li> </ul>

## Key ESG Action Themes

At the first ESG Committee session in fiscal 2020, we decided on the key action themes for the fiscal year.

Key themes	Main activities	Activity leader
Human rights protection	<ul style="list-style-type: none"> <li>• Formulate human rights policies</li> <li>• Carry out human rights due diligence</li> </ul>	<ul style="list-style-type: none"> <li>• HR Committee</li> </ul>
Climate change countermeasures	<ul style="list-style-type: none"> <li>• Formulate next term's environmental action plan and environmental vision</li> <li>• Plan specific action on TCFD</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental Protection Committee</li> <li>• Task force</li> </ul>
Support for ESG in supply chain	<ul style="list-style-type: none"> <li>• Disseminate CSR procurement policy</li> </ul>	<ul style="list-style-type: none"> <li>• Task force</li> </ul>
Revamping of governance system	<ul style="list-style-type: none"> <li>• Study framework giving clearer separation of execution and supervision</li> <li>• Strengthen risk management system</li> </ul>	<ul style="list-style-type: none"> <li>• Task force</li> </ul>
Contribution to SDGs from new business	<ul style="list-style-type: none"> <li>• Assess development themes from an SDG standpoint</li> </ul>	<ul style="list-style-type: none"> <li>• Development Committee</li> </ul>
Implementation of ESG-related capital investment	<ul style="list-style-type: none"> <li>• Plan environment-related capital investment</li> <li>• Spread barrier-free facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Facilities Committee</li> </ul>
ESG information disclosure (integrated report, securities report)	<ul style="list-style-type: none"> <li>• Increase number and depth of disclosure items</li> </ul>	<ul style="list-style-type: none"> <li>• Task force</li> </ul>
Concept of community service activities	<ul style="list-style-type: none"> <li>• Plan NGK Foundation for International Students and international student center activities</li> </ul>	<ul style="list-style-type: none"> <li>• Task force</li> </ul>

Note: Task forces are project teams comprising members of relevant business divisions.

## NGK Group Signs UN Global Compact

The NGK Group is a signatory to the United Nations Global Compact, which advocates for independent action on the part of companies. We believe that addressing a broad range of social problems through our business activities, while measuring progress against indicators such as the SDGs, is an important corporate social responsibility.

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



## Position on SDGs

Ever since its foundation, the NGK Group has pursued business in the energy, ecology, and electronics sectors in efforts to keep nature's air and water clean and thus help people live a comfortable, healthy life. Many of our technologies and products

contribute to the SDGs, and we will continue to provide new value by leveraging our unique ceramic technology towards the realization of a sustainable society.



## Corporate Governance

The NGK Group 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.

### Basic Policies

To ensure appropriate operations and transparent management, the NGK Group 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 system anchored by an Audit & Supervisory Board. In addition to the General Meeting of Shareholders, the Board of Directors, and the Audit & Supervisory Board, NGK corporate governance includes the Executive Committee and several other committees established to assist the president in management decision-making. These bodies help to enhance governance

efficacy by deliberating and reviewing important matters.

In recognition of needs to execute swift and optimal decision-making and respond promptly to changes in the operating environment, NGK introduced an executive officer system, thus separating the management decision-making and supervision functions from business execution functions, and clearly defining the responsibilities of both.

Furthermore, to strengthen the supervision and monitoring functions of the Board of Directors, major committees among those tasked with mitigating the various risks surrounding NGK are obligated to report to the Board of Directors. NGK has also established a committee scheme, including a Nomination and Compensation Advisory Committee, a Corporate Council, a

### A Audit & Supervisory Board

Constituent members: 4

Number of meetings in fiscal 2019: 14

The Audit & Supervisory Board is comprised of members from both within and outside of NGK who attend Board of Directors meetings and other important meetings. At those meetings they are able to audit the directors' decision-making process and execution of duties, confirm the status and operation of the company's internal control system, and review the appropriateness of accounting auditors' auditing methods and results.

### B Corporate Council

Constituent members: 8

Number of meetings in fiscal 2019: 3

The Corporate Council is comprised of outside directors, the president, and executive vice presidents. It serves as a vehicle for outside directors to offer advice to senior management on a variety of management-related issues.

### C Conference of Outside Directors and Outside Audit & Supervisory Board Members

Constituent members: 5

Number of meetings in fiscal 2019: 2

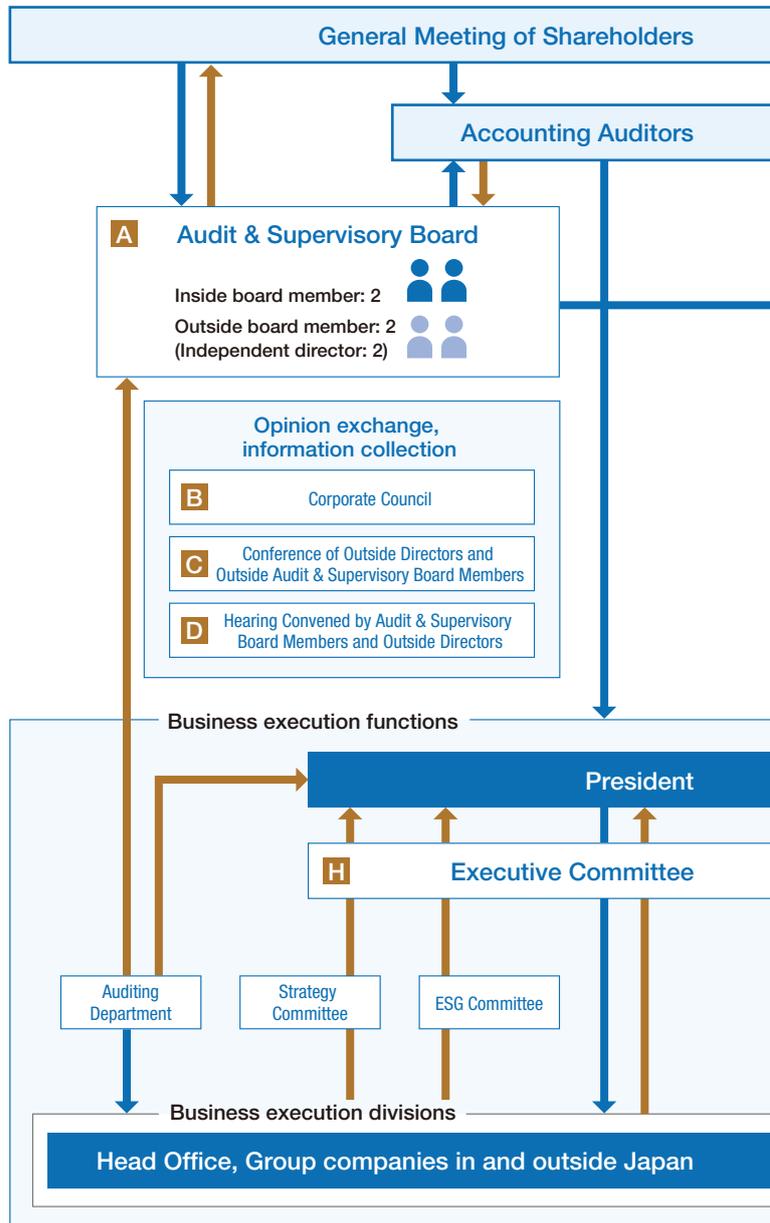
This conference is comprised of outside directors who exchange opinions concerning managerial issues and other matters, aiming to actively contribute to discussions at the Board of Directors' meetings.

### D Hearing Convened by Audit & Supervisory Board Members and Outside Directors

Constituent members: 7

Number of meetings in fiscal 2019: 7

This hearing is comprised of Audit & Supervisory Board members and outside directors. Information is collected from the personnel in charge within each division regarding the business environment and issues of NGK.



Conference of Outside Directors and Outside Audit & Supervisory Board Members, and a Business Ethics Committee to ensure the effectiveness of the Corporate Governance Code.

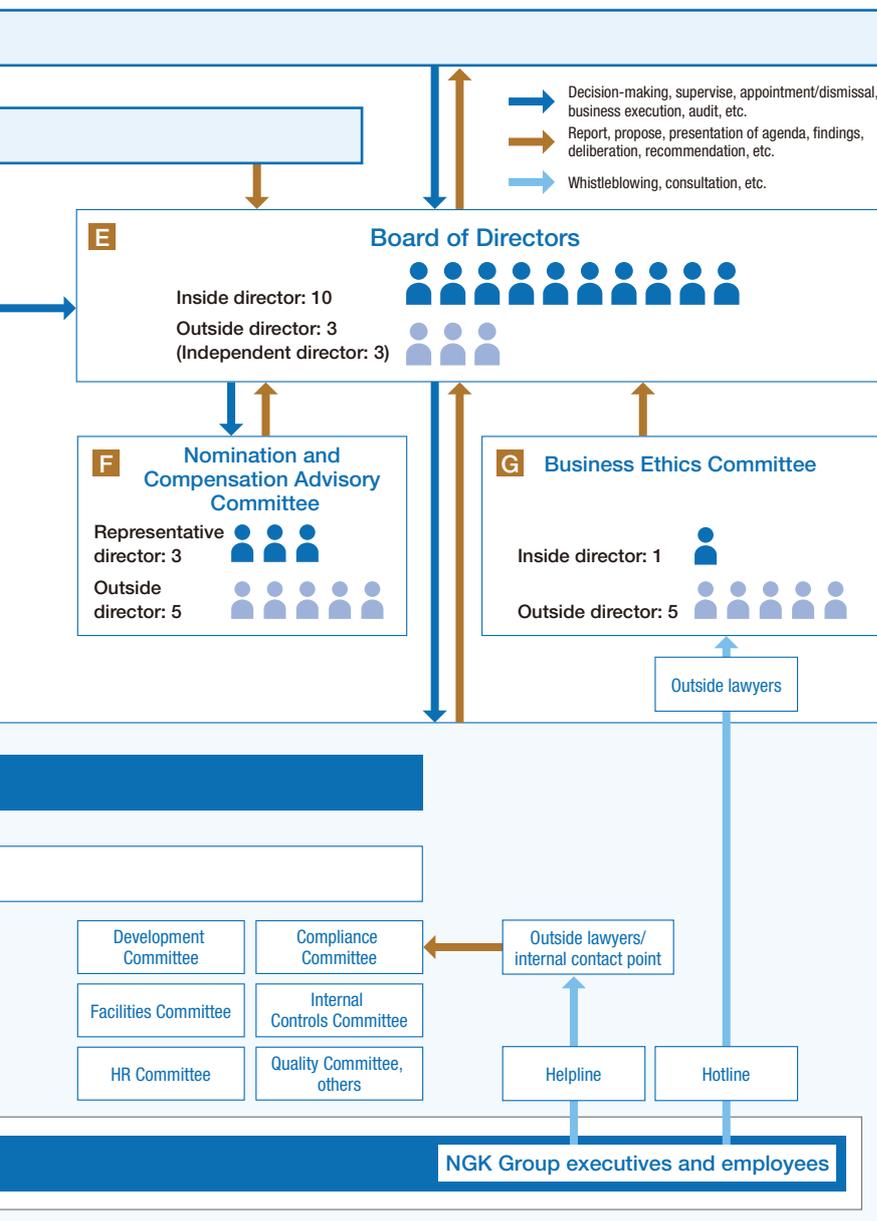
In addition, we have formulated the NGK Group Code of Conduct to stipulate how everyone working for the NGK Group should execute their jobs so that they abide by society's laws and the company's articles of incorporation and comply with corporate

ethics. All executives and employees are well versed in the code and are obligated to abide by it. To reflect changes in society since the previous revision, in January 2019 the NGK Group Code of Conduct was revised with an emphasis on respect for human rights, thorough compliance, and the realization of a sustainable society through business activities.

## Corporate Governance System

To ensure lawful business activities and management transparency, respond quickly to changes in the management environment, and

create and maintain a fair management system from the shareholder's perspective, NGK has created the following systems.



### E Board of Directors

**Constituent members: 13**

**Number of meetings in fiscal 2019: 14**

The directors who make up the Board of Directors deliberate and decide upon matters prescribed under the Companies Act, NGK's articles of incorporation, and other such authoritative sources, as well as upon important management-related matters. The Board also monitors the job performance of all company directors.

### F Nomination and Compensation Advisory Committee

**Constituent members: 8**

**Number of meetings in fiscal 2019: 2**

Comprising outside directors and representative directors, this committee deliberates on matters related to the appointment of directors and Audit & Supervisory Board members, remuneration of directors, executive officers, and Audit & Supervisory Board members, and Chief Executive Officer succession planning.

### G Business Ethics Committee

**Constituent members: 6**

**Number of meetings in fiscal 2019: 5**

This committee is comprised of outside directors and an inside director in charge of compliance. Its members look for fraud or illegalities involving officers and others of NGK, as well as monitor compliance with competition laws and the Foreign Corrupt Practices Act.

### H Executive Committee

**Constituent members: 18**

**Number of meetings in fiscal 2019: 21**

Comprising the president, directors, Audit & Supervisory Board members, and executive officers and division heads designated by the president, this body deliberates the matters necessary to help the president with decision-making.

## Corporate Governance

### Corporate Governance Enhancement

Ongoing structural enhancements aimed at strengthening corporate governance include the introduction of an executive officer system and an outside director system to improve the

management supervision and monitoring functions and facilitate recommendations with respect to overall management.

April 1999	Formulated the NGK Code of Conduct
April 2003	Revised guidelines into the NGK Group Code of Conduct
June 2005	Introduced an executive officer system
	Introduced a stock option
	Introduced an outside director system
July 2005	Established the CSR Committee
April 2007	Established the CSR Office
June 2010	Appointed independent directors
July 2011	Revised the NGK Group Code of Conduct

April 2015	Signed on to the UN Global Compact
June 2015	Established the Global Compliance Office
December 2015	Established the Nomination and Compensation Advisory Committee, Corporate Council, Conference of Outside Directors and Outside Audit & Supervisory Board Members, and Business Ethics Committee
June 2017	Appointed one additional outside director
October 2018	Appointed a chief compliance officer
January 2019	Revised the NGK Group Code of Conduct
April 2019	Established the ESG Committee
April 2020	Established the Compliance Committee Established the HR Committee

Reference  
URL

**Corporate Governance Report**

[https://www.ngk-insulators.com/en/resource/pdf/sustainability/governance\\_en.pdf](https://www.ngk-insulators.com/en/resource/pdf/sustainability/governance_en.pdf)



## Key Focuses of the Board of Directors

The Board of Directors focuses primarily on deliberating and deciding matters (such as company-wide unified budgeting; strategic planning such as dissolution, mergers, and alliances of the company; appointing and removing representative directors; approval of financial statements, business reports, etc.); the

disposal and acceptance of transfer of important assets; and the appointment and dismissal of an important employee ) prescribed under the Companies Act, NGK's articles of incorporation, and the governing rules of the Board of Directors. The Board also monitors the job performance of all company directors.

The following are key matters the Board of Directors deliberated and voted on in fiscal 2019.

(Voting matters)

- Budgeting and account settlement
- Establishment, dissolution, and liquidation of Group companies; investment in joint ventures
- Capital investment in production facilities and equipment
- Sale of cross-shareholdings

(Deliberation matters)

- Vision formulation procedures
- Activity status of new/reformed manufacturing structures
- Status and challenges of Group information systems
- Various committee reports (CSR Committee, Internal Controls Committee, Environmental Protection Committee, Quality Committee, Safety and Health Committee, etc.)

## Evaluation on the Effectiveness of the Board of Directors

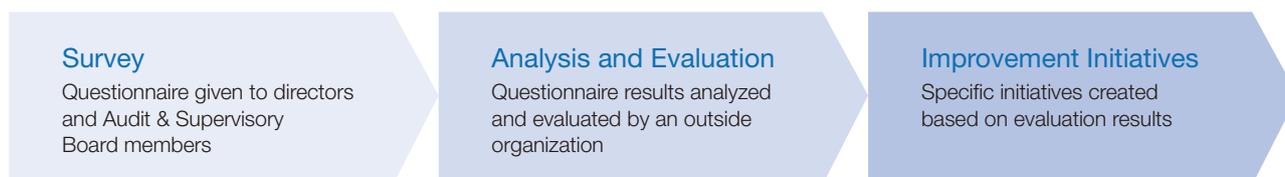
With regard to its effectiveness, the Board of Directors issues a survey at the end of every fiscal year to directors and Audit & Supervisory Board members. The results are reported at the Board of Directors' meeting, after the analysis and evaluation by an external organization, and NGK implements specific initiatives to enhance the effectiveness of the Board of Directors based on issues identified in the results of this evaluation.

Regarding the evaluation of the Board of Directors conducted in fiscal 2019, a survey with a total of 50 questions and an open-ended section was conducted in April 2020, and the results thereof were reported at a meeting of the Board of Directors. Regarding the overall evaluation, the comments at right were received from the external organization.

Based on the results of this evaluation, NGK will continue endeavoring to maintain and strengthen the effectiveness of the Board of Directors, including implementing specific measures suited to actual circumstances at the Company.

- The foundational elements required of the Board of Directors have been maintained, such as leadership, commitment, and its sound culture and operation. The Board of Directors also raised additional issues in order to make improvements.
- Owing to the above, the external organization considers that the Board of Director possesses sustained effectiveness.
- On top of issues previously identified, including the understanding of risks for important, large-scale projects, and the analysis of past management decisions, new issues were identified regarding the functions and composition of the Board of Directors, as well as the necessity of a medium- to long-term strategy.
- More in-depth discussions on the ideal functions and composition of the Board of Directors are expected to contribute to further improvements in the effectiveness of the Board of Directors.

### Measures to Boost Effectiveness



## Corporate Governance (Management System)

### Board of Directors (as of June 30, 2020)



**Taku Oshima**  
President

Attendance at Board of Directors meetings  
100% (14/14)

March 1980 Joins NGK  
June 2007 Appointed as vice president  
June 2011 Appointed as senior vice president  
June 2014 Appointed as president (incumbent)



**Hiroshi Kanie**  
Executive Vice President

Attendance at Board of Directors meetings  
100% (14/14)

March 1981 Joins NGK  
June 2010 Appointed as vice president  
June 2012 Appointed as senior vice president  
June 2014 Appointed as director and senior vice president  
June 2018 Appointed as executive vice president (incumbent)

Responsible for Corporate Planning Office, New Business Planning Dept., Secretarial Office, Corporate Communications Dept., Human Resources Dept., and General Affairs Dept.; Senior Officer in charge of Group Companies; HR Committee Chair; General Manager, Osaka Branch



**Chiaki Niwa**  
Executive Vice President

Attendance at Board of Directors meetings  
100% (14/14)

March 1984 Joins NGK  
June 2013 Appointed as vice president  
June 2015 Appointed as director and executive officer  
June 2016 Appointed as director and senior vice president  
June 2020 Appointed as executive vice president (incumbent)

Responsible for Corporate R&D Group, Corporate Manufacturing Engineering Dept., Quality Management Dept., Environmental Management Dept., Safety and Health Management Dept., and Information Systems Dept.; Chair of Quality Committee, Environmental Protection Committee, and Safety and Health Committee



**Susumu Sakabe**  
Director and Senior Vice President

Attendance at Board of Directors meetings  
100% (14/14)

March 1981 Joins NGK  
June 2007 Appointed as vice president  
June 2010 Appointed as director and executive officer  
June 2011 Appointed as director and senior vice president (incumbent)

Responsible for Finance & Accounting Dept. and Purchasing Dept.; General Manager, Tokyo Main Office



**Ryohei Iwasaki**  
Director and Senior Vice President

Attendance at Board of Directors meetings  
100% (14/14)

March 1982 Joins NGK  
June 2008 Appointed as vice president  
June 2009 Appointed as director and executive officer  
June 2012 Appointed as director and senior vice president (incumbent)

Group Executive, Process Technology Business Group



**Shuhei Ishikawa**  
Director and Senior Vice President

Attendance at Board of Directors meetings  
100% (14/14)

March 1984 Joins NGK  
June 2010 Appointed as vice president  
June 2014 Appointed as senior vice president  
June 2015 Appointed as director and senior vice president (incumbent)

Group Executive, Electronics Business Group



**Nobumitsu Saji**  
Director and Senior Vice President

Attendance at Board of Directors meetings  
100% (14/14)

March 1984 Joins NGK  
June 2013 Appointed as vice president  
June 2014 Appointed as director and executive officer  
June 2015 Appointed as director and senior vice president (incumbent)

Chief Compliance Officer; responsible for Auditing Dept., Group Compliance Dept., Legal Dept., and Intellectual Property Dept.; Chair of Compliance Committee and Internal Controls Committee



**Atsushi Matsuda**  
Director and Senior Vice President

Attendance at Board of Directors meetings  
100% (14/14)

March 1985 Joins NGK  
June 2012 Appointed as vice president  
June 2017 Appointed as senior vice president  
June 2018 Appointed as director and senior vice president (incumbent)

Group Executive, Ceramic Products Business Group; General Manager, Global Sales & Marketing Div., Ceramic Products Business Group; General Manager, Nagoya Site



**Shigeru Kobayashi**  
Director and Senior Vice President

Attendance at Board of Directors meetings  
Newly appointed

March 1983 Joins NGK  
June 2016 Appointed as vice president  
June 2018 Appointed as senior vice president  
June 2020 Appointed as director and senior vice president (incumbent)

Group Executive, Energy Infrastructure Business Group; General Manager, Komaki Site



**Tsutomu Nanataki**  
Director and Senior Vice President

Attendance at Board of Directors meetings  
Newly appointed

March 1986 Joins NGK  
June 2016 Appointed as vice president  
June 2019 Appointed as senior vice president  
June 2020 Appointed as director and senior vice president (incumbent)

Group Executive, Corporate R&D; Development Committee Chair



Independent Director  
**Hiroyuki Kamano**  
Outside Director

Attendance at Board of Directors meetings  
100% (14/14)

April 1971 Joins Ministry of Foreign Affairs  
April 1979 Trains at Legal Training and Research Institute, Supreme Court of Japan  
April 1981 Becomes registered attorney  
Oct. 1988 Becomes representative attorney, Kamano Sogo Law Offices (incumbent)  
June 2007 Appointed as outside Audit & Supervisory Board member, Komatsu Ltd.  
July 2007 Appointed as outside director, Sumitomo Life Insurance Company  
April 2009 Appointed as vice president, Tokyo Bar Association  
June 2011 Appointed as director, NGK (incumbent)  
June 2015 Appointed as outside audit & supervisory board member, House Foods Group Inc. (incumbent)  
June 2020 Appointed as outside director, Spancrete Corporation (incumbent)



Independent Director  
**Emiko Hamada**  
Outside Director

Attendance at Board of Directors meetings  
100% (14/14)

April 1984 Joins Taiyo Yuden Co., Ltd.  
Dec. 2001 Appointed as general manager, Quality Assurance Control R Technology Div., Engineering Group, Taiyo Yuden  
Sept. 2003 Appointed as chief engineer, Basic Research Div., General Research Laboratory, Engineering Group, Taiyo Yuden  
Nov. 2008 Appointed as associate professor, Center for Social Contribution and Collaboration, Nagoya Institute of Technology (NITech)  
April 2011 Appointed as professor, Center for Social Contribution and Collaboration, NITech, and professor for Master of Techno-Business Administration, NITech Graduate School  
April 2012 Appointed as professor, Center for Research on Assistive Technology for Building a New Community, NITech  
May 2015 Appointed as third-area program officer, A-STEP (Adaptable and Seamless Technology Transfer Program through Target-driven R&D), Japan Science and Technology Agency (incumbent)  
July 2016 Appointed as part-time lecturer, NITech (incumbent)  
Aug. 2016 Appointed as visiting professor, Nagoya University  
June 2017 Appointed as director, NGK (incumbent)  
June 2019 Appointed as outside director, Taiyo Yuden (incumbent)



Independent Director  
**Kazuo Furukawa**  
Outside Director

Attendance at Board of Directors meetings  
100% (11/11)  
Note: Attendance since assuming post on June 2019.

April 1971 Joins Hitachi, Ltd.  
April 2005 Appointed as representative executive officer, executive vice president, and executive officer; general manager and CEO, Information & Telecommunications Group; general manager, Export Control Div.; Hitachi  
April 2006 Appointed as representative executive officer and president, Hitachi  
June 2006 Appointed as director, representative executive officer, and president, Hitachi  
May 2007 Appointed as vice chair, Keidanren (Japan Business Federation)  
April 2009 Appointed as director, representative executive officer, and vice chair, Hitachi  
June 2009 Appointed as special advisor, Hitachi  
June 2011 Appointed as president, Information Processing Society of Japan  
Oct. 2011 Appointed as chair, New Energy and Industrial Technology Development Organization  
June 2019 Appointed as director, NGK (incumbent)  
Aug. 2019 Appointed as outside director (Audit & Supervisory Committee member), Pasona Group Inc. (incumbent)

## Audit & Supervisory Board (as of June 30, 2020)



**Ken Sugiyama**  
Audit & Supervisory Board Member

Attendance at Board of Directors meetings 100% (14/14)  
Attendance at Audit & Supervisory Board meetings 100% (14/14)

March 1980 Joins NGK  
July 2002 Appointed as general manager, Finance Dept.  
April 2007 Appointed as general manager, Auditing Dept.  
June 2015 Appointed as Audit & Supervisory Board member (incumbent)



**Takeshi Shimazaki**  
Audit & Supervisory Board Member

Attendance at Board of Directors meetings 100% (11/11)  
Attendance at Audit & Supervisory Board meetings 100% (10/10)  
Note: Attendance since assuming post on June 2019.

March 1982 Joins NGK  
April 2010 Appointed as manager, Finance Dept.  
June 2015 Appointed as general manager, Auditing Dept.  
June 2019 Appointed as Audit & Supervisory Board member (incumbent)



Independent Director  
**Junichi Ito**  
Audit & Supervisory Board Member, Outside

Attendance at Board of Directors meetings 100% (14/14)  
Attendance at Audit & Supervisory Board meetings 100% (14/14)

April 1975 Joins The Mitsubishi Bank, Ltd. (now MUFG Bank, Ltd.)  
June 2002 Appointed as executive officer, The Bank of Tokyo-Mitsubishi, Ltd. (now MUFG Bank)  
May 2005 Appointed as managing executive officer, The Bank of Tokyo-Mitsubishi (now MUFG Bank)  
June 2005 Appointed as managing director, The Bank of Tokyo-Mitsubishi (now MUFG Bank)  
Jan. 2006 Appointed as managing director, The Bank of Tokyo-Mitsubishi UFJ, Ltd. (now MUFG Bank)  
May 2009 Appointed as senior managing executive officer, The Bank of Tokyo-Mitsubishi UFJ (now MUFG Bank)  
June 2011 Appointed as senior executive vice president, CFO and representative director, Nikon Corporation  
June 2016 Appointed as counselor, Nikon Corporation (incumbent)  
Appointed as outside Audit & Supervisory Board member, The Hyakujushi Bank, Ltd.  
June 2017 Appointed as outside director (Audit and Supervisory Committee member), The Hyakujushi Bank (incumbent)  
June 2018 Appointed as Audit & Supervisory Board member, NGK (incumbent)



Independent Director  
**Masayoshi Sakaguchi**  
Audit & Supervisory Board Member, Outside

Attendance at Board of Directors meetings 100% (11/11)  
Attendance at Audit & Supervisory Board meetings 100% (10/10)  
Note: Attendance since assuming post on June 2019.

April 1980 Joins the National Police Agency  
Feb. 1999 Appointed as chief of First Area Headquarters, Metropolitan Police Department  
Sept. 2001 Appointed as chief of Akita Prefectural Police Headquarters  
Jan. 2003 Appointed as chief Criminal Investigations, Osaka Prefectural Police Headquarters  
Oct. 2011 Appointed as chief of Osaka Prefectural Police Headquarters  
Jan. 2013 Appointed as commissioner-general's secretariat, National Police Agency  
Jan. 2015 Appointed as deputy commissioner-general, National Police Agency  
Aug. 2016 Appointed as commissioner-general, National Police Agency  
May 2018 Appointed as senior advisor, Nippon Life Insurance Company  
June 2019 Appointed as Audit & Supervisory Board member, NGK (incumbent)  
Appointed as vice president, Japan Automobile Federation (incumbent)

## Executive Officers (as of June 30, 2020)

**Hiroshi Kurachi** Senior Vice President  
General Manager, Sensor Div., Ceramic Products Business Group

**Hiroto Matsuda** Senior Vice President  
Group Vice Executive, Process Technology Business Group; General Manager, High Performance Ceramics Div.

**Tadaaki Yamada** Senior Vice President  
General Manager, Human Resources Dept., Diversity & Inclusion Dept.; in charge of General Affairs Dept.

**Akira Katoh** Senior Vice President  
Group Vice Executive, Electronics Business Group; General Manager, New Metals Div.; General Manager, Chita Site

**Masanobu Inoue** Vice President  
General Manager, Industrial Process Div., Process Technology Business Group

**Hiroharu Kato** Vice President  
President, NGK EUROPE GmbH

**Atsushi Miyajima** Vice President  
Group Executive, Corporate Manufacturing Engineering; Facilities Committee Chair

**Hideaki Shindo** Vice President  
General Manager, Finance & Accounting Dept.

**Jun Mori** Vice President  
General Manager, Manufacturing Div., Ceramic Products Business Group

**Hiroyuki Shinohara** Vice President  
General Manager, Corporate Planning Office; in charge of New Business Planning Dept.

**Iwao Ohwada** Vice President  
General Manager, Advanced Device Components Div., Electronics Business Group

**Tatsumi Ichioka** Vice President  
General Manager, Energy Storage Div., Energy Infrastructure Business Group

**Ryo Ishihara** Vice President  
General Manager, Secretarial Office; in charge of Corporate Communications Dept.

**Mayumi Inagaki** Vice President  
General Manager, Legal Dept.

**Hirofumi Sakamoto** Vice President  
General Manager, Engineering Div., Ceramic Products Business Group

## Corporate Governance

### Reasons for Appointment of Directors and Audit & Supervisory Board Members

(As of June 30, 2020)

Name	Age	Years in office	Reasons for appointment	Committee	
				Nomination and Compensation Advisory Committee	Business Ethics Committee
Taku Oshima	63	6	Has been serving as Representative Director and President since 2014 and has abundant experience at the Company and insights into business operations.	○	—
Hiroshi Kanie	62	6	Has served as Representative Director and Executive Vice President since 2018 and has ample experience at the Company and knowledge in business operations.	○	—
Chiaki Niwa	60	5	Has ample experience at the Company, as well as deep knowledge in project management and manufacturing technology.	○	—
Susumu Sakabe	61	10	Has abundant knowledge and experience in business operations at the Company.	—	—
Ryohei Iwasaki	60	11	Has ample experience at the Company and knowledge in business operations.	—	—
Shuhei Ishikawa	60	5	Has ample experience at the Company, as well as a wealth of knowledge and personal contacts gained in the Electronics Business Group.	—	—
Nobumitsu Saji	61	6	Has ample experience at the Company and global insight into the legal field.	—	○
Atsushi Matsuda	59	2	Has ample experience and expertise in business operations in the automobile field at the Company.	—	—
Shigeru Kobayashi	59	—	Has ample experience at the Company, as well as a wealth of knowledge and personal contacts gained in the Energy Infrastructure Business Group.	—	—
Tsutomu Nanataki	58	—	Has ample experience at the Company, as well as a wealth of knowledge in the research and development field.	—	—
Hiroyuki Kamano	74	9	Possesses a wealth of experience and achievements in the legal community, and has been offering suggestions to the Company's business operation and properly overseeing the management of the Company.	○	○
Emiko Hamada	61	3	By utilizing the insights she has developed through her career, has been appropriately offering suggestions to the Company's business operation and overseeing the management of the Company.	○	○
Kazuo Furukawa	73	1	With his insights and experience, has been offering suggestions to the Company's business operation and properly overseeing the management of the Company.	○	○
Ken Sugiyama	63	5	Has a wealth of financial, accounting, and auditing knowledge and experience and puts this to appropriate use in performing management-related audits as a member of NGK's Audit & Supervisory Board.	—	—
Takeshi Shimazaki	60	1	Recognized for his ability to apply his experience towards the performance of management-related auditing that contributes to increased corporate value for NGK.	—	—
Junichi Itoh	69	2	His wealth of experience and expertise as a corporate management specialist make him well-suited to a role in which he will contribute to stronger corporate governance at NGK.	○	○
Masayoshi Sakaguchi	62	1	Recognized for his ability to apply his experience towards management-related auditing, providing a legal compliance and risk management-focused perspective that contributes to increased corporate value for NGK.	○	○

### Expertise of Directors (Excluding Outside Directors)

(As of June 30, 2020)

Name	Age	Business sector experience					Area of specialization				
		Energy infrastructure business	Ceramic products business	Electronics business		Process technology business	Finance	Law	HR/labor	Materials technology	Engineering
		Electricity/energy	Automobiles	ICT	Semiconductors	Chemical industry					
Taku Oshima	63	○							○	○	
Hiroshi Kanie	62	○	○					○			
Chiaki Niwa	60									○	
Susumu Sakabe	61			○			○	○	○		
Ryohei Iwasaki	60		○	○	○			○			
Shuhei Ishikawa	60			○	○					○	
Nobumitsu Saji	61	○		○	○		○	○	○		
Atsushi Matsuda	59		○							○	
Shigeru Kobayashi	59	○	○								
Tsutomu Nanataki	58		○	○	○					○	

\*Age as of June 29, 2020

Note: Managerial experience: At time of appointment (June 29, 2020), has experience running large organizations (business group, general manager, head of multiple divisions) or has served in upper management of Group companies.

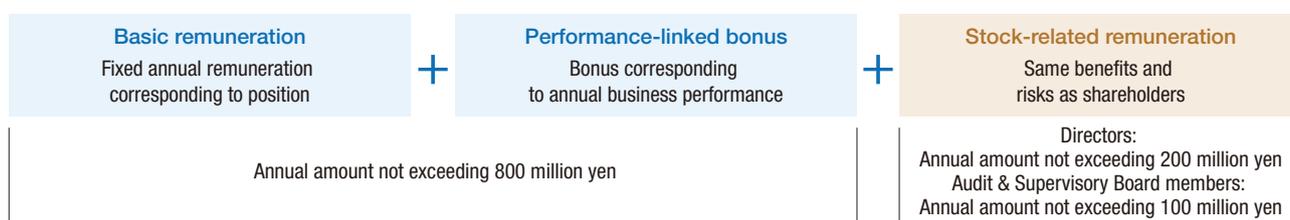
## Policies for Determining Remuneration of Directors

The remuneration of directors (excluding outside directors) and corporate officers consists of the following three components: (1) basic remuneration as fixed annual remuneration according to respective positions; (2) a performance-linked bonus, which is based on the business performance each year; and (3) stock-related remuneration to enhance the motivation, etc. of directors to improve the medium- to long-term corporate value through appropriate corporate management by increasing sensitivity toward the NGK stock price and sharing with shareholders both advantages and risks generated by ups and downs of the stock price. NGK does not pay any performance-linked bonus or stock-related remuneration to outside directors and Audit & Supervisory Board Members and

only pays basic remuneration since they assume roles in supervising and auditing management from an independent standpoint.

With regard to the ratio between this variable remuneration and fixed annual remuneration, the ratio of basic remuneration, performance-linked bonuses, and stock-related remuneration is set from a perspective of putting priority on the stability and enhancement of medium- to long-term performance. The total amount of remuneration, including basic remuneration, is determined in accordance with officers' positions, taking into consideration remuneration levels according to the size of companies and other factors, using data from reliable external research institutions.

### Policy for determination of remuneration



### Performance-linked bonus calculation method

The degree of indicator achievement is quantified and a value determined from that.

<b>Short-term focus</b>	Comparison between the anticipated net sales, operating income, and net income announced at the beginning and middle of the financial term and the respective financial results for each  Comparison between the previous and current financial term's net sales, operating income, and net income	✕ Assessed at between 0% and 200%
<b>Medium-term focus</b>	Year-on-year attainment of priority issues spanning multiple years designated by NGK  Operating income and net income, on which ROE is based	

### Overview of stock options

- Exercise price: 1 yen/share
- Amount granted corresponding to position
- Condition for exercise of rights: As a rule, must be exercised within five years from the date that marks one year since stepping down as an officer of NGK

### Remuneration of Directors and Audit & Supervisory Board Members

(Fiscal 2019)

Director category	Total remuneration (million yen)	Total remuneration by type (million yen)				Applicable directors (people)
		Fixed remuneration	Performance-linked remuneration	Stock options	Retirement benefits	
Directors (excluding Outside Directors)	535	377	113	44	—	9
Audit & Supervisory Board Members (excluding Outside Audit & Supervisory Board Members)	59	59	—	—	—	3
Outside Directors and Outside Audit & Supervisory Board Members	66	66	—	—	—	7

### Directors Receiving Total Remuneration of ¥100 Million or More

(Fiscal 2019)

Name	Director category	Company category	Total remuneration by type (million yen)				Total remuneration (million yen)
			Fixed remuneration	Performance-linked remuneration	Stock options	Retirement benefits	
Taku Oshima	Director	Submitting companies	65	26	8	—	100

## Corporate Governance

### Management Succession Planning

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In December 2018, the Board of Directors approved the NGK Group Chief Executive Officer Succession Plan, which establishes the required qualities, development policies, selection procedures, and other items for chief executive officer successors. Based on

this, the President provides the Nomination and Compensation Advisory Committee with a planning progress report each year, and its appropriateness is reviewed.

### Training Policies for Executives

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Taking into account that directors and Audit & Supervisory Board members assume the duty of care of a good manager as a fiduciary of NGK, NGK has established training policies to provide the following opportunities to improve their skills and knowledge so that they can adequately fulfill their respective responsibilities as experts in management or as supervisors of business execution.

1. Training for internal officers relating to the Companies Act, Financial Instruments and Exchange Act, competition laws, and corporate governance and compliance.
2. The provision of individual explanations from the relevant divisions to outside directors/Audit & Supervisory Board members, mainly relating to the items brought up at the Board of Directors' meetings as well as the periodic provision of information to, and opportunities to exchange opinions with, outside directors/Audit & Supervisory Board members on the business environment and other issues.

### Internal Control Systems

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The Board of Directors and the executive bodies overseen by the president are responsible for establishing and operating NGK's internal control system. The Auditing Department, a specialized internal audit body, is responsible for assessing the status of business execution at each operating division. Moreover, NGK has established the Internal Controls Committee to manage its reporting system for internal controls pursuant to Japan's Financial Instruments and Exchange Act.

The NGK Group Code of Conduct (revised in January 2019) was formulated as a policy embodying the Group's corporate philosophy. These guidelines specify the Group's fundamental stance with respect to business activities and corporate behavior to ensure it remains a company that is beneficial to society, even in the pursuit of its economic goals. The task of ensuring Group-wide compliance with the NGK Group Code of Conduct,

along with laws, regulations and corporate ethics, is the responsibility of the Compliance Committee Secretariat Council, which was established by the Compliance Committee and comprises managers from NGK divisions. The Business Ethics Committee handles matters of improper acts and legal violations involving NGK executives, and the ensuring of compliance with competition laws and overseas anti-corruption laws.

Please note that at a Board of Directors meeting in April 2020, members adopted an amendment to the "Resolution for the Development of Systems to Ensure the Appropriateness of Operations."

## Audit Structure

At NGK, we conduct separate Audit & Supervisory Board audits, accounting audits, and internal audits. Each of the main groups overseeing these audits—Audit & Supervisory Board members, accounting auditors, and internal auditing department members—engages in regular information exchange related to auditing policy, planning, results, and other areas pertinent to improving auditing effectiveness and efficiency.

NGK's Audit & Supervisory Board is comprised of two full-time members and two outside members. They are supplemented by one dedicated staff member who possesses the appropriate knowledge, skills, and experience to assist them.

Approval of the Audit & Supervisory Board is obtained with regard to staff reassignment, evaluations, and other decisions in

order to more fully ensure that such decisions are independent of directors and that the instructions of the Audit & Supervisory Board carry more force.

Internal auditing is carried out by the 17 members of the Auditing Department. The general manager of the Auditing Department is also a member of the Internal Controls Committee. Quality, environmental, and health and safety-related auditing is performed on an as-needed basis within the NGK Group by departments with specialized knowledge in these areas.

Accounting audits are overseen by two certified public accountants from Deloitte Touche Tohmatsu LLC. They are accompanied by 12 other certified public accountants and 20 assistants.

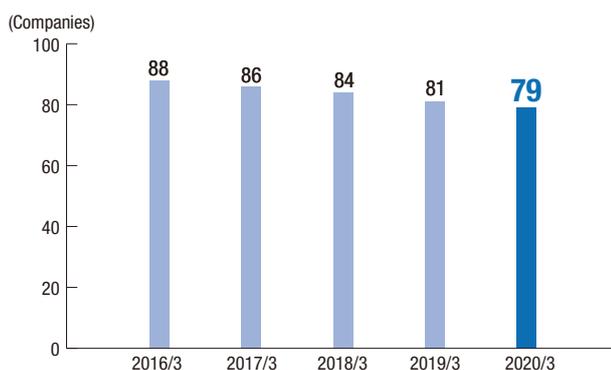
## Policy on Cross-Shareholdings

NGK holds shares of listed companies that contribute to the NGK Group's long-term business development as cross-shareholdings, primarily in order to maintain and strengthen business relationships. In addition, NGK holds the shares of each company in the Morimura Group, which was established by the same founders of NGK, for the mutual benefit of enhancing management quality, as the Morimura Group brand forms a part of NGK's corporate value through its philosophy and heritage. As all cross-shareholdings are a part of the asset portfolio, they are positioned as assets to supplement the amount of liquidity considered necessary in the business plan. NGK constantly strives to reduce the scale of cross-shareholdings from the perspective of capital efficiency. Furthermore, the scale of cross-shareholdings may fluctuate due to factors including changes in overall business trends and risks, financial conditions, and the status of NGK's business relationship with each business

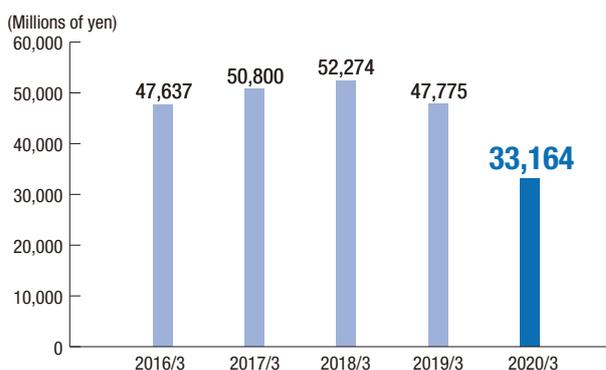
partner. Regarding the specific stocks held, at its Board of Directors' meeting, NGK regularly reviews the appropriateness of the continuous holding of shares as cross-shareholdings along with the capital policy, by determining the significance of holding from the business relationship, the safety of ratings and so forth, and the efficiency of dividend yields and so forth. On the other hand, when comparing cross-shareholdings to NGK's cost of capital, evaluations based solely on shares are not conducted. Instead, ROIC management is conducted for each business with differing risks and expected returns, and cross-shareholdings are evaluated after being included in each business's balance sheet. After verification, in fiscal 2019, four specified equity securities held for investment purposes were sold for a total of 4.353 billion yen.

## Status of Cross-Shareholding

**Number of Cross-Shareholding Companies**



**Reported Cross-Shareholdings Balance**



## Corporate Governance

### Comments from Outside Directors

#### Topic: Improving corporate value



**Hiroyuki Kamano**  
Outside Director

#### **Our role is to check managerial balance**

Given that companies exist as part of society, they cannot survive if they ignore the environmental and social impacts of their actions. Thus, I believe that the social value that a company provides, such as through hiring and contributing to the environment, is just as foundational to its existence as its economic value, such as profitability and growth potential.

Also, in the post-COVID-19 era and beyond, the importance of the relationship between companies and the environment looks to only grow stronger. An important issue facing society is humanity's coexistence with the environment, and this is an area where society is increasingly recognizing the lasting value of positively contributing companies.

In that sense, we can say that the NGK Group is extremely well-positioned. This is because the very business in which the NGK Group engages, such as developing environmentally beneficial products for automotive-related business, helps to reduce humanity's environmental footprint. If the NGK Group can capitalize on its expertise in ceramic technology to facilitate progress towards achieving the SDGs, it would be abundantly possible to turn the COVID-19 recession into a growth opportunity.

Company management cannot remain static in the face of tremendous societal upheaval. In order to achieve corporate growth, it must embrace significant innovation reflective of society's needs. Management tends to act conservatively out of a sense of obligation to responsibly handle the important assets of shareholders. However, the act of management entails a certain adventurousness that must be continually acted upon in order to grow.

The key, then, is balance: keeping management oriented in the direction of innovation while also keeping it within an acceptable range of risk. Management should not be being overly adventurous. Risk should be adequately calculated. A balance should be struck between risk and reward. Keeping check of all this is, I believe, the role that we must play as outside directors.

We will continue to provide the Board of Directors with recommendations so that the NGK Group can anticipate future values and head in the direction of change and innovation. Our wish is for young employees to look forward to realizing their dreams and that the NGK Group will continue to exist well into the future.



**Emiko Hamada**  
Outside Director

**Transformation and growth  
for the post-COVID-19 era**

Improving corporate value all depends on how well a company is meeting the essential expectations of society. This will require companies to be providing society with new value. This is exactly expressed in the mission of the NGK Group, as stated in its Group Philosophy: “Enriching Human Life by Adding New Value to Society.”

And, given its history of product development derived from the application of cumulative expertise in the difficult area of ceramic technology, this is a strong suit of the NGK Group. However, the NGK Group must avoid simply continuing to create better versions of its already outstanding products and services; rather, it is important that it focus on delivering products and services tailored to the changing times.

Ceramic materials offer superior durability and versatility, which suits them to an extremely broad range of applications. I think this durability and versatility can also be capitalized upon to great effect as part of the infectious disease measures within the medical and healthcare fields. With its expertise in ceramic technology, the NGK Group is capable of providing the new technologies and products demanded by our times.

In a post-COVID-19 era, things that we thought were still a way off in the future are suddenly becoming reality, and it is the companies delivering new ideas to meet this reality who will be building the era to come. I would like to see the NGK Group being a pioneer in the coming era through its technological innovation in new areas. That, I believe, is the transformation and growth for which the NGK Group must aim.

And in order to achieve sustainable growth as a company, it is important to recognize the value, as well as draw out the full potential, of each and every employee. Specifically, this means listening to the input of Group employees throughout the world and engaging in discussion, which incorporates a multitude of viewpoints. In other words, it means embracing diversity. The NGK Group already has a foundation of diversity in place; so, the next stage is to find ways of capitalizing on all of the diverse input that this foundation provides.



**Kazuo Furukawa**  
Outside Director

**Improving corporate value by working  
as a group to speed up all operations**

It has been a year since I was appointed as an outside director for the NGK Group. In that time, my impression of the NGK Group overall is that it is a well-functioning manufacturer, which is thorough in its operation of key committees and bodies, such as meetings of the Board of Directors, in its distribution of authority between Group companies, in its execution of global governance, and in much else. However, in order to further improve corporate value, it is important that the NGK Group be more proactive as a global company, working together as a group to speed up all operations.

Given the extremely rapid rate at which the market is changing, along with the ongoing spread of COVID-19, it is difficult to make any predictions in the current era. Moreover, with new technologies like AI, IoT, and quantum computers appearing one after another, the world is in the midst of significant and ongoing change. It is within this context that the NGK Group needs to capitalize on its expertise in ceramic technology by finding ways to combine it with cutting-edge technology to create unprecedentedly innovative products. NGK’s 100th anniversary slogan, “Surprising Ceramics.,” is finding concrete expression through the ongoing creation of next-generation products, such as the EnerCera® battery and zinc rechargeable batteries. I would like to not only see this trend accelerated by an increase in the speed of product development, I would also like to see the mass production system undergo a rapid reorganization from a global perspective. By enabling the NGK Group to plan, develop, and manufacture on a global basis, I think it will be possible to launch products and services simultaneously worldwide.

In addition, if all core ideas and expression adopt a global perspective, this will likewise affect not only products but also the way in which a business continuity plan (BCP) is performed. In the face of the COVID-19 pandemic, the smoothness with which measures such as transitioning to remote work arrangements has been handled is laudable. However, we are now in an era that requires readjusting supply chains and production bases, reforming the operations of indirect departments, and improving job satisfaction on a global basis and then quickly implementing ideas, quickly obtaining results, and providing feedback to each plant and office. It is my hope that the next 100 years will see the NGK Group achieve even greater growth as a global company.

## Corporate Governance

### Compliance

Viewing compliance as the foundation of CSR, the NGK Group positions enhancing trustworthiness as the most important initiative, and takes concrete measures to disseminate compliance awareness among employees and ensure that we abide by

international norms and the laws and regulations of all countries and regions. In line with business expansion, the NGK Group is also engaged in minimizing risks related to globalization and diversification while augmenting our risk management structure.

### Compliance Promotion Structure

In order to ensure strict observance of laws, regulations, and corporate ethics within the Group, we have established the Compliance Committee, and under this we have established the Compliance Committee Secretariat Council to serve as the committee body that ensures the proper implementation of the Compliance Committee's decisions.

#### ■ Establishment of the global compliance system

With the aim of building a group-wide foundation for an effective compliance scheme, the Group Compliance Department conducts education on compliance at each NGK site.

### Observing Competition Laws and Other Laws and Regulations Pertaining to Business Transactions

In addition to mandating compliance with competition laws in the NGK Group Code of Conduct, we have established the Competition Laws Compliance Rules, set forth to comply with international standards, which are strictly enforced by the NGK Group both in Japan and its overseas locations. We have established these policies and procedures in order to eradicate unfair business practices and maintain fair and equitable business relationships with our business partners.

We also provide education and training aimed at ensuring widespread awareness and thorough compliance with the Competition Laws Compliance Rules and the Competition Laws Compliance Handbook. Furthermore, since fiscal 2015, we have contracted PwC Advisory LLC (hereinafter, "PwC") as our

#### Compliance Promotion Structure



independent compliance professional. PwC is engaged to annually review the implementation status of the NGK Group's competition law compliance program per the Competition Laws Compliance Rules as well as assessing the overall oversight and reporting structures in place for NGK Group companies, both in Japan and overseas locations. On top of this, starting in fiscal 2017, PwC has also conducted interviews with the directors overseeing NGK's various business groups in order to: 1) assess the tone of each director's approach toward competition law compliance; and 2) to further enhance their awareness of these efforts. The results of these reviews are being leveraged for a variety of purposes, such as operating and improving the competition law compliance program.

### Anti-Harassment Measures

Our measures to combat harassment in the workplace include providing anti-harassment training to all executives and employees in NGK and NGK Group companies in Japan (including contract employees and dispatch employees).

Since fiscal 2017, we have held anti-harassment training sessions aimed at managers of Group companies in Japan, and

we have maintained a schedule that seeks to ensure the rest of the employees receive anti-harassment training within four years. In fiscal 2019, we held 31 sessions with a total attendance of 2,314. The aim of training is to contribute to a better workplace environment by providing both managers and employees with a proper understanding of what harassment is and how to prevent it.

### Corruption Prevention Structure

The NGK Group implements anti-bribery measures in order to ensure fair and transparent transactions. In fiscal 2015, we instituted anti-bribery rules for dealing with foreign public officials in order to ensure compliance with anti-bribery laws as well as

ethical standards for business conduct. Further, in fiscal 2017 our Auditing Department began a review of overseas money transfers and entertainment expenses.

### Conducting Anti-Bribery Training

In fiscal 2019, we not only had our in-house lecturers provide job grade-specific training to NGK employees, we also invited outside lawyers to run small-group, interactive training sessions. In

addition, we also arranged for attorney-led seminars and other training at all Group companies outside Japan.

## Quality Compliance

Based on the lessons we learned from dealing with issues of non-conformity in the testing procedures of insulators and related products in 2018, we are strengthening ongoing top management-led quality compliance activities, Quality Committee

direct guidance, and other initiatives. We are also working to improve corporate culture through a variety of efforts, including ensuring senior management and employees receive thorough quality-related training.

## Whistleblowing System

### ■ Helpline

We have established a helpline to receive inquiries and reports from employees aimed at curtailing and preventing activities contrary to the spirit of the NGK Group Code of Conduct and to facilitate the quick resolution when issues occur. Each Group company outside Japan has its own helpline. Our company rules guarantee protection of those seeking advice or reporting issues.

#### Number of Helpline Consultation Cases (in Japan)

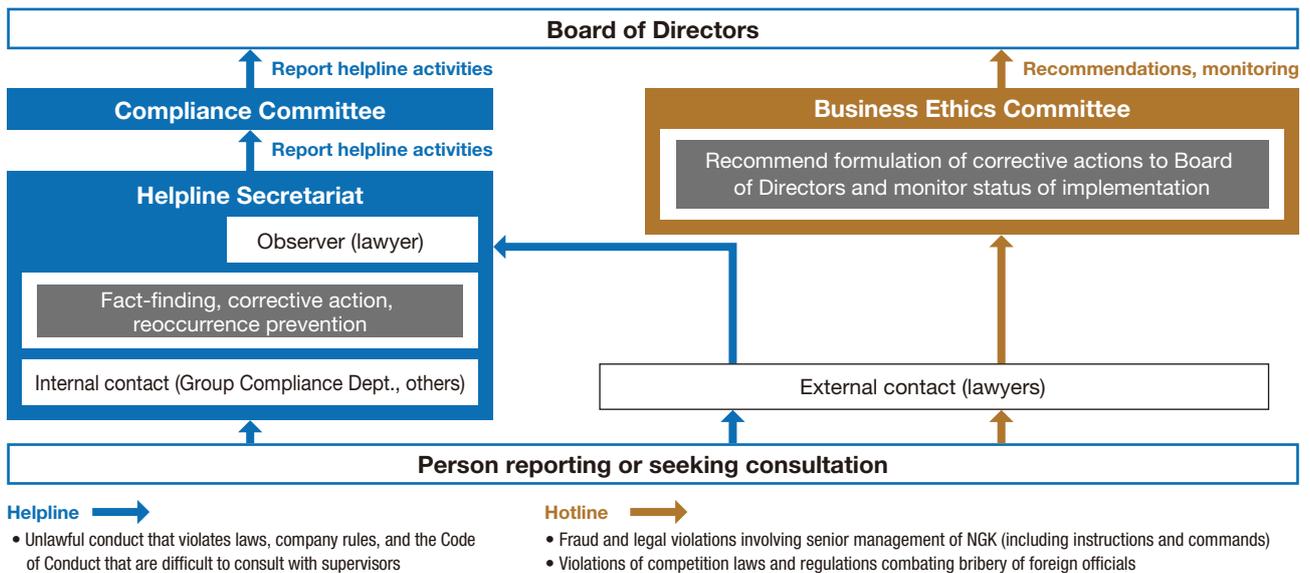
FY2017	FY2018	FY2019
43	75	55

### ■ Hotline

We have established a hotline as a whistleblowing system for responding to fraud and legal infractions committed by senior management of NGK, and competition law and anti-corruption law-related violations. The hotline is operated by outside lawyers, with issues handled by the Business Ethics Committee, composed mainly of outside directors, who report directly to the Board of Directors.

We have been pushing forward with the establishment of the hotline at Group companies outside Japan in light of the circumstances in each country.

#### Organization of Whistleblowing System



## Information Security Policy and Structure

Within the NGK Group, proper management and operation of information assets is a collaborative effort carried out by the General Affairs and Information Technology Departments, in conjunction with other relevant administrative divisions and in line with the Basic NGK Group Information Security Policy.

Every year, personnel of NGK's Information Technology Department visit several Group companies to conduct on-site checks and provide guidance on their implementation of IT security measures.

## Privacy Policy and Organization for Personal Information Protection

The NGK Group has established internal rules in an effort to ensure strict handling and management of personal information obtained from customers. In fiscal 2015, NGK formulated and published our Basic Policy on the Proper Handling of Specific Personal Information in

response to the enforcement of the Act on the Use of Numbers to Identify a Specific Individual in Administrative Procedures. Moreover, our policies are in full compliance with the revised Act on the Protection of Personal Information, which came into effect on May 30, 2017.

**Reference URL** [Protection of Personal Information](https://www.ngk-insulators.com/en/utpolicy/)  
<https://www.ngk-insulators.com/en/utpolicy/>



**Reference URL** [Basic NGK Group Information Security Policy](https://www.ngk-insulators.com/en/info/policies/)  
<https://www.ngk-insulators.com/en/info/policies/>



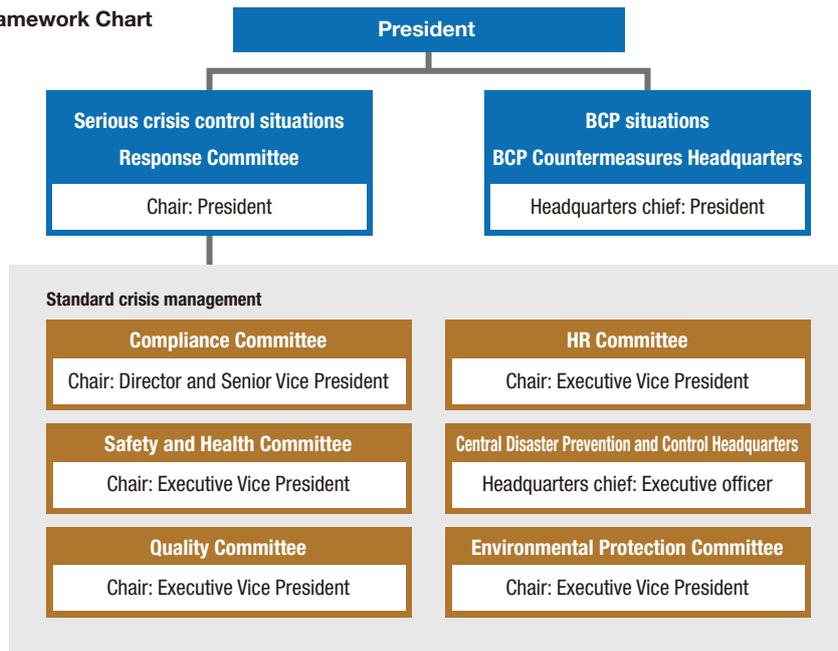
## Risk Management

### Approach to Risk Management

The NGK Group addresses the issue of serious risk by empowering the following committees to facilitate risk avoidance and prevention, in accordance with the Basic Rules of Crisis Management. Additionally, in the event of some particularly significant risk, the executive officer in charge of the Corporate Planning Office can call a meeting, which would include the president, to develop countermeasures.

In times of increasing socio-economic uncertainty, it is important to have a heightened awareness of risk and to act before risks turn into crises. Therefore, in addition to the six committees, which we maintain in order to oversee matters of day-to-day risk, we also have in place a system by which top management can coordinate a rapid response to growing risks.

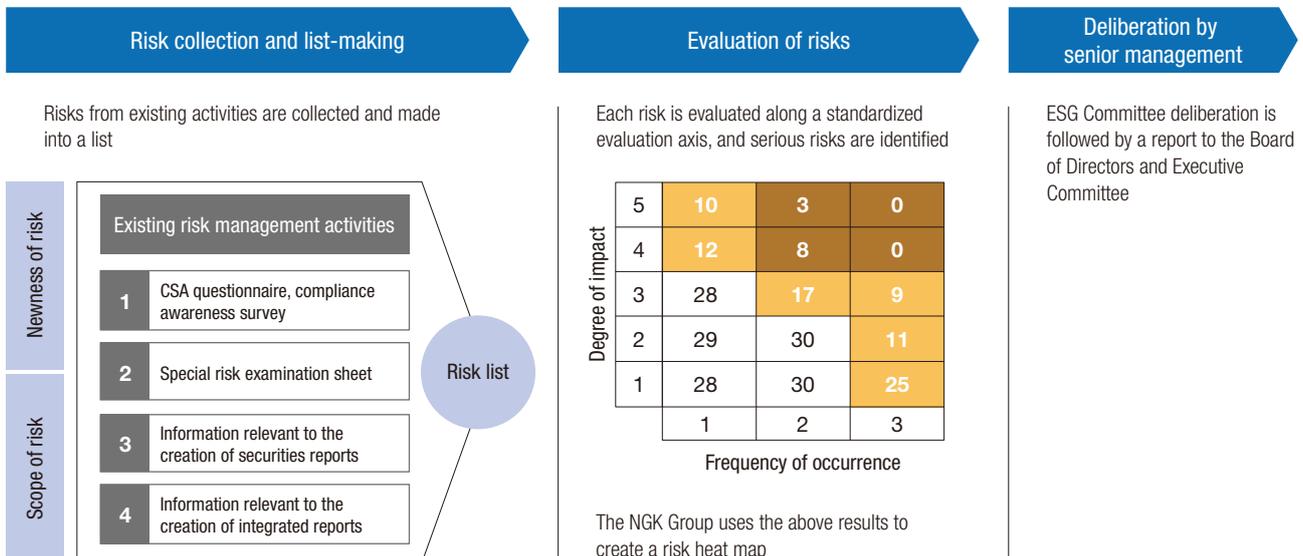
### Risk Management Framework Chart



### Risk Identification Process

All risks discovered through the standard risk management process, which have the potential to affect the operational or financial situation of the Group are collected and reevaluated in

order to identify any which may be serious risks. The ESG Committee will then deliberate and designate those risks that need to be managed by the Group as a whole.



**Risks, Risk Summaries, Risk Responses**

- 1 Business operation risks   2 R&D-related risks   3 Legal compliance, human rights and safety, and quality-related risks  
 4 Information systems-related risks   5 Currency exchange, capital, and procurement-related risks   6 Climate change and disaster-related risks

Risk	Summary	Response		
1	<p><b>All operations</b></p> <ul style="list-style-type: none"> <li>Demonstrations, terrorism, war, infectious or communicable disease, and other unforeseen matters</li> </ul>	<ul style="list-style-type: none"> <li>Construct globally distributed, alternative systems</li> <li>Compensate for drop in demand by increasing number of new and high-performance products in line with stronger exhaust regulations</li> <li>Strengthen competitiveness via technical responsiveness that anticipates environmental regulations, and via supply stability</li> <li>Respond appropriately to automaker planning and changing business conditions, and then make revisions to capital investment planning</li> <li>Work together with direct customers who manufacture semiconductor manufacturing equipment, and make revisions to equipment capacity and personnel and production systems, etc., where appropriate</li> <li>Carefully monitor semiconductor manufacturing process trends and revise production systems where appropriate to ensure quick response to changes in demand</li> <li>Carefully monitor customer trends and pursue production system innovation where appropriate to ensure quick response to changes in demand</li> <li>Carefully monitor customer trends and pursue timely technological development</li> <li>Carefully monitor energy policy trends in each country and revise production systems where appropriate to ensure quick response to changes in demand</li> <li>Strengthen competitiveness via technical responsiveness and supply stability</li> <li>Carefully monitor customer trends and revise production systems where appropriate to ensure quick response to changes in demand</li> </ul>		
	<p><b>1 Ceramic Products Business</b></p> <ul style="list-style-type: none"> <li>Drop in demand for NGK Group products due to decline in demand for internal combustion engine vehicles</li> <li>Drop in market share due to rising competition from Chinese market</li> <li>Inability to recover prior investment due to downturn in business, delayed timing of regulations, or other factors</li> </ul>			
	<p><b>2 Process Technology Business</b></p> <ul style="list-style-type: none"> <li>Deterioration in performance and financial status due to declining demand for semiconductors</li> <li>Delayed responsiveness to customer needs</li> <li>Emergence of innovative semiconductor manufacturing process</li> </ul>			
	<ul style="list-style-type: none"> <li>Drop in market share due to growth of competition in kilns for lithium-ion battery cathode materials and electronic components</li> </ul>			
	<p><b>3 Electronics Business</b></p> <ul style="list-style-type: none"> <li>Sudden drop in base station and data server demand</li> <li>Inability to develop new technology or release products compatible with customer technology innovations</li> </ul>			
	<p><b>4 Energy Infrastructure Business</b></p> <ul style="list-style-type: none"> <li>Change in energy policies overseas</li> <li>Trends among competitor companies and products</li> <li>Delay in timing of market expansion for large-capacity and long-life batteries</li> </ul>			
	2		<ul style="list-style-type: none"> <li>Inability to achieve adequate results with the input received due to increasingly complicated technological competition</li> </ul>	<ul style="list-style-type: none"> <li>Continue to receive input not only for increasing performance of existing products but also for finding promising new topics to explore</li> </ul>
	3		<p><b>1 Legal compliance-related risks</b></p> <ul style="list-style-type: none"> <li>Decline in NGK Group's reputation due to actions in opposition to society's expectations with regard to legal and regulatory compliance, respect for human rights, contract compliance, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Utilize employee training and handbook distribution to ensure employees are familiar with relevant laws and regulations and have a more compliance-focused mindset</li> <li>With regard to serious improprieties or legal/regulatory violations, undertake prevention and monitoring overseen by Business Ethics Committee, which comprises outside directors and compliance officers</li> <li>Undertake human rights due diligence via HR Committee</li> <li>In accordance with NGK Safety and Health Policy, identify serious hazard risks and use risk assessment to facilitate strengthening of preventative measures</li> <li>Follow up on employees who work long hours, and conduct job grade-specific mental health education</li> <li>Have Quality Management Department perform monitoring of each Business Group's quality activities, in line with NGK Quality Policy and under direct supervision of senior management</li> <li>Regarding serious issues, convene quality review meetings in order to find a solution quickly</li> </ul>
			<p><b>2 Human rights and safety-related risks</b></p> <ul style="list-style-type: none"> <li>Human rights violations of workers in supply chain</li> <li>Employee occupational hazards, illness, or physical and mental health problems</li> </ul>	
			<p><b>3 Quality-related risks</b></p> <ul style="list-style-type: none"> <li>Quality-related risks such as loss of trust or profits, or contraction in growth, due to serious market complaint, contractual violation, or other unsatisfactory operations</li> </ul>	
4	<ul style="list-style-type: none"> <li>Negative impact on societal trust or business continuity due to shutdown of data processing, or to theft, destruction, manipulation, loss, etc., of data, following external cyber-attack or unauthorized system access, or after unexpected system failure or security issue</li> </ul>	<ul style="list-style-type: none"> <li>Construct IT security system standardized for entire Group</li> <li>Conduct information security training for employees</li> </ul>		
5	<ul style="list-style-type: none"> <li>Decreased sales and profits and deterioration of business performance due to strong yen</li> <li>Risk of negative impact on business operations, performance, and financial situation of NGK Group as a result of financing difficulties stemming from serious regional financial crises and other factors</li> <li>Rising production costs due to rising raw materials prices</li> </ul>	<ul style="list-style-type: none"> <li>Keep production close to local demand centers, perform financing in local currency, and optimize purchasing according to currency exchange situation</li> <li>Hedge risks with forward foreign exchange contracts and other financial instruments</li> <li>Reflect risk in sale price to customer</li> <li>Reduce costs through competitive purchasing, increased productivity, and other means</li> </ul>		
6	<ul style="list-style-type: none"> <li>Deterioration in business performance due to additional costs incurred by future international GHG regulations, environmental taxes, carbon taxes, etc.</li> <li>Operational decline due to global warming-caused sea level rise, increased size and magnitude of typhoons, increased frequency of local torrential rains, etc.</li> <li>Deterioration in business performance due to shutdown of production following major disaster, fire, or other serious incident or accident</li> <li>Decline in operations and negative impact on product manufacturing and sales due to emergence and spread of major infectious disease, such as new strain of influenza or coronavirus</li> </ul>	<ul style="list-style-type: none"> <li>Invest time and resources into developing and popularizing products and services that reduce environmental impact, and into developing and introducing high-efficiency, environmentally friendly production technology</li> <li>Announced endorsement in February 2020 of Task Force on Climate-related Financial Disclosures (TCFD) recommendations. Begin taking concrete action</li> <li>Promote business continuity plan (BCP) for entire Group</li> </ul>		

## Environment

### NGK's Core Policy on the Environment

Recognizing that protecting the environment is a vital issue that all of humanity must face, the NGK Group formulated its Core Policy on the Environment in April 1996 based on Environmental Philosophy and Guidelines for Environmental Action in order to bring its corporate activities into harmony with the environment

(revised in June 2019). On the basis of this policy, the NGK Group works to reduce the environmental impact of business activities, and actively strives to help protect the environment by developing products and technologies to that end.

**Environmental Philosophy**

The NGK Group continues our commitment to improving the global environment through our "Triple E" businesses representing the energy, ecology, and electronic sectors.

**Reference URL**

**NGK's Environmental Initiatives**  
<https://www.ngk-insulators.com/en/sustainability/environment.html>



### NGK Endorses TCFD\*

The NGK Group is committed to making even greater efforts amidst government and private sector actions to achieve the goals of the Paris Agreement. The Group's top management determined the importance of endorsing the recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD), which encourages the disclosure of climate-change related risks and opportunities towards making plans for reducing CO<sub>2</sub>

emissions. In February 2020 the Group announced its endorsement of the recommendations of the TCFD.



\*TCFD: The Task Force on Climate-Related Financial Disclosures was established by the Financial Stability Board (FSB). The G20 Osaka Summit in June 2019 provided the impetus for many Japanese companies to announce their endorsement of the TCFD recommendations. (As of June 22, 2020, 276 companies and organizations have announced endorsement.)

### Five-Year Environmental Action Plan

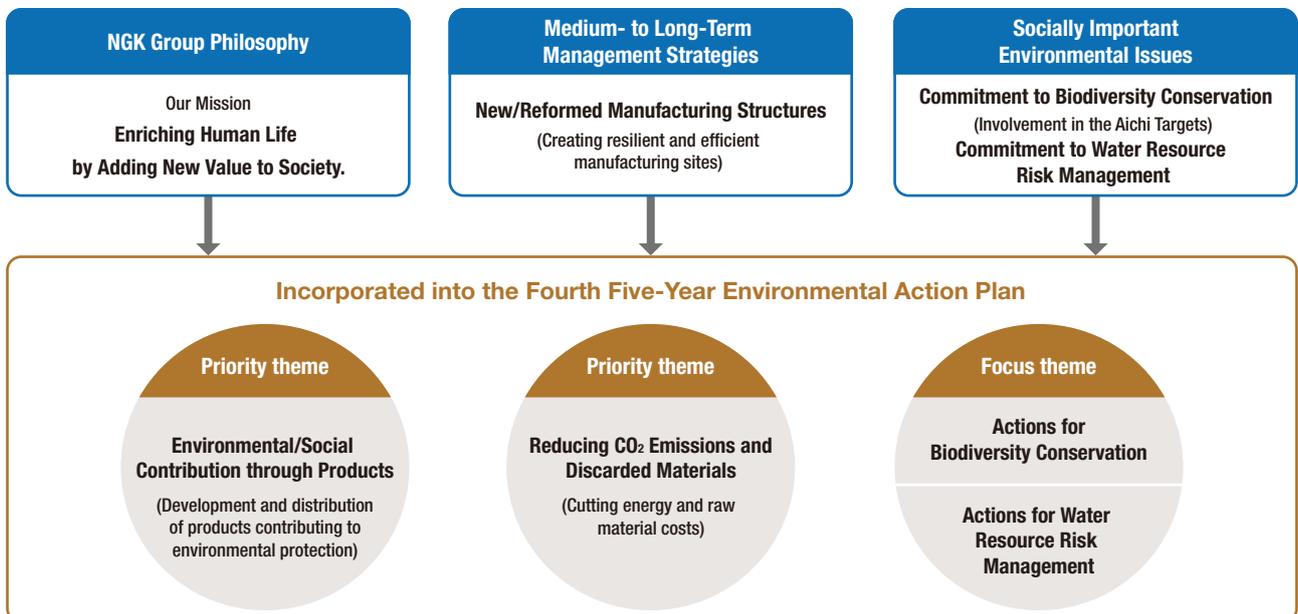
The NGK Group has established the Fourth Five-Year Environmental Action Plan (fiscal 2016–2020). To achieve the goals of the Plan, we are promoting environmental activities, setting annual targets.

**■ Outline of the Fourth Five-Year Environmental Action Plan**

The NGK Group organizes environmental initiatives by creating five-year action plans. The Fourth Five-Year Environmental Action Plan, initiated in fiscal 2016, has been formulated to broadly encompass major global environmental challenges that businesses are expected to take, and to select two key issues each for two

groups of themes, namely, priority themes and focus themes.

The two priority themes are: environmental/social contribution through products; and reducing CO<sub>2</sub> emissions and discarded materials. The first priority theme directly reflects the core concept of the corporate philosophy, while the other theme closely relates to NGK's medium- to long-term initiative of New/Reformed Manufacturing Structures for increasing competitiveness. For focus themes, we have also set two issues: biodiversity conservation and water resource risk management/response, both being major challenges for which socially responsible corporate action is required with greater urgency.

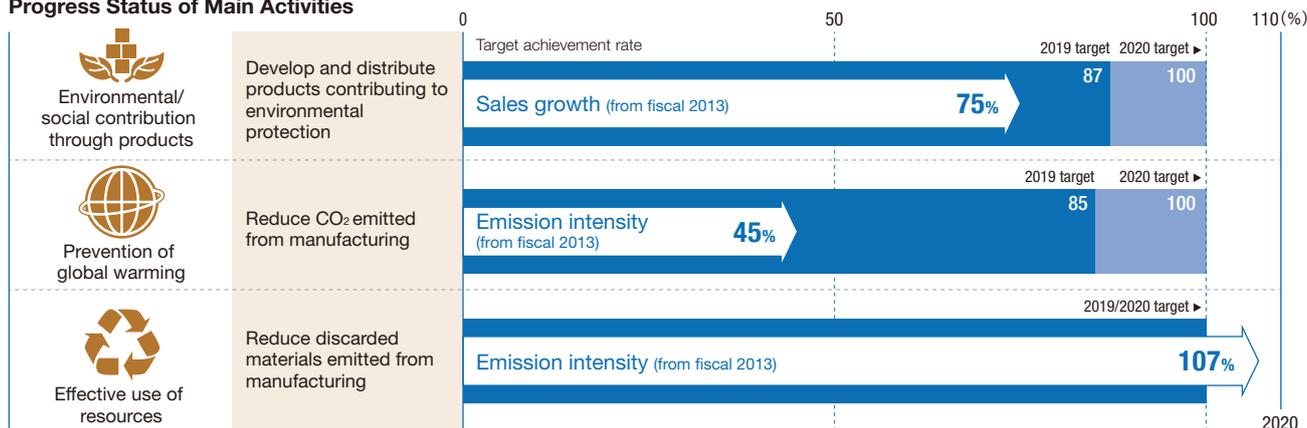


## Five-Year Environmental Action Plan Progress Report

In fiscal 2019, compared to forecasts at the start of the period, negative factors such as lower sales volume in core products and negative currency effects prevented us from achieving annual goals for a number of the items for which we set numerical goals. Fiscal 2020 is the final year of the Fourth Five-Year Environmental Action Plan. Despite the uncertainty in the global economy

caused by the growing COVID-19 pandemic, the NGK Group is working in concert to undertake environmentally beneficial activities that will enable us to meet the targets of the Five-Year Environmental Action Plan, including the smooth start-up of new plants and production lines and an increase in the production yield ratio.

### Progress Status of Main Activities



## Protecting Biodiversity

In the NGK Group, we view the challenge of protecting biodiversity as an integral part of achieving a sustainable society, and towards that end we are undertaking the following activities.

### Activities for achieving the Aichi Targets

The NGK Group has been pushing forward with activities pursuant to the Aichi Targets (international goals for biodiversity) agreed upon at the 10th Meeting of the Conference of the Parties to the Convention on Biological Diversity (COP 10).

Since fiscal 2016 under the current Five-Year Action Plan, we have done biodiversity surveys of company-owned sites, taken part in the Ministry of the Environment's "My Action Declaration" initiative, and worked in unison with our suppliers.

### Promoting participation in the Ministry of the Environment's "My Action Declaration" initiative

In fiscal 2017, as a way of raising awareness among employees, we began promoting participation in the "My Action Declaration" initiative led by the Japan Business Federation and the Ministry of the Environment. This project aims to have by 2020 a million people make a declaration to take action to conserve biodiversity.

Declarations have been received from a total of 5,200 employees who promised to take a personal interest in and work to protect the biodiversity around them. We have also expanded this initiative throughout NGK Group companies in Japan and so far a cumulative total of 6,500 group employees have made the declaration.

Aichi Targets	NGK Group Activities
1 Spread awareness	Employee environmental education, next-generation education, cooperation with suppliers, promoting employee participation in My Action Declaration initiative
4 Sustainable production and consumption	Expanding sales of products contributing to environmental protection, CO <sub>2</sub> reduction, effective use of resources, cooperation with suppliers
5 Inhibit loss of all natural habitats	Voluntary employee participation in forestation and other environmental conservation activities, biodiversity survey/appropriate control of company-owned site
8 Control pollution by chemical substances, etc.	Chemical substance management, management of exhaust and wastewater, expanding sales of products that prevent air pollution, cooperation with suppliers

Aichi Targets	NGK Group Activities
9 Alien species	Biodiversity survey/appropriate control of company-owned site
11 Conserve protected areas	Voluntary employee participation in forestation and other environmental conservation activities
14 Ecosystem services	Voluntary employee participation in forestation and other environmental conservation activities, biodiversity survey/appropriate control of company-owned site

Note: Source: "Guidelines for Action by the E&E Industries concerning Biodiversity Conservation" (The Biodiversity Working Group, The 4 Electrical and Electronic Industry Associations)

## Risk Management of Water Resources and Response

Within the NGK Group, we perform water risk assessments for all of our production bases, as well as promote more efficient water usage according to independently established guidelines. With regard to water risk, we utilize public tools to carry out self-assessments at all production bases, and at bases where

there are water shortage concerns, we bring in third parties to perform detailed analyses. Although no serious water-related risks have been identified to date at any of our facilities, we will continue to monitor the situation and stay abreast of regulatory trends to ensure stable operations in the future.

## Human Rights

### Basic Approach

In the NGK Group Code of Conduct revised in January 2019, our relationship with employees is based on the idea of

“Respect for Human Rights” and “Provide a Safe and Enjoyable Work Environment” and defined as follows.

**■ We will strictly comply with international standards of human rights and respect the diversity of all people.**

- We will respect human rights and undertake business activities without the use of forced labor or child labor.
- We will respect the individuality and independence of each employee and not engage in discrimination on the basis of race, citizenship, gender, age, religion, belief, existence of handicaps, sexual diversity or any other aspect.
- We will prevent the occurrence of harassment in the workplace and take prompt and appropriate action in the case where it occurs.

**■ We will provide a safe and enjoyable work environment that is comfortable for everyone to work in for all.**

- We will strictly comply with laws and regulations of each country and region relating to labor, safety and sanitation.
- We will aim to harmonize work and life, and support a variety of working styles.
- We will build up a relationship of trust through sincere debate and discussion with employees.
- We will give educational opportunities to employees and provide opportunities to stretch their motivation and abilities.

**Reference URL** **NGK's Employee-Focused Initiatives**  
<https://www.ngk-insulators.com/en/sustainability/society.html>



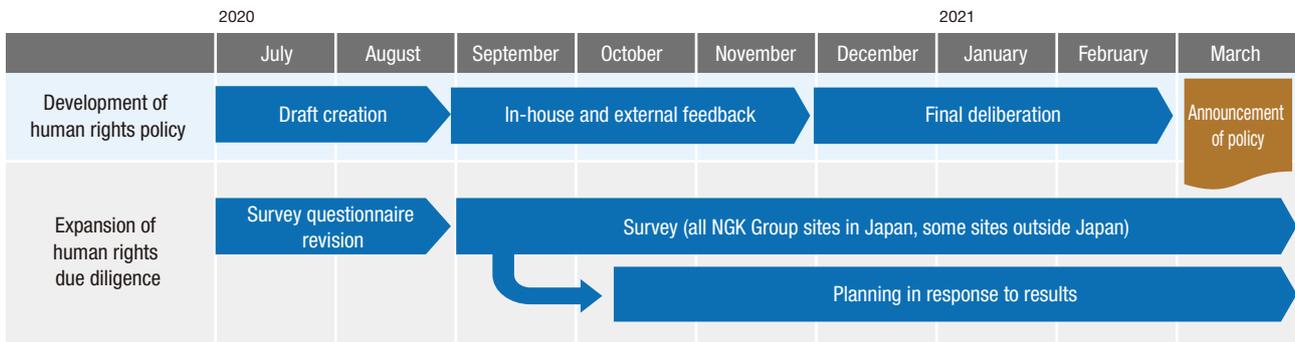
### Protecting Human Rights and Establishing an HR Committee

The NGK Group complies with international human rights standards and respects all aspects of employee diversity, including racial, nationality, and gender diversity. Our basic hiring policy is to recruit diverse personnel and to provide them with stable employment and equal opportunities. In April 2020, we established the HR Committee as a cross-sectoral, deliberative

body tasked with ensuring that corporate activities have a stronger focus on human rights and that important personnel issues are addressed by the NGK Group as a whole.

In fiscal 2020, we will focus on the following human rights initiatives.

1. Development and announcement of human rights policy
2. Expansion of human rights due diligence across the entire NGK Group



## Employees

### Work-Life Balance

NGK strives to promote a work-life balance and reduce long working hours. Towards that end, in fiscal 2011, we codified rules, which were the result of labor-management efforts over the previous three years.

We keep track of social changes, such as changing attitudes toward work as well as legislative amendments, and strive to respond to these changes flexibly and properly by improving systems and revising operations.

For the 6th consecutive year,  
99% of employees used 6 or more granted days of paid leave

For more than 10 consecutive years,  
the average number of days used for granted paid leave exceeded 10

For more than 5 consecutive years,  
usage of granted paid leave exceeded 60%

#### ■ 10 rules for promoting a work-life balance

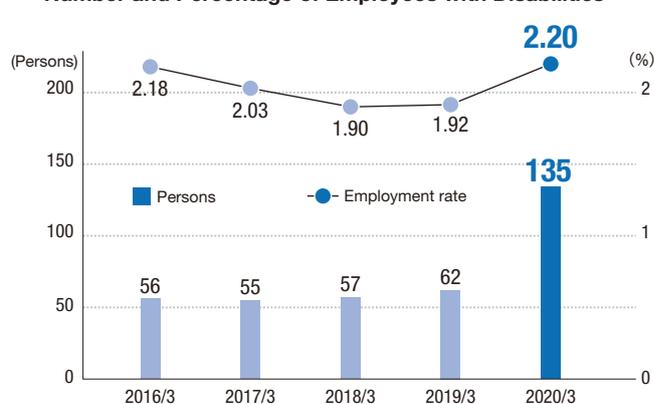
- No more than 70 hours of overtime work per month
- Overtime work exceeding 45 hours per month limited to six months each year
- The target for annual paid leave is 10 days, and employees are obligated to take at least six days a year
- No more than 300 hours of overtime work per six months
- In principle, there will be no overtime work on refresh days (Wednesdays and Fridays)
- If overtime is necessary, a prior permit application must be submitted
- In principle, work must not be performed for more than seven days straight
- If work in excess of seven days straight is necessary, a prior permit application must be submitted
- Written applications must be submitted when requesting employees to work on holidays or late at night
- There must be an interval period of at least 10 hours between shifts of late night work

### Initiatives for Persons with Disabilities

NGK undertakes a variety of initiatives aimed at employing people with disabilities, such as accepting students from special-needs schools as trainees and attending employment seminars for people with disabilities.

In fiscal 2019, we hired one new employee with a disability. We have a subsidiary that provides cleaning services and whose employees are mainly intellectually disabled. In September 2019, this company was certified as a special subsidiary for the employment of the disabled by Japan's Ministry of Health, Labor and Welfare (MHLW). This helped us meet the MHLW's 2.2% employment quota for persons with disabilities. With this figure set to go up to 2.3% in fiscal 2020, we are stepping up our efforts to hire people with disabilities by continuing to accept students from special-needs schools as trainees, attending employment seminars for people with disabilities, and expanding the work of our special subsidiary.

#### Number and Percentage of Employees with Disabilities



### Promoting the Success of Women

The NGK Group strives to increase opportunities for motivated and skilled people to enhance their skills regardless of gender. We are also engaged in creating comfortable working environment for women.

The number of female key personnel (managers) in NGK in fiscal 2019 was 26.

#### NGK Ratio of Female Key Personnel (Managers)

	FY2016	FY2017	FY2018	FY2019
Number of female key personnel	16	17	20	26
Ratio of female key personnel	2.0%	2.0%	2.2%	2.9%

#### Ratio of Female Key Personnel (Managers) at Group Companies Outside Japan

	FY2016	FY2017	FY2018	FY2019
Ratio of female key personnel	15.3%	21.0%	16.0%	20.2%

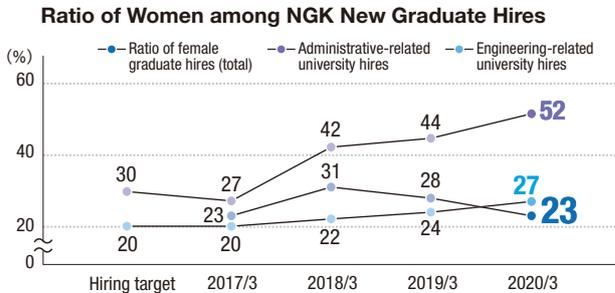
## Employees

### Increased Percentage of Women among New Graduate Hires

NGK continues to work at increasing participation by women in the workplace by setting goals to foster environments that are inclusive of women and to increase the number of women in managerial positions to 1.5 times its current amount. Nevertheless, we recognize the gravity of the problem inherent in there being only a small number of women in managerial positions, and we are working to address it over the medium to long term by increasing the percentage of women we hire among new university graduates.

In fiscal 2012, women were 16% of all NGK hires, and now in fiscal 2020 they have grown to encompass 23%. We have

exceeded our target percentage for female hiring in both administrative-related and engineering-related job categories.



### Establishment of a Career Consultation Helpdesk

In March 2016, we established a career consultation helpdesk for female employees to discuss career-related concerns. At the helpdesk, certified career consultants provide support and

consultation services to employees, while strictly observing confidentiality. Since May 2017, we have expanded the service to make it available not only to women but to all employees.

#### Being Active as a Female Leader

##### Understanding Yourself and Being Yourself at All Times

My main job, with eight members in my group, is formulating multi-year budgets of business group sales and operating income, managing budget execution over the course of the year, and providing senior management with explanations and suggestions concerning the current status and strategy of the business group. In my time here, I have taken childcare leave twice and, with the current spread of COVID-19, I am pursuing my duties while working from home.

NGK has a full set of support systems for working women, including childcare leave and reduced working hours. We even have childcare leave options exceeding the nationally mandated period of one year for employees who are unable to find a daycare. At the same time, however, employees are incentivized to return to work soon. Women who were my seniors at NGK did not have such a generous system when they joined the company, but my supervisor wanted me to be part of a pioneering generation of women and worked to create an environment where it would be easier for me to make use of this system. I am extremely grateful.

In my group there are five women. Their positions range from staff to clerical, and each one's professional and personal situations and ambitions are unique. I do not think that, just because we say it is the era of greater female participation in the workplace, this means all women will step up and aim for management-level positions. By enabling women to truly participate in the workplace by ensuring they have flexibility in choosing a career path and can pursue it in a way which accords with their lifestyle, I believe this is, ultimately, the high road to achieving a greater percentage of women in management. It is therefore important to utilize communication with group members to build the foundations for interpersonal relationships. By securing a psychological safety, we can

foster a workplace atmosphere where members can express their ideas and emotions without hesitation. I help each member set goals in improving their skills step by step in accordance with their own career aspirations. We use regular career planning for roughly five-year increments to ensure members' skill development and aspirations remain in alignment.

It is also important to recognize the job and efforts of each person. Evaluations enhance people's motivation. And it's not just with pay raises and promotions; even a "thank you" or "great work" spoken in acknowledgment of an employee's efforts can make a big difference. All it takes is a word or two to profoundly impact an employee.

My advice to the women who will come after me is to not force yourself to be someone or something you are not. If you force yourself, your motivation will eventually collapse. We can sometimes find ourselves unintentionally comparing ourselves to colleagues who are moving ahead, but it is important to understand yourself, that there is nothing more important than your health, and that you should pursue a spiritually rich life. And at NGK, as you strive to forge your own path, you will always have the support of those above you.



**Miwa Matsui**

Planning Group Manager, Business Planning Department, Energy Infrastructure Business Group

## Supply Chain (Implementation of Fair, Free, and Transparent Transactions)

With a basic policy centered on the three principles of openness and fairness, partnership, and relationship with society, the NGK Group is engaged in fair and honest business transactions with the procurement partners in our supply chain.

### Basic Approach

The NGK Group has established the Basic Purchasing Policy in an attempt to conduct fair and honest business transactions and to prosper together with all our procurement partners.

#### ■ Supply chain management system

At NGK, the Purchasing Department is responsible for managing tier 1 suppliers. It also manages tier 2 and beyond suppliers that provide critical items such as raw materials. All supplier management is done in line with NGK's Supplier Management Regulations.

Reference  
URL

**Helpline for Business Partners**  
<https://www.ngk-insulators.com/en/info/procure/>



### Basic Purchasing Policy

#### Open and Fair

- Open, fair, and honest procurement
- Pursuit of competition principles and profitability

#### Partnership

- Mutual prosperity based on mutual trust with suppliers

#### Relationship with Society

- Compliance with laws
- Preservation of the global environment

#### ■ CSR Procurement Guidelines

The NGK Group created the CSR Procurement Guidelines in fiscal 2010 as a guide to promote CSR procurement across the Group. The Guidelines specifically describe our obligations as a socially responsible buyer as well as our requirements for socially responsible suppliers.

In fiscal 2013, the Guidelines were expanded by being integrated with the previous Green Procurement Guidelines, which set forth rules for preferential purchase of environmentally friendly products and services, and adding provisions of conflict minerals, anti-corruption, human rights, and labor issues.

The expanded CSR Procurement Guidelines are publicly available on our website in multiple languages (Japanese, English, and Chinese).

#### ■ Improving CSR procurement

At the NGK Group, we develop activities to promote CSR procurement, such as visiting individual suppliers and conducting on-site inspections. We also request our suppliers, particularly new companies, to sign an agreement to comply with the CSR Procurement Guidelines.

Looking ahead, we will conduct a survey over the course of 2020 to 2021 in order to ascertain the degree to which suppliers understand and incorporate CSR procurement. We will perform CSR procurement-related audits (via information sessions, seminars, etc.) of suppliers who require support in order to facilitate CSR procurement-related improvement.



# Business Overview

In spite of an economy reeling from the effects of the COVID-19 pandemic, we aim to achieve new growth by expanding and upgrading highly functional products and products contributing to environmental protection.





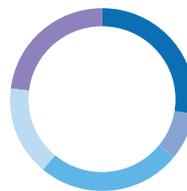
# Ceramic Products Business

While sales volume increased in gasoline particulate filters (GPFs) as a result of more stringent exhaust regulations in Europe and China, factors such as fewer automobiles produced and sold and the exchange rate effects of a strong yen added up to net sales on a par with the previous fiscal year. Operating income declined as a result of increased depreciation and amortization.

## Fiscal year ended March 2020 results (after elimination of intersegment sales)

Net sales **251.8** billion yen      Operating income **53.5** billion yen

### Net sales breakdown



- HONEYCERAM®  
28% 69.8 billion yen
- GPF  
8% 20.7 billion yen
- Cd-DPF, large catalyst supports  
25% 63.8 billion yen
- SiC-DPF  
16% 39.9 billion yen
- Sensors  
23% 57.6 billion yen

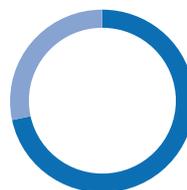
# Process Technology Business

Products for semiconductor manufacturing equipment experienced falling revenue due to declining demand caused by lower capital investment among semiconductor manufacturers. Revenue also fell for industrial process-related products on declining demand for products such as kilns for manufacturing positive electrode material for lithium-ion car batteries. Operating income dropped due to factors including lower shipments and increased depreciation and amortization.

## Fiscal year ended March 2020 results (after elimination of intersegment sales)

Net sales **91.5** billion yen      Operating income **6.4** billion yen

### Net sales breakdown



- High-performance ceramics  
71% 65.3 billion yen
- Industrial process  
29% 26.1 billion yen

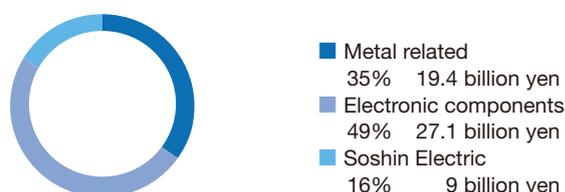
# Electronics Business

For metal-related products, shipments of beryllium copper products fell due to a worsening Chinese market. In electronic components, while volume was up for bonded wafers for SAW filters and piezoelectric micro-actuators for hard disk drives (HDDs), ceramic package volume was down against the background of stagnant investment in macrocell base stations in China. Consolidated subsidiary Soshin Electric saw net sales fall year-on-year due to a slowdown in the semiconductor and machine tool markets. The result was that net sales fell but operating income moved back into the black.

## Fiscal year ended March 2020 results (after elimination of intersegment sales)

Net sales **55.4** billion yen      Operating income **30** million yen

### Net sales breakdown



# Energy Infrastructure Business

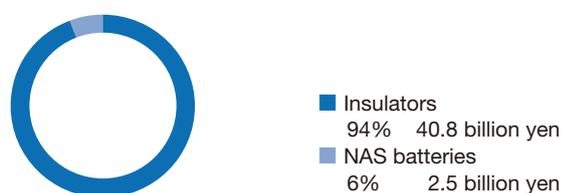
(Name changed from the Power Business in April 2020)

Insulators saw lower shipments due to ongoing capital investment cutbacks by power companies in Japan, in addition to downsizing of overseas production facilities. Sales of NAS<sup>®</sup> batteries were down due to a lack of major orders. Earnings were still in the red although somewhat improved.

## Fiscal year ended March 2020 results (after elimination of intersegment sales)

Net sales **43.3** billion yen      Operating income **(4.9)** billion yen

### Net sales breakdown



# Ceramic Products Business

Offering more high-performance products to satisfy increasingly stringent exhaust regulations and achieve greater growth

## Current Situation and Future Outlook

### ■ Laying the groundwork for dramatic growth amidst a period of increased revenues but decreased profits

Although the period ended March 31, 2020 saw a slight increase in sales revenue, operating income over the same period decreased. This reflects the impact of not only the global economic slowdown, which began in the latter half of the fiscal year but also the outbreak in China of COVID-19 at the end of the period. Nevertheless, the groundwork for dramatic future growth has been laid in the system of manufacturing facilities, such as with the start of operations at our second Chinese plant for gasoline particulate filters (GPFs), which represent an area of anticipated future growth, as well as with the completion of a production system encompassing the plants in China, Thailand, Poland, Ishikawa Prefecture in Japan and other areas, thanks to the past several years of large-scale capital investment.

However, the COVID-19 pandemic since the start of 2020 has resulted in stagnation within the global automotive market, and this has an inescapable impact on NGK as well. While the impact on business has been extremely large, I believe that demand will rebound once conditions in society have returned to normal.

## Growth Strategy

### ■ Delivering high-performance products to grow business

With a marked increase in exhaust regulation stringency being predicted worldwide, it is not just regulation leaders, i.e., Europe and the U.S., who are implementing tougher standards but also China and India. Thus, requirements are expected to become stricter for ceramic substrates for catalytic converters, exhaust filters, and NOx sensors, all of which are our core products in vehicle emission control systems. We therefore expect a significant increase in demand for lighter, thinner substrates and sensors for gases other than NOx. Naturally, this will mean greater manufacturing difficulty accompanied by a lower yield with higher costs. The number one challenge for us, therefore, is finding ways to overcome these challenges. While the costs should be better controlled, the products' higher performance should help customers recognize added value. I feel that such efforts will help to ensure profitability.

With regard to volume, by increasing the number of units installed per vehicle and the number of vehicles with installed units, an upward trend for sensors and GPFs is forecast to continue for the time being.

Although momentum towards EVs (electric vehicles) is strong, the recommendation is being made that CO<sub>2</sub> emissions volume needs to be assessed from the standpoint of LCA (life cycle assessment).

It is in this context that the synthetic fuel, or "e-fuel," being developed in Europe is garnering interest. Electricity created from renewable energy is used to generate hydrogen via water electrolysis, and when this hydrogen reacts with atmospheric CO<sub>2</sub>, or CO<sub>2</sub> from factory emissions or other sources, it turns into methane via the methanation process which can, ultimately, be used as a synthetic fuel. If we switched over to this sort of fuel, the automobiles we currently use to drive about our cities would immediately become carbon-free. Practical implementation is a topic that still needs to be addressed, but if it were achieved, it would provide us with a reasonable solution to global warming. NGK can contribute to achieving this solution by providing substrates and filters that thoroughly ensure carbon-free automobiles are not emitting NOx and other harmful exhaust.



**Main market**

**【Market for NGK products for emission control systems】**  
Global market size: 500 billion yen  
(2019 NGK estimate)

**Main customers**

**【Products for emission control systems】**  
Manufacturers of cars, trucks, and agricultural and construction equipment in and outside Japan

**Core products**

■ **Gasoline particulate filters (GPFs)**

These particulate filters for gasoline-powered vehicles are used mainly in direct-injection gasoline engines that provide high horsepower and excellent fuel economy.

■ **In-vehicle high-precision NOx sensors**

These sensors contain elements that utilize zirconia's oxygen pump function. They are now incorporated in clean diesel vehicles around the world because of their superior detection capabilities and greater durability.

■ **HONEYCERAM®**

In addition to the square-cell configuration, this product comes in a hexagonal configuration that is effective in reducing the amount of catalyst used. Used by the world's automakers, HONEYCERAM cumulative production has reached 1.6 billion units.

**Initiatives to Address Social Challenges**

■ **Towards a carbon-neutral manufacturing process**

All of the products we handle are products contributing to environmental protection. However, the manufacture of ceramic products requires the firing process for which natural gas is used as a fuel, and this produces a significant amount of CO<sub>2</sub>.

Moving forward, we are looking for ways to further cut CO<sub>2</sub> emissions from the manufacturing process so that we can move closer to the goal of being carbon neutral.

**Atsushi Matsuda**

Director and Senior Vice President;  
Group Executive,  
Ceramic Products Business Group



# Process Technology Business

Supporting society with the latest communications technology and high-quality, environmentally beneficial products

## Current Situation and Future Outlook

### Escaping a difficult situation and moving towards a market recovery

The period ended March 31, 2020 was characterized by extremely difficult conditions, and, as a result of stagnation in the semiconductor market, performance for the HPC (high-performance ceramics) business dropped markedly from the previous period. However, we continue to fight on gamely thanks to a recovery in the memory market towards the end of the fiscal year, coupled with positive developments in the semiconductor market relative to other markets despite the negative impact that the COVID-19 pandemic has had on markets in general. Our medium-to-long-term outlook is unchanged; we remain confident that the market will continue to grow thanks to the continuing expansion in IoT, AI, and 5G-related investment.

Our industrial process business experienced a decline in results due to such factors as NTS (an NGK Group company in China that manufactures and sells kilns for cathode materials used in lithium-ion batteries) being affected by increased

competition and stagnant EV sales caused by decreased government subsidies. This year we are working on rebuilding this business.

With regard to the impact of COVID-19, the almost simultaneous, worldwide issuance of stay-at-home orders and work-from-home recommendations resulted in sudden growth in demand for ICT, which deemed semiconductors an essential business undergirding the ICT infrastructure, and their production was made a priority. Therefore, the direct impact on HPC-related business is expected to be minor. At present, we are faced with concerns in parts procurement and other supply-side challenges. We are also worried about an indirect but negative impact on demand over the past year due to a global economic slowdown and a worsening of trade relations between the U.S. and China. However, over the medium term, we see the market recovering and growing.

## Growth Strategy

### Capturing market share by meeting customer needs

The HPC business struggled greatly last year with production yield for new products. Thanks to a focused investment of corporate resources, combined with company-wide support, the cooperation of improvement teams dispatched by customers, and various other assistance, we were ultimately able to stabilize production. We continue to work on maintaining a high production yield and, at the same time, are devoting energy and resources to developing new products that meet customer needs.

In the area of semiconductor production, there is the issue of how to maximize the number of semiconductor chips that can be produced from a 300 mm-diameter-wafer, which directly affects production capacity and cost. The solution requires a susceptor that can maintain a uniform temperature over the entire wafer during the membrane formation and etching process. This will require a product that can rapidly raise and lower the temperature as needed by the customer, that is highly resistant to corrosive gases, and that has only minimal temperature variation. By continuing to promptly provide products that are responsive to the ever-evolving semiconductor manufacturing process, we will differentiate

ourselves from our competition and secure a greater share of the market.

The plant in Tajimi, Japan, began operating last fall and is steadily increasing its production capacity. As it is a high-efficiency plant with sufficient capacity to handle future growth in demand, we plan to use it to its fullest capacity in order to contribute to business performance as soon as possible.

For the industrial process business, our top priority is rebuilding our business in cathode material production kilns. The core Chinese market continues to grow; however, at the same time, customer needs also continue to change. We will work to ensure that our structures and systems can track with this. We are also devoting time and resources into development within other areas as well. These include low-level radioactive waste treatment systems for decommissioned nuclear power plants and large ceramic membranes for CO<sub>2</sub> separation, for which demonstration testing is being conducted in the U.S. This is an important year for advancing development in a broad range of areas like these.



#### Main market

#### 【Capital investment in wafer fab equipment】

Global market size: \$47.6 billion  
(2019 SEMI estimate)

#### Main customers

#### 【Ceramic heaters】

Manufacturers of semiconductor production equipment

#### Core products

#### ■ Ceramic heaters

These are used to keep the temperature of silicon wafers constant during the membrane formation process. Our unique heater structure sees a shaft attached to the underside of the heated stage on which wafers are placed. This way, we can protect terminals and conducting wires from halogen gas.

#### ■ Industrial heating systems (kilns and drying furnaces)

Our high-precision, energy-efficient heating technologies, which were honed over long years of experience in producing ceramics, have enabled us to develop an excellent lineup of heating devices and refractories. These are widely used in all sorts of industries, from the cutting edge (solar cells and lithium-ion batteries) to the traditional (pottery).

#### ■ Ceramic membranes and separators

At NGK, we are skilled in advanced membrane engineering using all kinds of separation membranes. Our highly efficient separating systems are prized for use in a range of applications, including the purification of water for use in pharmaceutical production, food and beverage filtration, and the treatment of wastewater and gas in chemical and electronics plants.

## Initiatives to Address Social Challenges

### ■ Supporting modern society with semiconductor-related and environmentally beneficial products

Lifestyles are changing significantly. Amidst the concerted effort towards widespread adoption of 5G, IoT, and autonomous driving, the COVID-19 outbreak is rapidly accelerating the adoption of IT in various fields, such as telecommuting, home-based medical consultations, and remote learning. Semiconductors are central to enabling such high-volume, high-speed, simultaneous, low-lag communications, and our products facilitate their production.

We are also engaged in the manufacture of on-board battery materials, pharmaceutical water, large ceramic membranes for CO<sub>2</sub> separation, and other products that benefit environmental and human health. We will continue to provide such products for the sake of developing industry and helping to find solutions to the challenges facing society.

### Ryohei Iwasaki

Director and Senior Vice President;  
Group Executive,  
Process Technology Business Group



# Electronics Business

## Capitalizing on unique ceramic technology to drive technological innovation

### Current Situation and Future Outlook

#### ■ Solid business from data centers and growing 5G-related investment

Results for the period ended March 31, 2020 were generally in line with expectations, apart from the impact felt from stagnating investment in macrocell base stations due to the economic slowdown in China. Demand for bonded wafers for SAW filters, piezoelectric micro-actuators for hard disk drives (HDDs), and other core products exceeded expectations.

The spread of COVID-19 impacted first-quarter shipments to customers in China and South Korea, and we are currently investigating continued and future impacts. In the Chinese market, government investment in 5G-related technology continues. However, it has been impacted by trade frictions between the U.S. and China, as well as by the worldwide downturn in automotive sales. This likely will have an impact on products like ceramic packages. The outlook for products from our New Metals Division and Soshin Electric is uncertain, and the level of impact to expect moving forward is also uncertain. However, despite all of this, we forecast an overall recovery.



### Growth Strategy

#### ■ Capitalizing on global change as an opportunity to create new products

In our electronic components business, we have been focusing our time and resources in recent years into launching new products, including the EnerCera® lithium-ion rechargeable battery, micro-lenses for ultraviolet LEDs, and gallium nitride (GaN) wafers. For each of these, there is the twofold challenge of market development and cost reduction.

In the case of the EnerCera battery, applications are being developed in a variety of areas. In addition to smart cards and wearable devices, industrial applications are also being studied, such as in IoT for factories and stores, and in quality control for shipping. Alongside promotional tie-ups with IC manufacturers and power generation/power supply device manufacturers, we are exploring digital marketing and other new methods that allow us to reach out to companies that we have conventionally been unable to access.

Our micro-lenses for ultraviolet LEDs are manufactured using a unique mold casting technology. We can now expect a steady level of sales based on the fact that they have been well received for their high degree of design flexibility, which allows them to be tailored to the optical properties sought by customers.

Furthermore, the same mold casting technology is used in the development of the HICERAM® carrier wafer used in the semiconductor packaging process, and this has had a positive impact on customer assessment. We are accelerating the pace of commercialization in order to accommodate the demand

accompanying recovery in the semiconductor market.

For GaN wafers, we are working to make improvements that will differentiate us from our competition in terms of reliability and customer process yield. Although it will take a bit more time until environmental regulations lead to full demand for alternatives to mercury lamps, GaN wafers have future potential in the power semiconductor market beyond current laser oscillation applications.

With regard to our metal-related business, we are expanding sales of beryllium copper strips aimed at meeting the expected growth in demand for 5G base stations and EVs (electric vehicles). For our new copper-nickel-tin alloy, we are currently working on new applications that will complement our existing applications. We had been having difficulty developing applications for our zirconium-copper alloy wire, but we were able to surmount customers' electrical discharge wire-related difficulties and thereby facilitate improvement in machining setup. We have now moved it into mass production.

Factors such as the aftereffects of the COVID-19 pandemic, the expansion in 5G-related investment, and more widespread utilization of video data and IoT sensing are causing rapid change in market needs in the medium-to-long term. For us, these represent excellent opportunities to create new products and expand sales.



**Main market**

【Amount of digital data generated and transmitted worldwide】  
Average annual growth rate of approximately 30%  
Amount in 2025 will be more than five times that of 2018: 175 ZB (zettabytes: 1 trillion gigabytes) (IDEMA Japan estimate)

**Main customers**

【Piezoelectric devices for HDDs, bonded wafers, etc.】  
Manufacturers of HDDs, 4G/5G-related devices, and base stations

**Core products**

■ **Piezoelectric micro-actuators for HDDs**

Micro-actuators are indispensable for performing precise control of magnetic heads in HDDs. As the key device enabling both high capacity and reliability in HDDs, our ultra-compact micro-actuators are used in data centers throughout the world.

■ **Bonded wafers**

Bonded wafers are substrates for electronic devices developed by proprietary bonding technologies and ultra-high-precision wafer polishing technologies cultivated in the ceramics business. Combining different materials makes it possible for bonded wafers to deliver performance and functionality beyond wafers made from a single material.

■ **Beryllium copper alloy**

From 0.045 mm sheets and coils to bars and wire a mere 0.05 mm in diameter, we can provide the right alloy mix with a variety of hardness to meet customer needs. Beryllium copper alloys boast outstanding strength, conductivity, fatigue resistance, high-temperature characteristics, workability, and resistance to corrosion.

**Initiatives to Address Social Challenges**

■ **Anticipating global changes and providing products that help address social problems**

Our philosophy can be summed up as “Creating new products and business models that contribute to the growth of our society, company, and business.” Our goals align with those of the SDGs, as we believe in leveraging technology for the benefit of the world and in using our products to improve society and the lives of everyone around us. We have created our own handbook to cultivate a shared philosophy and shared goals among our employees.

Our business group has also set for itself the goal of being an organization that learns, and we therefore build up human resources who are capable of contributing to the growth of the group. We cultivate a broad perspective and encourage independent goal-setting and the pursuit of better methods and approaches.

Our vision for ourselves is to be an organization that anticipates global change and provides products that facilitate the sort of technological innovation that will help address society’s challenges. And we believe that by capitalizing on the unique ceramic technology that we have to offer, this vision is within reach.



**Shuhei Ishikawa**

Director and Senior Vice President;  
Group Executive,  
Electronics Business Group

# Energy Infrastructure Business

Contributing to a carbon-neutral social infrastructure

## Current Situation and Future Outlook

### ■ Striving to return the Insulator business to profitability during lean times of NAS batteries

The period ended March 31, 2020 saw an improvement in profit and loss for the Insulator business. This improvement is due in part to the consolidation of operations into four production facilities in Japan and two overseas, which has taken place over the past 10 years, as well as to other measures, such as the streamlining of indirect personnel. Currently, we are working to improve sale price both in and outside Japan and have already received consent from some of our customers. We are moving step-by-step to return NGK's insulator business to profitability by the end of fiscal 2021. Looking ahead, we are working steadily to stimulate and capture demand for replacing insulators installed during Japan's past high-growth periods.

In the NAS business, demand for large capacity and long-duration battery applications remains lean. However, we are confident that the future will bring with it fully realized demand for NAS® batteries. At present, our group is working

on developing business related to zinc rechargeable batteries, and this is being carried out with an eye to developing solutions that incorporate NAS batteries.

At the same time, soon after we discovered non-conformity in testing procedures of insulators, which arose in the past fiscal year, we put priority on changing the old corporate culture to one of openness and positivity. Our vision is to be an organization where employees can express themselves with honesty and where they feel that what they say is heard and acted upon. Results from an in-house survey conducted in February 2020 showed that more than half of employees felt the workplace environment had improved, which I feel shows that progress has come from the initiatives that were implemented these past several years.

Although the impact of the COVID-19 pandemic on business has thus far been limited, we will continue to carefully monitor the situation.

## Growth Strategy

### ■ Collaborating with BASF in building a new business model for NAS batteries

The trend towards a low-carbon, carbon-neutral society continues apace around the world. In Japan, a marketplace for balancing power supply and demand will be established in 2024, which is anticipated to be accompanied by the spread of virtual power plants (VPPs) that will use storage batteries to supply power. In the U.S., photovoltaic power generation used in conjunction with storage batteries is steadily becoming more cost-competitive relative to thermal power plants. We are on the cusp of an era where conventional thermal power generation will be replaced by renewable energy combined with storage batteries as part of a "local production for local consumption" system where local regions produce the energy that they consume.

Looking ahead to that era, last year we concluded an NAS battery sales partnership agreement and joint research agreement with BASF New Business GmbH, a wholly owned subsidiary of major German chemical manufacturer BASF. The aim of this partnership is to jointly develop the next generation of sodium-sulfur batteries, which discharge over four or more hours, and then have BASF leverage its enormous procurement power to keep costs down and use its global sales network to facilitate business expansion.

Consumers in Europe are very focused on greenhouse gas reduction, and BASF itself will build a carbon-free plant at the

behest of the German government. For this idea to work, storage batteries capable of storing renewable energy are essential. Currently, lithium-ion batteries are the mainstream choice, but there are limitations on procuring these batteries' primary ingredient, lithium. Conversely, the sodium, sulfur, and other materials used in NAS batteries are practically unlimited, and, if produced on a large scale, cost would be reduced greatly.

Moving forward, we will work with BASF in examining the optimal supply chain and production organization in order to grow our business in the future.

Also, with regard to zinc rechargeable batteries, we are working on indoor applications, which capitalize on their high level of safety. Zinc rechargeable batteries eliminate the need for any flammable electrolytic solutions and, thus, have the distinct advantage of having no combustion or overheating risks. Our aim is to make these batteries offer high energy density without battery life degradation, even with daily use.

There are a number of facilities where such a highly safe battery would be welcome, including schools, hospitals, commercial facilities, and base stations. We have even heard from customers who are keen to test them out as soon as possible.



**Main market**

【Global market for large rechargeable batteries】  
Storage system market size: 1.882 trillion yen  
(Estimate for 2030 by Fuji Keizai Management)

**Main customers**

【Stationary rechargeable batteries】  
Power utilities, engineering companies, etc.

**Core products**

■ **NAS batteries**

NGK developed the world's first commercialized battery system capable of storing hours of electricity. These systems, which enable a high output of electric power for long periods of time, have been installed in around 200 locations worldwide.

■ **Zinc rechargeable batteries**

Zinc normally causes short-circuiting during charging when used in rechargeable batteries. However, NGK has solved this problem and developed a zinc rechargeable battery by utilizing its proprietary hydroxide ion conducting ceramics. Featuring high capacity and inherent safety, the zinc rechargeable battery is an optimal storage solution for indoor installations.

■ **Insulators**

By ensuring that transmission lines and steel towers and equipment are completely isolated, insulators play a crucial role in maintaining the safety and stability of our energy lifelines. We have developed and are manufacturing products such as the world's strongest ultra-high-voltage (1,000 kV) transmission insulators and bushings that use our transformer insulators, which are among the world's largest. Our products are used in more than 100 countries around the world.

## Our Founding Spirit

■ **Contributing to a carbon-neutral social infrastructure**

In April 2020, we renamed our business group the Energy Infrastructure Business Group to reflect our role in ensuring stable power supply and in broadening the scope of energy possibilities, thereby contributing to the development of social infrastructure.

We hold on to the words of our first president, Kazuchika Okura, who said, "We do this to serve our country, and not for our own profit." The name change can therefore be seen as a return to our origins as a company. Expanding the scope of energy possibilities is the very reason and value for our existence.

Building a carbon-neutral society is essential for our times, and renewable energy will play a key role in tackling that challenge. Transmission lines are crucial to supplying this energy, storage batteries ensure its efficient use, and our products help secure seamless functioning between these elements. We are leading the way towards the coming era of renewable energy.

**Shigeru Kobayashi**

Director and Senior Vice President;  
Group Executive,  
Energy Infrastructure Business Group



A blurred photograph of a modern office lobby. The scene is captured with a long exposure, creating a sense of motion. In the foreground, the lower legs and feet of several people in business attire are visible as they walk across a polished, reflective floor. In the background, a man is sitting on a bench near a large window. The window reflects the exterior of a modern building and some greenery. The overall atmosphere is professional and dynamic.

# Corporate Data

Let's look at a range of information on the NGK Group, including major financial and non-financial data and consolidated financial statements.



## Financial and Non-Financial Data

### Financial Indicators

	March 2010	March 2011	March 2012	March 2013
Net sales	235,489	239,363	248,948	252,789
Cost of sales	168,716	160,804	172,456	178,052
Selling, general, and administrative expenses	43,319	46,456	49,986	54,041
Operating income	23,453	32,102	26,504	20,695
Net income attributable to owners of the parent	17,808	24,428	(35,351)	11,422
Capital expenditures	20,891	25,284	28,839	31,216
Research and development expenses	10,699	11,437	11,428	11,315
Net cash provided by operating activities	44,375	36,650	13,850	3,681
Net cash used in investing activities	(71,166)	(17,886)	(45,438)	(582)
Net cash provided by financing activities	1,681	(5,146)	56,608	12,448
Total assets	475,847	479,793	523,322	563,030
Interest-bearing debt	71,453	69,229	131,436	155,816
Net assets	319,472	323,945	264,381	303,073
Profit per share (yen)	54.51	74.80	(108.27)	34.98
Cash dividends per share (yen)	16	20	20	20
Ratio dividends to net worth (%)	29.4	26.7	–	57.2
Return on equity (ROE) (%)	6.1	8.0	(12.6)	4.2
Equity ratio (%)	63.5	64.0	48.5	52.0
Price-earnings ratio (PER)	35.0	19.9	–	29.0
Price-book value ratio (PBR)	2.1	1.6	1.5	1.1
Closing stock (yen)	1,907	1,487	1,181	1,013
Number of employees, end of year (persons)	11,176	11,666	12,372	13,159

### Non-Financial Indicators

	March 2010	March 2011	March 2012	March 2013
GHG emissions (Scope 1: Energy-origin CO <sub>2</sub> ) (10 <sup>3</sup> metric tons, NGK Group)	45.7	24.8	27.5	29.6
GHG emissions (Scope 2: Energy-origin CO <sub>2</sub> ) (10 <sup>3</sup> metric tons, NGK Group)	45.7	35.0	38.6	41.7
GHG emissions (Scope 3) (10 <sup>3</sup> metric tons, non-consolidated)	–	–	–	–
Total water consumption (10 <sup>3</sup> m <sup>3</sup> , NGK Group)	158*1	155*1	305	327.3
VOC emissions (metric tons, NGK Group)	0.89*1	0.94*1	5.7	4.8
PRTR substance emissions (metric tons, NGK Group)	4.4*1	4.8*1	17.3	14.8
Total water discharge (10 <sup>3</sup> m <sup>3</sup> , NGK Group)	166*1	165*1	172	215
Waste emissions (10 <sup>3</sup> metric tons, NGK Group)	1.07*1	4.8	3.6	3.9
Number of employees (persons, non-consolidated)	3,272	3,293	3,351	3,426
Employee breakdown (women) (% , non-consolidated)	13.6	13.3	13.1	13.4
Percentage of women among managers (% , non-consolidated)	1.0	1.1	1.1	1.0
Percentage of women among managers (% , overseas NGK Group companies)	–	–	–	–
Number/percentage of disabled employees (persons/%, non-consolidated)	42 (1.68)	42 (1.45)	43 (1.51)	49 (1.91)
Lost time incident rate (non-consolidated)*2	0.00	0.42	0.14	0.27
Social contribution expenditure (100 million yen, non-consolidated)	–	–	–	3.46
Number of directors (persons, non-consolidated)	13	13	13	11
Number of outside directors (persons, non-consolidated)	1	2	2	2
Total remuneration of directors (million yen, non-consolidated)	756	761	643	668
Number of patents held (Japan) (non-consolidated)	2,240	2,270	2,303	2,454
Number of patents held (overseas) (non-consolidated)	3,754	3,829	3,981	4,087

\*1 Non-consolidated basis

\*2 Based on a calendar year

(Millions of yen)

	March 2014	March 2015	March 2016	March 2017	March 2018	March 2019	March 2020
	308,671	378,665	435,797	401,266	451,125	463,504	441,956
	208,052	254,386	289,266	272,434	312,107	323,224	313,458
	56,366	62,700	65,633	65,619	68,991	75,574	73,496
	44,252	61,577	80,898	63,212	70,026	64,705	55,000
	27,045	41,504	53,316	36,379	45,814	35,506	27,135
	28,434	30,366	45,437	60,101	71,713	105,336	93,997
	12,060	13,942	17,410	18,653	21,100	23,271	22,928
	32,647	73,002	59,445	80,172	50,554	61,224	53,200
	(21,185)	(39,495)	(47,772)	(56,452)	(49,413)	(109,743)	(60,830)
	2,026	(26,000)	(373)	(13,013)	22,546	3,564	(18,796)
	614,219	702,234	711,897	759,434	826,243	863,636	833,085
	167,295	156,203	163,973	174,150	211,573	229,423	234,400
	344,453	404,001	417,972	427,593	472,863	489,245	469,118
	82.82	127.11	163.28	112.71	142.42	110.35	84.73
	22	28	38	40	44	50	50
	26.6	22.0	23.3	35.5	30.9	45.3	59.0
	8.6	11.4	13.3	8.8	10.4	7.6	5.8
	54.3	55.8	57.1	54.9	55.8	55.3	55.0
	26.0	20.2	12.7	22.4	12.9	14.6	16.7
	2.1	2.1	1.7	1.9	1.3	1.1	1.0
	2,150	2,565	2,079	2,520	1,834	1,608	1,417
	13,210	16,217	16,657	17,517	18,783	20,115	20,000

	March 2014	March 2015	March 2016	March 2017	March 2018	March 2019	March 2020
	30.2	29.0	31.1	31.7	32.0	32.3	30.9
	44.3	46.1	52.1	56.2	61.2	63.7	65.1
	–	–	–	–	87.7	104.7	97.7
	318.2	276	285	409	432	453	433
	5.3	6.3	6.8	155.4	145.3	119.7	68.4
	14.3	15.4	14.0	163.1	154.2	127.5	76.3
	223	196	197	279	287	281	314
	4.2	5.7	5.9	5.9	5.9	5.8	5.4
	3,531	3,569	3,700	3,937	4,142	4,119	4,224
	13.3	12.9	12.6	12.7	12.5	12.6	12.8
	1.5	1.8	1.8	2.0	2.0	2.2	2.9
	–	–	16.6	15.3	21.0	16.0	20.2
	53 (2.07)	56 (2.23)	56 (2.18)	55 (2.03)	57 (1.90)	62 (1.92)	135 (2.20)
	0.42	0.00	0.29	0.34	0.11	0.40	0.00
	3.48	3.31	3.46	3.15	3.00	3.02	2.73
	12	12	12	13	12	12	13
	2	2	2	2	3	3	3
	624	581	723	803	799	698	660
	2,685	2,719	2,907	3,038	3,191	3,352	3,513
	3,990	3,911	4,042	4,134	4,186	4,346	4,485

## Financial Position, Operating Results, and Cash Flow Analysis

### Overview of Business Results and Others

During the fiscal year ended March 31, 2020, the Japanese economy recorded negative growth during the fourth quarter of the fiscal year due to the spread of COVID-19, which turned from the moderate growth due to improvements in the employment and income environments. Overseas, the world experienced a sharp deterioration in economic, reflecting curbs on economic activities due to the spread of COVID-19 during the fourth quarter of the fiscal year despite being underpinned by the good employment environment and monetary easing.

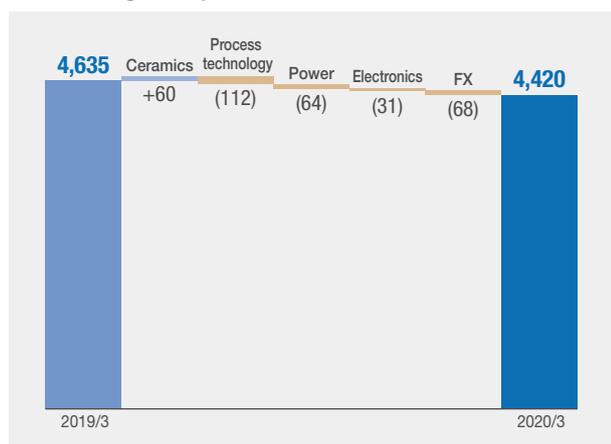
Under the circumstance, the NGK Group experienced weak shipments of both insulators and NAS<sup>®</sup> batteries in the Power Business Segment. In the Ceramics Business Segment, shipments of automotive ceramics were sluggish due to declines in global car sales and production. In the Electronics Business Segment, demand for ceramic packages declined against the backdrop of stagnant capital investment for mobile phone base

stations in China. In the Process Technology Business Segment, the distribution volume of products for semiconductor manufacturing equipment dropped against a backdrop of reduced capital investment by semiconductor manufacturers. As a result of the above, consolidated net sales for the fiscal year ended March 31, 2020 decreased 4.6% year on year to ¥441,956 million.

In terms of earnings, an increase in depreciation costs in addition to a decrease in net sales hereinabove causing operating income to fall 15.0% year on year to ¥55,000 million, and ordinary income was down 19.3% year on year to ¥51,952 million. Profit attributable to owners of the parent decreased 23.6% year on year to ¥27,135 million due to the recording of impairment loss of ¥12,558 million in the subsidiary manufacturing automotive ceramics in Thailand and package business, reflecting the impact of COVID-19.

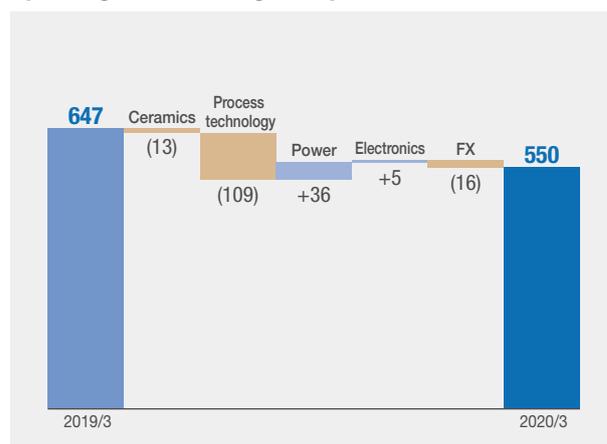
#### Sales Change Analysis for FY2020

(100 million yen)



#### Operating Income Change Analysis for FY2020

(100 million yen)



	2019/3	2020/3
FX rate	¥111/USD	¥109/USD
	¥128/EUR	¥121/EUR

## Segment Overview

### ■ Power Business Segment

(Renamed to Energy Infrastructure Business in April 2020)

Net sales of the Power Business Segment decreased by 13.0% year on year to ¥43,377 million.

Sales of insulators decreased due to sluggish domestic shipments against the backdrop of reduced capital investment by electric power companies, coupled with a decrease in overseas shipments due to scaling down of manufacturing base. Sales of NAS® batteries decreased due to a lack of large shipments.

In terms of earnings, there was an operating loss of ¥4,915 million compared with an operating loss of ¥8,498 million in the previous fiscal year.

### ■ Ceramics Business Segment

Net sales of the Ceramics Business Segment increased by 0.1% year on year to ¥251,785 million.

Net sales were comparable to the result of the previous fiscal year due to the impact of declines in global car sales and production and strong yen despite the distribution volume of gasoline particulate filters (GPFs) for gasoline fueled vehicles increased with tightened regulation of emissions in Europe and China.

Operating income decreased 4.4% year on year to ¥53,484 million due to an increase in depreciation.

### ■ Electronics Business Segment

Net sales of the Electronics Business Segment decreased by 5.8% year on year to ¥55,426 million.

Regarding metal-related products, the distribution volume of beryllium copper products decreased due to a deterioration the Chinese market. Regarding electronic components, the distribution volumes of bonded wafers for SAW filters and piezoelectric micro-actuators for HDDs increased. On the other hand, the distribution volume of ceramic packages dropped against the backdrop of stagnant capital investment for mobile phone base stations in China. Net sales of Soshin Electric, our consolidated subsidiary, decreased year on year due to a deterioration in the semiconductor and machine tools market.

In terms of earnings, there was an operating income of ¥25 million compared with an operating loss of ¥314 million in the previous fiscal year.

### ■ Process Technology Business Segment

Net sales of the Process Technology Business Segment decreased by 11.5% year on year to ¥94,296 million.

Net sales of products for semiconductor manufacturing equipment decreased from the previous fiscal year due to a decline in demand, reflecting a reduction of capital investment by semiconductor manufacturers. Regarding components for industrial equipment, sales decreased due to a decline in demand for kilns for cathode materials used in lithium-ion batteries for vehicle.

Operating income decreased 63.5% year on year to ¥6,436 million due to an increase in depreciation in addition to decrease in distribution volume.

(100 million yen)

	2016/3	2017/3	2018/3	2019/3	2020/3
<b>Power business</b>					
Sales	835	528	545	499	434
Operating income	26	(66)	(47)	(85)	(49)
<b>Ceramic business</b>					
Sales	2,511	2,452	2,407	2,515	2,518
Operating income	707	646	567	559	535
<b>Electronics business</b>					
Sales	1,014	1,035	613	588	554
Operating income	77	53	9	(3)	0
<b>Process technology business</b>					
Sales	—	—	975	1,065	943
Operating income	—	—	171	176	64

From the beginning of fiscal year ended March 31, 2019, following organizational change, the segment classification of the NGK Group has been changed from the "Power Business Segment," "Ceramic Products Business Segment," and "Electronics Business Segment" to the "Power Business Segment," "Ceramics Business Segment," "Electronics Business Segment," and "Process Technology Business Segment." Note that figures for the fiscal year ended March 31, 2018 have been calculated based on this new segment classification.

## Financial Position, Operating Results, and Cash Flow Analysis

### Financial Position

As of March 31, 2020, total assets were decreased by 3.5% from the previous fiscal year end to ¥833,085 million.

Current assets decreased by 10.1% from the previous fiscal year end to ¥398,374 million, mainly reflecting decreases in cash and bank deposits and securities despite an increase in inventories. Non-current assets were increased by 3.4% from the previous fiscal year end to ¥434,710 million, mainly due to an increase in tangible assets, reflecting capital investment to increase production capacity for automotive ceramics and semiconductor manufacturing equipment.

Current liabilities decreased by 22.7% from the previous fiscal year end to ¥114,289 million. This was mainly due to decreases in

current portion of long-term borrowings and notes and accounts payable trade. Long-term liabilities increased by 10.2% from the previous fiscal year end to ¥249,677 million, mainly reflecting an increase in long term borrowings.

Total net assets stood at ¥469,118 million, down 4.1% year on year, due to decreases in foreign currency translation adjustments and unrealized gain on available for sale securities despite an increase in retained earnings.

As a result, the ratio of net worth to total assets as of March 31, 2020 was 55.0% (compared with 55.3% at the previous fiscal year end), with net worth per share standing at ¥1,448.62, down ¥35.36 from the previous fiscal year end.

(100 million yen)

	2016/3	2017/3	2018/3	2019/3	2020/3
<b>Financial position</b>					
Total assets	7,119	7,594	8,262	8,636	8,331
Net assets	4,180	4,276	4,729	4,892	4,691

### Cash Flows

There was a net decrease ¥29,293 million in cash and cash equivalents from the previous fiscal year end to ¥94,691 million. This reflected ¥53,200 million in net cash provided by operating

activities, ¥60,830 million in net cash used in investing activities, and ¥18,796 million in net cash used in financing activities.

#### ■ Cash flows from operating activities

Net cash provided by operating activities was total ¥53,200 million. This was mainly attributable to posting an income before income taxes and non-controlling interests of ¥43,836 million and depreciation and amortization, despite cash outflows mainly due to income tax paid and an increase in inventories. In comparison with the previous fiscal year, net cash provided by operating activities decreased by ¥8,024 million.

#### ■ Cash flows from investing activities

Net cash used in investing activities was total ¥60,830 million. In terms of sales of investment securities, there were proceeds from sales of a part of stock of associated company, sales of cross shareholdings, and redemption of marketable securities. In terms of purchases of property, plant and equipment, there were cash outflows due to capital investment for the plants manufacturing automotive ceramics in China and Poland and the plant in Tajimi, Japan manufacturing semiconductor manufacturing equipment, and purchases of marketable securities. In comparison with the previous fiscal year, net cash used in investing activities decreased by ¥48,912 million.

#### ■ Cash flows from financing activities

Net cash used in financing activities was total ¥18,796 million. This was mainly due to cash dividends paid, repayment of long-term borrowings, and the acquisition of own shares to improve capital efficiency and enable NGK to flexibly exercise its capital policy in response to the changing managerial environment, despite proceeds from long term borrowings in foreign currency appropriated to overseas capital investment. In comparison with the previous fiscal year, net cash provided by financing activities decreased by ¥22,360 million.

(100 million yen)

	2016/3	2017/3	2018/3	2019/3	2020/3
Net cash provided by operating activities	594	802	506	612	532
Net cash used in investing activities	(478)	(565)	(494)	(1,097)	(608)
Net cash provided by financing activities	(4)	(130)	225	36	(188)
Cash and cash equivalents	1,361	1,447	1,699	1,240	947

## Capital Expenditure Overview

As of March 31, 2020, capital expenditure for the NGK Group totaled ¥93.997 billion.

For Power Business, ¥1.245 billion in capital expenditure is being spent primarily on insulator production facility upgrades.

For Ceramics Business, ¥52.265 billion in capital expenditure is being spent primarily on production facilities for automotive-related ceramic products.

For Electronics Business, ¥8.778 billion in capital expenditure is being spent primarily on production facilities for piezoelectric

micro-actuators for HDDs and wafer-related products.

For Process Technology Business, ¥22.221 billion in capital expenditure is being spent primarily on production facilities for semiconductor manufacturing equipment-related products.

For Head Office, ¥9.487 billion in capital expenditure is being spent primarily on office employee welfare facilities and new business equipment and facilities.

## Basic Policy for Profit Sharing and Dividends for the Current and Next Fiscal Years

NGK places a high priority on the interests of shareholders, and positions continuous improvement of corporate value and return of profits as one of the most important management policies. NGK regards return on equity (ROE) that exceeds the cost of capital as an essential medium- to long-term goal for its major management indicators, and it is working to make improvements by using the NGK version of ROIC (calculating operating income, equipment, inventory, and accounts receivable by product), which can be managed by each business segment. NGK pays cash dividends with a dividend rate of 3% on net assets and a consolidated dividend payout ratio of approximately 30% over the medium term, considering the management of net assets in line with changes in business risks and the linkage to business results (ROE) for approximately three years, as well as in consideration of

cash flow forecasts and other factors.

NGK paid a year-end dividend of ¥25 per share for the fiscal year ended March 31, 2020. This and the interim dividend of ¥25, which has already been paid, will bring the total annual dividend per share to ¥50.

Considering the forecast of dividend payout ratio and ratio of dividends to net worth, NGK expects the total annual dividend per share for the fiscal year ending March 31, 2021 to be ¥30, comprised of an interim dividend per share of ¥10 and a fiscal year-end dividend per share of ¥20.

Meanwhile, NGK plans to utilize retained funds primarily to extend its existing core business and capital expenditures in new business projects, with a view to enhancing its corporate value.

	2016/3	2017/3	2018/3	2019/3	2020/3
<b>Overview of capital expenditures, depreciation and amortization</b>					
Capital expenditures (100 million yen)	454	601	717	1,053	940
Depreciation and amortization (100 million yen)	274	266	303	357	396

### Basic policy for profit sharing and dividends for the current and next fiscal years

Dividend per share (yen)	38	40	44	50	50
Payout ratio (%)	23.3	35.5	30.9	45.3	59.0

## Consolidated Balance Sheet

### Consolidated Financial Statements

ASSETS As of March 31, 2020	Millions of yen		Thousands of U.S. dollars
	2020	2019	2020
<b>Current assets:</b>			
Cash and cash equivalents	¥ 94,691	¥ 123,984	\$ 868,727
Time deposits	1,869	4,149	17,145
Marketable securities	14,617	36,029	134,099
Notes and accounts receivable:			
Trade notes and accounts	101,378	106,414	930,073
Other	15,101	14,052	138,543
Allowance for doubtful accounts	(153)	(125)	(1,407)
Total	116,326	120,341	1,067,209
Inventories	157,390	148,032	1,443,943
Prepaid expenses and other current assets	13,482	10,835	123,693
Total current assets	398,375	443,370	3,654,816
<b>Property, plant and equipment:</b>			
Land	29,451	30,919	270,194
Buildings and structures	213,221	197,447	1,956,152
Machinery and equipment	527,626	480,933	4,840,606
Construction in progress	45,376	58,145	416,290
Other	2,286	–	20,974
Total	817,960	767,444	7,504,216
Accumulated depreciation	(458,552)	(441,382)	(4,206,897)
Net property, plant and equipment	359,408	326,062	3,297,319
<b>Investments and other assets:</b>			
Investment securities	33,971	48,751	311,658
Investments in unconsolidated subsidiaries and associated companies	16,026	21,109	147,025
Intangible assets	3,460	3,701	31,747
Net defined benefit assets	6,387	7,468	58,594
Deferred tax assets	12,766	10,442	117,122
Other assets	2,693	2,733	24,707
Total investments and other assets	75,303	94,204	690,853
Total	¥ 833,086	¥ 863,636	\$ 7,642,988

LIABILITIES AND EQUITY As of March 31, 2020	Millions of yen		Thousands of U.S. dollars
	2020	2019	2020
<b>Current liabilities:</b>			
Short-term borrowings	¥ 6,407	¥ 4,231	\$ 58,782
Current portion of long-term debt	9,219	29,198	84,576
Notes and accounts payable:			
Trade notes and accounts	42,690	51,032	391,652
Other	16,775	22,180	153,895
Total	59,465	73,212	545,547
Accrued expenses	19,836	21,492	181,986
Provision for NAS Battery safety measures	1,657	2,029	15,203
Provision for loss related to competition law	1,146	1,178	10,512
Income taxes payable	12,226	11,731	112,163
Other current liabilities	4,334	4,716	39,759
Total current liabilities	114,290	147,787	1,048,528
<b>Long-term liabilities:</b>			
Long-term debt	218,774	195,994	2,007,100
Net defined benefit liability	21,012	20,935	192,774
Provision for product warranties	899	1,632	8,245
Deferred tax liabilities	1,998	1,869	18,330
Other long-term liabilities	6,994	6,174	64,170
Total long-term liabilities	249,677	226,604	2,290,619
<b>Contingent liabilities</b>			
<b>Equity:</b>			
Common stock:			
Authorized — 735,030 thousand shares			
Issued — 322,212 thousand shares and 327,560 thousand shares at March 31, 2020 and 2019, respectively			
	69,849	69,849	640,818
Capital surplus	70,199	71,978	644,032
Stock acquisition rights	829	923	7,605
Retained earnings	345,689	343,324	3,171,457
Treasury stock — at cost: 5,668 thousand shares and 5,780 thousand shares at March 31, 2020 and 2019, respectively			
	(11,264)	(12,122)	(103,341)
Accumulated other comprehensive income			
Unrealized gain on available-for-sale securities	11,337	21,260	104,006
Deferred loss on derivatives under hedge accounting	(462)	(136)	(4,238)
Foreign currency translation adjustments	(21,390)	(11,057)	(196,240)
Defined retirement benefit plans	(5,406)	(5,580)	(49,597)
Total	459,381	478,439	4,214,502
Non-controlling interests	9,738	10,806	89,339
Total equity	469,119	489,245	4,303,841
Total	¥ 833,086	¥ 863,636	\$ 7,642,988

## Consolidated Statement of Income

### Consolidated Financial Statements

For the year ended March 31, 2020	Millions of yen		Thousands of U.S. dollars
	2020	2019	2020
<b>Net sales</b>	¥ 441,956	¥ 463,505	\$ 4,054,642
Cost of sales	313,459	323,224	2,875,769
Gross profit	128,497	140,281	1,178,873
Selling, general and administrative expenses	73,496	75,575	674,279
Operating income	55,001	64,706	504,594
<b>Other income (expenses):</b>			
Interest and dividends income	1,813	1,942	16,630
Interest expense	(3,025)	(2,763)	(27,752)
Loss on sales of and disposals of property, plant and equipment — net	(230)	(352)	(2,106)
Equity in earnings of unconsolidated subsidiary and associated company	1,352	1,565	12,402
Reversal of provision for product warranties	661	95	6,060
Foreign exchange loss	(3,072)	(736)	(28,181)
Gain on sales of investment securities — net	4,081	676	37,442
Impairment loss on fixed assets	(12,559)	(10,935)	(115,219)
Provision of reserve for loss related to competition law	—	(389)	—
Loss on liquidation of subsidiaries	(352)	(1,425)	(3,226)
Loss on the dissolution of a subsidiary	—	(2,961)	—
Subsidy income	591	—	5,422
Other — net	(425)	1,025	(3,901)
Other expenses — net	(11,165)	(14,258)	(102,429)
<b>Income before income taxes</b>	<b>43,836</b>	<b>50,448</b>	<b>402,165</b>
<b>Income taxes</b>			
Current	15,816	13,824	145,099
Refund	(426)	—	(3,905)
Deferred	1,956	1,013	17,947
Total income taxes	17,346	14,837	159,141
<b>Net income</b>	<b>26,490</b>	<b>35,611</b>	<b>243,024</b>
<b>Net (loss) income attributable to non-controlling interests</b>	<b>(645)</b>	<b>104</b>	<b>(5,921)</b>
<b>Net income attributable to owners of the parent</b>	<b>¥ 27,135</b>	<b>¥ 35,507</b>	<b>\$ 248,945</b>
<b>Per share of common stock</b>	Yen		U.S. dollars
Basic net income	¥ 84.73	¥ 110.35	\$ 0.777
Diluted net income	84.60	110.17	0.776
Cash dividends applicable to the year	50.00	50.00	0.459

## Consolidated Statement of Comprehensive Income

For the year ended March 31, 2020	Millions of yen		Thousands of U.S. dollars
	2020	2019	2020
<b>Net income</b>	¥ 26,490	¥ 35,611	\$ 243,024
<b>Other comprehensive loss</b>			
Unrealized loss on available-for-sale securities	(9,927)	(3,453)	(91,075)
Deferred loss on derivatives under hedge accounting	(314)	(110)	(2,885)
Foreign currency translation adjustments	(10,505)	(3,046)	(96,376)
Share of other comprehensive income in associated companies	82	106	760
Defined retirement benefit plans	(100)	2,056	(918)
Total other comprehensive loss	(20,764)	(4,447)	(190,494)
<b>Comprehensive income</b>	<b>¥ 5,726</b>	<b>¥ 31,164</b>	<b>\$ 52,530</b>
Total comprehensive income attributable to:			
Owners of parent	¥ 6,727	¥ 31,276	\$ 61,711
Non-controlling interests	(1,001)	(112)	(9,181)

# Consolidated Statement of Changes in Equity

## Consolidated Financial Statements

For the year ended March 31, 2020

	Thousands	Millions of yen				
	Outstanding number of common stock	Common stock	Capital surplus	Stock acquisition rights	Retained earnings	Treasury stock
<b>Balance at April 1, 2018</b>	321,766	¥69,849	¥71,948	¥858	¥322,622	¥(12,153)
Cumulative effects of accounting change	-	-	-	-	640	-
Net income attributable to owners of the parent	-	-	-	-	35,507	-
Cash dividends, ¥48 per share	-	-	-	-	(15,445)	-
Purchase of treasury stock	(3)	-	-	-	-	(5)
Disposal of treasury stock	18	-	(6)	-	-	36
Change in the parent's ownership interest due to transactions with non-controlling interests	-	-	36	-	-	-
Net change in the year	-	-	-	65	-	-
<b>Balance at March 31, 2019</b>	321,781	69,849	71,978	923	343,324	(12,122)
Cumulative effects of accounting change	-	-	-	-	242	-
Net income attributable to owners of the parent	-	-	-	-	27,135	-
Cash dividends, ¥50 per share	-	-	-	-	(16,090)	-
Purchase of treasury stock	(5,351)	-	-	-	-	(10,004)
Disposal of treasury stock	114	-	(72)	-	-	233
Cancellation of treasury stock	-	-	(1,707)	-	(8,922)	10,629
Net change in the year	-	-	-	(94)	-	-
<b>Balance at March 31, 2020</b>	316,544	¥ 69,849	¥ 70,199	¥ 829	¥ 345,689	¥ (11,264)

	Millions of yen						
	Accumulated other comprehensive income					Non-controlling interests	Total equity
	Unrealized gain on available-for-sale securities	Deferred loss on derivatives under hedge accounting	Foreign currency translation adjustments	Defined retirement benefit plans	Total		
<b>Balance at April 1, 2018</b>	¥ 24,659	¥ (31)	¥ (7,991)	¥ (7,920)	¥ 461,841	¥ 11,022	¥ 472,863
Cumulative effects of accounting change	-	-	-	-	640	(30)	610
Net income attributable to owners of the parent	-	-	-	-	35,507	-	35,507
Cash dividends, ¥48 per share	-	-	-	-	(15,445)	-	(15,445)
Purchase of treasury stock	-	-	-	-	(5)	-	(5)
Disposal of treasury stock	-	-	-	-	30	-	30
Change in the parent's ownership interest due to transactions with non-controlling interests	-	-	-	-	36	-	36
Net change in the year	(3,399)	(105)	(3,066)	2,340	(4,165)	(186)	(4,351)
<b>Balance at March 31, 2019</b>	21,260	(136)	(11,057)	(5,580)	478,439	10,806	489,245
Cumulative effects of accounting change	-	-	-	-	242	-	242
Net income attributable to owners of the parent	-	-	-	-	27,135	-	27,135
Cash dividends, ¥50 per share	-	-	-	-	(16,090)	-	(16,090)
Purchase of treasury stock	-	-	-	-	(10,004)	-	(10,004)
Disposal of treasury stock	-	-	-	-	161	-	161
Cancellation of treasury stock	-	-	-	-	-	-	-
Net change in the year	(9,923)	(326)	(10,333)	174	(20,502)	(1,068)	(21,570)
<b>Balance at March 31, 2020</b>	¥ 11,337	¥ (462)	¥ (21,390)	¥ (5,406)	¥ 459,381	¥ 9,738	¥ 469,119

	Thousands of U.S. dollars				
	Common stock	Capital surplus	Stock acquisition rights	Retained earnings	Treasury stock
<b>Balance at March 31, 2019</b>	\$ 640,818	\$ 660,353	\$ 8,470	\$ 3,149,759	\$ (111,212)
Cumulative effect of accounting change	-	-	-	2,221	-
Net income attributable to owners of the parent	-	-	-	248,945	-
Cash dividends, \$0.46 per share	-	-	-	(147,617)	-
Purchase of treasury stock	-	-	-	-	(91,782)
Disposal of treasury stock	-	(663)	-	-	2,144
Cancellation of treasury stock	-	(15,658)	-	(81,851)	97,509
Net change in the year	-	-	(865)	-	-
<b>Balance at March 31, 2020</b>	\$ 640,818	\$ 644,032	\$ 7,605	\$ 3,171,457	\$ (103,341)

	Thousands of U.S. dollars						
	Accumulated other comprehensive income					Non-controlling interests	Total equity
	Unrealized gain on available-for-sale securities	Deferred loss on derivatives under hedge accounting	Foreign currency translation adjustments	Defined retirement benefit plans	Total		
<b>Balance at March 31, 2019</b>	\$ 195,048	\$ (1,251)	\$ (101,435)	\$ (51,197)	\$ 4,389,353	\$ 99,135	\$ 4,488,488
Cumulative effect of accounting change	-	-	-	-	2,221	-	2,221
Net income attributable to owners of the parent	-	-	-	-	248,945	-	248,945
Cash dividends, \$0.46 per share	-	-	-	-	(147,617)	-	(147,617)
Purchase of treasury stock	-	-	-	-	(91,782)	-	(91,782)
Disposal of treasury stock	-	-	-	-	1,481	-	1,481
Cancellation of treasury stock	-	-	-	-	-	-	-
Net change in the year	(91,042)	(2,987)	(94,805)	1,600	(188,099)	(9,796)	(197,895)
<b>Balance at March 31, 2020</b>	\$ 104,006	\$ (4,238)	\$ (196,240)	\$ (49,597)	\$ 4,214,502	\$ 89,339	\$ 4,303,841

## Consolidated Statement of Cash Flows

### Consolidated Financial Statements

For the year ended March 31, 2020	Millions of yen		Thousands of U.S. dollars
	2020	2019	2020
<b>Operating activities:</b>			
Income before income taxes	¥43,836	¥50,448	\$402,165
Adjustments for:			
Income taxes — paid	(15,032)	(18,407)	(137,909)
Depreciation and amortization	39,580	35,729	363,118
Impairment loss on fixed assets	12,559	10,935	115,219
Gain on sales of investment securities — net	(4,081)	(676)	(37,442)
Changes in assets and liabilities:			
Decrease (increase) in notes and accounts receivable — trade	2,520	(3,595)	23,120
Increase in inventories	(13,966)	(18,193)	(128,128)
Increase in other current assets	(2,410)	(6,352)	(22,110)
Decrease in net defined benefit assets	469	1,821	4,302
(Decrease) increase in notes and accounts payable — trade	(6,752)	5,454	(61,942)
(Decrease) increase in other current liabilities	(6,781)	1,996	(62,214)
Other — net	3,259	2,065	29,901
Total adjustments	9,365	10,777	85,915
Net cash provided by operating activities	53,201	61,225	488,080
<b>Investing activities:</b>			
Purchases of marketable securities	(34,749)	(68,000)	(318,798)
Proceeds from sales and redemption of marketable securities	54,532	62,220	500,296
Proceeds from sales and redemption of investment securities	12,662	831	116,164
Purchases of property, plant and equipment	(93,799)	(102,826)	(860,537)
Decrease (increase) in time deposits	2,239	(807)	20,537
Other — net	(1,716)	(1,161)	(15,741)
Net cash used in investing activities	(60,831)	(109,743)	(558,079)
<b>Financing activities:</b>			
Increase (decrease) in short-term borrowings — net	2,409	(1,919)	22,099
Proceeds from long-term debt	34,559	31,853	317,054
Repayments of long-term debt	(28,980)	(10,845)	(265,873)
Purchase of treasury stock	(10,004)	(5)	(91,782)
Cash dividends	(16,090)	(15,445)	(147,617)
Other — net	(690)	(75)	(6,326)
Net cash (used in) provided by financing activities	(18,796)	3,564	(172,445)
Foreign currency translation adjustments on cash and cash equivalents	(2,867)	(980)	(26,299)
Net decrease in cash and cash equivalents	(29,293)	(45,934)	(268,743)
Cash and cash equivalents, beginning of year	123,984	169,918	1,137,470
Cash and cash equivalents, end of year	¥94,691	¥123,984	\$868,727

## Corporate Outline / Stock Information

(As of March 31, 2020)

### Corporate Outline

Company name	NGK Insulators, Ltd.	Consolidated subsidiaries	55
Address	2-56 Suda-cho, Mizuho, Nagoya 467-8530, Japan Telephone + (81) 52-872-7181	Equity-method affiliates	2
Established	May 5, 1919	Employees	NGK 4,224 Consolidated 20,000
Paid-in capital	69.8 billion yen	Stock exchange code	5333
Net sales	442.0 billion yen (consolidated, for FY2019)		

### Stock Information

Total number of shares authorized 735,030,000 shares	Major shareholders		
	<b>Names of shareholders</b>	<b>Number of shares held (1,000 shares)</b>	<b>Ratio to total (%)</b>
Total number of shares issued 322,211,996 shares	The Master Trust Bank of Japan, Ltd. (Trust Account)	42,287	13.35
	Japan Trustee Services Bank, Ltd. (Trust Account)	30,746	9.71
Total number of shareholders 39,457 persons	Meiji Yasuda Life Insurance Company	21,695	6.85
	The Dai-ichi Life Insurance Company, Limited	21,457	6.77
	MUFG Bank, Ltd.	7,204	2.27
Listed stock exchanges Tokyo Stock Exchange, Nagoya Stock Exchange	National Mutual Insurance Federation of Agricultural Cooperatives	7,029	2.22
	Japan Trustee Services Bank, Ltd. (Trust Account 5)	4,965	1.56
	Japan Trustee Services Bank, Ltd. (Trust Account 7)	4,759	1.50
	JPMorgan Chase Bank 385151	4,602	1.45
	Aioi Nissay Dowa Insurance Co., Ltd.	4,387	1.38

Note: The above list of major shareholders does not include NGK, which has a total of 5,668,000 treasury shares. The shareholding ratios above are calculated based on the number of shares derived by deducting the number of treasury shares from the total number of shares issued and by rounding down the calculation results to two decimal places.

### Distribution of Shares



Note: The total number of shares issued decreased by 5,348,200 from the end of the previous fiscal term due to the cancellation of treasury shares as of March 13, 2020.

## Third-Party Opinion

### VOICE



Professor, Ph. D. in Law (LL.D.),  
Graduate School and Faculty of  
Safety Science, Kansai University;  
Executive Director of Japan Society  
for Business Ethics; Senior  
Researcher of Business Ethics  
Research Center

**Dr. Kazuhiko Takano**

### 1. Features of NGK Report 2020

The NGK Group, which has been bolstering the economy of Japan with its ceramic technology, celebrated its 100th anniversary of company foundation last year in May. I would like to express my respect for supplying high-quality products for so many years and maintaining steady business growth. I will introduce some of the information in this report that gave me strong impression of the company's sustainability.

The first is that the company addresses many social issues through its main business. President Taku Oshima stated in his message that "coexistence between environment and humanity" is an important perspective in forming a new business vision, and he is encouraging active R&D of ceramic products with the aim of resolving social issues. For example, the company is developing large ceramic membranes, which are used for separation and collection of CO<sub>2</sub> discharged from factories, and zinc rechargeable batteries, which store electricity during off-peak hours and supply the stored electricity during the daytime peak hours. As the public is closely watching corporations' efforts towards the realization of a low-carbon society, I believe that NGK's products will receive strong public support.

The second point is that the report describes extensively about corporate governance. The report spares 14 pages for the description of corporate governance including the messages from outside directors. This indicates that discussions were held freely and openly in the board meetings. President Oshima mentions that he is promoting discussions on the formulation of a new business vision with the outside directors. Involvement of the outside directors, who have specialized knowledge of value creating processes and experience of managing a company, is very important. I think NGK practices corporate governance far more strictly than other advanced companies.

The third point is the thoroughness of risk management. While business risks are becoming increasingly diverse due to global business expansion, NGK has established a system to prevent the manifestation of risks and to minimize their impacts. The ratios of overseas sales are high in the NGK Group, so foreign laws that impose large fines or penalty payments can be considered as a significant risk. This report introduces NGK's sincere efforts in that regard, together with the detailed description of "observing competition laws and other laws and regulations pertaining to business transactions" and "corruption prevention structure."

I am pleased to know that this year's annual report shows that the NGK Group's ESG management is further developing.

### 2. Expectations for further development

The COVID-19 pandemic has become a serious social issue. This report uses two pages to introduce crisis-response activities. I would like to mention what I would expect from the NGK Group in the "new normal" era after the pandemic comes to an end.

The first is the initiatives to further enhance resilience. I would like to express my respect for preventing the spread of infection and maintaining the continuity of business at the same time without stopping the operation of most factories amid the COVID-19 pandemic. I look forward to the company's efforts to further enhance resilience based on the verification of measures against COVID-19 and the review and improvement of the business continuity plan (BCP).

The second is the initiatives to improve job satisfaction. Teleworking as a countermeasure against COVID-19 has increased the work style options for employees, so I think it can contribute to the reforms of work styles to improve job satisfaction. However, it is said that maintaining organizational efficiency requires a transformation to "job-based" management in which employees are assigned to jobs and employees are evaluated based on work results. I hope that NGK seeks systems and management styles that achieve a good balance between organizational efficiency and job satisfaction.

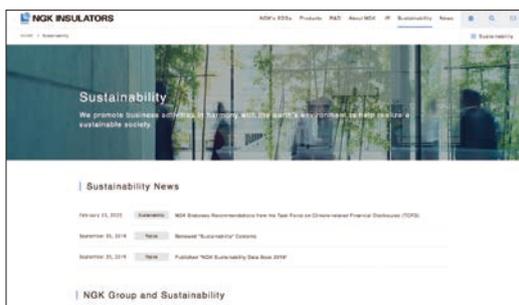
The third point is the continuous execution of the risk management process. Major risks were extracted and then discussed by the ESG Committee last year for the first time. This report introduces in detail the processes of taking measures against those risks. Since company growth and changes in society can create new major risks, I would like NGK to continue the efforts year after year.

Lastly, I look forward to the announcement of a new business vision aimed at achieving coexistence between environment and humanity and the completion of products presently under development. Armed with advanced ceramic technology, the NGK Group is capable of resolving social issues based on its main business. I sincerely hope that the NGK Group will continue growing as a corporate group needed by society.

# Information

## NGK Group Website

For more detailed information of the NGK Group, please visit the following websites.  
NGK Sustainability Data Book 2020 (PDF) is also available. It gives detailed ESG information.



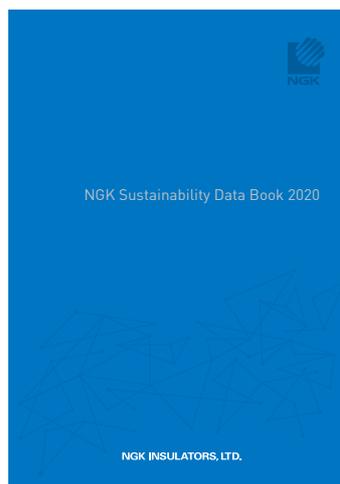
### Sustainability

English

<https://www.ngk-insulators.com/en/sustainability/>

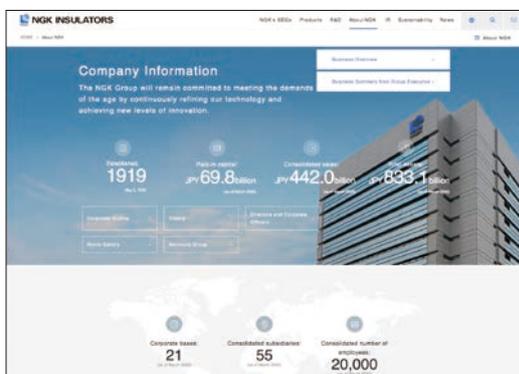
Japanese

<https://www.ngk.co.jp/sustainability/>



### NGK Sustainability Data Book 2020

<https://www.ngk-insulators.com/en/sustainability/pdf/2020/ngk2020data.pdf>



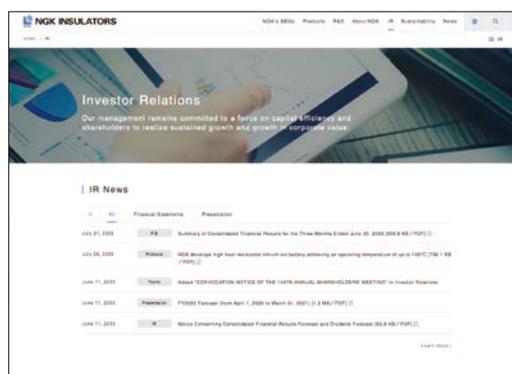
### Company Information

English

<https://www.ngk-insulators.com/en/info/>

Japanese

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



### Investor Relations

English

<https://www.ngk-insulators.com/en/ir/>

Japanese

<https://www.ngk.co.jp/ir/>

## NGK Group

### NGK Insulators

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Head Office / Tokyo Main Office / Osaka Branch / Chita Site / Komaki Site / Ishikawa Plant / Sapporo Sales Office / Sendai Sales Office / Hokuriku Sales Office / Hiroshima Sales Office / Takamatsu Sales Office / Fukuoka Sales Office

### Group Companies

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#### ■ Japan

ENERGY SUPPORT CORPORATION / KANSAI ENERGYS CORPORATION  
KYUSHU ENERGYS CO., LTD. / HOKURIKU ENERGYS CORPORATION  
ENERGYS SANGYO CORPORATION / AKECHI INSULATORS, LTD.  
NGK OKHOTSK, LTD. / NGK METEX CORPORATION  
NGK FINE MOLDS, LTD. / NGK CERAMIC DEVICE CO., LTD.  
NGK ELECTRONICS DEVICES, INC. / SOSHIN ELECTRIC CO., LTD.  
SOSHIN DEVICE CO., LTD. / SOSHIN POWERTECH CO., LTD.  
RISSHIN ELECTRONICS CO., LTD. / NGK CHEMITECH, LTD.  
NGK FILTECH, LTD. / NGK ADREC CO., LTD.  
NGK KILNTECH CORPORATION / NGK SPORTS PLANNING CO., LTD.  
NGK LIFE CO., LTD. / NGK YU-SERVICE CO., LTD. / NGK LOGISTICS, LTD.

#### ■ America

NGK-LOCKE, INC. / NGK CERAMICS USA, INC.  
NGK AUTOMOTIVE CERAMICS USA, INC. / NGK MATERIAL USA, INC.  
NGK CERAMICS MEXICO, S. DE R.L. DE C.V.  
NGK METALS CORPORATION / NGK INSULATORS OF CANADA, LTD.  
FM INDUSTRIES, INC. / NGK ELECTRONICS USA, INC.  
SOSHIN ELECTRONICS OF AMERICA INC.

#### ■ Europe, Africa

NGK ITALY S.R.L. / NGK BERYLCO U.K. LTD. / NGK CERAMICS EUROPE S.A.  
NGK EUROPE GMBH / NGK DEUTSCHE BERYLCO GMBH  
NGK BERYLCO FRANCE / NGK CERAMICS POLSKA SP. Z O.O.  
NGK CERAMICS SOUTH AFRICA (PTY) LTD.  
SOSHIN ELECTRONICS EUROPE GMBH

#### ■ Asia, Oceania

NGK INSULATORS (CHINA) INVESTMENT CO., LTD.  
NGK CERAMICS SUZHOU CO., LTD. / NGK TECHNOCERA SUZHOU CO., LTD.  
NGK AUTOMOTIVE CERAMICS KOREA CO., LTD.  
P.T. NGK CERAMICS INDONESIA / SIAM NGK TECHNOCERA CO., LTD.  
NGK CERAMICS (THAILAND) CO., LTD.  
NGK TECHNOLOGIES INDIA PVT. LTD. / NGK STANGER PTY. LTD.  
ENERGYS ELECTRIC SHANGHAI CORPORATION  
NGK ENERGYS MYANMAR CO., LTD. / SOSHIN ELECTRONICS (HK) LIMITED  
SOSHIN ELECTRONICS (SZ) LIMITED / TAIWAN SOSHIN ELECTRIC CO., LTD.  
SOSHIN ELECTRONICS (M) SDN. BHD.  
NGK ELECTRONICS DEVICES (M) SDN. BHD.  
NGK GLOBETRONICS TECHNOLOGY SDN. BHD.



NGK Head Office

## External Evaluation / Editorial Policy

### External Evaluation

In September 2019, NGK was selected for the 4th consecutive year for the Dow Jones Sustainability Asia Pacific Index in the Dow Jones Sustainability Indices, a major index for socially responsible investment.

NGK has been honored with other selections. These include the MSCI Japan ESG Select Leaders Index, an operator of

Japan's Government Pension Investment Fund (GPIF); the MSCI Japan Empowering Women (WIN) Index; and the 2020 Certified Health & Productivity Management Outstanding Organizations Recognition Program (White 500), managed by Japan's Ministry of Economy, Trade and Industry (METI) and the Nippon Kenko Kaigi.



2020 CONSTITUENT MSCI JAPAN  
ESG SELECT LEADERS INDEX

MSCI JAPAN  
EMPOWERING WOMEN INDEX (WIN)



### Editorial Policy

The publication of the NGK Report 2020 is carried out with the intent of communicating to our stakeholders what strengths the NGK Group has to offer, how we are creating value, how we plan to grow further and how we are contributing to sustainable development of society and the entire world. This report has been prepared and edited in line with the International Integrated Reporting Framework of the International Integrated Reporting Council (IIRC) and the Guidance for Collaborative Value Creation of Japan's Ministry of Economy, Trade and Industry. Detailed ESG information is given in the NGK Sustainability Data Book 2020.

#### ■ Target Organization

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

#### ■ Target Period

April 1, 2019 to March 31, 2020

#### ■ Forward-looking Statements

This report contains forward-looking statements such as performance forecasts. These forward-looking statements are based on things such as information currently available to NGK and on certain assumptions judged to be rational. Please note that actual performance may differ from forecasts due to various unforeseen reasons.





This Consolidated Financial Statements is printed on FSC-approved paper using vegetable oil inks.

## NGK INSULATORS, LTD.

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**Corporate Communications Department**

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Fax: +(81) 52-872-7690 <https://www.ngk-insulators.com/en/>

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**Plate making:** This report has been published using computer-to-plate (CTP) technology to eliminate the need for the film and other materials required in the conventional platemaking process.  
**Printing:** A waterless printing method has been adopted to significantly reduce the usage of developer chemicals and processing water, thereby decreasing the amount of hazardous effluent, compared with conventional methods.

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

**Design:** This report has been designed, with a focus on typeface, color scheme and diagram style, to improve legibility and readability.