

 **NGK INSULATORS**
Surprising Ceramics.

NGK INSULATORS, LTD.
Green Finance Framework

December, 2023



1. Introduction

1.1 About NGK

NGK INSULATORS, LTD. was founded out of a desire to localize the production of special high-voltage insulators, a key component in the modernization of Japan in 1919. At the founded time, when the electrification gradually began to gain traction, Japan relied on imports for high-voltage insulators. Japanese high-voltage insulator R&D and production began only with a desire “We do produce insulators in Japan to serve our country” and a small piece of an insulator from the United States to study. Despite such humble beginnings, NGK has consistently succeeded in developing ultra-high-voltage, ultra-high-strength insulators to meet the massive demand for electricity of rapidly evolving lifestyles and developing industries. As a result, we have grown into the world’s foremost manufacturer of insulators underpinning power supply the world over. Here at NGK, our formidable technological strengths, honed by long years of experience in the production of ceramic insulators, have enabled us to further develop a range of new technologies which are now contributing to the development of the energy, ecology and electronics sectors. These include the world’s first large-capacity storage batteries, which are paving the way for next-generation infrastructures; vehicle exhaust purifying products that provide a major leap forward in the fight to overcome environmental issues; industrial machinery that provides momentum for chemical industries; and the precision machinery that underpins the evolution of electronics. All of us at NGK are committed to leveraging our unique ceramic technologies to advance the manufacturing of products that meet the needs of all society and promote the betterment of the whole world.

1.2 Sustainability initiative

1.2.1 SDGs and value proposition

Since our foundation, the NGK Group has provided society with new values centered around ceramics, while possessing an SDGs-like concepts. Many of our technologies and products contribute to the SDGs, and we can provide new value by leveraging our unique ceramic technologies towards the realization of a sustainable society.

	Goals	Values provided by the NGK Group
	End poverty in all its forms everywhere	<ul style="list-style-type: none"> • Creating appropriate employment helps to end poverty • NGK's climate change countermeasures help mitigate natural disasters
	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	<ul style="list-style-type: none"> • The social infrastructure created by NGK products helps secure equal access to work opportunities
	Ensure healthy lives and promote well-being for all at all ages	<ul style="list-style-type: none"> • High-output, high-efficiency semiconductor lasers using gallium nitride (GaN) wafers are a substitute for ultra-high-pressure mercury lamps, thus contributing to less use of mercury • Micro-lenses are increasingly used instead of mercury in UV LED light sources for applications such as the sterilization of water and air, thus contributing to less use of mercury • Ceramics for purifying automobile exhaust make exhaust gas clean
	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	<ul style="list-style-type: none"> • Creating appropriate employment gives people the chance to have equal access to education • Giving international students opportunities to learn through providing the housing and the scholarship
	Achieve gender equality and empower all women and girls	<ul style="list-style-type: none"> • The social infrastructure created by NGK products helps provide more opportunities for women to enhance their abilities • Securing equal opportunities for women to participate and be leaders in society
	Ensure availability and sustainable management of water and sanitation for all	<ul style="list-style-type: none"> • Ceramic membrane filters provide highly safe water • Ceramic membrane filters purify wastewater
	Ensure access to affordable, reliable, sustainable, and modern energy for all	<ul style="list-style-type: none"> • Insulators are indispensable to stable power supply • NAS® batteries allow stable supply of renewable energy • Ceramics for purifying automobile exhaust make exhaust gas clean, thus enabling clean usage of fossil fuels
	Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all	<ul style="list-style-type: none"> • Creating appropriate employment and providing employees with a satisfying work environment contributes to economic growth
	Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation	<ul style="list-style-type: none"> • Thin lithium-ion rechargeable batteries provide power for the new IoT generation • 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
	Reduce inequality within and among countries	<ul style="list-style-type: none"> • We prevent discrimination and take prompt and appropriate action when violations occur
	Make cities and human settlements inclusive, safe, resilient, and sustainable	<ul style="list-style-type: none"> • NAS batteries enable innovation in urban energy management for the creation of sustainable cities
	Ensure sustainable consumption and production patterns	<ul style="list-style-type: none"> • We efficiently use the natural resources used to make ceramics
	Take urgent action to combat climate change and its impacts	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Ceramic membrane filters purify wastewater to prevent marine pollution
	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	<ul style="list-style-type: none"> • We protect biodiversity on land owned by NGK
	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable and inclusive institutions at all levels	<ul style="list-style-type: none"> • We comply with the rules and regulations of the countries and regions in which do business, and ensure respect for and strict compliance with international treaties
	Strengthen the means of implementation and revitalize the global partnership for sustainable development	<ul style="list-style-type: none"> • We encourage and promote effective partnerships among governments, corporations, and society as a whole

1.2.2 NGK Group Vision: Road to 2050

Still valuing the philosophy of sustainability, we formulated a mid- to long-term vision in April 2021 in order to continue contributing to the resolution of social issues in an era of extreme change. Envisioning the future society of 2050, we will seize the enormous trends of rapid advancement toward the realization of carbon neutrality and a digital society as an opportunity for new development and work on promoting Five Transformations: (1) Promotion of ESG management, (2) Profitability improvement, (3) Focus on R&D, (4) Focus on commercialization, and (5) DX (digital transformation). With “Surprising Ceramics.” as the slogan for our unique ceramic technology, we intend to convert our business structure in anticipation of the “Third Foundation.”

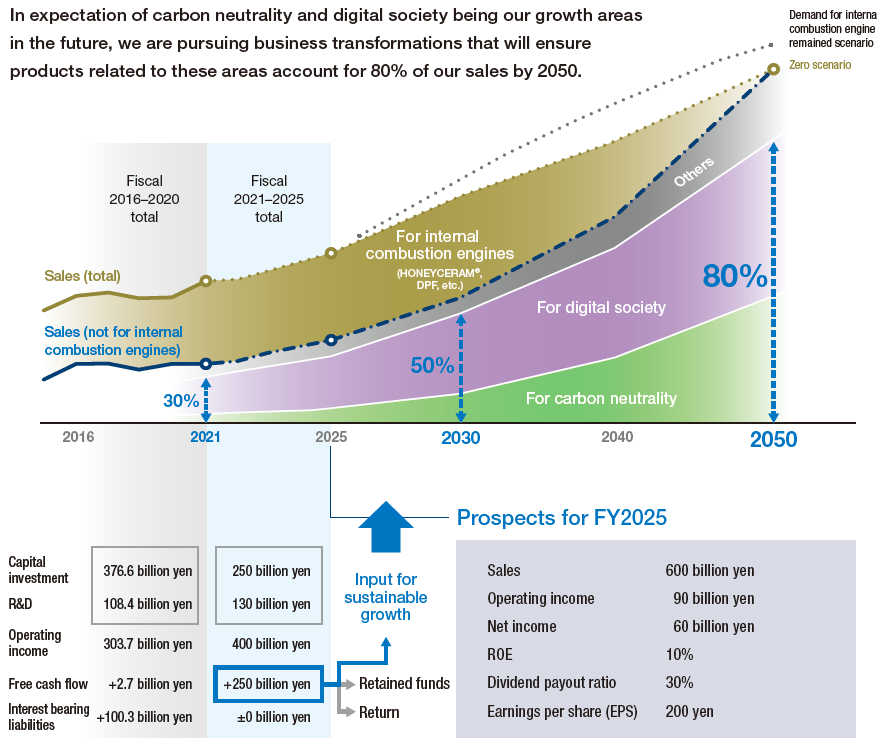
We will position fields related to “carbon neutrality,” in which people coexist with the natural environment, and “digital society,” in which they can live securely, conveniently, comfortably, and in good health, as the focus fields and will develop business so that products related to these fields make up 80% of the company’s sales in 2050. We plan to allocate a total of 300 billion yen in R&D expenses over the next 10 years and distribute 80% of that amount to both fields. We have established a goal of “New Value 1000” to achieve net sales of 100 billion yen from new businesses in 2030, which will be a checkpoint in the plan. We will invest management resources with a focus on promising development topics for creating new products and businesses.

NGK Group Vision: Road to 2050

Achieve 80% of sales from CN/DS

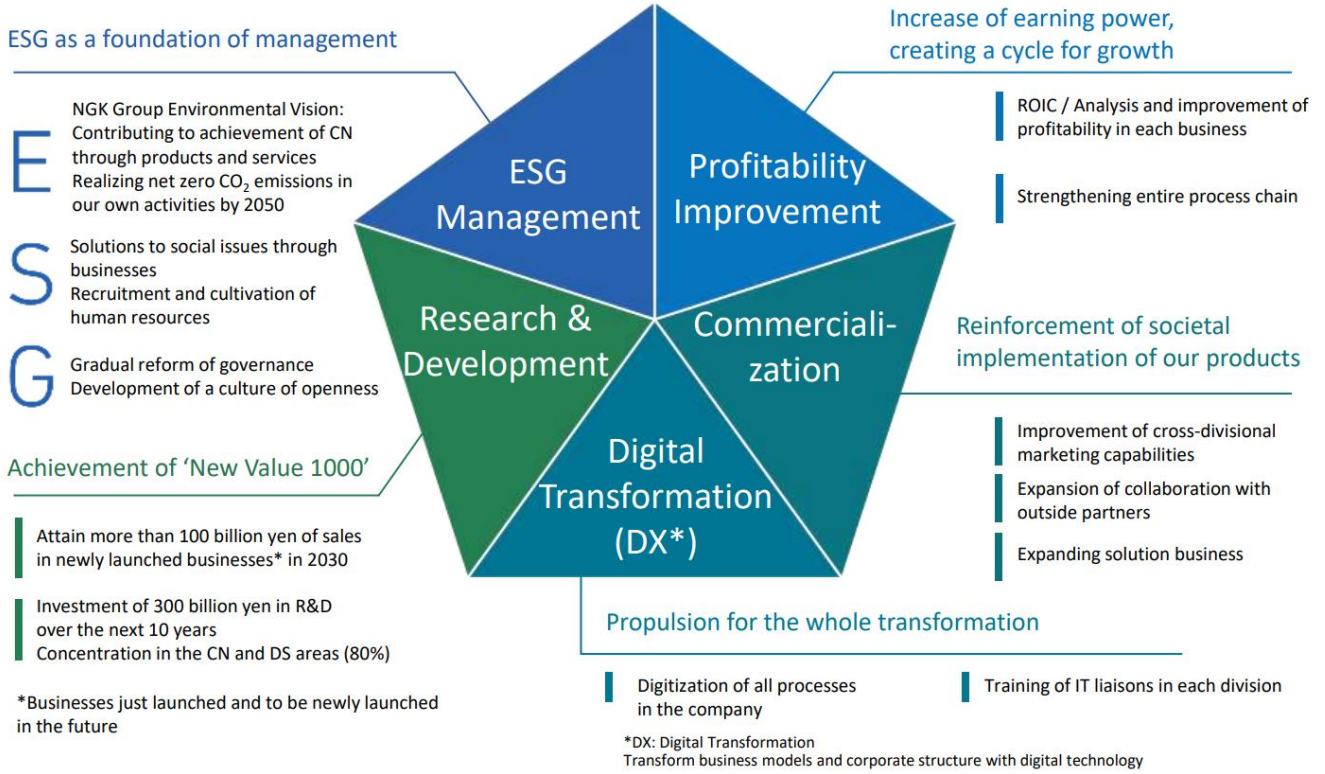
(Carbon Neutrality/Digital Society)

In expectation of carbon neutrality and digital society being our growth areas in the future, we are pursuing business transformations that will ensure products related to these areas account for 80% of our sales by 2050.



5 Transformations

To Realize What We Want to Be



1.3 Initiative for environment

1.3.1 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 in order to bring its corporate activities into harmony with the environment. Based on the NGK Group Environmental Vision for 2050 formulated in April 2021, we will promote initiatives to contribute to carbon neutrality, a recycling-oriented society, and harmony with nature. 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.

Guidelines for Environmental Action

1. Strive to develop, design, and manufacture products that contribute to the environment and products with low environmental impact.
2. Work to reduce the environmental impact arising from business activities. Conduct design reviews to scientifically study and evaluate the environmental impact of business activities.
 - Promote energy conservation measures and expand the use of renewable energy for all processes and facilities, and make efforts to control CO₂ emissions.
 - Promote resource saving and recycling, and make efforts to control the generation of by-products.
 - Manage the risks of water resources and strive to make effective use of water in our business activities.
 - Through the appropriate use and control of chemical agents, work to reduce the risks inherent in toxic substances.
 - Give precedence to environmentally friendly materials, parts, products, and facilities in procurement and purchasing, strengthening cooperative alliances with our business partners.
3. Enhance environmental management systems from a global perspective while continuously reducing our environmental impact.
4. Not only abide by environmental laws, regulations, and other requirements, but also institute voluntary standards and work to improve our own environmental conservation.
5. Provide environmental information to the public at the appropriate time and pursue dialogue with all stakeholders. Proactively develop social action programs. Also, engage in education and publicity in order to improve employees' environmental consciousness.

1.3.2 NGK Group environmental vision

“NGK Group Vision: Road to 2050” outlines the kind of entity NGK strives to become by 2050 and stresses ESG management as a key reform towards realization. To this end, we formulated the NGK Group Environmental Vision as the environmental policy in the ESG management. The NGK Group will contribute to the realization of society’s direction toward “carbon neutrality,” “a recycling-oriented society,” and “harmony with nature” through its business activities.

■Toward carbon neutrality

We will develop and provide products and services that contribute to the realization of a carbon-neutral society and apply them to our own business activities in order to achieve our goal of net zero CO₂ emissions by 2050.

■Toward a recycling-oriented society

We will contribute to the realization of a recycling-oriented society by reducing our natural resource consumption and developing and providing resource-efficient products.

■Toward harmony with nature

We will minimize our environmental impact on ecosystems and raise stakeholder awareness through educational activities in order to achieve harmony with nature.

In order to realize our environmental vision, we have adopted the following four strategies.

Strategy 1: Development and provision of carbon neutrality (CN)-related products/services

In addition to pursuing our existing carbon neutrality (CN)-related products, we will also work to develop and commercialize new products as well as offer society NAS battery-driven renewable energy supply business and other relevant services.

Strategy 2: Top-down enhancement of energy-saving

We will work to further enhance our existing energy-saving activities, as well as introduce high efficiency equipment and facilities and more energy-efficient operations.

Strategy 3: Promotion of technical innovation

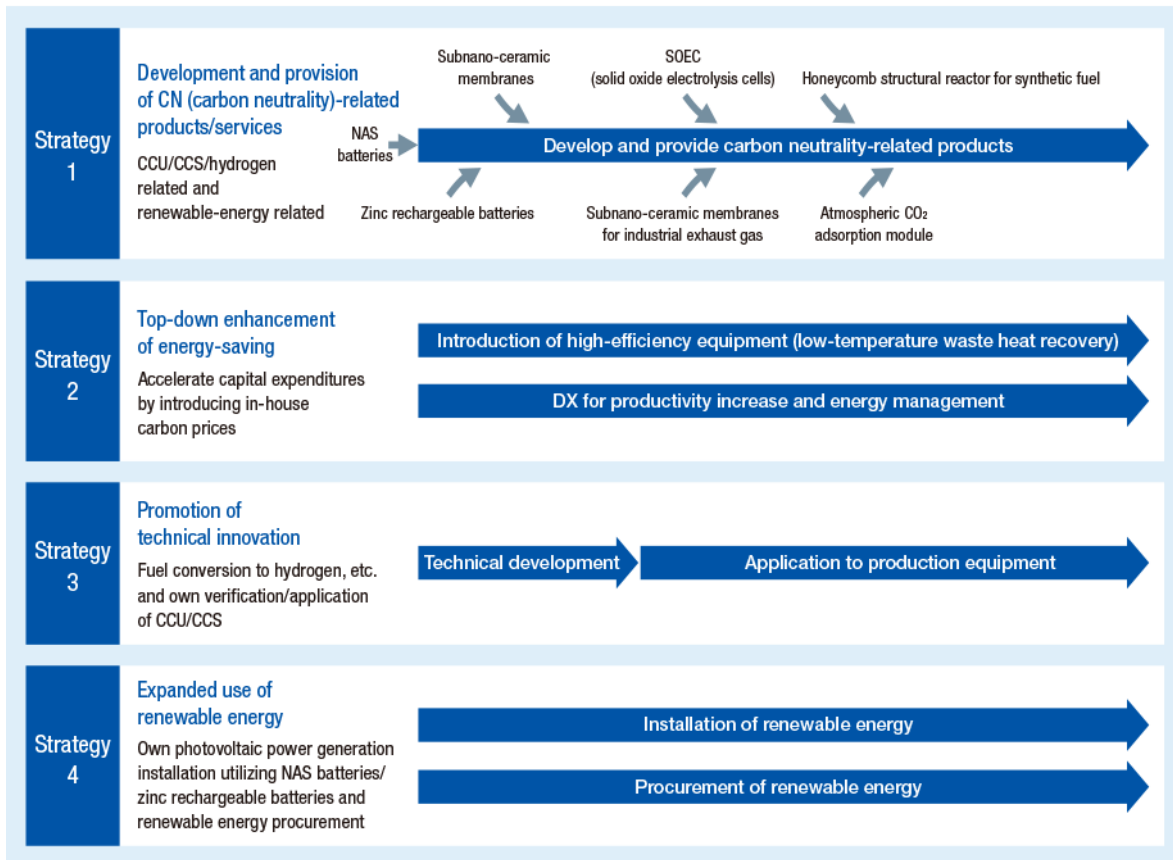
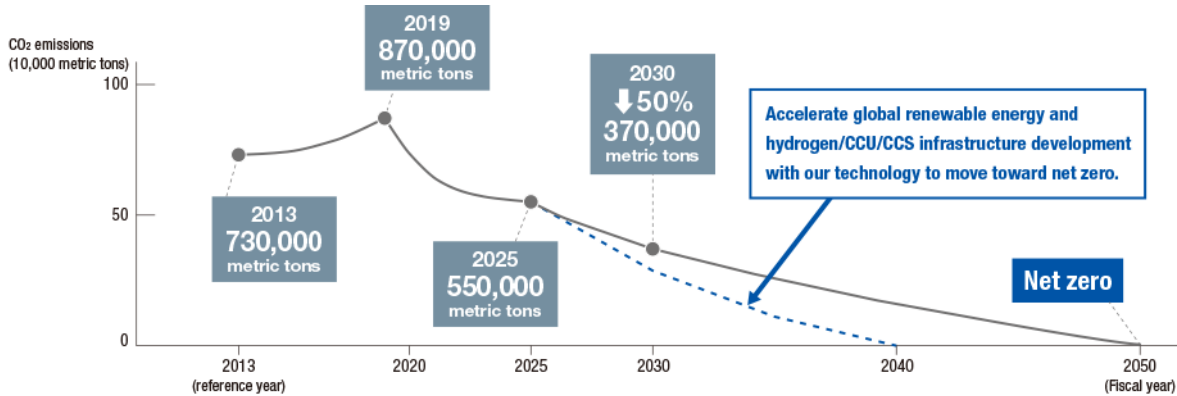
Although the ceramic calcining process requires fossil fuel which is responsible for CO₂ emissions, we will work to switch over to hydrogen, ammonia and other fuels that will allow us to become fossil fuel-free.

Strategy 4: Expanded use of renewable energy

In addition to promoting various renewable energy procurement strategies both within Japan and overseas, we will install photovoltaic power generation systems at manufacturing sites within the NGK Group, and use them in conjunction with NAS batteries and zinc rechargeable batteries, to achieve demand control. We will use this as a model case in NGK Group’s renewable energy business, and work towards the goal of enabling all energy demand within the NGK Group to be met through renewable energy.

1.3.3 Carbon Neutrality Strategic Roadmap

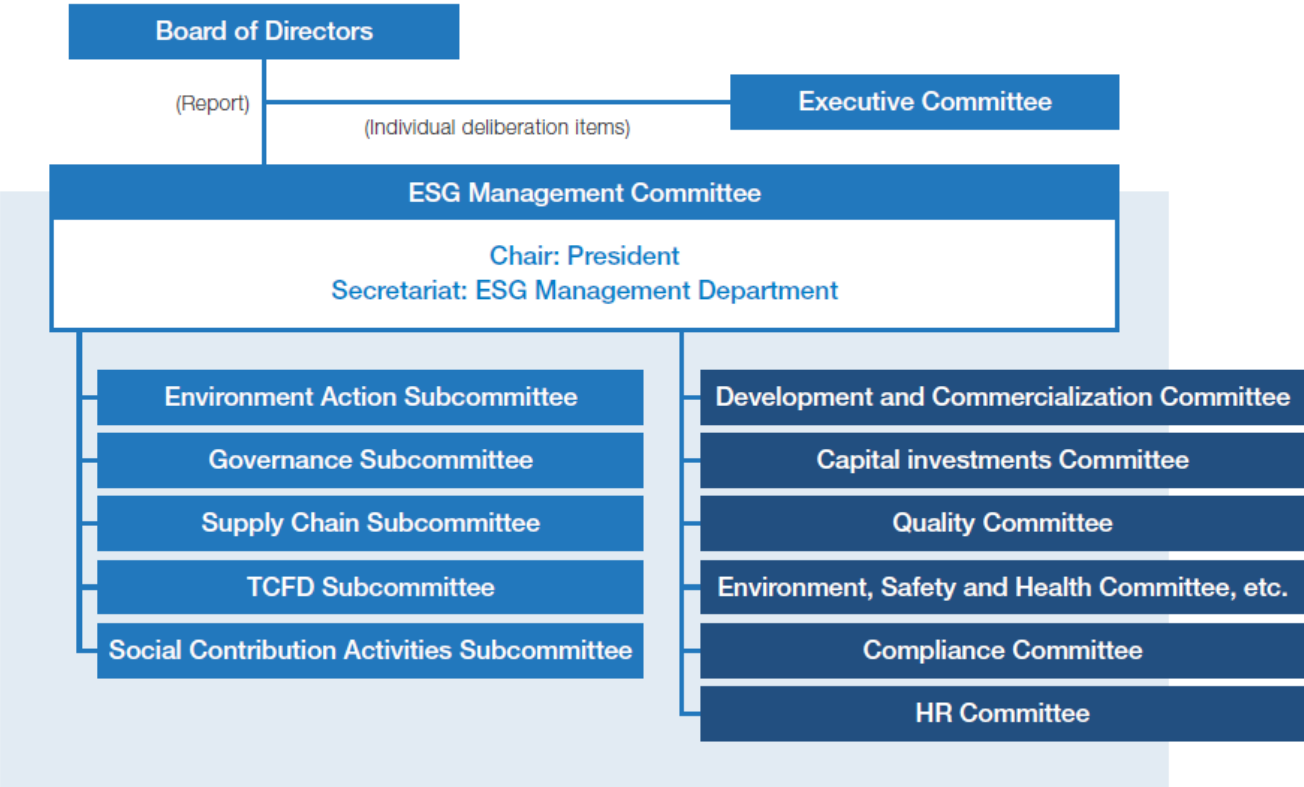
The NGK Group has drawn up its Carbon Neutrality Strategic Roadmap as a working guide to realizing the goals of the NGK Group Environmental Vision. We have established a Group-wide target of net zero CO₂ emissions by 2050, with milestone targets along the way of 550,000 metric tons by fiscal 2025 (a reduction of 25% compared with the fiscal 2013 base year) and 370,000 metric tons by fiscal 2030 (a reduction of 50% compared with the fiscal 2013 base year). And to help society as a whole become carbon neutral, we are working to develop and provide the use of relevant products and services. In the future, we will consider advancing our efforts to achieve net zero by promoting the development of hydrogen/CCU/CCS-related technologies.



1.4 ESG Action framework

In fiscal 2019, in order to consolidate discussions related to the environment, society, and governance, we established the ESG Committee 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. In April 2021, we established the ESG Management Department in order to handle lateral implementation of ESG and SDGs related activities across the NGK Group and to strengthen information dissemination about the activities. In April 2022, ESG Committee was reorganized to ESG Management Committee chaired by the president to strengthen the handling of the Group's sustainability issues, including ESG/SDGs-related topics, at the management level. The reform was also intended to establish a system for the Board of Directors to supervise the activities of ESG Management Committee appropriately.

ESG Action System



1.5 Participation in external initiative

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 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 CO₂ emissions. In February 2020 the Group announced its endorsement of the recommendations of the TCFD.

In April 2022, we began disclosing the information on our website regarding the results of scenario analysis in accordance with the four sections of the TCFD: "Governance," "Strategy," "Risk Management," and "Metrics and Targets."

At the same time, we also submitted our greenhouse gas reduction target for the approval from the Science Based Targets initiative (SBTi) to ensure that it is consistent with the 1.5°C target of the Paris Agreement.

1.6 Purpose of issuing green finance

The NGK Group will issue the green finance to develop and provide our products and service as well as establishment of production process, which meet social needs of "carbon neutrality," "a recycling-oriented society," and "harmony with nature." We believe that our high quality products based on our reliable technology will bring the future where people coexist with the natural environment.

2. Green finance framework

This green finance framework is in alignment with the Green Bond Principles 2021 published by The International Capital Market Association (ICMA) and the Green Bond Guidelines 2022 published by the Ministry of Environment of Japan, the Green Loan Principles ("GLP") 2023 published by the Loan Market Association ("LMA"), the Asia-Pacific Loan Market Association ("APLMA") and the Loan Syndications and Trading Association ("LSTA") and the Green Loan and Sustainability Linked Loan Guidelines 2022 published by the Ministry of the Environment of Japan and follows the four core pillars as described below.

1. Use of proceeds
2. Process for project evaluation and selection
3. Management of proceeds
4. Reporting

In accordance with this green finance framework, we will issue each green finance.





2.1 Use of proceeds






An amount equal to the total proceeds of the green bonds or green loans that the Company issues will be allocated to finance new investments or refinance existing investments in eligible projects. For investments of existing projects, the use of proceeds is restricted to refinance investments whose expenditures were made within two years prior to issuance of the green bonds or green loans.

Eligible projects are capital investment and/or expense which meet below eligibility criteria and may be financed by NGK or one of its affiliates.

Eligible projects







A. Distribution of environmentally friendly products and services

Eligible project categories	ICMA GBP category	Eligibility criteria and examples of projects	SDGs
Batteries	Circular economy adapted products, production technologies and processes and/or certified eco-efficient products	<p>R&D and manufacturing of batteries that meet the increasingly complex needs for storage batteries and power generation to promote renewable energy and develop smart grids.</p> <p><Examples of projects></p> <ul style="list-style-type: none"> > NAS® battery: A storage battery required for adjusting supply and demand of electric power of unstable output volume of renewable energy. It has features of large capacity, high energy density, and long life, and it enables high power output in supplying electricity over a long period of time. It is useful for peak shaving and stabilizing renewable energy by leveling electric power load, and contributing to power saving, energy cost reduction, and environmental load reduction. In R&D, NGK aims to improve cost competitiveness while working to build a business model including offering electricity storage services. > Zinc rechargeable batteries: A storage battery (rechargeable battery) that achieves high safety and high capacity suitable for indoor installation. It can be installed compactly with high energy density, and can be operated at room temperature. In addition, it is highly safe because it uses incombustible electrolysis water solutions, thereby there are no risks of internal 	   

		<p>ignition or heat run-off. NGK aims prompt introduction in the market and establishing sales channels and supply system. (R&D)</p> <ul style="list-style-type: none"> > All-ceramic batteries (all-solid-state batteries): A next-generation battery (rechargeable battery) that is being developed worldwide for use in vehicles and stationary applications. The type of products, which use sulfides as electrolyte, is expected to be in practical use soon. However, sulfides generate highly poisoned hydrogen sulfide when they respond to water in the air. Therefore, NGK is developing "all-ceramics battery" that uses safer oxide-based ceramics. Since oxide-based ceramics electrolyte has low ion conductivity, there are not so many examples of development in the world. However, NGK aims of developing its unique high-performance and safe batteries of NGK Group by further developing the technologies cultivated through developing EnerCera® semi-solid batteries. (R&D) 	
Next-generation power semiconductors	Circular economy adapted products, production technologies and processes and/or certified eco-efficient products	<p>Conventional silicon semiconductors used for motor control and power control/conversion (power semiconductors) will be replaced by ultra-low-power consumption semiconductors (SiC/GaN semiconductors, etc.), with R&D conducted to develop materials and parts required for a carbon-neutral society.</p> <p><Examples of projects></p> <ul style="list-style-type: none"> > Gallium nitride (GaN) wafers:R&D for wafers (substrates) using gallium nitride (GaN) semiconductors. They can significantly reduce loss during power control and conversion compared to conventional silicon semiconductors. Therefore, they can significantly reduce power consumption. By using NGK's high-quality wafers (substrates), power semiconductor manufacturers can produce higher-performance gallium nitride (GaN) power semiconductors. > DCB and AMB substrates: R&D for ceramic circuit boards for power modules (a packaged components combining multiple power semiconductors) for automotive and industrial equipment with superior reliability and thermal conductivity. Demand is expected to expand over the medium to long term due to electrification of automobiles. 	  
CCU/CCS and hydrogen / ammonia	Circular economy adapted products, production technologies and processes and/or certified eco-efficient products	<p>R&D focusing on technologies and products essential for capturing, storing and utilizing CO₂ and for promoting utilization of hydrogen and ammonia.</p> <p><Examples of projects></p> <ul style="list-style-type: none"> > CO₂ separation membrane: Large ceramic membranes capable of separating CO₂ at the molecular level. They will contribute to reducing CO₂ emitted into the atmosphere by separating and capturing CO₂ from associated gas of natural gas and crude oil. NGK has already started to initiatives to separate CO₂ from industrial emissions from plants, etc. (R&D) > SOEC (solid oxide electrolysis cells): Develop an essential device for a system to use ion-conducting 	 

		<p>ceramics to create fuels and raw materials from CO₂ and water with high efficiency.</p> <ul style="list-style-type: none"> > Honeycomb structural reactor for synthetic fuel production: Develop devices (or systems) to utilize large-scale extrusion and separation membrane technologies to make fuel and raw-materials synthesis more efficiency. > Ceramic substrate for Direct Air Capture (DAC): Direct air capture (DAC) is a technology that collects CO₂ directly from atmosphere with adsorbing and absorbing. Applying the ceramic honeycomb structure technology which the company has cultivated in ceramics for automotive exhaust gas purification, we develop Honeycomb Structure Sorbent Material for Direct Air Capture with the features including that “it is compact and has a large surface area” and “it has low pressure loss.” 	
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B. The NGK Group’s business and manufacturing activities for carbon neutral initiatives

Eligible project categories	ICMA GBP category	Eligibility criteria and examples of projects	SDGs
Clean energy utilization	Renewable energy	<p>Development and introduction of carbon neutral technologies and facilities for possible applications to the NGK Group’s manufacturing activities (including demonstrations and test operations)</p> <p><Examples of projects></p> <ul style="list-style-type: none"> > Development of firing processes for ceramics, using hydrogen and ammonia as fuel > Demonstration testing of a firing kiln for ceramics, using hydrogen and ammonia as fuel 	  
		<p>Installation of facilities to switch to green electricity for use in the NGK Group’s business activities.</p> <p><Examples of projects></p> <ul style="list-style-type: none"> > Installation of solar power generation facilities using NAS® batteries and zinc rechargeable batteries > Installation of solar power generation facilities > Procurement of green electricity 	
Energy-efficient manufacturing	Energy efficiency	<p>Installation of high-efficiency facilities to improve energy efficiency of the NGK Group’s manufacturing activities.</p> <p><Examples of projects></p> <ul style="list-style-type: none"> > Investment in high-efficiency facilities with excellent energy-saving performance to achieve carbon-neutral targets > R&D of new energy-efficient manufacturing processes 	  

2.2 Process for project evaluation and selection

Candidate projects, for which use of proceeds of green bonds or green loans are allocated, will be specified by NGK's ESG Management Department based on the conformity to the eligible criteria set forth in 2.1 Use of the proceeds. The executive officer in responsible for the ESG Management Department makes a final decision that specified projects are qualified from the viewpoint of consistency with NGK Group's basic environmental policy and environmental vision. The results are reported to the ESG Management Committee, which is chaired by President.

We will confirm that the following measures are taken for each eligible project in order to reduce environmental and social risks if necessary:

- Complying with environmental relating laws and regulations of Japan and local governments of the project location, and implementation of environmental impact studies as necessary
- Proving sufficient explanations to local residents in carrying out businesses
- Procurement of materials, prevention of environmental pollution, and consideration for the working environment and human rights in accordance with the NGK Group's philosophy and policies for global environmental conservation activities, basic purchasing policy, etc.

2.3 Management of proceeds

Funds procured through green bonds or green loans are allocated to eligible projects and managed by NGK's Finance & Accounting Department. The Finance & Accounting Department tracks and manages funds every fiscal year using internal accounting system as long as the bonds and loans remain outstanding so that the same amount of bonds or loans issued based on the framework will be allocated to any of eligible project.

Unallocated funds until proceeds of green bonds or loans fully allocated to the eligible project are treated as cash or cash equivalents, and it intends to fully allocate the funds within two years or so from the relevant issuance (including the case where there are no sufficient eligible projects available).

2.4 Reporting

We will report on the status of allocation to eligible projects and impacts on the environment annually on the company's website and/or integrated report. If financed by loans, we also have an option to report directly to the providers of the loans and other related parties. The initial report will be published within one year after issuance of each green finance.

2.4.1 Allocation reporting

NGK plans to report the following items relating to allocation status of proceeds from green bonds or loans to the eligible project annually as much as possible considering the practical operation until the proceeds are fully allocated.

- Total amount of proceeds allocated to eligible projects
- Allocated and unallocated amounts by eligible project category
- Where unallocated amounts exist, scheduled allocation
- Percentage of new financing and refinancing

NGK will disclose any major changes in its funding position in a timely manner after the amount of the proceeds has been allocated.

2.4.2 Impact reporting

As long as outstanding balance of green bonds or loans exists, NGK plans to report the following items related to the environmental impact of eligible projects on an annual basis as much as possible considering the practical operation. In addition, NGK will disclose any major changes in circumstances in a timely manner.

Eligible projects

A. Distribution of environmentally friendly products and services

Eligible project categories	ICMA GBP Category	Examples of Impact Reporting Indicators
Batteries	Circular economy adapted products, production technologies and processes and/or certified eco-efficient products	<ul style="list-style-type: none"> > Technology and product overview > In the case of R&D, <ul style="list-style-type: none"> • Outline and progress of R&D plan • Overview of projects targeted for research and development and explanation of targeted effects (purpose of use, expected additional effects, expected storage capacity, expected energy density, life expectancy, etc.)
Next-generation power semiconductors	Circular economy adapted products, production technologies and processes and/or certified eco-efficient products	<ul style="list-style-type: none"> > Technology and product overview > In the case of R&D, <ul style="list-style-type: none"> • Outline and progress of R&D plan • Overview of projects targeted for research and development and explanation of targeted effects (anticipated use purposes, products, etc.)
CCU/CCS and hydrogen/ ammonia	Circular economy adapted products, production technologies and processes and/or certified eco-efficient products	<ul style="list-style-type: none"> > Technology and product overview > In the case of R&D, <ul style="list-style-type: none"> • Outline and progress of R&D plan • Explanation of the outline of the businesses targeted for research and development and the expected effects (purpose of use, anticipated final products, equipment of users, expected additional effects, etc.)

B. The NGK Group's business and manufacturing activities for carbon neutral initiatives

Eligible project categories	ICMA GBP Category	Examples of Impact Reporting Indicators
Clean energy utilization	Renewable energy	<ul style="list-style-type: none"> > Overview of facilities > A reduction in CO₂ emissions through use of hydrogen in the manufacturing process > Number of facilities introduced and output capacity of photovoltaic power generation using NAS® batteries > Purchased amount of electricity of renewable energy source > Avoided CO₂ emissions amount by use of renewable energy
Energy-efficient manufacturing	Energy efficiency	<ul style="list-style-type: none"> > Overview of the facility installed > Overview of Initiatives for improving energy efficiency > Status of energy saving (reduction in power consumption/percentage)