

(1) Carbon Neutral Society Transition Risks and Opportunities (1.5°C scenario)

Category	Summary of assumed scenario	Business risks & opportunities		Details of risks & opportunities	Timeframe	Response strategy	Financial impacts
Policy/ Legal	<ul style="list-style-type: none"> Rapid reduction in emissions required to achieve carbon neutral by 2050. Adoption of carbon pricing against CO₂ emissions of our company or our supply chain. 2030: 130\$/t- CO₂ 2050: 250\$/t- CO₂ 	Increased cost of responses to further reduce greenhouse gas emissions	Risks	Incurring response costs related to equipment replacement and upgrades for energy saving, renewable energy procurement, electrification of energy sources, and energy conversion from natural gas as a furnace fuel to fuels sources such as hydrogen or ammonia.	Short- to long-term	<ul style="list-style-type: none"> Trend and prediction monitoring for the regulations and carbon pricing systems of various countries Promote enhanced energy saving, technological innovation, and initiatives towards expanding the use of renewable energy in line with the NGK Group Environmental Vision and Carbon Neutrality Strategic Roadmap Monitor supply status of fuels with low greenhouse gas emissions Promote greenhouse gas emissions reductions in accordance with Supply-Chain CSR Guideline Expand Scope 3 calculations and range of disclosure, conduct life cycle assessments (LCA) for major products to identify reduction targets 	Financial impacts of energy conversion/carbon pricing (increased expense)* ¹ 2025: - ¥2.0 bil 2030: - ¥5.8 bil 2050: - ¥12.3 bil (Reference: Impacts of carbon pricing without reductions: - ¥5.9 bil to - ¥17.7 bil)
		Increased costs due to adoption of carbon pricing	Risks	Costs increase due to adoption of carbon pricing on company emissions and emissions along the upstream of our supply chain			
Technology	Growing battery demand leading to decline in prices for rechargeable lithium-ion and other batteries. Also seeing the emergence and adoption of new battery technology with high added value.	Risks and opportunities associated with battery technology innovation and the emergence /adoption of new technology	Opportunities	<ul style="list-style-type: none"> Increased competitiveness by advancing proprietary technology development Increased storage battery needs 	Medium- to long-term	<ul style="list-style-type: none"> Monitoring of trends in technology innovation R&D advancement 	We are currently carrying out qualitative studies due to the lack of quantitative indicators.
			Risks	Competitiveness of our technologies will decline as competitors advance proprietary technology development			
	Rapid growth in CO ₂ capture volume in various sectors, including fuel production, power generation, and industry.	Market growth driven by widespread adoption of CCU/CCS (CO ₂ capture, utilization, and storage)	Opportunities	Growth in CCU/CCS market will increase business opportunities for our ceramic products (subnano-ceramic membranes, etc.)	Medium- to long-term	<ul style="list-style-type: none"> Monitoring of technology innovation and market trends Business expansion in the CCU/CCS market, new product development promotion marketing, business schemes, promotion of New Value 1000 to accelerate new product development Research, development, and provision of subnano-ceramic membranes, solid oxide electrolysis cells (SOEC), and the establishment of carbon cycles to use them. 	Financial impacts of CCUS-related products* ² 2025: + ¥0 bil 2030: + ¥14 bil 2050: + ¥270 bil
Market	<ul style="list-style-type: none"> In the short-term, vehicle emissions restrictions will be stricter, increasing demand for improved fuel economy. In the medium- to long term, the proportion of electric vehicles (EVs) and fuel cell vehicles (FCVs) in automobile sales will rise rapidly, and the proportion of internal combustion engine vehicles will decline. 	Changes in demand for automotive parts	Opportunities	<ul style="list-style-type: none"> In the short term, demand for catalyst substrates for controlling automotive emissions and NOx sensors will increase due to stricter exhaust gas regulations. In the medium- to long-term, demand for gallium nitride (GaN) wafers, DCB and AMB substrates, and beryllium copper alloy for EVs will increase. 	Short- to long-term	<ul style="list-style-type: none"> Monitoring of regulatory, market, and demand trends Plan and implement production and capital expenditures in response to the plans of automobile manufacturers Cover decline in demand for internal combustion engine vehicles due to tougher exhaust gas regulations by increasing the number of new products and high-performance products Expand adoption of gallium nitride (GaN) wafers, beryllium copper alloy, and DCB and AMB substrates for EVs and plug-in hybrid vehicles (PHEVs) Develop and offer products for heat management in EVs, new products for synthetic fuels, etc. 	Financial impacts of automotive-related products* ² 2025: + ¥65 bil 2030: - ¥50 bil 2050: - ¥244 bil
			Risks	Demand for products for internal combustion engine vehicles will decline over the medium- to long-term			
	The capacity of power storage batteries and demand for lithium-ion rechargeable batteries for EVs will rapidly expand.	Increased storage battery demand	Opportunities	<ul style="list-style-type: none"> Increased demand for NAS batteries and Zinc Rechargeable Batteries Increased business opportunities in the heating and refractory business for lithium-ion rechargeable batteries 	Short- to long-term	<ul style="list-style-type: none"> Monitoring of power policies and customer trends in each country Enhance production systems in response to growing demand Provide new value through solutions services Commercialize Zinc Rechargeable Batteries 	Financial impacts of battery-related products* ² 2025: + ¥23 bil 2030: + ¥33 bil 2050: + ¥68 bil
Demand for semiconductors will increase with electrification in various fields such as industry and transportation.	Growth in demand for semiconductor-related products	Opportunities	Increased demand for parts for semiconductor manufacturing equipment and electronic parts / metals in the digital society business	Short- to long-term	<ul style="list-style-type: none"> Monitoring of demand trends Enhance production systems in response to growing demand Partner with semiconductor manufacturing equipment manufacturers, increase facility capacity, personnel, facility systems, etc. as necessary 	We are currently carrying out qualitative studies due to the lack of quantitative indicators.	
Reputation	<ul style="list-style-type: none"> Regular and growing trend of investors and financial institutions factoring climate change risk into investment decisions and requiring lenders to set SBT*³. Customers are increasingly demanding renewable energy adoption and reductions in CO₂ emissions. 	Improving assessments by contributing to carbon neutrality	Opportunities	Assessments by stakeholders can be improved by proactively responding to climate change and providing products and services that contribute to carbon neutrality.	Short- to long-term	<ul style="list-style-type: none"> Business structure conversion, one of the goals outlined in the NGK Group Vision Promote measures to reduce greenhouse gas emissions Conduct information disclosure in line with the TCFD framework Ascertain customer demands and implement responses accordingly 	We are currently carrying out qualitative studies due to the lack of quantitative indicators.
		Decline in trust from stakeholders due to delays in responding to climate change	Risks	Delays in climate change measures will have a negative impact on brand, capital procurement, transactions, etc.			

*¹ We set certain assumptions and premises about things like future business expansion based on the parameters (carbon price, energy unit price, power source mix, etc.) of scenarios in the International Energy Agency (IEA) "Net Zero by 2050" report (2021 edition). Then we combined the costs of energy conversion and energy saving with carbon prices for greenhouse gases to calculate the amount of financial impact on profits.

*² We used certain assumptions and premises to estimate our market share based on changes in the automobile, CCU/CCS, and battery markets according to scenarios in the International Energy Agency (IEA) "Net Zero by 2050" report (2021 edition). Then estimated the impact on sales of some products compared to the present to determine financial impacts.

*³ SBT: Abbreviation of Science-based Targets, which is an initiative that requires companies to set targets for reducing greenhouse gas emissions based on scientific evidence.

(2) Physical Risks and Opportunities Associated with Advancing Climate Change (mainly 4°C scenario)

Category	Summary of assumed scenario	Business risks & opportunities		Details of risks & opportunities	Timeframe	Response strategy	Financial impacts
Acute	<ul style="list-style-type: none"> Frequency of flooding increasing in regions such as Japan and Asia. The frequency of violent typhoons increasing. 	Impact of wind and flood damage on factories and supply chains	Risks	<ul style="list-style-type: none"> Increasing impact of factors such as property damage to facilities and machinery caused by wind and flooding, profit losses due to the suspension of business, and difficulty in employees coming to work. Supply chain disruption due to increased wind and flood damage 	Short- to long-term	<ul style="list-style-type: none"> Flood risk assessments for major sites including future climate Create and promote BCP (Business Continuity Plan), including for supply chains Create a structure that enables global substitutions by decentralizing sites Prepare for supply chain disruption by evaluating alternative procurement methods in advance (focus on production areas with high disaster risks) Evaluate the flood risk assessments of major suppliers 	Changes in our company's financial impacts (expected value) due to floods and storm surges affecting our plants and suppliers* 2025: - ¥70 mil 2030: - ¥100 mil 2050: - ¥540 mil
Chronic	Sea levels continue to rise.	Impact of storm surge on coastal factories	Risks	<ul style="list-style-type: none"> Increased storm surge risk, increased property damage and profit losses due to flood damage Costs incurred for measures such as height elevation and barriers and relocation 	Medium- to long-term		

* Drawing on location information for our plants and major suppliers, we used a simulation that employed the Climate Score Global (CSG) model developed by Jupiter Intelligence in the United States to evaluate the inundation depths caused by flooded rivers and storm surges at a resolution of 90 m. Based on this evaluation, we calculated the expected amount of financial impact on profits by tallying up the value of losses to our company due to asset losses at our plants and losses due to shutdown of our plants and major suppliers. This expected value is an index calculated from the amount of losses due to floods and the probability of flood occurrence in a given year. The loss amount is estimated based on a uniform damage rate according to depth of inundation and does not reflect the disaster preparedness measures in place in the areas where sites are located.