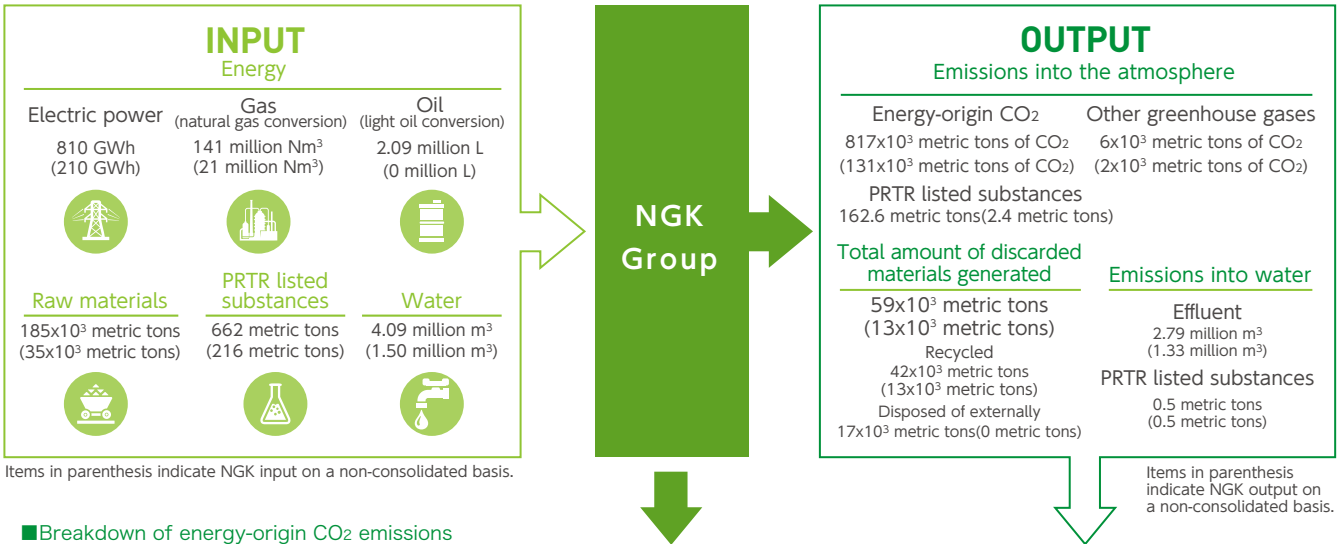


Overall Perspective of Environmental Impact

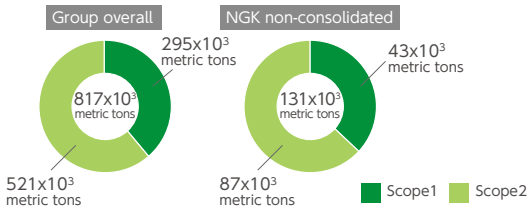
The diagram below shows aggregate inputs to and outputs from manufacturing operations of the entire NGK Group engaged in at all domestic and overseas sites.

Inputs represent data for raw materials and energy etc. and outputs for manufactured products and services as well as substances that are discharged into the atmosphere and into water.

NGK Group Material Balance (Input and Output)



Breakdown of energy-origin CO₂ emissions



Notes:

1. Environmental performance values in this report have been rounded up for convenience; therefore the sum of individual values may not match the totals.
2. "Discarded materials" indicates the total amount of industrial waste and valuables.
3. CO₂ conversion factors (kg-CO₂/unit) used in calculating NGK's CO₂ emissions on a non-consolidated basis are as follows (units are indicated in parentheses): Purchased electric power (kWh): 0.42, Fuel oil A (liters): 2.677, Diesel fuel (liters): 2.64, Kerosene (liters): 2.49, City gas (Nm³): 2.29, LPG (kg): 3.007, LNG (kg): 2.70, Gasoline (liters): 2.322 Sources: The Federation of Electric Power Companies of Japan (actual figures for fiscal 1990), Ministry of the Environment. Some factors calculated independently by NGK have been used. Incidentally, the fiscal 2016 energy-origin actual CO₂ emissions volume for NGK on a non-consolidated basis is 146x10³ metric tons when using the CO₂ conversion factor provided by the Order for Enforcement of the Act on Promotion of Global Warming Countermeasures (revised in May 2016).

INPUT

1. Energy

Electric power: Consumption amount of electric power

Gas: Consumption volume of each type of fuel gas converted into natural gas volume = $\Sigma(\text{Consumption volume of each fuel gas} \times \text{Unit heating value of each fuel gas} / \text{Unit heating value of natural gas})$

<Unit heating value of fuel gas>

Natural gas: 40.9 MJ/Nm³ City gas: 45.0 MJ/Nm³

LPG: 50.2 MJ/kg LNG: 54.5 MJ/kg

Oil: Consumption volume of each type of fuel converted into light oil volume = $\Sigma(\text{Consumption volume of each fuel} \times \text{Unit heating value of each fuel} / \text{Unit heating value of light oil})$

<Unit heating value of fuel gas>

Light oil: 38.2 MJ/L Fuel oil: 39.1 MJ/L Kerosene: 36.7 MJ/L

2. Water

Total consumption volume of city water, industrial water, well water and rainwater

3. PRTR Substances

Total amount handled of Japan's PRTR Type 1 listed substances

4. Raw materials

Total weight of raw materials used in product manufacturing

OUTPUT

5. Energy-origin CO₂ emission volume

Energy-origin CO₂ emission volume = $\Sigma(\text{Consumption of each energy} \times \text{CO}_2 \text{ conversion factor of each energy})$

<CO₂ conversion factor of energy>

(Unit of electric power factor: kgCO₂/kWh Unit of fuel factor: kgCO₂/fuel unit)

Electric power Japan: 0.42; United States: 0.709; Belgium: 0.292; France: 0.061; Poland: 0.986; South Africa: 1.096; China: 0.983; Thailand: 0.687; Indonesia: 0.790; Australia: 1.390; Mexico: 0.741

Fuel Natural gas (Nm³): 2.02; City gas (Nm³): 2.29; LPG (kg): 3.007; LNG (kg): 2.70;

Light oil (L): 2.64; Fuel oil (L): 2.677; Kerosene (L): 2.49; Industrial steam (MJ): 0.06

6. Emission volume of other greenhouse gases

Emission volume of other greenhouse gases = active mass × emission factor × global warming potential

<Global warming potential>

CO₂: 1, CH₄: 25, N₂O: 298, HFC: Differs by type, PFC: Differs by type, SF₆: 22800, NF₃: 17200

7. Effluent

Total amount of effluent excluding rainwater

8. PRTR Type1 listed substances

Emissions into water: Total emission amount of Japan's PRTR Type 1 listed substances into public waters

Emissions into atmosphere: Total emission amount of Japan's PRTR Type1 listed substances into atmosphere

9. Total amount of discarded materials generated

Total amount of discarded materials generated = Externally disposed amount*1 + externally recycled amount

Recycled amount: Externally recycled amount = Paid disposal*2 + Valuable amount (selling off)

*1 Externally disposed amount: Direct disposal by landfill, or simple incineration

*2 Paid disposal: Outsourcing disposal and paying for recycling

Preventing Global Warming

The NGK Group strives to reduce CO₂ emissions, a major cause of global warming, setting reduction targets for the entire Group, including its manufacturing sites in and outside of Japan.

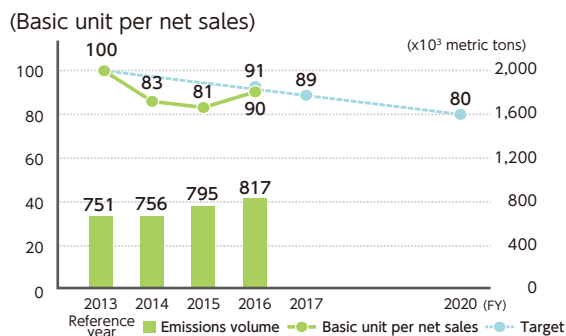
Reducing CO₂ Emissions from Manufacturing Activities

Toward the achievement of CO₂ emissions reduction targets set under the Five-Year Action Plan, we have achieved steady results by creating and implementing annual improvement plans in line with the business plan at each manufacturing site in and outside of Japan.

We achieved the fiscal 2016 targets to make steady progress under the Five-Year Action Plan. This accomplishment resulted from our successful efforts to carry out reduction measures as initially planned, despite the basic unit per net sales decreasing from the previous year due to a number of negative factors, such as the stronger yen, change in the product mix, and a new production line launched overseas. The reduction rate against BAU, an indicator newly introduced under the Fourth Action Plan to present more directly the effect of measures to reduce emissions from the manufacturing division, reached the 2020 target of 15%, backed by a significant improvement in the basic unit per production volume.

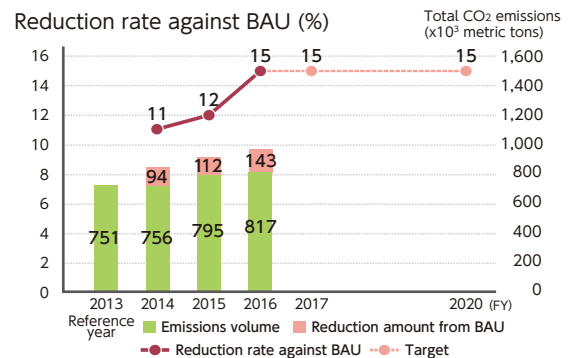
For fiscal 2017, we will exert additional efforts to achieve annual targets in order to overcome the temporary rise in CO₂ emissions expected owing to two extraordinary events, namely, the completion of a new large factory overseas and starting the mass production of new products. To address this challenge, we will strive to carry out reduction measures even more effectively across the entire manufacturing division while focusing on cost cutting efforts.

CO₂ emissions/basic unit per net sales (NGK Group)



* Basic unit per net sales calculated with the value in fiscal 2013 set at 100.

CO₂ emissions/reduction rate against BAU* (NGK Group)



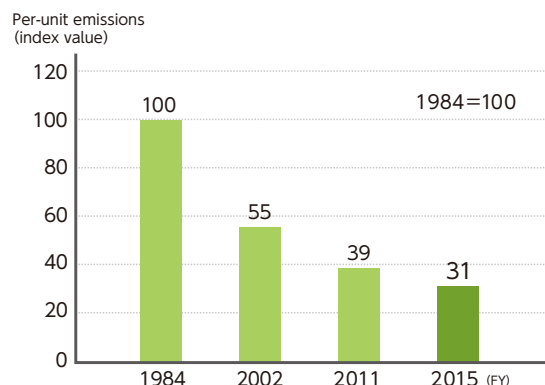
* Reduction rate against BAU: The percentage rate of emissions reduction resulting from implemented actions against a computed value for the hypothetical absence of the actions.

Adoption of Environmentally Friendly Production Processes

Through the introduction of highly-efficient equipment and the promotion of the collection and use of exhaust heat and improved production efficiency, the NGK Group makes efforts to reduce environmental impacts resulting from production. Also, our "Reformed Manufacturing Structures" aimed at enhancing competitiveness significantly contribute to the realization of eco-processes. We will create further advanced eco-processes through our "New/Reformed Manufacturing Structures".

(See the lower right graph for change in CO₂ emissions from continuous kilns, which constitute major production equipment at NGK.)

Change in CO₂ emissions from continuous kilns by the year of introduction



Measures to Reduce CO₂ Emissions and Effects

As it continues to expand overseas manufacturing, the NGK Group is particularly striving to raise manufacturing efficiency at its overseas sites in order to reduce the amount of CO₂ and discarded materials released from the Group. We have made steady progress through applying innovative processes and improvements to facilities and operations practiced in Japan to our overseas sites as well as promoting energy-saving activities for general-purpose equipment.

In fiscal 2016, these overseas initiatives achieved significant results, including an annual CO₂ reduction effect of 9,500 metric tons (a reduction rate of 1.2%).

Examples of initiatives aimed at reducing CO₂ emissions

Categories	Measures	Effects
Highly efficient manufacturing processes	Main production efficiency initiatives at overseas locations <ul style="list-style-type: none"> ▪ Introduction of innovative production processes ▪ Equipment improvements ▪ Management improvements 	CO ₂ reduction effect Domestic: 5,200 metric tons Overseas: 9,500 metric tons Of which
Group company energy-saving diagnostics	<ul style="list-style-type: none"> ▪ An English version of the voluntary energy-saving guidelines and a best practice catalog created and distributed to overseas sites ▪ Conducted in conjunction with local employees 	<ul style="list-style-type: none"> ▪ Production process improvements Domestic: 1,900 metric tons Overseas: 7,300 metric tons
General-purpose equipment energy-saving activities	Horizontally deployed main improvements <ul style="list-style-type: none"> ▪ Replacing boilers with more efficient models ▪ Eradicated air and steam leaks from plumbing ▪ LED lighting ▪ Eliminated wasteful air conditioning 	<ul style="list-style-type: none"> ▪ General purpose equipment energy savings Domestic: 3,300 metric tons Overseas: 2,200 metric tons

Energy-Saving Activities for General-Purpose Equipment through Cooperation between the Manufacturing Division and the Head Office

The NGK Group promotes energy-saving activities for its general-purpose equipment, such as lighting, air conditioners, boilers and compressors. In this, the head office plays a central function in terms of sharing know-how among different manufacturing locations, thereby achieving more efficient activities. In fiscal 2016, an energy center was established under the head office Engineering Department to direct energy-saving activities at the Group's manufacturing sites.

(1) Head office supporting energy-saving activities at overseas manufacturing sites

The head office Engineering Department has, over the years, sent personnel to overseas manufacturing sites to perform energy audits and, as necessary, help local staff develop and carry out effective energy-saving measures using the know-how gained from practices in Japan. These efforts have produced solid results at overseas companies, including NGK Insulators Tangshan. (See “Energy-Saving Activities at Group Companies.”)

(2) Creating and distributing a printed version of the energy-saving catalogue and guidelines

We have created a printed version (Japanese, English) of our energy-saving guidelines and catalog of best practices, both of which were previously available only in digital formats. Copies have been distributed to each manufacturing site in and outside of Japan to be kept handy at worksites for easy reference. This is expected to help enhance activities to reduce CO₂ emissions.



Promoting energy-saving activities globally using 100 best practices

Environmental Management Department
Toru Oka

We have issued the Energy-Saving Best Practices catalog. This catalog is a compilation of around 100 successful measures taken to address various issues, categorized under compressors, boilers, lighting, air-conditioning and other functions, specifically describing improvement methods and cost-effectiveness. In addition, the Energy-Saving Guidelines for General-Purpose Equipment have been created to provide instructions and advice for effective activities. Containing plenty of photos and illustrations, these easy-to-understand manuals have been well received by Group companies overseas as well as in Japan. They are also utilized by the Energy Center to give instructions and advice to Group companies. The two tools will be expanded by adding new practices, thereby facilitating energy-saving activities across the Group.



Energy-Saving Activities at Group Companies

NGK Insulators Tangshan Co., Ltd.

NGK Insulators Tangshan has introduced measures conducted at Japanese sites to reduce CO₂ emissions. Our efforts started with encouraging the daily practice of switching off lighting and other equipment when not in use, with the primary intention of raising employee awareness. We are continually working to improve activities with the help of the Komaki Site, which sends personnel to Tangshan every six months to perform an on-site inspection and suggest improvement plans.



NGK Ceramics Polska Sp. z o.o.

Since 2011, NGK Ceramics Polska has been focusing on improving processes for manufacturing SiC-based DPFs, its main product. Target areas include particularly energy-intensive calcination and drying processes, for which we have carried out various measures to reduce our CO₂ emissions. To further improve our performance, we will introduce new measures, including technologies provided by the Nagoya Site.



NGK Metals Corporation

NGK Metals is reducing CO₂ emissions by updating control systems and improving the operation of production equipment. Among various efforts, a particularly distinctive effect resulted from automating the control units of the oil circulation system for rolling mills. The automation eliminated unnecessary around-the-clock operation, a measure taken to address inefficient activation/deactivation processes, as well as simplifying complex manual processing. This change helped reduce electric power consumption as well as CO₂ emissions.

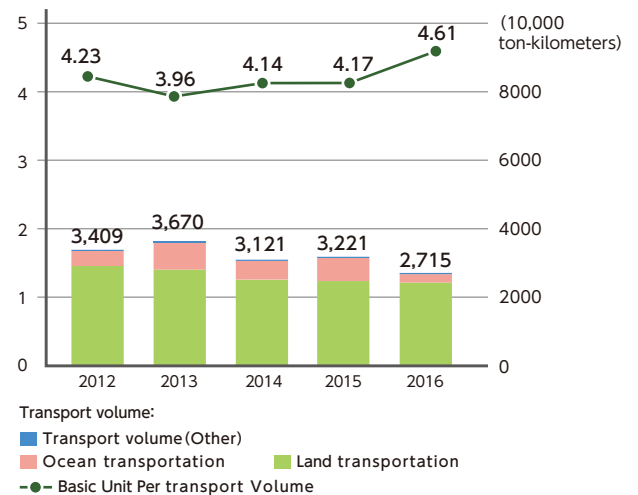


Reduction of CO₂ from Logistics

NGK works to reduce CO₂ emissions from logistics, setting a target of reducing the basic unit per transport volume by 1% year on year on a five-year average, as required by the Energy Saving Act. To achieve this target, we have implemented a number of measures, including raising loading efficiency and promoting a modal shift. For fiscal 2016, we recorded a 2.1% increase on a five-year average, reflecting the considerable lowering of the rate of marine transport, a mode emitting less CO₂, to address a change in the product mix.

Transport Volume / Basic Unit Per Transport Volume (NGK)

Basic Unit Per Transport Volume
(KL/100,000 ton-kilometer)



Starting to Report SCOPE 3 CO₂ Emissions

The NGK Group reports Scope 1 and 2 CO₂ emissions data for the Group overall and for NGK independently in relation to logistics (for shipment). In addition to this, NGK has begun to prepare Scope 3 data on a non-consolidated basis in response to emerging expectations for businesses to expand the relevant data reporting scope to include the supply chain.

Introduction of Green Power

As part of our corporate activities aimed at harmony with the environment, NGK began introducing Green Power (energy sources such as wind and solar power and biomass fuels) in 2002, earlier than any other company. The Green Power Certification System contract we signed with Japan Natural Energy Company Limited calls for them to generate two million kilowatt hours of wind power for us each year.

This accounts for about 60% of the power consumed annually at the NGK headquarters building, attaining a reduction effect of approximately 1,000 metric tons of CO₂ emissions per year (based on the fiscal 2016 results; CO₂ conversion factor: 0.532), or the annual amount of CO₂ absorbed by approximately 71,000 cedar trees.



Promoting Effective Use of Resources

To boost yield from manufacturing process improvements, NGK Group reuses in-process materials in an effort to curb discarded materials while also focusing efforts on recycling to reduce final disposal volumes to promote resource recycling.

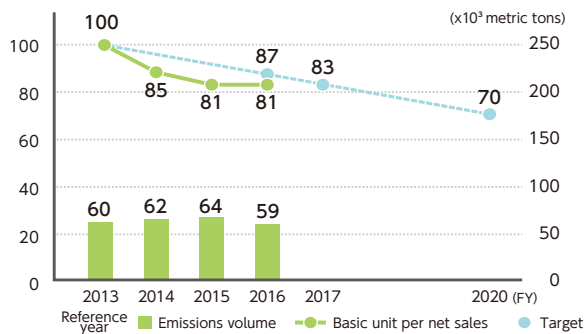
Reducing Discarded Materials from Manufacturing Activities

Similar to its efforts to reduce CO₂ emissions, the NGK Group works to suppress its generation of discarded materials by formulating and managing annual improvement plans to achieve the Five-Year Plan targets for the reduction of discarded materials.

In fiscal 2016, we exceeded the annual targets, securing the basic unit per net sales at the level of the previous year despite negative factors such as the unfavorable exchange rate affecting net sales and the launch of a new manufacturing line. This achievement resulted from the manufacturing division's outperforming efforts directed at an increased material utilization rate and production yield for each process and a higher recycling rate within processes, attaining a significant improvement from the previous year in the basic unit per production volume for many mainstay products. The reduction rate against BAU, which indicates improvement from the fiscal 2013 level, grew substantially from the previous year to 18%. In fiscal 2017, we will continue with these ongoing efforts, aiming to accomplish the Five-Year Plan targets.

Amount of discarded materials generated/basic unit per net sales (NGK Group)

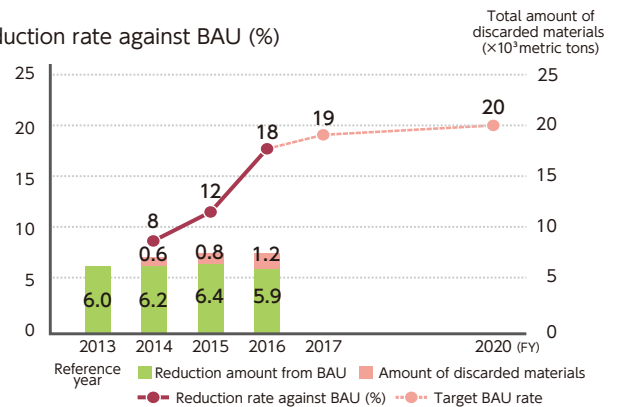
(Basic unit per net sales)



* Basic unit per net sales calculated with the value in fiscal 2013 set at 100.

Discarded Materials/Reduction Rate against BAU* (NGK Group)

Reduction rate against BAU (%)



* Reduction rate against BAU: The rate of reduction compared to the value if no efforts were made

Promoting of Resource Recycling

At the NGK Group, we promote resource recycling initiatives, pursuing rigorous sorting and separating practices and seeking out new methods of recycling.

In fiscal 2016, we focused particular efforts on NGK Electronics Devices, a consolidated subsidiary from fiscal 2014 that was included in the reporting scope from fiscal 2016, and Akechi Insulators, which was looking for new service providers. With assistance from NGK headquarters, both companies successfully carried out recycling programs while keeping treatment costs at a reasonable level, significantly decreasing the amount of landfill disposal. As a result, we have maintained a domestic recycling rate of 99% or higher since fiscal 2013, a target set under the Five-Year Plan. NGK, by itself, achieved zero landfill disposal, or a recycling rate of 100%. At overseas Group companies, where situations vary by country and region, suitable targets are set taking into account circumstances specific to each location. The overseas recycling rate has remained at around 90% based on calculations that exclude three companies that generate non-recyclable discarded materials, out of a total of 16 overseas manufacturing Group companies.

Overseas Group Company Implementation Examples

At overseas Group companies, waste material separation management is strictly enforced. Waste separation rules are posted where waste materials are stocked and color-coordinated containers are provided for each category of waste to avoid confusion.



NGK Ceramics Europe



NGK Ceramics USA

Risk management of water resources and Response

The NGK Group recognizes the management of water resources as an important issue for the company in achieving a sustainable society, and promotes relevant initiatives as described below.

Water Risk Evaluation

At the NGK Group, to ascertain water supply risks for each manufacturing site in and outside of Japan, we perform a simplified internal survey to assess water shortage risks based on the water supply capacity of rivers in the respective regions. In fiscal 2016, we newly introduced a third-party survey to provide advanced analyses for sites where concerns are identified from the internal screening. For water supply/demand risks, the external assessment employs a range of indicators, from the river's water supply capacity and seasonal fluctuations in groundwater flow to the reservoir capacity of dams and other systems, and produces a supply/demand forecast. The assessment also analyzes risks of flooding and water quality deterioration.

The external survey reported that no serious water risks have been identified at any surveyed site. We plan to expand the advanced assessment to all overseas bases. We will also work to keep up with related regulatory trends to ensure stable operations in the future.

Water Usage Guidelines

NGK created guidelines (an implementation status checklist) aimed at appropriate water usage and, in fiscal 2015, launched inspections to ascertain the efficiency of water usage at all manufacturing sites in and outside of Japan. Going forward, we will enhance these guidelines through internal and external case studies while encouraging efforts at each location to strengthen the operational structure against a future tight water supply.

Promoting efficient water use at Group companies

NGK Ceramics Mexico, S. de R.L. de C.V.

We strive to use precious water resources as appropriately and efficiently as possible, including the recycling of water used inside plants, at Group companies located in highly water-stressed regions. For example, at NGK Ceramics Mexico, manufacturing process waste water is filtered using reverse osmosis membranes and the recycled water is reused as coolant and boiler water or sprinkled on vegetation.



Filtration device using reverse osmosis membranes

Cooperation with Suppliers

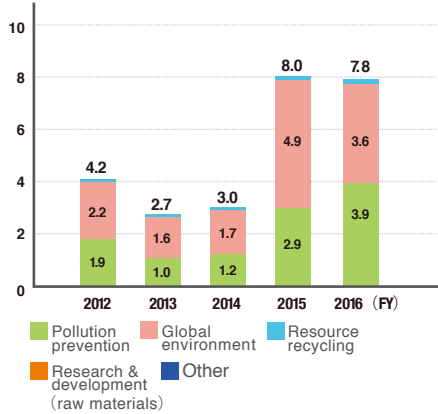
Believing that it is important to address issues related to water resources throughout the supply chain, the NGK Group asks its suppliers to practice water resources-related risk management and efficient water usage via the CSR Procurement Guidelines, which includes relevant items. In fiscal 2016, a total of 723 companies, accounting for 99.4% of NGK's domestic supply chain, agreed to our request

Environmental Accounting

As an important index of environmental management, NGK has begun conducting environmental accounting and announcing the results. In addition to announcing the costs of environmental conservation (capital investment, expenses), the economic benefits of environmental accounting, and the cost effectiveness of environmental accounting, information on the environmental efficiency of CO₂ and discarded materials has been added since FY2007.

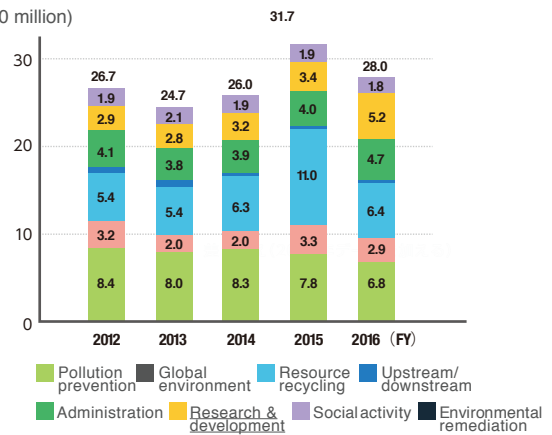
Capital Investment (NGK and Domestic Group Companies)

(¥100 million)



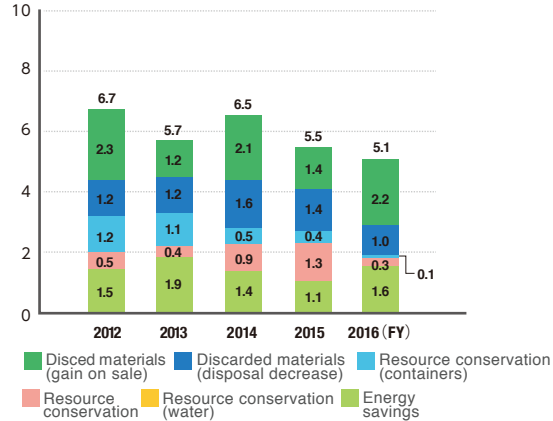
Expenditures (NGK and Domestic Group Companies)

(¥100 million)

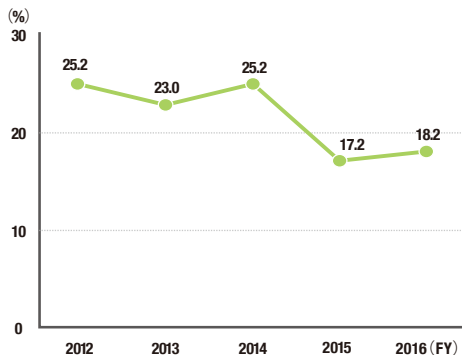


Economic Benefits (NGK and Domestic Group Companies)

(¥100 million)

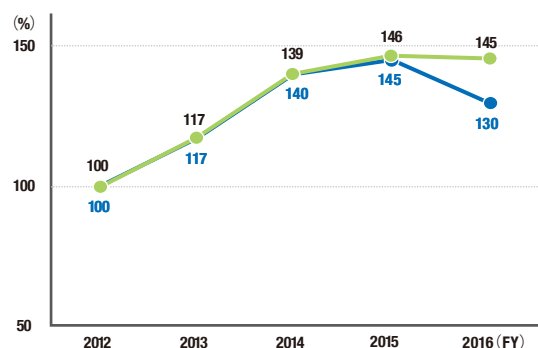


Cost-Effectiveness (NGK and Domestic Group Companies)



$$\text{Cost-effectiveness} = \frac{\text{Benefits}}{\text{Costs}}$$

Environmental Efficiency (NGK and Domestic Group Companies)



$$\text{CO}_2 \text{ eco-efficiency} = \frac{\text{net sales}}{\text{CO}_2 \text{ emissions}}$$

$$\text{Discarded materials eco-efficiency} = \frac{\text{net sales}}{\text{Total discarded materials generated}}$$

The above charts do not include data for NGK Electronics Devices, Inc. and other subsidiaries, depending on the target year: specifically, from FY2012 to FY2015 for charts (1) to (4); and in FY2012 for chart (5).