NEDO

2025

NEDO Project Success Stories

2025-2026

New Energy and Industrial Technology Development Organization

Challenge for

Introduction

Following the two oil crises of the 1970s, NEDO was established in 1980 to promote the development and introduction of new energy technologies. Since then, NEDO has become one of the largest public research and development management organizations in Japan, and it works with the government to implement economic and industrial policies. In this capacity, NEDO undertakes technology development and demonstration activities to carry out the two basic missions of addressing energy and global environmental problems and enhancing industrial technology by integrating the combined efforts of industry, academia, and government. In order to further advance its activities, NEDO has formulated technology development strategies with a mid- and long-term perspective, and has planned and proposed new projects based on its strategies. In addition, with the aim of creating greater innovation, a new project manager system has been introduced to improve management capabilities and enhance NEDO's role as an intermediary for discovering technology seeds and facilitating the commercialization of innovative technology.

NEDO is carrying out its Fourth Five-Year Plan that began in April 2018 with a focus on its three pillars of achieving results for practical application through technology development management, fostering technology-based startups, and providing a new direction for mid- and long-term technology development.

First, as a specific effort to achieve results for practical application through technology development management, NEDO is striving to further strengthen its management capability to promote challenging research and development activities based on technology strategies. This is expected to enable a quick response to innovation that is taking place around the world and produce practical applications that utilize research and development results as much as possible. Second, NEDO will develop and implement various support measures to foster human resources and technology-based startups by establishing a system to provide consistent support from the seed phase to practical application. NEDO's activities will also include giving assistance to discover human resources capable of bringing about innovation, thereby creating new industries. In addition, NEDO facilitates open innovation and cooperates and exchanges information with other public organizations with the aim of serving as a public-private support hub for venture businesses and open innovation. Third, a new direction for mid- and long-term technology development is being established, which will lead to cultivation and practical use of innovation in the future.

In addition to providing evidence necessary for policy making, technology development strategies utilizing Japan's competitive advantages will be formulated by anticipating innovation trends faster and more accurately than in other countries. NEDO will then plan and carry out industryacademia-government collaborative projects.

As this fiscal year marks the 40th anniversary of its establishment as a governmental organization and also the mid-point of its Fourth Five-Year Plan, NEDO will further enhance its approach to achieving goals with the aim of promoting ongoing development of three social systems necessary to realize a sustainable society. To this end, NEDO will continue to make every effort to contribute to society by providing opportunities to produce innovation through industry-academia-government collaboration and achieving results in a timely manner.

New Energy and Industrial Technology
Development Organization
Chairman SAITO Tamotsu

Innovation

NEDO's role as an innovation accelerator

New paths to commercialization.
To make technologies available in society as products and services, researchers need to overcome various challenges through repeated trial and error.

To assist in surmounting such challenges, NEDO combines the efforts of industry, academia, and government to drive progress to create innovation.

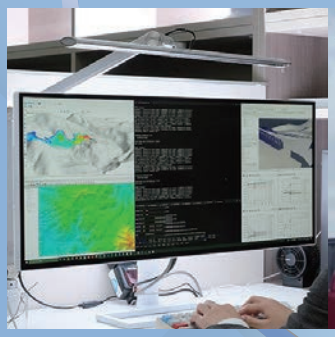
In its pursuit of achieving a sustainable society, NEDO promotes the practical application of the results of its research and development in society, thereby helping to solve social issues.

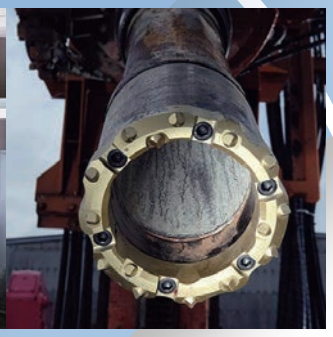
Contents

About NEDO Project Success Stories

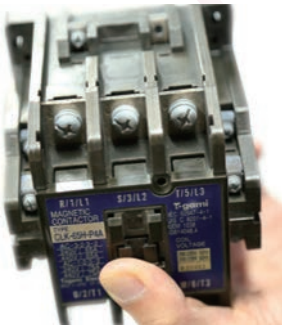
Behind every accomplishment in NEDO's research and development projects is a story of how companies overcame daunting technical challenges to achieve commercialization.

New Energy





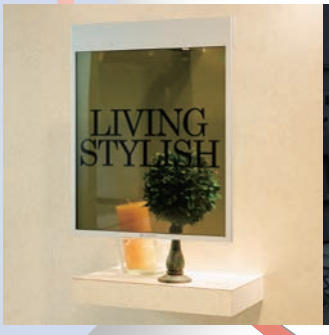
Resolution of Global Environmental Problems

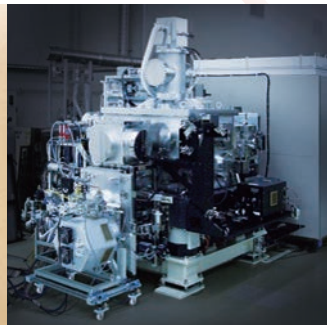


The results of NEDO projects

Energy Conservation

Electronic / Information





NEDO carries out a post-project evaluation after a project is completed by conducting follow-up monitoring to determine how project results have spread throughout society. Based on the products and services identified in the monitoring, interviews are conducted with related companies, and then the products and services are introduced in NEDO Project Success Stories, which are posted on NEDO's website. NEDO Project Success Stories have introduced more than 130 technology development themes since publication of such stories was started 17 years ago.

Material

Medical Biotechnology

contribute to a better future.

Robots / AI / Welfare Equipment

This brochure outlines four new success stories of technology development leading to commercialization.

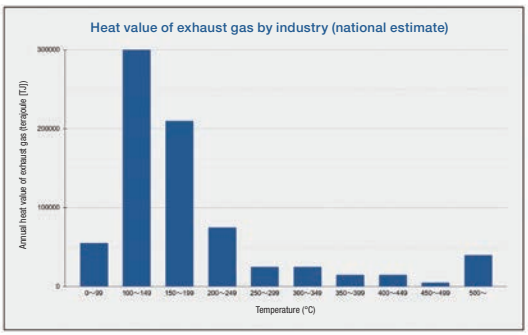
Energy Conservation

Effective Use of Low-Temperature Waste Heat, Anytime and Anywhere! Heat Storage System Using Adsorbent HAS-Clay

►Strategic Innovation Program for Energy Conservation Technologies

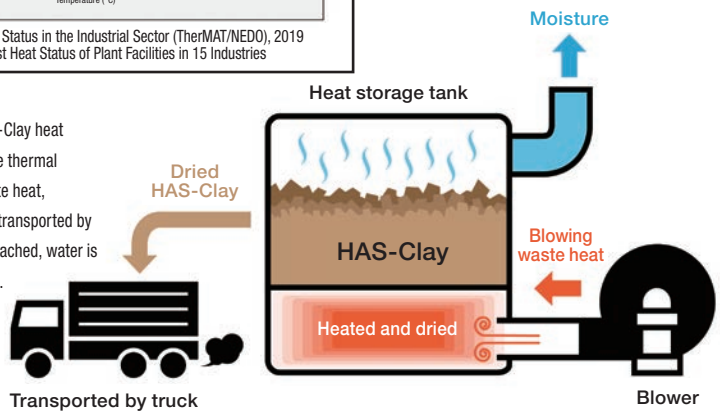
Takasago Thermal Engineering Co., Ltd., National Institute of Advanced Industrial Science and Technology

(Organization: Takasago Thermal Engineering Co., Ltd., ISHIHARA SANGYO KAISHA, LTD., TEPCO Energy Partner, Inc., MORIMATSU INDUSTRY CO., LTD., Hino Motors, Ltd., and National Institute of Advanced Industrial Science and Technology)



Survey Report on Exhaust Heat Status in the Industrial Sector (TherMAT/NEDO), 2019
Survey Report on Exhaust Heat Status of Plant Facilities in 15 Industries

This graph illustrates unutilized waste heat in the industrial sector, based on a 2019 survey. It indicates that a large amount of waste gas heat is at low temperatures between 100°C and 199°C, with 86% of the heat below 250°C.

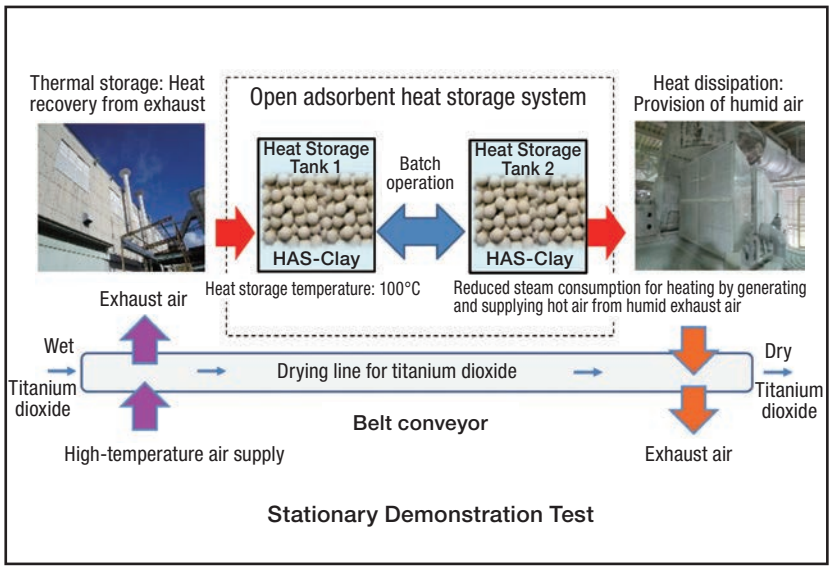


Conceptual diagram of the HAS-Clay heat storage system. HAS-Clay in the thermal storage tank is dried using waste heat, allowing it to store heat and be transported by truck. Once the destination is reached, water is adsorbed and heat is dissipated.

Discarded low-temperature heat from unnecessary to necessary areas

With global warming becoming an urgent issue, utilizing untapped energy is crucial to achieving a sustainable society. However, low-temperature waste heat of around 100°C emitted from factories and other facilities has been viewed as difficult to utilize effectively. To address this challenge, a research and development team consisting of five companies and one institute, led by Takasago Thermal Engineering Co., Ltd. (Takasago Thermal) and the National Institute of Advanced Industrial Science and Technology (AIST), has created a revolutionary heat storage system using HAS-Clay. This new heat storage material allows low-temperature waste heat to be accessible anytime and anywhere.

Year	2008	2018	2020	2022	2024
Milestone	AIST created a new inorganic adsorption material, HAS-Clay	Takasago Thermal and AIST participated in a NEDO project to explore the possibility of utilizing heat from HAS-Clay	Demonstration tests of a stationary thermal storage system and an offline heat transport system	Received numerous awards, including the Award of Excellence in the Industrial Use category at the Cogeneration Grand Prize 2021	Introduced Mega Stock, a commercialized HAS-Clay thermal storage system, to the market



A schematic diagram of the stationary demonstration, in which the role of the heat storage tank is sequentially switched between heat storage and heat radiation during batch operation. The heat is utilized in the same facility as the heat exhaust site (left). The offline heat transport demonstration test involves transporting dried HAS-Clay by truck to a remote location to utilize the heat (right). (Source: Takasago Thermal Engineering Co., Ltd.)

Utilizing medium- and low-temperature waste heat presents a challenge for all Japanese industries

Reusing waste heat discarded by factories and power plants is expected to save energy and reduce CO_2 emissions. However, the temporal and spatial gap between where waste heat is generated and where it is needed, along with transportation costs, has remained a significant challenge. Takasago Thermal has initiated the development of a system that enables long-distance heat transport by applying HAS-Clay, an adsorbent material developed by AIST, as a heat storage material. As part of a NEDO project, efforts are progressing toward the practical application of low-cost, high-efficiency waste heat utilization technology.

Two-part project: material development and system development

Led by AIST in materials development and by Takasago Thermal in system development, this project focused on shortening the payback period and establishing an implementation design and fabrication method for the system. For material development, powdered HAS-Clay was processed into a granular form by improving the material composition and fine-tuning the granulation conditions. This approach addressed the low bulk density and high production costs associated with conventional HAS-Clay. As a result, the heat storage density was over twice that of conventional products, achieving a heat storage efficiency of more than 90%. In addition, optimization of particle size and shape improvement has enabled a design that minimizes energy loss.

Demonstration of stationary equipment conducted at Ishihara Sangyo's Yokkaichi Plant

Establishing mass production technology was another key issue. Ishihara Sangyo's industrial-level manufacturing technology helped overcome the challenges of mixing and stirring. The transition from laboratory level to industrial scale was achieved, successfully realizing the mass production of low-cost, high-heat storage density HAS-Clay. In addition, Ishihara Sangyo's Yokkaichi Plant carried out a demonstration of stationary equipment to reuse waste heat in the drying process. As a result, a highly efficient system design and operating method were established to utilize high waste heat.

Demonstration of offline heat transport at Hino Motors' Hamura Plant

The challenges in developing the system included controlling installation costs and ensuring compliance with safety standards. The granulation of HAS-Clay increased the amount of heat that could be transported at one time for the same amount of HAS-Clay, thereby reducing transportation costs. The amount of HAS-Clay required to store the same amount of heat was also reduced, allowing for equipment downsizing and contributing to the system's overall cost reduction. In the offline heat transport demonstration test that was conducted in collaboration with Hino Motors, a model was developed to utilize waste heat in remote locations, and safety was improved by adopting nonflammable materials and incorporating overheat prevention functionality. Furthermore, a thermal energy management system has been developed, alongside an established method for evaluating offline heat transport systems. With these achievements, the HAS-Clay heat storage system has created new opportunities for the utilization of waste heat by achieving high efficiency, low cost, and enhanced safety.

FACE Developer Profiles —Inside the Minds of Innovators—

Project Leader for Development of Thermal Engineering Technology, Thermal · Energy R&D Office, Research & Development Center, Research and Development Headquarters, Takasago Thermal Engineering Co., Ltd.

TANINO Masayuki

A desire to promote greater understanding of thermal energy worldwide

Tanino Masayuki acted as team leader for the project.

"Thermal energy can be challenging to understand because it's invisible and has a slow reaction time. This is even more so when it comes to waste heat. But it is very rewarding for me to share this with a broader audience around the world."

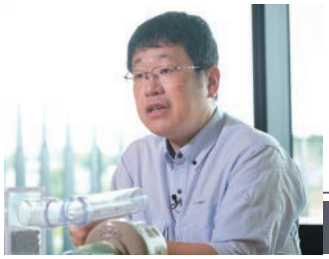
Deputy Director Research Institute for Geo-Resources and Environment, Geological Survey of Japan, National Institute of Advanced Industrial Science and Technology

SUZUKI Masaya

Putting others first and personal enjoyment second

Suzuki Masaya is driven by his interest in zeolite-based adsorption chillers to pursue his research career.

"Although it's of great scientific interest to me, I have a strong desire to create products that make a real difference around the world. The interesting part is that I can make progress by combining both research and practical use."



General Manager, Thermal • Energy R&D Office, Research & Development Center, Research and Development Headquarters, Takasago Thermal Engineering Co., Ltd.

KAWAKAMI Yoshiaki

A united team, encouraging all to share ideas across the organization

Kawakami Yoshiaki is responsible for coordinating the research and development of the system side of the project.

"Six industry-academia organizations from multiple fields participated in the project. I have the impression that many of the team members were enthusiastic and optimistic about new technologies and projects. We were a united team, openly sharing our opinions and helping one another, regardless of organizational boundaries."

Senior Research Engineer, Thermal • Energy R&D Office, Research & Development Center, Research and Development Headquarters, Takasago Thermal Engineering Co., Ltd.

KAMATA Haruyuki

Engineers must be strong and self-reliant, like lone samurai

Kamata Haruyuki is a member of the system development team.

"I like what my mentor once told me, 'Engineers are like lone samurai,' which means that each engineer should be as strong as a fierce warrior. I always try to approach my work with this mindset."

Deputy Manager, Carbon Neutral Business Promotion Office, Carbon Neutral Business Development Division, Research and Development Headquarters, Takasago Thermal Engineering Co., Ltd.

OYAMA Takamasa

Work that connects us to community-wide energy cycles

Oyama Takamasa is responsible for business development.

"I was really pleased with this project because we successfully bridged the gap between our ideas in the office and experimental facilities and the actual opinions of our customers."

Manager, Carbon Neutral Sales Promotion Office, Carbon Neutral Business Development Division, Research and Development Headquarters, Takasago Thermal Engineering Co., Ltd.

MOTODA Osamu

A project I hoped would succeed

Motoda Osamu is responsible for the project's exit strategy.

"I honestly believed it would be amazing if this technology could succeed. Most people still don't realize how much thermal energy they're wasting, so I think the first step is to raise awareness."

NEDO's Role

Strategic Innovation Program for Energy Conservation Technologies, FY2012–FY2024
Frontier Department (formerly Energy Conservation Technology Department)

NEDO is strategically promoting efforts to innovate energy-saving technologies with the aim of achieving sustainable energy conservation that is compatible with economic growth. In this project, NEDO supported the development of technologies that transitioned seamlessly to commercialization, thereby contributing to the creation of an energy-efficient economic society in Japan and the enhancement of industrial-technological capabilities. In addition, NEDO also made a point of announcing joint releases and participating in exhibitions to share the development results with a wide audience.

As a successor to the Strategic Innovation Program for Energy Conservation Technologies, the Program to Develop and Promote the Commercialization of Energy Conservation Technologies to Realize a Decarbonized Society is currently being implemented to support the development of technologies that are expected to have high energy conservation effects by 2040. As management focused on promoting technology development and market dissemination, NEDO will continue to address technical issues through the Technology Promotion Committee, which includes external experts and expert dispatch programs, while actively sharing the results of our efforts to facilitate technology and business matching.

Basic Knowledge

Takasago Thermal Engineering Co., Ltd./ National Institute of Advanced Industrial Science and Technology

Conventional Thermal Storage Technology and HAS-Clay: A Comparison of Features

Thermal storage technologies with diverse properties

There are four main types of thermal storage technologies that store heat in materials.

Sensible heat storage

Sensible heat storage is a technology that uses the specific heat of a material to store heat. Typical examples of sensible heat storage materials, such as water and bricks, are used to create hot water bottles and to regulate the temperature inside buildings, taking advantage of their characteristics that require substantial thermal energy to change temperature.

Latent heat storage

Latent heat storage is a technology that uses phase change (the process of changing the state of a substance between gas, liquid, and solid) to store heat. Paraffin and inorganic hydrated salts, for example, absorb heat as they change from solid to liquid and release heat as they return from liquid to solid.

Chemical heat storage

Chemical heat storage is a technology that uses chemical reactions to store heat. Magnesium hydroxide-based thermal storage materials, in particular, leverage the reversibility of the reaction to offer stable heat storage over extended periods.

Desiccant thermal storage

Desiccant thermal storage is a technology that utilizes a new mechanism for storing heat through the moisture adsorption and desorption reactions of adsorbent materials.

Unlike conventional latent heat storage materials, HAS-Clay can store two to three times as much heat per volume and is lightweight, making it easy to transport. It also requires no temperature control during storage, making it suitable for long-term storage.

HAS-Clay is an adsorbent based on desiccant heat storage technology. It utilizes the heat storage and desorption that occur during moisture adsorption and desorption. (Source: National Institute of Advanced Industrial Science and Technology)

Features of Thermal Storage Technologies

	Sensible heat storage	Latent heat storage	Chemical heat storage	Desiccant thermal storage
Storage material	Water/brick	Sodium acetate/erythritol	Magnesium hydroxide, etc.	HAS-Clay, etc.
Storage method	Specific heat	Phase change between solid and liquid	Chemical reaction	Water vapor adsorption/desorption
Storage density (weight)	4.2 kJ/(kg °C), 0.8 kJ/(kg °C)	265 kJ/kg, 340 kJ/kg	Approx. 2,000 kJ/kg	Approx. 1,000 kJ/kg
Storage density (volume)	4.2 kJ/(L °C), 2 kJ/(L °C)	157 kJ/L, 238 kJ/L	Approx. 1,000 kJ/L	Approx. 500 kJ/L
Temperature required for heat storage	0 - 100°C/40 - 200°C	58°C/121°C	200°C - 250°C	80°C - 120°C
Heat dissipation principle (heat loss)	Specific heat of liquids and solids (with heat loss)	Phase change from liquid to solid (with heat loss)	(without heat loss)	Water vapor adsorption (no heat loss)
Heat utilization	(1) Air conditioning (heating) and hot water supply (2) Air conditioning (cooling)	(1)Air conditioning (heating) and hot water supply	(1) Air conditioning (heating) and hot water supply (4) Steam	(1) Air conditioning (heating) and hot water supply (2) Air conditioning (cooling) (3) Dehumidification
Domestic results	Practical use	Field demonstration	None in particular	None in particular
Notes	None in particular	Use of heating medium oil (No. 4 petroleum)	None in particular	None in particular

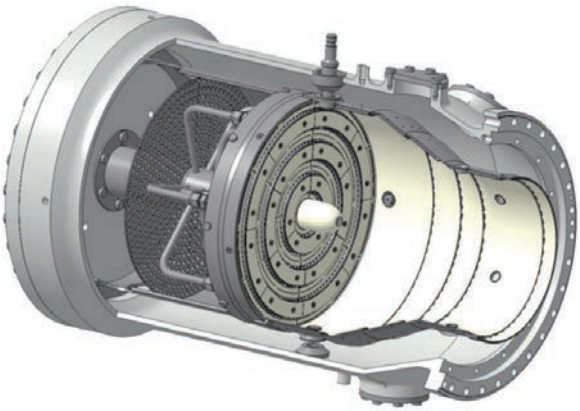
(Source: National Institute of Advanced Industrial Science and Technology)

New Energy

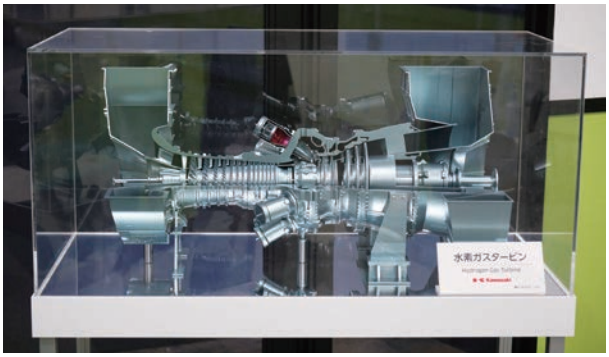
Dry Hydrogen Gas Turbine Cogeneration System for Achieving CO_2-free Power Generation in a Decarbonized Society

► Development of Technologies for Realizing a Hydrogen Society

Kawasaki Heavy Industries, Ltd.



Schematic diagram of a micromix combustor. Fuel is injected in small portions through tiny injection holes measuring 1 mm or less in diameter, and the fuel is burned by numerous microflames. This process eliminates localized high-temperature areas and ensures that NOx emissions remain stable and low. (Source: Kawasaki Heavy Industries, Ltd.)

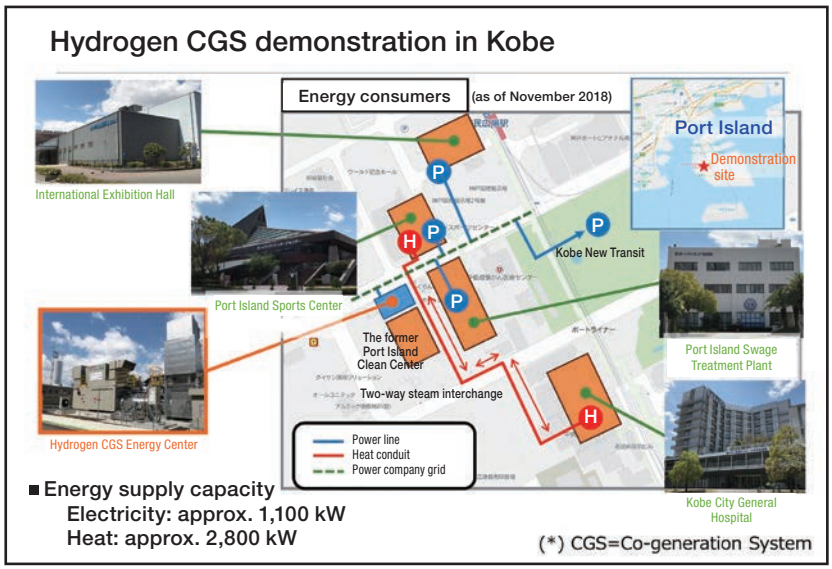


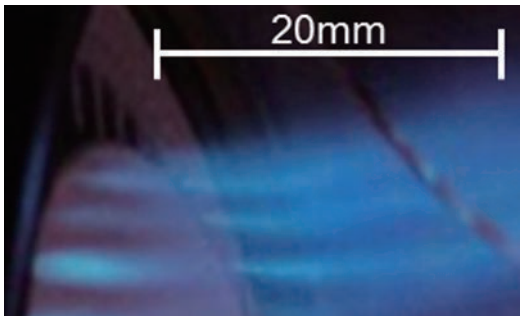
Cutaway model of the internal structure of a hydrogen gas turbine. By substituting the combustor designed for natural gas with one compatible with hydrogen, current power generation facilities can be converted into hydrogen power generation facilities.

Development of the world's first dry hydrogen gas turbine

Kawasaki Heavy Industries, Ltd. has developed a dry hydrogen gas turbine cogeneration system within its hydrogen energy business, anticipating a decarbonized society. A cogeneration system (CGS) produces electricity, steam, and hot water from a single fuel source. Micromix combustion technology is used to achieve low NOx emissions. This technology is crucial for achieving a carbon-neutral society, as it is compatible with both hydrogen-exclusive combustion and hydrogen-natural gas co-combustion. Additionally, it can be decarbonized by simply replacing combustors in existing facilities.

Year	2010	2019	2020	2021	2022	2023
Milestone	Started designing a combustor concept in collaboration with an overseas institution that possessed elemental technology for micromix combustion	Started developing dry hydrogen-fired gas turbine technology with low NOx as part of a NEDO project	Successfully demonstrated the world's first dry hydrogen-fired gas turbine with low NOx technology at Port Island, Kobe	Started a new NEDO project featuring a demonstration test to establish a regional model for hydrogen gas turbine CGS	Successfully demonstrated the operation of a dry hydrogen gas turbine that significantly reduced NOx emissions and utilized a hydrogen/natural gas mixed fuel	Commenced sales of the world's first 1.8 MW-class gas turbine CGS using dry hydrogen firing





Schematic diagram of the hydrogen CGS demonstration at Kobe Port Island. International Exhibition Hall, Kobe New Transit, and other nearby facilities were supplied with electricity and heat energy generated by the hydrogen CGS (left). (Source: Kawasaki Heavy Industries, Ltd.) Hydrogen flame in a micromix combustor captured by visualization measurement (right) (Source: Kawasaki Heavy Industries, Ltd.)

Participation in the NEDO project to create a hydrogen supply chain

After completing the first hydrogen gas turbine development in 2018, Kawasaki Heavy Industries began developing dry hydrogen-fired gas turbine technology with low NOx in 2019, aiming to achieve both environmental performance and economic efficiency. Conventional hydrogen gas turbines use a wet method to lower the combustion temperature in the combustor with water or steam, thereby reducing NOx emissions. However, a portion of the fuel energy is consumed to evaporate water, which reduces power generation efficiency. Additionally, the use of pure water increases both equipment and operating costs. On the other hand, the dry method does not use water, and its combustion method is expected to lower NOx emissions, reduce costs by simplifying facilities, and maintain high power generation efficiency. The social significance of these technologies has been verified, and this initiative is now being undertaken as part of a NEDO project.

Challenges and solutions in the development of dry hydrogen gas turbine technology with low NOx

When implementing the dry turbine method, we focused on micromix combustion technology. This technology eliminates localized high-temperature areas and achieves stable, low-NOx combustion by injecting fuel through tiny injection holes (1 mm or less in diameter) and burning it with numerous microflames. Conventional premixed combustion systems, which mix fuel and air in advance, carry the risk of "backfire," in which the flame travels back through the hydrogen supply. Micromix combustion eliminates premixing passages, thereby reducing this risk.

The challenge was to overcome combustion vibration, a high-frequency pressure vibration that occurs in the combustion chamber. This phenomenon is dangerous as it causes noise and can damage equipment. Kawasaki Heavy Industries introduced specialized measuring equipment and a high-speed photography system to visualize the phenomenon and ascertain its cause. Through repeated trial and error, we succeeded in suppressing combustion vibrations.

Demonstration of hydrogen gas turbine at Port Island, Kobe

In FY2020, a demonstration test was conducted on Port Island in Kobe City, successfully generating approximately 1,100 kW of electricity and 2,800 kW of heat energy for nearby facilities. During the subsequent demonstration phase from FY2021 to FY2022, we further improved the NOx emission control performance of micromix combustion technology. We also focused on the compatibility of co-combustion with natural gas, while preventing combustion vibration, and successfully reducing NOx levels to below half of the Japanese environmental standard.

The dry hydrogen gas turbine lineup now features a model for co-firing with natural gas in addition to hydrogen-only firing. As a highly reliable system capable of meeting strict environmental regulations, it has made significant progress toward a future hydrogen-powered society.

FACE Developer Profiles —Inside the Minds of Innovators—

Project Leader, Hydrogen Gas Turbine CGS Development and Demonstration Project, Chief Executive Staff Officer, Business Development Group, Hydrogen Strategy Division, Kawasaki Heavy Industries, Ltd.

ASHIKAGA Mitsugu

A team of experts in their respective fields

Ashikaga Mitsugu spearheaded the project to develop a dry hydrogen gas turbine with low NOx.

"With a team composed of members who were well-suited to their respective fields, my role as a coordinator is to ensure that the team works effectively together. In addition, I have also worked hard to coordinate with project collaborators, NEDO, city of Kobe, and other organizations that have provided support for the project. I always try to remember that we must never give up. After all, once I start a project, I really want to make it a reality."

Manager, Research Section 1, Energy Systems Research Department, Technical Institute Corporate Technology Division, Kawasaki Heavy Industries, Ltd.

HORIKAWA Atsushi

World's first micromix combustor achieved by Kawasaki Heavy Industries team

Horikawa Atsushi oversaw the development of the micromix combustor. Throughout the demonstration phase of the technical research, he made multiple trips between Japan and Germany to use the experimental facilities at the Technical University of Aachen, where he was working on research and development collaborations.

"That university had an excellent experimental facility that we lacked. I was allowed to travel to Germany numerous times to take advantage of it. The university prioritized our access to their facilities when Kawasaki Heavy Industries came for testing. Thanks to the support of the people involved in this project, I believe we achieved a world's first micromix combustor with this project."

Manager, Power Generation Demonstration Section, Development & Demonstration Department, Project Group, Hydrogen Strategy Division, Kawasaki Heavy Industries, Ltd.

YAMAGUCHI Masato

Acceptance from local residents and facilities

During this project, Yamaguchi Masato was involved in the operational experiments at the demonstration plant.

"I was extremely happy when the hydrogen-fired gas turbine at the demonstration facility was successfully operated for the first time. When undertaking something new, you really need local residents to clearly understand what is happening. The electricity and heat generated here is sent to nearby facilities for their use, and we held a public tour attended by around 70 people of all ages. Everyone was really interested in environmental issues, and I think the fact that power generation does not emit CO_2 went over very well."

Head of Hydrogen Power Generation Project Development Office, Energy Solution Business Division, Energy Solution & Marine Engineering Company, Kawasaki Heavy Industries, Ltd.

TATSUMI Koji

Pioneering development of the first unit offers significant advantages

Tatsumi Koji oversaw the commercialization and sales of the hydrogen gas turbine that was developed. For him, the significance of being involved in the hydrogen gas turbine business is also a significant undertaking.

"Few people ever have the chance to experience a world's first breakthrough, so it's great that I was able to be involved in this field. Hydrogen fuel itself remains quite expensive and difficult to obtain in Japan. However, I do believe that hydrogen will be more widely used worldwide in 10 to 15 years. At that time, I hope as many people as possible will realize that this type of technology is already available and will become widely used in the future."

Hydrogen is a clean energy source that emits no air pollutants or greenhouse gases. It is expected to play a central role in the future of energy due to its high energy density, ease of transportation and storage, and diverse production methods.

With the aim of drastically expanding the utilization of hydrogen in the power generation field and other areas, NEDO has conducted the Development of Large-scale Hydrogen-energy Utilization Technology and the Regional Hydrogen Utilization Technology Development projects as part of the larger Development of Technologies for Realizing a Hydrogen Society project. For the first time in the world, NEDO has succeeded in the technological demonstration of a dry hydrogen-fired gas turbine with low NOx using the micromix combustion technology outlined in this article.

NEDO will continue to support businesses engaged in research and development to achieve a sustainable society, acting as an innovation accelerator that promotes the implementation of innovative technologies in society.

Basic Knowledge

Kawasaki Heavy Industries, Ltd.

Features of Hydrogen Combustion

Hydrogen, a clean and environmentally friendly energy source

Hydrogen is a colorless, odorless gas that, when combusted, reacts with oxygen to produce water, making it an exceptionally clean energy source. Due to these characteristics, it does not emit carbon dioxide or other atmospheric pollutants during combustion, so there is growing interest in its potential as an environmentally friendly fuel. In particular, it can contribute to the reduction of greenhouse gases and is expected to be widely used as part of a sustainable energy supply.

Wide combustion range of ultra-lightweight hydrogen

Hydrogen has an exceptionally wide combustion range, with combustible concentrations in air varying from 4% to 75%. This broad range enables hydrogen to burn under a wider variety of conditions when compared to other combustible gases. Hydrogen is extremely light and diffuses very rapidly, causing any leakage to dilute quickly into the atmosphere. This characteristic may also lower the risk of fire.

Hydrogen's rapid combustion rate improves energy efficiency

Hydrogen burns very quickly compared to methane and propane, two other combustible gases. While this increased combustion rate improves energy efficiency, it also has the potential to cause explosive reactions.

Carbon neutral with minimal environmental impact

Hydrogen has the advantage of minimal impact on the environment because it does not emit carbon dioxide (CO_2) during combustion. When hydrogen burns, it mainly produces water vapor, which emits fewer greenhouse gases. As a result, it makes a substantial contribution to reducing global warming and creating a carbon-neutral society.

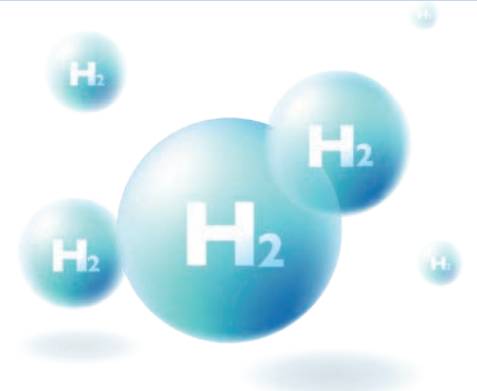
Combustion at 2,000 degrees or higher

When hydrogen and oxygen react, they produce extremely high temperatures of around 2,000 degrees or higher. For this reason, it is occasionally utilized as a heat source in power plants and industrial processes.

While hydrogen combustion is highly efficient and has a low environmental impact, it also entails safety management and technical challenges, so appropriate measures must be taken. Hydrogen is a clean energy source that is environmentally friendly and can be used for various purposes. However, understanding its properties and combustion mechanisms is crucial when considering future energy challenges.

Features of Hydrogen Combustion

	Features
Safety	Fast diffusion speed and quick dilution in case of leakage Wide ignition range (4% to 75% in air)
Combustion speed	Combustion speed is six times faster than hydrocarbon fuels, such as natural gas Power output can be altered quickly
Eco-friendliness	Zero CO_2 emissions during combustion NOx emissions must be considered during high-temperature combustion
Combustion temperature	Maximum temperature reaches approximately 2,000°C or higher High-temperature combustion is possible

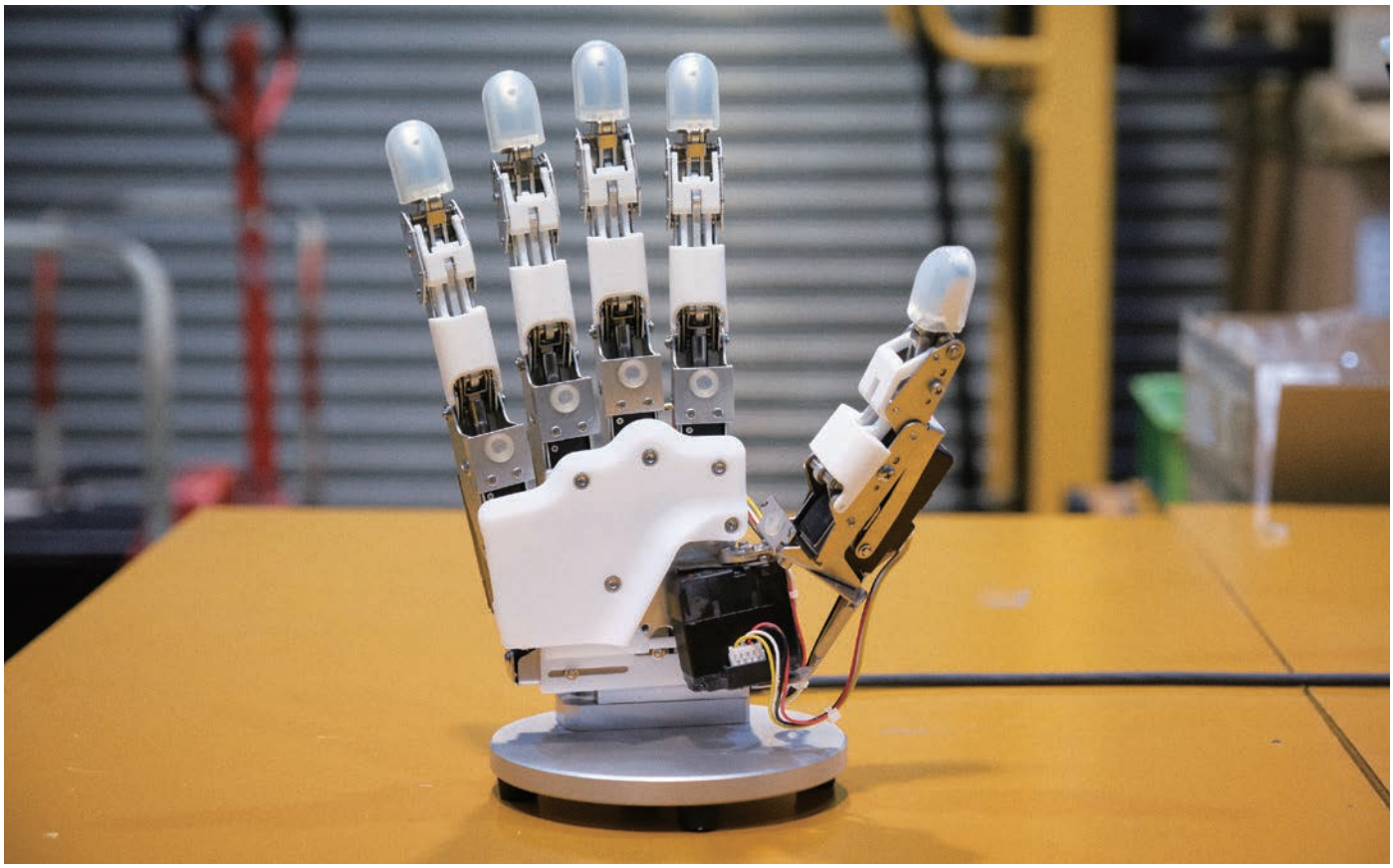


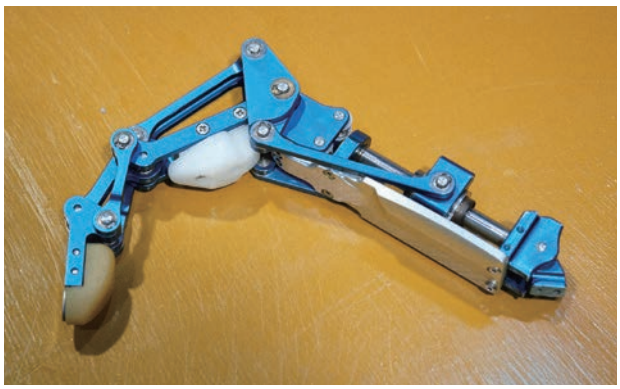
Robots
AI
Welfare Equipment

D-Hand: Robotic Hand for Grasping Various Objects

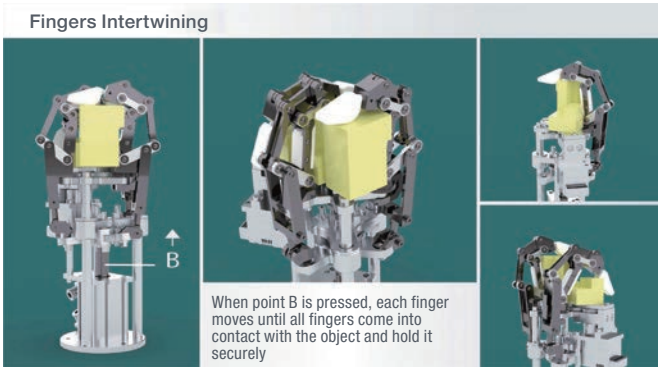
► Development of Core Technologies for Next-Gen AI and Robotics

Double Giken Co., LTD.





The karakuri mechanism reproduces the role of the tendons that bend and extend human fingers through a unique link mechanism. Each part moves in coordination with the movement of other parts.

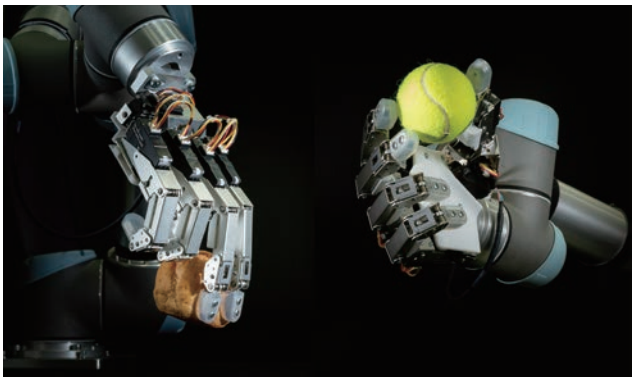


A karakuri mechanism that allows intertwining finger action. As each finger conforms to the shape of the object being grasped, it bends until the contact point comes to a stop. (Source: Double Giken Co., LTD.)

A robotic hand capable of grasping various objects using a single power source

Growing demand for robots that can replace human tasks has led to the development of humanoid robot hands that can be used universally. Developed by Double Giken Co., LTD., D-Hand is a robotic hand that can control all fingers in tandem using only one motor by applying a unique karakuri (mechanical linkage) mechanism. Owing to the performance improvements made through the NEDO project, it was possible to develop a multi-fingered and articulated design capable of grasping objects of varying shapes. Its applications are expected to be used not only in production and manufacturing sites, but also in more familiar places, such as the service industry and welfare sites.

Year	2000	2010	2014	2016	2017	2018	2019
Milestone	Encountered the karakuri mechanism that was installed in a prosthetic hand model	Started research and development of the initial D-Hand model	Developed the initial D-Hand model featuring three fingers	Adopted as a new NEDO project, aiming for even higher performance	Developed an industrial three-finger robotic hand based on a karakuri mechanism	Successfully developed a prototype of an improved conventional model featuring a variable stiffness mechanism	Successfully developed a three-finger robotic hand with variable stiffness mechanism (D-Hand Type R) and began accepting orders for production



D-Hand Type R, a three-finger robotic hand featuring a locking mechanism, has improved the performance of grasping and pinching functions compared to the previous model (left). The D-Hand, a five-finger model equipped with seven motors that enable movements more similar to those of a human hand, can lift soft objects, such as cream puffs, without crushing them, as it is better able to control the motor output (right). (Source: Double Giken Co., LTD.)

Unique karakuri mechanism for cost reduction and versatility

Double Giken's development of the D-Hand was prompted by an acquaintance of a university professor who requested an evaluation of a prosthetic hand model devised by a student. Recognizing the potential of the karakuri mechanism in the prosthetic hand model, this company decided to launch research and development to find a way to apply it to the practical application of the D-Hand, a general-purpose robotic hand designed for grasping objects. In FY2016, it was selected as a NEDO project and has evolved over the course of the three-year development initiative.

The most significant feature of D-Hand is its innovative karakuri mechanism, which links multiple fingers to a single power source. The unique linkage mechanism reproduces the movement of tendons in the human hand and fingers, enabling the fingers to naturally adapt to the shape of an object without requiring sensors. This significantly reduces the number of parts compared to conventional multi-fingered robotic hands. While maintaining low manufacturing costs, the new robotic hand is flexible enough to gently grasp a wide range of objects. While earlier models relied on wires, durability has been improved through the use of a proprietary link mechanism.

Development projects tackling three main challenges

The NEDO project took on three main challenges. The first was to improve the sophistication of motor control. The motor output can be adjusted to switch between a strong grip and a gentle grip.

The second was to enhance resistance to external forces. We overcame the conventional weakness of vulnerability to external forces by developing a new 3D flexible unit with a variable stiffness mechanism that automatically locks its posture after gripping.

The third was to improve the accuracy of movements so that the same movements can be reproduced repeatedly. Individual differences in the balance of linkage between fingers can lead to inconsistencies in movement, such as one of the fingers failing to move at the correct time. We utilized a 3D printer to accelerate the prototyping of parts and reviewed materials to eliminate variations in interlocking finger movements.

Committee proposal for a no-cost prototype

In the middle of the project, a total of 100 prototypes of the five-finger model were manufactured in a short timeframe based on a proposal from the NEDO committee. Despite facing challenges in designing the molds for mass production and measuring the dimensions of curved parts, we successfully obtained multifaceted evaluations by providing the prototypes free of charge to research institutes across Japan. This feedback has driven further development and evolution, leading to a variety of applications today, ranging from supermarket picking operations to robotic hands for harvesting crops.

D-Hand, which has achieved technical reliability with the support of NEDO, is expected to play an even greater role in new fields, such as welfare and housing. The evolution continues toward a future where robots naturally support human life.

Communicate your intentions clearly before taking action

Wada Hiroshi served as Representative Director and played a leading role after joining the NEDO project. He mentions that he initially worked in a completely different industry.

"I was originally working in the civil engineering field, but once I retired, my father invited me to join him at Double Giken, which was a machining company at the time. Having taught myself about how to make machines, I can still create various types of machines and conduct business, so I believe I am well-suited for it."

Hiroshi's motto is, "If you do it, you will succeed."

"I believe that without the right mindset, you will never achieve your goals. I've always had a clear idea of who I want to be and what I want to achieve, and I've shared those goals with various people throughout the year. When I do, I surprisingly receive hints and advice from them. Instead of merely taking actions, I believe you should express your intentions clearly before taking action."

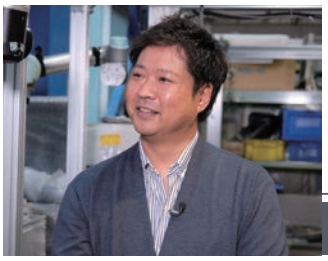
Chairman of the Board,
Double Giken Co., LTD.

WADA Hiroshi

Making Double Giken an exciting company

Wada Shiryu was appointed as the third Representative Director of Double Giken in 2024. We asked him what kind of company he intended to build around Double Giken.

"During the development period of D-Hand, I mainly focused on the welfare equipment business. However, when I first saw a prototype model of D-Hand with just one finger, I honestly thought it was amazing. Simply put, I want to create an exciting company. Although this may sound a little bit abstract, my aim is to establish a company that is enjoyable in multiple ways. The most enjoyable aspect of Double Giken is that we are free to explore or create something without any restrictions. I would like to continue carrying on this approach, and more than anything else, my personality is such that if I am going to do something, I want to enjoy doing it. I hope the entire company will feel the same way."



Representative Director,
Double Giken Co., LTD.

WADA Shiryu

Using my current work as a stepping stone to future achievements

Yoshizawa Naoyuki oversaw development of the mechanism and demonstration testing of the robotic hand in the NEDO project. Currently leading the company's robotic hand development, he finds the greatest joy in seeing his ideas come to life.

"I feel happy and fulfilled when an idea I had for a new principle or structure that could function this way actually takes shape and succeeds. I try to think of what I am doing now as practice toward what I will achieve next. What I did this time might be useful for a future job years from now. I always think about what I did well and what I failed to accomplish so that I can make the most of it next time. When I do one particular job, I always try to make something new. Since not all jobs are exactly the same, I always try to make progress, even if it's just a little bit, by applying what worked well last time or, conversely, improving on areas where I encountered difficulties."

Product Development Group
Leader, FA Division,
Double Giken Co., LTD.

YOSHIZAWA Naoyuki

This project focused on innovative elemental technologies that are not just extensions of current technologies but also exceed human capabilities and aim to create demand in fields that have yet to be envisioned. In this context, the newly developed robotic hand can adjust its posture based on the movements of the human forearm and wrist, utilizing human flexibility to replace manual labor and automate multi-product order picking operations. Furthermore, NEDO is aiming to apply this technology to a broader range of fields, such as general consumer products and welfare facilities.

NEDO will continue to support the development of technologies marked by clear novelty and originality, as demonstrated in this case, while focusing on creating usable technologies with a view toward real-world social implementation.

Basic Knowledge

Double Giken Co., LTD.

Types of Robotic Hands and Their Roles

Robotic hand and arm

A robotic hand corresponds to the human hand from the wrist onward. Conversely, the part that corresponds to the arm is referred to as a robotic arm.

Industrial robotic hands are mainly classified into grasping, suction, and rubber actuator functions. A robotic hand that best suits the application is selected.

Grasping robotic hand

A grasping robotic hand uses its fingers to grasp objects, similar to a human hand. It has multiple fingers and can hold an object firmly. The number and shape of the fingers can vary depending on the application, and they are capable of handling objects of different shapes and sizes.

There are two main types of grasping robotic hands: motorized, which is driven by a motor and program-controlled to adjust the finger opening and grasping force, and pneumatic, which regulates the grasping force by modifying air pressure.

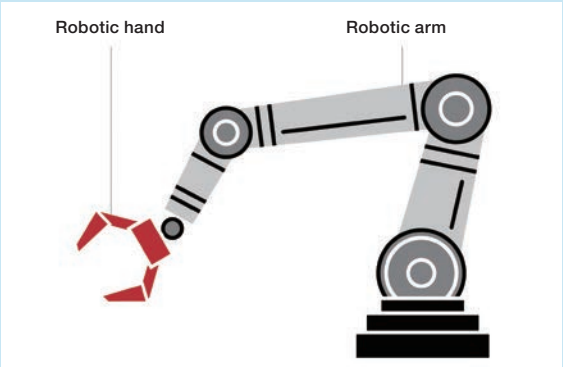
Suction robotic hand

A suction robotic hand uses vacuum or magnetic force to suction and lift objects. There are two types: vacuum and magnetic. Vacuum robotic hands create a vacuum within the pad for suctioning objects and are particularly effective for large objects, such as glass or metal plates, that are difficult to manipulate with the grasping function. Magnetic robotic hands use magnets to attract magnetic objects. This type of hand can magnetically attract and lift objects, even if their surfaces are slightly uneven.

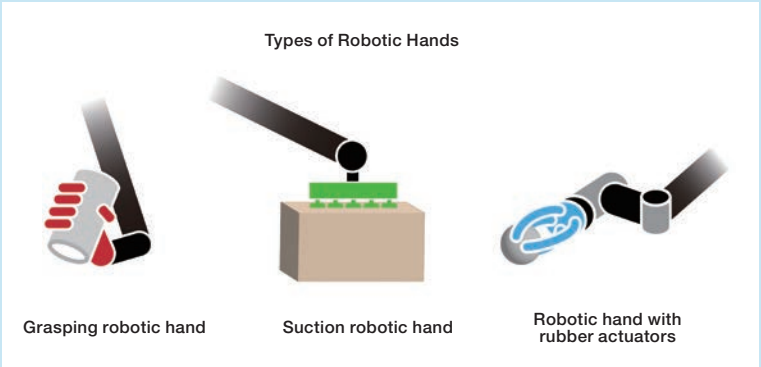
Robotic hand with rubber actuators

The robotic hand uses rubber actuators to combine flexibility and strength by utilizing artificial muscles made of rubber. This technology consists of a rubber tube and a sleeve made from high-strength fiber, which is lightweight yet delivers high output. It is particularly suitable for handling soft materials, as it is flexible enough to handle objects of various shapes and hardness.

In addition, specialized robotic hands are sometimes used, including an iron robotic hand for welding and a spraying robotic hand for painting.



A robotic hand and a robotic arm. If we compare it to a human hand, the part from the wrist to the end is referred to as the robotic hand, while the part that corresponds to the arm is referred to as the robotic arm.



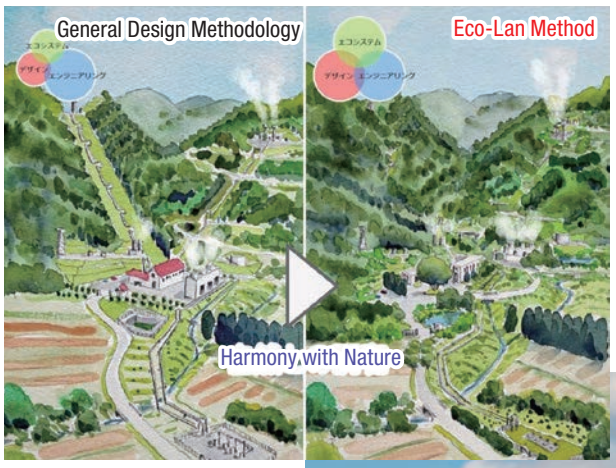
There are various types of robotic hands, including those that grasp, use suction, and operate rubber actuators. Compared to robotic arms, which are already well-developed, there is still significant potential for growth and evolution.

New Energy

Eco-Lan to Support the Introduction of Geothermal Power Plants in Harmony with the Natural Environment

► Research and Development of Geothermal Energy Generation Technologies

Tohoku Ryokka Kankyo Hozen Co., Ltd.



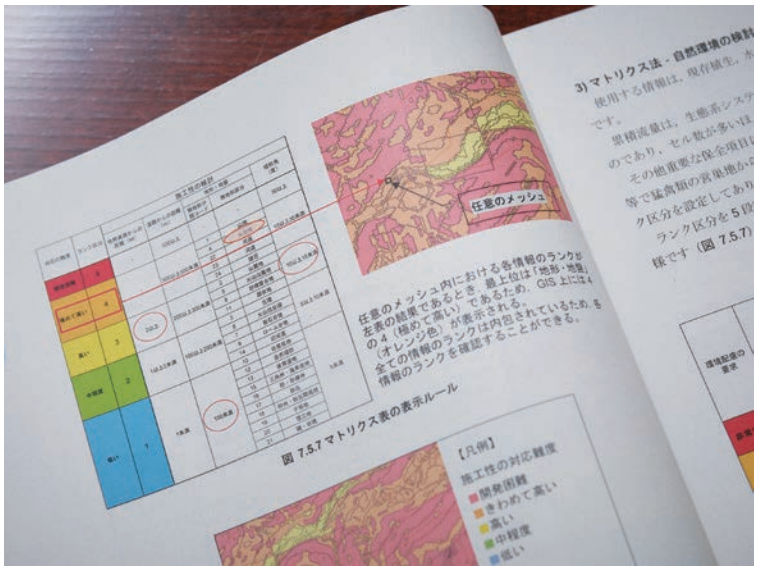
What sets the Eco-Lan method apart from general design methods is its aim of achieving a well-balanced space that simultaneously meets the needs of three elements: ecosystem, landscaping technology, and landscape. The introduction of the Eco-Lan method allows for development plans to be formulated in harmony with the natural environment. (Source: Tohoku Ryokka Kankyo Hozen Co., Ltd.)

Visit to the demonstration site in the Kyushu region. In this region, Eco-Lan conducted case studies focusing on suitable geothermal development sites and landscape studies across a wide area. (Source: Tohoku Ryokka Kankyo Hozen Co., Ltd.)

Progress and revision of Eco-Lan to support geothermal energy development

Japan has the world's third-largest geothermal resources, but 80% of these are located within national parks, posing a challenge to balance power plant development with landscape conservation. In response to this situation, Tohoku Ryokka Kankyo Hozen Co., Ltd. (TRK), a member of the Tohoku Electric Power Group, has developed Design Support Tools Based on the Ecological Landscape Design (Eco-Lan) Method, an environmental conservation technology announced by NEDO, by drawing on its 50 years of knowledge in environmental assessment and landscaping technology. The newly completed "Eco-Lan Set" is a tool that helps minimize the environmental and landscape impacts during the design phase of geothermal power plants.

Year	2018	2019	2019	2020	2021
Milestone	NEDO released Eco-Lan, which aims to assist geothermal developers in designing their plans	TRK was selected for a NEDO project and started working on an explanatory document for the Eco-Lan Set	Trial run of the Eco-Lan Set revealed certain issues, prompting the production of a revised manual	Completed the Manual on Considerations for Natural Environment and Scenic Landscape [Revised Version]. New 3D software was tested during explanatory meetings with residents	Completed reconstruction as an updated Eco-Lan Set



The Manual on Consideration for Natural Environment and Scenic Landscape [Revised Version] adds easy-to-understand five-level evaluation criteria, represented by five colors (left). The screen of the revised 3D application (right) utilizes a 3D engine for games and enables realistic landscape simulation. (Source: Tohoku Ryokka Kankyo Hozen Co., Ltd.)

Composition of the Eco-Lan Set and TRK's challenges

The Eco-Lan Set includes three tools: the Manual on Considerations for Natural Environment and Scenic Landscape, a guide for environmentally conscious design; the Reference Collection of Patterns for Consideration Methods, a compilation of approximately 100 examples from Japan and abroad; and a 3D application for landscape simulation. In 2019, TRK participated in a NEDO project to develop environmental protection technologies for geothermal energy generation. The project also involved creating an explanatory document for the Eco-Lan Set.

Challenges in securing demonstration sites and manuals

The first challenge of the project was securing a three-stage demonstration site for the geothermal energy development process (surface investigation, borehole investigation, and environmental assessment), which can take more than 10 years. To complete all phases of the demonstration within the time frame, it was necessary to have the cooperation of multiple operators involved in each phase of the development site. After considerable effort to secure a location for the demonstration, the test operation was finally launched. However, an unforeseen situation arose in which one of the cooperating businesses noted that the manual was difficult to use.

Revised manuals for improved clarity

In response to the previous feedback, TRK completely revised the manual, simplifying the evaluation criteria for selecting candidate sites using GIS analysis from the earlier 16-level point system to a five-level evaluation across three key axes: constructability, natural environment, and social constraints. Revisions have been made to display sites in different colors in order to make it easier for anyone to identify sites suitable for development. Furthermore, using TRK's environmental conservation expertise, including raptor action zone survey methods, and incorporating use case examples that reflect newly collected demonstration data from three regions, we have completed revisions to the manual and a collection of patterns, integrating the content of the commentary that was the original purpose of the manual.

Evolution of 3D applications through game technology

The 3D application, which was previously unnatural in its visuals and difficult to operate due to the need for a specialized operator, has also been redesigned. The new 3D application has been innovated by using a 3D engine for games, which provides high-definition simulations based on topographical data from the Geospatial Information Authority of Japan. The simulation can reproduce seasonal and time-of-day changes and has been enhanced for ease of use. Now, anyone can operate it and visualize landscape changes, such as freely shifting viewpoints with mouse controls. We used it during the 2020 residents' explanatory meetings, and it greatly contributed to their understanding of the project.

Thus, the collective wisdom of the public and private sectors has come to fruition, and the newly reborn Eco-Lan Set is expected to serve as a valuable tool for expanding the implementation of geothermal power plants that coexist in harmony with nature, aiming to achieve both environmental conservation and energy development.

My advice: “Never keep it to yourself”

Kojima Hideyuki assumed a leadership role in the project. He noted that he always remembers the phrase, “Individual problems become company problems.”

“According to what a senior colleague explained to me some time ago, if only one person has a particular problem and something goes wrong, it will be your fault. However, just by talking to someone, even if it is the person sitting next to you, you have already shared the problem. If they view a certain issue as ‘that’s the company’s problem now,’ I think they will seek advice from someone else. So, I always try to tell people, ‘Never keep it to yourself.’ There were many problems in this project, but I believe that we were able to achieve our major goals because we all shared our problems based on this way of thinking.”

General Manager, Landscaping and Civil Engineering Department, Business Division, Tohoku Ryokka Kankyo Hozen Co., Ltd.

KOJIMA Hideyuki

If you persevere despite challenges, your efforts will be rewarded

Yanbe Eishi is a veteran of TRK’s natural environment research. His personality and work ethic have earned him the respect and admiration of many, both inside and outside the company.

“I have always had a deep love for living things. I have been excited to have worked in the natural environment for almost 50 years since joining this company.

His motto is a saying by Yōzan Uesugi, the feudal lord of the Yonezawa Domain: “If you try, you may succeed. If you don’t, you will never succeed. Success depends on effort.”

“When the section for the survey of flora and fauna was first established in the Environmental Research Department, I was one of only two people who were involved. The section now has more than 30 employees. Through my own experience, I believe I’ve demonstrated that when it comes to training others, perseverance and working as hard as possible despite challenges will be rewarded in the end. These words are precious to me.”

Technical Advisor, Environmental Research Department, Business Division, Tohoku Ryokka Kankyo Hozen Co., Ltd.

YANBE Eishi

Seeing others working hard rekindled my desire to recall my original intentions

Sato Hisanari previously oversaw assessment work related to the living environment. During this project, he was responsible for GIS analysis. He noted that his most memorable moment was seeing an old-growth beech forest during field research.

“As I mostly work on urban environmental surveys, I was really struck by a large old-growth beech forest I came across while researching a site for potential development. It would only take a moment to destroy it, but it would take hundreds of years to restore it. At this moment, I learned firsthand the importance of natural environment research.”

Inspired by other staff members who are certified engineers and consistently work hard every day to maintain their high level of technical skills, Sato notes that he would like to recall his own original intentions.

“If I am satisfied with myself, I will stop growing, so I want to be humble at all times, without becoming proud, self-centered, or overbearing.”

Branch Manager of Niigata Regional Office, Tohoku Ryokka Kankyo Hozen Co., Ltd.

SATO Hisanari

Geothermal energy development requires developers to adopt appropriate measures (to formulate good practices), including the introduction of technologies and methods that minimize the impact on the natural environment, scenic beauty, and park use. Although there has been a lack of specific procedure manuals to serve as references for developers, this project has created a design support tool using the Eco-Lan method. It was restructured as a revised version in 2021 and is currently used in a wide range of situations, from surface surveys to environmental assessments.

NEDO will continue to promote the expansion of geothermal power plants in harmony with the natural environment and scenic landscape by encouraging more developers to utilize this tool to improve the efficiency of their geothermal development projects and facilitate communication with stakeholders.

Basic Knowledge

Tohoku Ryokka Kankyo Hozen Co., Ltd.

GIS Analysis

GIS analysis using maps

A geographic information system (GIS) is a tool for efficiently collecting, managing, analyzing, and visualizing geospatial data. Smartphone map apps, which we use every day, are also a form of GIS. GIS analysis involves using GIS to analyze geographic data, such as store locations, population distribution, and temperature changes, to extract useful information.

Four steps of GIS analysis

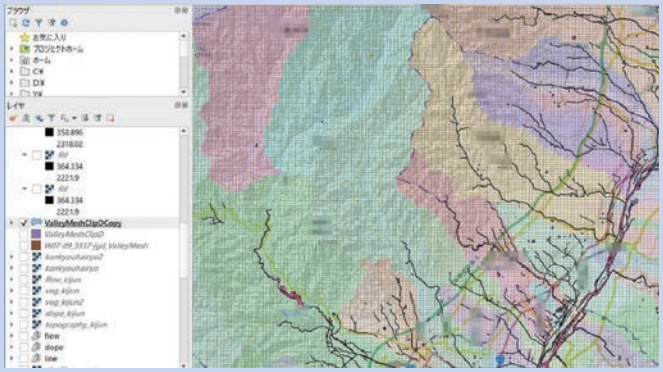
There are four major steps in GIS analysis. First is data collection. Data is collected through a variety of methods, including satellite photos, sensors, and questionnaire surveys. The second is data management. Large amounts of data are organized and stored in a database, making it easy to retrieve them quickly when required. The third is data analysis. The data that has been collected and organized is analyzed to uncover hidden relationships and patterns. For example, by superimposing the location of a specific disease outbreak onto that of a factory, one can hypothesize that the factory exhaust could be causing the disease. The fourth is data visualization. Results are presented in an easy-to-understand manner in the form of maps and graphs.

Various analytical methods for GIS

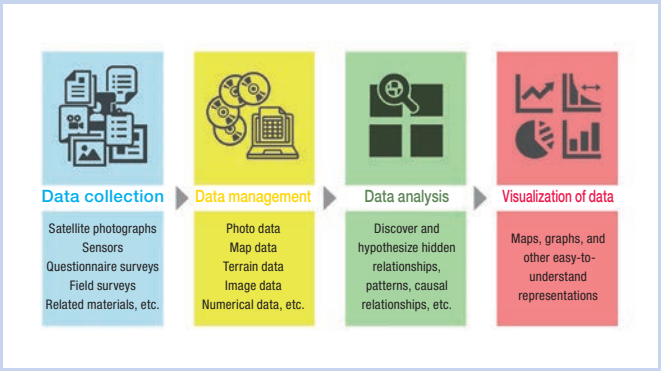
There are various methods of GIS analysis. The spatial analysis technique focuses on the location of the data. For example, mapping areas with crime hotspots can identify where patrols should be intensified. Network analysis is a method of analyzing networks, such as roads and railroads. It is helpful for identifying the best route to avoid traffic congestion and for planning evacuation routes in the event of a disaster. Time series analysis examines data that evolves over time. For example, the effects of global warming can be assessed by analyzing temperature changes over the past several decades.

Utilization of GIS analysis data across multiple fields

As a powerful tool for solving various problems to improve our lives, GIS analysis is used in urban planning, disaster prevention, environmental issues, business, and many other fields. It also helps achieve the Sustainable Development Goals (SDGs), an initiative to solve the world's problems of poverty, hunger, and climate change.



Screenshot of the GIS analysis tool. This overlays various data on a single map to derive cause-and-effect relationships and other data. (Source: Tohoku Ryokka Kankyo Hozen Co., Ltd.)



The four steps of GIS analysis. Data is collected, managed, and analyzed for interrelationships, which are then visualized by mapping or graphing on a map.

INDEX Examples of Practical Applications of NEDO Projects

An index of NEDO projects introduced as NEDO Project Success Stories up to 2024.

New Energy 20 themes

	interviewee	Projects	Interview date
Shifting from Large Wind Tunnel Experiments to Simulation Drastically Improves Environmental Assessment Efficiency for Geothermal Energy Generation	Central Research Institute of Electric Power Industry	Research and Development of Geothermal Energy Generation Technologies and on Environmental Conservation Technologies for Power Plants and other projects	OCT, NOV 2021
Wider Popularization of Aquifer Thermal Energy Storage Systems	Japan Groundwater Development Co., Ltd., National Institute of Advanced Industrial Science and Technology (AIST)	Research and Development for Utilization of Heat as Renewable Energy and other projects	NOV, DEC 2020
Next-Generation Lithium-Ion Batteries that support New Energy Applications	Toshiba Corporation	Technology Development Project for the Application and Commercialization of Lithium-Ion Batteries and other projects	SEP 2018
New Technology from Japan that Contributes to the Expansion of Bioethanol Production in Southeast Asia	Yamaguchi University, SAPPORO HOLDINGS LTD., Iwata Chemical Co., Ltd.	International Projects for Increasing the Efficient Use of Energy and System Demonstration Projects and other projects	NOV, DEC 2017
Development of Innovative Blowers for Fuel Cell Systems Indispensable for Realization of a Hydrogen-Based Society	Techno Takatsuki Co., Ltd.	New Energy Venture Business Technology Innovation Program and other projects	NOV 2016
The First of Its Kind in Industry! SOKODES Was Developed for Use with Solar Panels to Quickly Detect Faults and Estimate Their Location	System JD Co., Ltd.	New Energy Venture Business Technology Innovation Program and other projects	JAN 2016
Development of Small High-performance Hydrogen Production Equipment for Hydrogen Stations for Fuel Cell Vehicles that will become Popular in the Future	Mitsubishi Kakoki Kaisha, Ltd.	Development of Technologies for Hydrogen Production, Delivery, and Storage Systems	JAN 2014
Achieving Higher Efficiency by Gasifying Coal - “Integrated Coal Gasification Combined Cycle (IGCC)”	MITSUBISHI HITACHI POWER SYSTEMS, LTD. JOBAN JOINT POWER CO., LTD.	Project for the Development of an Entrained Bed Coal Gasification Power Generation Plant and other projects	NOV 2013
Development of a Residential Fuel Cell System using a High-Efficiency Solid Oxide Fuel Cell (SOFC)	Osaka Gas Co., Ltd.	Solid Oxide Fuel Cell System Technology Development and other projects	MAR 2013
Biomass Gasification Power Generation System that Contributes to Reducing CO_2 Emissions and Enhancing the Local Vitality	Chugai Ro Co., Ltd.	Development of Technology for High Efficiency Biomass Energy Conversion and other projects	OCT 2013
Highly Efficient General Compact Wind Powered Generation System	Zephyr Corporation	Industrial Technology Practical Application Development Support Project	JUL, SEP 2012
Realizing Energy Conservation with “DC for DC” - Leave it up to a stable supply of electricity!	NTT FACILITIES, INC	Quality-Based Electrical Power Supply System Verification Studies and other projects	SEP, DEC 2012
Developing Solar Cells to Achieve Record- breaking 40% Conversion Efficiency	Sharp Corporation	Research and Development of Photovoltaic Power Generation Technology and other projects	FEB 2012
World’s First Gasification System for Sewage Sludge Transforms Fuel Gas into Power	METAWATER Co., Ltd. Bureau of Sewerage Tokyo Metropolitan Government	Development of Technology for High Efficiency Biomass Energy Conversion	OCT 2011
High-efficiency Power Generators That Use Hydrogen: Development of Fuel Cells for Household Use	TOKYO GAS Co., Ltd.	Establishing Platforms for the Widespread Use of Fuel Cells and other projects	MAR 2011
From Wind Power Generating Systems for Remote Islands to Large Downwind Turbines	Fuji Heavy Industries Ltd.	Technology Development of Advanced Wind Turbine Systems for Remote Islands and other projects	SEP, NOV 2010
Development of Large-area High-speed Film Deposition Technology for Sharply Enhancing Solar Cell Productivity	Mitsubishi Heavy Industries, Ltd.	New Sunshine Project / Research and Development of Photovoltaic Power Generation Technology and other projects	MAR 2010
Mass Production of New Non-silicon Solar Cells	SHOWA SHELL SEKIYU K.K.	New Sunshine Project / Research and Development of Photovoltaic Power Generation Technology and other projects	FEB, MAR 2010
Mass Production of Lithium-ion Secondary (Rechargeable) Batteries for Hybrid Vehicles	Hitachi Vehicle Energy, Ltd.	Development of Technology for the Dispersed Storage of Battery Power and other projects	DEC 2009, MAR 2010
New Hybrid Solar Cells: Promising Technology for the Solar Cell Market	KANEKA CORPORATION	Development of Technology to Accelerate the Dissemination of Photovoltaic Power Generation Systems	MAR 2009

Energy Conservation 20 themes

	interviewee	Projects	Interview date
Leading the World in Commercialization of 1700°C-Class Gas Turbines for Next-Generation Thermal Power Generation	Mitsubishi Heavy Industries, Ltd	Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation and others	AUG 2022
Commercialization of a Single-Effect Double-Lift Absorption Chiller for More Effective Utilization of Unused Thermal Energy in Industrial Plants	Hitachi-Johnson Controls Air Conditioning, Inc.	Research and Development Project on Innovative Thermal Management Materials and Technologies	OCT 2021
Toward the Application of 3D Nano Structure Control Development of Super Fuel-Efficient Tires	Bridgestone Corporation, JSR Corporation	Innovation Promotion Project, Nanotech Advanced Component Utilization Research and Development, and other projects	OCT 2019
High-Efficiency, Energy-Saving Heating Technology Completion of a Heat Pump for Use in Vehicles	DENSO Corporation	Research and Development Program for Innovative Energy Efficiency Technology	OCT 2019

Commercialization of an Energy-Saving LED Lamp With Ultrahigh Intensity and Ultrahigh Flux	Shikoku Instrumentation Co., Ltd.	Strategic Energy Saving Technology Innovation Program	SEP 2018
Practical Application of "SiC Power Semiconductor" That Contributes to a Next-Generation Electric Society, as Rolling Stock Inverters Used in Railways	National Institute of Advanced Industrial Science and Technology (AIST) Mitsubishi Electric Corporation Odakyu Electric Railway Co., Ltd.	Next-Generation Power Electronics Project Realizing Low Carbon-Emission Society and other projects	DEC 2016, FEB 2017
ECM Cement Reduces Energy Consumption and CO_2 Emissions by More Than 60%	ECM Joint Research and Development Team	Research and Development Program for Innovative Energy Efficiency Technology and other projects	DEC 2016, FEB 2017
Achieving Energy Saving on the Level of Industrial Complexes through the Sharing of Heat between Factories	Chiyoda Corporation	Strategic Development of Energy Conservation Technology Project and other projects	DEC 2013, JAN 2014
Optimally Adjusting the Ratio between Heat and Electricity to Suit the Place of Utilization - Development of a Gas Engine System that Expands the Scope for the Popularization of Natural Gas Cogeneration	Mitsui Engineering & Shipbuilding Co., Ltd.	Strategic Development of Energy Conservation Technology Project	DEC 2013
Ultra-low-temperature Freezing System that Achieves -60°C Using Air as the Refrigerant	MAYEKAWA MFG. CO., LTD.	Strategic Development of Energy Conservation Technology Project and other projects	NOV 2013
Clean Diesel Engine with the World's Highest Level Fuel Efficiency and Environmental Performance	Mazda Motor Corporation	General Technological Development of Innovative Next- generation Low-emission Vehicles	JUL 2013
Residential Heat Pumps - Contributing to Expanding the Market for EcoCute	DENSO CORPORATION	Strategic Development of Energy Conservation Technology Project	MAR 2013
Improving Fuel Efficiency of a Belt CVT by Increasing the Coefficient of Friction	JATCO Ltd.	Development of Material Surface Control Technology for Low Friction Loss High Efficiency Drive Machines	MAR 2013
Distillation Facilities Boasting Maximum Energy Conservation Effects of 60%	Kimura Chemical Plants Co., Ltd.	Development of Energy Saving Distillation Technology using Internal Heat Exchange and other projects	MAR 2013
Contributing to Solve Global Environment and Energy Issues with a World's Highest Level High Efficiency Large Sized Gas Turbine	Mitsubishi Heavy Industries, Ltd.	Development of High Efficiency Gas Turbine and other projects	DEC 2012
High Performance Industrial Furnace Greatly Contributing to Energy Conservation and Environmental Load Reduction in Industrial Fields	Japan Industrial Furnace Manufacturers Association	Development of High Performance Industrial Furnace and other projects	JUL 2012
Development of World's First Hybrid Hydraulic Excavator Contributes Greatly to Energy Saving and CO_2 Reduction	Kobelco Construction Machinery Co., Ltd. Kobe Steel, Ltd.	Strategic Technology Development for Energy Use Rationalization and other projects	MAR 2012
Air-conditioning System Uses Hydrate Slurry to Cool Large Facilities, Save Energy	JFE Engineering Corporation	Strategic Development of Energy Conservation Technology Project and other projects	SEP 2011
Micro Steam Energy Generator Effectively and Thoroughly Utilizes Manufacturing Steam	Kobe Steel, Ltd.	Strategic Development of Energy Conservation Technology Project and other projects	MAR 2011
Trucks and Buses Also Follow Hybrid Trends	Mitsubishi Fuso Truck and Bus Corporation	R&D of Advanced Clean Energy Vehicles (ACE Project)	DEC 2009

Resolution of Global Environmental Problems 21 themes

	interviewee	Projects	Interview date
Development of a Hydrogen Power Generation System That Enables Local Production and Local Consumption of Clean Energy	Alhytec Inc.	Strategic Innovation Program for Energy Conservation Technologies and others	AUG 2022
Realization of Widespread Use of Refrigerants with Low Greenhouse Gas Effects Revision of International Standards Based on Safety Evaluation Methods	The University of Tokyo, National Institute of Advanced Industrial Science and Technology (AIST)	Technology Development of High-Efficiency Non-Fluorinated Air-Conditioning Systems	NOV 2019
Significant Reductions in Energy and Costs through Integrating Seawater Desalination with Sewage Treatment	Global Water Recycling and Reuse Solution Technology Research Association (GWSTA)	Water Saving and Environmentally-Friendly Water Recycling Project and other projects	SEP 2017
Recycling of Waste Plastic Reduces CO_2 Emissions in a Blast Furnace. Pulverization Further Improves Efficiency	JFE Steel Corporation	Development of Technology to Recycle Waste Plastic Into a Blast Furnace Reducing Agent	FEB 2015
Construction of a New White Goods Recycling System in Collaboration with Local Governments and Manufacturers	Hitachi, Ltd. Tokyo Eco Recycle Co., Ltd.	Development and Demonstration of a Home Appliance Recycling Plant	JAN 2015
Development of "RPF", an Inexpensive New Fuel that Emits a Smaller Amount of CO_2 than Fossil Fuels	EARTHTECHNICA Co., Ltd. SEKISHOUTEN Co., Ltd.	Research and Development to Develop Revolutionary Environmentally-friendly Energy Technologies with Immediate Effects	JAN 2014
A Technology that Halves the Consumption of the Rare Earth Element that Is Indispensable for Glass Grinding	KOKONOE ELECTRIC CO., LTD. Ritsumeikan University	Rare Metal Substitute Materials Development Project	AUG 2013
Mass Production of Freon / Halon Substitute with a World's First Composition Methodennfou	TOSOH F-TECH INC.	Energy Saving Freon Substituting Substance Composition Technology Development and other projects	FEB 2013
An Innovative Device that Prevents Leaking of Gasoline Vapor	Tatsuno Corporation	Research and Development of Toxic Chemical Substance Risk Reducing Platform Technologies	DEC 2012, MAR 2013
Dual-Arm Construction Machinery, Expected to be Active in Sites of Building Deconstruction	Hitachi Construction Machinery Co., LTD.	"Strategic Advanced Elemental Robot Technology Development" Project	DEC 2012
Destruction of HFC-23 Through Burning and Cooling	Tsukishima Kankyo Engineering Ltd.	Development of HFC-23 Destruction Technology and other projects	FEB 2012
Asbestos Removal Robot Contributes to Safe and Efficient Workplace Through Remote Control and Automation	TAISEI Corporation	Urgent Development of Fundamental Technologies for the Practical Reduction of Asbestos and other projects	FEB 2012

From Tohoku to the World! Innovative Coating Process Reduces Use of Harmful Chemicals	KAMI ELECTRONICS IND CO., LTD.	Development of Fundamental Technologies for Risk Reduction of Hazardous Chemical Substances	DEC 2011
Non-Fluorinated CO_2-cooled Refrigeration System for Supermarket Showcases	SANYO Electric Co., Ltd	Development of Non-fluorinated Energy-saving Refrigeration and Air Conditioning Systems	DEC 2011
On-site Processing System for Safe, Stable and Highly Efficient Neutralization of Asbestos	Hokuriku Electric Power Company	Urgent Development of Fundamental Technologies for the Practical Reduction of Asbestos and other projects	NOV 2011
Development of a High-performance Insulating Coating Resin	Showa Denko K.K.	Development of Fundamental Technologies for Risk Reduction of Hazardous Chemical Substances	DEC 2010
Creation of a Safer Heat-resistant Material as a Replacement for Asbestos	JAPAN MATEX CO., LTD.	Urgent Development of Fundamental Technologies for the Practical Reduction of Asbestos and other projects	OCT 2010
Birth of COF_2: New Clean Gas for Semiconductor Manufacturing with Very Low Greenhouse Gas Effects	Kanto Denka Kogyo Co., Ltd.	Research and Development of Semiconductor CVD Chamber Cleaning Systems for Electronic Device Manufacturing Using New Alternative Gases as a Substitute for SF6, PFCs and Other Gases and other projects	DEC 2009
Achieving More Efficient, Cleaner Waste Incineration with New Technology	JFE Engineering Corporation	Research and Development on Advanced High-temperature Air Combustion Control Technology	MAR 2009
Developing an Eco-Diesel Engine with Clean Exhaust Gas	NISSAN DIESEL MOTOR CO.,LTD.	R&D of Advanced Clean Energy Vehicles	NOV 2008
New Catalyst for Maximum Cleaning of Diesel Fuel Oil	COSMO OIL CO., LTD.	Research and Development of Petroleum Refining Pollutant Reduction	NOV 2008

Electronic / Information 17 themes

	interviewee	Projects	Interview date
Commercialization of a Transparent Display that adds a New Function to Window Glass	Sharp Display Technology Corporation/National Institute of Advanced Industrial Science and Technology	Clean Device Society Promotion Program	AUG 2022
Establishment of Next-Generation Inspection Technology for the Semiconductor Manufacturing Process	Lasertec Corporation	Development of Next-Generation Semiconductor Microfabrication and Basic Evaluation Technologies	AUG 2018
Development of an Eyewear Device for Low- Vision Aid That Uses Semiconductor Laser Technology	QD Laser, Inc.	Development Promotion Project for Practical Use of Walfare Equipment and other projects	OCT 2017
Realization of Compact, Light-weight, and High-performance Devices with “Moving” Semiconductors	OMRON Corporation	Micromachine Technology Research and Development Project and other projects	FEB 2014
Realized the World’s Smallest Scale Assuring a Single Atom Size Error	National Institute of Advanced Industrial Science and Technology (AIST) Hitachi, Ltd. Hitachi High-Technologies Corporation	R&D of 3D Nanoscale Certified Reference Materials Project	DEC 2013, FEB 2014
World’s First Realization of an All Solid-state UV Laser Source with Advanced Waver-length Conversion Characteristic	Osaka University Kogakugiken Corp.	Research and Development for Photon Measurement and Processing and other projects	DEC 2013
Electronic Beam Mask Writing Device Boasting an Overwhelming Share in the World	NuFlare Technology, Inc.	Super Head Electronic Technology Development Promotion Project	NOV 2012
High Precision Machining Equipment Enabling Accurate Optical Connector Mold Marking	NACHI-FUJIKOSHI CORP.	Integrated Development of Materials and Processing Technology for High Precision Components	FEB 2012
Improvement of Curved-Surface Displays for Ultra-Large Screens	Shinoda Plasma Co., Ltd.	Research and Development of Energy-saving Ultra-thin Film Large Light-emitting Display Devices and other projects	DEC 2011
Development of Die Bonding Film Contributes to High Performance in Electronic Devices	Hitachi Chemical Company, Ltd.	R&D on Nanostructured Polymeric Materials	OCT 2011
Revolutionary High-qua2lity Semiconductor Production Equipment	Tokyo Electron Limited	Development of Infrastructure Technology for High-efficiency Semiconductor Production Processes and other projects	DEC 2010, JAN 2011
Evaluation Technology Leads to Remarkable Improvement of Nonvolatile Memory Reliability	Fujitsu Limited FUJITSU SEMICONDUCTOR LIMITED	Research and Development on Next-generation Ferroelectric Memory (FeRAM) and other projects	DEC 2010
Commercialization of a Perpendicular Magnetic Recording Method to Achieve High-density, Highly Reliable HDD	HGST Japan	Super-advanced Electronics Technology Development Promotion Project	OCT 2010
Development of Blu-ray Disc Offering High Image Quality	Sony Corporation	Research and Development of a Nanometer-controlled Optical Disc System	SEP, NOV 2010
Development of a Laser Light Source Indispensable for Surface Machining for Manufacturing Miniature Semiconductor Devices	Gigaphoton Inc.	Development of F2 Laser Lithography Technology and other projects	DEC 2009
Development of Metallic Glass for Improving Electronic Device Performance	ALPS ELECTRIC CO., LTD.	Research and Development of Super Metal Technology	FEB 2009
Controlling Your Home Remotely with a Home IT System	Toshiba Home Appliances Corporation	Digital Information Device Interoperability Infrastructure Project	NOV 2008

Material 17 themes

	interviewee	Projects	Interview date
Ultra-High Dispersion Mass Production Eliminates the Biggest Obstacle, “Aggregates”, to Utilize Carbon Nanotubes	GSI Creos Corporation	Project for Practical Application of Carbon Nanomaterials for a Low Carbon Emission Society	SEP 2022, JAN 2023
High-Reliability, Low-Cost, High-Speed, High- Precision Electron Beam Metal 3D Printer	JEOL Ltd.	Project for Modeling Technology Development and Practical Applications of Next-Generation Industrial 3D Printers	OCT 2021
Simultaneous Nanofiber and Resin Composite Production– Commercialization of Cellulose Nanofiber Composite Resin	SEIKO PMC CORPORATION, Kyoto University	Development of Fundamental Technologies for Green and Sustainable Chemical Processes and other projects	OCT, NOV 2020
Development of New Materials for a Highly Sustainable Society through Artificial Synthesis of Structural Proteins	Spiber Inc.	Support for Ventures Involved in Innovation and Practical Application / Development of Super-high Function Fibroin Fiber for Commercialization and other projects	NOV 2020
Succeeded in Commercialization of the World’s Highest Spec Sand 3D Printer for Casting	National Institute of Advanced Industrial Science and Technology, Gun Ei Chemical Industry, Co., Ltd., CMET Inc., KOIWAI Co., Ltd.	Next-Generation Industrial 3D Printer Modeling Technology Development and Commercialization Business	OCT 2019
Development of a High-Performance Bio-Resin from Plant Seeds	Hitachi Zosen Corporation, Osaka University	Technology Development of Manufacturing Processes for Non- Edible Plant-Derived Chemicals and other projects	AUG 2018
World’s First Commercialization of a Promising New Material : Cellulose Nanofiber	Nippon Paper Industries Co., Ltd., The University of Tokyo	Innovation Promotion Project, Nanotech Advanced Component Utilization Research and Development, and other projects	NOV 2018
DDS (Drug Delivery System) Research into a Medicinal Hair Restorer for Women	NANOEGG Research Laboratories, Inc.	Innovation Promotion Project	OCT 2017
World’s First Commercialization of Mass Production Processes Using Microwave Technology	Microwave Chemical Co., Ltd.	New Energy Venture Business Technology Innovation Program and other projects	OCT 2016
The World’s First Mass Production Factory for Single-Walled Carbon Nanotubes Developed in Japan Starts Operation	Zeon Corporation National Institute of Advanced Industrial Science and Technology (AIST)	Carbon Nanotube Capacitor Development Project and other projects	JAN 2016. FEB 2017
Development of Visible Light Responsive Photocatalyst for Indoor use Provision of Sanitary and Comfortable Living Space	Showa Denko Ceramics Co., Ltd TOTO LTD. Panasonic Corporation	Project to Create Photocatalyst Industry for Recycling-oriented Society	FEB 2014
Renovation of “Cutting, grinding, and Polishing” Hardest and Strongest “Super Diamond”	Sumitomo Electric Industries, Ltd.	Grant for Practical Application on Industrial Technology	AUG 2013
Plastics that Soften when subject to High Speed and Strong Impact	Toray Industries, Inc.	Precision High Polymer Technology Project	NOV 2012
Development of Film Improves Visibility of LCD Displays from any Angle	Zeon Corporation	Development of High-performance LCD TV Technology	DEC 2011
Vacuum Insulation Panel Contributes to Residential Energy Conservation	Panasonic Corporation	Strategic Development of Energy Conservation Technology Project	NOV 2010
Melt-spinning Cellulose to Create Fiber Having Correct Cross-sectional Shape	Toray Industries, Inc.	Fundamental Technology Research Facilitation Program	NOV 2009
Polymer Simulation for Enhancing the Efficiency of Material Development	JSOL Corporation	Development of Advanced Functional Material Designing Platforms	FEB 2009

Robots / AI / Welfare Equipment 16 themes

	interviewee	Projects	Interview date
For Everyday Situations Where Humans and Robots Coexist Automated Delivery Robot HAKOBO	Panasonic Holdings Corporation	Technological Development Project to Realize a New Delivery Service Using Autonomous Robots	SEP 2023
Realizing a World With Drones Flight Operating System for Simultaneous Operation of Multiple Drones	KDDI Corporation	Drones and Robots for Ecologically Sustainable Societies Project	SEP 2023
Commercialization of the “Five Senses” AI-Enabled Camera That Predicts and Prevents Crimes and Accidents by Implementing AI in Security Cameras	Earth Eyes Co., Ltd.	Development of Core Technologies for Next-Generation AI and Robotics	OCT 2021
3D Distance Image Sensor for Safety Protection	Nippon Signal Co., Ltd.	Project for Practical Application of Personal Care Robots / Development of Person-Carrier Robots Based on Safety Technologies	OCT 2020
Reduction of Operation Time to One Tenth Development of AI That Can Perform Concrete Crack Detection	Shutoko Engineering, Co., Ltd., National Institute of Advanced Industry Science and Technology (AIST), Tohoku University	Robot and Sensor System Development Project for Infrastructure Maintenance and Disaster Survey: Development of an Infrastructure Status Monitoring System Using Imaging Technology	NOV 2019
Realizing Small, Lightweight, High-Precision and Inexpensive Development of an Epoch-Making 3D Vision Sensor	YOODS Co., Ltd.	Technology Development Project for Robot Commercialization Applications: Development of robot platform technology (hardware), Platform technology development for a general-purpose robot vision system	SEP 2019
Realization of Next-Generation Life Support Technology with a Smart Mobility Vehicle	Tmsuk Company Limited, NTT DOCOMO, INC., Kyushu University	International R&D and Demonstration Project in the Environment and Medical Device Sector, International R&D and Demonstration Project in the Robotics Field, and other projects	NOV 2018
Electric Wheelchair that Makes Going out Fun Increased Popularity with the Release of the Standard Model	WHILL Inc.	Development Promotion Project for Practical Use of Walfare Equipment and other projects	NOV 2017
Establishment of Safety Requirements and a Certification System that Underpin the Development of Safe and Trustworthy Service Robots	National Institute of Advanced Industrial Science and Technology (AIST) Japan Automobile Research Institute (JARI) Nagoya University	Project for the Practical Application of Service Robots and other projects	DEC 2016, FEB 2017
Three-Dimensional Vision Sensor That Gives Industrial Robots Seeing and Thinking Capabilities to Enable Automated Assembly Lines	3D MEDiA Company Limited	Innovation Commercialization Venture Support Project and other projects	OCT 2016

Reducing the Fatigue of Agricultural and Care Work Development of the Smart Suit	Smart Support Technologies Inc. Hokkaido University	Development Support Project for Practical Application of Problem-Solving Welfare Equipment and other projects	JAN, FEB 2016
Easy and Safe Transferring from Bed to Toilet Development of New Transferring Equipment to Support Care in a Highly Aging Society	IDEA SYSTEM CO., LTD.	Promotion of R&D on Practical Welfare Equipment and other projects	JUL 2013
A Rescue Robot Displaying High Driving Performance at Disaster Sites with Stairs and Rubble	CHIBA INSTITUTE OF TECHNOLOGY	Strategic Advanced Elemental Robot Technology Development Project	FEB 2013
Automatic Wheelchair and Mattress Washing Machines That Reduce the Burden of Caregivers	ATAM Giken Co., Ltd.	Promotion of R&D on Practical Welfare Equipment	JAN 2013
Robot Suit HAL®: Reading Intention to Support Physical Functions and Improve Quality of Life	CYBERDYNE Inc.	Project for Practical Application of Next-generation Robots and other projects	JAN 2011
Improved Short Lower-limb Brace Offers Patients Better Walking Comfort	Kawamura Gishi Co., Ltd.	Promotion of R&D on Practical Welfare Equipment and other projects	OCT 2010

Medical Biotechnology 20 themes

	interviewee	Projects	Interview date
Painless Needles Bring Innovation to the Fields of Cosmetics and Medicine: Hollow Microneedles	Think-Lands Co., Ltd.	Technology-Based Support Program	SEP 2023
New Fluorescent Imaging with PID High- Brightness Fluorescent Nanoparticles	Konica Minolta, Inc.	Comprehensive Research and Development of an Early Stage Diagnosis Method and Instruments for Treating Cancer and other projects	NOV, DEC 2021
A4-Size High-Concentration Oxygen Generator	VIGO MEDICAL Co., Ltd.	Development Promotion Project for Practical Use of Welfare Equipment / Small Oxygen Generator as a Respiratory Aid for Elderly People	NOV 2020
Efforts to Reduce Waiting Time and Enhance the Efficiency of Medical Practice Administration Development of an AI-Driven Medical Interview System	AR advanced technology, Inc., Yokohama National University	Future AI and Robot Technology Development Project: Next- generation artificial intelligence technology area	OCT 2019
Development of Groundbreaking Hip Joint Prostheses for an Aging Society	Teijin Nakashima Medical Co., Ltd., Kyoto University	Innovation Promotion Project and other projects	OCT 2018
Peptide Search System that Opened up New Avenues for Drug Discovery	The University of Tokyo, PeptiDream Inc.	Technology Development for Accelerating Genomic Drug Discovery	NOV 2017
Towards Regenerative Cell Therapy by Large- Scale Culture of Synovium-Derived MSCs	TWOCELLS COMPANY, LIMITED,Space Bio-Laboratories Co., Ltd. Osaka University, Osaka Health Science University, Hiroshima University	Development to Accelerate the Practical Application of Human Stem Cells and other projects	AUG 2017
Development of Innovative Culture Media for Human Pluripotent Stem Cells (ES and iPS Cells) and an Automated Cell Culture System	Kyoto University Nissan Chemical Industries, Ltd. Nipro Corporation	Development to Accelerate the Practical Application of Human Stem Cells / Development of Basic Evaluation Technologies for the Practical Application of Human Stem Cells	NOV 2016
Development of Japan's First PET Device Dedicated for Breast Cancer and Able to Perform High-Precision Examinations Without Inflicting Pain	SHIMADZU CORPORATION	R&D Project on Molecular Imaging Equipment for Treatment of Malignant Tumors	JAN 2016
Development of a Procedure That Dramatically Streamlines Essential Screening in Medicine Development	Mie University HASHIMOTO ELECTRONIC INDUSTRY CO., LTD.	Innovation Commercialization Venture Support Project and other projects	JAN 2016
The World's First Reagent to Determine the Progression of Hepatic Fibrosis by Measuring Changes in the Sugar Chain	Sysmex Corporation National Institute of Advanced Industrial Science and Technology (AIST)	Technology Development Utilizing Sugar Chain Functions and other projects	FEB 2015
The World's First Practical Application of High- Precision Cerebral Infarction Risk Assessment Through Biomarker Measurement	Amine Pharma Research Institute Co., Ltd.	University-Launched Business Creation and Practical Application Research and Development Project and other projects	JAN 2015
Development of a Next-Generation 4D Radiation Therapy System That Enables Irradiation of a Moving Cancer	Mitsubishi Heavy Industries, Ltd Kyoto University Foundation for Biomedical Research and Innovation	Fundamental Technology Research Facilitation Program	JAN, FEB 2015
Development of a Confocal Laser Scanner for Live Cell Imaging	Yokogawa Electric Corporation	Development of Technologies for the Analysis of Intracellular Network Dynamism	FEB 2011
4D X-ray CT System Capable of Imaging a Heart in 0.35 Seconds	Toshiba Medical Systems Corporation	Development of a High-speed Cone Beam 3D X-ray CT and other projects	JAN 2011
Achieving Mass Synthesis of Glycans, "Third Chain" Molecules Holding the Key to Life Phenomena	Tokyo Chemical Industry Co., Ltd.	Bio / IT Synthesis Equipment Development Project and other projects	MAR 2010
Next-generation Operating Room Improves Brain Surgery Survival Rate	Tokyo Women's Medical University	Grant for Industrial Technology Research Development of a System for Complete Brain Tumor Removal and other projects	DEC 2009, MAR 2010
Electron Microscope Assists in Drug Discovery by Analyzing Membrane Protein Structure	JEOL, Ltd.	Analysis of Biopolymer Conformation Information and other projects	DEC 2009
Setting the World Standard in Glycan Profiling with Technology Made in Japan	GP Biosciences, Ltd	Structural Glycoproteomics Project: Development of Glycan Structure Profiling Analysis Technology	FEB 2009
The Laser Scanning Microscope: A Powerful Tool for Unraveling the Mechanisms of Living Things	Olympus Corporation	Research and Development of a Graphical Analyzer for Human Chromosomes Using a Confocal Laser Scanning Microscope	DEC 2008

Background Information

Designation	National Research and Development Agency New Energy and Industrial Technology Development Organization (NEDO) Business name: New Energy and Industrial Technology Development Organization (NEDO)	
Foundation	Originally established as a semi-governmental organization on October 1, 1980; reorganized as an incorporated administrative agency on October 1, 2003	
History	October 1980	New Energy Development Organization established under the Law Concerning the Promotion of the Development and Introduction of Alternative Energy
	October 1988	Industrial technology research and development added; name changed to New Energy and Industrial Technology Development Organization
	October 2003	Incorporated Administrative Agency New Energy and Industrial Technology Development Organization established under the Act on the New Energy and Industrial Technology Development Organization
	April 2015	Redesignated and renamed National Research and Development Agency New Energy and Industrial Technology Development Organization to reflect the enforcement of a partial amendment of the Act on General Rules for Incorporated Administrative Agencies and the Act on the New Energy and Industrial Technology Development Organization
Missions	Addressing energy and global environmental problems NEDO actively undertakes the development of new energy and energy conservation technologies, verification of technical results, and introduction and dissemination of new technologies (e.g., support for introduction). Through these efforts, NEDO promotes greater use of new energy and improved energy conservation. NEDO also contributes to a stable energy supply and the resolution of global environmental problems by promoting the demonstration of new energy, energy conservation, and environmental technologies abroad based on knowledge obtained from its domestic projects. Enhancing industrial technology With the aim of raising the level of industrial technology, NEDO pursues research and development of advanced new technology. Drawing on its considerable management know-how, NEDO carries out projects to explore future technology seeds as well as mid- to long-term projects that form the basis of industrial development. It also supports research related to practical application.	
Details of Major Operations	Operations relating to technology development management	
Minister in Charge	Minister of Economy, Trade and Industry	
Governing Laws	Act on General Rules for Incorporated Administrative Agencies Act on the New Energy and Industrial Technology Development Organization	
Personnel	1,565 (as of April 1, 2025)	
Budget	Approximately 146.4 billion yen (as of April 1, 2025) *Additional funding programs are also being implemented.	

New Energy and Industrial Technology Development Organization

Project Management Department

Muza Kawasaki Central Tower, 1310 Omiya-cho, Saiwai-ku, Kawasaki city,

Kanagawa 212-8554 Japan

https://www.nedo.go.jp/english/index.html

October 2025 (1st Edition)