



Profile of NEDO

Contributing to Society by Accelerating Innovation and Achieving Results in a Timely Manner

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 the technological capabilities of the Japanese industry by integrating the combined efforts of industry, academia, and government. In order to further advance its activities, NEDO has formulated technology development strategies from the 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. These efforts are expected to maximize research and development outcomes and allow NEDO to respond quickly to changes that occur due to innovations around the world, thus producing 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 the cultivation and practical use of innovation in the future. In addition to providing the 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 industry-academia-government collaborative projects.

The current fiscal year marks the end of the Fourth Five-Year Plan, as well as the beginning of a strategic innovation incubator program to achieve greater economic security and a grant program to establish production facilities for specific types of advanced semiconductors. In this manner, NEDO strives to meet greater expectations and shoulder its responsibilities to usher in a sustainable society. NEDO also remains committed to supporting the energy and environmental policies of Japan and playing a leading role in Japan's innovation policy.

NEDO intends to enhance its role as an innovation accelerator that promotes the practical application of project results and contribute even further to the resolution of social issues.

ISHIZUKA Hiroaki
Chairman

New Energy and Industrial Technology Development Organization



About NEDO

- NEDO is a national research and development agency that creates innovation by promoting technological development necessary for realization of a sustainable society.
- NEDO acts as an innovation accelerator to contribute to the resolution of social issues by developing and demonstrating high-risk innovative technologies having practical application.

NEDO's Missions

Addressing energy and global environmental problems

NEDO actively undertakes the development of new energy and energy conservation technologies. It also conducts research to verify technical results. Through these efforts, NEDO promotes greater utilization 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 the knowledge obtained from 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 expertise, 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.

Three Initiatives Based on NEDO's Fourth Five-Year Plan

Managing Technological Development to Utilize Results in Society

P.8-9▶

Fostering Technology-Based Startups

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Determining the Direction of Mid- to Long-Term Technology Development

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Positioning of NEDO as an Innovation Accelerator

In order to contribute to the resolution of social issues, NEDO formulates technology strategies and project plans and, as part of its project management, establishes project implementation frameworks by combining the capabilities of industry, academia, and government. NEDO also promotes technology development by carrying out, evaluating, and allocating funding to promising projects to accelerate the practical application of project results.

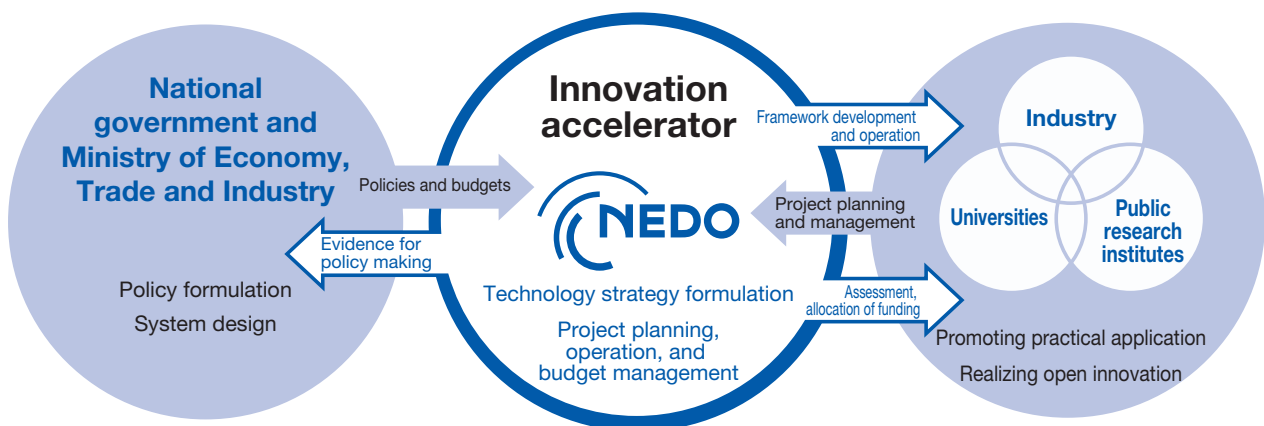


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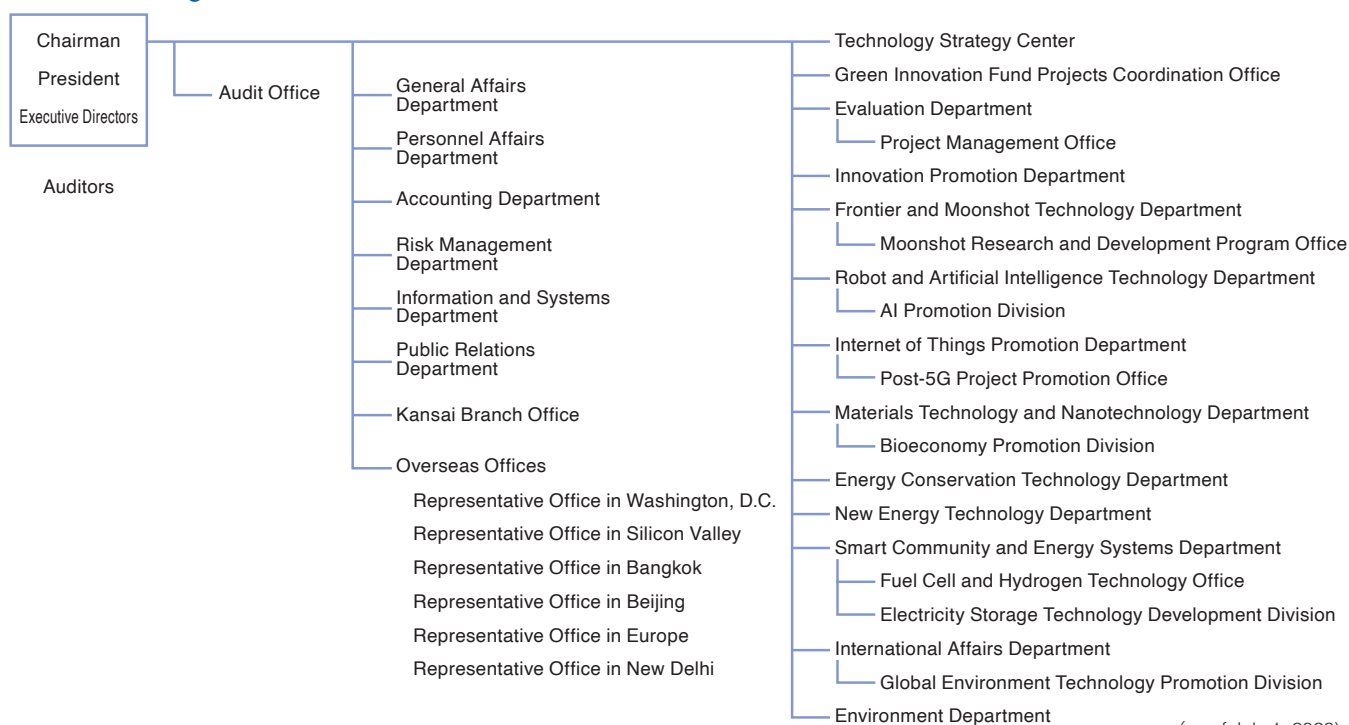
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Background Information

| | |
|-----------------------------|--|
| 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 on October 1, 1980; reorganized as an incorporated administrative agency on October 1, 2003 |
| Purpose | The purpose of NEDO is to enhance industrial technology and promote commercialization by comprehensively performing functions such as: promoting research and development (R&D) carried out using skills from the private sector; promoting R&D carried out by the private sector with regard to technology for non-fossil energies, combustible natural gas, and coal; promoting the technology required for the rational use of energy and technology in mining and industry; and promoting the utilization of such technology in cooperation with the international community; to thereby contribute to ensuring a stable and efficient energy supply in accordance with the changes in the domestic and foreign economic and social environments and to the development of the economy and industry. |
| Details of Major Operations | Operations relating to technology development management (national projects and practical application promotion activities) |
| 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 | 1,412 (as of April 1, 2022) |
| Budget | Approximately 1.28 billion US dollars (FY 2022) *Additional funding programs are also being implemented. |
| Executives | Chairman Mr. ISHIZUKA Hiroaki President Mr. OIKAWA Hiroshi Executive Directors Mr. OYAMA Kazuhisa, Mr. KUKITA Shoji, Dr. YUMITORI Shuji, Mr. NISHIMURA Tomoyasu, Mr. WADA Takashi Auditors Mr. NAKANO Hideaki, Ms. EGAMI Mime |

(as of April 1, 2022)

Organization



(as of July 1, 2022)

NEDO History

In the 1970s, the world experienced two oil crises. To improve Japan’s energy diversification, NEDO was established in 1980 to help usher in energy conservation and new energy technologies. In 1988, NEDO added research and development of industrial technology to its activities. Today, it uses its role as a research and development management organization to boost innovation and promote research and development on energy, environmental technology, and industrial technology.

- 1974 ● Long-term Sunshine Project aimed at developing new energy technologies started
- 1978 ● Long-term Moonlight Project aimed at developing energy conservation technologies started
- 1980 ● **New Energy Development Organization established**
- 1988 ● **Research and development on industrial technology added. Name changed to New Energy and Industrial Technology Development Organization (NEDO)**
- 1993 ● New Sunshine Project started
- 1996 ● Integration with Coal Mine Damage Agency. Coal mine damage compensation program added
- 2003 ● **Incorporated Administrative Agency New Energy and Industrial Technology Development Organization established under the Act on the New Energy and Industrial Technology Development Organization**
- 2006 ● Kyoto Mechanisms Credit Acquisition Program added
- 2007 ● Transitional operations related to coal mine damage recovery completed
- 2012 ● Coal and geothermal operations transferred to Japan Oil, Gas and Metals National Corporation
- 2014 ● Technology Strategy Center established
- 2015 ● **Status changed from incorporated administrative agency to national research and development agency**
- 2016 ● Kyoto Mechanisms Credit Acquisition Program discontinued
- 2021 ● Green Innovation Fund Projects started



1986
Experiments on a large-scale grid-connected photovoltaic power system started for the first time on Rokko Island in Hyogo Prefecture

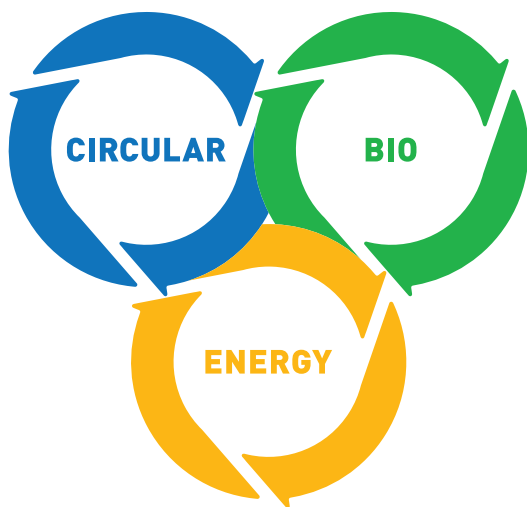


1998
Development started on underlying optical disc technologies that later led to Blu-ray discs



2012
Commercial model demonstration hydrogen station constructed

3 Essential Social Systems for Sustainable Society



ESS logo

In order to realize a sustainable society, it will be necessary to promote the three social systems shown below on an ongoing basis. To this end, NEDO has defined such social systems as the “Three Essential Social Systems for a Sustainable Society” and created an ESS logo. NEDO will actively work to promote and expand public awareness of these social systems.

1. Circular Economy (Blue symbolizes the Earth.)
2. Bioeconomy (Green symbolizes organisms.)
3. Sustainable Energy (Orange symbolizes energy.)

An ESS logo to symbolize the Three Essential Social Systems for a Sustainable Society was introduced in February 2020.

FY 2022 Budget

1.28 billion US dollars

(FY 2022 tentative budget)

NEDO aims to address energy and global environmental problems and raise the level of industrial technology through the integrated management of technological development. This ranges from the discovery of technology seeds to the promotion of mid- to long-term projects and support for practical application.

*As only an outline of NEDO's activities is given below, individual budget amounts do not add up to the total.

Individual Operational Activities

Energy Systems (472 million US dollars) P. 12▶

Areas of focus

- System provision technology
- Energy storage technology, such as batteries
- Technology related to hydrogen production, storage, transport, and use
- Renewable energy technology

Energy Conservation and Environment (341 million dollars) P. 13▶

Areas of focus

- Technology to harness unutilized thermal energy
- Environmentally friendly steel manufacturing technology
- Development of high-efficiency coal-fired power generation technology
- CO₂ capture, utilization, and storage
- Fluorocarbon recovery technology
- 3R technology, including resource screening and metal refining technology
- International demonstrations, Joint Crediting Mechanism activities, and other activities

Industrial Technology (350 million dollars) P. 14▶

Areas of focus

- Robot and AI technology
- IoT, electronics, and information technology
- Manufacturing technology
- Materials and nanotechnology
- Biotechnology

New Industry Creation and Discovery of Technology Seeds (57 million dollars) P. 16▶

Areas of focus

- Fostering technology-based startups
- Promotion of open innovation

NEDO promotes the development of key future technologies (including technology demonstrations) that are difficult for private enterprises to develop on their own due to the high level of risk leading up to practical application. Instead of hiring its own researchers, NEDO coordinates and integrates the technological capabilities of private enterprises and the research capabilities of universities. These capabilities are then leveraged for national projects focused on technology development.



NEDO also promotes open innovation and provides support to small and medium-sized enterprises and venture businesses that are becoming new leaders in innovation, thereby discovering promising technology seeds and creating new industries.

*In addition to the above, the following programs will be funded and conducted as publicly solicited research and development projects.

- Moonshot Research and Development 206 million US dollars
- Research and Development Project for Enhancement of the Bases for Post-5G Information and Communication Systems 2.5 million US dollars
- Green Innovation Fund Projects 16.3 billion US dollars
- Program for Developing Important Economic Security Technologies 1.02 billion US dollars
- Programs for Specified Semiconductor Production-Related Development 5.04 billion US dollars

FY 2022 Project List

| Project name | Period (FY) | Department |
|---|-------------|--|
| Energy Systems | | |
| Research and Development of Wind Power Generation Technologies | 2008 - 2024 | New Energy Technology Department |
| Project for Supporting the Introduction of Wind Power Generation | 2013 - 2023 | New Energy Technology Department |
| Development of Production Technologies for Biojet Fuels | 2017 - 2024 | New Energy Technology Department |
| Research and Development for Total Cost Reduction of Heat Utilization as Renewable Energy | 2019 - 2023 | New Energy Technology Department |
| Development of Technologies to Promote Photovoltaic Power Generation as a Primary Power Source | 2020 - 2024 | New Energy Technology Department |
| RD&D for Innovative Technologies Applied to Geothermal Exploration and Exploitation | 2021 - 2025 | New Energy Technology Department |
| Support Project for Creating Sustainable and Effective Supply Systems of Woody Biomass Fuels | 2021 - 2028 | New Energy Technology Department |
| Advancement of Hydrogen Technologies and Utilization Project | 2014 - 2022 | Smart Community and Energy Systems Department |
| Development of Technologies for Realizing a Hydrogen Society | 2014 - 2025 | Smart Community and Energy Systems Department |
| Development of Material Evaluation Techniques for Advanced and Innovative Batteries (Phase 2) | 2018 - 2022 | Smart Community and Energy Systems Department |
| Development of Technologies for Hydrogen Refueling Stations | 2018 - 2022 | Smart Community and Energy Systems Department |
| Next-Generation Power Network Stabilization Technology Development for Large-Scale Integration of Renewable Energies | 2019 - 2023 | Smart Community and Energy Systems Department |
| Development of a Multi-Purpose and Multi-Terminal High Voltage Direct Current Transmission System | 2020 - 2023 | Smart Community and Energy Systems Department |
| Collaborative Industry-Academia-Government R&D Project for Solving Common Challenges Toward Dramatically Expanded Use of Fuel Cells and Related Equipment | 2020 - 2024 | Smart Community and Energy Systems Department |
| Technology Development for the Utilization and Production of Ammonia as Fuel | 2021 - 2025 | Smart Community and Energy Systems Department |
| Research and Development Initiative for Scientific Innovation of New Generation Batteries 3 | 2021 - 2025 | Smart Community and Energy Systems Department |
| Next-Generation Power Network Stabilization Technology Development for Large-Scale Integration of Renewable Energies | 2022 - 2026 | Smart Community and Energy Systems Department |
| Development of Flexible and Distributed Energy Resources Control Technology to Mitigate Congestion in Power Systems (FLEX DER Project) | 2022 - 2026 | Smart Community and Energy Systems Department |
| Research and Development on New Energy Technology for Discovering Technology Seeds and Commercializing Developed Technologies | 2007 - | New Energy Technology Department and Innovation Promotion Department |
| NEDO Feasibility Study Program | 2014 - 2027 | Frontier and Moonshot Technology Department |
| International Demonstration Project on Japan's Energy Efficiency Technologies | 1993 - 2025 | International Affairs Department |
| Program to Facilitate Private-Sector-Led Promotion of Low Carbon Technology Overseas | 2011 - 2022 | International Affairs Department |
| Research and Development Program for Promoting Innovative Clean Energy Technologies Through International Collaboration | 2020 - 2025 | International Affairs Department |
| Research for Strategy Formulation | 2000 - | Technology Strategy Center |
| Energy Conservation/Environment | | |
| Research and Development Project on Innovative Thermal Management Materials and Technologies | 2015 - 2022 | Energy Conservation Technology Department |
| Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation | 2016 - 2026 | Environment Department |
| Research and Development of Recycling Technologies for Establishing a High Efficiency Resource Circulation System | 2017 - 2022 | Environment Department |
| Development of Technology and Assessment Techniques for Next-Generation Refrigerants with a Low GWP Value | 2018 - 2022 | Environment Department |
| Innovative Plastic Resource Circulation Process Technology Development | 2020 - 2024 | Environment Department |
| Research, Development and Demonstration of CCUS Technology | 2018 - 2026 | Environment Department |
| Development of advanced circulation technology for aluminum materials | 2021 - 2025 | Environment Department |
| Development of Environmental Technology for Steelmaking Process | 2013 - 2022 | Environment Department and Energy Conservation Technology Department |
| Strategic Innovation Program for Energy Conservation Technologies | 2012 - 2024 | Energy Conservation Technology Department |
| Program to Develop and Promote the Commercialization of Energy Conservation Technologies to Realize a Decarbonized Society | 2021 - 2035 | Energy Conservation Technology Department |
| NEDO Feasibility Study Program | 2014 - 2027 | Frontier and Moonshot Technology Department |
| Demonstration Project for Introducing an Energy-Saving Resource Circulation System in Asia | 2016 - 2022 | Environment Department |
| Project for International Promotion and Dissemination of Carbon Recycling and Advanced Thermal Power Generation Technologies | 2022 - 2026 | Environment Department |
| International Demonstration Project on Japan's Energy Efficiency Technologies | 1993 - 2025 | International Affairs Department |
| Program to Facilitate Private-Sector-Led Promotion of Low Carbon Technology Overseas | 2011 - 2022 | International Affairs Department |
| International Research and Development Co-Funding Project | 2014 - 2022 | International Affairs Department |
| Research and Development Program for Promoting Innovative Clean Energy Technologies Through International Collaboration | 2020 - 2025 | International Affairs Department |
| Research for Strategy Formulation | 2000 - | Technology Strategy Center |

- National Projects
- Proposal-Based Activities
- International Demonstration and Joint Projects
- Survey Activities
- Specified Proposal-Based Research and Development
- Demonstration Projects
- Programs for Specified Semiconductor Production-Related Development
- Other Projects

| Project name | Period (FY) | Department |
|--|-------------|---|
| Industrial Technology | | |
| Development of Integrated Core Technologies for Next-Generation AI and Robots | 2018 - 2023 | Robot and Artificial Intelligence Technology Department |
| Realization of a Smart Society by Applying Artificial Intelligence Technologies | 2018 - 2022 | Robot and Artificial Intelligence Technology Department |
| Drones and Robots for Ecologically Sustainable Societies Project | 2017 - 2022 | Robot and Artificial Intelligence Technology Department |
| Research and Development of Advanced Aircraft Systems for Practical Application | 2015 - 2023 | Robot and Artificial Intelligence Technology Department |
| Cross-Ministerial Strategic Innovation Promotion Program (SIP): Automated Driving for Universal Services | 2018 - 2022 | Robot and Artificial Intelligence Technology Department |
| Cross-Ministerial Strategic Innovation Promotion Program (SIP): Big Data and AI-Enabled Cyberspace Technologies | 2018 - 2022 | Robot and Artificial Intelligence Technology Department |
| Technology Development Project on Next-Generation Artificial Intelligence Evolving Together with Humans | 2020 - 2024 | Robot and Artificial Intelligence Technology Department |
| Project to Construct a Basis for Research and Development of Innovative Robots | 2020 - 2024 | Robot and Artificial Intelligence Technology Department |
| Development of AI-Based Innovative Remote Technologies | 2021 - 2024 | Robot and Artificial Intelligence Technology Department |
| Realization of Advanced Air Mobility (ReAMo) project | 2022 - 2026 | Robot and Artificial Intelligence Technology Department |
| Project for Innovative AI Chip and Next-Generation Computing Technology Development | 2016 - 2027 | Internet of Things Promotion Department |
| Project for Accelerating Innovative AI Chip Development | 2018 - 2022 | Internet of Things Promotion Department and Innovation Promotion Department |
| Basic Technology Development Project for Metal Additive Manufacturing Parts | 2019 - 2023 | Internet of Things Promotion Department |
| Cross-Ministerial Strategic Innovation Promotion Program (SIP): Intelligent Knowledge Processing Infrastructure Integrating Physical and Virtual Domains | 2018 - 2022 | Internet of Things Promotion Department |
| Cross-Ministerial Strategic Innovation Promotion Program (SIP): Cyber Physical Security for IoT Society | 2018 - 2022 | Internet of Things Promotion Department |
| Technology Development Project to Strengthen the Semiconductor Manufacturing Base of Energy-Saving Electronics | 2021 - 2025 | Internet of Things Promotion Department |
| Research and Development Utilizing Wireless Communication Technologies to Reinforce the Dynamic Capabilities of the Manufacturing Industry | 2021 - 2025 | Internet of Things Promotion Department |
| Digital Infrastructure Development Project for Digital Transformation of Industries | 2022 - 2024 | Internet of Things Promotion Department |
| Research and Development of Innovative Structural Materials | 2014 - 2022 | Materials Technology and Nanotechnology Department |
| Ultra High-Throughput Design and Prototyping Technology for Ultra Advanced Materials Development | 2016 - 2022 | Materials Technology and Nanotechnology Department |
| Development of Innovative Sensing Technology to Realize an IoT Society | 2019 - 2024 | Materials Technology and Nanotechnology Department |
| Development of Continuous Production and Process Technologies of Fine Chemicals | 2019 - 2025 | Materials Technology and Nanotechnology Department |
| Technology Development Project for Social Implementation of Marine Biodegradable Plastics | 2020 - 2024 | Materials Technology and Nanotechnology Department |
| Cellulose Nanofiber Related Technology Development to Contribute to a Carbon Cycle Society | 2020 - 2024 | Materials Technology and Nanotechnology Department |
| Development of New Innovative Composite Materials and Forming Technologies | 2020 - 2024 | Materials Technology and Nanotechnology Department |
| Development of Bio-Based Production Technology to Accelerate Carbon Recycling | 2020 - 2026 | Materials Technology and Nanotechnology Department |
| Development of Materials for Aircraft Engines and Bases for Material Evaluation Systems | 2021 - 2025 | Materials Technology and Nanotechnology Department |
| Development of a Technology Base and Applied Technologies for the Manufacturing Processes of Next-Generation Advanced Ceramics | 2022 - 2026 | Materials Technology and Nanotechnology Department |
| NEDO Feasibility Study Program | 2014 - 2027 | Frontier and Moonshot Technology Department |
| International Demonstration Project on Japan's Energy Efficiency Technologies | 1993 - 2025 | International Affairs Department |
| Research and Development Program for Promoting Innovative Clean Energy Technologies Through International Collaboration | 2020 - 2025 | International Affairs Department |
| International Research and Development Co-Funding Project | 2014 - 2022 | International Affairs Department |
| Research for Strategy Formulation | 2000 - | Technology Strategy Center |
| New Industry Creation and Seed Discovery | | |
| Development Promotion Project for Practical Use of Welfare Equipment | 1993 - 2022 | Innovation Promotion Department |
| Research and Development on New Energy Technology for Discovering Technology Seeds and Commercializing Developed Technologies | 2007 - | New Energy Technology Department and Innovation Promotion Department |
| Technology-Based Startup Support Program | 2014 - 2023 | Innovation Promotion Department |
| Intensive Support for Young Promising Researchers | 2020 - | Frontier and Moonshot Technology Department |
| Development and Demonstration of a Situation Awareness System Using Satellites to Contribute to Efficient Supply Chain Modification | 2021 - 2022 | Innovation Promotion Department |
| SBIR Promotion Program | 2021 - | Innovation Promotion Department |
| NEDO Feasibility Study Program | 2014 - 2027 | Frontier and Moonshot Technology Department |
| Fundamental Technology Research Facilitation Program | 2001 - | Innovation Promotion Department |
| Specified Proposal-Based Research and Development | | |
| Moonshot Research and Development | 2020 - | Frontier and Moonshot Technology Department |
| Research and Development Project for Enhancement of the Bases for Post-5G Information and Communication Systems | 2020 - | Internet of Things Promotion Department |
| Green Innovation Fund Projects | 2021 - | Green Innovation Fund Projects Coordination Office |
| Program for Developing Important Economic Security Technologies | 2022 - | |
| Programs for Specified Semiconductor Production-Related Development | | |
| Specified Semiconductor Funding Program | 2022 - | Internet of Things Promotion Department |
| Program for Specified Semiconductor Interest Subsidies | 2022 - | Internet of Things Promotion Department |

Three Initiatives Based on NEDO's Fourth Five-Year Plan

1. Managing Technological Development to Utilize the Results in Society

Start

Collecting information and formulating strategies for each field

As technology development activities become increasingly competitive worldwide, NEDO actively collects information on a variety of different fields both inside and outside of Japan. Such information is then used to formulate technology strategies, set milestones, and develop project plans.

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One to Two Years

Developing technology to support progress in fields with a promising future
Project planning

NEDO sets goals for technology development by studying domestic and international technology trends and consulting with experts. It aims to use innovation to drive economic growth and solve societal problems. Projects are planned by looking five, ten, and twenty years into the future.

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NEDO projects make it possible!

- ✓ Mid- to long-term initiatives
- ✓ Technological development coordinated with standardization
- ✓ Cross-industrial cooperation
- ✓ Full-scale demonstration
- ✓ International cooperation

NEDO support draws on a wealth of knowledge

Partnership agreements with foreign countries

NEDO enters into agreements with institutions in various countries and actively supports international development.

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Taking a global approach through standardization activities and intellectual property strategies

NEDO aims to establish international standards that will help promote the practical application of developed technologies. It also provides support to research teams participating in projects for consensus building regarding intellectual property. This promotes practical application and global market acquisition.



Diverse human resource networks

NEDO organizes committees on project adoption, evaluation, technology, and other issues as needed by making use of its network of outside specialists and experts from industry and science.



NEDO's Fourth Five-Year Plan covers the plans NEDO is executing from FY 2018 to FY 2022. The plan's aim is to maximize the results of research and development. It strengthens management of technology development from strategy formulation to societal implementation and promotes challenging research and development, accelerates open innovation, and fosters research and development-oriented ventures.

In the energy and environment sector, NEDO promotes the discovery and development of innovative technologies to achieve carbon neutrality by 2050 based on the implementation plan of the Green Growth Strategy. In the industrial technology sector, NEDO aims to fuse technology with Japan's strengths in manufacturing. It hopes to focus on artificial intelligence (AI) and robotics to build Society 5.0 and distill the wisdom of industry, academia, and government to deliver the world's most advanced technology to society.

Two to Six Years

Ten Years

Technology development and demonstration testing

Project review and follow-up monitoring

NEDO promotes technology development projects and large-scale demonstration projects that are difficult for private sector companies to carry out on their own. It aims to make the most of its results. To do so, it focuses on authentication and systems for society to use, while anticipating future developments from a global perspective.

After a project is completed, an evaluation is conducted by a third party, and project results are thoroughly assessed. In addition, NEDO conducts follow-up monitoring of results to examine the economic and social effects of the project. Information collected during monitoring is also used to improve future project management.

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NEDO supports social implementation based on authentication, evaluation, and systems

NEDO also considers establishing new authentication and evaluation methods and then revising systems to support technology development and social implementation in collaboration with related agencies. This allows unprecedented technologies and revolutionary results to be used by society.

Public relations for disseminating easy-to-understand information

NEDO holds press conferences and meetings to publicize and disseminate the results of technology development in an easy-to-understand form. It works hard to publicize results using a variety of approaches, such as opening databases to the public.

Promoting practical application through business matching

NEDO supports activities that lead to business so as to accelerate the commercialization of research and development results. This includes using exhibitions inside and outside of Japan to cultivate new needs and provide users with product samples.

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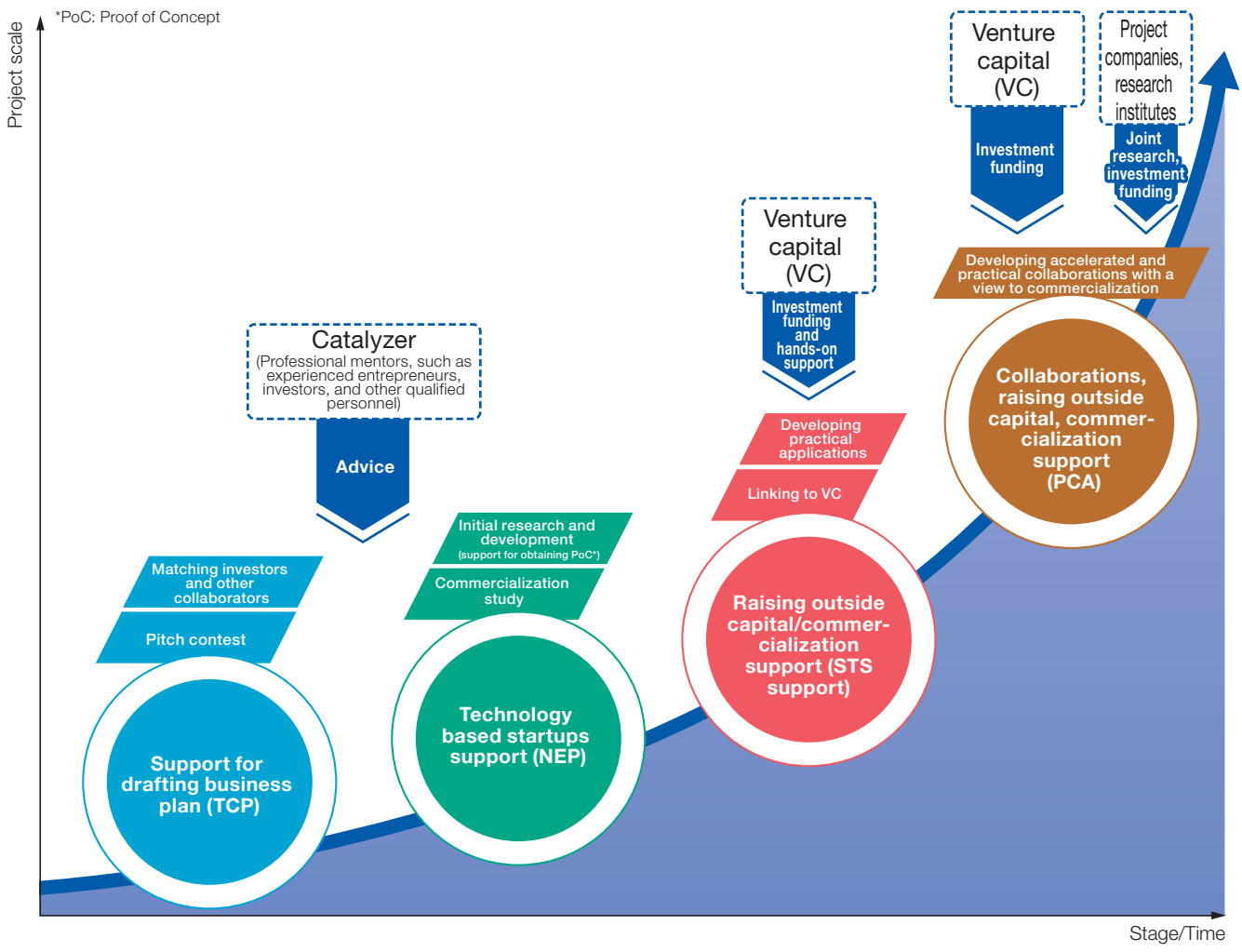
Three Initiatives Based on NEDO's Fourth Five-Year Plan

2. Fostering Technology-Based Startups

It is important to foster novel and dynamic technology-based startups. These should help revitalize the economy and lead the way to creating new industries and employment opportunities. Accordingly, NEDO is helping to build a venture ecosystem by providing seamless support for the discovery of technology seeds, acquiring private funding for high-risk/high-return investments, and providing commercialization support. In addition, NEDO aims to raise the level of technology-based startups by strengthening systems for collaboration between regional areas and public support institutions.

Providing support for commercialization of technology-based startups

- Cultivating technology seeds and entrepreneurial candidates having business innovation skills
- Supporting seed-stage technology-based startups in collaboration with venture capital
- Supporting collaborations between technology-based startups with business ideas and project companies



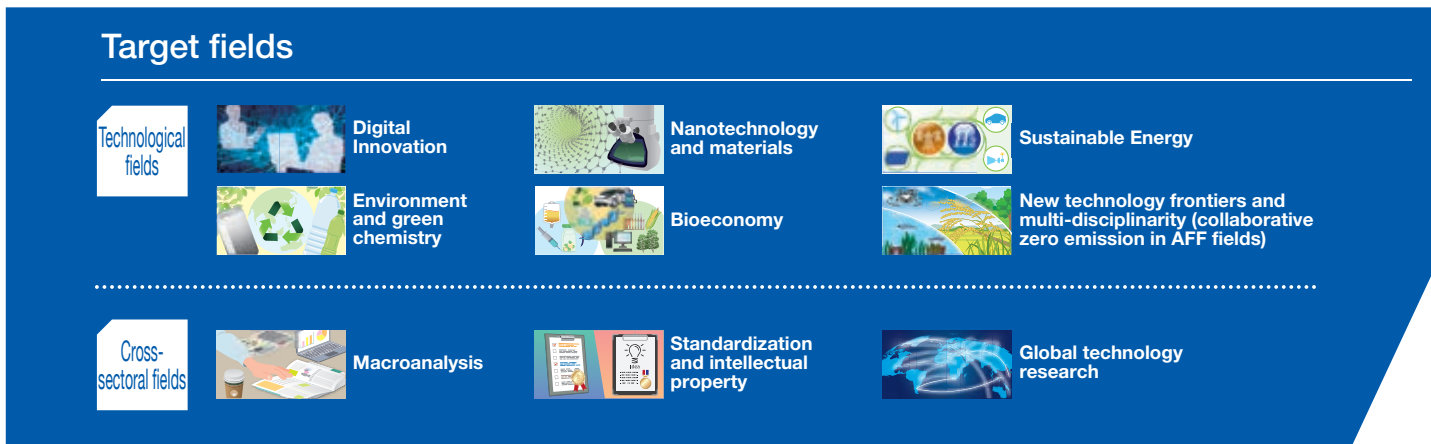
TCP: Technology Commercialization Program
 STS: Seed-stage Technology-based Startups

NEP: NEDO Entrepreneurs Program
 PCA: Product Commercialization Alliance

3. Discovering emerging innovation and implementing it in society

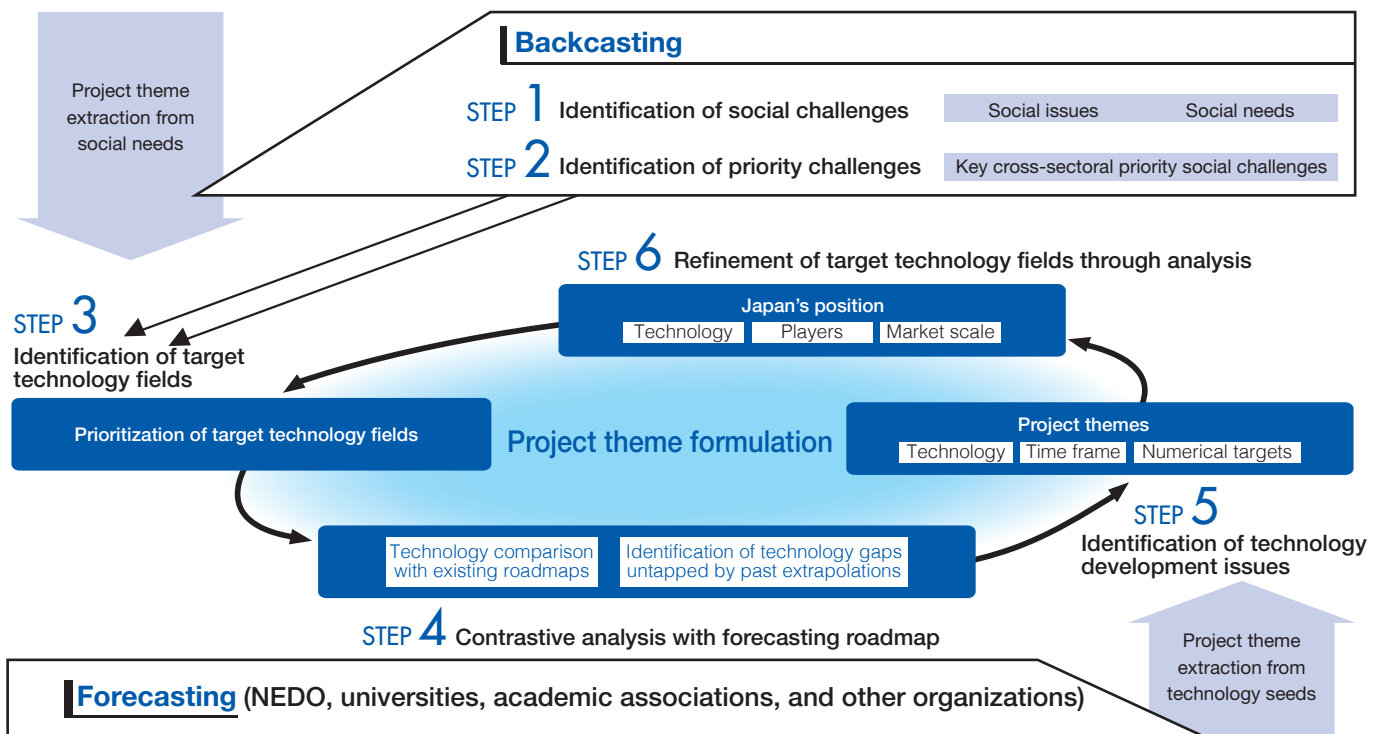
Determining the Direction of Mid- to Long-Term Technology Development

NEDO's Technology Strategy Center takes the lead in continually ascertaining and analyzing the movement of social and market trends. It works to discover promising technologies in energy, environmental technology, and industrial technology both within Japan and abroad. The Center also works to narrow down the technological development Japan should undertake, formulate technology strategies, and plan projects based on them. It aims to incorporate multifaceted analysis in strategy formulation and uses technology development projects to accelerate economic growth.



Process leading to project theme formulation

NEDO uses an approach it calls “allcasting” to formulate project themes. Allcasting is a combination of backcasting based on social needs and challenges and forecasting based on current technological conditions and seeds.



Technologies Under Development by NEDO

Energy Systems

Energy system technologies

Storage batteries, hydrogen energy, fuel ammonia, smart communities, and system controls



Fukushima Hydrogen Energy Research Field (FH2R)

In the field of hydrogen energy, NEDO is promoting technology development, from production to transportation, storage, and the use of hydrogen, including fuel cells, hydrogen refueling stations, hydrogen power generation, large-scale hydrogen supply chains, and power-to-gas technology, in order to significantly expand the utilization of hydrogen. In the field of storage batteries, NEDO also conducts research to develop all-solid-state lithium-ion batteries with performance far superior to conventional lithium-ion batteries as well as other types of innovative storage batteries.

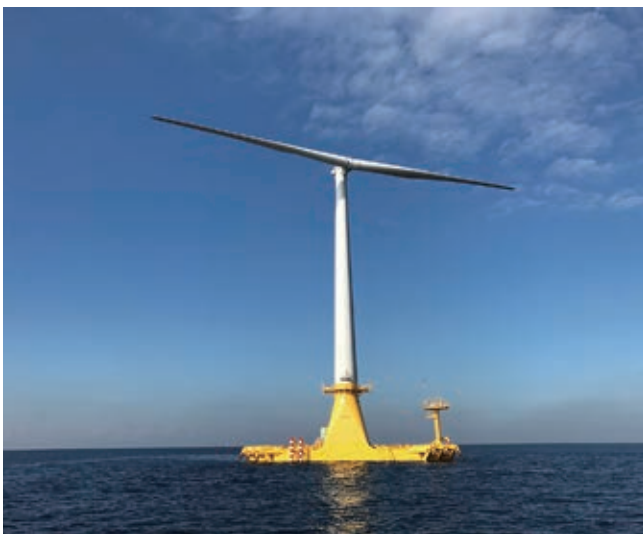


Microgrid operation with a large-scale battery system on an in-service distribution network (Demonstration in the U.S. state of California)

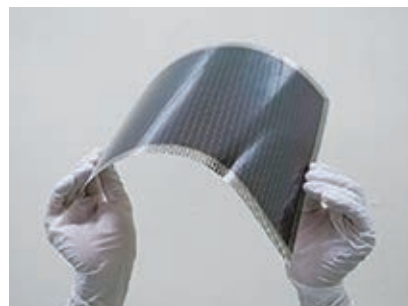
In addition, NEDO is devising resilient, sustainable, and smart energy systems that efficiently tap into renewable energy, storage batteries, electric vehicles, heat pumps, and other distributed energy resources. For instance, it is working to overcome grid constraints with home-grown technologies. Various demonstration projects are underway around the world in different business settings to validate the technical and commercial viability of energy systems.

Renewable energy technologies

Solar power, wind power, ocean energy, biomass, geothermal energy, and renewable thermal energy



Barge-type floating offshore wind turbine system demonstrator



Large area (703 cm²; 24.15 cm × 29.10 cm) film-type perovskite solar module for the world's highest conversion efficiency

NEDO propels the grid integration of renewable sources on a massive scale so that they can become main sources of power supply. Along with relevant guidelines, it is developing cost-saving and other useful technologies for the extensive use of solar, wind, and renewable thermal energy, as well as biomass. These technologies are intended for harnessing solar energy on exterior building walls and mobility-related platforms such as automobiles, thereby expanding their application in new markets, and achieving more reliable operations over the long term. NEDO supports the demonstration of floating wind turbine systems, the development of wind farms, and also engages in the development and demonstration of technologies for providing Sustainable Aviation Fuel (SAF) and generating power with biomass resources. Technology development is underway to tap into supercritical geothermal sources and to provide heat pump systems that harness ground sources, solar heat, or other renewable thermal sources.

NEDO promotes challenging research and development based on its technology development strategy to address the various issues facing society. NEDO aims to lead the world in realizing innovation by shifting to new industrial systems, creating a society that thoroughly conserves energy, and accelerating the adoption of renewable energy.

Energy Conservation and Environment

Energy conservation technologies

Innovative energy-saving technologies, and unutilized thermal energy



Demonstration of a three-phase coaxial superconducting cable

The Sixth Strategic Energy Plan formulated by the Japanese government entails sweeping energy conservation measures, such as reduction of final energy consumption by around 62 million kL in oil equivalent by FY2030. NEDO supports initiatives to develop innovative energy-conservation systems and technologies in Japan. Initiatives are being carried out in areas such as harnessing untapped thermal energy or making iron with reduced levels of energy consumption and carbon emissions.

Next-generation thermal power plants and CCUS technologies

High-efficiency thermal power generation; CO₂ capture, utilization, and storage (CCUS); and environmentally friendly production processes



Tomakomai CCS Demonstration Facilities

Various innovative technologies must be employed in Japan's bid to reach carbon neutrality by 2050. Lower carbon emissions are pursued by NEDO through research to develop technologies for efficiently generating power, effective use of ammonia to provide a carbon-free process, and alternative ironmaking processes that employ hydrogen reduction. NEDO also engages in research to develop CO₂ capture, utilization, and storage technologies aimed at recycling and sequestering CO₂ rather than releasing it.

Environment and resource conservation technologies

3Rs, alternatives to hydrofluorocarbons, and water circulation



Recycling system for WEEE (Waste Electrical and Electronic Equipment) in Thailand



Energy-efficient seawater desalination plant (Saudi Arabia)

NEDO enhances environmental and resource conservation in Japan by promoting the development of robust urban mining systems to recycle valuable metals, waste plastics, and aluminum materials and is also encouraging the rollout of recycling operations in other countries. In another initiative to reduce emissions of hydrofluorocarbons (HFCs), a type of greenhouse gas increasingly used as a coolant in refrigerators and air conditioners, NEDO is developing technologies to offer less harmful alternatives. In addition, it conducts overseas demonstrations of Japanese water treatment technologies and systems to hone the global competitiveness of relevant domestic industries.

Industrial Technology

Robots and AI technologies

Robots, drones, artificial intelligence (AI), electric aircraft, and automated driving



Demonstration of a delivery service in residential area



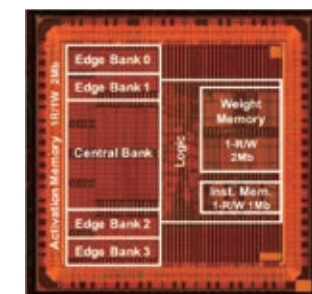
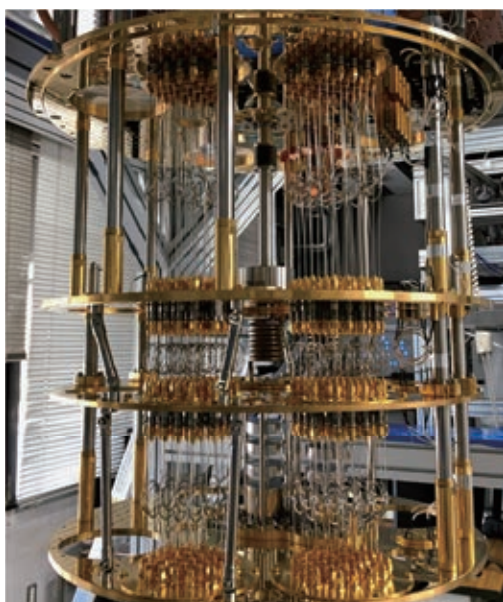
Compact high-performance drone that securely performs aerial imagery

NEDO is developing robots capable of handling high-mix low-volume manufacturing or delivery, pioneering the utilization of robots in sectors where the introduction of robots has not been progressing and promoting a platform for bringing down costs involved in robot deployments. In anticipation of the popular use of drones

and Advanced Air Mobility in the future, NEDO is also carrying out flight demonstrations to develop performance benchmarks for ensuring flight safety and developing technologies for drone traffic management. As Japan presses ahead to achieve the smarter human-centered Society 5.0 with extensive adoption of artificial intelligence, NEDO will encourage the practical application of relevant technologies with priority in the prioritized areas of productivity, health, medical services and welfare and mobility. For instance, NEDO intends to develop an evolutionary AI system evolving together with humans and other innovative remote technologies to serve future generations and will also venture into research, for instance, to develop a leading-edge electric propulsion system for aircraft, as well as automated driving to reduce traffic accidents and congestion.

IoT, electronics, and information technology

Internet of Things (IoT), computing, and power semiconductors



LSI prototype with efficient AI processing for smartphones and robots

In order to address social challenges by using IoT, AI, and big data, NEDO is collecting real-world data, providing feedback on societal applications for data accumulation, analysis, management and services, and conducting research and development at all stages. In addition, NEDO promotes both the hardware and software-related aspects of the relevant technologies from electronic devices that make low-power high-speed processing possible to cross-sectoral technology development that is fundamental to maintaining security at every level. NEDO is contributing to the real-world implementation of IoT by creating services that lead to solutions to social problems and to the creation of new businesses that do not rely on existing businesses. In addition to its own research and development, NEDO collaborates with project participants, laboratories, and businesses that use IoT.

Superconducting quantum annealing machine

Manufacturing technologies

Dynamic capabilities and additive manufacturing



Testing system for electron-beam additive manufacturing

NEDO is developing new manufacturing systems that can greatly reduce energy consumption, such as a system for high-mix and low-volume manufacturing and a system for connecting to cyberspace. Specifically, NEDO is promoting the development of additive manufacturing (3D printing) technologies suitable for high value-added production and technologies to enhance dynamic capability through the use of 5G and other technologies. By putting these technologies into practical use, NEDO is contributing to the realization of "Society 5.0."

Materials and nanotechnologies

Structural materials, functional materials, motors, chemical production, and sensing



Photocatalyst water-splitting panels with an area of 100 m²

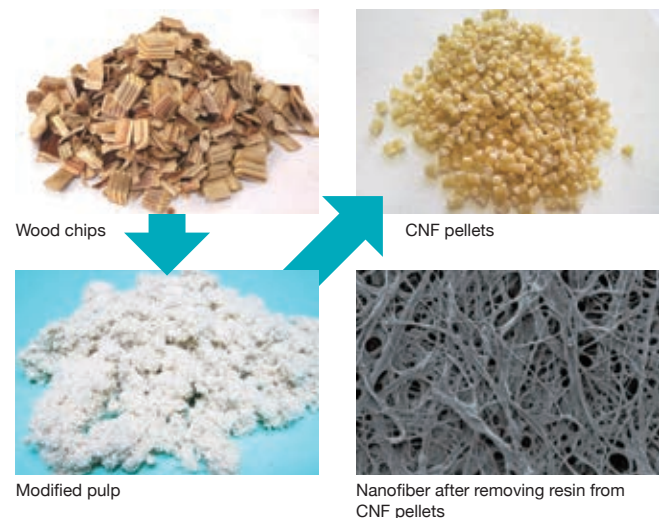
Japan's metals, plastics, ceramics, and other material industries boast a high level of technology worldwide. They are key industries sustaining the country's entire manufacturing industry. Nanotechnology (technology to control material structures on the nanoscale of 10⁻⁹ m) is being applied to material development in coordination with different industries and disciplines, both upstream and downstream. NEDO aims to strengthen Japan's industrial technologies by creating innovative materials.

Biotechnology

Cellulose nanofibers (CNF), smart cells, and marine biodegradable plastics



Small-scale fed-batch culture tanks used for validation of practical applications and development of human resources in bioproduction processes



Recent innovations in biotechnology have made strengthening competitiveness in this field an urgent necessity for Japan. In preparation for the future depletion of oil reserves, NEDO is developing technologies related to resin compound materials using CNF, technologies required for social applications of marine biodegradable plastics, and smart cell technology, which produces high-performance products efficiently by controlling, modifying, and maximizing the metabolic systems of plants and microorganisms.

New Industry Creation and Discovery of Technology Seeds

Commercialization support for small and medium-sized enterprises and startups

Carrying out seamless support from discovery of technology seeds and entrepreneurs to research and development of practical applications



Ring-array breast ultrasound imaging system COCOLY launched on the market



One-touch mounting

Expanded functions

Long leg brace with enhanced adjustability that can be worn with a single touch

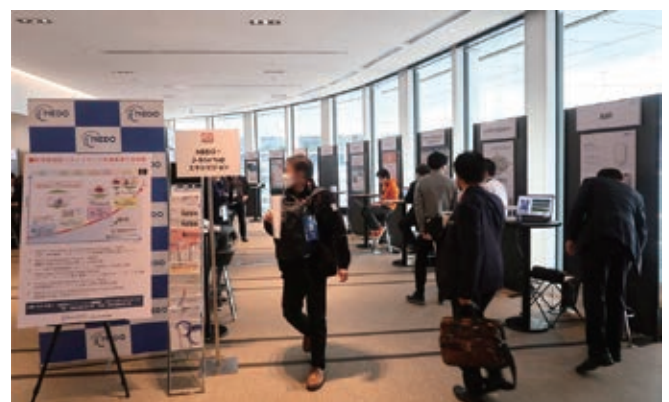
In line with national investment strategies, NEDO provides a wide range of assistance for small businesses and startups at various phases of their development so that their technology seeds can be put into practical application after the necessary research and development. It has also instituted a cross-sectoral support and advisory framework so that entrepreneurs and startups can launch successful businesses with the necessary professional advice provided by experts, such as venture capitalists, lawyers, accountants, and intellectual property consultants. Apart from providing assistance with research and development, NEDO also builds close rapport with project participants to enhance their business plans and venture into new business domains, thereby turning their technology seeds into viable businesses.

Encouraging open innovation

Matching support, and Japan Open Innovation Council (JOIC)



JOIC workshop (also held online)



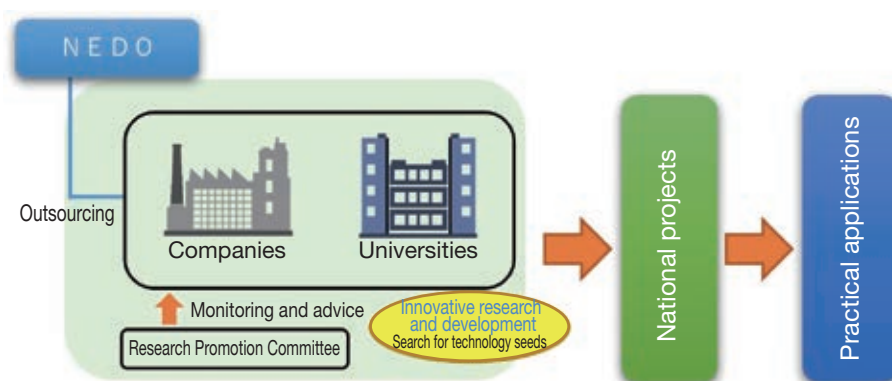
Innovation Leaders Summit 2022

As international competition intensifies, it will be important to promote open innovation that utilizes external technologies, ideas, and resources to lead the global market. It will also be vital to tie this effort to the creation of new products and business models. NEDO is strengthening its promotion of open innovation by organizing activities, such as matching events that lead to the creation of joint research and technology alliances between NEDO project participants and external businesses, universities, and other organizations. In addition, the Japan Open Innovation Council (JOIC), for which NEDO serves as the secretariat, investigates and shares success stories from within Japan and abroad. JOIC holds events, such as pitch contests, with the aim of further deepening and expanding open innovation by businesses and other relevant entities.

Nurturing budding industrial technologies with a vision beyond 2040

Search for technology seeds to be rolled out nationwide and beyond

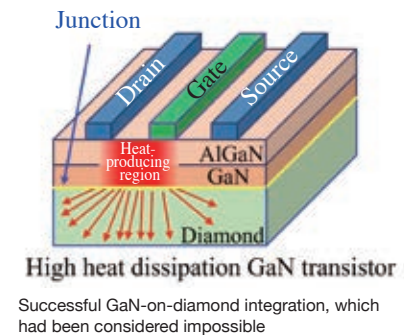
Conceptual diagram



In order to maintain a technological edge, Japan must exercise foresight in identifying and nurturing budding industrial technologies that yield a competitive advantage in the world beyond 2040.

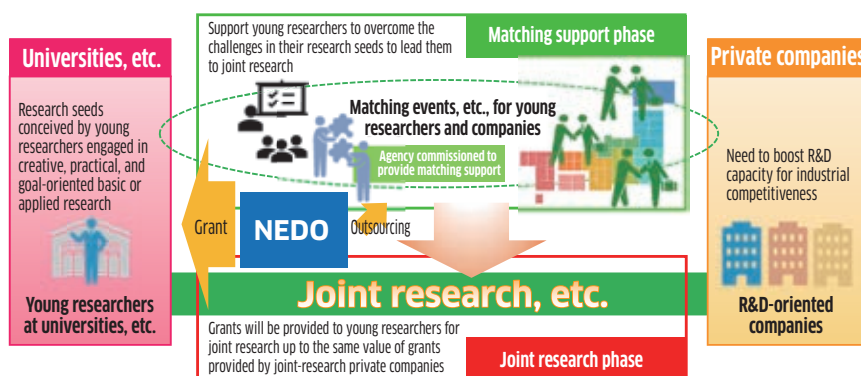
In its Feasibility Study Program, NEDO searches for technology seeds, helps develop them into promising technologies after feasibility studies are conducted, and then promotes their deployment in future national projects or society at large.

Example of technology seed



Intensive support for young promising researchers

Promote joint research between universities, etc. and private companies, and foster future human resources in innovation.



This program identifies young researchers engaged in creative, practical and goal-oriented basic or applied research at universities, etc. and assists them to move to joint research with private companies. With this program, NEDO aims at fostering future human resources in innovation and improving Japan's industrial capabilities.



Matching platform

Special website set up for companies to discover young researchers with promising technology seeds



<https://wakasapo.nedo.go.jp/>

(Only available in Japanese)

Cross-Sectoral Proposal-Based Research and Development Activities

Bold investments to realize carbon neutrality by 2050

Green Innovation Fund Projects

In October 2020, aligned with the growing global momentum for decarbonization, Japan committed itself to reaching carbon neutrality by 2050. This will not be an easy undertaking, so Japan needs to radically reorganize its energy and industry sectors and accelerate innovation with bold investments. With this in mind, NEDO has received funding of two trillion yen to implement the Green Innovation Fund Projects, which aims to support companies committed to ambitious goals related to achieving carbon neutrality through the research, development, demonstration, and practical application of their technologies over the next decade.

Outline

Support Target

Long-term funding is provided for projects aimed at the practical application of technologies expected to have a profound impact in priority areas with action plans developed in line with Japan's Green Growth Strategy.

Strategy for Maximizing Results

The program requires long-term commitments from their top management to work tenaciously to address any business challenges they encounter to ensure the social application of their technologies.

Project

*Based on the planned budget allocation by target area (as of April 2022)

| Promotion of green electric power | Transformation of the energy structure | Transformation of the industrial structure |
|--|---|---|
| <ul style="list-style-type: none"> ■ Cost reduction for offshore wind power generation ■ Next-generation solar cells | <ul style="list-style-type: none"> ■ Large-scale hydrogen supply chain establishment ■ Hydrogen production through water electrolysis using power from renewables ■ Hydrogen utilization in iron and steel-making processes ■ Fuel ammonia supply chain establishment ■ Producing raw materials for plastics using CO₂ and other sources ■ Fuel production with CO₂ ■ Producing concrete and cement using CO₂ ■ CO₂ separation and capture ■ Development of CO₂ reduction technology for waste treatment and circulation of resources | <ul style="list-style-type: none"> ■ Next-generation storage battery and motor ■ In-vehicle computing and simulation technologies for energy conservation by electric vehicles ■ Smart mobility society ■ Next-generation digital infrastructure construction ■ Next-generation aircraft ■ Next-generation ship ■ Reduction or recovery of CO₂ emissions from food, agriculture, forestry, and fisheries industries ■ Carbon recycling by biomanufacturing |

Outreach

NEDO introduces each of the Green Innovation Fund Projects on its dedicated website for the program. The dashboard helps visitors easily find useful information regarding industries and technologies promoted by the projects.





Pioneering a new frontier

Moonshot Research and Development Program

In a bid to spark home-grown disruptive innovations, the Japanese government has launched the Moonshot Research and Development Program, with nine specific goals established to boldly promote ambitious research and development activities. NEDO is conducting pioneering research and development projects to achieve Goal 4 under the program.

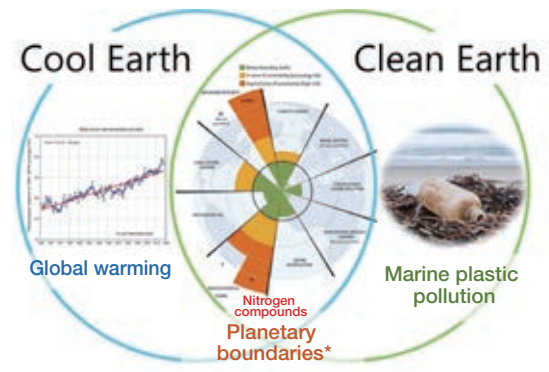
Moonshot Goal 4 Realization of sustainable resource circulation to recover the global environment by 2050

Committed to recovering the global environment, NEDO aims to realize more sustainable resource circulation by curbing global warming (referred to as the Cool Earth concept) and combatting environmental pollution (referred to as the Clean Earth concept).

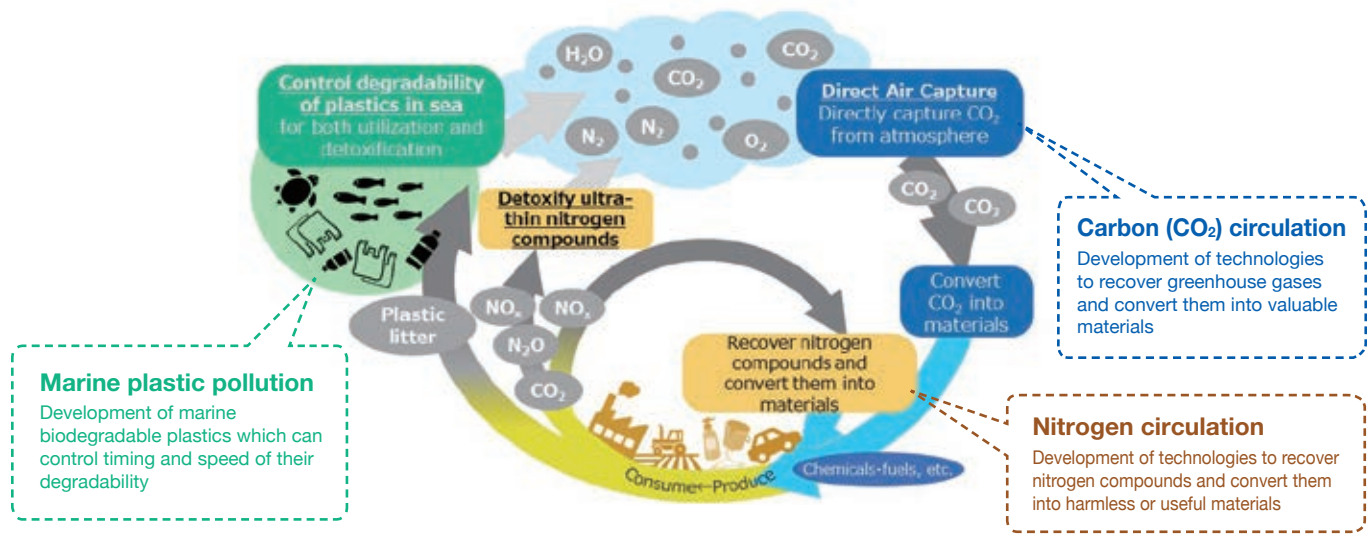
Background

Greenhouse gases, nitrogen compounds, marine plastic pollution, and many other harmful substances are continually being released into the environment. Efforts to reduce the amount of harmful substances being released must be combined with measures to recycle them.

*The concept of planetary boundaries refers to thresholds within which humans can continue to develop and thrive. Exceeding these thresholds, however, results in irreversible changes to the natural environment on which humans depend.



Goal 4 projects



Enhancement of information/communication systems development and manufacturing infrastructures toward the 5G expansion phase

Research and Development Project of the Enhanced infrastructures for Post-5G Information and Communication Systems

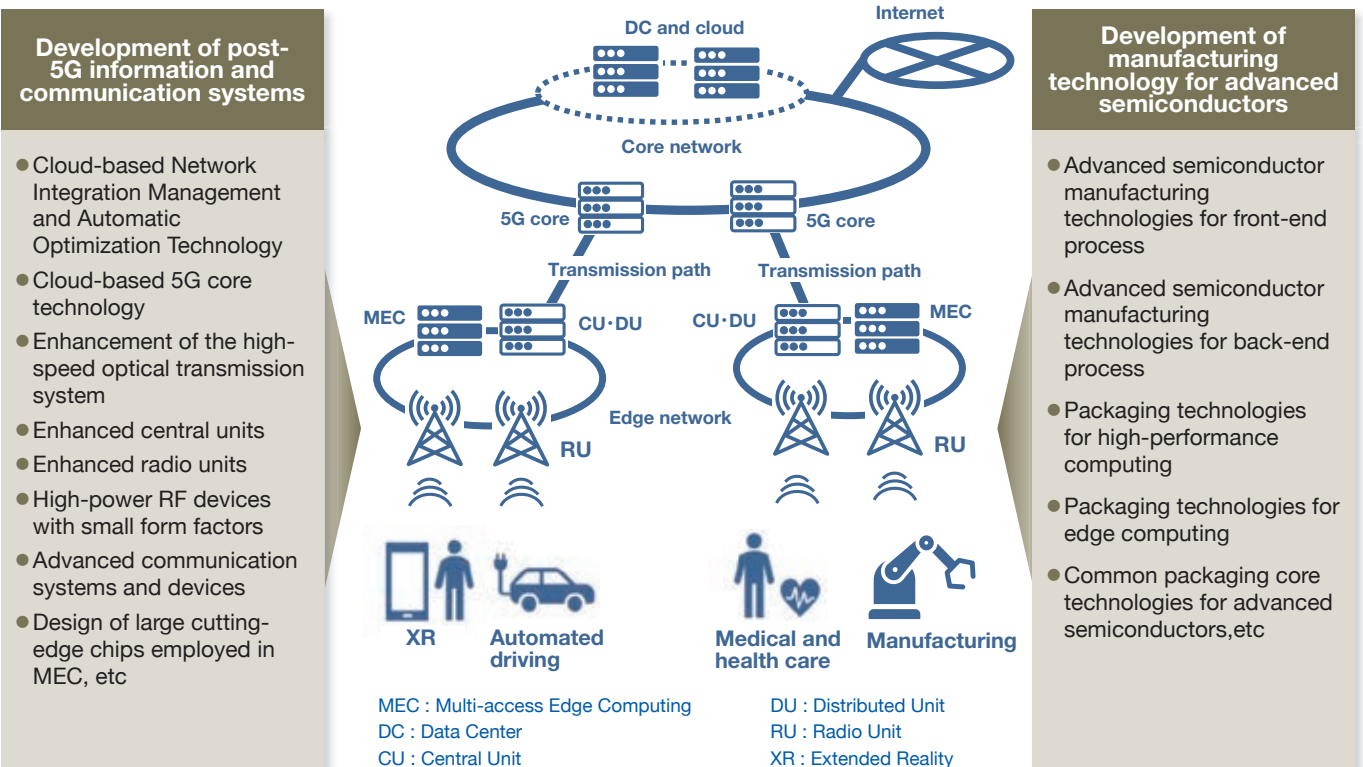
Background

In the mobile communications industry, a new generation of technologies has emerged about every decade. Today, commercial services are being launched across the world over the 5th Generation Mobile Communications System(5G) networks to replace those offered over 4G networks. Initially, 5G deployment has mainly been driven by its ultra-high speeds and large data capacity. As enhanced 5G (hereinafter "post-5G") additionally offers multi-connectivity with much lower latency, its industrial application is set to expand across various fields, such as extended reality (XR), Automotive, medical and health care, and manufacturing. These technologies are therefore expected to give a vital competitive edge to Japanese industry in the country's bid to achieve Society 5.0.

Outline

This project intends to develop the core technologies for post-5G information and communication systems. More specifically, NEDO supports to develop technologies for post-5G information and communication systems, as well as the semiconductors employed by them. And, to secure the advanced semiconductor technologies in domestic semiconductor manufacturing site in future, NEDO will also support developing advanced semiconductor technologies. Project outcomes will be effectively applied for more extensive deployment of post-5G to realize tangible benefits. In parallel with such efforts, NEDO will exercise foresight and cultivate promising technologies that could shape mobile communications systems beyond 5G.

Conceptual diagram



Case Studies on the Practical Application of NEDO Project Outcomes

Achievements of completed NEDO projects

NEDO Project Success Stories

 <https://www.nedo.go.jp/content/100899120.pdf>



NEDO conducts follow-up monitoring to ascertain how the technology developed through a project has been utilized in products and services and how project results have been disseminated throughout society. NEDO then interviews businesses and developers about the products and services it has discovered and shares this information through NEDO Project Success Stories.



Five new articles published in NEDO project success stories



3D Distance Image Sensor for Safety Protection



Simultaneous Nanofiber and Resin Composite Production-Commercialization of Cellulose Nanofiber Composite Resin



Development of New Materials for a Highly Sustainable Society through Artificial Synthesis of Structural Proteins



Wider Popularization of Aquifer Thermal Energy Storage Systems



A4-Size High-Concentration Oxygen Generator

Impact of NEDO project results

NEDO Inside Products

NEDO Inside Products are products and processes that use the results of NEDO projects as core technologies*1 and have been found to have a considerable socio-economic impact. A total of 120 products had been selected as of FY2020. To clarify the medium- and long-term effects of these products, NEDO calculates their actual sales, CO₂ emission reductions, and primary energy consumption reductions.

*1. "Core technologies" refer to technologies at the research and development stage that a NEDO project took the opportunity to commercialize and without which new products or processes would not have resulted.

Example of recently featured NEDO Inside Product

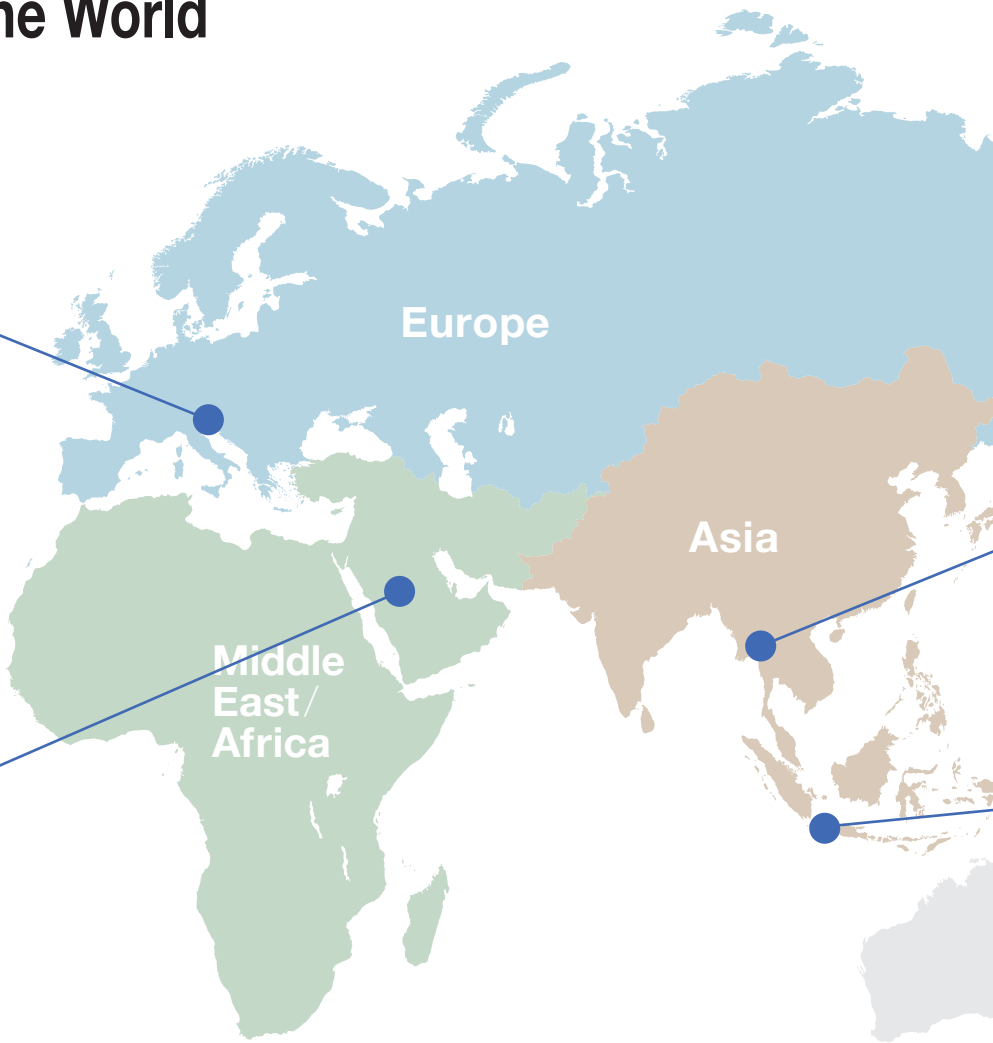


Defect inspection device for EUV mask blanks

- An EUV source with an extremely short wavelength was successfully employed to perform defect inspections on the entire surface of a mask blank.
- Compared to conventional devices, this successfully commercialized product can inspect deeper into mask blanks with considerably greater sensitivity in terms of defect detection, thereby improving the yield and defect management.
- In the oligopolistic markets found in both Japan and abroad, this device has given its manufacturer a leading competitive edge over its competitors.

Introducing Japanese technologies to the world

Activities Around the World



International Demonstration Projects on Japan's Energy Efficiency Technologies

| | |
|--|--------------|
| A Smart Grid and Smart Community System Coordinated Research and Demonstration Action | Slovenia |
| Demonstration Project for Energy Saving Seawater RO System | Saudi Arabia |
| Demonstration Project to Increase Energy Efficiency Through Utilization of Electric Vehicle and Mobile Battery Sharing | Indonesia |
| Demonstration Project for an Energy-Saving Cellulosic Sugar Production System Using Bagasse | Thailand |

Program to Facilitate Private-Sector-Led Promotion of Low Carbon Technology Overseas

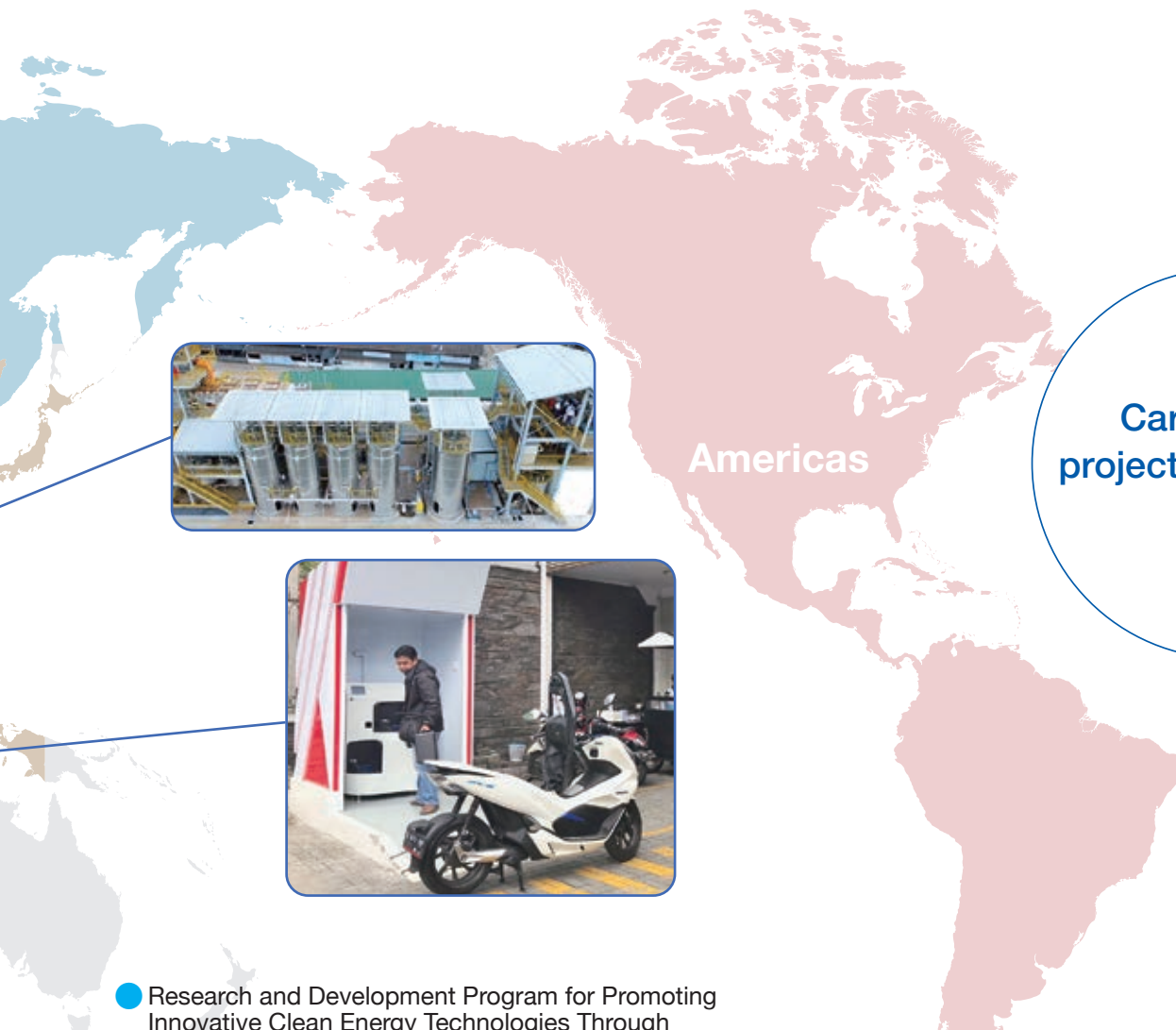
| | |
|---|----------|
| Demonstration Project on Improved Power Generation Using Digital Technologies | Thailand |
| Demonstration Project for Low-Carbonized Operation of a Power Grid Utilizing Online Voltage-var (Q) Optimal Control "OPENVQ" with ICT | Thailand |

Demonstration Project for Introducing an Energy-Saving Resource Circulation System in Asia

| | |
|--|----------|
| Demonstration Project on an Energy-Saving Resource Circulation System to Utilize Waste Electrical and Electronic Equipment in Thailand | Thailand |
|--|----------|

International Research and Development Co-Funding Projects

| | |
|---|----------------|
| Smart Radiation Monitoring using novel Scintillator and Artificial Intelligence Algorithm | France |
| Biobased Methacrylates for a Sustainable Future | UK |
| Delivering next-generation smart clothing: Developing safe, sustainable, smart life jacket | UK |
| Bright Laser diodes for advance metal additive manufacturing systems | UK |
| Valorization and catalytic transformations for green solvent innovations (electrolytes for Li-ion batteries and Li-Sulfur batteries and new pigment formulation innovations) from plastic waste | Spain |
| Clarification of Fuel and Oil Flow Behavior Around the Piston Rings of Internal Combustion Engines | Germany |
| Ultralight CFRP Mirror for Space Telescope | Germany |
| Minimal Fab Design of the Atomic Layer Deposition System | Czech Republic |
| Active Noise Control for Open Acoustics Headphones | Israel |
| Q-Band Low Noise Block Downconverter for Satellite Communications | Canada |



Carrying out projects around the world

Research and Development Program for Promoting Innovative Clean Energy Technologies Through International Collaboration

| | |
|---|---------------------------|
| International Collaborative R&D for Low-Cost and High-Durability Solar Cells | UK & France |
| International Joint R&D for Multi-Junction Solar Cells Based on Innovative and Novel Structures | France |
| Development of Microbial Production of Next-Generation Polylactate from Biomass-Derived Sugars | Finland |
| International Joint Research on Efficient Intermediate Temperature Solid Oxide Electrolysis Cell | Germany, UK & Switzerland |
| Chemical Productions through Formate Intermediates by Solid Bis-metallic Catalysts | France |
| International Joint Research of Innovative Thermoelectric Devices and Advanced Evaluation Technology | France, Germany & Korea |
| Development of innovative solution growth technology that improves productivity and quality of SiC crystals | France |
| International Joint Research for Metal-free Redox Flow Battery | Italy |
| International collaboration on CCU for circular carbon in Steelmaking | Spain |
| International joint research and development of innovative high-temperature thermal energy storage technology | Sweden & India |
| International collaboration on CIS-based tandem PVs | Germany |

| | |
|---|---|
| International joint research and development of lead-free alloyed tin perovskite tandem solar cells | Italy |
| Long-term stabilization of automotive adhesion and the interfacial design | Germany |
| Reliability Assessment Methodology for Advanced Ceramic Matrix Composites (CMCs) | USA & UK |
| International Joint Research on High Voltage Devices and Power Electronics Element Technologies for the Effective Utilization of Renewable Energy | Switzerland, Germany & USA |
| International joint research for supply technology of high-pressure and purity of hydrogen by chemical compressor using formic acid | France, Korea, Saudi Arabia, UK & Netherlands |
| International joint R&D of CO2 direct utilization jet fuel synthesis for carbon recycle | Thailand |
| International Project of Innovative Artificial Apomixis Induction Technology | USA |
| International Joint Research on Solid Oxide Reversible Electrolyzer Cells | USA |
| International Joint Research and Development of Solar Concentrating Reactor for Carbon Dioxide Decomposition | USA |
| International R&D collaboration for low-cost CO2 recovery technology using novel zeolite adsorbent | USA |
| Development of advanced low-temperature sintering process using nanocrystals for next generation energy devices | USA |



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