NEDO Activity Report
Annual Report

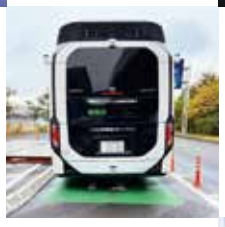
FY 2020 April 2020 -March2021









New Energy and Industrial Technology Development Organization

Accelerating Innovation for a Sustainable Future Beyond Our Four Decades of Initiatives

In October 2020, NEDO marked its 40th anniversary as one of Japan's largest public research and development management organizations. Ever since its foundation in 1980, NEDO has helped the Japanese government take the lead in pursuing an economic and industrial policy aimed at addressing energy and global environmental problems and building up the technological capabilities of industry. To further support the fulfillment of these two missions, NEDO works closely with companies, universities, and public research institutions to develop and demonstrate innovative technologies.

In FY2020, the third year of NEDO's Fourth Five-Year Plan, efforts to optimize the results of technology development activities were continued in four sectors: Energy Systems; Energy Conservation and Environment; Industrial Technology; and New Industry Creation and Discovery of Technology Seeds. In addition, NEDO sought to further strengthen its management capacity in all stages of technology development, from strategy formulation to practical application, with a view to promoting ambitious research and development, encouraging open innovation, and fostering R&D ventures. To this end, NEDO adopted the following three pillars: pursuing the practical application of research outcomes through technology development management; encouraging the growth of R&D ventures; and offering a new direction for mid- to long-term technology development.

With COVID-19 cases surging around the world, NEDO published a report in June 2020 entitled "Social Changes and Promising Innovations in the Post-COVID World." This report drew favorable responses from many organizations. In October of the same year, NEDO worked with the Ministry of Economy, Industry and Trade (METI) to host international discussions on environmental innovations at the following events as part of a series of leading conferences dubbed the Tokyo Beyond-Zero Week: Hydrogen Energy Ministerial Meeting 2020, Second International Conference on Carbon Recycling 2020, and Innovation for Cool Earth Forum 2020.

In an effort to keep pace with the global pivot toward a carbon-free future, Japanese Prime Minister SUGA Yoshihide declared in October 2020 that Japan would become carbon-neutral by 2050. In line with this commitment, NEDO has intensified its efforts to reach carbon neutrality. Examples of these efforts include a renewable energy project involving the Fukushima Hydrogen Energy Research Field (FH2R), the world's largest hydrogen production plant operating with renewable energy, as well as the demonstration of carbon recycling technologies in Osakikamijima, Hiroshima Prefecture.

FY2020 also marked the full-scale launch of the Moonshot Research and Development Program, a Japanese initiative for funding homegrown disruptive innovations, as well as efforts to develop post-5G technologies for telecommunication systems to bolster the competitive edge of Japanese industry.

Furthermore, NEDO and eight other government agencies have agreed to work together through the Platform for Unified Support for Startups (Plus) to provide better one-stop services.

Through its initiatives for harnessing both digital transformation measures aimed at realizing Society 5.0 and green innovations aimed at securing a carbon-free future, NEDO has become keenly aware of the increasingly sophisticated and demanding roles that it is expected to fulfill. To live up to such expectations, NEDO is committed to resolutely underpinning Japan's energy and environment policy and leading the country's innovation policy. In the coming decade, NEDO aspires to advance innovations even further to offer solutions to global issues by encouraging the practical application of research outcomes.

New Energy and Industrial Technology Development Organization (NEDO)

Chairman **ISHIZUKA Hiroaki**

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FY2020 Budget

1.44 billion US dollars

NEDO aims to address energy and global environmental problems and raise the level of industrial technology through 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.

512 million US dollars

Energy Systems

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

395 million US dollars

Energy Conservation and Environment

- Technology to harness unutilized thermal energy
- Environmentally-friendly steel manufacturing technology
- Development of high-efficiency coal-fired power generation technology
- CO_2 capture, utilization and storage
- Fluorocarbon recovery technology
- 3R technology, including resource screening and metal refining technology
- International demonstrations, Joint Crediting Mechanism activities, and others

409 million US dollars

Industrial Technology

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

60 million US dollars

New Industry Creation and Discovery of Technology Seeds

- Fostering technology-based startups
- Promotion of open innovation

Managing Technological Development to Utilize Results in Society

To ensure that its activities have meaningful benefits to society, NEDO engages in activities that range from collecting research and development information from around the world to devising strategies and implementing and assessing projects in various fields using a consistent management system.

Start

Collecting information and formulating strategies for each field

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

1-2 Years

Developing technology to support progress in fields with a promising future

Project planning

NEDO projects make it possible!

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

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.

2-6 Years

Technology development and demonstration testing

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.

10 Years

Project review and follow-up monitoring

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.

FY 2020 Project List

Energy Systems

Project name	Period (FY)	Department
Next-Generation Power Network Stabilization Technology Development for Large-Scale Integration of Renewable Energies	2019 - 2023	Smart Community Department
Research and Development of a Multi-Purpose and Multi-Terminal High Voltage Direct Current Transmission System	2020 - 2023	Smart Community Department
Research and Development of Wind Power Generation Technologies	2008 - 2022	New Energy Technology Department
Project for Supporting the Introduction of Wind Power Generation	2013 - 2022	New Energy Technology Department
Demonstration of Ocean Energy Power Generation	2018 - 2020	New Energy Technology Department
Research and Development of Geothermal Energy Generation Technologies	2013 - 2020	New Energy Technology Department
Research and Development of Supercritical Geothermal Resources	2018 - 2020	New Energy Technology Department
Development of Production Technologies for Biojet Fuels	2017 - 2024	New Energy Technology Department
Demonstration Project for Independent Regional Biomass Energy Systems	2014 - 2020	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
Development of Material Evaluation Techniques for Advanced and Innovative Batteries (Phase 2)	2018 - 2022	Advanced Battery and Hydrogen Technology Department
Research and Development Initiative for Scientific Innovation of New Generation Batteries 2	2016 - 2020	Advanced Battery and Hydrogen Technology Department
Advancement of Hydrogen Technologies and Utilization Project	2014 - 2022	Advanced Battery and Hydrogen Technology Department
Development of Technologies for Realizing a Hydrogen Society	2014 - 2022	Advanced Battery and Hydrogen Technology Department
Development of Technologies for Hydrogen Refueling Stations	2018 - 2022	Advanced Battery and Hydrogen Technology Department
Collaborative Industry-Academia-Government R&D Project for Solving Common Challenges Toward Dramatically Expanded Use of Fuel Cells and Related Equipment	2020 - 2024	Advanced Battery and Hydrogen Technology Department
NEDO Feasibility Study Program	2014 - 2023	Innovation Promotion Department
International Demonstration Project on Japan's Energy Efficiency Technologies	1993 - 2020	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 - 2020	International Affairs Department
Research and Development Program for Promoting Innovative Clean Energy Technologies Through International Collaboration	2020 - 2024	International Affairs Department
Research for Strategy Formulation	2000 -	Technology Strategy Center
Moonshot Research and Development	2020 -	Innovation Promotion Department

Energy Conservation/Environment

Project name	Period (FY)	Department
Research and Development Project on Innovative Thermal Management Materials and Technologies	2015 - 2022	Energy Conservation Technology Department
Project to Promote Commercialization of High-Temperature Superconductivity Technology	2016 - 2020	Energy Conservation Technology Department
Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation	2016 - 2024	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
Development of Zero-Carbon Steel Technologies	2020 - 2021	Environment Department
Development of Carbon Circulation Technology for the Cement Industry	2020 - 2021	Environment Department
Innovative Plastic Resource Circulation Process Technology Development	2020 2024	Environment Department
Research, Development and Demonstration of CCUS Technology	2018 - 2024	Environment Department
Development of Environmental Technology for Steelmaking Process	2013 - 2022	Environment Department, Energy Conservation Technology Department
Strategic Innovation Program for Energy Conservation Technologies	2012 - 2021	Energy Conservation Technology Department
NEDO Feasibility Study Program	2014 - 2023	Innovation Promotion Department
Demonstration Project for Introducing an Energy-Saving Resource Circulation System in Asia	2016 - 2020	Environment Department
Project for International Promotion and Dissemination of Carbon Recycling and Advanced Thermal Power Generation Technologies	2017 - 2021	Environment Department
International Demonstration Project on Japan's Energy Efficiency Technologies	1993 - 2020	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 - 2020	International Affairs Department
Research and Development Program for Promoting Innovative Clean Energy Technologies Through International Collaboration	2020 - 2024	International Affairs Department
Research for Strategy Formulation	2000 -	Technology Strategy Center
Moonshot Research and Development	2020 -	Innovation Promotion Department

Industrial Technology

Project name	Period (FY)	Department
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 - 2021	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
Technical Base Development for Secure and Reliable Drones	2020 - 2020	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 Technologies for Super Energy-Efficient Optical Electronics Implementation Systems	2013 - 2021	Internet of Things Promotion 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, Innovation Promotion Department
Development of Advanced Laser Processing with Intelligence Based on High-Brightness and High-Efficiency Next-Generation Laser Technologies (TACMI Project)	2016 - 2020	Internet of Things Promotion Department
Development Project on Data Sharing in Collaborative Areas and AI System to Achieve the "Connected Industries"	2019 - 2021	Internet of Things 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
Research and Development of Innovative Structural Materials	2014 - 2022	Materials Technology and Nanotechnology Department
Development of Magnetic Materials for High-Efficiency Motors	2014 - 2021	Materials Technology and Nanotechnology Department
Ultra High-Throughput Design and Prototyping Technology for Ultra Advanced Materials Development	2016 - 2021	Materials Technology and Nanotechnology Department
Artificial Photosynthesis Project	2014 - 2021	Materials Technology and Nanotechnology Department
Development of Innovative Catalytic Processes for Organosilicon Functional Materials	2014 - 2021	Materials Technology and Nanotechnology Department
Development of Production Techniques for Highly Functional Biomaterials Using Plant and Other Organism Smart Cells	2016 - 2020	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
NEDO Feasibility Study Program	2014 - 2023	Innovation Promotion Department
International Demonstration Project on Japan's Energy Efficiency Technologies	1993 - 2020	International Affairs Department
Research and Development Program for Promoting Innovative Clean Energy Technologies Through International Collaboration	2020 - 2024	International Affairs Department
International Research and Development Co-Funding Project	2014 - 2020	International Affairs Department
Research for Strategy Formulation	2000 -	Technology Strategy Center
Development of Digital Technologies for Refinement of Regulations	2020 - 2020	Robot and Artificial Intelligence Technology Department
Moonshot Research and Development	2020 -	Technology Strategy Center
Research and Development Project for Enhancement of the Bases for Post-5G Information and Communication Systems	2020 -	Internet of Things Promotion Department

New Industry Creation and Seed Discovery

Project name	Period (FY)	Department
Development Promotion Project for Practical Use of Welfare Equipment	1993 -	Innovation Promotion Department
Research and Development on New Energy Technology for Discovering Technology Seeds and Commercializing Developed Technologies	2007 -	Innovation Promotion Department
Technology-Based Startup Support Program	2014 - 2023	Innovation Promotion Department
Program to Support Ventures for Developing Space Components	2018 - 2021	Innovation Promotion Department
Intensive Support for Young Promising Researchers	2020 2024	Innovation Promotion Department
NEDO Feasibility Study Program	2014 - 2023	Innovation Promotion Department
Fundamental Technology Research Facilitation Program	2001 -	Innovation Promotion Department
Moonshot Research and Development	2020 -	Innovation Promotion Department

National Projects
Specified Proposal-Based Research and Development
Proposal-Based Activities
Demonstration Projects
International Demonstration and Joint Projects
Other Projects
Survey Activities

NEDO Hot Topics

In the pursuit of a sustainable society, NEDO is engaged in the development and demonstration of a wide range of technologies that address various challenges. This section provides an overview of FY2020 by highlighting key NEDO activities from each month.

4 April

Effective application of AI reduces the number of tests used in the development of flexible transparent film to less than one twenty-fifth of the number required with conventional approaches

>> P.25

Application for a flexible transparent film
(Requires both transmittance and mechanical strength)

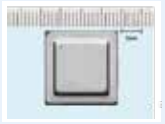
6 June

NEDO commences demonstrations of automated driving around Haneda Airport

>> P.21

NEDO prototype of AI-edge LSI achieves ten times efficiency in image recognition and image processing and 1/20 SLAM processing time

>> P.22



Prototype of an evolutionary low-power LSI for AI-enabled edge computing

NEDO signs an agreement with the Fukushima Prefectural Government for more extensive use of low-carbon hydrogen

>> P.10 P.13

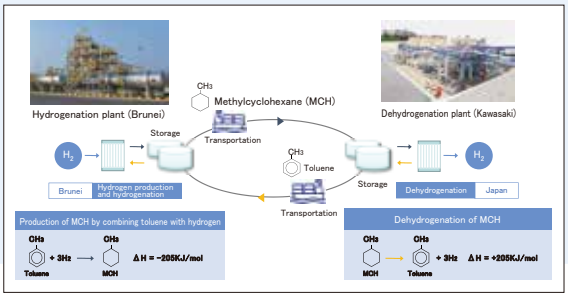
TSC releases the "TSC Brief Report: Social Changes and Promising Innovations in the Post-COVID World"

>> P.10 P.34

NEDO conducts the world's first full-scale demonstration of international hydrogen transportation

World's first

>> P.12



Demonstration of a supply chain for hydrogen produced using untapped energy by means of the organic chemical hydride method

2020. 4 | 5 | 6 | 7 | 8 | 9

5 May

NEDO develops a search engine with a focus on case reports concerning COVID-19 infections

>> P.23

NEDO releases a "Comprehensive Report" on the Large-scale CCS Demonstration Project in Tomakomai

>> P.19

Tomakomai CCS demonstration site

NEDO develops the world's first photocatalyst for a water-splitting process with a quantum yield of nearly 100%

World's first

>> P.25

NEDO releases the third edition of the Open Innovation White Paper

>> P.32

7 July

NEDO develops a hybrid multi-tasking machine with blue diode lasers to perform copper cladding six times faster than conventional solutions

>> P.24

Hybrid multi-tasking machine

NEDO signs a partnership agreement with eight government agencies that help business startups

>> P.32

Plant for demonstrating dry low-NOx combustion with a hydrogen-fueled gas turbine

World's first

NEDO conducts the world's first successful demonstration of dry low-NOx combustion with a hydrogen-fueled gas turbine

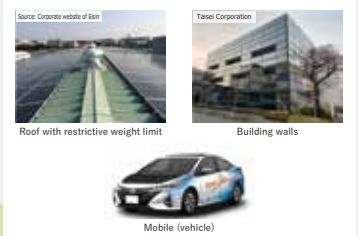
>> P.13

NEDO commences the development of AI technology evolving together with humans

>> P.20

NEDO picks 44 areas to support the development of new photovoltaic technologies

>> P.15



Examples of new photovoltaic markets

8 August

NEDO commences the development of carbon recycling technologies at the R&D and demonstration base in Osakikamijima
>> P.18

Appearance of the IGFC* demonstration plant (*) Integrated Coal Gasification Fuel Cell Combined Cycle

Planned base for R&D and demonstration of carbon recycling technologies

NEDO commences the development of innovative process technologies for plastic recycling
>> P.19

10 October

Demonstration of ferro-coke production commences in a medium-sized facility
>> P.17

Project launches to lay the foundation for research and development into innovative robots
>> P.8

NEDO completes the world's first rack-mounted server-board optical interconnect system
World's first
>> P.22

NEDO signs an agreement with the Namie Municipal Government for more extensive use of hydrogen
>> P.10 P.13

NEDO develops a loop heat pipe with the world's highest heat transport capacity of 6.2 kW without relying on a power supply
World's best
>> P.17


Loop heat pipe with a high heat transport capacity for harnessing untapped thermal energy

Grand prix awards received in multiple categories at the CEATEC AWARD 2020
>> P.23 P.36

12 December

NEDO develops a new autofluorescence microscopy method to perform quantitative evaluations and identify the physiological status of microbes in just ten minutes
>> P.26


Confocal laser microscopy system

10 | 11 | 12 | 2021.1 | 2 | 3

9 September

NEDO commences research and development toward dramatically expanded use of fuel cells and related equipment
>> P.12

NEDO commences the development of automatically operating robots for last-mile delivery
>> P.8


Demonstration of delivery in residential neighborhood (Panasonic)

NEDO increases the productivity of a rare amino acid (ergothioneine) almost 1,000-fold compared to conventional levels
>> P.26

11 November

World's first energization of a three-phase coaxial superconducting power cable successfully conducted in a demonstration at a private plant
World's first
>> P.16

NEDO picks 11 projects to support the development of energy-saving technologies for adapting to pandemic-induced social changes
>> P.16

NEDO tests broadcast communication for the remote identification of unmanned aircraft
>> P.20


Demonstration of a traffic management system

NEDO develops Japan's first dry methane fermentation (biogas) plant for small dairy farmers
>> P.31



Automatic feeder and pretreatment unit for raw materials as well as an FRP methane fermentation tank (thermophilic dry fermentation)

2 February

NEDO develops a platform to consolidate its achievements from individual projects
>> P.24


Laser processing machine mounted on the Kashiwa-II Platform

Annual Report 2020.4-2021.3

NEDO Highlights

This section presents a selection of high-profile projects conducted by NEDO in FY2020.

A ray of hope amid the pandemic gloom

Robots

Practical robotics applications that meet the needs of the times, including applications for contact-free and high-mix low-volume production

NEDO promotes the pursuit of promising robotics projects that offer solutions to recent labor shortages as well as other challenges faced by society, such as the need to shift away from manual production due to the pandemic.

Automatically operating robots

NEDO began developing automatically operating robots to facilitate remote and contact-free last-mile delivery from logistic hubs to residences or other destinations, which is an especially promising solution during the pandemic. Demonstrations of the robots are underway to verify their mobility in multifamily residential buildings, urban areas, commercial facilities, and industrial districts.
Increased use of such robots will be pursued to offer innovative delivery services and overcome various challenges, such as the shortfall of delivery workers during a time of surging demand for deliveries being exacerbated by the spread of coronavirus infections among such workers.

Demonstration on a public road (SoftBank)

Test delivery to an apartment (Japan Post)

Demonstration of delivery in a residential neighborhood (Panasonic)

Innovative industrial robots

An alliance was forged by 11 companies together with 11 universities and other educational institutes to commence research and development into the core technologies for innovative industrial robots that are more compatible with high-mix low-volume production and other processes where robots have not really been utilized until now. This alliance goes beyond simply improving on existing technologies. It seeks to develop innovative new technologies by returning to scientific basics and adopting seed technologies from other fields.

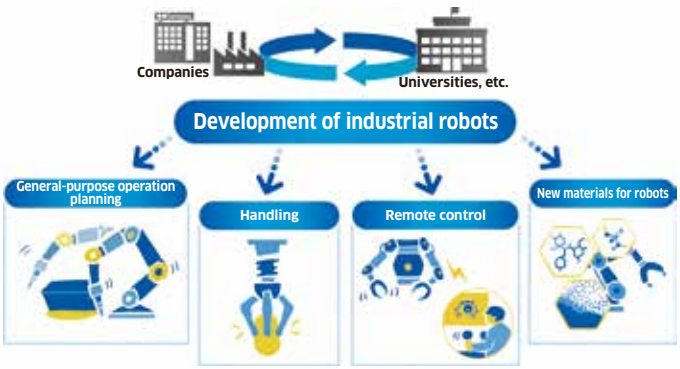


Illustration of the Project to Construct a Basis for Research and Development of Innovative Robots

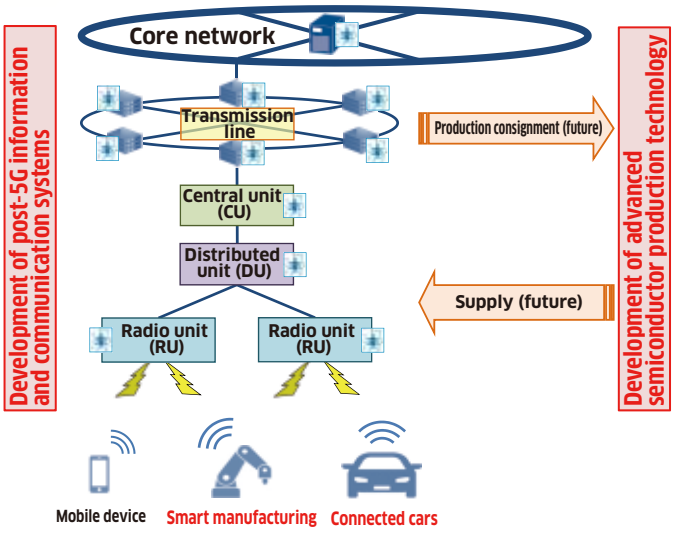
Advancing the digitization of society

Post-5G telecommunications systems

NEDO advances the development of promising next-generation telecommunications systems for smart factories, automated driving, and various other industrial applications

In line with Japan's efforts to realize Society 5.0, NEDO has set up a fund for the development of the core technologies and semiconductors necessary for post-5G telecommunications networks, which are expected to bolster the competitive edge of Japanese industry.

The 5G telecommunications systems that have been commercially applied in Japan and other countries since 2020 provide faster connections and greater capacity than their predecessors. Post-5G telecommunications systems that offer ultra-low latency, multiple simultaneous connections, as well as other enhanced features are expected to further shore up smart factories, automated driving, and other industrial processes. As Japan works to realize Society 5.0, these networks are expected to bolster the competitive edge of Japanese industry.
Given this, NEDO has set up a fund for the development of the core technologies and semiconductors necessary for post-5G telecommunications systems.
By conducting a first call for proposals in April 2020, NEDO funded projects for the development of a cloud-native core network system, a faster optical transmission line, and a multi-vendor connection technology with a virtualized and open base station. Further development of core technologies will be continued to develop a post-5G telecommunications system, thereby reinforcing Japan's manufacturing base.



Development of post-5G telecommunications systems to reinforce Japan's manufacturing base

Pioneering new fields

Moonshot Research and Development Program

NEDO funds 13 R&D projects aimed at restoring the Earth's environment through homegrown disruptive innovations

In August 2020, R&D projects selected by NEDO were launched with the aim of addressing the problems of global warming (Cool Earth) and environmental pollution (Clean Earth) to further efforts to restore the Earth's environment.

The Japanese government established the Moonshot Research and Development Program to encourage ambitious research and development into unprecedented technologies inspired by bold ideas with the aim of fostering homegrown disruptive innovations. In order to achieve Moonshot Goal 4: Realization of sustainable resource circulation to recover the global environment by 2050, NEDO has started pursuing ambitious R&D, including R&D on Direct Air Capture (DAC) technology which directly captures CO_2 from the atmosphere and converts it into materials, and R&D on marine biodegradable plastics which can control the timing and speed of their degradability.

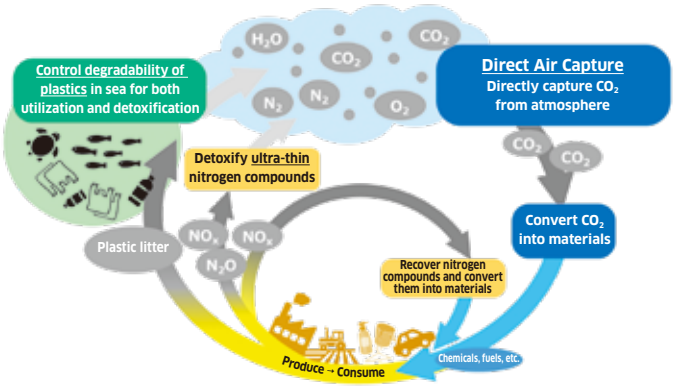


Figure: R&D to be promoted for realization of sustainable resource circulation

Initiatives in the spotlight

Special Feature

NEDO signs partnership agreements with the Fukushima Prefectural Government and the Namie Municipal Government to encourage more extensive use of renewable energy and hydrogen

In an attempt to establish low-cost clean technologies for producing hydrogen with renewable energy, NEDO is conducting empirical research at the Fukushima Hydrogen Energy Research Field (FH2R) in Namie, Fukushima Prefecture. The aim of this research is to promote the effective use of the low-carbon hydrogen produced at FH2R and the wider application of hydrogen energy. To this end, NEDO signed basic partnership agreements with the Fukushima Prefectural Government and the Namie Municipal Government on June 19 and October 26, 2020, respectively. The Fukushima Prefectural Government encourages the broader application of renewable energy, the development of related industries, and the formation of clusters among them. The Namie Municipal Government is continuing with its community development to take the lead in the transition to a hydrogen society. FH2R supplies hydrogen for the pure hydrogen fuel cells installed at the Azuma Sports Park, J-Village, and Namie Michi-no-Eki to provide part of the electricity and heat for these facilities.

Fukushima Hydrogen Energy Research Field (FH2R)

Signing ceremony with the Fukushima Prefectural Government

Signing ceremony with the Namie Municipal Government

TSC Brief report

Publication of "Social Changes and Promising Innovations in the Post-COVID World"

On June 24, 2020, NEDO released the "TSC Foresight Brief Report: Social Changes and Promising Innovations in the Post-COVID World" ("COVID-19 Report"). Compiled immediately as it became clear that the pandemic was causing social change across the world, this report describes the social challenges posed by the pandemic and presents various promising innovations designed to address them. The report received considerable feedback from various sectors. (see Page 34 for details).

COVID-19 Report

https://www.nedo.go.jp/library/ZZNA_100039.html

40th anniversary of NEDO's foundation

Publication of "NEDO 40th Anniversary Report: Building a Brighter Future through Innovations"

NEDO 40th Anniversary Report: Building a Brighter Future through Innovations

In October 2020, NEDO marked the 40th anniversary of its foundation. The organization was established in 1980 to take the lead in efforts to explore new energy sources and energy conservation with the aim of helping Japan wean itself away from its over-reliance on petroleum following the oil crises of the 1970s. In 1988, NEDO assumed the additional role of conducting research and development into industrial technologies. Ever since then, NEDO has promoted the development of various technologies as one of Japan's largest public research and development management organizations.
The 40th Anniversary Report summarizes how NEDO has helped develop new technologies and supported business startups in line with the changing social conditions in Japan and the rest of the world. In addition, it features interviews with leading experts from Japan and abroad, including two Nobel prize winners, Dr. YOSHINO Akira and Dr. AMANO Hiroshi.

https://www.nedo.go.jp/library/ZZKH_100063.html

Project Summaries by Field

Energy Systems

12 Energy Systems

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Energy Systems

NEDO adopts a cross-sectoral approach in the development of technologies for the wider application of batteries, fuel cells, and hydrogen as well as for the reliable operation of more robust power grids. It also conducts demonstrations of solutions developed to address both the technical and business issues associated with commercial operations with the aim of delivering more resilient and sustainable energy systems.

Hydrogen

NEDO conducts the world's first full-scale demonstration of international hydrogen transportation

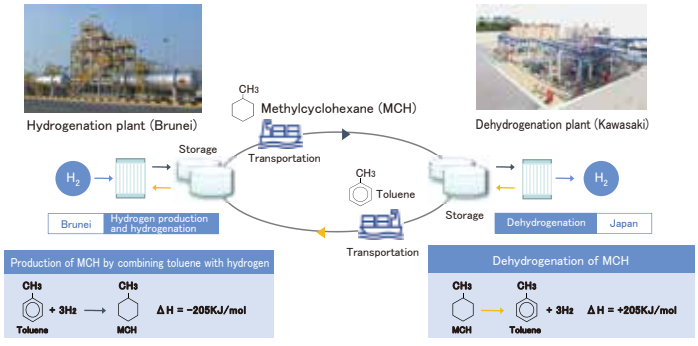
NEDO is conducting the world's first demonstration of international hydrogen transportation by adopting the organic chemical hydride method, which employs methylcyclohexane as a hydrogen carrier. This demonstration lays the groundwork for the establishment of a global supply chain that runs all the way from the point of supply to the point of consumption.

Achievements

Methylcyclohexane (MCH) produced in Brunei is transported by sea to a dehydrogenation plant in Kawasaki. After dehydrogenation of MCH, the hydrogen is supplied as fuel for a gas turbine at the Mizue Thermal Power Plant operated by TOA Oil. Meanwhile, the toluene produced through dehydrogenation is shipped back to Brunei for reuse by means of hydrogenation. The data required to facilitate a later scaling up of this demonstration is being obtained by verifying the supply chain for the hydrogen involved in these processes.

Going forward

Through this demonstration, NEDO is accumulating technologies for operating hydrogenation and dehydrogenation plants as well as the know-how required for international trade. To realize a hydrogen society, NEDO is striving to apply these outcomes effectively and establish a large-scale system for generating power with hydrogen shipped from overseas or utilizing hydrogen in other ways.



Demonstration of a supply chain for hydrogen produced using untapped energy by means of the organic chemical hydride method

Project outline

Name: Development of Technologies for Realizing a Hydrogen Society
Implementation: FY2014-2025 **Budget for FY2020:** 14.12 billion yen

Hydrogen

NEDO commences research and development toward dramatically expanded use of fuel cells

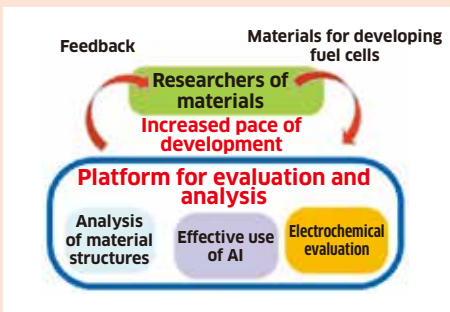
A new R&D project was initiated with the aim of accelerating the wider use of fuel cells in vehicles (FCVs) and their installation for business or industrial use. Examples of the 46 topics encompassed by this project include the development of fundamental technologies capable of delivering the level of coordination required to meet user needs and the development of technologies for expanding the application of fuel cells.

Achievements

A platform was created to facilitate the evaluation and analysis of polymer-electrolyte fuel cells to allow structural evaluations of material samples based on common benchmarks and offer feedback to researchers. This platform is expected to drive the development of materials, components, and element technologies with the aim of providing cheaper fuel cells that offer greater durability and improved performance. Through this platform, NEDO also intends to streamline and expedite relevant research and development while encouraging researchers with backgrounds in fields other than electrochemistry to join these efforts.

Going forward

Through this project, NEDO is working to realize a hydrogen society while also reinforcing Japan's competitive edge as a fuel cell pioneer and consolidating its leading position in the global market.



Concept of the evaluation and analysis platform

Project outline

Name: Collaborative Industry-Academia-Government R&D Project for Solving Common Challenges Toward Dramatically Expanded Use of Fuel Cells and Related Equipment
Implementation: FY2020-2024 **Budget for FY2020:** 5.25 billion yen

Hydrogen

NEDO conducts the world's first successful demonstration of dry low-NOx combustion with a hydrogen-fueled gas turbine

NEDO has been conducting co-generation system demonstrations using hydrogen-fueled gas turbines on Port Island, Kobe. One such turbine, developed by Kawasaki Heavy Industries, is equipped with a micro-mix burner to achieve dry low-NOx combustion. This technology was successfully demonstrated for the first time in the world in a test that began in May 2020. This type of combustion boasts greater efficiency than the combustion that occurs in conventional turbines.

Achievements

Power generation using dry combustion achieves greater efficiency and lower NOx emissions compared to the conventional water injection method. One major issue that needed to be addressed was ensuring stable combustion while suppressing the backfire caused by extremely fast hydrogen combustion. NEDO successfully developed and demonstrated the world's first gas turbine to achieve dry low-NOx combustion by adopting a micro-mix burner that utilizes multiple miniaturized hydrogen flames.

Going forward

Building on this achievement, NEDO is striving to establish a new system for ensuring a more efficient supply and use of energy in local communities with the aim of realizing a society capable of tapping into hydrogen as a source of energy.

Project outline

Name: Development of Technologies for Realizing a Hydrogen Society
Implementation: FY2014-2025 **Budget for FY2020:** 14.12 billion yen

Plant for demonstrating dry low-NOx combustion with a hydrogen-fueled gas turbine

Hydrogen

NEDO signs partnership agreements with the Fukushima Prefectural Government and the Namie Municipal Government to encourage broader use of low-carbon hydrogen

NEDO has signed partnership agreements with the Fukushima Prefectural Government and the Namie Municipal Government to encourage the broader application of renewable energy as well as hydrogen produced by such energy sources. Cooperation will be sought mainly by demonstrating the production of hydrogen from renewable energy at the Fukushima Hydrogen Energy Research Field (FH2R), which opened in March 2020 in Namie, Fukushima Prefecture.

Achievements

Based on these agreements, FH2R supplies hydrogen for the pure hydrogen fuel cells installed at Azuma Sports Park (Fukushima City), J-Village (Naraha Town), and Namie Michi-no-Eki (Namie Town) to cover part of their electricity and heat needs. FH2R also supplied hydrogen in a timely manner at the delivery ceremony for the new fuel cell vehicles that the two governments will be adopting.

Going forward

NEDO will take the lead in efforts to promote greater hydrogen use in Fukushima Prefecture by encouraging the effective use of hydrogen produced at FH2R and by providing relevant information.

Signing ceremonies with the Fukushima Prefectural Government and the Namie Municipal Government

Project outline

Name: Development of Technologies for Realizing a Hydrogen Society
Implementation: FY2014-2025
Budget for FY2020: 14.12 billion yen

Power grids

NEDO starts the development of an advanced high-voltage direct current (HVDC) power transmission system

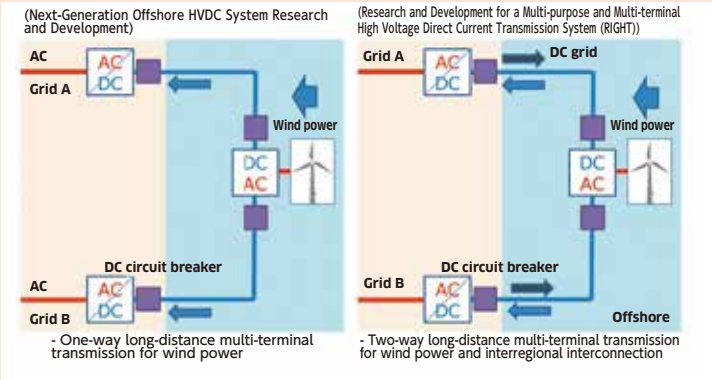
In Japan, the efficient transmission of power from promising offshore wind farms has been hindered by the considerable distances between suitable sites for such farms and areas with high power consumption. To resolve this issue, NEDO began developing an efficient system for multi-terminal direct current power transmission over long distances in FY2020. This initiative built on the achievements of an earlier project that was conducted until FY2019 to develop a system for DC power transmission from offshore sources.

Background and significance

Offshore wind power generation has been identified as a key priority in the Green Growth Strategy set out by the Japanese government with the aim of reaching carbon neutrality by 2050. Power generation sites located in the ocean or near isolated islands can exploit the better wind conditions found there and they suffer fewer locational constraints. Systems for multi-terminal HVDC power transmission over long distances are vital for facilitating the efficient supply of vast amounts of energy from remote sources to major cities.

Going forward

NEDO aims to develop an HVDC power transmission system by adopting a multi-terminal cable that allows wind power to be reliably transmitted while also implementing suitable protection controls and tidal controls. Going beyond simply promoting wind power, NEDO will also summarize by FY2023 the technical requirements that will need to be met to help balance power supply with demand, address obstacles to the adoption of renewable energy, and ensure a more resilient power supply.



Conventional (one-way) and new (two-way) multi-terminal DC power transmission systems

Project outline

Name: Research and Development for a Multi-purpose and Multi-terminal High Voltage Direct Current Transmission System (RIGHT)
Implementation: FY2020-2023 **Budget for FY2020:** 1 billion yen

Power grids

Promoting the development of systems for leveraging existing power grids and facilitating the large-scale effective application of renewable energy

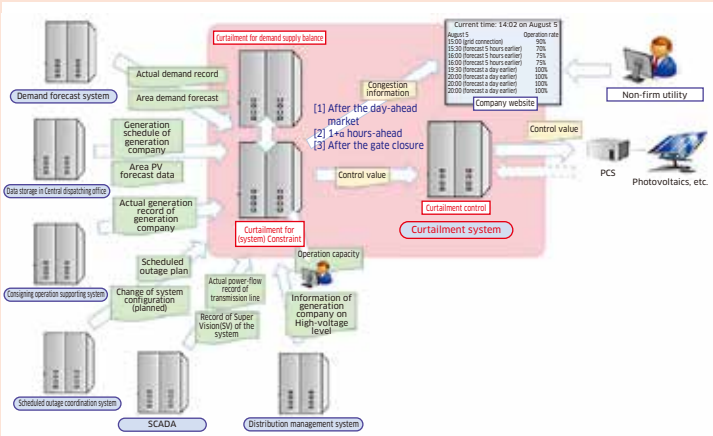
NEDO develops core system technologies for the early adoption of non-firm connections in line with government discussions on facilitating the effective application of renewable energy. Such connections enable power sources to be added in situations where their outputs are controllable in the event of connected grids being overloaded.

Background and significance

In order to further introduce renewable energy sources such as solar power generation and wind power generation which vary according to the weather, a considerable reinforcement of the power grids is required given the constraints of existing technologies and the institutional framework. This is no easy task as securing the necessary plots will require a tremendous amount of time and money. Therefore, the effective adoption of renewable energy depends crucially on the development of a system for enabling non-firm connections to make the most of existing grids.

Going forward

The findings of a FY2019 feasibility study will be incorporated into the design process of a complex system for enabling non-firm connections, which requires a high degree of reliability. By FY2023, NEDO intends to develop a smart and efficient system after conducting a field demonstration. It will also establish a method for operating such a system effectively in order to quicken the pace of its practical application.



Conceptual diagram of a non-firm connection system

Project outline

Name: Next-Generation Power Network Stabilization Technology Development for Large-Scale Integration of Renewable Energies
Implementation: FY2019-2023 **Budget for FY2020:** 2.19 billion yen

Renewable Energy

NEDO is striving to facilitate the large-scale application of renewable energy with the aim of making it a mainstream source of power. To this end, NEDO issues guidebooks and sets out technical and other guidelines while also working to develop and demonstrate relevant technologies so that renewable energy can be tapped into at lower costs. Examples of energy sources targeted by NEDO include photovoltaics, wind, marine energy, and geothermal energy for power generation; biomass energy for cogeneration; and renewable thermal energy.

Photovoltaics

NEDO picks 44 areas to support the development of new photovoltaic technologies

NEDO has picked 44 target areas to support Development of Technologies to Promote Photovoltaic Power Generation as Main Power Source that could help turn photovoltaics and other renewable energy sources into mainstream sources of power. The aim of this project is to create a new photovoltaic market, turn photovoltaics into a reliable and lasting source of power, and develop common core technologies. In addition to boosting the application of photovoltaics, the project also seeks to bolster the competitive edge of Japanese industry.

Background and significance

Until now, photovoltaic systems have mainly been installed on the ground or rooftops. However, suitable sites such as these are expected to become scarce. Furthermore, these systems would need to be made safer and more reliable for them to serve as reliable sources of power over the long term. Solutions also need to be devised to recycling technology for the growing number of photovoltaic power generation equipment and to mitigate their load impact on power grids

Going forward

This project seeks to expand the applications of solar cells and create new markets by developing new materials and production methods. New markets for photovoltaic system installation include building walls, roofs with restrictive weight limits, and vehicles. The project also aims to enable existing photovoltaic installations to function as reliable sources over the long term.

Roof with restrictive weight limit

Building walls


Mobile (vehicle)

Examples of new photovoltaic markets

Project outline

Name: Development of Technologies to Promote Photovoltaic Power Generation as Main Power Source
Implementation: FY2020-2024 **Budget for FY2020:** 3 billion yen

Biomass

Revision and disclosure of guidelines for self-sustaining local biomass energy projects

It is expected that more businesses will work in the biomass sector in the future with a view toward realizing a decarbonized society. However, in Japan, the foundation that supports business in this sector is fragile, and appropriate wisdom and ingenuity are required for long-term business continuity. Therefore, NEDO will contribute to the realization of an economically and sustainably established biomass energy business by creating and disclosing guidelines.

Achievements

NEDO has drawn up practical guidelines based on the findings of its feasibility studies and demonstration projects while keeping in mind various factors behind the success and failure of other leading projects in Japan. NEDO has made the guidelines even more user friendly in a newly revised version that outlines what needs to be done from conceptualization through the feasibility study phase as well as the decision-making process. The revised guidelines also include a tool that analyzes a project's performance by visualizing the ripple effects on the local economy.

Going forward

NEDO will continue revising its guidelines to enhance their practicality and usability. In doing so, it will summarize the challenges faced during demonstration projects and how they were overcome. The revision process will also incorporate the findings of feasibility studies based on commercial operation data and local economic evaluations, insights into the latest trends from studies in Japan and abroad, and feedback from users and experts. In addition, NEDO will hold workshops and other events to promote the widespread adoption of the guidelines.

Introduction requirements and technical guidelines on self-sustaining local biomass energy systems

https://www.nedo.go.jp/library/biomass_shishin.html

Project outline

Name: Demonstration Project for Self-Sustaining Regional Biomass Energy Systems/Studies for Establishing Requirements and Technical Guidelines for the Adoption of Biomass Energy
Implementation: FY2018-2021 **Budget for FY2020:** 70 million yen

Energy Conservation

The recent long-term energy supply and demand forecasts prepared by the Ministry of Economy, Trade and Industry (METI) are premised on thorough energy conservation with a reduction in final energy consumption by an oil equivalent of roughly 50.3 million kL. To make this happen, NEDO supports research and development into innovative technologies for saving energy and effectively harnessing untapped thermal energy.

Strategic energy conservation

NEDO picks 11 projects to support the development of energy-saving technologies for adapting to pandemic-induced social changes: Assistance for small businesses and entrepreneurial ventures as a new driving force of innovation

NEDO announced an additional call for proposals to urgently support energy-saving technologies in order to respond swiftly to pandemic-induced changes in social and energy structures. This call for proposals on the program was targeted exclusively at small businesses and entrepreneurial ventures as a driving force of technological innovations in energy conservation. Such calls for proposals would usually attract about 30 proposals, but 43 were received on this occasion. NEDO chose to support 11 of them.

Background and significance

R&D investment has dwindled among private companies hit hard by the pandemic. In response, NEDO urgently announced an additional call for proposals to encourage continued R&D activities and innovations to facilitate new lifestyles and adapt to pandemic-induced social changes. This was done as an extension of a program aimed at bolstering energy-saving technologies for achieving sustainable economic growth.

Going forward

NEDO will support the projects selected for this program until FY2022 to help society adapt to pandemic-induced changes while bolstering the competitive edge of Japanese industry.

Project outline

Name: Strategic Innovation Program for Energy Conservation Technologies
Implementation: FY2012–2022 **Budget for FY2020:** 7.35 billion yen

Extract from "TSC Foresight Brief Report: Social Changes and Promising Innovations in the Post-COVID World"

Superconductivity

World's first energization of a triaxial superconducting power cable successfully conducted in a demonstration at a private plant

SWCC Showa Cable Systems has developed a low-cost triaxial superconducting power cable that is expected to deliver reductions in transmission losses of more than 90%. This power cable is intended for use in aging private plants with transmission cables that need to be upgraded. The world's first demonstration of such a cable was conducted at a private plant.

Achievements

This demonstration illustrated the potential for this cable system to deliver significant reductions in both installation costs and cooling costs as well as the recovery of investment in less than ten years if the system is applied in petrochemical or other plants that use cooling media, such as liquid nitrogen. The cable developed under the project and a cooling system were installed at a plant operated by BASF Japan, a partner company in this research. Reliable power transmission has been maintained since its energization in November 2020.

Going forward

Tests will be conducted for roughly one more year until the end of September 2021 to check the system's energy-saving performance, running costs, safety, and reliability as well as to make sure that its application in other plants will have the anticipated effects. Public relations activities are also underway to promote the use of this technology in other plants.

Project outline

Name: Strategic Innovation Program for Energy Conservation Technologies/Development and Demonstration/Development of a Low-Cost Triaxial Superconducting Power Cable for In-Plant Use
Implementation: FY2017–2021 (demonstration and practical application)
Budget for FY2020: 47 million yen

High-temperature superconducting cable

Cable termination

Cabling layout

Pig iron production

Demonstration of ferro-coke production commenced in a medium-sized facility

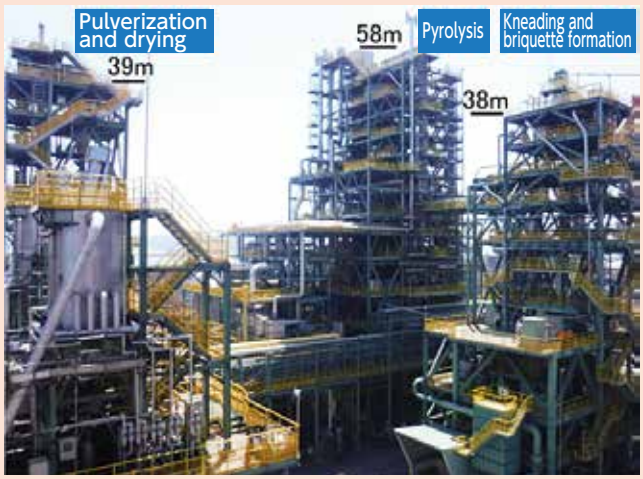
Ferro-coke is an innovative material that is produced from low-grade coal and iron ore for use in blast furnaces. The use of metallic iron, which constitutes 30% of the material, as a catalyst enhances the efficiency of the iron ore reduction. The aim of this ongoing demonstration is to reduce both CO_2 emissions and energy consumption by roughly 10% while also reducing the coke input to the blast furnace.

Achievements

In September 2020, JFE Steel completed the construction of a medium-sized facility (1/5 of the commercial scale) with a daily coke-ferro production capacity of 300 tons at its West Japan Works. Trial operation of the facility began the following month.

Going forward

By FY2022, the facility is expected to produce ferro-coke that can be continuously fed into a commercial blast furnace over a long period to evaluate how the proportion of the reduction material in the furnace influences operational stability. The operator plans to adopt this technology and roll it out to five blast furnaces by around 2030.



Appearance of the ferro-coke production facility

Project outline

Name: Development of Environmental Technology for Steelmaking Process/ Development of Technologies for Ferro-Coke
Implementation: FY2017–2022
Budget for FY2020: 5.3 billion yen

Untapped heat

NEDO develops a loop heat pipe with the world's highest heat transport capacity of 6.2 kW without relying on a power supply: Radical energy conservation by tapping into exhaust heat from cars, factories, and other sources

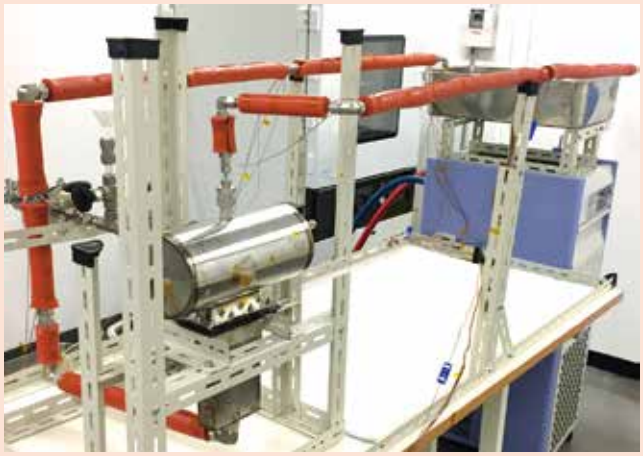
To use untapped heat effectively, an efficient means of transporting heat from hot sources to the intended destinations is essential. In this project, a large-capacity loop heat pipe that enables efficient heat transport was developed by Nagoya University, a member of the Thermal Management Materials and Technology Research Association (TherMAT). This technology offers a promising means of realizing radical energy conservation through the effective use of exhaust heat from cars and factories as well as the proper management of thermal energy from data centers and large power generation units.

Achievements

A loop heat pipe uses capillary action to draw up a working fluid through a porous wick. It is driven by waste heat without any need for an additional power supply. The developed large-capacity pipe successfully transported 6.2 kW of thermal energy over a distance of 2.5 m without a power supply thanks to the ingenious structures of the evaporator and condenser. This is the best heat transport performance achieved anywhere in the world, a staggering improvement on the several hundred watts transported by conventional pipes.

Going forward

NEDO will pursue radical energy conservation by developing a wider range of applications for the technology employed in this loop heat pipe to transport several kilowatts of heat without relying on a power supply. Examples of these applications include the effective use of exhaust heat from cars and factories as well as the cooling of data centers and large power generation units.


Large-capacity loop heat pipe to use untapped heat effectively

Project outline

Name: Research and Development Project on Innovative Thermal Management Materials and Technologies
Implementation: FY2015–2022 **Budget for FY2020:** 650 million yen

Environment and Resource Conservation

NEDO has advanced the commercial application of CO_2 capture, use, and storage technologies as well as development efforts aimed at ensuring the recycling of plastics and aluminum. It has also driven the development of refrigerants with a low greenhouse effect, equipment that runs on these refrigerants, and evaluation methods for them. In the Middle East and Africa, NEDO has also stepped up its preparations to conduct large-scale demonstrations of seawater desalination with low environmental loads.

Reducing fluorocarbon emissions

NEDO commences an evaluation of working prototypes of equipment that runs on advanced refrigerants in a demonstration conducted on commercial premises

Green refrigerants or other advanced refrigerants with a low greenhouse effect are still not widely used in some areas of Japan. This demonstration project targets commercial premises in these areas to begin an evaluation of working prototypes of equipment that runs on advanced refrigerants.

Background and significance

Adopted as the initial alternative to chlorofluorocarbons (CFCs) for use in refrigerators and air conditioners, hydrofluorocarbons (HFCs) also damage the environment with their potent greenhouse effect. To address the urgent need to switch to more advanced refrigerants, relevant technologies must be developed to facilitate their wider use and commercial application. The tasks required to do this include developing advanced refrigerants, establishing methods for evaluating their safety and risks, and enhancing the performance and versatility of equipment that runs on them.

Going forward

The project will further promote the wider use and commercial application of advanced refrigerants and equipment that runs on them by establishing international standards built on NEDO's achievements and developing a broad range of relevant technologies. Through these efforts, NEDO will facilitate the transition to refrigerators and air conditioners that use advanced refrigerants, thereby helping Japan to fulfill its HFC reduction commitments under the Paris Agreement and the Kigali Amendment to the Montreal Protocol.

20-HP water-cooled CO_2 condensing unit utilizing waste heat and air-water heat exchanging unit for field tests

Project outline

Name: Development of Technology and Assessment Techniques for Next-Generation Refrigerants with a Low GWP Value
Implementation: FY2018–2022
Budget for FY2020: 700 million yen

Green technologies

NEDO commences the development of carbon recycling technologies at the R&D and demonstration base in Osakikamijima

NEDO is working to hasten the commercial application of technologies that can effectively recycle CO_2 as a valuable resource. To this end, it aims to establish a base in Osakikamijima to allow various research and development activities to be conducted in a focused and cross-sectoral manner. As a first step, research into various carbon recycling technologies has been initiated along with preparation of the necessary research and development equipment, primarily at the Osaki Power Station operated by the Chugoku Electric Power Company.

Background and significance

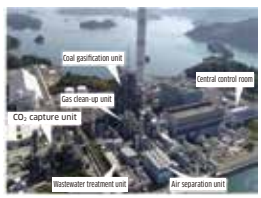
Formulated by the Japanese government in June 2019, the Roadmap for Carbon Recycling Technologies encourages the use of CO_2 to produce materials and fuels. Meanwhile, the Carbon Recycling 3C Initiative (published in September 2019) and other official announcements have designated Osakikamijima as a R&D and demonstration base for power generation using integrated coal gasification fuel cell combined cycle technology as well as CO_2 capture.

Going forward

NEDO will assist in the preparation of the equipment necessary for the establishment of a R&D and demonstration base in Osakikamijima as well as the operation and research activities to be conducted there. Later, it will develop various technologies for effectively recycling CO_2 and conduct comprehensive evaluations to assess factors such as their economic performance and the resultant reduction in CO_2 emissions.

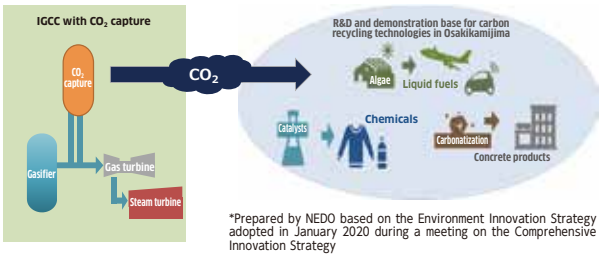
Project outline

Name: Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation/Development of Technologies for CO_2 Utilization at the R&D and Demonstration Base
Implementation: FY2020–2024 **Budget for FY2020:** 480 million yen



Appearance of the IGFC* demonstration plant
(*) Integrated Coal Gasification Fuel Cell Combined Cycle

Planned base for R&D and demonstration of carbon recycling technologies



*Prepared by NEDO based on the Environment Innovation Strategy adopted in January 2020 during a meeting on the Comprehensive Innovation Strategy

Schematic view of R&D and demonstration base for carbon recycling technologies in Osakikamijima, Hiroshima Prefecture

CCS

NEDO prepared a "Comprehensive Report" on its achievement of a cumulative injection of 300,000 tons of CO_2 in the Large-scale CCS Demonstration Project in Tomakomai.

Carbon dioxide capture and storage (CCS) is a technology that captures carbon dioxide (CO_2) emitted from factories, power plants and other facilities before it is released into the atmosphere and then stores it underground. The Ministry of Economy, Trade and Industry (METI) will study in particular the adoption of CCS technology in coal thermal power generation by 2030, on the premise of commercialization.

Achievements

This project was initiated by METI in FY2012. Since its handover to NEDO in FY2018, the CCS demonstration project has been conducted with the aim of verifying the operation of an integrated system from capture to injection.
Upon achieving its CO_2 injection target, NEDO compiled a "Comprehensive Report" on the results and challenges of the demonstration project while also bearing in mind the content of discussions held among experts from various fields.

Going forward

Henceforth, NEDO will continue conducting surveys of the marine environment around the storage site and monitor the behavior of the injected CO_2. Outreach activities will be continued both in Japan and abroad.
In addition, NEDO will pursue the comprehensive social implementation of carbon dioxide capture, utilization and storage (CCUS) technologies, adding to CCS the additional component of utilization. To this end, it will verify the ship transportation and cargo handling of CO_2 captured at large-scale emission sources such as coal-fired power plants while also establishing a CCUS demonstration hub by utilizing the CCS demonstration facility in Tomakomai.

Tomakomai CCS demonstration site

Project outline

Name: Research, Development, and Demonstration of CCUS Technology/Large-Scale Demonstration of CCUS in Tomakomai
Implementation: FY2018-2026
Budget for FY2020: 3.5 billion yen

3R

NEDO commences the development of innovative process technologies for plastic recycling

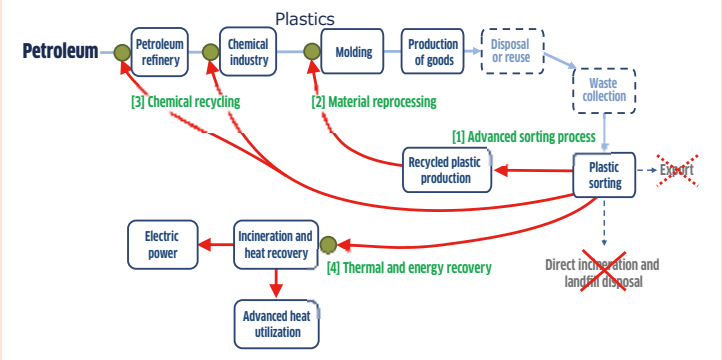
The need to make effective use of plastic waste and reduce its environmental load through appropriate treatment is a pressing social issue. NEDO is striving to propose an efficient system for the recycling of plastic waste by developing technologies capable of sorting such waste effectively and turning it into useful materials and energy sources.

Background and significance

Ocean pollution caused by inadequately treated plastic waste has gained considerable attention in recent years. Unfortunately, even treated plastic waste is generally not recycled as a useful resource. To establish a circular economy for plastics, the most pressing task is to turn waste plastic into useful resources by ensuring that it is adequately recycled into materials and chemical feedstock or used in energy recovery.

Going forward

The aim of this project is to refine sorting, material reprocessing, chemical recycling, and energy recovery so that these advanced practices can be combined to reduce the environmental load and turn waste plastic into invaluable resources. The project seeks to optimize grade-based treatment systems to facilitate both the advanced recycling of waste plastic and a reduction in its environmental load.



Conceptual diagram of plastic recycling

Project outline

Name: Innovative Plastic Resource Circulation Process Technology Development
Implementation: FY2020-2024
Budget for FY2020: 700 million yen

Robots and AI

NEDO engages in the development and demonstration of technologies that are applied in robots, drones, artificial intelligence (AI), and automated driving. In FY2020, it embarked on research and development into innovative industrial robots and AI technologies evolving together with humans. In addition, it ventured into new fields, such as digital technologies for the refinement of regulations and automatically operating robots for coping with the pandemic.

Drones

NEDO promotes the development and demonstration of technologies aimed at helping to shape a societal system that ensures safe drone flights

In October, NEDO tested the remote identification of drones at Fukushima Robot Test Field as part of a demonstration aimed at assessing their practical application. The technical data was published to help shape and operate the necessary societal system. Further functional enhancements were also sought through the use of a traffic management system that is currently being developed. Moreover, NEDO has embarked on a real-world demonstration project to simulate the practical use of drones.

Achievements

The remote identification system was validated through an evaluation of broadcast communication. The safety of drone flights through interconnection with the traffic management system has also been successfully confirmed in field tests. Further functional enhancements for the practical application of drones will be sought by building on these achievements. NEDO will also provide useful feedback for real-world demonstration and development activities to simulate the practical use of drones.

Going forward

By 2022, drones are expected to be able to fly above non-operators without direct visual observation. To make this a reality, NEDO will continue validating remote identification, traffic management systems, and other relevant technologies to help develop the industry and requisite societal system. In validating the traffic management system, NEDO will focus on use cases that are relevant to the practical application of drones in the intended communities.

Demonstration of a traffic management system

Project outline

Name: Drones and Robots for Ecologically Sustainable Societies Project
Implementation: FY2017-2021
Budget for FY2020: 4 billion yen

AI

NEDO commences the development of AI technology evolving together with humans

NEDO is working to develop AI technology evolving together with humans in order to help society cope with issues such as the decline in the working-age population. This technology would enable humans and AI to interact and collaborate while focusing on tasks in their respective areas of expertise.

Background and significance

The growing use of AI in society underscores the need for collaboration between humans and AI while they focus on handling tasks in their respective areas of expertise, particularly in relation to manufacturing, medical care, transport, and other fields that substantially impact society and the economy. AI systems evolving together with humans would address this need to perform a variety of tasks in such fields.

Going forward

The challenges faced in developing AI technology evolving together with humans will be identified through field tests as well as evaluations by experts and users. These challenges will be addressed through the feedback cycle in further research and development in order to speed up efforts aimed at addressing social issues in a practical way.

Concept of research and development

Project outline

Name: Technology Development Project on Next-Generation AI Evolving Together with Humans
Implementation: FY2020-2024 **Budget for FY2020:** 2.93 billion yen

Refinement of regulations

NEDO develops digital technologies to support the refinement of regulations being explored by the Japanese government

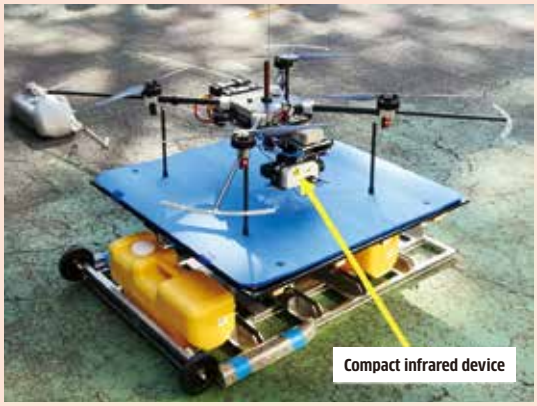
To keep pace with advances in AI, sensing, and other digital technologies, it is vital that we introduce, revise or refine regulations aimed at facilitating the creation and streamlining of relevant businesses. In this project, NEDO aims to advance the development of useful technologies for the refinement of regulations in the fields of mobility, finance, and construction.

Achievements

One example of the project outcomes is NEDO's compilation of regulatory requirements for the mobility field after examining how inspections of completed vehicles are streamlined with AI to save on manual labor. Another example is NEDO's validation of an approach that allows multiple financial institutions to share an anti-money laundering system to promote the industry-wide advancement and streamlining of necessary measures. Also, in an effort to speed up inspections of exterior building walls and reduce the associated costs, NEDO has developed a close-up inspection system that ensures safe flights for drones equipped with a compact high-precision infrared device.

Going forward

The digital technologies and research findings realized by this project will be incorporated into the refinement of regulations undertaken by authorities with jurisdiction over the mobility, finance, and construction sectors.



Drone system for close-up inspections

Project outline

Name: Development of Digital Technologies for Refinement of Regulations
Implementation: FY2020
Budget for FY2020: 2.83 billion yen

Automated driving

NEDO conducts field operational tests of an advanced public transport system with automated buses integrated into the infrastructure around Haneda Airport

NEDO is working to develop the infrastructure and test solutions necessary for the realization of a safe and user-friendly advanced public transport system that utilizes automated vehicles equivalent to level 4 or higher. In relation to this goal, NEDO conducted field operational tests in areas such as enhancing the punctuality of bus transport services, using magnetic markers for automated driving, achieving gentler acceleration and deceleration, and realizing precision docking at bus stops.

Achievements

In the demonstration area, magnetic markers were installed on public roads, special lanes were designated in certain segments, and temporary bus stops were put in place. Despite some delays due to the pandemic, the infrastructure required to conduct driving tests was put in place by June 2020 for the demonstration of an advanced public transport system. The subsequent driving tests by test participants were completed in November 2020.

Going forward

The know-how required for the business rollout of the demonstrated service was compiled based on findings related to the infrastructure development, advance verification, maintenance, and management of the advanced public transport system. Specific examples include how to install magnetic markers more precisely, how to streamline tasks, and how to optimize maintenance and management. These examples will be provided to help future business operators develop the necessary infrastructure for such a system.

An automated bus docked at a temporary bus stop

Project outline

Name: Cross-Ministerial Strategic Innovation Promotion Program (SIP) Phase 2/Automated Driving for Universal Services
Implementation: FY2018–2022
Budget for FY2020: 3.21 billion yen

IoT, Electronics, and Information Technology

Using prototypes of AI-edge LSI, NEDO has achieved ten times the efficiency in image recognition and processing. It has also completed the world's first rack-mounted server-board optical interconnect system. This system was developed using a cloud double checking system with AI to support gastric cancer screening and a search engine focused on case reports concerning COVID-19 infections.

AI chips

NEDO prototypes of AI-edge LSI achieved ten times the efficiency in image recognition and processing and 1/20 the SLAM processing time

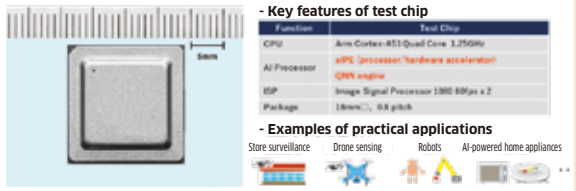
NEDO has performed research and development into the edge AI employed by IoT devices deployed on the network periphery (edge). Evaluation of AI-edge computing that was performed with a prototype of an evolutionary low-power LSI demonstrated ten times the efficiency in image recognition and processing and 1/20 the real-time simultaneous localization and mapping (SLAM) self-position estimation processing time compared to conventional semiconductor chips.

Achievements

In this project, NEDO has developed new technologies for hybrid quantized deep learning (DNN), evolutionary virtual engine architecture (aIPE), and real-time SLAM processing. The evaluation of AI-edge LSI with these technologies demonstrated low-power image recognition and processing and accurate self-position estimation of high speed mobile robots.

Going forward

NEDO aims at advancing this technology further so that AI-edge LSIs can operate with lower-power and expand their applications to industrial inspections, driving support, and drone sensing. Thereby, NEDO promotes more advanced utilization of increasing amounts of data and contributes to bringing about an ultra-low power consumption society with edge distributed processing.



Prototype of evolutionary low-power AI edge LSI

Project outline

Name: Project for Innovative AI Chip and Next-Generation Computing Technology Development
Implementation: FY2015–2027
Budget for FY2020: 10.01 billion yen

Optical electronics

NEDO completes the world's first rack-mounted server-board optical interconnect system

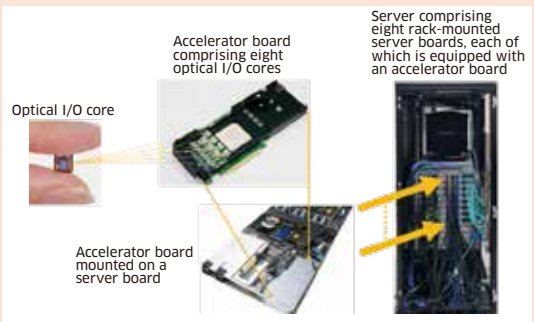
The combination of a full-mesh design for optical interconnects and distributed switches allowed vast amounts of data to be processed at an order of magnitude more quickly than is possible for conventional electric interconnects. For instance, correlation computation was about 17 times quicker between two sets of roughly 130 million pieces of data.

Achievements

Global data traffic is expected to grow further as the ongoing pandemic pushes more people online. Data centers are struggling to cope with surging power consumption as the information transmission rate among their LSIs hits its limit. To offer an alternative, NEDO has developed a parallel distributed server equipped with eight rack-mounted server boards that have a transfer rate of 1.6 Tbps, with each board comprising eight optical I/O cores to easily provide compact optical interconnects.

Going forward

NEDO will help promote big data and AI into greater societal value by encouraging the application of optical circuits in data centers and computers while also pursuing ever faster information transfers among LSIs with even less power consumption.



The world's first rack-mounted server-board optical interconnect system

Project outline

Name: Development of Technologies for Super Energy-Efficient Optical Electronics Implementation Systems
Implementation: FY2011–2021
Budget for FY2020: 1.84 billion yen

AI system for gastric cancer diagnosis.

NEDO develops a cloud double checking system with AI to support gastric cancer screening.

NEDO is collaborating with AI Medical Service Inc. to develop a cloud double checking system with AI to support gastric cancer screening. This AI system is constructed using 100,000 endoscopic videos provided from 114 of Japan's leading medical institutions. In the verification study, the AI system outperformed 66 endoscopists in terms of sensitivity.

Background and significance

The five-year survival rate for cancer patients is improving with the progress of medical care. As early detection grows in importance, an increasing number of endoscopies are being performed for gastric cancer treatment. However, endoscopic examinations require a second reading by another doctor, which places a heavy burden on doctors. Therefore, it is expected that the reading support system will improve the efficiency of doctors' work and the accuracy of medical examinations.

Going forward

NEDO will strive to ensure more robust performance and realize accurate detection by major endoscopes regardless of the manufacturer, model, image file format, or data compression configuration, and will also seek regulatory approval for their clinical use. In addition to enhancing the quality of endoscopy, these efforts are also intended to reduce both the number of cancer deaths and the treatment costs.

Diagnostic accuracy of AI comparable to that of experts

Project outline

Name: Development Project on Data Sharing in Collaborative Areas and AI System to Achieve the "Connected Industries"
Implementation: FY2019-2021
Budget for FY2020: 3.05 billion yen (total for 27 target areas)

AI-assisted medical care

NEDO develops a search engine with a focus on case reports concerning COVID-19 infections

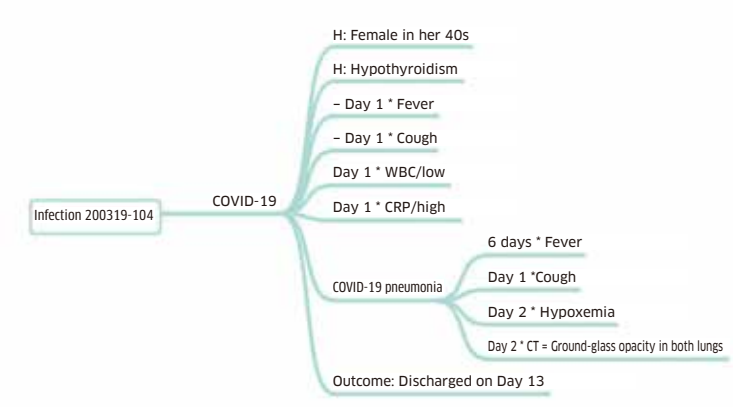
In any medical setting, the correct information needs to be shared properly to reduce errors and enhance the quality of medical care. At the same time, however, medical staff tend to be overworked, with reports suggesting that 60.3% of doctors feel exhausted and 45.5% feel sleep deprived. In a project conducted jointly with Precision, NEDO is developing a system that supports the provision of medical care by means of an AI-driven search engine to both ease the strain on frontline staff and enhance the quality of care.

Achievements

In response to the social upheaval caused by the COVID-19 pandemic, NEDO has changed its grant program to include the development of a search engine with a focus on case reports concerning COVID-19 infections. On May 3, 2020, this engine was installed on the website for the Japan Medical Association COVID-19 Expert Meeting. Case reports were organized into a tree diagram to facilitate the visualization and simple analysis of COVID-19 cases.

Going forward

Containing structured and digitized medical knowledge, the resultant database was used by medical practitioners eager to share experiences of successful coronavirus treatments and empirical knowledge in order to deal with the pandemic more effectively. In the fight against COVID-19, this tool is expected to help drive the development of diagnostic and treatment methods.



Example of a structured COVID-19 case report

Project outline

Name: Development Project on Data Sharing in Collaborative Areas and AI System to Achieve the "Connected Industries"
Implementation: FY2019-2021
Budget for FY2020: 3.05 billion yen (total for 27 target areas)

Manufacturing Technologies

NEDO has developed a hybrid multi-tasking machine with blue diode lasers to perform copper cladding six times faster than conventional solutions. A platform has also been built that brings together newly developed laser processing machines. Practical applications for new laser processing technologies will be further sought by identifying user needs while developing improved processing technologies and more effective lasers with brighter, stronger, and better-quality beams.

Laser processing

NEDO develops a hybrid multi-tasking machine with blue diode lasers to perform copper cladding six times faster than conventional solutions

Blue lasers offer greater energy absorption efficiency with metals and have the potential to be used as beam sources that outperform conventional near-infrared lasers in gold and copper processing.
In addition, the antimicrobial and antiviral actions of copper and its alloys effectively reduce the risks posed by bacteria and viruses, making such materials promising options for handrails and doorknobs at hospitals, nursing homes, and the like.

Achievements

NEDO is collaborating with Osaka University, Yamazaki Mazak Corporation, and Shimadzu Corporation to develop a blue diode laser with a higher beam output. In FY2020, the consortium developed a hybrid multi-tasking machine equipped with a 600-W multi-beam processing head consisting of three 200-W bright blue diode lasers. This increased output opens the way to performing copper coating quickly and precisely on components and other objects with complex shapes.

Going forward

The development of even brighter blue beams will be pursued with diode lasers by employing a kilowatt-class multi-beam processing head. Using such a hybrid multi-tasking machine, NEDO will strive to enable the coating process to be performed ten times faster in practical applications by 2021.

Hybrid multi-tasking machine

Project outline

Name: Development of Advanced Laser Processing with Intelligence Based on High-Brightness and High-Efficiency Next-Generation Laser Technologies (TACMI Project)
Implementation: FY2016-2021 **Budget for FY2020:** 2 billion yen

Laser processing

NEDO develops the Kashiwa-II Platform to consolidate achievements from individual projects

Laser processing is considered a key tool with great potential in manufacturing because of its ability to perform precise processing that mechanical processing would be incapable of handling as well as its compatibility with digital controls. Currently, however, this method suffers from an overreliance on the experience and instinct of human operators in the optimizing of laser processing conditions, which vary greatly for different target objects. A more systematic approach to this optimization needs to be established.

Achievements

Some lasers and laser processing machines have already been developed in this project. They include a bright laser processing machine that produce beams with an unprecedentedly short wavelength in order to perform high-quality processing for materials that are difficult to handle. NEDO created a platform to bring these technologies together in a joint effort with 13 institutions, including the University of Tokyo and the National Institute of Advanced Industrial Science and Technology. Test uses are being conducted to identify a broad range of potential users.

Going forward

After this project, the laser sources and processing machines packed on the platform will be operated continuously under the framework of the TACMI consortium.* NEDO will endeavor to obtain cross-device processing data and identify user needs. The database will be enriched to address actual industrial needs, identify hidden needs, and offer clues to solutions for various challenges.
* The TACMI consortium was established under an industry-academia-government partnership led by the University of Tokyo to facilitate collaborative optical manufacturing.

Laser processing machine mounted on the Kashiwa-II Platform

Project outline

Name: Development of Advanced Laser Processing with Intelligence Based on High-Brightness and High-Efficiency Next-Generation Laser Technologies (TACMI Project)
Implementation: FY2016-2021
Budget for FY2020: 2 billion yen

Materials and Nanotechnology

NEDO is continuing its development efforts while building on Japan's technical edge in the material manufacturing and nanotechnology industries. Ongoing activities include the development of innovative chemical manufacturing processes that do not rely on fossil resources; the development of structural materials for providing lighter transport machinery; the development of magnets that are better suited to smaller, more efficient motors; and the development of materials employing advanced artificial intelligence (AI) technologies.

AI and machine learning

Applying AI techniques to the development of flexible transparent films enabled a reduction in the number of trials to less than one twenty-fifth in comparison with conventional methods. Accelerating the development of functional materials to satisfy conflicting demands of characteristics.

NEDO is working to create development apparatuses of fundamental technologies for organic and polymeric functional materials. Innovative development apparatuses are produced using various results and data combined with AI techniques, which are obtained from computational science, fast prototyping, innovative manufacturing processes and advanced nano-scale measurements and their evaluation techniques. The goal of this project is to reduce the number of trials and minimize development periods to less than one-twentieth in comparison with conventional methods of material development.

Achievements

Data from actual measurements of transmittance, breaking stress, and elongation as well as chemical structural data, such as molecular structure and material ratio, were introduced into specially prepared AI learning methods in the development of a flexible transparent film. The AI predicted candidates of optimum films to satisfy the demands of conflicting characteristics among high transmittance, strong breaking stress, and high elongation. Accordingly, NEDO succeeded in reducing to less than one twenty-fifth the number of trial productions in comparison with conventional production methods.

Going forward

Improvements in these AI techniques are being developed to predict better properties of molecular structures and material ratios while satisfying their characteristic demands. In addition, the development of functional materials is also being considered to satisfy conflicting demands of characteristics.

Application for a flexible transparent film
(requiring both transmittance and mechanical strength)

Project outline

Name: Ultra High-Throughput Design and Prototyping Technology for Ultra Advanced Materials Development
Implementation: FY2016-2021
Budget for FY2020: 2.48 billion yen

Artificial photosynthesis

NEDO develops the world's first photocatalyst for a water-splitting process with a quantum yield of almost 100%: Potential for significant advancement in the solar-conversion efficiency of photocatalysts

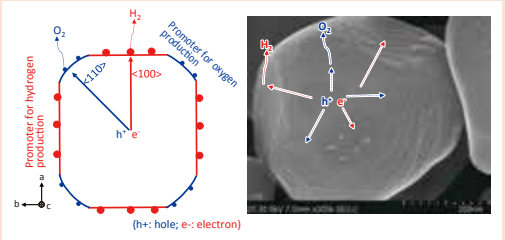
NEDO is conducting research and development into the possibility of splitting water into hydrogen and oxygen with a photocatalyst, safely separating the solar hydrogen from the gas mixture, and combining the hydrogen with CO_2 from factories or other emission sources to produce core chemicals (C_2-C_4 olefins) for the manufacture of plastics and the like.

Achievements

NEDO successfully generated electrons and holes from different crystal faces for a subsequent reaction with water on a promoter surface by controlling the crystal shape of aluminum-doped $SrTiO_3$ as an ultraviolet photocatalyst. Conventional methods suffered from an inefficient use of photons (i.e., low quantum yield), partly as a result of the recombination of electrons and holes. This success demonstrates that the yield can reach almost 100%. A spectacular improvement in the conversion efficiency can be expected by applying this technology to visible-light photocatalysts.

Going forward

NEDO will accelerate the development of efficient and inexpensive photocatalyst sheets by applying the same technologies to regulate crystals composed of $Y_2Ti_2O_5S_2$ or other visible-light photocatalysts.. In this way, NEDO is working to help Japan reach carbon neutrality through the early application of processes for producing chemicals from solar hydrogen and CO_2 emitted by factories and other emission sources.



Aluminum-doped $SrTiO_3$ as a photocatalyst that achieved a quantum yield of 100%
Left: Schematic illustration of how the migration of electrons and holes are regulated in a crystal
Right: Electron microscope image of photocatalyst crystals

Project outline

Name: Artificial Photosynthesis Project
Implementation: FY2014-2021
Budget for FY2020: 1.68 billion yen

Biotechnology

NEDO is developing technologies to accelerate the transition to a bioeconomy. Examples of these technologies include smart cells that regulate and modify material production by plants and microbes to provide functional products most effectively, the use of cellulose nanofibers to help clean up the Earth, and the practical use of marine biodegradable plastics.

Smart cells

NEDO develops a new autofluorescence microscopy method to perform quantitative evaluations and identify the physiological status of microbes in just ten minutes

For microbes and other biological resources to be employed in the production of materials, their cells must be evaluated in advance. Most commonly, cells are destroyed to analyze their composition. This approach not only requires at least a few days to obtain the laboratory findings but also renders the examined cells dead. Consequently, NEDO is undertaking research and development to develop a means of evaluating cells quickly while keeping them alive.

Achievements

By using autofluorescence microscopy with a confocal laser system, NEDO has developed a noninvasive technique and automatic analysis software to enable the quantitative physiological evaluation and identification of microbial cells to be conducted quickly without staining and destroying the cells. This shortens the time spent conducting physiological evaluations and identifying microbes from a few days to as little as 10 to 60 minutes.

Going forward

Moving beyond basic research into cell breeding for microbes, plants, and animals, the practical application of these solutions can be expanded at an increasing pace. Examples across different industries include biological production processes using yeasts or other microbial cells, water pollution mitigation through the visualization of microbes in the environment, and regenerative medicine.

Confocal laser microscopy system

Transmission image of a highly productive strain of oleaginous yeast

The same image as that shown above captured within the autofluorescence spectrum

Project outline

Name: Development of Production Techniques for Highly Functional Biomaterials Using Plant and Other Organism Smart Cells
Implementation: FY2016–2021 **Budget for FY2020:** 2.6 billion yen

Smart cells

NEDO achieves the world's highest level of productivity for a rare amino acid (ergothioneine) by using smart cells, marking an almost 1,000-fold increase compared to conventional levels

Ergothioneine (EGT) offers a broad range of prospective applications in industries such as food, cosmetics, and pharmaceuticals. In an attempt to devise a way of producing this rare amino acid through fermentation, NEDO utilized smart cell technology. Still under development, this technology achieved the world's highest level of production efficiency by boosting the productivity of microbial cells spectacularly.

Achievements

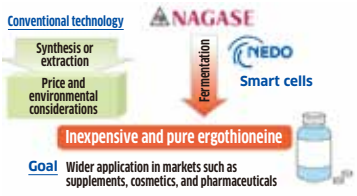
NEDO attempted to enhance the EGT production capacity of microbial cells by applying four distinct core technologies for employing smart cells: enzyme engineering and designing; metabolic pathway designing; high-throughput microbial cultivation and evaluation; and transporter searches. By successfully optimizing the productive response in microbial cells, NEDO has established a new technology that achieves the world's highest level of productivity, delivering an almost 1,000-fold increase compared to conventional levels.

Going forward

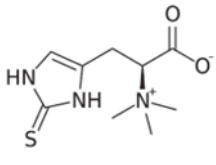
To further tap into smart cells on an industrial scale, the commercially viable production of EGT will be sought as early as possible by employing the productive microbe strains developed under the NEDO project.

Project outline

Name: Development of Production Techniques for Highly Functional Biomaterials Using Plant and Other Organism Smart Cells
Implementation: FY2016–2021 **Budget for FY2020:** 2.6 billion yen



Overview



Ergothioneine (EGT)

Assistance for International Rollouts

NEDO conducts international demonstration projects to address global environmental issues by leveraging Japan's unique energy and environmental technologies to help other countries switch to alternative energy sources and adopt low-carbon or carbon-free solutions. NEDO also helps Japanese companies engage in joint research and development in order to boost their worldwide open innovations and tap into overseas markets.

Co-funding program

Japan collaborates with the Czech Republic to jointly develop a deep ultraviolet solid-state seed laser with the aim of radically reducing the size and costs of narrow-band high-power exposure light sources for producing semiconductor memories

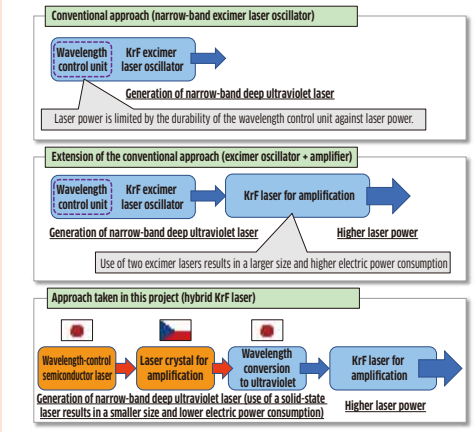
Advanced 3D-NAND memories adopt an ultra-high-stacked structure to provide greater capacity, and their production requires high-power exposure light sources. The three project partners combined their solid-state laser technologies to develop a deep ultraviolet solid-state seed laser that will play a key role in the compact, low-power consumption, narrow-band, and high-power hybrid KrF excimer laser necessary for enhancing the memory production throughput and reducing the memory costs.

Achievements

In this joint project, the Japanese company Gigaphoton has been tasked with developing a precise wavelength-control semiconductor laser and a wavelength conversion unit for producing deep ultraviolet light. Meanwhile, the Czech company CRYTUR and the Czech national laboratory HiLASE are to contribute a technology that enables optical amplification to be performed using a laser crystal, for which neither Japanese manufacturer has sufficient capacity. Gigaphoton has already established the necessary technologies, and in the near future, a deep ultraviolet solid-state seed laser capable of spectacular performance is expected to be completed once the Czech technology for optical amplification is ready.

Going forward

The seed laser technology established in this project will be employed to develop a narrow-band high-output hybrid KrF excimer laser. The companies involved intend to begin mass production of the KrF exposure light sources by 2024 to capture a global market share of 70% by 2025 and perhaps even 100% by 2027. Today, Japan boasts a considerable global market share in relation to exposure light sources for the production of semiconductor memory and this project will consolidate its unrivaled advantage.



Approaches to generate narrow-band and high-power deep ultraviolet lasers

Project outline

Name: International Research and Development Co-Funding Program/Japan-Czech Joint Research and Development
Implementation: FY2019-2020 **Budget for FY2020:** 10 million yen

JCM

Thailand's first demonstration project of optimized performance enabling network for Volt/Var in power transmission networks starts, aiming to reduce transmission loss and associated greenhouse gas emissions.

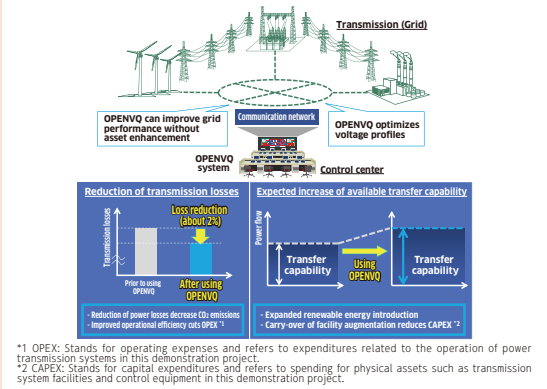
To make power system operations more sophisticated and efficient and thereby lead to a reduction in power losses, the Optimized Performance Enabling Network for Volt/Var(Q) system, named the OPENVQ system, was introduced into the Northeastern Area Control Center of the Electricity Generating Authority of Thailand (EGAT). The OPENVQ system can forecast the future power flow and supply-demand balance and can optimize the voltages and reactive power by combining measurement data in the transmission network with power generation plans and weather forecasts.

Background and significance

Thailand is expected to introduce renewable energy and other power sources to meet its surging electricity demand in line with its economic development and the ageing of its thermal power plants. Nonetheless, EGAT has been faced with the challenge of reducing power losses because no technology for voltage optimization has been installed in the current transmission network. To reduce greenhouse gas emissions, the OPENVQ system has been installed in the transmission network to optimize voltages and reduce transmission losses.

Going forward

The reduction in transmission losses achieved by installing the OPENVQ system will contribute to cutting down on the fuel procurement cost at thermal power plants and trimming CO2 emissions associated with grid operations. In addition, the available transfer capability deemed to be increased through voltage optimization in the grid is expected to contribute to the expanded adoption of renewable energy sources. Furthermore, greenhouse gas emission reductions will be quantified and visualized through the Joint Crediting Mechanism (JCM), and the OPENVQ system will be promoted to other ASEAN countries.



*1 OPEX: Stands for operating expenses and refers to expenditures related to the operation of power transmission systems in this demonstration project.
*2 CAPEX: Stands for capital expenditures and refers to spending for physical assets such as transmission system facilities and control equipment in this demonstration project.

Overall picture of the demonstrated system and expected effects

Project outline

Name: Program to Facilitate Private Sector-Led Promotion of Low-Carbon Technology Overseas / Program to Promote Market Creation Using Low-Carbon Technology / Low-carbonized Operation for Power Grid Utilizing Online Voltage-Var(Q) Optimal Control (OPENVQ) with ICT (Thailand)
Implementation: FY2020-2022 **Budget for FY2020:** 185 million yen

International Partnerships

NEDO shares unique Japanese solutions with communities around the world to address their diverse needs in accordance with their respective social conditions. It also encourages the development of useful technologies by facilitating joint international research and development and conducting international demonstration projects.

Europe 欧州

Russia

NEDO conducts studies to evaluate the effects of smart traffic signal system dissemination in Russia

NEDO has evaluated the effects of disseminating smart traffic signal systems in 14 Russian cities and confirmed their potential to ease congestion by up to 66%. Eight of these cities expressed an interest in officially adopting the system.

Russia

"Polar Microgrid System" starts demonstration operation in the Russian Far East

A "Polar Microgrid System" has started operating in an especially frigid region at temperatures below -30°C to realize a stable and low-cost energy supply. The system includes three cold-resistant wind turbines, diesel generators, storage batteries, and an energy management system.

Middle East / Central Asia 中東、中央アジア

Saudi Arabia

Construction work gathers pace for the demonstration of an energy-saving seawater desalination system

Collaboration between NEDO and Saudi Arabia's Saline Water Conversion Corporation is under way to demonstrate an energy-saving seawater desalination plant with a daily water production of 10,000 tons. This plant combines a low-pressure two-step high-yield reverse-osmosis system with low-pressure reverse-osmosis membranes. Arrangements were made for the construction work to be conducted on-site and for the equipment to be produced by the Japanese counterpart.

Uzbekistan

NEDO demonstrates a highly efficient co-generation system equipped with small- and medium-sized gas turbines

NEDO has demonstrated one of the world's most highly efficient distributed co-generation systems equipped with small- and medium-sized gas turbines. The system has been verified as offering distributed energy production and consumption with lower heat and power losses, thereby ensuring a reliable heat and power supply while also reducing energy consumption by 38% compared to conventional systems.

East / Southeast Asia 東・東南アジア

Projects currently underway around the world

United States

NEDO project launches world's first navigation application for electric vehicles

To help expand EV cruising ranges and promote the widespread use of EVs, NEDO and Kanematsu launched a navigation app for smartphones. The app instantly shows the shortest route based on waiting and charging times at charging stations and thereby enhances convenience for EV drivers and reduces their "range anxiety" related to insufficient battery power.

米州

Americas

China

NEDO validates the latest energy management system at energy-intensive factories

NEDO has introduced and demonstrated power-saving equipment and the latest energy management systems in major Chinese factories for textile and aluminum manufacturing. Consequently, a significant reduction in energy consumption has been achieved along with cost reductions associated with enhanced production processes.

Thailand

NEDO completes an operational demonstration of a system for recycling end-of-life vehicles

NEDO has completed the first operational demonstration in Thailand for end-of-life vehicle recycling system using heavy machinery. NEDO has also helped Thailand consider institutional arrangements for handling end-of-life vehicles.

Assistance for SMEs and Startups in Starting Commercial Operations

NEDO offers seamless assistance aimed at helping business startups as well as small- and medium-sized enterprises to identify and match seeds of business for viable commercial operations. In FY2020, an additional project was launched to help startups develop tangible and sustainable sales plans while also providing assistance to facilitate the commercial application of new energy sources, welfare equipment, and other ventures.

Business startups — Graduates of Technology-based Startup Support Program make the grade in FY2020 as well!

To date, NEDO has assisted technology-based startups at a wide range of stages in their development, with many of these companies continuing to grow and shine. In FY2020, the following companies attracted particular interest in the wake of news releases and featured articles in Focus NEDO, the public relations magazine published by NEDO.

Achievements

- Photosynth: Completed SUI and SCA
  - Total funding of 5 billion yen
  - Establishment of a joint venture to develop and supply smart locks for housing
- SEQSENSE: Completed SCA
  - Official adoption of security robots by multiple companies
- Epsilon Molecular Engineering: Completed STS
  - Total funding of 570 million yen
  - Successful development of a VHH antibody capable of inhibiting COVID-19 infections
- Metcela: Completed STS, SCA, and CRI
  - Total funding of 1.32 billion yen
- ANSeeN: Completed STS, SCA, and PCA
  - Total funding of 900 million yen

Going forward

The above are notable examples of the assistance NEDO has successfully provided for fundraising and business partnerships needed by technology-based startups when launching their products and services on the market.

Photosynth, which makes a smart lock called Akerun, was the first innovative startup assisted by NEDO's support programs.

Outline

SUI: StartUp Innovators
STS: Seed-stage Technology-based Startups
CRI: Collaboration with Research Institute
SCA: Startups in Corporate Alliance
PCA: Product Commercialization Alliance

Business startups — NEDO commences the Technology-based Startup Support Program and the Product Commercialization Alliance (PCA)

In FY2020, NEDO introduced the Product Commercialization Alliance (PCA) program, a new form of assistance that helps startups begin commercial operations within three years from the time they are first proposed. From proposals submitted by 59 companies, ten companies were selected after a comprehensive review of their business and fundraising plans in terms of factors such as scalability, prospects for sustainable sales, corporate structure, and partnerships with other entities.

Background and significance

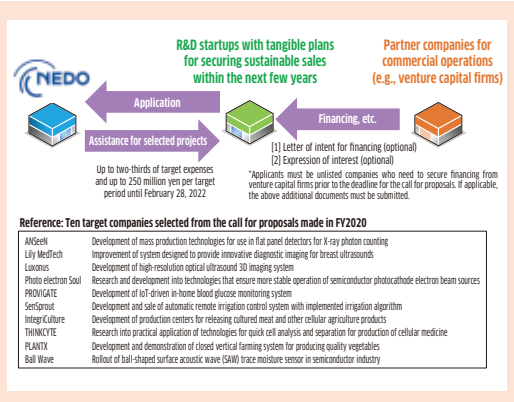
This program constitutes the final stage of the seamless assistance NEDO provides through its Technology-based Startup Support Program, which begins from the creation of a startup to the final release of its product. The program provides a final push to help technology-based startups overcome the second "valley of death" phase, which typically absorbs tremendous amounts of time and money before the startup's business becomes commercially viable.

Going forward

NEDO provides assistance for the first fiscal year of a startup's three-year product release plan. Interviews and follow-up surveys are conducted throughout the duration of the plan to ensure the company's business grows to be commercially viable. In the future, NEDO intends to build an ecosystem designed to facilitate the business growth of innovative startups who can make a tangible difference in the world.

Project outline

Name: Technology-based Startup Support Program/Product Commercialization Alliance (PCA)
Implementation: FY2020–2023 **Budget for FY2020:** Approx. 1.5 billion yen



Reference: Ten target companies selected from the call for proposals made in FY2020

ANSeeN	Development of mass production technologies for use in flat panel detectors for X-ray photon counting
Lily MedTech	Improvement of system designed to provide innovative diagnostic imaging for breast ultrasounds
Luxonus	Development of high-resolution optical ultrasound 3D imaging system
Photo electron Soul	Research and development into technologies that ensure more stable operation of semiconductor photocathode electron beam sources
PROVIGATE	Development of IoT-driven in-home blood glucose monitoring system
SenSprout	Development and sale of automatic remote irrigation control system with implemented irrigation algorithm
IntegriCulture	Development of production centers for releasing cultured meat and other cellular agriculture products
THINKCYTE	Research into practical application of technologies for quick cell analysis and separation for production of cellular medicine
PLANTX	Development and demonstration of closed vertical farming system for producing quality vegetables
Ball Wave	Rollout of ball-shaped surface acoustic wave (SAW) trace moisture sensor in semiconductor industry

Project concept and targets for FY2020

Biomass

NEDO develops Japan's first dry methane fermentation plant for small-scale dairy farmers: Distributed energy production and consumption pursued through the use of dairy cow manure

NEDO has developed Japan's first dry methane fermentation plant for small-scale dairy farmers. It is designed to reliably and efficiently produce methane and other biogases from semi-solid dairy cow manure. The plant supplies the biogases to gas turbines and fuel cells in order to cover part of the electricity and thermal energy needs of dairy farmers.

Achievements

In this NEDO project, Japan's first dry methane fermentation plant for small-scale dairy farmers was developed after successfully addressing cost-related issues. The biogas plant is expected to promote distributed energy production and consumption without relying on grid power and help build the requisite framework.

Going forward

So far, the project has demonstrated that the plant can generate power continuously throughout the day to reliably supply electricity (three-phase, 200 V) and warm water to cattle barns. The plant will be examined further to assess its energy optimization/redistribution and its stability after continuous long-term operations. A single-phase residential power supply will be tested at a voltage of 100 V.

Automatic feeder and pretreatment unit for raw materials as well as an FRP methane fermentation tank (thermophilic dry fermentation)

Project outline

Name: Assistance for Innovation in New Energy Technologies by Pursuing Entrepreneurial Ventures (Biomass)/Development of a Distributed Dry Methane Fermentation Plant for Small Dairy Farmers
Implementation: FY2018-2020
Budget for FY2020: 50 million yen

Welfare equipment

Development of a lower extremity orthotic brace that quickly fits various body sizes and a walking control device that enables the brace to be controlled automatically with a single touch

TOKUDA Prosthetics and Orthotics produces prosthetic and orthotic devices to help people with disabilities be actively involved in their communities. The company seeks to address compensatory movements which occur during conventional rehabilitation of the disabled as well as alleviate the strain exerted on the physiotherapists who assist them. To this end, the company is developing a highly compatible modular leg brace that can be assembled without tools along with a removable device that can be attached to the leg brace with a single touch so that the stance and swing phases of walking can be controlled automatically.

Achievements

As part of its efforts to devise a leg adjustment mechanism for lower extremity orthotic braces, TOKUDA has completed the development of the Modular Leg Brace NEO for use in combination with a control device. The company is ready to mass produce the leg brace during this project, which is intended to facilitate the practical application and development of prosthetic and orthotic devices that overcome certain challenges. The company has also developed Switch Knee, a walking control device that features a single-touch attachment mechanism. The market release of these products is scheduled for FY2023, after the completion of strength tests, weight reduction measures, electronic control component development, and substantive experiments.

Going forward

Conventional orthotic devices compromise the user's walking performance because they straighten the legs with the knees locked in place. An attachment for functional expansion allows the user to learn proper walking patterns and expand their range of activities in everyday life. Once the installation cost has been brought down, the device will help major hospitals and local medical institutions provide necessary services and extend the periods during which people with disabilities can walk.

Modular Leg Brace NOE combined with Switch Knee for walking control

Project outline

Name: Development Promotion Project for Practical Use of Welfare Equipment
Implementation: FY2017-2019 **Budget for FY2020:** 90 million yen

Facilitation of Open Innovation

NEDO released the third edition of the Open Innovation White Paper as part of its continuous efforts to encourage open innovation in Japan. In addition, NEDO has established a one-stop service point to provide full support for business startups under a partnership agreement signed with eight partner government agencies.

JOIC NEDO releases third edition of Open Innovation White Paper

In its role as the secretariat of the Japan Open Innovation Council (JOIC), NEDO has been conducting awareness activities to encourage open innovation in Japan and tirelessly sharing relevant findings. A good example of this is the Open Innovation White Paper, with the first edition having been released in 2016 and the second in 2018.

Background and significance

Released in May 2020, the third edition provides recommendations aimed at encouraging innovation in Japan. The paper calls for a back-to-basics approach that requires the reader to first acquire a sound understanding of innovation before going on to develop an understanding of open innovation. To this end, it sets out a chronological history of innovation policies from both the macro and micro perspectives and also analyzes innovation factors in the global and Japanese market landscapes.

Going forward

In addition to further compiling the latest findings and case studies, NEDO will continue to support technology-based startups while bolstering the role of the JOIC. It will also promote alliances between startups and large corporations to ensure that their advanced technologies are practically applied to boost innovation.

Chapter	Title	Description
1	**Significance and historical trends**	Historical trends and innovation factors
2	**Background to innovation by country and industry**	Changes in the macro-environment and industry, innovation policies in different countries, innovation ecosystems throughout the world, and Japan's strengths and weaknesses in the macro-environment
3	**Innovation in Japan today**	Innovation and innovative initiatives employed by Japanese companies
4	**Case studies of innovation pursued in Japan and abroad**	Case studies of innovative practices employed by companies and ecosystems in Japan and abroad, summaries of roundtable talks and interview surveys, and tangible measures that should be taken in Japan
5	**Challenges and measures for encouraging innovation in Japan**	Opportunities for encouraging innovation in Japan, measures that should be pursued in Japan, and different approaches to innovation
6	**Past activities for encouraging innovation**	Examples of activities conducted by NEDO and JOIC

Open Innovation White Paper (Third Edition)

Partnership agreement NEDO signs a partnership agreement with eight government agencies that provide assistance to startups

In July 2020, NEDO established a program called Platform for Unified Support for Startups (Plus) under a partnership agreement with eight government agencies. This program is intended to provide continuous support for startups and entrepreneurs, form a conducive ecosystem for startups in Japan, and help address socioeconomic challenges both in Japan and abroad.

Background and significance

Poor access to unevenly distributed information has been identified as a major obstacle to the provision of public assistance to startups. The Plus program brings its member agencies closer together with the aim of addressing this problem through collaboration. In November 2020, NEDO established a one-stop service point on its official website to provide consultations for startups.

Going forward

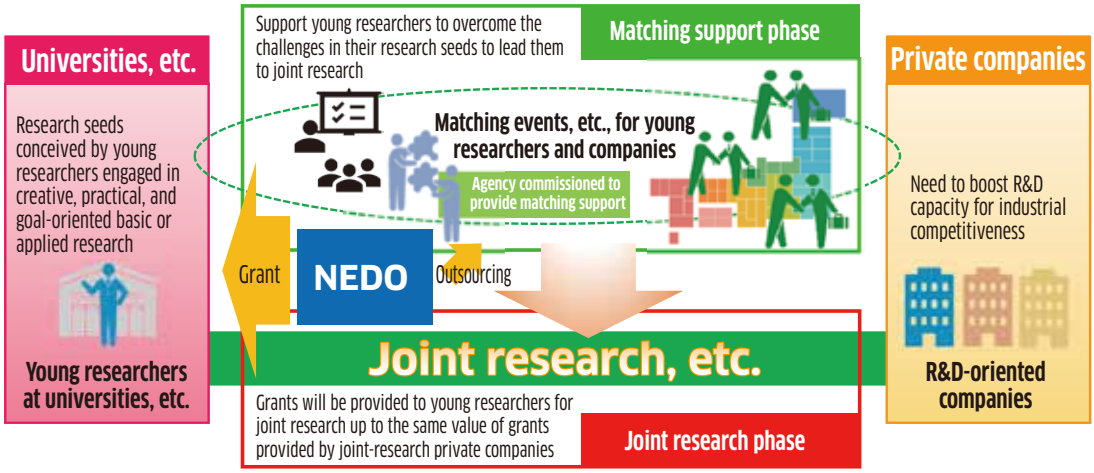
NEDO will organize events and create an information-sharing system in a joint initiative with the other members of the Plus program. The partnerships created under this program will be further expanded through agreements with government-affiliated financial institutions as well as through collaborations with private-sector experts on startup assistance. In this way, NEDO aspires to play a key role in establishing an ecosystem for Japanese startups.

Plus member agencies and representatives

TOPIC

Intensive Support for Young Promising Researchers

This program is being carried out to identify young researchers*3 engaged in creative, practical, and goal-oriented basic or applied research*1 with specific goals at universities or other institutions*2 in order to assist them in working with companies to undertake joint research or similar initiatives.*4 Ultimately, the program is aimed at fostering future leaders in innovation and sharpening the technological edge of Japanese industry.



***1: Creative, practical, and goal-oriented basic or applied research**
Research conducted to facilitate the industrial application of seed technologies resulting from creative R&D activities by undertaking tasks such as discovering working principles, creating prototypes, and conducting demonstrations in order to overcome challenges.

***2: Universities or other institutions**
National or public research institutes, national or public universities, inter-university research institute corporations, private universities, national technical colleges, national research and development agencies, national or local independent administrative agencies, and any other comparable institutions.

***3: Young researchers**
Researchers under the age of 45 who have earned a doctoral degree or are enrolled in a doctoral program as of April 1, 2021 (i.e., in the first fiscal year of this program).

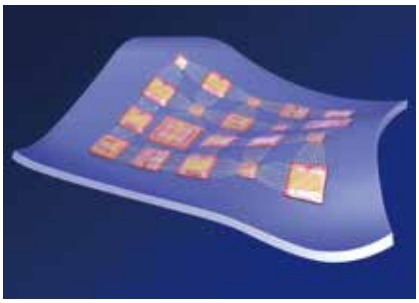
***4: Joint research or similar initiatives**
Joint research, commissioned research, technical guidance, doctoral research internships, cross-appointment systems, and other initiatives that facilitate the practical application of technologies jointly pursued with companies registered in Japan (i.e., companies whose decision-making authority or core base of technology development is located in Japan).

Examples of ongoing research and development activities

Development of a chip-embedded wearable µLED display (Tohoku University)

Matching support phase

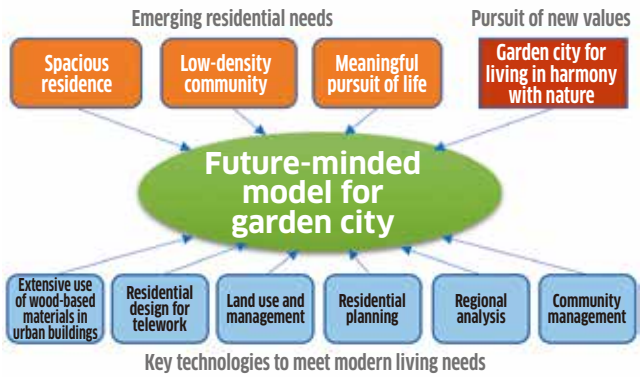
Nowadays, wearable display devices, including those resembling wristwatches, are typically made of rigid substrate. A multi-functional sensor embedded on a more flexible substrate, however, could be applied in a broader range of biochemical microelectronics applications. For instance, such a device would allow health monitoring to be performed without causing disruptions to sleep. For this reason, NEDO is working on the development of a high-throughput and high-yield manufacturing process for flexible µLED displays by using self-assembly and fine-pitch interconnect technologies. This process employs an advanced semiconductor packaging manufacturing method for embedding tiny µLED chiplets ranging in size from 10 µm to 100 µm on a transparent flexible resin without the use of thermal compression bonding.



Development of a future-minded model for a garden city to shape residential areas in harmony with nature (Waseda University)

Joint research phase

Young researchers are expected to propose a new style of environmentally conscious residential neighborhood capable of meeting modern needs in spacious metropolitan suburbs in line with the increasing popularity of work styles that make extensive use of information and communication technologies (e.g., telework and small office/home office [SOHO]). In so doing, researchers will draw on the architecture and urban planning insights that they gained at university along with the technical know-how of companies involved in handling wood products and promoting grassroots community development.



Presentation of Promising Innovations for Tackling the COVID-19 Pandemic

TSC releases "TSC Brief Report: Social Changes and Promising Innovations in the Post-COVID World"

In April 2020, the Technology Strategy Center (TSC) redefined its mission to "Catch Moves, Design Our Future and Show Strategies Forward." Given this redefined mission, TSC is working together with policy authorities on the planning of important technology development projects as well as the formulation of technology strategies to address environmental and energy issues and strengthen industrial capabilities in Japan. TSC's achievements are regularly reported in TSC Foresight. In FY2020, TSC also began to release TSC Brief Reports, as part of its activities to be more sensitive to capturing social changes. In April 2020, the COVID-19 pandemic began causing notable social changes to our world. Reacting swiftly to these changes, the TSC released its first brief report entitled "TSC Foresight Brief Report: Social Changes and Promising Innovations in the Post-COVID World" ("COVID-19 Report") on June 24.

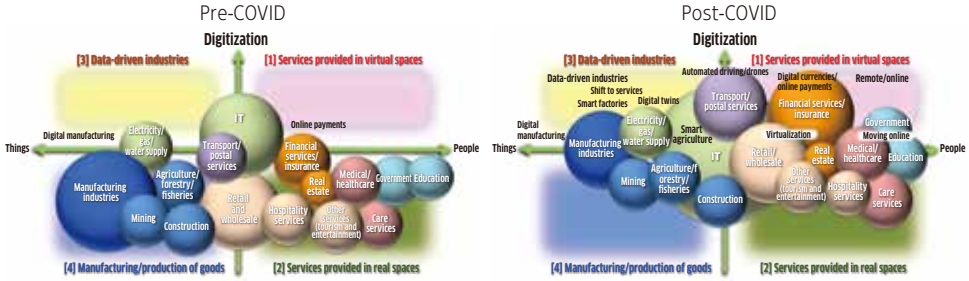
Key points of COVID-19 Report

The COVID-19 pandemic has coincided with the ever-increasing pace of innovation being driven by the recent trends toward digital transformation and globalization. In reference to the impact of the pandemic, the COVID-19 Report presents new visions for innovations expected in the post- COVID world after providing a series of multifaceted discussions based on an analysis of data collected from Japan and abroad. For instance, the following social designs are envisioned in the report as promising models for the "new normal" in the post-COVID world.

- A society in which cyber space, where physical contact is not necessary, and the real world, where physical contact is necessary, are seamlessly linked in every conceivable scenario, from everyday life to economic or industrial activities, classroom activities, and medical activities, so that people can enjoy the benefits of both in a stress-free manner while effectively preventing infectious diseases.
- A society with resilience underpinned by more advanced digital technologies, the autonomous supply and demand of energy, as well as resource-saving, localized, and circular supply chains to ensure the continuity of socio-economic activities without stagnation, even in the event of an infectious disease outbreak or disaster.

Future designs are envisioned to extend across many fields and are global in nature. Japanese policy authorities, industry, and academic communities are expected to work in unison to combine their technological capabilities and knowledge and take the lead globally in this social transformation.

COVID-19 Report



Pandemic-induced changes in various industries

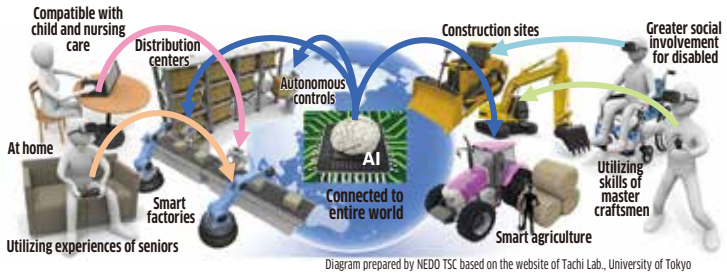


Diagram prepared by NEDO TSC based on the website of Tachi Lab., University of Tokyo

Image of innovations in industry using both autonomous control and tele existence

Dialog with a wide range of stakeholders

The COVID-19 Report has received considerable feedback from private companies, government agencies, and academic institutions alike, resulting in requests for interviews, presentations, and article contributions. These organizations include the Japanese Ministry of Economy, Trade and Industry (METI), the Engineering Academy of Japan, and the Japan Society of Mechanical Engineers. In response to requests from government agencies, NEDO shares relevant information and engages with a wide range of stakeholders at advisory councils and study meetings, including the R&D and Innovation Subcommittee organized by METI.

Providing clear and widely accessible information

https://www.nedo.go.jp/library/ZZNA_100039.html

The innovations introduced in the COVID-19 Report are illustrated and explained in comic-book-style stories, four of which, have been published on the NEDO website.

COVID-19 Report in comic-book-style stories (created by SHINFIELD)

TSC Foresight publications in FY2020

TSC Brief Report

https://www.nedo.go.jp/library/tsc_tanshin.html

The findings of studies and analyses of social trends are summarized in TSC Brief Reports.

- Social changes and promising innovations in the post-COVID world
- Global trends: Global response to the COVID-19 pandemic
- Global trends: Shift in US innovation and climate policies under the Biden administration
- Material technologies for enhancing well-being in society
- Contributions of bioindustry in addressing environmental and energy needs: Challenges and potential of biomanufacturing
- Global trends: New environmental markets created by the European Green Deal: International rollout of European technologies
- Information and communications technologies expected in the next generation

TSC Technology Strategy

https://www.nedo.go.jp/library/foresight.html

This report reviews technological, industrial, and policy trends related to key technologies both in Japan and abroad before discussing efforts to develop technologies aimed at addressing social challenges and ways of achieving the envisioned future.

- Advanced aviation biofuels
- Semantic artificial intelligence
- Distributed autonomous systems
- Application of human data
- Thermal use of renewable energy
- Thermal energy
- Nanotechnologies and materials for advanced application of IoT
- Smart Tele-Autonomy (teleoperation and autonomous system assisted by human intervention)

TSC Foresight Technology Strategy Report

Online TSC Foresight seminars

Discussing prospects for future technological developments

TSC shares its survey and analysis findings through seminars and other channels in a timely manner.

Innovations required in anticipation of the “new normal” of the post-COVID world

On July 30, 2020, NEDO invited scientists and industry experts to join a panel discussion held in combination with the presentation of the “TSC Foresight Brief Report: Social Changes and Promising Innovations in the Post-COVID World.” Necessary innovations were discussed in anticipation of a “new normal” for the post- COVID world.

Exploring the future of agriculture, forestry, and fisheries: New value offered by energy and resource distribution systems

On December 11, 2020, NEDO and the MONODZUKURI Nihon Conference co-hosted an expert panel discussion that was combined with a presentation on initiatives for developing and applying innovative production systems in agriculture, forestry, and fisheries. In addition to considering the future outlook, participants discussed the challenges to be addressed by a broad coalition of stakeholders to strengthen the international competitiveness of these industries and implement the practical application of innovative zero-emission solutions.

The key to the post-COVID social transformation: Combining human augmentation, AI, and remote technologies

On February 10, 2021, NEDO and the MONODZUKURI Nihon Conference invited experts from their respective fields to discuss the future outlook and innovations expected in anticipation of the social changes caused by COVID-19. Special focus was placed on innovative applications utilizing human augmentation technologies and the challenges associated with their social implementation.

TSC Foresight online seminar (left photo: courtesy of Nikkan Kogyo Shimbun)

Evaluations and Awards

Project Evaluations

In addition to planning and implementing technology development projects, NEDO conducts evaluations of ongoing projects. Using a plan-do-check-act cycle that incorporates evaluation results in the planning process, NEDO endeavors to improve its management to carry out appropriate technology development that achieves excellent development results.

NEDO carries out an ex-ante evaluation during the planning stage, a midterm evaluation about three years after the start of project implementation, and an ex-post evaluation after project completion. Midterm evaluation results are incorporated into tasks such as revising technology development plans, and ex-post evaluation results are used to improve future planning and management of technology development projects. In FY2020, 17 midterm and 11 ex-post evaluations were conducted.

For a period of five years after a project ends, follow-up monitoring of project participants is carried out using surveys and other information collection techniques. This monitoring is used to determine the utilization of NEDO project results and to analyze key issues for transferring them to practical application. After the results are introduced to the market as products or services, they are designated as "NEDO Inside Products" and NEDO publishes an estimated sales performance forecast on its website. In addition, reports on the researchers involved and how they achieved practical application are published as "NEDO Project Success Stories" (see page 37 for details).

In FY2020, follow-up monitoring surveys were conducted for a total of 1,196 companies, organizations, and other entities. The practical application rate of project results utilization during the five years from FY2014 was 33.9%.

Awards and commendations

In addition to winning many awards in Japan and overseas for its projects, NEDO has instituted a commendation program to encourage the practical application of its project outcomes.

Awards

First Japanese winners of the ISGAN Award of Excellence

In 2020, NEDO and Hitachi became the first Japanese winners of the ISGAN Award of Excellence, which is affiliated with the International Energy Agency. Intended to recognize excellence in initiatives related to smart grids around the world, this award was presented in commendation of the achievements of the Japanese partners involved with the demonstration of a promising smart community project conducted jointly with the Slovenian national electric power transmission operator ELES, d.o.o.

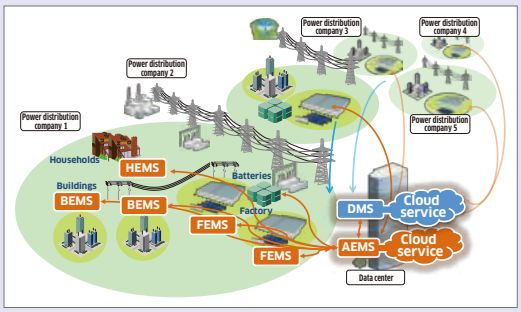


Illustration of the smart community demonstration project in Slovenia

NEDO wins Grand Prix awards at CEATEC AWARD 2020, in both the Open and Co-Creation Park categories

NEDO has won Grand Prix awards at CEATEC AWARD 2020, in both the Open and Co-Creation Park categories, in recognition of its achievements in innovative projects. The awards ceremony took place during CEATEC 2020 ONLINE, an exhibition covering all aspects of the Society 5.0 concept being pursued by Japan.

- Grand Prix Open Category Award: Coin-Size Vibrational Energy Harvester for IoT Network Society (developed by NMEMS TRA)
- Grand Prix Co-Creation Park Category Award: Early Detection of Gastric Cancer using Endoscopic AI (developed by AI Medical Service Inc.)

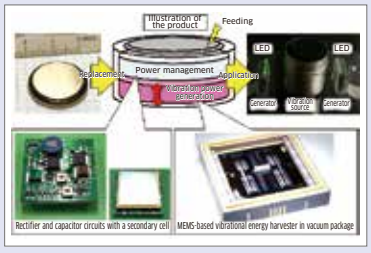


Illustration of a vibrational energy harvester integrated with a button cell provided by a combination of a MEMS-based vibrational energy harvester and a power management circuit

Diagnostic accuracy of AI comparable to that of experts.

Commendations

NEDO recognizes accomplishments in the development of six types of energy-saving technologies

In FY2020, NEDO recognized accomplishments realized through FY2019 by ten business operators in their respective projects to develop six types of energy-saving technologies. These awards are presented to recognize particularly innovative energy-saving technologies developed under NEDO's Strategic Innovation Program for Energy Conservation Technologies which began in FY2012 and will conclude in FY2022. Among the ten FY2020 award winners, FLOSFIA received special recognition as winner of the NEDO Chairman's award.

Commendation ceremony

Case Studies on the Practical Application of NEDO Project Outcomes

Achievements of completed NEDO projects

NEDO Project Success Stories.

https://www.nedo.go.jp/hyoukabu/

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.

For the full story, please visit the NEDO website.

Seven new articles published in NEDO project success stories

Realizing Small, Lightweight, High-Precision and Inexpensive Development of an Epoch-Making 3D Vision Sensor

Reduction of Operation Time to One Tenth Development of AI That Can Perform Concrete Crack Detection

Realization of Widespread Use of Refrigerants with Low Greenhouse Gas Effects Revision of International Standards Based on Safety Evaluation Methods

Efforts to Reduce Waiting Time and Enhance the Efficiency of Medical Practice Administration Development of an AI-Driven Medical Interview System

Succeeded in Commercialization of the World's Highest Spec Sand 3D Printer for Casting

Toward the Application of 3D Nano Structure Control Development of Super Fuel-Efficient Tires

High-Efficiency, Energy-Saving Heating Technology Completion of a Heat Pump for Use in Vehicles

Impact of NEDO project results

NEDO Inside Products

https://www.nedo.go.jp/nedo_inside.html

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, CO_2 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.

Selection of a new 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.

TOPIC

Training Courses

Comprehensive activities for developing human resources and encouraging industry-academia partnerships with NEDO projects at the core

Since FY2006, NEDO has offered special courses aimed at cultivating individuals who will lead the way in developing technologies in advanced and cross-sectoral fields as well as shaping a venue for encouraging interpersonal exchanges through industry-academia-government partnerships.

Training course on cellulose nanofibers (CNFs)

Cellulose nanofibers (CNFs) are expected to replace conventional petroleum-derived materials in a wide range of areas. NEDO began offering a special training course for engineers who develop advanced CNF technologies to accelerate their practical application in society. In both the first and second halves of the course, lectures and practical work are conducted over 21 days at four leading CNF research institutes: the University of Tokyo, Kyoto University, the Kyoto Municipal Institute of Industrial Technology and Culture, and the AIST Chugoku. In FY2020, 39 individuals from various industries completed the course. In addition to encouraging interpersonal exchanges among professionals from various backgrounds, NEDO offers advice and support on analyzing and evaluating sample materials. In this way, NEDO is seeking to initiate a positive cycle that will enable future leaders to develop competence in their specialist fields in line with new CNF applications.

Compounding of CNFs and natural rubber using a planetary centrifugal mixer

View of lecture

Training courses that promote wider application and advancement of robot common software technologies

Robot common software technologies were developed as part of 'Technology Development Project for Robot Commercialization Applications' completed in FY 2019, to streamline their system integration and bring down costs. In FY2020, training courses were offered to improve and broaden the application of the technologies. The extensive application of robots through the effective use of OSS will be pursued by not only providing training on applying the project outcomes, but also by offering more opportunities for human resource exchanges and building ecosystems for the retention and continuous improvement of these technologies.

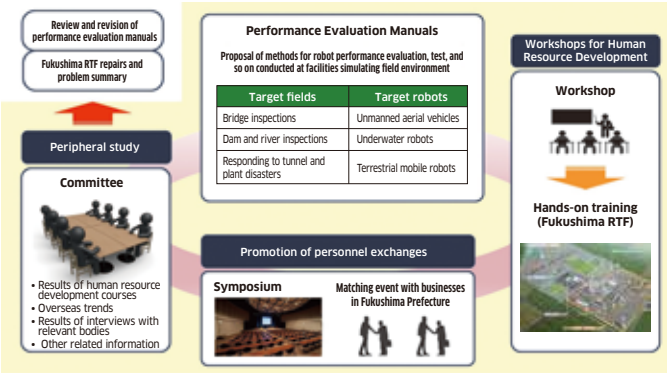
Courses offered at the end of March 2021	
1. Introduction to robot common software technology	[1] Hands-on ROS course [2] Explanatory course on licenses for the effective utilization of OSS
2. Commercialization through effective employment of the project outcomes	[1] Course on mobile manipulation [2] Platform for 3D robot vision
3. Application of ROS	[1] Course on the effective employment of image processing technologies and AI

Description of training courses

On-demand streaming of seminar videos

Special course on evaluation methods for robot performance

Beginning in FY2018, NEDO launched a human resource development project with the aim of accelerating the use and wider deployment of robots for infrastructure maintenance and disaster response.
In this project, integrated presentations on human resource development, person-to-person exchanges, and peripheral studies were held to raise people's awareness and understanding of the Performance Evaluation Manuals for Robots and the Fukushima Robot Test Field (RTF) where performance evaluation testing will take place. The manuals were compiled jointly by NEDO and METI and are intended for use in the performance evaluation process. Through this activity, NEDO aims to create relevant markets for robots by cultivating personnel who can contribute to accelerating the application and wider deployment of robots in this field.



Initiatives as an Organization

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45 Creating a Positive Workplace Environment

45 Response in Emergency Situations

46 Conveying Information

47 Background Information

Environmental Report

Goals of activities to reduce environmental impact

By engaging in business with others and through its actions, NEDO is actively pursuing initiatives to address energy and environmental problems. A particular area of focus is the problem of global warming, which is attracting rising concern worldwide. Accordingly, with the goal of reducing its environmental impact by FY2030, NEDO established its Implementation Plan for Curbing Emissions of Greenhouse Gases at the New Energy and Industrial Technology Development Organization on March 22, 2018, in line with the Action Plan for Greenhouse Gas Emission Reduction in Government Operations (Cabinet decision, May 13, 2016; referred to below as the "government's action plan").

https://www.nedo.go.jp/jyouhoukoukai/other_index.html

Reference **Contents of Plan to Reduce Emissions of Greenhouse Gases (version drafted on March 22, 2018)**

Overview of the Implementation Plan for Curbing Emissions of Greenhouse Gases at the New Energy and Industrial Technology Development Organization formulated on March 22, 2018; referred to below as the "implementation plan."

I Applicable Office Work and Operations

Office work and operations carried out primarily by NEDO (e.g., head office, branch offices)

II Applicable Period

FY2017 to FY2030, to be reviewed as necessary in accordance with the FY2021 implementation plan onward in line with revisions to the government's action plan and other relevant factors.

III Goal

By FY2030, NEDO aims to reduce total greenhouse gas emissions directly resulting from its office work and operations by 40% compared to the FY2013 baseline. The interim target is a 20% reduction by FY2020.

IV Review of Implementation Plan

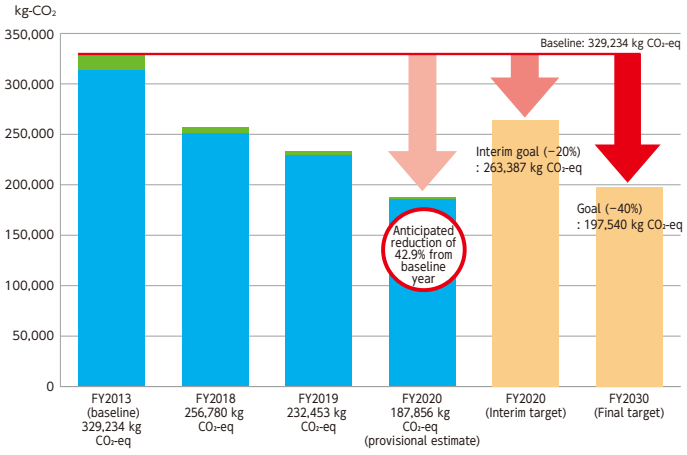
A review of the implementation plan will be conducted every year and posted on NEDO's website or other suitable platforms.

V Details of Specific Measures

1. **Proportion of next-generation vehicles used by NEDO**
   NEDO only uses next-generation vehicles and will continue to do so to ensure that the interim emissions reduction target is met.
2. **Fuel consumption by NEDO vehicles**
   Fuel consumption of NEDO vehicles will be halved by FY2020 compared to the FY2013 baseline.
3. **Share of LED lighting in use**
   The share of LED lighting will be increased to at least 90% by FY2020.
4. **Paper consumption**
   Paper consumption will be reduced by at least 40% by FY2020 compared to the FY2013 baseline.
5. **Power consumption per unit of office area**
   Power consumption per unit of office area will be reduced by at least 15% by FY2020 compared to the FY2013 baseline.

Greenhouse gas emissions

In FY2020, greenhouse gas emissions were reduced to 187,856 kg of CO_2 equivalent (provisional estimate).



Planned reduction targets and greenhouse gas emissions in FY2020 (provisional estimate)

Future efforts

In line with its mission to develop technologies for addressing energy and global environmental issues, NEDO will continue its efforts to reduce energy consumption and environmental impacts and strive to achieve the FY2030 reduction targets stipulated in the implementation plan.

Efforts related to green procurement

When purchasing goods and services, NEDO promotes green procurement, which is a system of selecting goods and services that have a low environmental impact. Every year, NEDO drafts and publishes its Procurement Policy for Promoting the Procurement of Environmental Goods and Services (referred to below as the "procurement policy").

Policy for FY2019 https://www.nedo.go.jp/koubo/ZZAG_100017.html

Specified procured goods

For specified procured goods, goods that meet judgment criteria for each item are procured in accordance with the procurement policy.

Environmental goods and services other than specified procured goods

For other environmental goods and services, NEDO endeavors to procure goods and services that have either received eco-label or green mark certification or possess equivalent environmental characteristics. In the procurement of office equipment and home appliances, NEDO selects models that are energy-efficient and use recycled materials.

https://www.nedo.go.jp/koubo/choutatu_kankyou.html

NEDO goes beyond just meeting the judgment criteria specified in the procurement policy and endeavors to procure goods with as little environmental impact as possible.
NEDO will report on its procurement of environmental goods and services during FY2019 to Japan's Ministry of the Environment and disclose this information on the NEDO website.

Energy conservation measures

NEDO implements a variety of initiatives to reduce its energy consumption.

Energy conservation in offices

- Turning off all lights during lunchtime and turning off alternate lights during work hours
- Diligently turning off office equipment when not in use
- Establishing workdays when all employees go home at the same time
- Switching lighting fixtures to LED lamps

Alternate lights (LED lamps) are turned off during lunchtime

Power saving through the optimal use of air conditioning

Every year, NEDO rigorously enforces an organization-wide campaign to save power by optimizing the use of air conditioning from May to September. Office temperatures are adjusted to save power by encouraging employees to work in more casual clothing (i.e., without ties, jackets, etc.). This policy applies to NEDO employees as well as visitors, who are advised of the policy and encouraged to cooperate.

Adoption of cloud computing

Since it adopted cloud computing in FY2010, NEDO has eliminated its dedicated server room and replaced the desktop terminals of all personnel with laptops. This has enabled a major reduction in power consumption. In addition, by switching to an information infrastructure service in FY2015, NEDO has reduced the number of its network devices and multifunction printers, thereby achieving a reduction of nearly 40% in energy consumption.

Measures to conserve resources

NEDO takes various steps to promote a 3R (reduce, reuse, and recycle) policy within its facilities.

Reduction in paper use

The steps shown on the right are being taken to reduce the amount of paper used by NEDO. In FY2019, the amount of paper used was reduced by 38% in terms of weight compared to FY2013.

- Promotion of paperless meetings and briefings (using a paperless meeting system and laptop computers)
- Simplification and digitalization of documents
- Adoption of an electronic approval system

Future efforts

NEDO is committed to reducing and sorting waste in compliance with city initiatives to reduce waste generation, encourage recycling, and reduce the amount of incineration through approaches such as improved sorting and collection of recyclable paper as well as plastic containers and packaging.
In addition, NEDO encourages the reuse of office supplies and office equipment. For example, folders and paperclips are sorted and stored with priority given to making effective use of existing resources.

Containers for sorting garbage on each floor

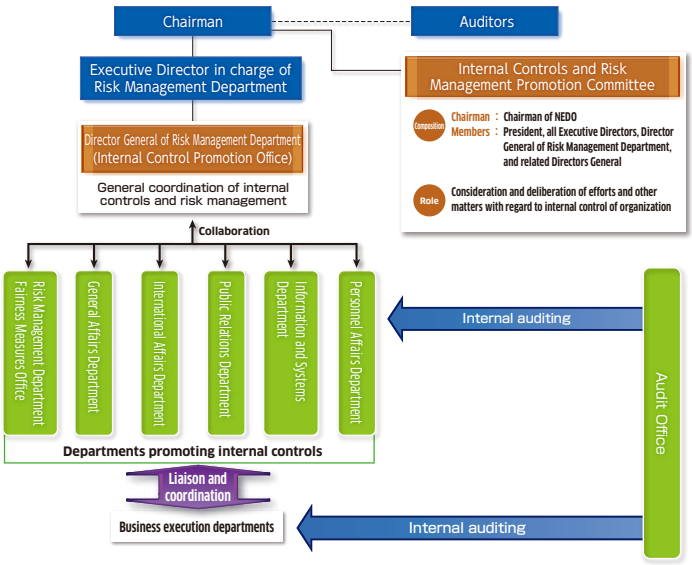
Compliance Activities

System for promoting internal controls

As an organization that handles state-of-the-art technical information, NEDO recognizes the need for a controlled environment that ensures reliable business practices and maintains a high level of ethical standards so as to earn the trust of society. To promote legal compliance through strengthening of internal controls and risk management, NEDO has established a governance system based on policies set by the Internal Controls and Risk Management Promotion Committee, which is led by NEDO's chairman. The Risk Management Department is responsible for supervising the entire internal control system.

https://www.nedo.go.jp/jyouhoukoukai/compliance_index.html

NEDO system for promoting internal controls



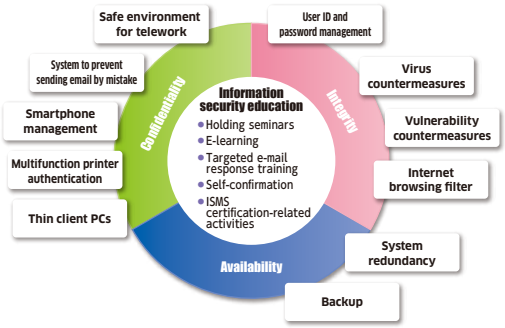
Activities to strengthen compliance

NEDO internal instructors provide compliance training to new employees promptly after they start working. Training of executives and staff is also provided by external instructors. Furthermore, in order to eliminate in advance any potential hazards that may emerge throughout the organization, NEDO works to increase each employee's awareness of compliance through initiatives such as intranet posts about compliance violations being reported in the news, various training materials, reports on examples of near-miss incidents, and alert messages.
In addition, as a measure to prevent fraud by NEDO project participants and in light of a case involving misuse of research expenses that occurred in FY2017, NEDO is working to strengthen and improve its governance system and ensure that the system is fully understood by all concerned.

Strengthening information security measures

NEDO has put in place a safe telework environment by using thin laptop computers that do not save data locally. This is a safeguard against data breaches in the event a computer is lost or compromised. Additional safeguarding measures have been adopted by employing the latest technologies, such as multifunction printers with authentication features to prevent documents from being lost or left unattended as well as online storage for downloading files to be attached to emails to prevent mailing mistakes.

Activities to strengthen information security measures



Maintenance of international standard ISO/IEC 27001 (ISMS) certification

As part of its internal control strategy, from 2016, NEDO has been engaged in activities to maintain its information security management system (ISMS) certification under international standard ISO/IEC 27001:2013 with the aim of establishing and operating appropriate and relevant information security measures. NEDO will continue to undertake information security measures through ISMS activities to maintain and improve its internal controls.

ISMS-I367

Organization name : New Energy and Industrial Technology Development Organization
Registration number : I367
Date of registration : December 15, 2016
* Coverage does not include foreign offices.

Information disclosure

Based on the Act on Access to Information Held by Administrative Organs, NEDO is actively working to disclose the information it holds. On its website, information is disclosed regarding NEDO's organization, finances, and other matters. Information is also disclosed on all types of procurement, as well as NEDO's efforts to ensure transparency in contracts.

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

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

Communication with Society

Dissemination and raising awareness both inside and outside of Japan

1. Hosting of international conferences, participation in exhibitions, etc.

NEDO hosts international conferences and debriefing sessions to raise public awareness regarding the technologies developed through its projects as well as its support programs. NEDO also facilitates business matching and exchanges by participating in exhibitions and hosting seminars, symposiums, and other events.

International conferences

In October 2020, during a series of events known as Tokyo Beyond-Zero Week, NEDO worked with the Ministry of Economy, Industry and Trade (METI) to host the following online conferences on environmental innovations: Hydrogen Energy Ministerial Meeting 2020, Second International Conference on Carbon Recycling 2020, and Innovation for Cool Earth Forum 2020. Government officials, researchers, experts, and other conference participants from around the world reviewed various innovative initiatives and the latest findings in their respective countries as well as the potential for international partnerships. The lectures and panel discussions were streamed online with the aim of building a strong international industry-academia-government network.

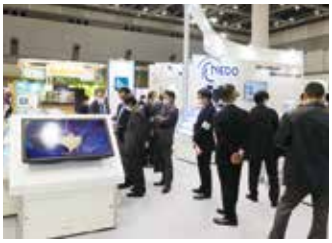
International Conference on Carbon Recycling 2020

Hydrogen Energy Ministerial Meeting 2020

Exhibitions

NEDO participates in various exhibitions to encourage practical applications of its project outcomes. In FY2020, some of these exhibitions, such as CEATEC 2020 ONLINE, were held online for the first time in response to the COVID-19 pandemic. NEDO participated in several exhibitions that were held both online and on-site, including BioJapan 2020, nano tech 2021, and ENEX2021, in order to share relevant information and support business networking.

NEDO's virtual booth as posted on CEATEC 2020 ONLINE



NEDO's booth at ENEX2021

2. News releases and press conferences

NEDO communicates widely with the public through news releases, press conferences, study tours, and various other kinds of media aimed at deepening public understanding of NEDO's activities and their importance to society.

Sample news release

Press conference

Extensive use of social media and online content

In FY2020, NEDO opened an official Twitter account to share the latest information posted on its official website, such as news releases, calls for proposals, and event announcements. It also launched NEDO+, a web-based magazine that compiles its public relations magazine, NEDO Project Success Stories (as a follow-up on past projects), videos, and other content. NEDO will continue to make extensive use of social media and other online content.

Announcement on Twitter

Screenshot of NEDO+ website

Recruitment and Human Resources Development

Recruiting

NEDO proactively recruits temporary workers and accepts seconded employees who will contribute to realizing innovation from private companies, universities, national research institutes and other organizations.

NEDO also hires new graduates from universities and graduate schools who are expected to become core NEDO personnel. Moreover, NEDO accepts experienced professionals with diverse career backgrounds from private entities, governmental organizations, and other entities.

Human resources development

NEDO plans and conducts various training programs for all its employees. For example, since project management is one of its most important roles, NEDO organizes project manager training programs that cover topics such as team management, leadership, facilitation, and negotiations. As a Japanese governmental funding agency, NEDO also requires the development of administrative skills in areas such as accounting, financial operations and public relations. In addition, the skills of permanent NEDO staff are enhanced through their participation in level-adjusted training sessions and study programs conducted in Japan and abroad. Furthermore, to enhance its overall organizational operations, NEDO provides its managers with various training programs in areas such as supervisory skills and labor management. NEDO also implements employee programs aimed at facilitating employee self-improvement, self-motivation and career development.

Project management training

The following types of project training are provided to develop PM personnel:

- Seminars for strengthening exit strategies: lectures on domestic and foreign case studies of industrial and intellectual property policies, standardization, intellectual property strategy management, and other topics
- Training program for advanced industrial science and technology: Review of policy trends and case studies to facilitate the practical application of project outcomes

Training by level

- New hire training
- Basic skill enhancement training: This training is targeted at NEDO employees who have joined the organization within the previous one to three years. They undergo external training to acquire knowledge about finance and other subjects and take courses to improve their presentation and other skills. The program aims to enhance the necessary basic capabilities of NEDO employees.
- Training for each level: This training improves the thinking, communication, and personnel and organization management skills needed to play the role required for positions such as coordinator, project general manager, section manager representative, or manager.

Outside study and temporary transfer programs

- Domestic and overseas study abroad program: Personnel master capabilities that enable them to handle a wide range of work by acquiring a master's degree or doctorate in technology management science, engineering, or another related field at a graduate school in Japan or overseas.
- Program for temporary transfer of personnel to administrative agencies: Personnel learns about the policymaking process and related topics by gaining work experience from a policy perspective at administrative agencies such as the Ministry of Economy, Trade and Industry.

Language training

- For employees involved in international activities, NEDO organizes a foreign language training program that develops English language skills necessary for conducting effective telephone conversations and composing e-mails.

Practical training

- Employees are provided assistance for self-improvement through support for a portion of the cost of correspondence and classroom courses, e-learning, or other education related to work. In addition, the entire NEDO workforce regularly undergoes training on matters such as inspections, audits, compliance, and accounting standards for independent administrative institutions to help employees acquire specialized skills for carrying out assignments in their respective areas of responsibility.

Business English conversation training

Employee award program

To ensure vigorous organizational growth, NEDO has established an employee recognition program with the aim of motivating its employees to continue their professional development and contribute further to the organization.

Personnel evaluations

Personnel evaluations are carried out along two axes: evaluation of goal achievements, where attainment of goals set at the beginning of a period is evaluated at the end of the period; and evaluation of conduct, which assesses fulfillment of conduct requirements needed to produce results and carry out a necessary role. NEDO has developed a system that clearly identifies the skills that employees need to improve. Motivation is provided by reflecting evaluation results in staff treatment, such as bonuses and raises, and providing feedback on goal setting and evaluation results.

Creating a Positive Workplace Environment

Improving the workplace environment

NEDO is building a framework for balancing work with family life by establishing an action plan based on the Act on Advancement of Measures to Support Raising Next-Generation Children. This effort has been recognized by the awarding of certification from the Minister of Health, Labour and Welfare. NEDO is also taking other proactive steps to pursue workstyle reform and a better work-life balance in accordance with a workstyle reform initiative by NEDO's chairman.

Establishment of various programs

To support parenting and caregiving, NEDO has adopted programs for childcare leave, care leave, time off to care for pre-school children, time off to care for family, shorter working hours, and flexible working hours. In addition, it has also adopted telework to realize support for parenting, caregiving, employees' work-life balance, and so on.

Health Committee

A Health Committee has been established to improve the workplace environment, and efforts are regularly made to prevent employee accidents and health problems, improve the workplace environment, and achieve a work-life balance.

Training

- Work-life balance training: Employees learn about balancing work and their private lives so they can both avoid and prevent such problems as poor work efficiency or work-related accidents due to long working hours.
- Personnel management training: Employees are taught about everything from the basics of personnel management to recent trends in the field. They also learn precautions for managing the working hours of subordinates.

Measures to prevent harassment

NEDO has established internal rules to prevent harassment and is working to ensure awareness among all employees through compliance training and other approaches. A help desk on workplace harassment has been established in the Personnel Affairs Department, and NEDO is working to maintain and improve the workplace environment by utilizing a law office as an outside notification contact.

Maintaining and promoting employee health

Regular health checkups are provided to employees to detect health problems at an early stage. A blood pressure monitor is available for use at any time, and it helps maintain employee health. Employees are also encouraged to undergo comprehensive medical examinations that are available to those belonging to union-managed health insurance. In addition, NEDO supports health consultations by industrial physicians and public health nurses, follow-up on the results of health diagnoses, mental health consultations, and mental healthcare training.

Health consultation with occupational health physician

Response in Emergency Situations

Establishment of a system for disasters and other emergencies

NEDO has drawn up disaster management rules that set out the basic policy for disaster responses and require the establishment of a disaster response headquarters. Measures to ensure the safety of employees and respond to disasters are described in NEDO's disaster response manual. In addition, NEDO's continuity plan specifies the preparations and procedures necessary for NEDO to continue operations in the event of a disaster.
NEDO has continued operating during the ongoing COVID-19 pandemic by establishing a disaster response headquarters to prevent further infections and ensure the safety of its personnel.

Rules, disaster manual, and other information are contained in a disaster response notebook

Disaster response equipment

NEDO conducts various types of disaster preparedness training, including fire drills and courses on using automated external defibrillators. Disaster response awareness is also instilled by an e-learning course for all employees.

To enable business continuity and aid those who have difficulty returning home, NEDO stockpiles three days of emergency provisions (drinking water, food, and daily necessities). The following equipment is provided in offices:

- Boxes with emergency tools for securing an escape route in case of an emergency (Boxes are placed at various locations on each floor.)
- AED lifesaving equipment (One is located on each floor.)
- A NEDO disaster response notebook (containing a disaster response manual, a fire self-protection manual, a business continuity plan, and other information) is positioned at various locations on each floor. Employees can easily refer to the notebook during normal times, or in an emergency, so necessary action can be taken immediately.

Conveying Information

NEDO publicizes information about its activities widely so that the public can utilize the know-how and results from NEDO's technology development efforts and demonstration projects by conducting development of databases, issuance of white papers, and other documents, cultivation of human resources, and so on.

Website

https://www.nedo.go.jp

On its website, NEDO posts a wide variety of information, including news releases, information on public solicitations and events, technical details regarding NEDO projects, recently developed technologies, case studies of successful commercial applications, and recent trends.

Twitter

https://twitter.com/nedo_info

NEDO's official Twitter account provides the latest information from its website, including news releases, events, and calls for participants. Please follow NEDO's official Twitter account.

Database of progress reports

Every year, NEDO publishes numerous progress reports that describe the results of its projects, surveys, and other activities. These reports can be downloaded from a searchable database available on the NEDO website for up to 10 years after original publication.

Public outreach magazine

Focus NEDO

This reader-friendly magazine features information on technologies currently being developed, project results, and relevant policy frameworks. It also provides information on case studies describing the successful practical application of NEDO project results and detailed commentaries on technology-related topics covered in NEDO news releases.

NEDO+

https://plus.nedo.go.jp/

This web-based magazine provides clear and easy-to-understand information regarding NEDO's activities and achievements in addressing energy and global environmental problems and enhancing industrial technologies. Topics range from renewable energy to robotics/IoT and others.

Videos

NEDO Channel on YouTube

Video content on the NEDO Channel on YouTube offers information regarding NEDO's organization, existing or emerging NEDO project technologies, and achievements resulting from NEDO projects. The channel also features various other videos, such as presentations made by entrepreneurial startups and presentations given at seminars.

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
1,256 (as of April 1, 2021)

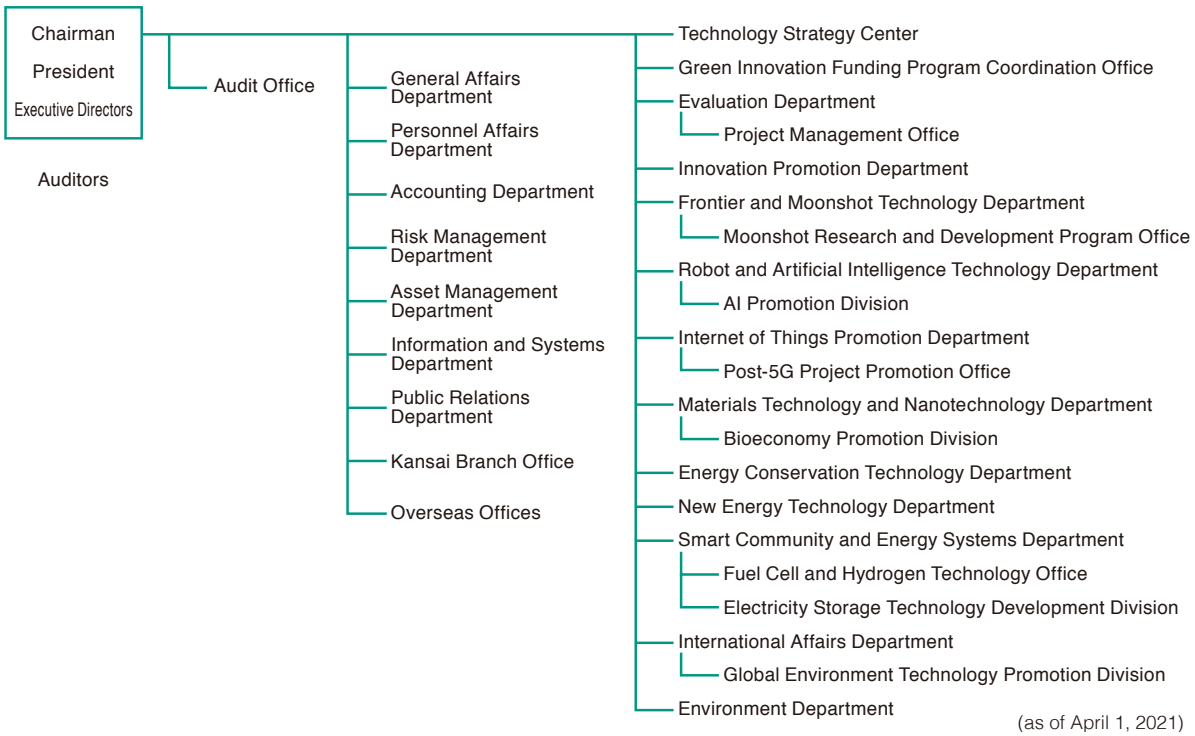
Budget
Approximately 1.44 billion US dollars (FY 2021)
*In addition to the above, the following programs will be funded and conducted as publicly solicited research and development projects.
Green Innovation Funding Program: 18 billion US dollars
Post-5G Research and Development Project: 1805 million US dollars
Moonshot Research and Development Program: 187 million US dollars

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 October 1, 2021)

Organization



(as of April 1, 2021)

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Oct.2021 (1st Edition)