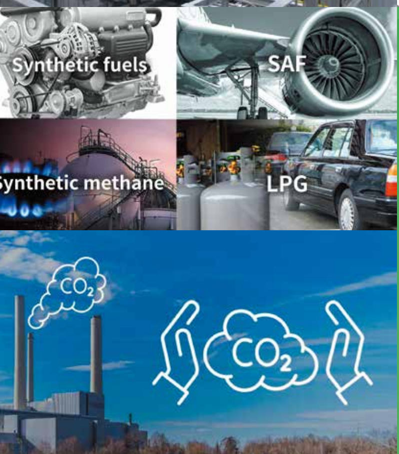
Green Innovation Fund Projects



Green Japan, Green Innovation

Working toward a carbon-neutral future.

New Energy and Industrial Technology Development Organization

Contents

Working toward a carbon-neutral future.

The driving force behind Japan's future growth is the challenge of achieving carbon neutrality.

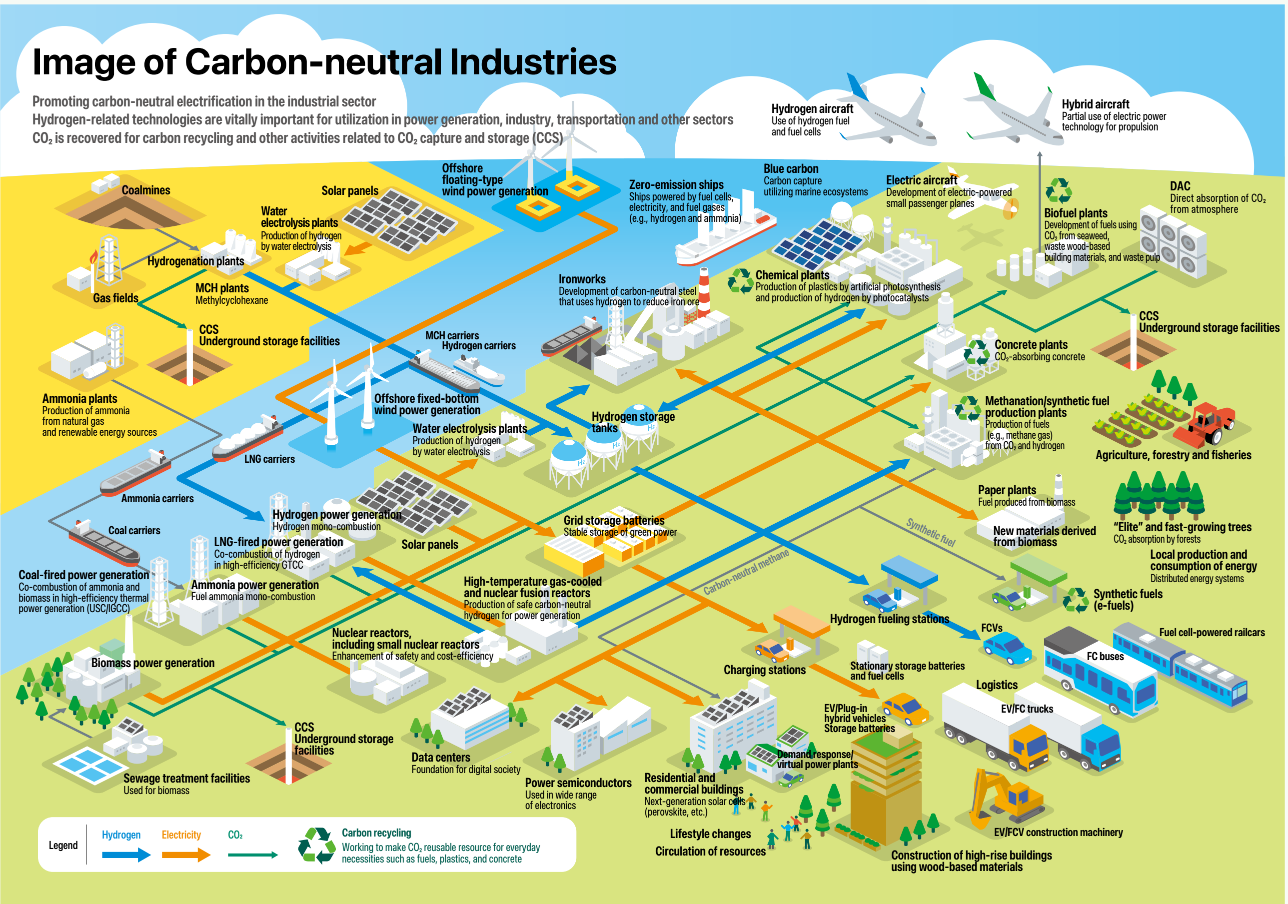
In October 2020, Japan declared that it aims to achieve carbon neutrality by 2050, with the goal of reducing overall greenhouse gas emissions to zero by this year. Carbon neutrality by 2050 cannot be realized through ordinary efforts. It is necessary to significantly accelerate efforts toward structural changes in the energy and industrial sectors, and undertake bold investment for innovation.

For this reason, the Ministry of Economy, Trade and Industry (METI), in collaboration with other ministries and agencies, formulated the "Green Growth Strategy through Achieving Carbon Neutrality in 2050."

The strategy specifies 14 promising areas expected to demonstrate future growth and provides action plans for each of these areas from the viewpoints of both industrial and energy policies. The strategy reflects Japan's determination to pursue ambitious goals while highlighting to the greatest extent possible realistic pathways toward their achievement.

Moreover, to support the forward-looking efforts of companies aiming to realize these goals, many kinds of policy measures are being mobilized. As part of this effort, a 2 trillion yen* fund has been established at NEDO in March 2021 to launch the Green Innovation Fund Projects.

*300 billion yen was added to the second supplementary budget for FY2022, and 456.4 billion yen was added to the initial budget for FY2023, bringing the total to 2.7564 trillion yen as of November 2024.



Source: Created by NEDO based on "Image of Carbon Neutral Industries" by METI

Green Innovation

The Green Innovation Fund Projects, carried out on the basis of ambitious goals shared by the public and private sectors, aims to provide continuous support to companies and other organizations committed to addressing such goals as part of their business activities. Such support, available for up to a maximum of ten years, ranges from research and development (R&D) activities and demonstrations to social implementation of project outcomes.

Basic Policies for Green Innovation Fund (Summary)

01 Purpose and Outline

To achieve carbon neutrality by 2050, METI established a 2 trillion-yen fund as part of NEDO and provide continuous support for R&D projects, demonstrations, and social implementation projects for up to 10 years to companies that commit to ambitious goals.

02 Program Target

(Per project) Ambitious 2030 targets, etc. (Performance, Cost, etc.)

Monitor Cross-sectoral monitoring of fund projects based on the following;

＊International Competitiveness
＊Commercialization (TRL, etc.)
＊Potential for attracting private investment

- CO_2 Reduction Effect
- Economic Effect

03 Support Target

METI's support will focus on priority fields for which implementation plans have been formulated within the Green Growth Strategy, or key fields for which a future roadmap has been presented based on the "Basic Policy for Realization of GX", where policy effects are significant, and long-term continuous support is required to realize public implementation.

- Average size of conventional R&D projects (20 billion yen) or more.
- Projects for which short-term government support programs is sufficient are not eligible.
- Main implementers should be companies or other profit-making businesses capable of carrying out the entire process of public implementation (participation of small and medium-sized venture companies is encouraged; participation of universities and research institutions is also expected).
- The project must include innovative and fundamental R&D elements that are worthy of being commissioned by the government.

04 Strategy for Maximizing Results

To ensure that research and development results are steadily implemented publicly, METI seeks the commitment of the managers of companies and other organizations to persevere in challenging these goals as long-term business issues.

(Efforts required of company managers)
＊Submission of the vision and the long-term business strategy at the time of application
＊Attendance and report to the WG
＊Submission of a management sheet showing the status of initiatives

(Implementation of a system to enhance commitment)
1)If the status of the project is inadequate, the project will be canceled, and a portion of the consignment fee will be returned.
2)Introduction of a system(an incentive measure)that allows the government to pay more depending on the degree of achievement of targets.

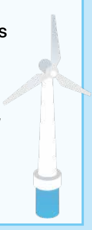
The 14 priority fields in the Green Growth Strategy for which action plans have been compiled

- Upholding ambitious goals, steadily implement action plans corresponding to the phase of technology, and strengthen international competitiveness.
- Trial calculations indicate that the economic effect will be approximately 290 trillion yen and the effect in terms of employment will be approximately 18 million jobs in 2050.

Energy-related Industries

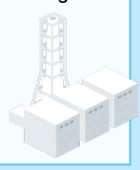
01 Offshore Wind Power, Solar Power, Geothermal Power

- By 2040, develop projects to generate 30-45GW [Offshore wind power]
- By 2030, aim for a power generation cost of 14 yen/kWh through next-generation solar cells [Solar power]



03 Next-generation Heat Energy

By 2050, aim to inject synthetic methane by 90% into existing infrastructure.

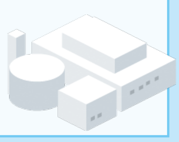


02 Hydrogen and Fuel Ammonia

- By 2050, introduce approximately 20 million tons [Hydrogen]
- Aim to capture a market of 500 billion yen in Southeast Asia [Fuel ammonia]

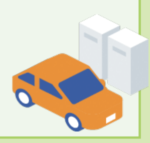
04 Nuclear Power

By 2030, establish underlying technologies related to carbon-free hydrogen production by high-temperature gas-cooled reactors (HTGR).



05 Automobiles and Storage Batteries

For passenger vehicles, electrified vehicles will account for 100% of new vehicle sales by 2035



06 Semiconductors and Information and Communication

By 2040, aim to achieve carbon neutrality in the semiconductor/information and communication industries.

＊In accordance with Japanese law, NEDO is not authorized to implement or provide funding for research and development activities solely targeting nuclear power.

Fund Projects

Moreover, by leveraging government funding, this program is intended to serve as an impetus encouraging private sector investment in R&D activities and infrastructure development, and also attract global ESG-related funding, estimated to total approximately 35 trillion dollars, to Japan. Through such efforts, Japan aims to realize carbon neutrality by 2050.

05 Scheme

Build a highly transparent and effective governance system that incorporates the knowledge of external experts and close cooperation among related organizations.

Green Innovation Project committee
＊Deliberation on the "Basic Policy"
＊Preparation of the "Policy for Allocation of Funds for each Field," etc.

↔ Installation Report ↔

Field-specific working groups (WG)
＊Deliberation on the content and scale of each project, etc.
＊Confirmation of the status of the project, etc.

↕ Presentation and deliberation of the draft basic policy (Green Innovation Project committee – METI)

Presentation and deliberation of proposed R&D and public implementation plan＊1 (METI – WG)

↕ Progress reports and Advice (WG – NEDO)

METI
＊Project Management office for the committee and WGs
＊Preparation of basic policies
＊Planning of each project＊2, etc.

↔ Subsidize and collaboration ↔

NEDO
＊Management and administration of funds
＊Administrative work related to public solicitation, screening, inspection, payment, etc.
＊Technical and business advice by experts, etc.

1 A plan describing the project's goals for 2030, R&D items, maturity level of the target technologies(TRL, etc.), budget scale, etc. (A draft of the plan is discussed by the WG.)
2 Including the division office in charge of the project in the relevant ministry or agency.

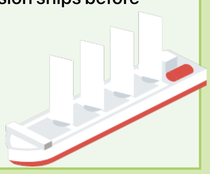
06 Program Schedule

March 2021	From March onward	From April onward	Every year	at any time
Formulate the Basic Policy	**Organize the Projects**	**Implement the projects**	**Evaluate the Projects**	**End of the Projects**
＊Deliberations in the committee	＊Preparation of fund allocation policy for each field ＊Deliberations in WGs	＊Public Offering, Examination, Inspection, Payment, etc.	＊(NEDO → WG → committee) Periodic monitoring	＊Completion or termination ＊Ex-post evaluation

Transportation and manufacturing-related industries

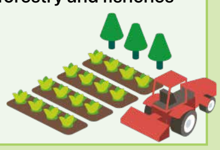
07 Shipping

Realize the commercial operation of zero-emission ships before 2028.



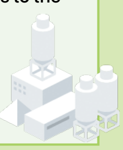
09 Food, Agriculture, Forestry, and Fisheries Industries

By 2050, achieve zero fossil-fuel-derived CO_2 emissions in the agriculture, forestry and fisheries industries.



11 Carbon Recycling and Materials

● By 2050, aim to bring the price of plastic raw materials made by artificial photosynthesis to the same level as existing products [Carbon recycling]
● Realize zero-carbon steel [Materials]



08 Logistics, People Flows, and Civil Engineering Infrastructure

By 2050, realize carbon neutral ports and decarbonization of construction works, etc.

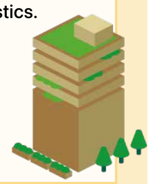
10 Aircraft

Aim for the phased implementation of core technologies for aircraft batteries, etc. from 2030.

Home and office - related industries

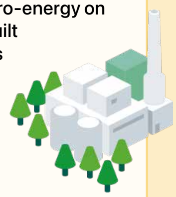
13 Resource Circulation

By 2030, introduce approximately 2 million tons of bioplastics.



12 Housing and Building and Next-generation Power Management

By 2030, realize zero-energy on average in newly built zero-energy homes (ZEH) and zero-energy buildings (ZEB). [Housing and building]



14 Lifestyle-related

By 2050, aim to realize carbon-neutral, resilient and comfortable living.

List of Projects

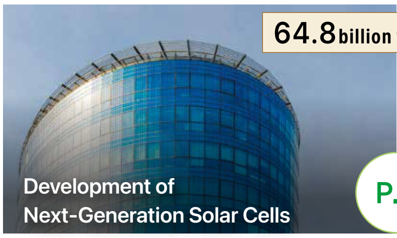
Projects ranging from research and development (R&D) activities and demonstrations to social implementation of project outcomes with view to realizing carbon neutrality by 2050

Field of Green Power Promotion, etc.

Cost Reductions for Offshore Wind Power Ge neration

123.5 billion yen

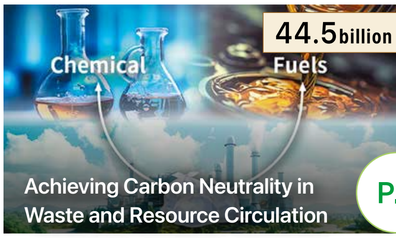
P.7



Development of Next-Generation Solar Cells

64.8 billion yen

P.8



Achieving Carbon Neutrality in Waste and Resource Circulation

44.5 billion yen

P.9

Field of Energy Structure Transformation

Large-scale Hydrogen Supply Chain Establishment

315 billion yen

P.10

Hydrogen Production through Water Electrolysis Using Power from Renewables

70.83 billion yen

P.11

Hydrogen Utilization in Iron and Steelmaking Processes

449.9 billion yen

P.12

Fuel Ammonia Supply Chain Establishment

68.8 billion yen

P.13

Development of Technology for Producing Raw Materials for Plastics Using CO_2 and Other Sources

154.03 billion yen

P.14

Development of Technology for Producing Fuel Using CO_2, etc.

115.28 billion yen

P.15

Development of Technology for Producing Concrete and Cement Using CO_2

56.78 billion yen

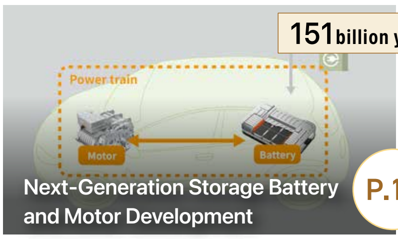
P.16

Development of Technology for CO_2 Separation, Capture, etc.

38.23 billion yen

P.17

Field of Industry Structure Transformation



Next-Generation Storage Battery and Motor Development

151 billion yen

P.18

Development of In-vehicle Computing and Simulation Technology for Energy Saving in Electric Vehicles

42 billion yen

P.19

Establishment of a Smart Mobility Society

113 billion yen

P.20

Next-generation Digital Infrastructure Construction

190.12 billion yen

P.21

Next-generation Aircraft Development

51.68 billion yen

P.22

Next-generation Ship Development

35 billion yen

P.23

Development of Negative Emissions Technologies in Agriculture, Forestry, and Fisheries Industries

15.92 billion yen

P.24

Promotion of Carbon Recycling Using CO_2 from Biomanufacturing Technology as a Direct Raw Material

176.7 billion yen

P.25

Decarbonization of thermal processes in manufacturing

32.51 billion yen

P.26

*The amount shown in each project image is the maximum amount to be contributed from the fund (as of November 2024). In addition, there are other costs to be borne by the implementing companies, etc.

Field of Green Power Promotion, etc.

Cost Reductions for Offshore Wind Power Generation

Budget
Up to
123.5
billion yen

Project Overview

To achieve carbon neutrality by 2050, it is essential to introduce renewable energy as much as possible. Given the feasibility of large-scale introduction and cost reductions as well as the anticipated economic ripple effects, offshore wind power generation holds the key to making renewable energy a main source of power.

Offshore wind power has been expanding mainly in Europe, but the Asian market is expected to grow rapidly between now and 2050. Especially in Japan and other parts of Asia, which have large areas of deep sea, there is an increasing need for systems optimized to suit local oceanographic and meteorological conditions, such as low wind speeds, typhoons, and lightning strikes.

The aim of this project, therefore, is to establish technology that can achieve a power generation cost of 8 to 9 yen/kWh with fixed-bottom wind turbines under certain conditions, and technology to commercialize floating offshore wind turbines at internationally competitive cost levels.

Based on the results of demonstration projects carried out thus far, the cost of offshore wind power, particularly for floating wind turbines, can be quickly reduced, thereby facilitating an expansion in public implementation efforts.

≪ Research & Development ≫

- Technology development project for next-generation wind turbines
- Technology development project for basic manufacturing and installation cost reduction for floating wind turbines
- Technology development project for offshore wind power-related electrical systems
- Innovative offshore wind power operation and maintenance project

- Floating offshore wind turbine demonstration project

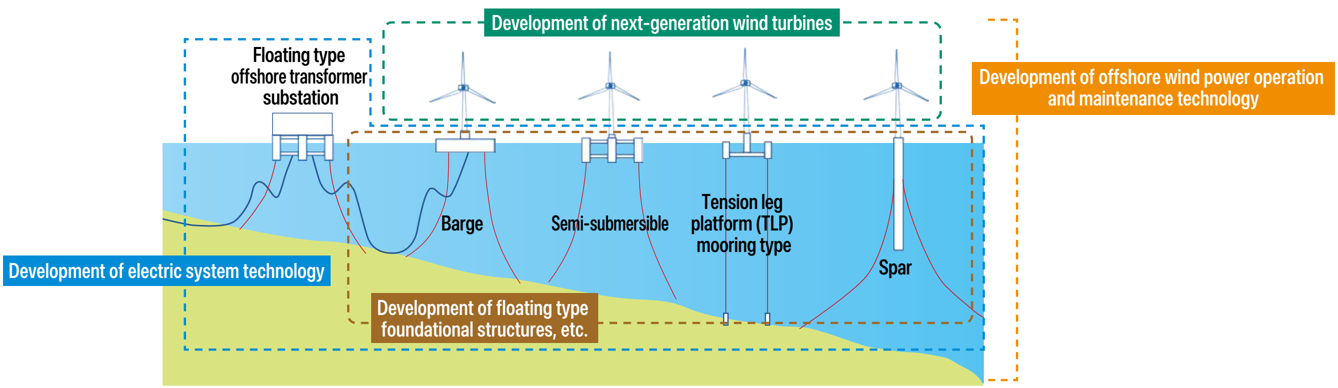
Integration

- Development of Common Basic Technologies for Floating Offshore Wind Power Generation

CO_2 Reduction Effect (Japan)	Economic Effect (World)
In2030 Approximately 3-7 million tons/year	In2030 Approximately 1 trillion yen
In2050 Approximately 90 million tons/year	In2050 Approximately 2 trillion yen

Source : METI, R&D and Social Implementation Plan

Image of technology development for floating type offshore wind power



Detailed information https://green-innovation.nedo.go.jp/en/project/offshore-wind-power-generation/

Project period Maximum of 10 years from FY2021 to FY2030

Department in charge Renewable Energy Department gi-wind[*]nedo.go.jp

When using the email addresses listed above, please change the [*] to @

● Field of Green Power Promotion, etc.

Development of Next-Generation Solar Cells

Budget
Up to
64.8
billion yen

Project Overview

To achieve carbon neutrality by 2050, it is necessary to introduce renewable energy sources, including solar power, as much as possible with the aim of using them as primary sources of power. In Japan, where most land is not flat, one way of securing suitable areas for solar power generation is installing next-generation solar cells that can be installed in places where existing photovoltaic cells could not (walls of buildings, factory roofs that can only support small loads, etc.). Installation in such locations, therefore, requires the development of lightweight next-generation solar cells that are flexible enough to be installed on curved surfaces such as walls and which are also comparable to existing photovoltaic cells in terms of performance (conversion efficiency, long-term reliability, etc.).

Through the development of basic technologies for next-generation solar cells (perovskite solar cells) and R&D for realizing technologies for various manufacturing processes (coating processes, electrode formation, and sealing processes) for scaling up products, the aim of this project is to achieve the same electricity costs of 14 yen/kWh or less by 2030 as conventional silicon solar cells.

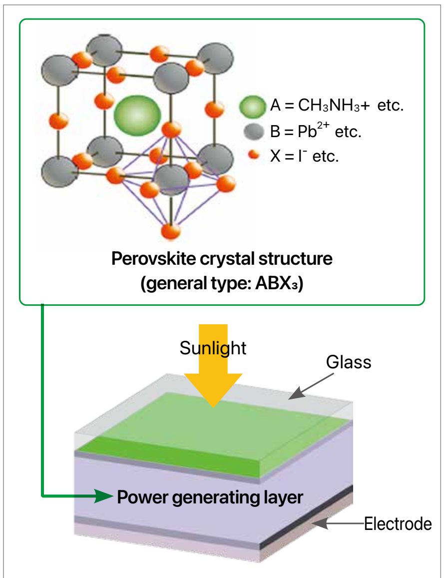
≪ Research & Development ≫

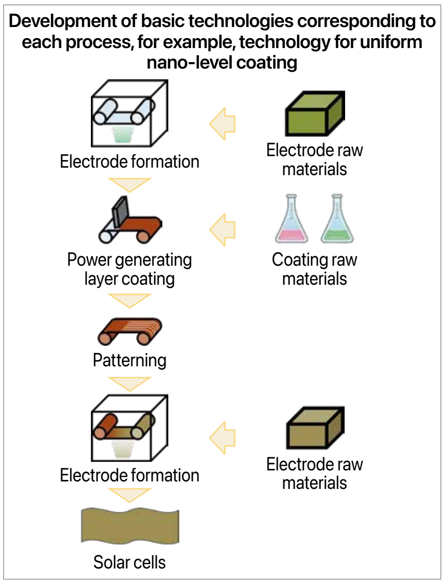
- Project for fundamental technology development of next-generation solar cells
- Project for practical realization of next-generation solar cells
- Project for demonstration of next-generation solar cells

CO_2 Reduction Effect (Japan)	Economic Effect (World)
In2030 Approximately **0.6** million tons/year	In2030 Approximately **12.5** billion yen
In2050 Approximately **100** million tons/year	In2050 Approximately **1.25** trillion yen

Source : METI, R&D and Social Implementation Plan

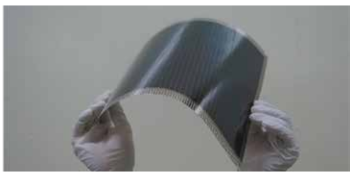
Improved performance at laboratory size ▶ **Upsized with enhanced durability** ▶ **Installation and commercialization**





＊Image Source: Taisei Corporation

Source: The University of Tokyo



Source: Toshiba Corporation

Detailed information https://green-innovation.nedo.go.jp/en/project/next-generation-solar-cells/

Project period Maximum of 10 years from FY2021 to FY2030

Department in charge Renewable Energy Department ✉ nedo.gi-pv[*]ml.nedo.go.jp

● Field of Green Power Promotion, etc.

Achieving Carbon Neutrality in Material Cycles and Waste Management

Budget Up to 44.5 billion yen

Project Overview

Waste management has a problem due to CO_2 emissions from incineration of plastics and other materials and methane emissions from landfill disposal of organic waste, and in order to achieve carbon neutrality, it is essential to recover carbon from waste and circulate it in society as recycled materials and fuels.

On the other hand, the properties of waste (composition, heat content,moisture content, etc.) are constantly changing depending on the region, season, and weather, and cannot be controlled stably,so the amount and properties of the gas after waste treatment are always unstable, making it difficult to utilize carbon capture technologies utilized in other fields as is.

This project aims to develop and demonstrate "carbon-neutral-type carbon circulating systems", which minimizes and achieves virtually zero atmospheric emissions of greenhouse gases such as CO_2, methane,etc. in waste treatment, by stably and efficiently capturing carbon from waste and circulating and supplying it as recycled materials and fuels to industry, with the goal of creating a social implementation model.

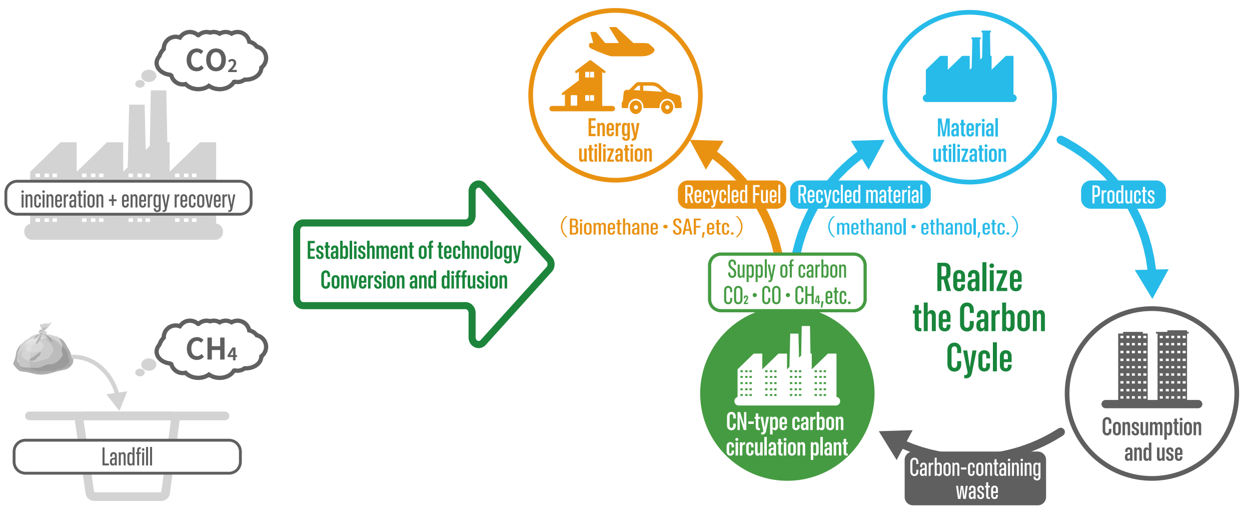
≪Research & Development≫

- Development of waste incineration treatment technology with CO_2 separation and capture system
- Large-scale demonstration of high-efficiency pyrolysis treatment plant
- Development of technology for high-efficiency biomethane conversion

CO_2 Reduction Effect (World)	Economic Effect (World)
In2030 Approximately 10.5 million tons/year	In2030 Approximately 0.5 trillion yen/year
In2050 Approximately 1.244 billion tons/year	In2050 Approximately 5.2 trillion yen/year

Source : Ministry of the Environment,R&D and Social Implementation Plan

Conventional waste treatment system | **Waste treatment system in 2050 (image)**



Source: Prepared based on the "Achieving Carbon Neutrality in Material Cycles and Waste Management" project's directions for research and development and social implementation (Ministry of the Environment)

Detailed information https://green-innovation.nedo.go.jp/en/project/waste-resource-circulation-carbon-neutral/

Project period Maximum of 8 years from FY2023 to FY2030

Department in charge Circular Economy Department / Renewable Energy Department

gi-wastetox[*]ml.nedo.go.jp

When using the email addresses listed above, please change the [*] to @

Large-scale Hydrogen Supply Chain Establishment

Budget
Up to
315
billion yen

Project Overview

Hydrogen can not only directly contribute to the decarbonization of the power generation sector by converting surplus power into hydrogen for storage and utilization, it can also maximize its potential as a zero-emission renewable energy power source. Hydrogen is therefore expected to be used as a secondary energy source for achieving carbon neutrality and contribute to decarbonization in industrial fields such as raw material utilization and heat demand where decarbonization through electrification is difficult.

To promote the social implementation of hydrogen, supply costs must be reduced by increasing the size of supply facilities while also creating large-scale hydrogen demand. However, since long-term hydrogen demand is currently uncertain, it is difficult for private companies to make large-scale investments in infrastructure. To reduce this uncertainty, a social implementation model must be established that can increase supply and create hydrogen demand by maximizing use of existing infrastructure.

In addition to enlarging the transportation facilities, and other resources including hydrogen carriers, the project will implement demonstrations of hydrogen power generation at an actual power plant (co-combustion with other fuels and single-fuel combustion using hydrogen only). The aim is to establish technologies that will make reducing supply costs possible along with creating a large-scale demand for hydrogen, and to achieve a hydrogen supply cost of 30 yen/Nm³ by 2030, and 20 yen/Nm³ or below by 2050 (similar level to fossil fuels).

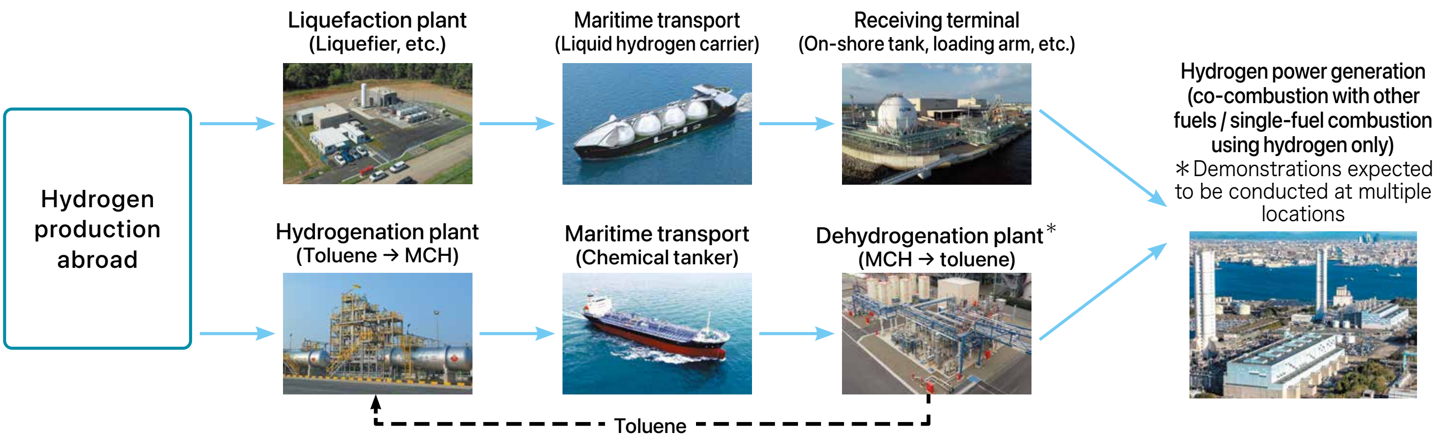
≪Research & Development≫

- Large-scale hydrogen supply chain demonstration, and development of innovative hydrogen transportation technology
- Developing a foundation for material evaluations to support R&D on liquefied hydrogen-related equipment
- Demonstration of hydrogen power generation technology at an actual power plant

CO_2 Reduction Effect (World)	Economic Effect (World)
In2030 Approximately 7 million tons/year	In2030 Approximately 0.3 trillion yen/year
In2050 Approximately 400 million tons/year	In2050 Approximately 5.5 trillion yen/year

Source : METI, R&D and Social Implementation Plan

Large-scale hydrogen supply chain for liquid hydrogen and methylcyclohexane (MCH) (image)



* Oil refineries and other existing facilities are expected to be utilized to the maximum
Source: Created by the Agency for Natural Resources and Energy based on the websites of HySTRA, AHEAD, etc.

Detailed information https://green-innovation.nedo.go.jp/en/project/hydrogen-supply-chain/

Project period Maximum of 10 years from FY2021 to FY2030

Department in charge Hydrogen and Ammonia Department

hydrogen[*]ml.nedo.go.jp

Field of Energy Structure Transformation

Hydrogen Production through Water Electrolysis Using Power from Renewables

Budget
Up to
70.83
billion yen

Project Overview

Hydrogen can not only directly contribute to the decarbonization of the power generation sector by converting surplus power into hydrogen for storage and utilization, it can also maximize its potential as a zero-emission renewable energy power source. Hydrogen is therefore expected to be used as a secondary energy source for achieving carbon neutrality and contribute to decarbonization in industrial fields such as raw material utilization and heat demand where decarbonization through electrification is difficult.

To promote the social implementation of hydrogen, supply costs must be reduced by increasing the size of supply facilities while also creating large-scale hydrogen demand. However, since long-term hydrogen demand is currently uncertain, it is difficult for private companies to make large-scale investments in infrastructure. To reduce this uncertainty, a social implementation model must be established that can increase supply and create hydrogen demand by maximizing use of existing infrastructure.One such model focuses on the utilization of water electrolysers for self-consumption and hydrogen utilization in nearby areas.

To achieve this social implementation model, as well as establish a domestic hydrogen production base and develop markets overseas, the aim of this project is to develop technologies at a close-to-commercial level that will realize alkaline type water electrolysers at a cost of 52,000 yen/kW and PEM type water electrolysers at a cost of 65,000 yen/kW.

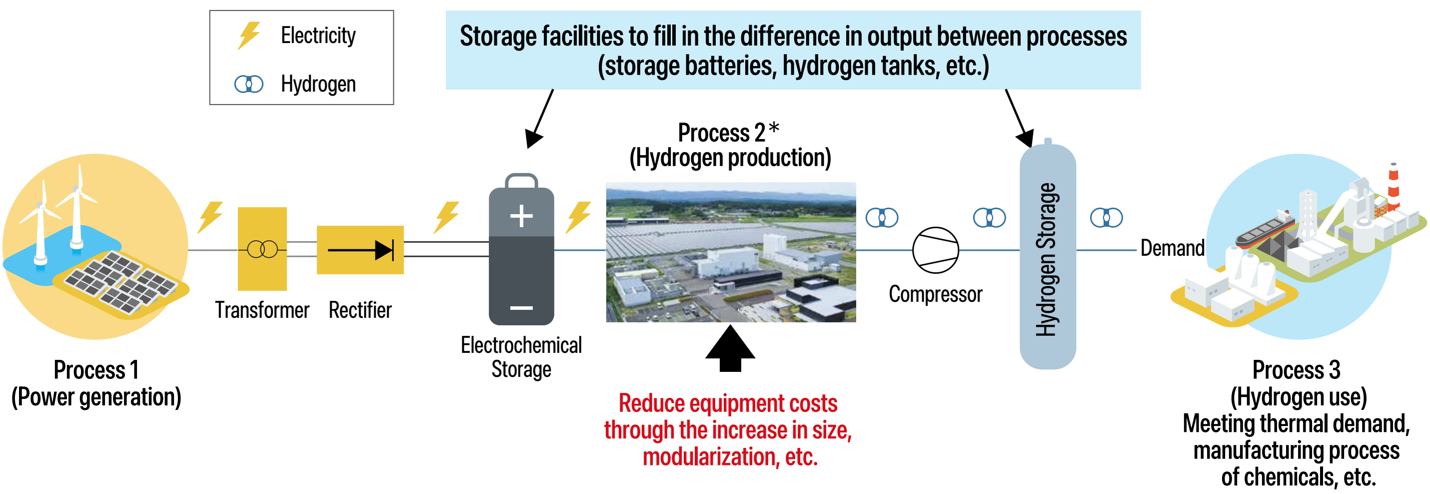
≪Research & Development≫

- Technology development for increasing the size of water electrolysers, and Power-to-X large-scale demonstrations
- Establishment of performance evaluation technologies for water electrolysers

CO_2 Reduction Effect (World)	Economic Effect (World)
In2030 Approximately 40 million tons/year	In2030 Approximately 0.4 trillion yen (Total up to 2030)
In2050 Approximately 1.52 billion tons/year	In2050 Approximately 4.4 trillion yen/year

Source : METI, R&D and Social Implementation Plan

Power-to-X system's structure



* Utilize hydrogen that is manufactured using power generated from excess renewable energy in various sectors, such as industries including electric power, transportation, heating, and industrial raw materials.

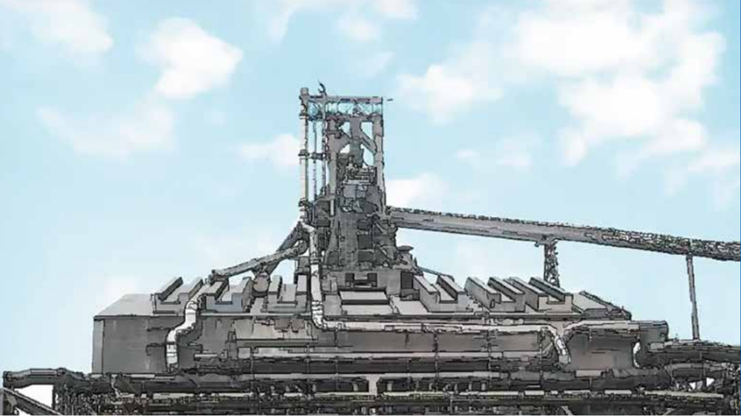
Detailed information https://green-innovation.nedo.go.jp/en/project/hydrogen-production-water-electrolysis-utilizing-electric-power-derived/

Project period: Maximum of 10 years from FY2021 to FY2030

Department in charge: Hydrogen and Ammonia Department

hydrogen[*]ml.nedo.go.jp

When using the email addresses listed above, please change the [*] to @



● Field of Energy Structure Transformation

Hydrogen Utilization in Iron and Steelmaking Processes

Budget
Up to
449.9
billion yen

Project Overview

Steel is used in many products, ranging from spacecrafts to more common products such as automobiles, bullet trains, computers, smartphones, and houses, and the steel industry is the foundation for various other industries.

Even in the carbon-neutral society of 2050, demand is expected to remain high for automobiles, electronics, and infrastructure-related products. During the manufacturing process for these products, however, large quantities of CO_2 are emitted.
CO_2 emissions in the iron and steel industry totaled approximately 131 million tons in FY2020, and currently account for roughly 40% of all industrial CO_2 emissions in Japan.

Since ancient times, the primary method for making steel has been to use carbon, in the form of charcoal or coal, as the means for reducing iron ore. However, this method inevitably generates CO_2. Therefore, to reduce CO_2 emissions, it is necessary to radically change the steel-making process by moving away from coal as a raw material/reduction agent. For this reason, research is underway all over the world on steelmaking through the use of hydrogen reduction where hydrogen is used instead of carbon to reduce iron ore, but this method has not yet been put into practical use.

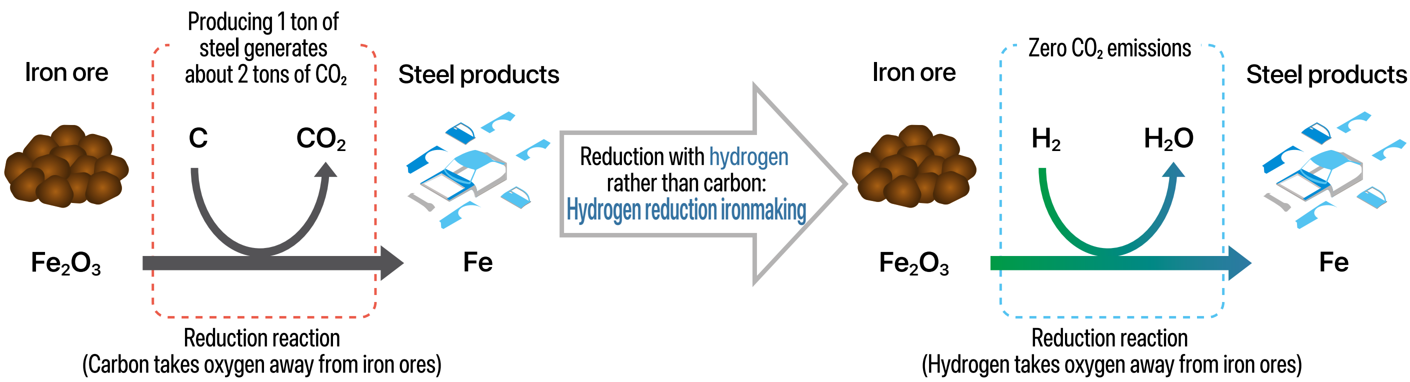
To achieve carbon neutrality in the steelmaking process, this project aims to reduce CO_2 emissions by at least 50% through the application of hydrogen reduction technology to existing blast furnaces (using blast furnace hydrogen reduction technology) and technology for using hydrogen to directly reduce low-grade iron ore (using direct hydrogen reduction technology).

≪Research & Development≫
- Development of hydrogen reduction technology using blast furnaces
- Development of direct hydrogen reduction technology that reduces iron ore with hydrogen only

CO_2 Reduction Effect	Economic Effect (World)
In2030 (Japan) Approximately 2 million tons/year	In2030 Approximately 320 billion yen/year
In2050 (World) Approximately 1.3 billion tons/year	In2050 Approximately 40 trillion yen/year

Source : METI, R&D and Social Implementation Plan

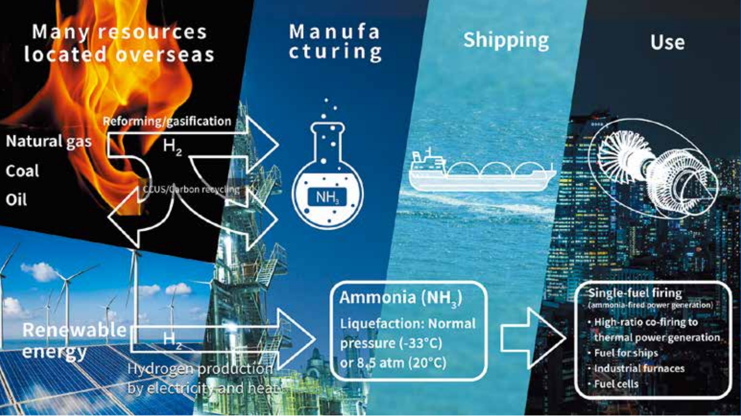
Image of hydrogen reduction ironmaking



Detailed information https://green-innovation.nedo.go.jp/en/project/utilization-hydrogen-steelmaking/

Project period Maximum of 10 years from FY2021 to FY2030

Department in charge Circular Economy Department ✉ gi-steelmaking[*]ml.nedo.go.jp



● Field of Energy Structure Transformation

Fuel Ammonia Supply Chain Establishment

Budget Up to 68.8 billion yen

Project Overview

Similar to hydrogen, ammonia does not emit CO_2 during combustion, so it is expected to be used as a zero-emission fuel for power generation and shipping, thereby helping to realize carbon neutrality. For power generation applications in particular, it is important to promote the decarbonization of thermal power generation by replacing fossil fuels with ammonia. Ammonia can also be used as a hydrogen carrier, so by using existing infrastructure, it can be manufactured and transported inexpensively. Because of these characteristics, ammonia fuel is attracting attention all over the world, and demand is expected to increase rapidly in the future, especially in Asia.

However, ammonia is not currently used as a fuel, so to realize a society where ammonia fuel can be used, various issues must be addressed, such as expanding its use, securing stable supply sources, and reducing its cost.

To address these issues, the aim of this project is to realize technology necessary to reduce ammonia supply costs to the high 10 yen range perNm³ (equivalent to hydrogen bycalorific value) by 2030. Another goal concerns establishing high-ratio co-combustion and mono-fuel combustion technologies for using ammonia power generation to achieve the estimated domestic demand level of 30 million tons/year by 2050.

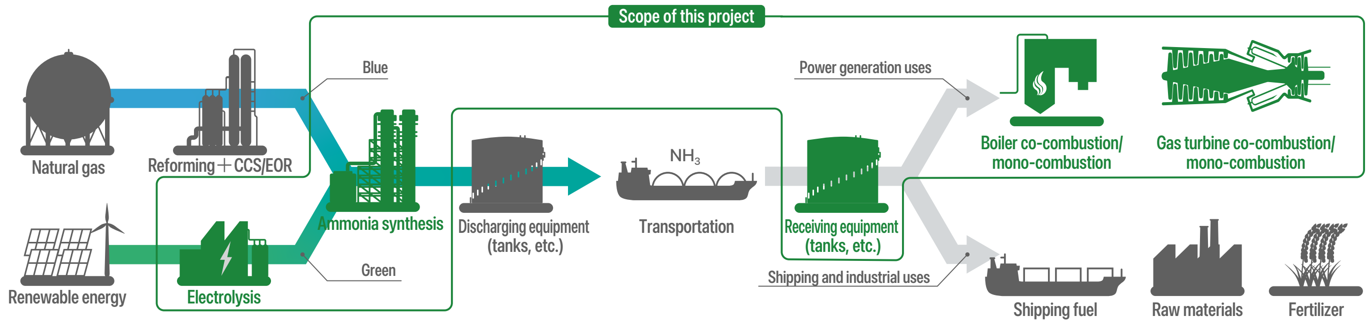
≪Research & Development≫

- Reduction of ammonia supply costs
- High-ratio co-combustion and mono-fuel combustion needed for ammonia power generation

CO_2 Reduction Effect	Economic Effect (World)
In2030 (Japan) Approximately 6.15 million tons/year	In2030 Approximately 0.75 trillion yen
In2050 (World) Approximately 1.15 billion tons/year	In2050 Approximately 7.3 trillion yen/year

Source : METI, R&D and Social Implementation Plan

Fuel Ammonia Supply Chain



Source: Created by NEDO based on diagram produced by IHI Corporation

Detailed information https://green-innovation.nedo.go.jp/en/project/building-fuel-ammonia-supply-chain/

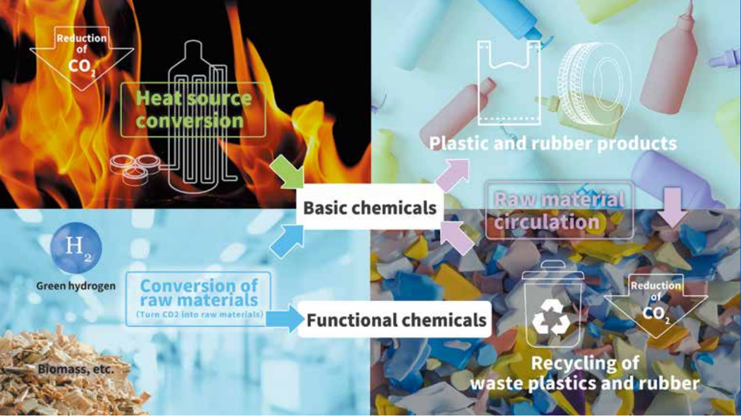
Project period Maximum of 10 years from FY2021 to FY2030

Department in charge

Reduction of Ammonia Supply Costs : Hydrogen and Ammonia Department ✉ hyam-ammonia[*]ml.nedo.go.jp

Use of Ammonia for Power Generation : Circular Economy Department ✉ gi-ammonia[*]ml.nedo.go.jp

When using the email addresses listed above, please change the [*] to @



Field of Energy Structure Transformation

Development of Technology for Producing Raw Materials for Plastics Using CO_2 and Other Sources

Budget
Up to
154.03
billion yen

Project Overview

Carbon Recycling is a key technology that effectively utilizes CO_2 as a resource for realizing a carbon neutral society. As of 2019, the industrial sector accounts for 29.3% of total CO_2 emissions in Japan, and the chemical industry, which accounts for 18.6% of the industrial sector, emits 60.18 million tons on an annual basis.

Most of the raw materials for plastics are derived from naphtha (crude gasoline), which is obtained from refining petroleum, and about half of the CO_2 emitted by the chemical industry is due to processes like cracking naphtha to produce basic chemicals such as ethylene and propylene.

In addition, about 84% of waste plastics are recycled, but some 57% of these are used as a heat source for waste-to-energy plants, etc. (thermal recycling), and are eventually discharged as CO_2. So drastic measures are therefore necessary.

The aim of this project, therefore, is to develop four carbon recycling technologies related to the manufacture of plastic raw materials: advanced technology for naphtha cracking furnaces by adopting carbon-free heat sources, technology for producing chemicals from waste plastics and rubber, technology for producing functional chemicals from CO_2, and technology for producing chemicals from alcohols.

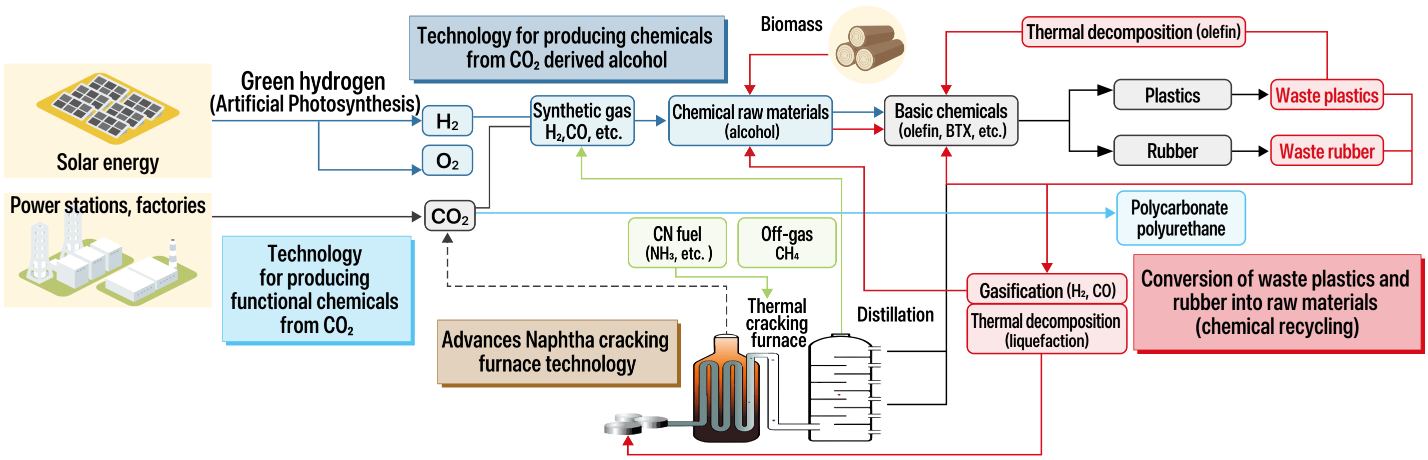
≪Research & Development≫

- Development of advanced technology for naphtha cracking furnaces by adopting carbon-free heat sources
- Development of technology for producing chemicals from waste plastics and rubber
- Development of technology for producing functional chemicals from CO_2
- Development of technology for producing chemicals from alcohols

CO_2 Reduction Effect (World)	Economic Effect (World)
In2030 Approximately 40 million tons/year	In2030 Approximately 10 trillion yen/year
In2050 Approximately 1.5 billion tons/year	In2050 Approximately 363 trillion yen/year

Source : METI, R&D and Social Implementation Plan

Positioning of R&D topics under project



Detailed information https://green-innovation.nedo.go.jp/en/project/development-plastic-raw-material-manufacturing/

Project period Maximum of 12 years from FY2021 to FY2032

Department in charge Biotechnology and Materials Department gi_cr_plastic[*]nedo.go.jp

Development of Technology for Producing Fuel Using CO_2, etc.

Budget
Up to
115.28
billion yen

Project Overview

To achieve carbon neutrality by 2050, it is essential to replace fossil fuels with fuels that do not increase CO_2 levels in the atmosphere when burned.

Such fuels have the potential to transform the energy supply and demand structure in Japan—which is dependent on fossil fuels from other countries—making it important from the perspective of energy security. Using existing infrastructure will greatly help reduce initial costs. The goal is to solve issues related to production technology and lower production costs to implement them throughout society.

It is necessary to promote the development of technology for carbon recycling fuels as one of the various options for realizing a decarbonized society. This project will work toward the social implementation of two liquid fuels—(1) synthetic fuels and (2) sustainable aviation fuels (SAF)—and two gaseous fuels—(3) synthetic methane and (4) green LPG.

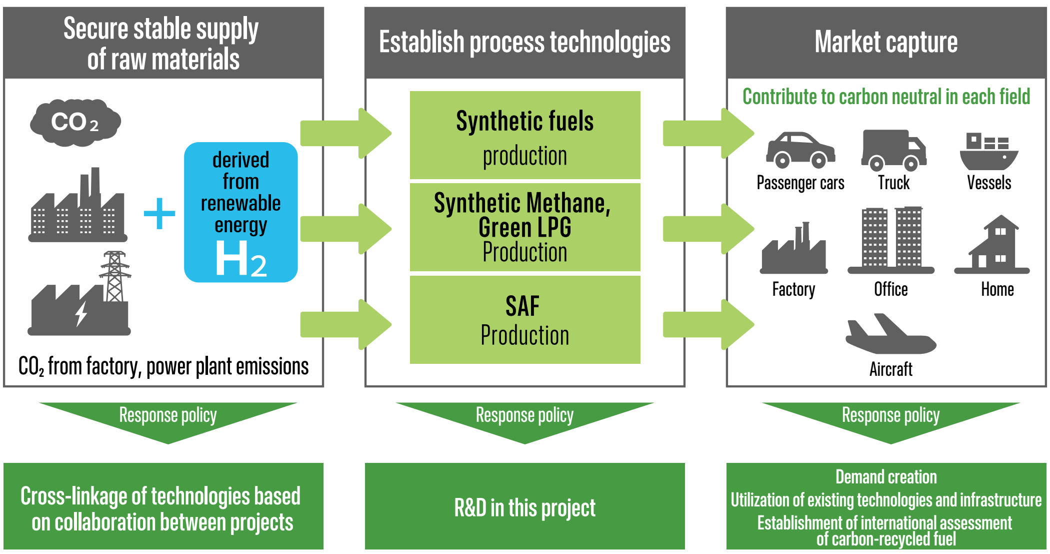
≪Research & Development≫

- Development of technology for improving production yield and utilization technology of synthetic fuels
- Development of technology for producing Sustainable Aviation Fuel (SAF)
- Development of innovative technology for the production of synthetic methane
- Development of technology for synthesizing green LPG without fossil fuels

CO_2 Reduction Effect (World)	Economic Effect (World)
In2030 Approximately 6.008 million to 9.438 million tons/year	In2030 Approximately 270.4 billion to 1.1 trillion yen (Total up to 2030)
In2050 Approximately 320 million tons/year	In2050 Approximately 17.1 trillion yen (Total up to 2050)

Source : METI, R&D and Social Implementation Plan

Image of utilization of CO_2 etc. in major carbon recycle fuels



Source: METI, Development of technology for producing fuel using CO_2, etc, revision

Detailed information https://green-innovation.nedo.go.jp/en/project/development-fuel-manufacturing-technology-co2/

Project period Maximum of 9 years from FY2022 to FY2030

Department in charge

Synthetic Fuels (Improving Production Yield), Synthetic Methane,Green LPG	: Circular Economy Department	gi-fuel[*]ml.nedo.go.jp
Synthetic Fuels (Utilization Technology)	: Automotive and Storage Battery Department	gi8eng[*]ml.nedo.go.jp
Sustainable Aviation Fuels (SAF)	: Renewable Energy Department	nedo.biofuel[*]ml.nedo.go.jp

When using the email addresses listed above, please change the [*] to @

● Field of Energy Structure Transformation

Development of Technology for Producing Concrete and Cement Using CO_2

Budget
Up to
56.78
billion yen

Project Overview

Carbon Recycling is a key technology that effectively utilizes CO_2 as a resource for realizing a carbon neutral society. Japan has a competitive edge in the field of CO_2 separation and capture, as well as certain kinds of chemicals relevant to this technology.

Due to the high potential for CO_2 fixation and the stability of products, the use of CO_2 in concrete, cement, and carbonates in particular will be implemented in society, which is expected to greatly reduce CO_2 levels. In Japan, the United States, and Europe, R&D and demonstration projects in this area are already underway.

In order to achieve decarbonization in concrete and cement field, however, it is necessary to reduce CO_2 emissions and increase CO_2 fixation of concrete, a product used all around the world, as well as promote its use by reducing costs. Cement, a material used in concrete, also emits CO_2 through the decarbonization reaction of limestone, one of its raw materials, making it another issue that needs to be addressed.

To realize a carbon neutral society, the aim of this project is to address the above issues related to the social implementation of Carbon Recycling technologies, and strategically promote their diffusion in Japan and overseas.

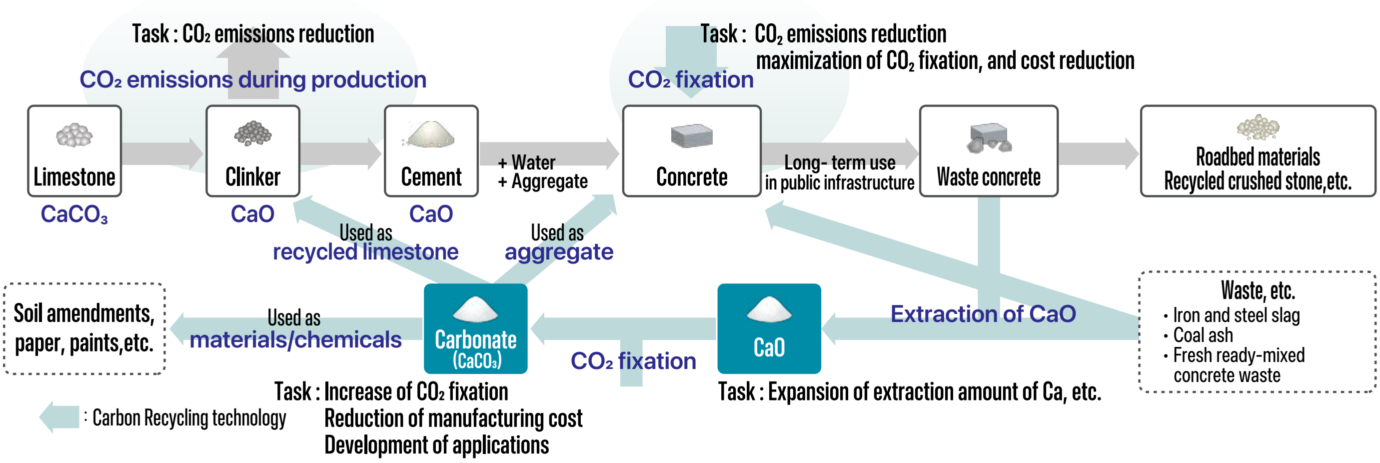
≪Research & Development≫

- Development of concrete produced with maximized volumes of CO_2 emissions reduction and CO_2 fixation
- Development of technology related to quality control/fixation evaluation methods for concrete produced with maximized volumes of CO_2 emissions reduction and CO_2 fixation
- Design and demonstration of CO_2-capturing cement production process
- Development of carbonation technology using various calcium sources

CO_2 Reduction Effect (World)	Economic Effect (World)
In2030 Approximately 0.6 to 1.4 billion tons/year	In2030 Approximately 380 billion yen
In2050 Approximately 3 billion tons/year	In2050 Approximately 156 trillion yen

Source : METI, R&D and Social Implementation Plan

CO_2 emissions reduction and CO_2 fixation in concrete and cement



Detailed information https://green-innovation.nedo.go.jp/en/project/development-manufacturing-concrete-using-co2/

Project period	Maximum of 10 years from FY2021 to FY2030
Department in charge	Circular Economy Department ✉ gi-concrete[*]ml.nedo.go.jp

Development of Technology for CO_2 Separation, Capture, etc.

Budget Up to 38.23 billion yen

Project Overview

The power sector is moving toward decarbonization by introducing renewable energy to the greatest extent possible. However, in order to meet domestic demand for electricity, it is necessary to maintain a certain amount of thermal power generation and capture the resulting CO_2 emissions.

At the same time, while efforts to realize decarbonization in the industrial sector are moving forward, by such means as electrification and fuel conversion to hydrogen, demand for fossil fuels is expected to continue to some degree due to cost-related factors. In addition, it is difficult to avoid CO_2 emissions emanating from raw materials used in industrial sectors such as cement, steel, and chemicals.

There is consequently an increasing need for CO_2 separation and capture technologies in both the power generation and industrial sectors. However, challenges include the large amount of energy inputs needed for separation and capture and high costs for the equipment and materials used for capture.

The aims of this project are to establish technology for the first time for low-pressure, low-concentration CO_2 separation and capture at a concentration of 10% or less, to expand the business for CO_2 separation and capture equipment and materials, and to strengthen Japan's international competitiveness in the carbon recycling market while linking these results to the development of negative emission technologies such as Direct Air Capture (DAC).

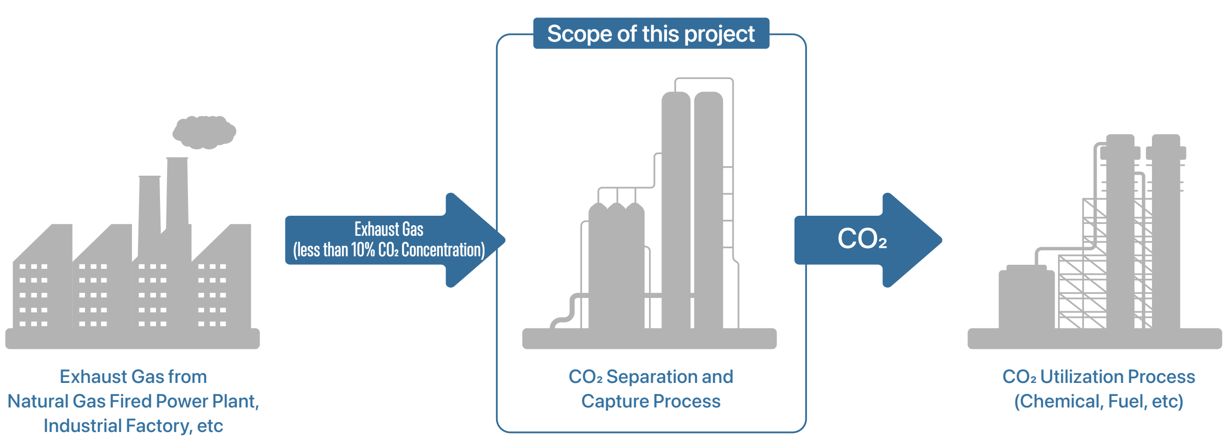
≪Research & Development≫

- Technology development and demonstration of large-scale CO_2 separation and capture from natural gas-fired power generation exhaust gas
- Technology development and demonstration of small- and medium-scale CO_2 separation and capture from factory exhaust gas, etc.
- Establish a common base for evaluating the standards of CO_2 separation materials

CO_2 Reduction Effect (World)	Economic Effect (World)
In2030 Approximately 1.6 billion tons/year	In2030 Approximately 6 trillion yen/year
In2050 Approximately 8 billion tons/year	In2050 Approximately 10 trillion yen/year

Source : METI, R&D and Social Implementation Plan

CO_2 (Low Pressure/Low Concentration) Separation and Capture Process

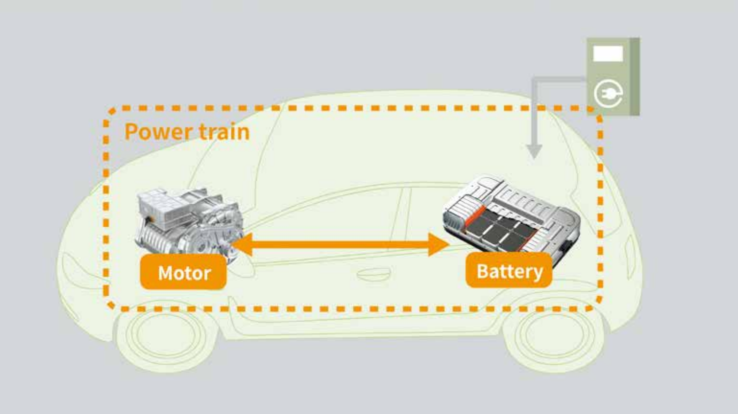


Detailed information https://green-innovation.nedo.go.jp/en/project/development-co2-separation-recovery/

Project period Maximum of 9 years from FY2022 to FY2030

Department in charge Circular Economy Department gi-capture[*]ml.nedo.go.jp

When using the email addresses listed above, please change the [*] to @



● Field of Industry Structure Transformation

Next-generation Storage Battery and Motor Development

Budget Up to **151** billion yen

Project Overview

Use of automobiles accounts for 16% of total CO_2 emissions both globally and domestically. The movement toward the use of electric vehicles to stem global warming is accelerating worldwide, and the spread of electric vehicles and plug-in hybrid vehicles is rapidly expanding in Europe and China. Efforts to support the development of fuel-cell trucks and buses are also increasing in many countries. To maintain and strengthen competitiveness in the automotive industry, the main pillar of Japan's economy, it is essential to accelerate initiatives toward electrification.

The challenges to be addressed toward the widespread use of electrified vehicles include expanding social acceptance through vehicle price reductions and infrastructure development such as electrified vehicle charging infrastructure and hydrogen stations. Another challenge will be to strengthen electrified vehicle-related technologies, supply chains, and value chains, including storage batteries, fuel cells, and motors. It is especially important to develop small lightweight storage batteries and motors for light and commercial vehicles which face restrictions in terms of vehicle body design and whose pricing is an important issue for consumers. In addition to developing highly efficient motors, another important issue, from the perspective of reducing life cycle CO_2 emissions of a car, is the reduction of CO_2 emissions during the manufacture and disposal of storage batteries and motors. In addition, since significant amounts of natural resources, such as lithium, nickel, cobalt, graphite, neodymium, and dysprosium, are used for producing storage batteries and motors, materials with lower supply chain risks must be developed to overcome constraints on resource availability, and issues related to recycling must also be addressed.

The aim of this project, therefore, is to address the following technological issues: 1. Improving the performance and affordability of storage batteries and motor systems, 2. Improving performance and promoting resource saving at the level of materials, and 3. Commercializing advanced recycling technologies. The aim of this project is also to strengthen the industrial competitiveness of storage batteries and motors along with developing basic technologies to support electrified vehicles in the future and strengthen supply and value chains.

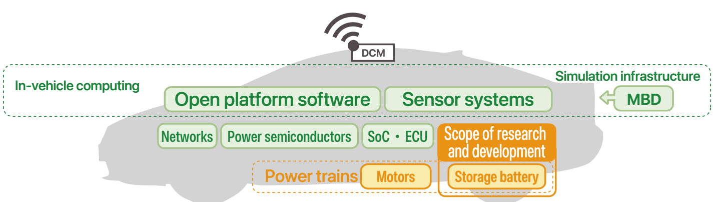
≪Research & Development≫

- Research and development of high-performance storage batteries and materials
- Development of technology for storage battery recycling
- Development of high-efficiency and high-power-density technologies for mobility-related motor systems

CO_2 Reduction Effect (World)	Economic Effect (World)
In2040 Approximately 260 million tons/year	In2040 Approximately 62 trillion yen
In2050 Approximately 940 million tons/year	In2050 Approximately 182 trillion yen

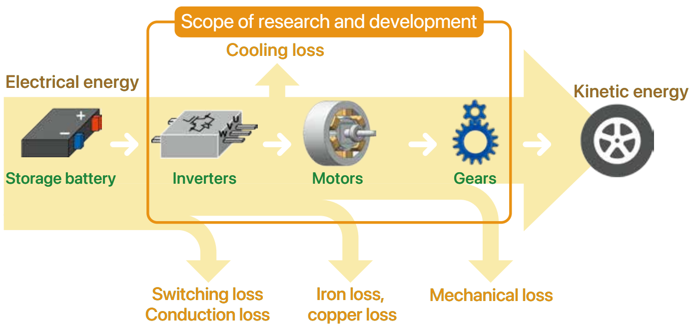
Source : METI, R&D and Social Implementation Plan

R&D Targets under Project



EVs and self-driving cars

Storage Battery



Motor System

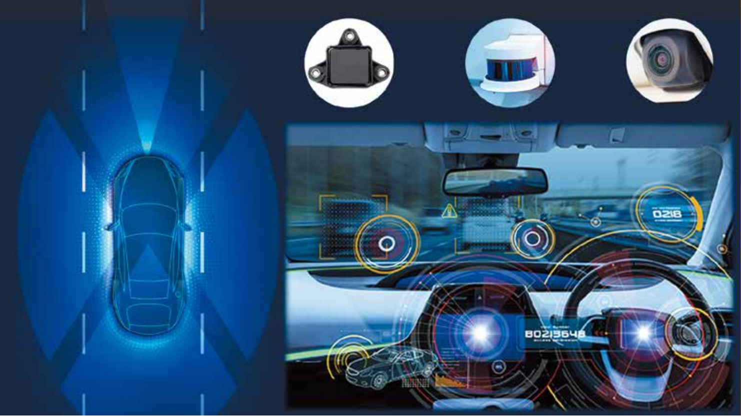
Detailed information https://green-innovation.nedo.go.jp/en/project/development-next-generation-storage-batteries-next-generation-motors/

Project period Maximum of 9 years from FY2022 to FY2030

Department in charge Automotive and Storage Battery Department

Storage Battery ✉ gi_battery[*]ml.nedo.go.jp

Motor System ✉ gi_motor[*]nedo.go.jp



Field of Industry Structure Transformation

Development of In-vehicle Computing and Simulation Technology for Energy Saving in Electric Vehicles

Budget
Up to
42
billion yen

Project Overview

As a comprehensive effort to reduce CO_2 emissions from the use of automobiles, it is expected that publicly implementing automated driving will lead to the prevention of traffic congestion and accidents that cause such congestion.

However, in-vehicle computing, which is required for automated driving, uses a significant amount of power, which can affect the driving time and distance of electric vehicles, and given the current technology, could be a bottleneck to widespread use of electric vehicles.

Therefore, in order to greatly improve the energy efficiency of in-vehicle computing (namely by reducing power consumption by 70% compared to current technology), this project will conduct R&D on improving the energy efficiency of automated driving software and sensor systems, which have a significant effect on power consumption.

At the same time, in order to strengthen the competitiveness of the entire supply chain, where development systems for electrification and automation need to be transformed, the project will develop a standard simulation model for electric vehicles overall that is compatible with automated driving.

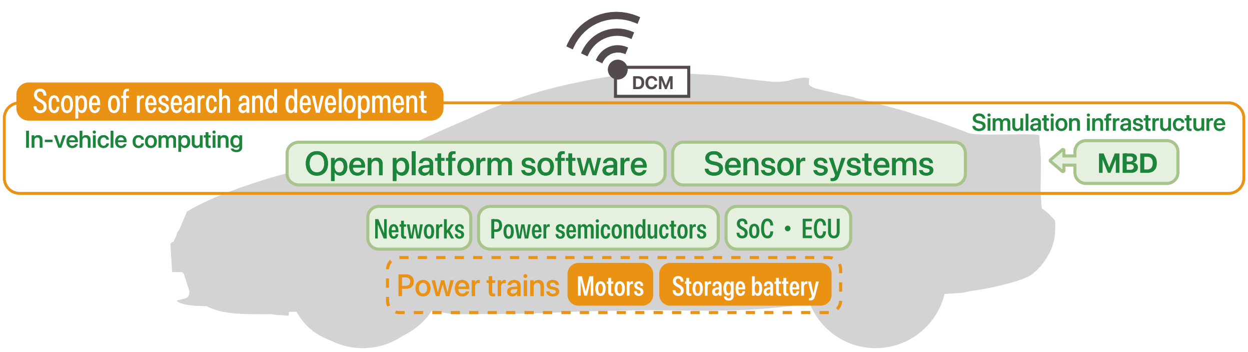
≪Research & Development≫

- Development of automated driving open platform software
- Development of automated driving sensor systems to realize high performance and low power consumption
- Development of electric vehicle simulation infrastructure

CO_2 Reduction Effect (Japan)	Economic Effect (World)
In2030 Approximately 1.69 million tons/year	In2030 Approximately 43 trillion yen
In2050 Approximately 13.2 million tons/year	In2040 Approximately 148 trillion yen/year

Source : METI, R&D and Social Implementation Plan

R&D Targets under Project



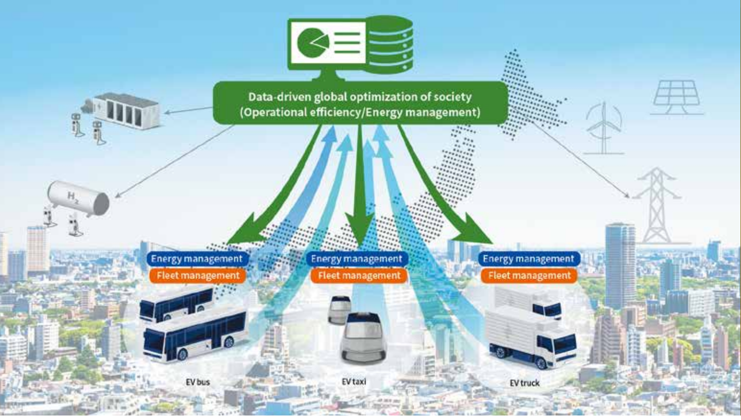
EVs and self-driving cars

Detailed information https://green-innovation.nedo.go.jp/en/project/in-vehicle-computing-simulation-technology/

Project period Maximum of 9 years from FY2022 to FY2030

Department in charge Automotive and Storage Battery Department gi_vehicle_computing[*]nedo.go.jp

When using the email addresses listed above, please change the [*] to @



● Field of Industry Structure Transformation

Establishment of a Smart Mobility Society

Budget
Up to
113
billion yen

Project Overview

CO_2 emissions during the automobile use phase account for about 16% of total CO_2 emissions both in Japan and abroad, and in Japan, about 40% of these emissions come from vehicles intended for commercial use. Electrification for commercial vehicles, in addition to passenger cars, is also underway worldwide with the aim of curbing global warming.

As the commercial use of electric vehicles (EVs) expands, society will face issues including increased demand for electricity for recharging and increased social costs such as power grid reinforcement due to overlapping recharging timing. For transportation companies that own vehicles, there are concerns that recharging will reduce transportation efficiency and increase transportation business costs, such as the review of contracted electricity consumption and the installation and maintenance of related equipment. Therefore, it is necessary to manage operational planning and power demand in an integrated manner. In addition, the commercial use of fuel cell vehicles (FCVs) requires the optimal placement and administration of hydrogen stations, which are expensive to maintain.

Therefore, in order to reduce costs and optimize the operation of the entire social system that contributes to the spread and expansion of electrified vehicles (EVs and FCVs), this project will build an optimization simulation system for the entire society based on external data such as commercial vehicle and driving data, energy consumption, infrastructure usage status, and maps [1].

In addition, we will conduct research and development involving a large-scale demonstration of commercial use of electrified vehicles by multiple companies to collect the data necessary for this purpose and to realize operation management and integrated energy management to expand the introduction of electrified vehicles on a transportation company-by-company basis [2].

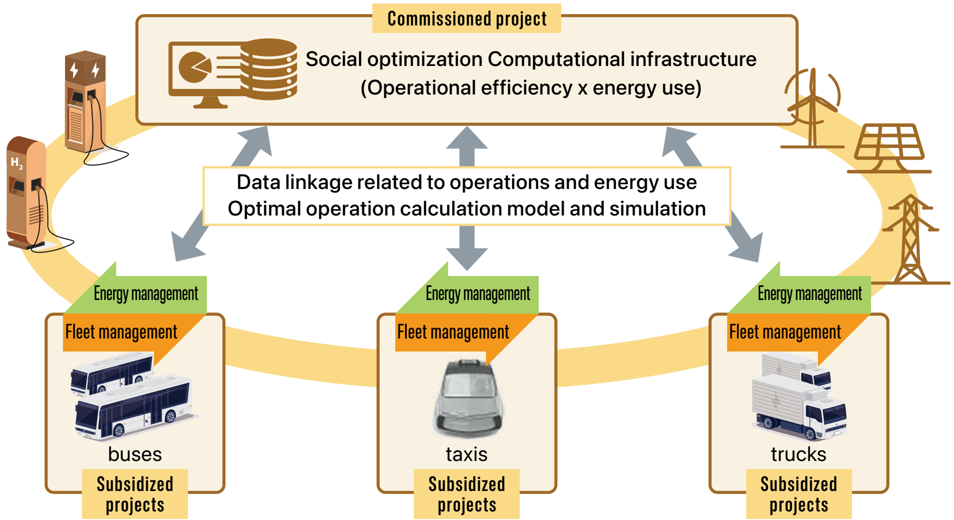
≪Research & Development≫

- R&D for development of simulation model to promote widespread use of commercial EVs
- R&D for development of integrated energy/fleet management system to realize large-scale introduction of commercial EVs

CO_2 Reduction Effect (World)	Economic Effect (World)
In2040 Approximately **90** million tons/year	In2040 Approximately **2.6** trillion yen/year
In2050 Approximately **260** million tons/year	In2050 Approximately **7.1** trillion yen/year

Source : METI・Ministry of Land, Infrastructure, Transport and Tourism (MLIT), R&D and Social Implementation Plan

[1]Development of simulation system to achieve global optimization of a society



[2]Research and development of energy management integrated with operation management for transportation companies

Detailed information https://green-innovation.nedo.go.jp/en/project/smart-mobility-society/

Project period Maximum of 9 years from FY2022 to FY2030

Department in charge Automotive and Storage Battery Department gi-smartmobility[*]nedo.go.jp

Field of Industry Structure Transformation

Next-generation Digital Infrastructure Construction

Budget
Up to
190.12
billion yen

Project Overview

Increasingly electrified and digitalized society can realize Carbon Neutrality in all fields including manufacturing, services, transportation, and infrastructure. Therefore, the semiconductor/information and communication industries, as a foundation for digitization and electrification, are the key to advancing green and digital initiatives at the same time.

In addition, power semiconductors are used to control various electrical products related to everyday life, such as automobiles and industrial equipment, electric power generation and railways, and home appliances.
To realize a carbon-neutral society, the energy efficiency of such electric devices is extremely important. Demand is expected to increase with the development of electric and digital technologies in the following areas:
1. Medium-capacity electric vehicles, 2. Large-capacity renewable energy power generation systems, and 3. Power supplies for small-capacity data centers.

Moreover, data flows are increasing rapidly (at an annual rate of approximately 30%), resulting in a steady expansion in the market for data center servers. Because of this rapid increase in large-scale data centers, power consumption for all data centers is expected to increase, and the current pace of power reduction of technological evolution will not be able to keep pace with increases in power consumption.

In the field of IoT sensing, large volumes of data are sent from sensors and other edge devices to the cloud. However, if the current approach continues, the increased data is expected to place a greater load on networks and lead to higher power consumption. As a result, edge computing technology, which enables efficient data processing for edge devices, is gaining traction.

The aim of this project, therefore, is by 2030 to: reduce the power loss of next-generation power semiconductors by more than 50%, reduce the cost of such semiconductors to a level similar to that of silicon(Si) power semiconductors, improve data center efficiency by over 40%, and develop edge computing technologies to achieve a 40% reduction in power consumption of the entire system.

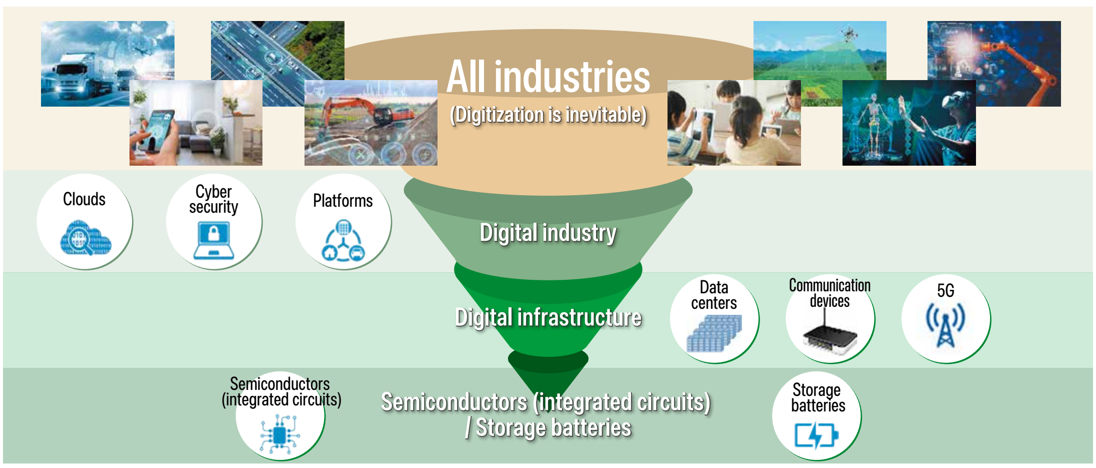
≪Research & Development≫

- Development of next-generation green power semiconductor technology
- Development of next-generation green data center technology
- Construction of an IoT sensing platform

CO_2 Reduction Effect (World)	Economic Effect (World)
In2030 Approximately 1,276 million tons/year	In2030 Approximately 89 trillion yen
In2050 Approximately 8,919 million tons/year	In2050 Approximately 358 trillion yen

Source : METI, R&D and Social Implementation Plan

Digital transformation/digitization forms basis of all industries: Need for the strategy for semiconductors and the digital industry



Detailed information https://green-innovation.nedo.go.jp/en/project/building-next-generation-digital-infrastructure/

Project period Maximum of 10 years from FY2021 to FY2030

Department in charge Semiconductor and Information Infrastructure Department

gi-digitalinfra[*]ml.nedo.go.jp

When using the email addresses listed above, please change the [*] to @

Field of Industry Structure Transformation

Next-generation Aircraft Development

Budget Up to 51.68 billion yen

Project Overview

Although the global aviation industry was severely affected by the COVID-19 pandemic, it had recovered to 2019 levels by 2024. Beyond that, driven by economic growth in emerging countries and other factors, the industry is projected to record sustainable annual growth of around 3%. Hence, the aircraft industry is poised to continue this rise.

Meanwhile, at the International Civil Aviation Organization Assembly in October 2022, the long-term goal of achieving carbon neutrality by 2050 was adopted for the international aviation sector, reflecting the rapidly increasing demand for decarbonization.In response, major OEM manufacturers, particularly in Europe and the U.S., are further pursuing technologies to reduce the weight and improve the efficiency of airframes and engines, as well as developing electric aircraft.

In addition, following Airbus' announcement that it plans to introduce a carbon-neutral aircraft by 2035, the competition to develop hydrogen aircraft has intensified.

Our project aims to increase the participation rate in international collaborative development of airframes and engines (currently running at about 20% to 30% of the global aviation sector) and contribute to the decarbonization of the entire sector. We will focus on developing core technologies and systems for hydrogen-powered aircraft (hydrogen combustion and hydrogen fuel cells), developing complex shapes and significant weight reduction for key aircraft structural components, and advancing technologies to increase electrification.

≪Research & Development≫

- Development of core technologies for hydrogen aircraft
- Development of primary aircraft structures with complex shapes and dramatically reduced weight
- Development of Fuel Cell Electric Propulsion Systems Using Liquid Hydrogen Fuel and Core Technologies
- Development of Technology for Power Control, Heat and Air Management Systems, and to improve Electrification Rate

CO_2 Reduction Effect (World)	Economic Effect (World)
In2050 Approximately 680 million tons/year	In2050 Approximately 2.1 trillion yen/year

Source : METI, R&D and Social Implementation Plan

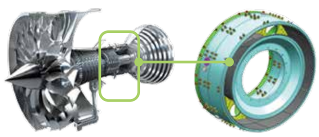
R&D targets under project

Development of core technologies for hydrogen aircraft

③ Study of hydrogen aircraft body structure

Development of core technologies for hydrogen aircraft

① Engine combustor and system technology development



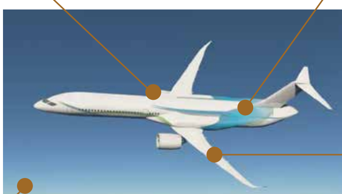
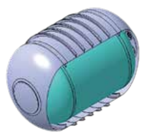


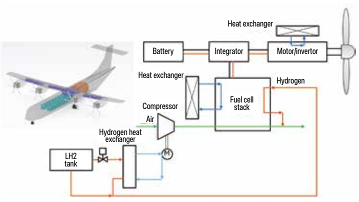
Image of next-generation aircraft

Development of core technologies for hydrogen aircraft

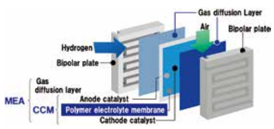
② Liquefied hydrogen fuel storage tank development

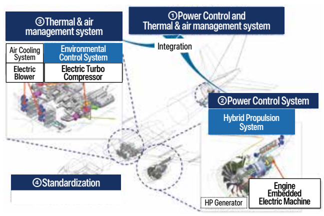


Development of primary aircraft structures with complex shapes and dramatically reduced weight



Development of Fuel Cell Electric Propulsion System and Core Technologies Using Liquid Hydrogen Fuel





Development of Power Control, Thermal, and Air Management System Technologies

Detailed information https://green-innovation.nedo.go.jp/en/project/development-next-generation-aircraft/

Project period Maximum of 10 years from FY2021 to FY2030

Department in charge Aerospace Department gi-aircraft[*]nedo.go.jp

Field of Industry Structure Transformation

Next-generation Ship Development

Budget
Up to
35
billion yen

Project Overview

As of 2018, international shipping accounts for approximately 2.1% of global CO_2 emissions. Since the global economy is growing, demand for shipping is expected to continue increasing and, if no action is taken, CO_2 emissions from the shipping sector will also continue to increase.

To achieve carbon neutrality in the shipping sector, it is essential to move away from existing heavy fuel oil to gas fuels such as hydrogen, ammonia, and clean methane from recycled carbon dioxide. It is also necessary to develop shipping products that utilize hydrogen and ammonia as fuels and reduce methane slip on vessels fueled by LNG that contains clean methane from recycled carbon dioxide.

With the goal of realizing zero-emission ships by 2050, under this project, engines, fuel tanks, and fuel supply systems will be developed for ships using hydrogen and ammonia fuels and carry out demonstration operations using actual ships. Technology will also be developed to prevent methane slip, an important challenge for using LNG-fueled ships. The project ultimately aims to strengthen the international competitiveness of Japan's shipping-related industries, and promote social implementation in conjunction with the shipping industry.

≪Research & Development≫

- Development of hydrogen-fueled ships
- Development of ammonia-fueled ships
- Preventing methane slip on LNG-fueled ships

CO_2 Reduction Effect (World)	Economic Effect (World)
In2030 Approximately 0.33 million tons/year	In2030 Approximately 0.17 trillion yen
In2050 Approximately 560 million tons/year	In2050 Approximately 6.8 trillion yen

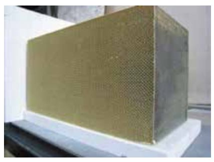
Source : MLIT, R&D and Social Implementation Plan

Aiming for conversion from heavy fuel oil to low- and zero-carbon fuels such as hydrogen, ammonia, and LNG fuel

Hydrogen / ammonia-fueled engines

Fuel tank / fuel supply systems

Methane slip reducers



Install on ships for demonstration of an ocean-going ships

Next-generation ships

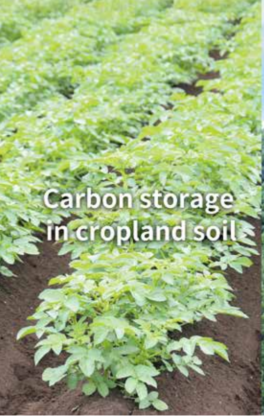
Detailed information https://green-innovation.nedo.go.jp/en/project/development-next-generation-vessels/

Project period Maximum of 10 years from FY2021 to FY2030

Department in charge Hydrogen and Ammonia Department

gi-ship-kobo[*]nedo.go.jp

When using the email addresses listed above, please change the [*] to @



● Field of Industry Structure Transformation

Development of Negative Emissions Technologies in Agriculture, Forestry, and Fisheries Industries

Budget
Up to
15.92
billion yen

Project Overview

Industries in the food, agriculture, forestry, and fisheries sectors are expected to play multiple roles, including the provision of stable supplies of high-quality food, replenishment of the atmosphere and water sources, and promotion of biodiversity conservation through the appropriate management and conservation of croplands, forests, and oceans. Moreover, in FY2022, CO_2 absorption from farmland and forests totaled 50.2 million tons, while CO_2 absorption from newly included seagrass and seaweed beds amounted to 350,000 tons.

With a view to achieving carbon neutrality by 2050, the Ministry of Agriculture, Forestry and Fisheries formulated its "Strategy for Sustainable Food Systems," known as MeaDRI (Measures for Achievement of Decarbonization and Resilience with Innovation) in May 2021. This strategy clarifies Japanese government policies intended to accelerate R&D and the commercialization of technologies, including those that; promote the use of biochar to capture and store carbon on croplands, promote the use of wood-based materials for the construction of high-rise buildings, and promote the use of seaweed beds to capture and store CO_2 (the latter being an example of the "blue carbon" concept).

In this project, which focuses on the development of promising negative emissions technologies for CO_2capture and storage anticipated in the agriculture, forestry and fisheries industries, emphasis will be placed on the promotion of ambitious R&D efforts that go beyond conventional ideas and technical limitations, targeting impactful issues that will lead to the creation of future growth industries.

≪Research & Development≫

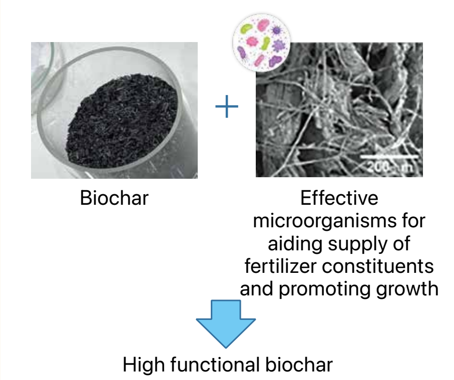
- Development of technologies to realize and effectively utilize high-functional biochar and other materials
- Development of wood-based large-scale isotropic cross-sectional structural members for the construction of high-rise buildings and other structures
- Development of technologies for constructing seaweed beds in support of blue carbon efforts

CO_2 Reduction Effect	Economic Effect
In2030 (Japan) Approximately 0.53 million tons/year	In2030 (Japan) Approximately 54.4 billion yen/year
In2050 (World) Approximately 46.61 million tons/year	In2050 (World) Approximately 2.0 trillion yen/year

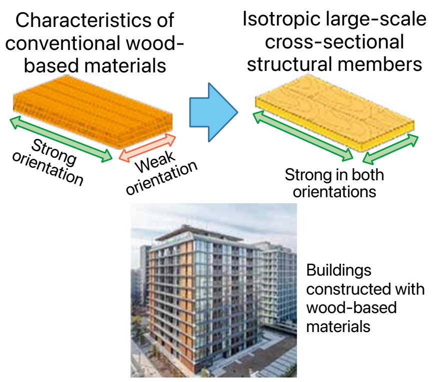
Source : Ministry of Agriculture, Forestry and Fisheries, R&D and Social Implementation Plan

R&D contents tackled in this project

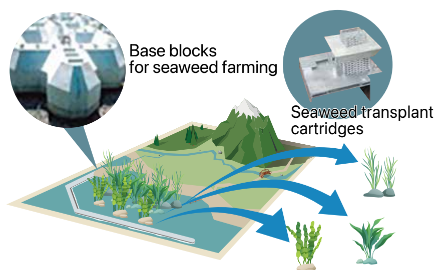
Cropland carbon storage using High-functional biochar



New engineered wood for urban carbon storage



Promotion of blue carbon

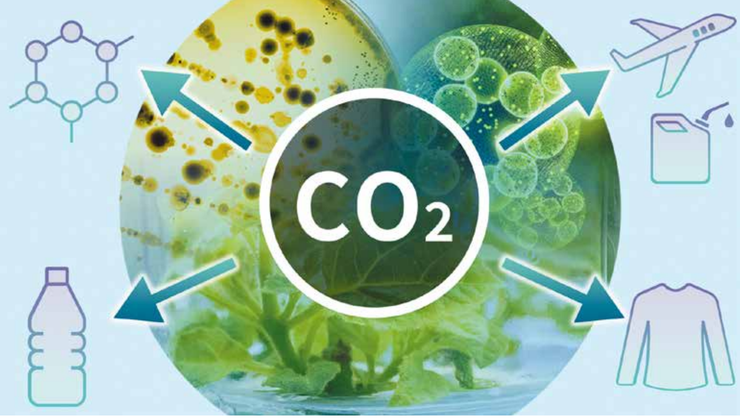


Detailed information https://green-innovation.nedo.go.jp/en/project/development-co2-agriculture-forestry-fisheries-industries/

Project period Maximum of 9 years from FY2022 to FY2030

Department in charge Frontier Department

gi-agri[*]nedo.go.jp



Promotion of Carbon Recycling Using CO_2 from Biomanufacturing Technology as a Direct Raw Material

Budget
Up to
176.7
billion yen

Project Overview

Since carbon recycling that leverages biomanufacturing technology can be expected to greatly improve productivity in the future due to the application of cutting-edge bio technologies such as genome editing and genome construction, it is a viable option for helping realize a carbon neutral society.

CO_2-utilizing biomanufacturing refers to activities for producing chemicals used in bioplastics, functional materials, fuels, and foods (such as protein and livestock feed) by using biomass resources or CO_2 recovered from the atmosphere as a raw material. In the industrial sector in Japan, biomanufacturing-related industries such as chemicals, textiles, and food/beverages discharge 89.017 million tons of CO_2 per year, and biomanufacturing technologies can be expected to help reduce CO_2 emissions.

Through promoting joint development efforts between microorganism modification platform businesses, who play a central role in biomanufacturing, and businesses in a variety of fields such as innovative materials and fuels, this project aims to nurture and strengthen operating companies that will drive large-scale fermentation and biomanufacturing production. Moreover, by leveraging the technologies of platform businesses related to the highly efficient development of microorganisms, the inherent capacity of microorganisms to fixate CO_2 will be fully maximized with a view to resolving technical issues and promoting carbon recycling through biomanufacturing that uses CO_2 as a raw material. In addition, by constructing a value chain ranging from the supply of CO_2 raw materials to the manufacturing of products, and by promoting upscaled commercial production and more sophisticated manufacturing technologies, the project aims to realize both the social application of new biomanufacturing products made from CO_2 raw materials and the structural transformation of the industrial sector through carbon recycling.

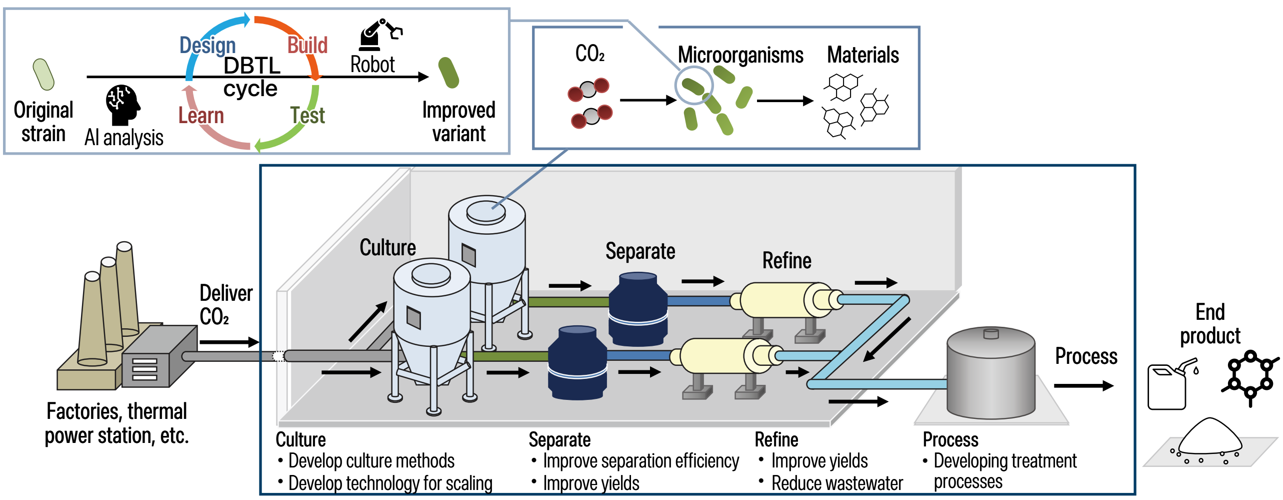
≪Research & Development≫

- Advancement of platform technologies for microorganism modification to accelerate the development of useful microorganisms
- Development and enhancement of microorganisms that can produce materials using CO_2 as raw material
- Development and demonstration of technologies using microorganisms that can produce materials using CO_2 as raw material

CO_2 Reduction Effect (World)	Economic Effect (World)
In2040 Approximately **1.35** billion tons/year	In2040 Approximately **65.4** trillion yen/year
In2050 Approximately **4.21** billion tons/year	In2050 Approximately **199.4** trillion yen/year

Source : METI, R&D and Social Implementation Plan

Manufacturing Flow of Products based on Microorganisms Using CO_2 as a Raw Material

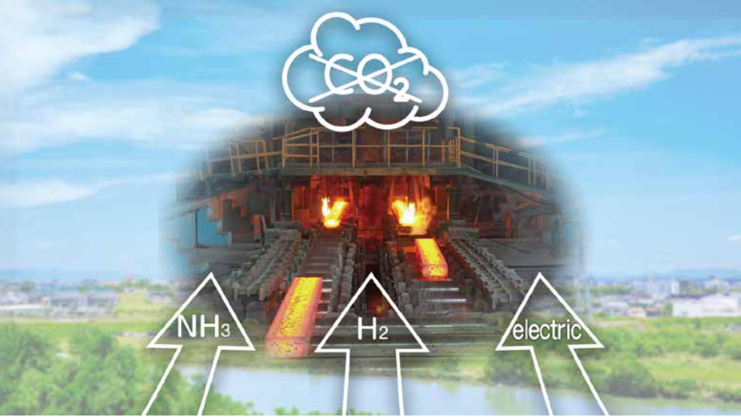


Detailed information https://green-innovation.nedo.go.jp/en/project/bio-manufacturing-technology/

Project period Maximum of 9 years from FY2022 to FY2030

Department in charge Biotechnology and Materials Department ✉ gi-bio[*]nedo.go.jp

When using the email addresses listed above, please change the [*] to @



● Field of Industry Structure Transformation

Decarbonization of thermal processes in manufacturing

Budget
Up to
32.51
billion yen

Project Overview

The production industry accounts for about 30% of the CO_2 emissions of Japanese industry, and since a large amount of CO_2 is emitted from industrial furnaces used in the thermal process of heating metals, the decarbonization of thermal processes in manufacturing is an urgent issue.

Industrial furnaces used for thermal processes include "combustion furnaces," which heat by burning fuel, and "electric furnaces," which heat by electricity.

Combustion furnaces are fueled by natural gas and other fossil fuels, and the use of ammonia and hydrogen, which do not emit CO_2 during combustion, is promising for decarbonization, but the challenge is to establish combustion technologies that achieve combustion stability and NOx reduction, while suppressing chemical changes such as nitriding and hydrogen embrittlement in metal products.

On the other hand, electric furnaces, which do not emit CO_2 when used, are a promising option for decarbonization, but there are some issues to be solved, such as the need for a special high-voltage power contract and installation of power receiving equipment when transitioning from combustion furnaces to electric furnaces.
Given the economics, efficiency, and characteristics of electric furnaces, it is important to establish a combustion furnace option as well.

This project will develop technologies for combustion furnaces compatible with ammonia and hydrogen fuels, etc., and for minimizing and increasing the efficiency of electric furnace receiving capacity, which is essential for promoting the transition from combustion to electric furnaces, with a view to establishing a supply base for zero-emission fuels in the future.

≪ Research & Development ≫

- Establishment of ammonia and hydrogen combustion industrial furnace technology for handling metal products
- Establishment of technology to reduce the capacity of electric furnace receiving equipment and increase efficiency

CO_2 Reduction Effect (Japan)	Economic Effect (World)
In2040 Approximately 20 million tons/year	In2040 Approximately 4.2 trillion yen (Total up to 2040)
In2050 Approximately 80 million tons/year	In2050 Approximately 10.0 trillion yen (Total up to 2050)

Source:METI,R&D and Social Implementation Plan

Development of industrial furnaces that handle carbon-neutral compatible metal products

Development of ammonia combustion industrial furnaces
Development of hydrogen combustion industrial furnaces

- Development of 50% co-combustion industrial furnaces with existing fuels such as natural gas
- Demonstration of 100% mono-fuel combustion technology

Development of next-generation electric furnaces

- Hybrid operation technology combining ammonia/hydrogen combustion technology and electric heating
- Technology to reduce peak power consumption and power receiving capacity

Development of common base technology

- Combustion stability and control
- NOx emission control
- Simulation, digital twin technology, etc. for optimal design and operational efficiency

Detailed information https://green-innovation.nedo.go.jp/en/project/thermal-processes-in-manufacturing/

Project period Maximum of 9 years from FY2023 to FY2031

Department in charge Circular Economy Department ✉ gi-thermal-process[*]ml.nedo.go.jp

When using the email addresses listed above, please change the [*] to @

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	1,525 (as of April 1, 2024)
Budget	Approximately 182.8 billion yen (initial budget for FY 2024) *In addition to the above, fund projects and other activities will be implemented.
Executives	Chairman — Mr. SAITO Tamotsu President — Mr. YOKOSHIMA Naohiko Executive Directors — Mr. YOSHIOKA Masatsugu,Dr. YUMITORI Shuji,Mr. NISHIMURA Tomoyasu,Mr. HAYASHI Shigekazu,Dr. IIMURA Akiko Auditors — Mr.YABUTA Keisuke, Dr. FUKUSHIMA Michi

Organization

- **Auditor**
- **Chairman / President / Executive Directors**
  - **Strategic Planning and Management Department**
  - **Audit Office**
  - **General Affairs Department**
  - **Human Resources Department**
  - **Accounting Department**
  - **Legal Department**
  - **Overseas Office**
    - Representative Office in Washington, D.C.
    - Representative Office in Silicon Valley
    - Representative Office in Bangkok
    - Representative Office in Beijing
    - Representative Office in Europe
    - Representative Office in New Delhi
  - **Project Management Department**
    - Green Innovation Fund Projects Coordination Office
    - Economic Security Program Coordination Office
  - **Hydrogen and Ammonia Department**
  - Renewable Energy Department
  - Circular Economy Department
  - Semiconductor and Information Infrastructure Department
    - Post-5G Projects Promotion Office
  - Artificial Intelligence and Robotics Department
  - Biotechnology and Materials Department
    - Bioproduction Fund Project Promotion Office
  - Automotive and Storage Battery Department
  - Aerospace Department
  - Startup Support Department
  - Frontier Department
  - International Projects Department
  - Technology and Innovation Strategy Center (TSC)

NEDO

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Bangkok 10110 Thailand
TEL: +66-2-256-6725～6
FAX: +66-2-256-6727

Inquiries

- **For general inquires related to Green Innovation Fund Projects, please contact the NEDO Green Innovation Fund Projects Coordination Office**

NEDO Green Innovation Funding Program Coordination Office
✉ green-innovation[*]nedo.go.jp

- **Implementation contents, etc. of each project in the Green Innovation Fund Projects concerning the system**

For inquiries related to the implementation of specific Green Innovation Fund Projects, please contact the NEDO department responsible for project implementation.

- **Other Inquiries**

https://qasys.nedo.go.jp/webapp/form/13394_evt_7/index.do
Inquiries on other NEDO activities may be submitted via the inquiries page on our website.
(Inquiries may be submitted at any time, however, please allow time for NEDO to respond during regular business hours)

NEDO's SNS

NEDO regularly releases information to the public regarding our activities via news releases, public solicitations, event-related announcements, and other types of communication.

X **Facebook**

Only available in Japanese

NEDO also provides regular updates on social media platforms regarding Green Innovation Fund Projects so please follow us on Facebook, Twitter, and YouTube.

#NEDO
#Green Innovation Fund Projects

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

March 2025