環境省
Ministry of the Environment

Ministry of the Environment, Government of Japan

Low Carbon Technology Research, Development and Demonstration Program

Ongoing Projects in FY2017

Note: Fiscal year (FY) starts on April 1

RD&D for Transportation

Hydrogen fueling station that generates hydrogen at 70 MPa by high pressure electrolysis powered by renewable energy
Honda Motor Co., Ltd. 2015-2017

Fuel-cell-powered garbage collection vehicles to realize a hydrogen/recycling-oriented society
Flat Field Co., Ltd. 2015-2017

EV system for large vehicles to promote early EV adoption in bus/truck category
Kumamoto University 2016-2018

Hydrogen filling station using medium-scale (1.5 kg/h) water electrolyzer powered by renewable energy
Kobe Steel, Ltd. 2016-2017

Light-duty truck powered by fuel cell
Tokyo R&D Co., Ltd. 2016-2018

LNG-fueled marine hybrid system with gas engine, fuel cell, battery and gas heat pump
Yanmar Co., Ltd. 2016-2018

Heavy-duty LNG truck and optimal design for refuelling infrastructure
Isuzu Motors Limited 2016-2018

Low CO_2 emission purification technology to produce hydrogen from biogas
Kyoto University 2016-2018

High-density and high-output fuel cell units for industrial vehicles
Toyota Industries Corporation 2017-2019

CNT electrical wires for ultra-high performance motors to reduce carbon dioxide emission from transportation
Furukawa Electric Co., Ltd. 2017-2019

Energy-saving automotive air conditioners to reduce CO_2 emissions
DENSO Corporation 2017-2019

Innovative low cost printed RFIDs
Toray Industries, Inc. 2017-2019

Ultra fast charge infrastructure demonstration from train's excess regenerative electricity to Electric Transit Bus
Sumitomo Corporation 2017-2019

RD&D for Buildings

Centrifugal chiller for commercial use featuring low lifecycle costs, low loss, high efficiency
Mitsubishi Heavy Industries, Ltd. 2015-2017

Devices to reduce power consumption of refrigeration and air-conditioning equipment
Panasonic Corporation 2015-2017

Onsite performance evaluation system for Variable Refrigerant Flow (VRF) air conditioning equipment
Tokyo University of Marine Science and Technology 2015-2017

An Energy-saving support system utilizing lifestyle and living environment information
Hokkaido Gas Co., Ltd. 2015-2017

Data center hybrid cooling system with 1.0 power usage effectiveness
Nippon Telegraph and Telephone East Corporation 2016-2018

A zero-fuel, low-temperature snow-melting system that utilizes summertime solar heat and household water heat
TRUST PLAN Inc. 2016-2018

High-efficiency air conditioning system with liquid desiccant and water-refrigerant heat pump technologies
Waseda University 2016-2018

Central air conditioning chillers using natural refrigerants
Panasonic Corporation 2017-2019

Air conditioning control methods for space with exterior openings, by using people-flow, air-flow sensors, and Artificial Intelligence
Kobe University 2017-2019

Energy-saving ventilation equipment development and demonstration to reduce electricity consumption by air conditioning equipment
Mitsubishi Electric 2017-2019

Insulated window by nanocellulose
RENIAS CO., LTD. 2017-2019

RD&D for Renewable and Distributed Energy

Mooring system for floating offshore wind turbines
Kyushu University 2015-2017

High-voltage, large-capacity, amorphous core transformers for renewable energy sources such as wind farm
Hitachi, Ltd. 2015-2017

Thermal well and heat pump system for aquifer thermal energy storage systems
Kansai Electric Power Co, Inc (KEPCO) 2015-2017

A greenhouse with light-transmitting organic photovoltaics to reduce carbon dioxide emissions from protected horticulture
Kyoto University 2015-2017

High-efficiency evaporator-crystallizer system for 50% reduction of CO_2 emissions using thermal recovery of vapor latent heat
Kajima Corporation 2015-2017

Micro hydro generation systems to optimize unutilized energy in existing water pipelines
Daikin Industries, Ltd. 2016-2018

Next-generation coastal wave power generation systems
Mitsui Zosen Steel Structures Engineering Co.,Ltd. 2016-2018

Power recovery unit to increase supply from solar panels and power conditioning systems
JGC Corporation 2016-2018

Offshore wind measurement and verification with buoy-mounted LiDAR
Japan Weather Association 2016-2018

Digital grid router (DGR) and power interchange settlement system to accelerate the introduction of renewable energy
Tateyama Kagaku Industry Co., Ltd. 2017-2019

Renewable energy storage using hydrogen storage alloy to reduce CO_2 emissions
NASU DENKI—TEKKO CO., LTD. 2017-2019

New geothermal power generation method using hydrothermal circulation system
Obayashi Corporation 2017-2018

Removable tapered pile foundations and construction methods for promotion of marine renewable energy
Rinkai Nissan Construction Co., Ltd. 2017-2019

RD&D for Biomass and Recyclable Resources

Stand-alone production processes to expand use of bio-upgraded coal and 100% firing technologies for bio-upgraded coal in pulverized coal boilers
Mitsubishi Heavy Industries Environmental & Chemical Engineering Co., Ltd. 2015-2017

Long-term demonstration of 25% reduction of CO_2 emissions from general waste incineration facilities using bio-coke from mixed feedstock
Japan Coal Energy Center 2015-2017

Graphene synthesis technologies and applications for energy devises to reduce CO_2 emissions
Okayama University 2017-2019

Innovative sewage treatment system for energy saving and energy production
Mitsubishi Kakoki Kaisha, Ltd. 2017-2019

Development of low carbon technologies based on collaboration between efficient productions of algae biomass and their conversions to high performance plastics
University of Tsukuba 2017-2019

Production technology for gas barrier bottles and packagings made from 100% bio-based polyethylene furanoate (PEF)
Toyobo Co., Ltd. 2017-2019

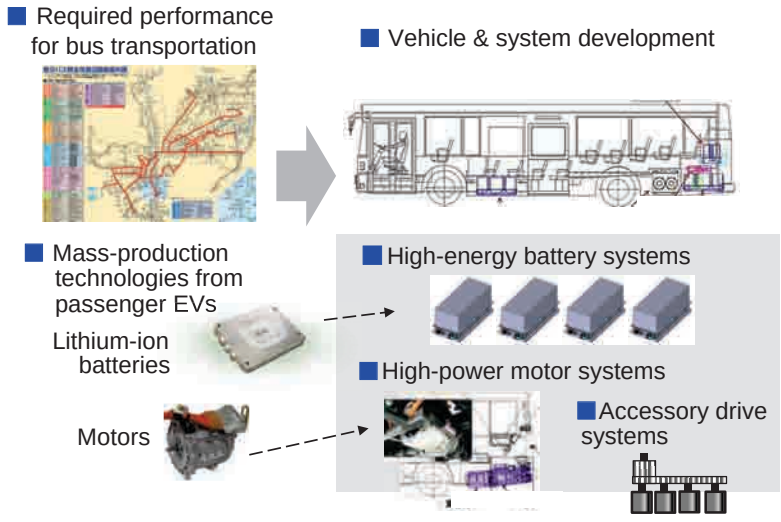
RD&D for Transportation

EV system for large vehicles to promote early EV adoption in bus/truck category

Contractor: Kumamoto university
Duration: FY2016 - FY2018 (planned)

Project Overview

To promote early adoption of electric vehicles (EV) in the bus and truck category, this project aims to realize low-cost EV system technology for that category. The goal of this technology development is to commercialize EV systems for large vehicles. The aim is a practical EV bus for ordinary bus routes, with a maximum additional vehicle price of 10 million yen (compared to conventional diesel models). The project will incorporate high-energy battery, high-power motor, and accessory drive systems. It will utilize mass production technologies already common for passenger EVs and will standardize EV bus manufacturing technology. With early adoption of EV technology in the bus and truck category, it is hoped that the project will lead to decarbonization of transportation, zero emissions, good fuel economy, and regional industrial promotion. Work in FY2017 will include fabrication of a demonstration test bus and the launch of evaluation tests on bus routes operated by the Kyushu Sanko Bus Company in Kumamoto City.

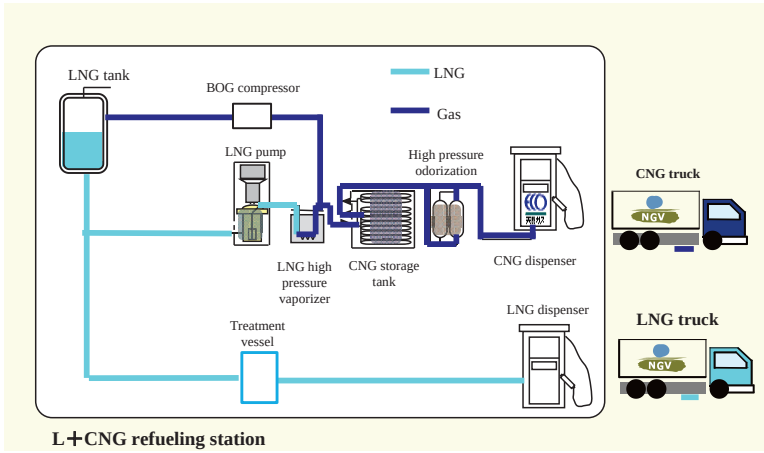


Heavy-duty LNG truck and optimal design for refuelling infrastructure

Contractor: Isuzu Motors Limited
Duration: FY2016 - FY2018 (planned)

Project Overview

This project aims to develop a heavy duty LNG truck with a range of at least 1,000 km before refueling. Natural gas has lower CO_2 emissions per unit calorific value compared to diesel fuel. This feature could help mitigate climate change if natural gas were to be used as a fuel for transportation equipment. Heavy duty trucks have high fuel consumption and operate long distances, so lower-carbon operations are a worthy goal. Furthermore, LNG is seen as a suitable fuel for vehicles. The development of refueling infrastructure is essential for promoting the use of LNG vehicles, and this requires the identification of best practices in actual use, plus technologies and infrastructure for LNG vehicle refueling stations. Thus, besides developing a heavy duty LNG truck the project will also develop the related refueling infrastructure and conduct assessments through actual fleet operations using the truck.



L+CNG refueling station

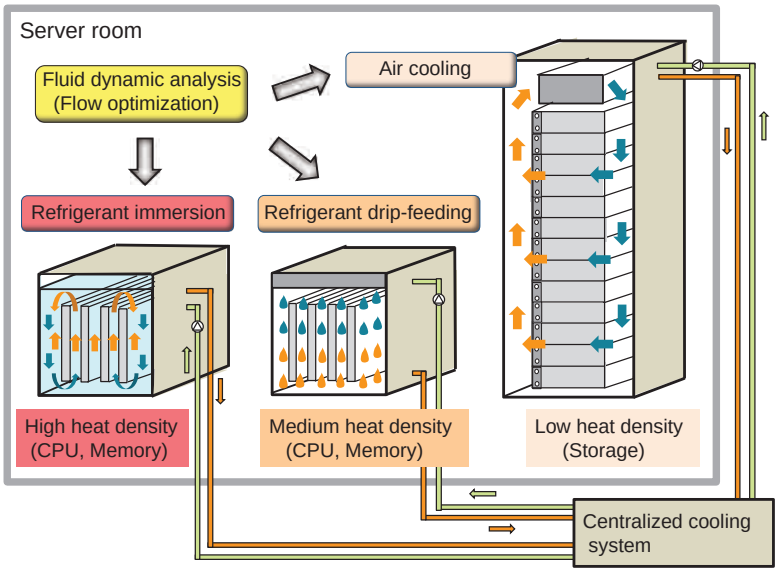
RD&D for Buildings

Data center hybrid cooling system with 1.0 power usage effectiveness

Contractor: Nippon Telegraph and Telephone East Corporation
Duration: FY2016 - FY2018 (planned)

Project Overview

The total power consumption of data centers has increased rapidly, making energy saving an important challenge today. This project aims to significantly improve the cooling efficiency of data centers by designing an optimum cooling system with a hybrid method using refrigerant immersion and air cooling, suitable for the heat density of ICT equipment. The server room will be managed in three zones depending on cooling method: (1) refrigerant immersion for high heat density, (2) refrigerant drip-feeding for medium heat density, and (3) air cooling for low heat density. Efficiency is improved by use of a centralized cooling system to enable heat exchange for these refrigerants, with flow optimization managed by computational fluid dynamic analysis. Through these technologies, the project aims to realize a cooling system with 1.0 power usage effectiveness (PUE), where the power consumption without ICT equipment is close to zero.



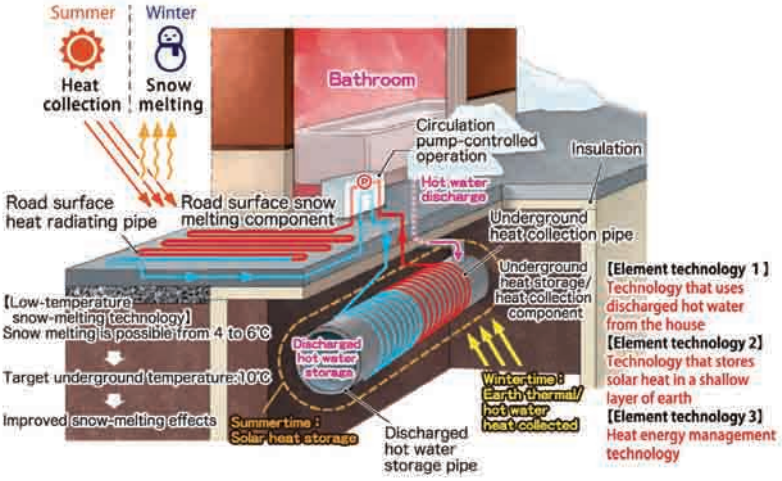
System configuration

A zero-fuel, low-temperature snow-melting system that utilizes summertime solar heat and household water heat

Contractor: TRUST PLAN Inc.
Duration: FY2016 - FY2018 (planned)

Project Overview

Conventional household road heating consists mainly of electrothermal and kerosene boiler methods. They consume a considerable amount of energy, however, so they pose problems in rate of adoption due to changing public expectations and high CO_2 emissions. This project will develop new snow-melting technology to store summertime solar heat and heat from household bathwater in a shallow reservoir, one meter below ground. An optimal underground temperature is maintained, resulting in zero-fuel snow-melting technology using heat exchange via circulatory fluid only (no heat pump) to maximize effectiveness. Extracting heat from a shallow depth reduces construction costs, and energy for snow-melting is consumed only by the circulation pump, resulting in significantly reduced maintenance costs and easier adoption of the system. Because CO_2 output is significantly reduced compared to conventional technologies, widespread adoption could reduce the carbon footprint in the household sector, resulting in lower CO_2 emissions. A 30 square meter snow-melting experiment is planned for 2017 with verification of snow-melting and CO_2 reduction effectiveness.



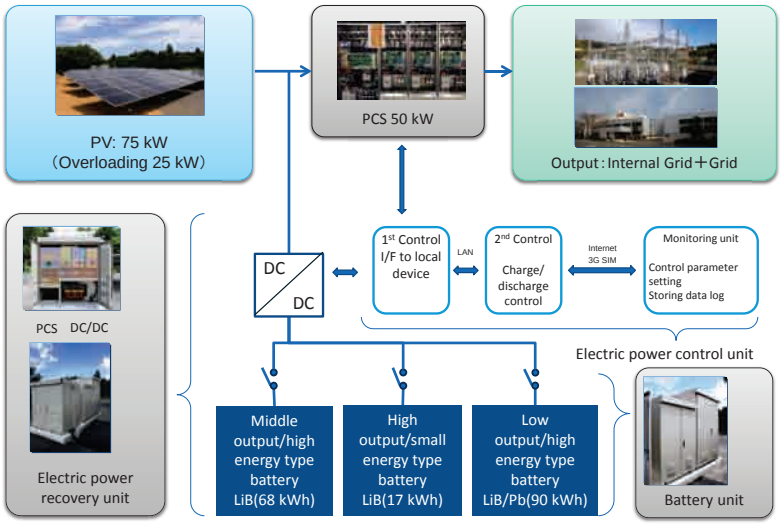
RD&D for Renewable and Distributed Energy

Power recovery unit to increase supply from solar panels and power conditioning systems

Contractor: JGC Corporation
Duration: FY2016 - FY2018 (planned)

Project Overview

In the solar power sector, legislation in Japan forces transmission and distribution system operators to curtail the amount of solar power generated because an increased supply electric power obtained by photovoltaic (PV) solar panels leads to increased costs for grid infrastructure. Power generation operators curtail the power supplied to the grid using power conditioning systems (PCS) to meet the requirements. However, solar power has not reached its full potential in terms of what solar panel plants can generate, due to curtailment by PCS. This project aims to increase the total amount of PV power generated even under this curtailment. It will develop an electric power recovery unit on the DC bus between PV solar panels and the PCS. The unit will control the charging and discharging of batteries using electricity generated from solar power while maintaining the maximum power output of PV solar panels.

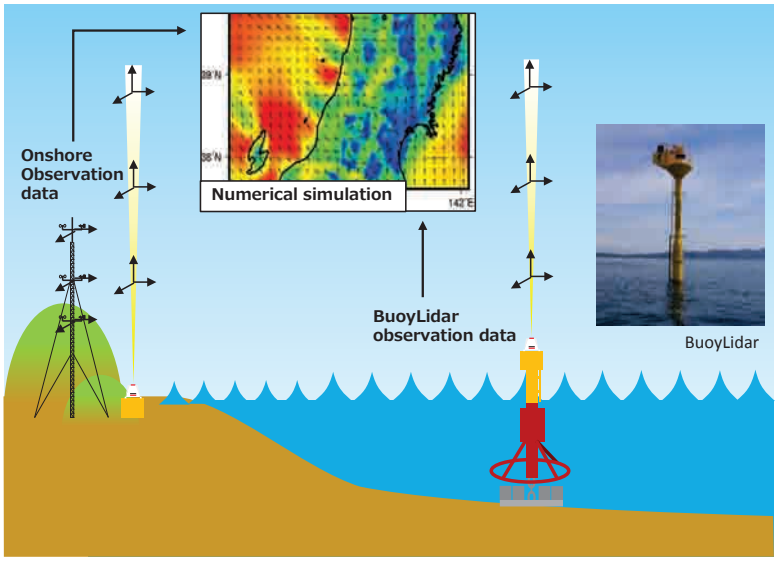


Offshore wind measurement and verification with buoy-mounted LiDAR

Contractor: Japan Weather Association (with Eco Power Co.,Ltd.)
Duration: FY2016 - FY2018 (planned)

Project Overview

In Japan, offshore wind power generation is an important option to maximize the use of renewable energy. When studying the feasibility of offshore wind power projects, wind power generation companies require a good understanding of offshore wind conditions, but offshore wind observation can be costly. This study will develop a "BuoyLidar" offshore wind observation system and wind estimation methodology using numerical simulation. "BuoyLidar" is a low cost and highly accurate system that combines Doppler lidar with a spar-type buoy equipped with a motion stabilizer. A numerical estimation method for offshore wind conditions will be developed to study unique meteorological and hydrographic conditions using observational data. The first goal of this study is to reduce the cost of offshore wind observation to about one-tenth the cost of current methods, which involve the construction of offshore wind observation towers. The second goal is to reduce to below 10% the relative error of estimating annual energy production by offshore wind power. Ultimately, it is hoped that this study will contribute to the diffusion of offshore wind farms and reduction of CO_2 emissions.



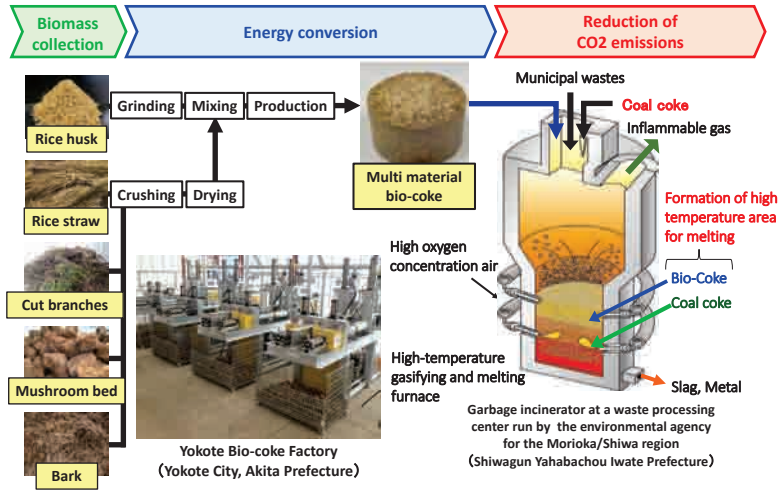
RD&D for Biomass and Recyclable Resources

Long-term demonstration of 25% reduction in CO_2 emissions from general waste incineration facilities using bio-coke from mixed feedstock

Contractor: Japan Coal Energy Center
Duration: FY2015 - FY2017

Project Overview

High-temperature gasifying and melting furnace systems have been widely adopted in Japan for the treatment of municipal wastes, due to their good environmental performance and ash volume reduction. Wastes are typically gasified and melted in a high-temperature coal-coke bed. However, bio-coke, which combusts in a high-temperature environment and is made from various types of biomass, could be a worthy alternative and is considered to be a carbon-neutral fuel that. Bio-coke has been verified to reduce CO_2 emissions by at least 25% compared to conventional fuel. This project aims to achieve four objectives: (1) steady collection of biomass in Yokote City, Akita Prefecture (mainly rice husks and bark, but their availability varies with harvest and snow season, so various types of biomass will be collected to provide a steady year-round supply of mixed feedstock); (2) development of effective and economically viable technologies to produce bio-coke from mixed feedstock; (3) long-term demonstration of operations using bio-coke at facilities of the Morioka/Shiwa District Environmental Facilities Association; and (4) investigation of the applicability of bio-coke from mixed feedstock in other industries.

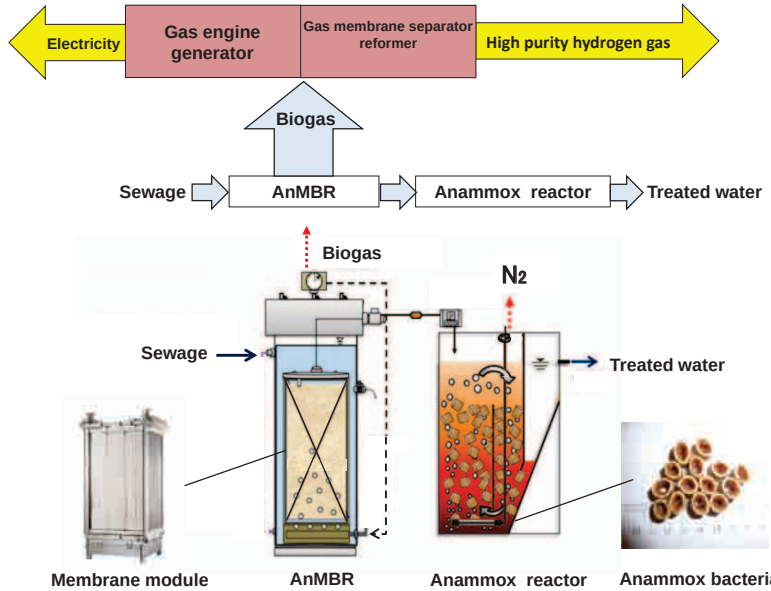


Innovative sewage treatment system for energy saving and energy production

Contractor: Mitsubishi Kakoki Kaisha, Ltd.
Duration: FY2017 - FY2019 (planned)

Project Overview

Sewage is the most abundant type of wastewater and a valuable resource containing water, nutrients and energy. It is typically treated by an activated sludge (AS) process, then discharged into a water body. The AS process has been used worldwide for over 100 years, but shortcomings include high energy consumption, greenhouse gas emissions, and sludge production, so new technologies are being sought. This project will develop an energy-positive innovative sewage treatment system integrating an anaerobic membrane bioreactor (AnMBR) and anaerobic ammonium oxidation (Anammox) process. Organic pollutants in sewage are anaerobically converted into methane gas (CH_4) in the AnMBR. The anammox process with suspended carriers converts nitrogen pollutants into nitrogen gas (N_2). A water body receiving discharge should be safe from eutrophication as effluent will be regulatory compliant in terms of carbon and nitrogen nutrients. System performance will be tested in a pilot-scale experiment, for pollutant removal, energy production, and CO_2 emission reduction. Facilities will be built to utilize the resulting biogas. In future this system could treat other types of wastewater rich in organic matter and nitrogen.



Low Carbon Technology Research, Development and Demonstration Program

Purpose and Features

The purpose of this Program is to promote reductions in carbon dioxide emissions and contribute to stronger future measures against climate change.
The development and demonstration of technologies to reduce CO_2 emissions in fields such as renewable energy, the utilization of otherwise unused energy, and energy conservation, helps increase the magnitude of CO_2 emission reductions and reduce the cost of measures to address climate change, and helps create a low-carbon society by spreading those technologies.
To realize a 26% reduction in GHG emissions by FY2030, further progress in CO_2 emission reduction measures is still needed in every sector. Technological breakthroughs are needed to boost efficiency and reduce costs and to create new and better low-carbon technologies. It is also crucial that they actually be widely deployed in society in order to support stronger future strategies against climate change.
Meanwhile, there is no assurance that adequate progress would be made in research, development and demonstration (RD&D) of the technologies needed to reduce CO_2 emissions if work was left solely to the private sector. There are various reasons for this, including risks associated with R&D, uncertain profitability, and the lack of incentives for industries to voluntarily bolster their own climate change countermeasures. Because of these factors, it is essential that the national government provide leadership and encouragement for the RD&D of technologies needed to make large reductions in CO_2 emissions in the medium and long term. In that context, this Program aims to promote the RD&D of technologies that can be highly effective in reducing CO_2 emissions and lead to stronger future measures (including regulation) to address climate change and to achieve significant emission reductions.

Program funded by the Special Account for Energy Policy
This Program is funded by the Sub Accounts for Supply and Demand of Energy, under the Japanese government's Special Account for Energy Policy. Legislation governing the special account limits the use of these funds to the RD&D of technologies such as renewable energy, the utilization of otherwise unused energy, and energy conservation that can contribute to reductions in energy-derived CO_2 emissions in Japan.

Eligible Technology Areas

Funding is available for the RD&D of technologies that can lead to stronger future measures against climate change, in areas where CO_2 emission reductions could be relatively large, but where only limited progress could be expected by private sector initiatives alone.

1 Low Carbon Transportation
Development and demonstration of technologies to decarbonize the transportation sector. Examples include technologies to promote and improve the performance of electric vehicles (EV), hybrid vehicles (HV) and fuel-cell vehicles (FCV), which are expected to become more widely used in the future; and to improve energy efficiency in the transportation sector (including rail, etc., but excluding the automotive sector).

2 Low Carbon Buildings
Development and demonstration of technologies to decarbonize the household/commercial sector. Examples include technologies to improve energy efficiency in housing and offices through improved energy conservation of equipment in buildings, introduction of renewable energy, and progress toward zero emissions.

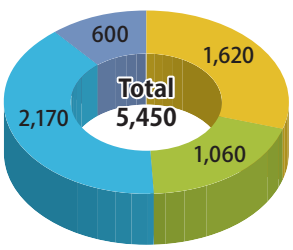
3 Low Carbon Renewable and Distributed Energy
Development and demonstration of technologies to promote the introduction of renewable energy. Examples include the adoption of photovoltaic, wind, micro-hydro,and geothermal energy, etc., and improvements in energy efficiency such as through the development of independent and decentralized energy systems.

4 Low Carbon Biomass and Recyclable Resources
Development and demonstration of technologies to promote the utilization of biomass-from-waste technologies and decarbonization through resource recycling. Examples include technologies to decarbonize and reduce costs of total systems to utilize biomass from waste (including biomass collection and manufacturing methods). (The Program is limited to technologies with an expected GHG emission reduction of at least 50% compared to baseline scenarios, considering the entire life cycle from raw material production/extraction to transportation, use and waste.)

5 Innovations for Decarbonization of Social Infrastructure (planned to start in FY2018)
Development and demonstration of innovative technologies for decarbonization of social infrastructure. Examples include efforts to achieve significant decarbonization of energy infrastructure and logistics/distribution through systems to optimize and utilize advanced technologies including ICT as well as CNT, graphene and other carbon materials, for applications including producing hydrogen with renewable energy, as well as IoT and AI technologies.

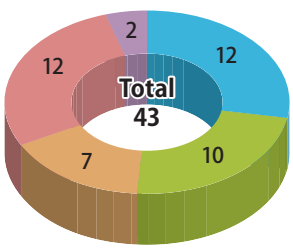
Statistics on Ongoing Projects in FY2017

Budget allocation for each field (million yen)



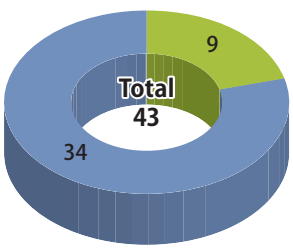
- Transportation
- Buildings
- Renewable and Distributed Energy
- Biomass and Recyclable Resources

Number of projects by budget size (million yen)



- <50
- 50-100
- 100-150
- 150-300
- ≧300

Number of projects by type of representative organization



- University
- Private Company