FY2015

環境省
Ministry of the Environment

Ministry of the Environment, Japan

Low Carbon Technology Research and Development Program


Transportation


Buildings


Renewable and Distributed Energy


Biomass and Recyclable Resources

Ongoing Projects for FY2015

Note:Fiscal year (FY) starts April 1

R&D for Transportation

Route buses powered by large fuel cells
Hino Motors, Ltd. 2013–2015

Eco-shipping for Japanese coastal vessels:(verification project for CO_2 emission reductions with ship-scheduling/voyage-planning system)
National Maritime Research Institute 2013–2015

A common ICT platform for various systems of EV/small-EV sharing
Ubiteq, Inc. 2013–2015

Fuel cell forklift truck and optimum hydrogen fuel gas supply system
Toyota Industries Corporation 2014-2016

Wireless electric vehicle charging service for both buses and passenger vehicles
Toshiba Corporation Social Infrastructure Systems Company 2014-2016

Fuel cell-powered marine craft
Toda Corporation 2014-2015

Electric vehicle and plug-in vehicle usage promotion platform
Toyota Media Service Corporation 2014-2015

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

Garbage truck powered by hydrogen fuel cells
Flat Field Co., Ltd. 2015-2017

R&D for Buildings

Combined panels to convert solar energy into electricity and heat
Daiwa House Industry Co., Ltd. 2013–2015

Photovoltaic movable louvers and their application to stand-alone DC power supplies for perimeter zones
Takenaka Corporation 2013–2015

Low-carbon data centers and better waste-heat utilization for offices
NTT DATA INTELLILINK Corporation 2013–2015

Radiant heating and cooling system using concrete slab with passive geothermal and solar thermal system
Ritsumeikan University 2013–2015

Low-carbon community-spaces for office workers: Arrangement planning and ICT services for invitation and guidance
Takenaka Corporation 2013–2015

Implementation of Zero-energy building design for medium to small size buildings in urban areas
Taisei Corporation 2013–2015

Solar heat pump air conditioning and hot-water supply system, plus exterior materials to reduce cooling/heating load
Mitsui Home Co.,Ltd 2014–2016

Turbo 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

Technical development of small and highly precise on-site performance evaluation system for variable refrigerant flow (VRF) equipment
Tokyo University of Marine Science and Technology 2015–2017

Home energy and environment management system with indoor thermal control
Hokkaido Gas Co., Ltd. 2015–2017

R&D for Renewable and Distributed Energy

Cost-effective micro-hydro power generation for water pipelines
Daikin Industries, Ltd. 2013–2015

An efficient, stable and durable 1MW-class natural gas engine cogeneration unit using isothermal combustion and low temperature plasma discharge ignition system
Chiba University 2013–2015

A high-efficient methane production from an anaerobic digestion process using sewage and solar heat energy utilization system
Osaka City University 2013–2015

Long-term field investigation of safety and efficiency of a hot spring binary power plant using ammonia water as working fluid
Geothermal Energy Research and Development Co., Ltd. 2013–2015

Unique photovoltaic panels for vertical or horizontal fixed mount: Actually effective under oblique illumination
Clean Venture 21 Corporation 2013–2015

Compact, efficient wave-power plant
Mitsui Engineering & Shipbuilding Co., Ltd. 2013–2015

Low-cost hybrid solar tower system
Mitsubishi Hitachi Power Systems, Ltd. 2014–2016

Computer-assisted 3D-radar monitoring system to minimize collisions of birds with wind turbines
KEYCOM Corporation 2014–2016

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
The Kansai Electric Power Company, Incorporated 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

R&D for Biomass and Recyclable Resources

Implementation of a medium size methane production system by anaerobic fermentation of food waste: Collection, transportation, selection, fermentation, and residue treatment
Mitsubishi Materials Corporation 2013–2015

Thermal conversion of solid biomass to gaseous and/or liquid fuel by an updraft furnace
Meiwa Industries, Ltd. 2013–2015

A compressed hot air turbine generator powered by heat energy of a biomass/waste combustion furnace
The Institute of Applied Energy 2013–2015

Co-firing system with high biomass ratio in an existing coal power plant
IHI Corporation 2013–2015

Innovative high-efficiency engine fueled by low-concentration bio-ethanol
Miyakojima Industrial Innovation Agency 2014–2016

Producing bioethanol and co-products from waste materials in domestic cane sugar factories
Toray Industries, Inc. 2014–2016

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

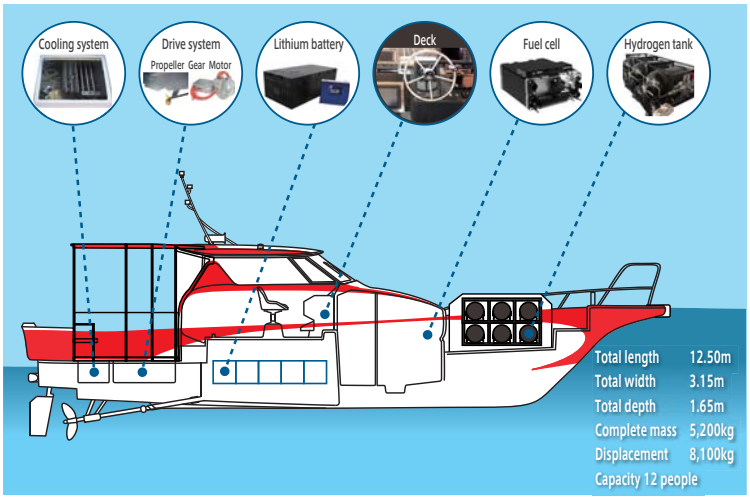
Long-term demonstration of 25% reduction of CO_2 emissions from general waste incineration facilities using bio-coke from mixed feedstock
Japan Coal Energy Center 2015–2017

R&D for Transportation

Fuel cell-powered marine craft

Contractor: Toda Corporation **Duration:** FY2014–2015

Project Outline

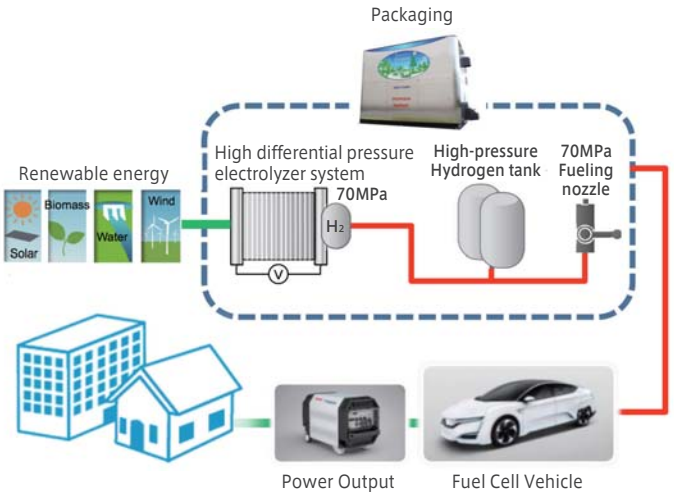


Estimates from sources including fiscal 2011 Fisheries Agency statistics show that fuel consumption by small privately-operated vessels in Japan amounts to 950 million liters in fuel oil A equivalent annually, producing 2.5 million tons per year of CO_2 emissions. However, compared to advances with automobiles, low-carbon initiatives for small vessels, such as improvement of fuel efficiency, have not made much progress and measures are been called for.
In an effort to move toward low-carbon small vessels, experiments have taken place using rechargeable lithium-ion batteries in vessels, but the heavy battery weights limit what can be equipped on board, limiting vessel operation to about one hour at most.
This project, in cooperation with the Ministry of the Environment's floating offshore wind turbine verification project, uses hydrogen generated from verification trials for the use of electricity. We have developed and constructed a trial model of a low-carbon design of a small vessel that can operate on the open seas, powered by fuel cells.
In test runs the vessel has reached maximum speeds of 20 knots. Safety and durability verification tests for commercialization are now under way.

Hydrogen fueling station that generates hydrogen at 70 MPa by high pressure electrolysis powered by renewable energy

Contractor: Honda Motor Co., Ltd. **Duration:** FY2015–2017 (planned)

Project Outline



Fuel cell vehicles (FCVs) will require hydrogen at a pressure of 70 MPa. For that purpose, this project modified a compact package-type hydrogen station capable of generating hydrogen on-site at 35 MPa without a mechanical compressor. The modifications include development of a new high-pressure electrolysis system, expanded capacity for hydrogen generation, and other changes. The result will be a compact hydrogen station system capable of fueling FCVs at 70 MPa. Trials will verify its performance in actual use.
A substantial reduction in CO_2 emissions is expected by generating hydrogen at high pressure by electrolysis using electricity from renewable energy sources, and then using the hydrogen fuel to power FCVs. In addition, besides the reduction in CO_2 emissions from day-to-day use, the system can also generate and supply nine kilowatts of electricity for external use during a disaster. Trials will start in fiscal 2016 to test market acceptance.

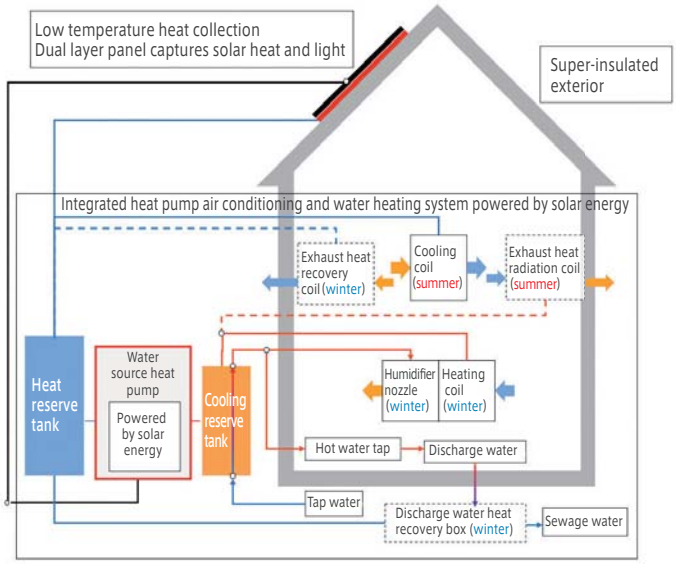
R&D for Buildings

Solar heat pump air conditioning and hot-water supply system, plus exterior materials to reduce cooling/heating load

Contractor: Mitsui Home Co., Ltd. **Duration:** FY2014–2016 (planned)

Project Outline

Popular home heating and cooling systems using heat pumps are not able to perform optimally in some situations. For instance, the houses with improved heat insulation can create an extra load on the system, as it keeps more heat inside the building. Additionally, the heat insulation performance of exterior materials has been improving, but it is possible to further enhance their heating load reduction properties. Meanwhile, available roof areas are limited in homes built in urban areas, making it difficult to install efficient energy generation systems utilizing solar light or heat.
This project aims to develop optimal housing technologies to combine a single heat pump that functions as an aggregate heat source for both air conditioning and hot-water supply systems, utilizing excess energy from solar collection, heat pump exhaust and solar power generation, efficient generation and use of thermal and electric energy, and exterior materials with high thermal performance (insulation and summertime solar shading).

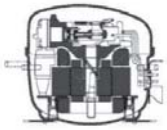


Devices to reduce power consumption of refrigeration and air-conditioning equipment

Contractor: Panasonic Corporation **Duration:** FY2015–2017 (planned)

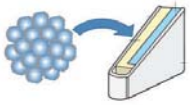
Project Outline

Approximately 20% of the power in a typical household is said to be consumed by refrigerators and air-conditioners. In order to reduce power consumption, home appliance manufacturers have been pursuing technology developments; however, their technological advances appear to be slowing.
This project aims to develop technologies for key devices to further reduce refrigerator energy consumption and CO_2 emissions in the household sector. One component is the development of high-efficiency compressors with motors using new magnetic materials featuring ultra-low core loss. Others include heat exchangers that can reduce the amount of frost formed and improve defrosting time, and new insulation materials with lower heat conductivity and greater flexibility than the conventional urethane foam used in refrigerators.
The project aims to further reduce CO_2 emissions by also applying these technologies to a wide variety of refrigeration and air-conditioning equipment for commercial use.

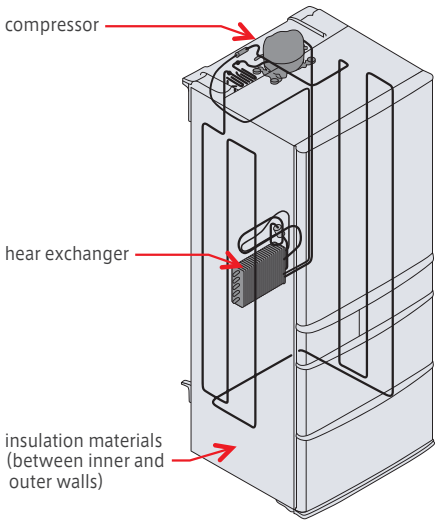


High-efficiency compressor using new magnetic materials

Heat exchanger with reduced amount of frost and short defrosting time



Application of new thermal insulation materials



Structure of a refrigerator and its key devices

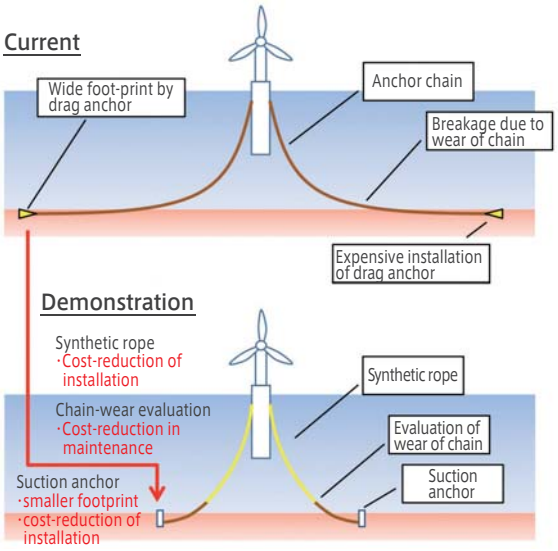
R&D for Renewable and Distributed Energy

Mooring system for floating offshore wind turbines

Contractor: Kyushu University **Duration:** FY2015–2017 (planned)

Project Outline

Power generation from floating wind turbines has significant potential, leading to high expectations for practical applications.
Currently, floating wind turbine facilities usually employ catenary mooring systems using drag anchors and chains. However, their installation costs can be high due to the large footprint of the mooring system, and the need for a pull-test of holding capacity.
This project aims to develop a mooring system consisting of suction anchors and synthetic fiber ropes, suitable to the actual conditions around Japan, and to demonstrate reductions in initial costs by use of this system. To reduce maintenance costs, the project will also develop methods to assess chain wear, leading to maintenance-free systems. The project also aims to summarize the findings as design guidelines for general use, in order to expand the use of floating wind power generation and reduce CO_2 emissions.



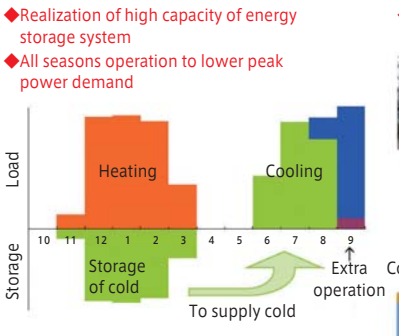

Floating Wind Turbine Facility

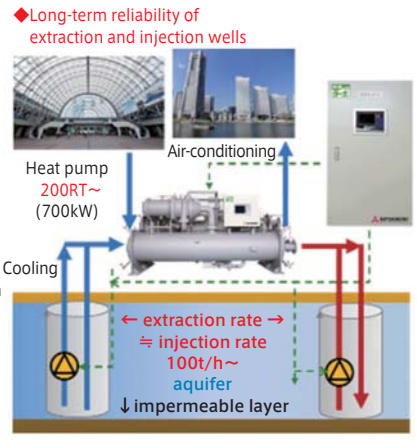
Thermal well and heat pump system for aquifer thermal energy storage systems

Contractor: The Kansai Electric Power Co., Inc. **Duration:** FY2015–2017 (planned)

Project Outline

This project aims to develop Japan's first combined aquifer thermal energy storage system for large commercial buildings and other uses, to operate in all seasons and at all times of day or night. The system pumps up groundwater from an aquifer, uses the heat, and immediately returns the water to the aquifer, thereby minimizing land subsidence risk. The well system structure and construction method will make it capable of switching between extraction and injection, reduce clogging, and maintain long-term reliability. The heat pump system will have heat and flow controls that prevent thermal well clogging. Parameters include a pump extraction rate of 100 cubic meters per hour, heat source output 200 RT (700 kilowatts), and system COP 4.1, and the system is expected to realize a 35% energy saving compared to conventional systems. The system will also reduce CO_2 emissions by being compatible with renewable energy sources such as wind power and photovoltaics, and being able to lower the peak power demand.





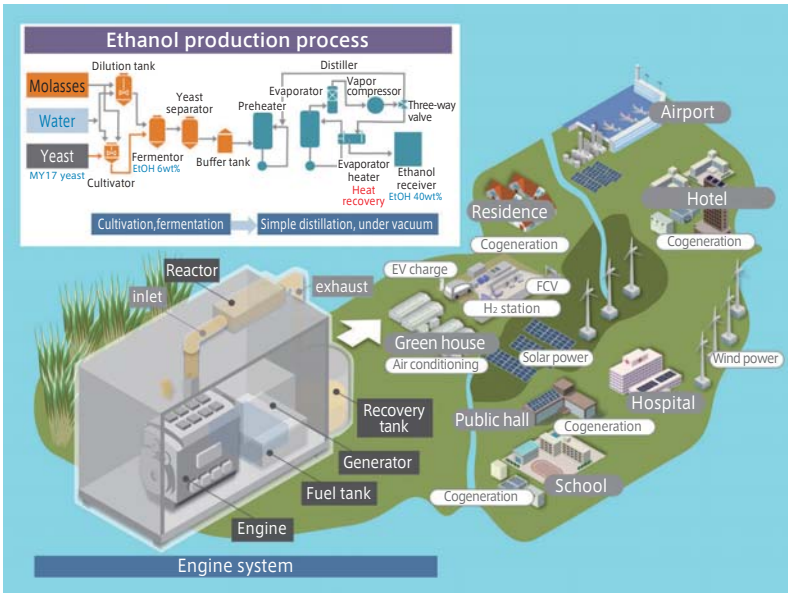
R&D for Biomass and Recyclable Resources

Innovative high-efficiency engine fueled by low-concentration bio-ethanol

Contractor: Miyakojima Industrial Innovation Agency (with Hitachi, Ltd.) **Duration:** FY2014–2016 (planned)

Project Outline

This project is developing and demonstrating new technology to produce bioethanol (water content approx.. 40wt%) from molasses locally available on Miyako Island in Japan. The technology is economical even on a small-scale, consuming less energy in production and reducing CO_2 emissions.
Second, the project is developing and demonstrating a high-efficiency engine with a heat efficiency of 50%, achieved by reforming ethanol into a hydrogen-rich gas before combustion, recovering engine exhaust heat and combusting the reformed fuel with a high compression ratio.
By applying these new technologies, the project aims to develop new applications for bioethanol fuel, including local and decentralized power generation with CO_2 emissions far lower than by fossil fuels, for local areas such as remote islands, and for power supply leveling to complement wind and photovoltaic power.

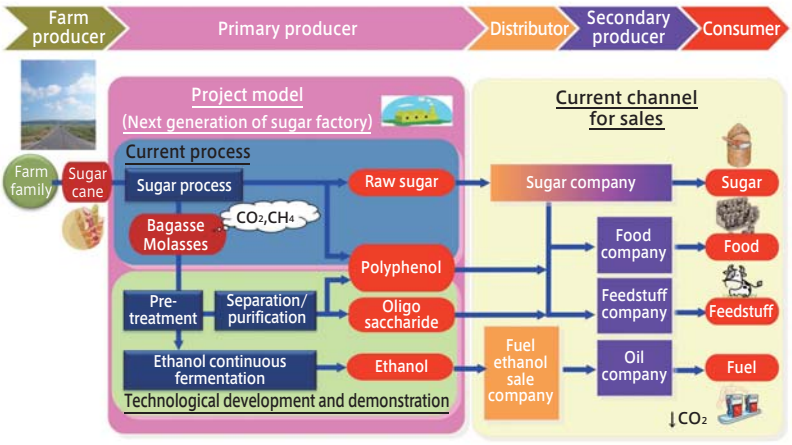


Producing bioethanol and co-products from waste materials in domestic cane sugar factories

Contractor: Toray Industries, Inc. (with Mitsui Sugar Co., Ltd.) **Duration:** FY2014–2016 (planned)

Project Outline

This project demonstrates novel technologies for production of bioethanol with valuable co-products (ethanol, oligo saccharide, and polyphenol) from waste materials (bagasse and molasses) with reduced GHG emissions, at a cane sugar factory in Japan. As a gasoline alternative, bioethanol has the potential to contribute significantly to the reduction of GHG emissions.
In this project, bioethanol is produced from bagasse and molasses available at a cane sugar factory, so the bioethanol does not result in additional GHG emissions for cultivation of sugar cane. Moreover, the economic potential of bioethanol will be significantly improved by producing valuable co-products.



This project also demonstrates energy-saving processes by recovering and reusing unharnessed steam and generating electricity by combustion of saccharification residue at the cane sugar factory. The key technology of this project is membrane technology for efficient ethanol fermentation and purification for oligo saccharide and polyphenol .

Low Carbon Technology Research and Development Program

Purpose and Features

The purpose of this Program is to promote reductions in greenhouse gas (GHG) emissions and contribute to stronger future measures against global warming.

The development and demonstration of technologies to reduce CO_2 emissions—in fields such as renewable energy, unused energy and energy conservation—helps increase the magnitude of CO_2 emission reductions and reduce the cost of measures against global warming, and helps create a low-carbon society by spreading those technologies broadly. To realize a 26% reduction in GHG emissions by 2030, further progress in CO_2 emission reduction measures is needed in every sector. It is of utmost importance to make technological breakthroughs, boost efficiency and reduce the cost of low-carbon technologies, and to create new and better low-carbon technologies. It is also crucial that they actually be widely deployed in society, in order to lead to stronger future strategies against climate change.

Meanwhile, there is no guarantee that the progress needed in low-carbon research and development will happen if that R&D is left solely to the private sector. There are various reasons for this, including the risk and uncertainty of R&D profitability, profits being squeezed due to cost increases, and the small incentive for industry to voluntarily boost their own climate change countermeasures. Because of these factors, it is essential that the national government provide leadership and encouragement for research, development and demonstration 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 research, development and demonstration of advanced CO_2 emission reduction technologies that will lead to stronger future measures (possibly including government regulation) against global warming.

Program funded by Special Account for Energy Policy

The Low Carbon Technology Research and Development Program is funded by the Sub Accounts for Supply and Demand of Energy, under the Japanese government's Special Account for Energy Policy. Based on legislation, these funds are to be used for the development of technologies to limit energy-related CO_2 emissions, and are limited to the development and demonstration of technologies for renewable energy and energy conservation, etc.

Eligible Technology Areas

Funding is available for the research, development and demonstration 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.

❶Low Carbon Transportation

Research/development/demonstration for a low-carbon transportation sector, to promote and improve the performance of electric vehicles (EV), hybrid vehicles (HV) and fuel-cell vehicles (FCV) 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).

❷Low Carbon Buildings

Research/development/demonstration for a low-carbon household/commercial sector, 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.

❸Low Carbon Renewable and Distributed Energy

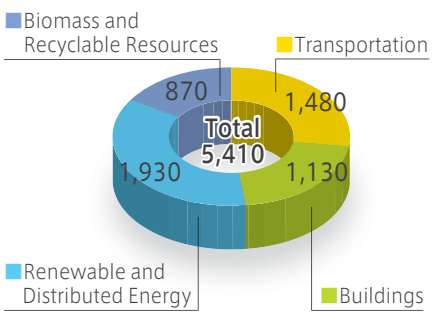
Research/development/demonstration to promote the introduction of photovoltaic, wind, micro-hydro, and geothermal energy, etc., and to improve energy efficiency.

❹Low Carbon Biomass and Recyclable Resources

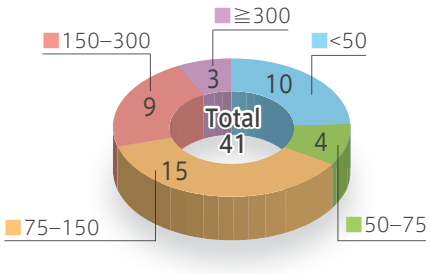
Research/development/demonstration to promote the utilization of biomass-from-waste technologies by creating low-carbon total systems to utilize biomass (including biomass collection/manufacturing methods), and reducing costs. (The Program is limited to biomass with an expected GHG emission reduction of at least 50% compared to a baseline scenario, considering the entire life cycle from production/extraction of the raw material to transportation, use, and waste.)

Statistics on Ongoing Projects for FY2015

Budget allocation for each field (million yen)



Number of projects by budget size (million yen)



Number of projects by type of organization