FY2014

環境省
Ministry of the Environment

Ministry of the Environment, Japan

Low Carbon Technology Research and Development Program

Ongoing Projects for FY2014

Note:Fiscal year (FY) starts April 1

R&D for Transportation

Integrated new hybrid vehicle system for heavy duty trucks
Hino Motors, Ltd. 2010–2014

CO_2-emissions reduction system combining small-scale solar hydrogen stations and fuel-cell electric vehicles
Honda Motor Co., Ltd. 2011–2014

Fixed-route EV-buses with super quick chargers (160 kW) assisted by second-hand automotive Li-ion batteries (SCiB)
Toshiba Corporation Social Infrastructure Systems Company 2012–2014

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

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

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

A small ship powered by hydrogen fuel cells
Toda Corporation 2014-2015

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

R&D for Buildings

High thermal insulation woody window-frame for zero energy home
Kazu Architect Office Co., Ltd 2012–2014

DC-smart grid for energy interchange systems between communities
NTT FACILITIES, INC. 2012–2014

Photovoltaic power system for large building in disaster situations
Mori Trust Holdings Inc. 2012–2014

New U-tube configurations for geothermal borehole system
Obayashi Corporation 2013–2014

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

PV/Solar assisted heat pump system as air conditioner/ water heater in highly insulated housing
Mitsui Home Co.,Ltd 2014-2016

R&D for Renewable and Distributed Energy

DC-smart grid appropriate for isolated islands and/or fishing villages
Kobe University 2012–2014

Demonstration of blowhole-type wave power plant
The University of Tokyo 2012–2014

Development of self-reliant smart communities in disaster areas
Waseda Environmental Institute Co., Ltd. 2012–2014

Wide-area operation system for distributed power sources like wind turbines
Japan Weather Association 2012–2014

Regional energy network gathering existing energy resources through rail network
Osaka City University 2012–2014

Binary cycle power plant using hybrid energy sources: wind turbine, solar heat and biomass boiler
Toshiba Corporation Power Systems Company 2012–2014

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

Energy network planning in existing multipurpose urban areas for a low carbon future
Tokyo Gas 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

R&D for Biomass and Recyclable Resources

Hydrocarbon-type biodiesel fuel from waste edible oil
Advanced Scientific Technology & Management Research Institute of KYOTO 2012–2014

Bio-ethanol production through syngas obtained by thermal-gasification of waste biomass
SEKISUI CHEMICAL CO., LTD 2012–2014.

Alkali treatment using two-axis extruder for enzymatic saccharification in bioethanol production from woody wastes
Daiei Kankyo 2012–2014

Production of "Satoyama" firewood and promotion of its diffusion into real world
Tokyo University of Agriculture 2012–2014

Liquid biofuel production from grass and woody waste through small-size Fischer-Tropsch process
Micro Energy Co., Ltd. 2012–2014

Two-step production system for fossil-fuel alternatives from biomass in municipal solid waste
Hitachi Zosen Corporation 2013–2014

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

Implementation of thermochemical treatments (torrefaction) of woody biomass to achieve higher co-firing rates (ca. 30%) in coal-fired power plants
Mitsubishi Heavy Industries Environmental and Chemical Engineering Co.,Ltd. 2013–2014

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

An internal combustion engine using dilute ethanol (ca.40%) as a fuel
Miyakojima Bio-Industrial Innovation Agency 2014-2016

Production of bioethanol and fine chemicals from sugar industry wastes by fermentation and membrane separation
Toray Industries, Inc. 2014-2016

A unique integration of a steam-turbine power generator with a waste incinerator
Institute of Applied Energy 2014

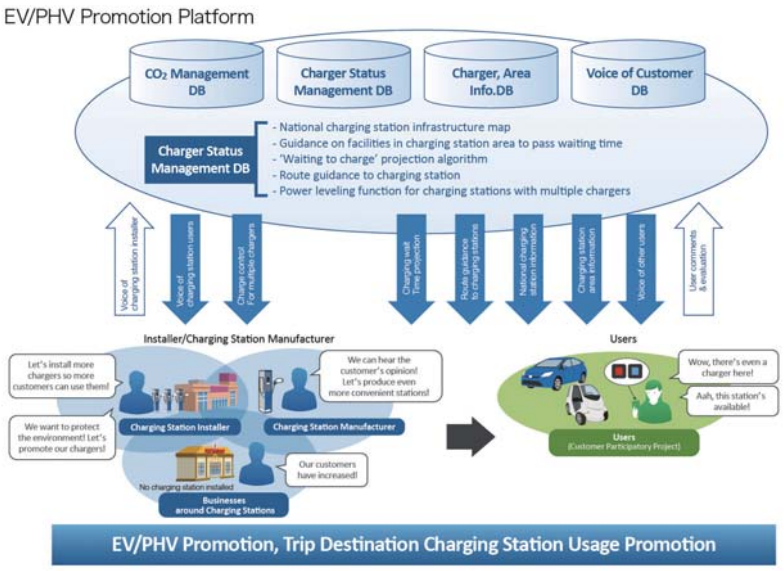
R&D for Transportation

Electric vehicle and plug-in hybrid vehicle usage promotion platform

Contractor: Toyota Media Service Corporation. **Duration:** FY2014–2015 (planned)

Project Outline

With the growing use of electric vehicles (EV) and plug-in hybrid vehicles (PHV), the infrastructure for charging these vehicles has also expanded. With this growth, however, other issues have emerged, such as access to information about the locations and status of charging stations; as well as waiting times as charging stations become more congested. To address this, the partners are working together to develop a service that provides users with station locations and information on facilities in the vicinity of the user, to improve the convenience of charging stations, with the ultimate aim of promoting EV/PHV usage and reducing CO_2 emissions. They are developing a platform to provide this information as well as waiting times, and testing its practical implementation with support from the Aichi Prefectural Government and the Aichi EV/PHV Promotion Network.



Fuel cell forklift truck and optimum hydrogen fuel gas supply system

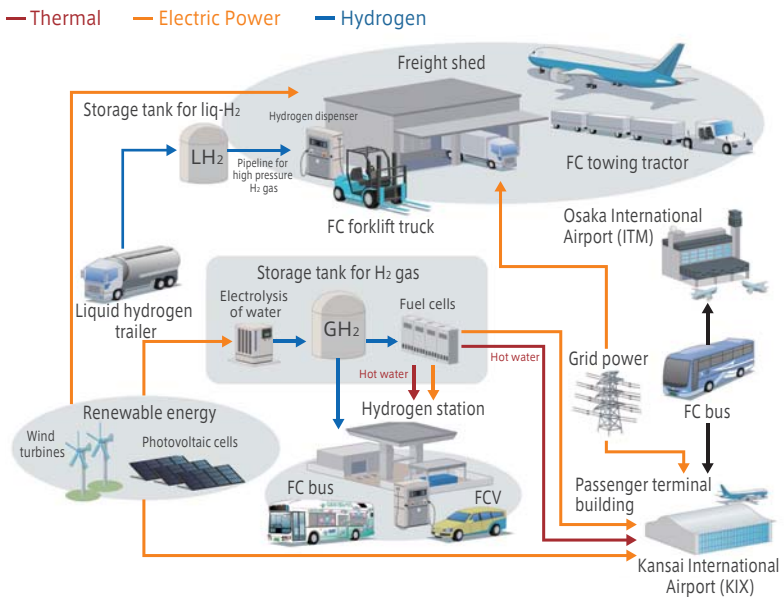
Contractor: Toyota Industries Corporation **Duration:** FY2014–2016 (planned)

Fuel cell forklift truck

Project Outline

A practical model of a fuel cell forklift truck that achieves excellent environmental and economic performance is being developed for trial operation in the international cargo area of Kansai International Airport (KIX). This project is installing and testing Japan's first system to supply hydrogen fuel gas from a large storage tank to multiple dispensers via long high-pressure pipes. The company is working to establish a model to promote both the use of fuel cell forklift trucks and the matching hydrogen supply system, with an eye on international markets, while helping to raising Japan's potential as a hydrogen-based society in the future.

Conceptual diagram of the hydrogen grid in Kansai International Airport (KIX)



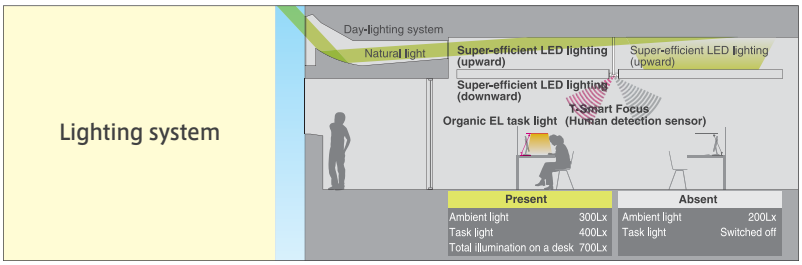
R&D for Buildings

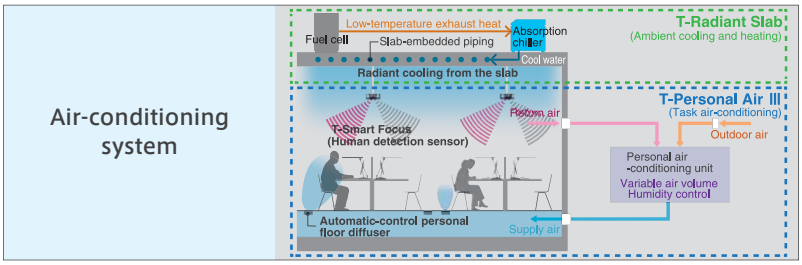
Net Zero Energy Building (ZEB) technologies in small/medium-sized buildings in urban areas

Contractor: Taisei Corporation **Duration:** FY2013–2015 (planned)

Project Outline

This project is testing various energy-saving technologies in a demonstration building for the purpose of creating a Zero Energy Building (ZEB) design for urban areas. The target is a 75% reduction in energy consumption compared to conventional buildings, in order to achieve a net-zero energy (annual) budget for the building. For lighting systems, the project evaluates the light environment and energy saving using natural light collection equipment. For air-conditioning systems, the project evaluates the thermal environment and energy saving using a radiant cooling/heating slab and "personal" air-conditioning systems. With these technologies, the project aims to demonstrate and promote ZEB technologies in urban areas.





High-efficiency geothermal heat utilization system

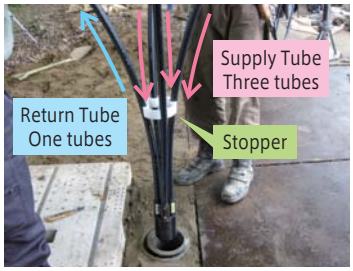
Contractor: Obayashi Corporation **Duration:** FY2013–2014

Project Outline

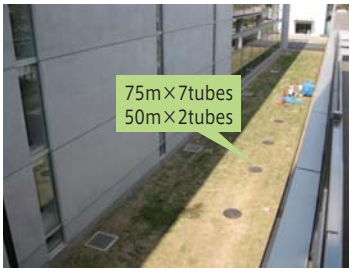
Conventional geothermal heat utilization systems generally use underground-installed U-tubes which have single supply and return tubes for heat collection and radiation, and heat-sealed tops. However, since U-tubes are designed with supply tubes adjacent to the return tubes, one challenge is to reduce heat loss from thermal "short-circuits" between tubes. In this study, methods using new tubes were developed and applied to actual buildings. The new designs have stoppers to maintain a separation between the main tubes. The study confirmed an increase in heat collection efficiency. New techniques such as a high speed construction system were also developed in this study, reducing construction cost by reducing construction time. Future plans are to promote these cost-competitive methods and further promote geothermal heat utilization systems.

Conventional system(U-Tube)

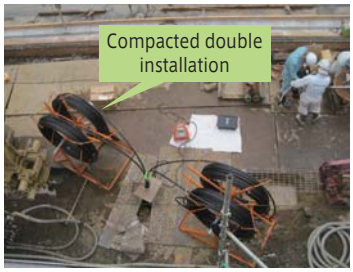
New tube system



Experimental Site
(OL2 in Obayashi Corp. technical inst.)



high speed construction system
(shortening of construction period)



R&D for Renewable and Distributed Energy

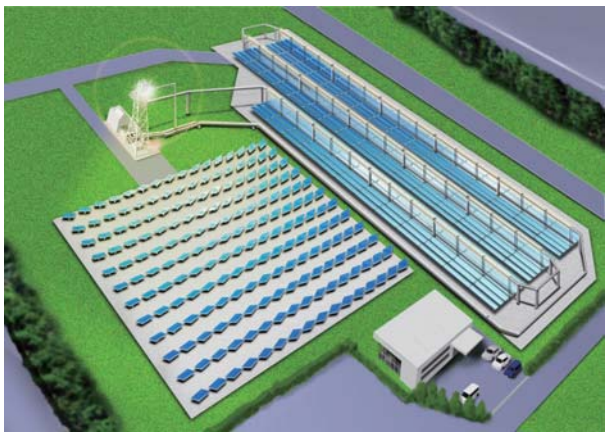
Low-cost hybrid solar tower system

Contractor: Mitsubishi Hitachi Power Systems, Ltd. **Duration:** FY2014–2016 (planned)

Project Outline

Concentrating Solar Power (CSP) is a system in which sunlight from a large area is focused on a smaller area in order to generate high-temperature steam, which is then used to drive a steam turbine and generate electricity. Challenges needing to be overcome are the complexity of the CSP system itself and the relatively higher cost of power generation compared to more conventional systems. In response to these challenges, this project has devised proprietary technology for a low-cost Hybrid Solar Tower System (HSTS) that combines a low-temperature Fresnel evaporator and a compact tower-type superheater. Through this project, the project aims to develop and verify a low-cost solar thermal collecting system—key to overcoming the cost impediment—and develop optimal technology for the total system with power generation equipment, including verification of the high-temperature heat storage system.

1MWth Concentrating Solar Power (CSP) test rig illustration



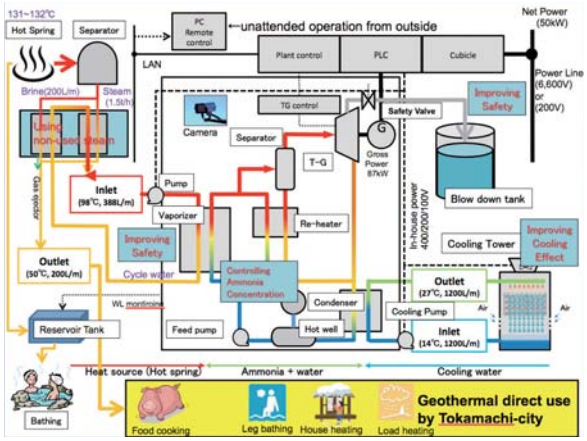
(To be located at Mitsubishi Hitachi Power Systems, Ltd. Yokohama Works)

An efficient geothermal electricity from hotsprings with a binary-cycle system using ammonia water (Kalina cycle)

Contractor: Geothermal Energy Research & Development Co., Ltd. **Duration:** FY2013 to 2015 (planned)

Project Outline

A binary-cycle plant can generate electricity using residual heat from hotsprings to drive a turbine by boiling a medium with a boiling point lower than that of water. HFC is a popular medium despite its significant global warming effect. This project tests ammonia water (a CFC-free medium with high power generation efficiency and almost no to global warming impact) as a medium and demonstrates a secure and safe treatment of ammonia-water system. Three project objectives include generating power with about half the conventional hotspring water consumption through a heat recovery system from accompanying steam; boosting efficiency 18 percent with a sophisticated heat exchanger and appropriate choice of the ratio between ammonia and water; and reducing ammonia leakage risk. A local town, city, and prefecture are participating in the project.



Heat exchanger that improves heat-collection efficiency and requires no inspection based on the Electricity Business Act

Heat exchanger for collecting untouched vapor heat

Permanent-magnet and high-speed turbine generator for ammonia rated at 87 kW with an average turbine efficiency of 77.4%

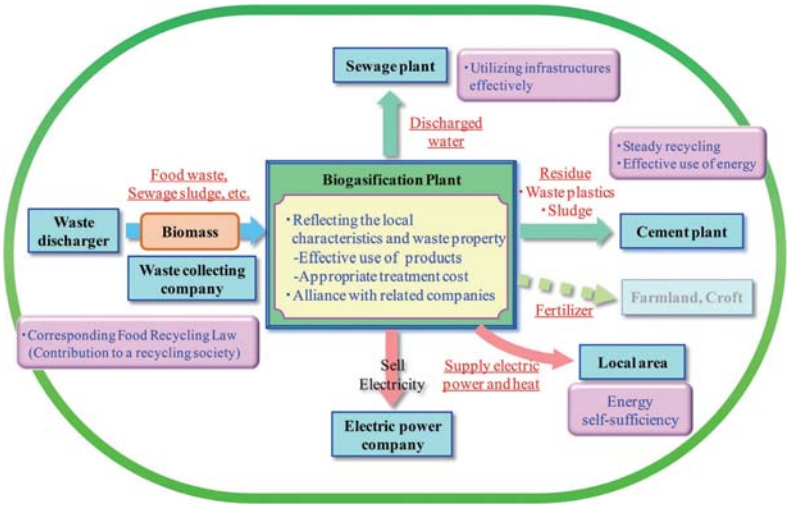
R&D for Biomass and Recyclable Resources

Medium-scale biogas plants for food waste

Contractor: Mitsubishi Materials Corporation **Duration:** FY2013–2015 (planned)

Project Outline

To promote the biogasification of food waste, considering issues about the collection of food waste, there is a need not only for large-scale plants (capacity of about 100 tons/day) best suited to large cities, but also medium-scale plants (about 10 to 30 tons/day). However, due to variability in the quality and quantity of waste, medium-scale plants face challenges of low profitability due to the demands of pre-processing, as well as high costs of treating contaminants and effluent. The goals of this project are to build successful business models of medium-scale biogas systems by approaches such as optimizing preprocessing equipment to adjust to waste volumes and properties, utilizing sewage treatment facilities to reduce the demand for effluent treatment, and recycling the residue effectively through reuse at cement plants.

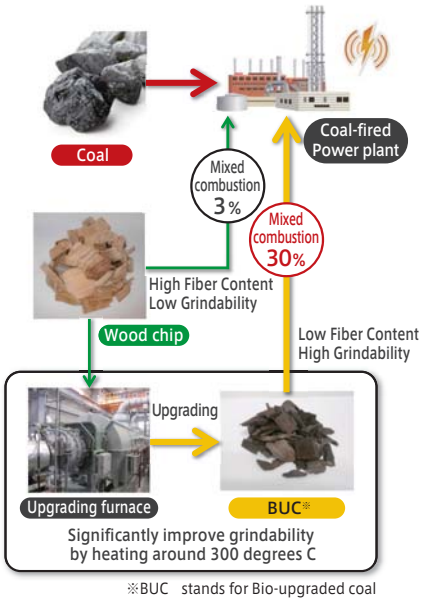


Quality improvement to achieve 30% ratio of woody biomass in fuel for coal-fired power plants

Contractor: Mitsubishi Heavy Industries Environmental & Chemical Engineering Co., Ltd. **Duration:** FY2013–2014

Project Outline

After the Great East Japan Earthquake in 2011, plans have been developed to construct several coal-fired power plants as an alternative to nuclear power to generate electricity. Coal is comparatively cheaper than other fossil fuel resources, and reserves are still plentiful. However, coal also has a problem of having the highest CO_2 emissions. Although burning coal mixed with biomass (wood chips) can reduce CO_2 emissions, since wood contains a lot of fiber, the low grindability suppresses the mixed-fuel burning ratio with coal to approximately 3%. The biomass quality improvement technology developed in this joint project with CRIEPI makes it possible to significantly improve grindability and manufacture bio-upgraded coal, which can increase to 30% the mixed-fuel burning ratio with coal. The project's goal is for coal-fired power generation to be used as a power source that is cleaner than oil-fired power generation.



※BUC stands for Bio-upgraded coal

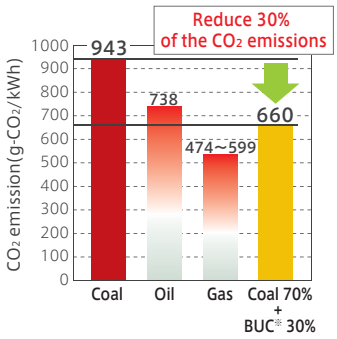


Figure. Comparison of CO_2 emission in fossil fuel power plant

Source : Central Research Institute of Electric Power Industry (CRIEPI)

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 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 an 80% reduction in GHG emissions by 2050, 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 riskiness and uncertainty about R&D profitability, profits being squeezed due to cost increases, and small incentives 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 CO_2 emission reductions 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 the research, development and demonstration of technologies that can lead to stronger future measures against climate change, in areas where CO2 emission reductions could be relatively large, but where only limited progress could be expected by private sector initiatives alone.

①Low 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).

②Low 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 buildings/equipment, introduction of renewable energy, and progress toward zero emissions.

③Low Carbon Renewable and Distributed Energy

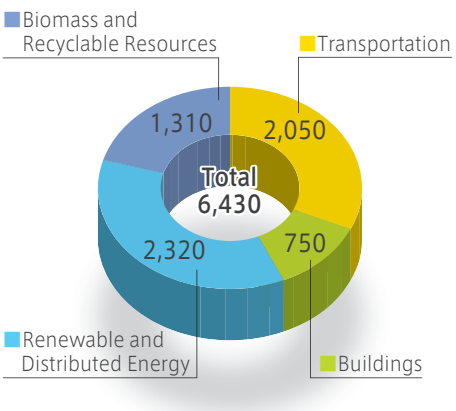
Research/development/demonstration to promote the introduction of renewable energy (excluding biomass) such as photovoltaic, wind, micro-hydro, and geothermal energy, etc., and to improve energy efficiency.

④Low Carbon Biomass and Recyclable Resources

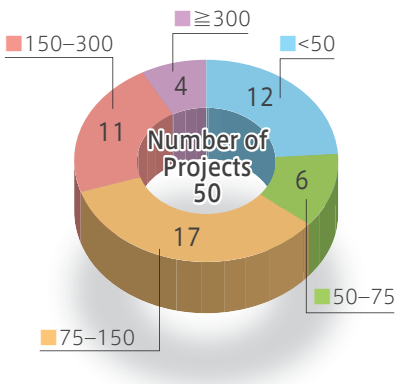
Research/development/demonstration to promote the utilization of biomass-from-waste and waste-to-energy technologies by creating low-carbon total systems to utilize biomass (including biomass collection/manufacturing methods), reducing costs, and improving efficiency (including for waste-to-electricity, etc.).

Statistics on Ongoing Projects for FY2014

Budget allocation for each field (million yen)



Number of projects by budget size (million yen)



Number of projects by type of organization