FY2013

環境省
Ministry of the Environment

Ministry of the Environment, Japan

Low Carbon Technology Research and Development Program

Ongoing Projects for FY2013

Note:Fiscal year (FY) starts April 1

R&D for Transportation

Integrated new hybrid vehicle system for heavy duty trucks
Hino Motors, Ltd. 2010–2013

CO_2-emissions reduction system combining small-scale solar hydrogen stations and fuel-cell electric vehicles
Honda Motor Co., Ltd. 2011–2013

Reduction of departure latencies in airports by an innovative passenger-baggage management system
DENSO Communications Corp. 2012–2013

Business models toward battery exchange networks for electric motorcycles
JTB Corporate Sales Inc. 2012–2013

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

R&D for Buildings

Practical study on energy management to reduce CO_2 emissions from university campuses
Keio University 2011–2013

Optimization of electricity and heat efficiency and CO_2 reduction using energy management systems for distributed power generation
Honjo Waseda Research Park Foundation 2011–2013

Mitigation of below-ground environmental impacts of aquifer thermal energy storage systems
Japan Ground Water Development Co., Ltd. 2011–2013

Geothermal heat pump system using horizontal heat exchanger installed under floor of railway tunnel
Odakyu Electric Railway Co., Ltd. 2011–2013

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

A next generation organic EL (electronic luminescence) panel
ASON TECHNOLOGY Co., Ltd. 2012–2013

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

Note:Fiscal year (FY) starts April 1

R&D for Renewable and Distributed Energy

Avoiding/minimizing noise from wind power plants
E&E Solutions Inc. 2011–2013

Control system for drilling geothermal wells at high angles of deviation in national parks
Geothermal Energy Research and Development Co., Ltd. 2011–2013

Wankel-type rotary heat engines for recovering waste heat below 200°C
Da Vinci Co., Ltd. 2011–2013

Compact transportable system for latent heat storage tanks
Sanki Engineering Co., Ltd. 2011–2013

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

Environmental sound and high efficient binary cycle power generation system using water vapor
The Institute of Applied Energy 2012–2013

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

R&D for Biomass and Recyclable Resources

Quantitative production of both low-cost bioethanol and lignophenols directly from woody biomass through a phase-separation system
Mie University 2011–2013

Woody biomass high-efficiency energy utilization system
Waseda Environmental Institute Co., Ltd. 2011–2013

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

High efficient methanation from garbage and grass biomass
Nihonkai Gas Co., Ltd. 2012–2013

Two-step production system for fossil-fuel alternatives from biomass in municipal solid waste
Hitachi Zosen Corporation 2013–2015

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

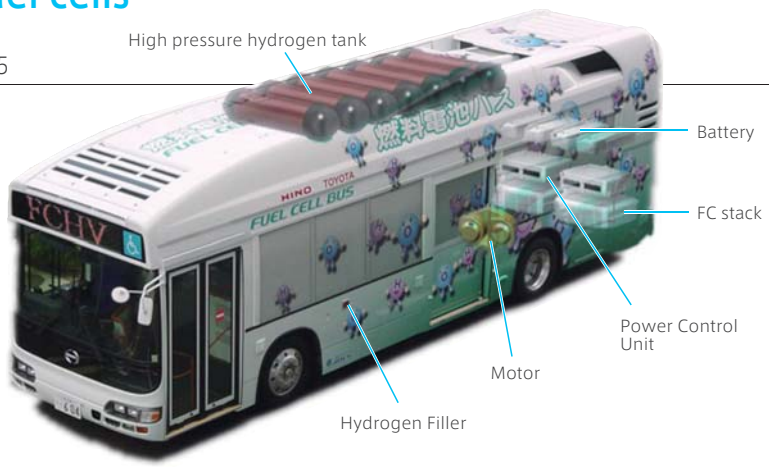
R&D for Transportation

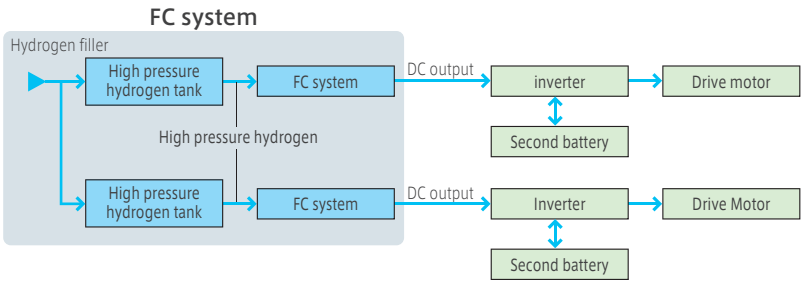
Route buses powered by large fuel cells

Contractor: Hino Motors, Ltd., **Duration:** FY2013 - FY2015

Project Outline

Purpose: Develop route buses powered by heavy-duty fuel cells, to further promote fuel cell vehicles.
Future demand for these types of buses is expected to grow due of their public benefits and environmental performance.
Many challenges remain for fuel cell applications in commercial vehicles.
This project is developing fuel cell systems for heavy-duty route buses, and evaluating the technologies for power performance, reliability and durability, with a view to future market launch.



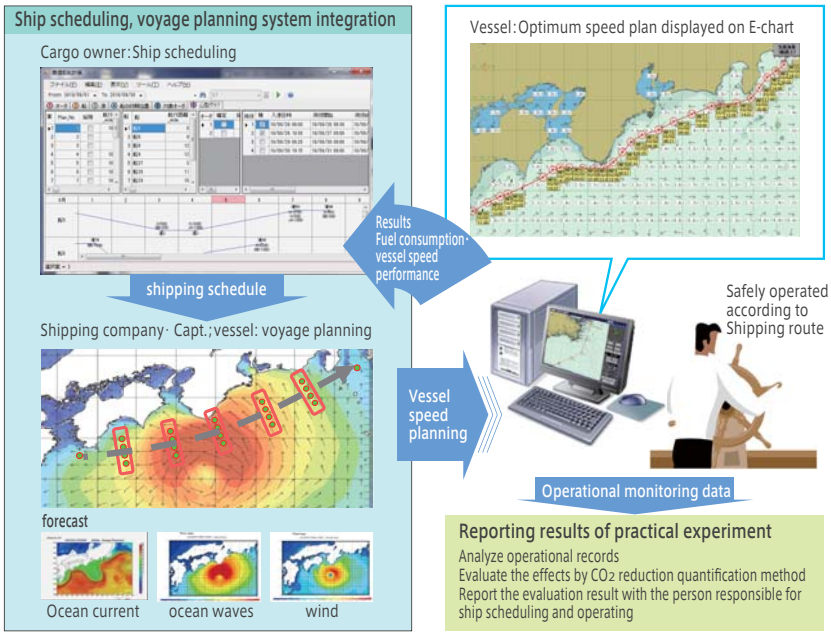


Eco-shipping for Japanese coastal vessels: (verification project for CO_2 emission reductions with ship-scheduling/voyage-planning system)

Contractor: National Maritime Research Institute **Duration:** FY2013 - FY2015

Project Outline

In the shipping industry, "slow steaming" (reduced vessel speed) improves fuel efficiency and reduces CO_2 emissions.
But ships are often travel at full speed to reduce the chance of late arrival due to weather and sea conditions.
This project will help ships make eco-friendly voyages at optimum speeds. It will develop and integrate a shipping schedule system for slow steaming, with a system that provides just-in-time voyage planning, taking weather conditions into consideration.
The project involves a practical experiment using 40 vessels, including cement carriers, oil tankers and roll-on/roll-off ships, which account for the bulk of Japanese coastal transportation. It will verify the effectiveness of the systems with a newly-developed measurement/reporting/verification system for CO_2 emission reductions.



R&D for Buildings

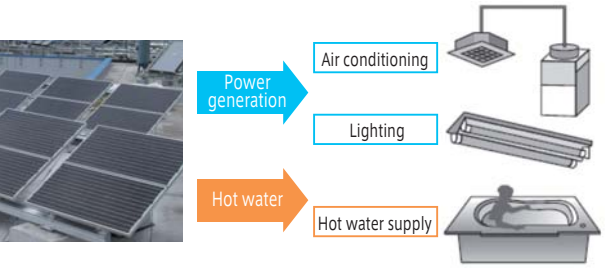
Combined panels to convert solar energy into electricity and heat

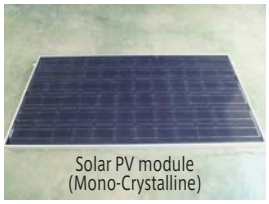
Contractor: Daiwa House Industry Co., Ltd. **Duration:** FY2013 - FY2015

Project Outline

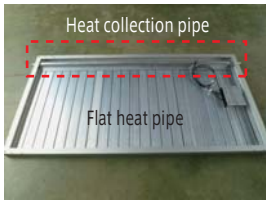
This solar hybrid panel includes both photovoltaic and heat-collection functions. The design uses photovoltaic cells, flat heat-collection pipes, and hot water piping to allow the unit to convert solar energy into both electricity and heat. The combination can improve the total solar energy-conversion efficiency while also reducing electricity-generation losses caused by heating of the photovoltaic module. Expected benefits include better total efficiency in the use of solar energy, reduced construction costs by using shared mounts and footings, and more effective use of roof space.

Solar Hybrid Panel

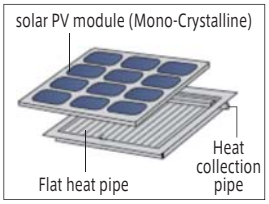




Front face



Back face



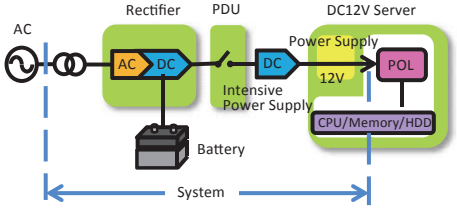
Schematic

Low-carbon data centers and better waste-heat utilization for offices

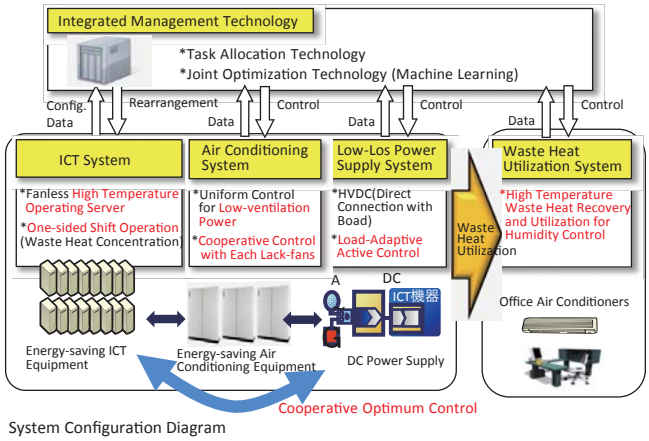
Contractor: NTT DATA INTELLILINK CORPORATION **Duration:** FY2013 - FY2015

Project Outline

Electricity consumption at data centers is rising rapidly. To address this problem, this project is developing and testing the following technologies to reduce power consumption:
(1) a 30% reduction for ICT by using a combination of fan-less server technology and rack-fan or independent air conditioning; (2) a 30% reduction for air conditioning compared to conventional floor vents by using low-power air conditioning systems that supply cooled air directly into server rooms; (3) a 15% reduction compared to conventional uninterruptible power supplies (UPS), by introducing a simple design power supply system – a high-voltage direct current system (HVDC) obtained from a single AC/DC conversion system from 200V-AC; (4) a 10% reduction in required heat source for humidity control of the air conditioning systems for accompanying offices, by recovering heat from the hot air at 50 Celsius exhausting from the server racks assembled with heat-resistant CPU units manufactured by the high operation temperature server technology (HOTST).



HVDC (High Voltage Direct Current) 12V System



System Configuration Diagram

R&D for Renewable and Distributed Energy

Compact, efficient wave-power plant

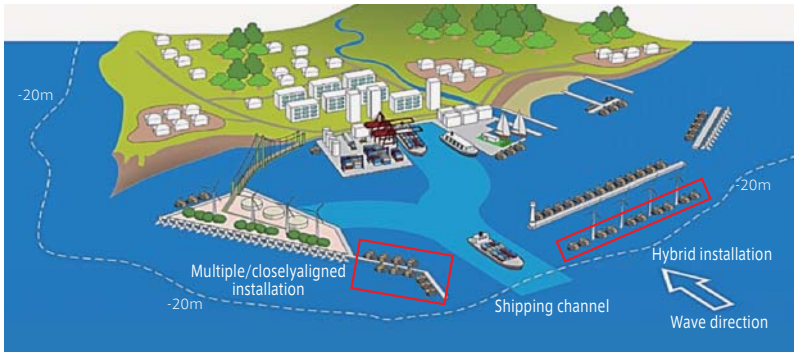
Contractor: Mitsui Engineering & Shipbuilding Co., Ltd. **Duration:** FY2013 - FY2015

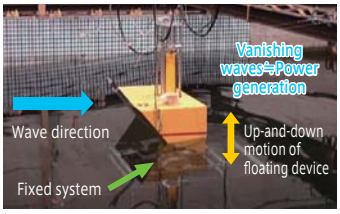
Project Outline

This firm is developing technology for a compact, efficient and intelligent wave-power harvesting system. The system is designed for islands and ports that need extra electricity. It is designed to provide power efficiently to the port area and facilities using an intelligent control module. It is expected to work even where waves are relatively small. The design uses space efficiently, and has a high power gain (on average about 40 times that of photovoltaic systems). Other features include quick installation and flexibility in site selection. Many configurations are possible, including hybrid installation with offshore wind power plants, and multi-unit installations.
The system will be tested at Oarai Port in Ibaraki Prefecture.

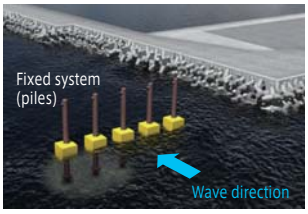
Suggested installation

- Space-efficient use of port area and around area.
- Hybrid installation with wind power plant.
- Lowering cost by commoditized power facilities.
- New business model by local production for local consumption around the port area.





Basis of power generation



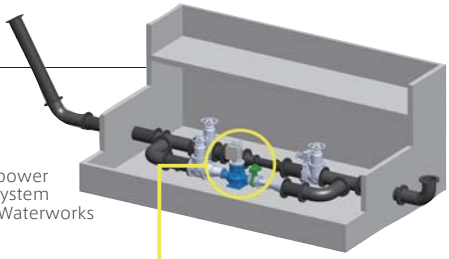
Multiple installation at port area, ex.breakwater
(Single installation for this project.)

Cost-effective micro-hydro power generation for water pipelines

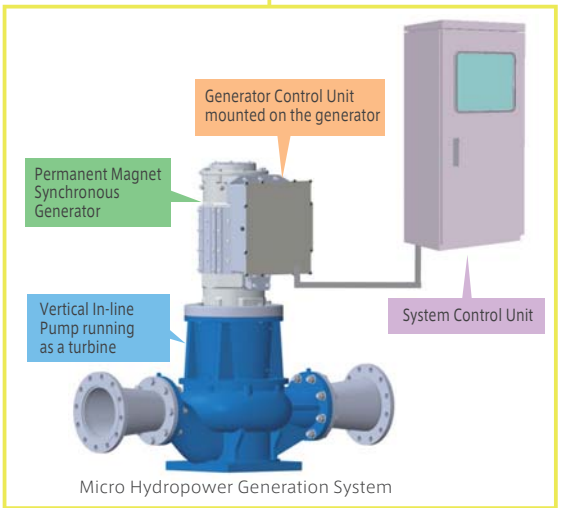
Contractor: Daikin Industries, Ltd. **Duration:** FY2013 - FY2015

Project Outline

Electricity generation from small-scale hydropower is a promising renewable energy, thanks to its high power density and high capacity factor compared with PV and/or wind turbine system.
This project is developing a cost-effective micro-hydro generation system for water pipelines that maximizes the power generated and minimizes installation space, initial costs, and maintenance costs.
Main components include a permanent-magnet synchronous generator that is highly efficient, small in size and light in weight, plus a vertical in-line pump running as a turbine, which features a small footprint and easy maintenance, and a generator-control unit mounted on the generator.
The project will test the system in waterworks facilities to utilize the otherwise-unused energy of flowing water. Field tests will verify the effectiveness of the system under actual operating conditions.



Micro Hydropower Generation System Applied to a Waterworks Facility



Micro Hydropower Generation System

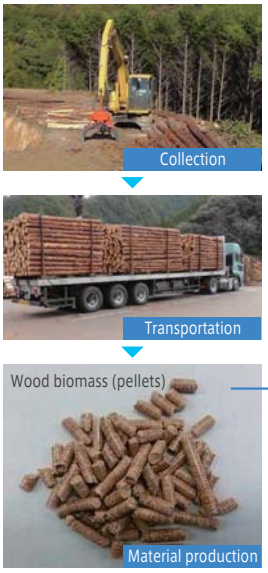
R&D for Biomass and Recyclable Resources

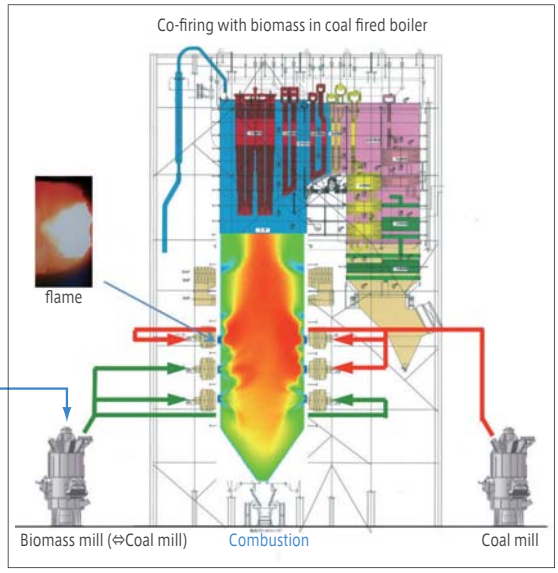
Co-firing system with high biomass ratio in an existing coal power plant

Contractor: IHI Corporation **Duration:** FY2013 - FY2015

Project Outline

Coal-fired power plants are an economical and stable source of electricity, but their CO_2 emissions per kilowatt-hour are higher compared to some other types of power plants. Co-firing using a high ratio of wood biomass to coal could be an effective way to reduce CO_2 emissions from a coal-fired plant.
Testing last year showed that co-firing with 50% of combustion energy provided by wood biomass was economically- and technically-feasible in a conventional coal-fired plant.
This year, the project will test improvements in some processes that bring wood biomass from the forest to power plants that are on the scale of hundreds of megawatts. Co-firing tests will be conducted with higher biomass ratios.



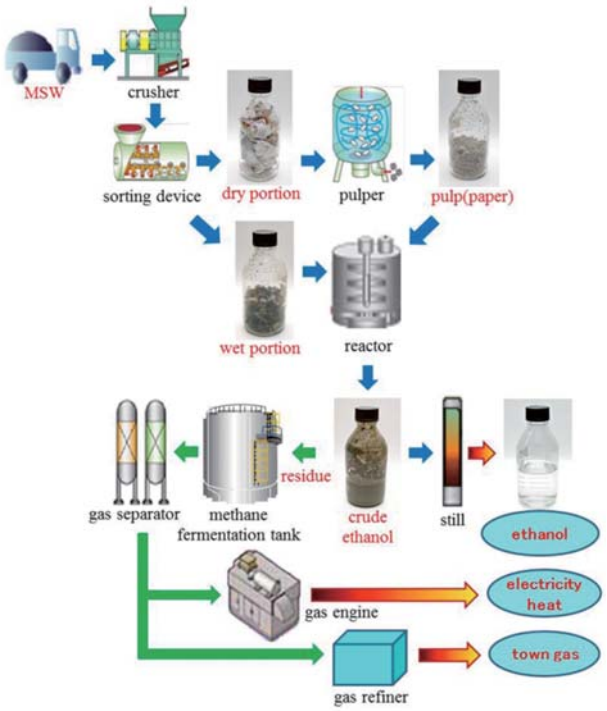


Two-step production system for fossil-fuel alternatives from biomass in municipal solid waste

Contractor: Hitachi Zosen Corporation **Duration:** FY2013 - FY2015

Project Outline

A two-step production system can produce an alternative to fossil fuels using municipal solid waste (MSW). In this new production system to produce fuel, first the biomass (e.g. paper waste and garbage) separated mechanically from MSW is converted to ethanol by a simultaneous saccharification and fermentation (SSF) process. Then, biogas is recovered from the ethanol residue by methane fermentation. The current project will conduct a verification test of this new system.
Until now, no processes have been able to efficiently and economically recover energy from small incineration plants. This system, however, can produce fossil-fuel alternatives even in small-scale plants, with efficient energy recovery and a reduction of CO_2 emissions. This technology can potentially reduce the number and size of incineration plants required to handle waste. As biomass typically accounts for 30 to 40 percent of MSW, another benefit could be a reduced financial burden on national and local governments dealing with waste management.



Low Carbon Technology Research and Development Program

Purpose and Characteristics

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 advanced CO_2 emission reduction technologies is indispensable for reducing the costs of measures against global warming, widely disseminating the technologies, and realizing large reductions in future CO_2 emissions. To accomplish those aims, breakthroughs on technological challenges—to dramatically improve the CO_2 reduction performance of technologies (such as renewable energy and energy conservation technologies), reduce costs, improve efficiency, and improve durability—are of the utmost importance, and the breakthroughs must lead to stronger measures against global warming.
Technologies to reduce CO_2 emissions are an area of special expertise for Japan, and it is becoming increasingly important to develop such technologies, from the perspective of the desire to create a low-carbon society, boosting international competitiveness, growing the economy, and creating employment.
Meanwhile, if this development is left only to the private sector, there is no assurance that the essential CO_2 emission reduction technologies will be developed. Thus, through this Program, it is important to promote the development and demonstration of technologies for which there is little development incentive in the private sector.
In that context, this Program aims to promote the development and demonstration of advanced CO_2 emission reduction technologies that will lead to stronger future measures against global warming, measures that might include government regulation.

The budget for the Low Carbon Technology Research and Development Program comes from the Sub Accounts for Supply and Demand of Energy of the Special Accounts for Measures for Energy. According to legislated provisions on the accounts, funds are to be used for technological development to limit emissions of CO_2 from energy sources, and are limited to the development and demonstration of renewable energy and energy conservation technologies.

Eligible technology areas

① R&D for Low Carbon Transportation

To move toward low-carbon transportation in the transportation sector, this technology area targets R&D relating to diffusion and performance improvement of electric vehicles (EV), hybrid vehicles (HV) and fuel-cell vehicles (FCV), which are expected to become more common in the future. This technology area also targets R&D for improving transportation energy efficiency for rail and other modes as well as automobiles.

②R&D for Low Carbon Buildings

To move toward low-carbon society in the household/commercial sector, this technology area targets R&D for residential and office energy-efficiency improvements such as through improved energy conservation of buildings and equipment; for the introduction of renewable energy; and for zero emissions technologies.

③R&D for Low Carbon Renewable and Distributed Energy

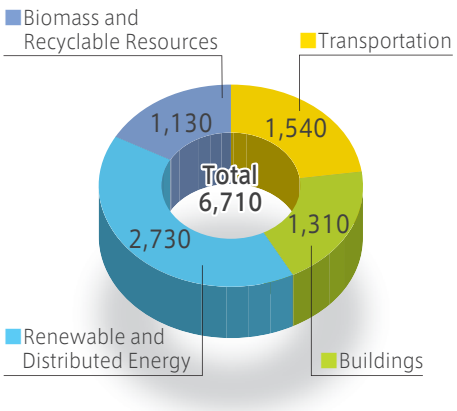
This technology area targets R&D to promote renewable energy, with the exception of biomass, and to promote the introduction of and improved energy efficiency of photovoltaic, wind, micro-hydro, and geothermal energy, etc.

④R&D for Low Carbon Biomass and Recyclable Resources

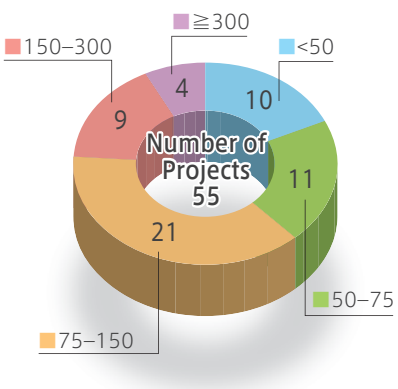
In order to promote the utilization of biomass from waste, and waste-to-energy, this technology area targets R&D for low-carbon systems overall for biomass utilization, including biomass collection and manufacturing methods, etc., cost reduction, and efficiency improvements for waste-to-electricity, etc.

Statistics on Ongoing Projects for FY2013

Budget allocation for each field (million yen)



Number of projects by budget size (million yen)



Number of projects by type of organization