環境省
Ministry of the Environment

Ministry of the Environment, Government of Japan

Low Carbon Technology Research, Development and Demonstration Program

Transportation

Buildings

Renewable and Distributed Energy

Biomass and Recyclable Resources

Ongoing Projects in FY2016

Note:Fiscal year (FY) starts on April 1

RD&D for Transportation

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

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 systems for large vehicles to expand applications for EV buses and trucks
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

RD&D for Buildings

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

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

Snow-melting system using ground thermal storage of summer solar and household wastewater heat, no fuel required
TRUST PLAN Inc. 2016-2018

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

RD&D for Renewable and Distributed Energy

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
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 Engineering & Shipbuilding Co., Ltd. 2016-2018

Technologies to increase electric energy recovery from photovoltaic system
JGC Corporation 2016-2018

New geothermal power generation method using hydrothermal circulation system
Obayashi Corporation 2016

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

RD&D for Biomass and Recyclable Resources

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

Biomass fuel conversion technology to recycle mushroom cultivation waste for local energy production and consumption
Ueno Village Mushroom Center Co., Ltd. 2016

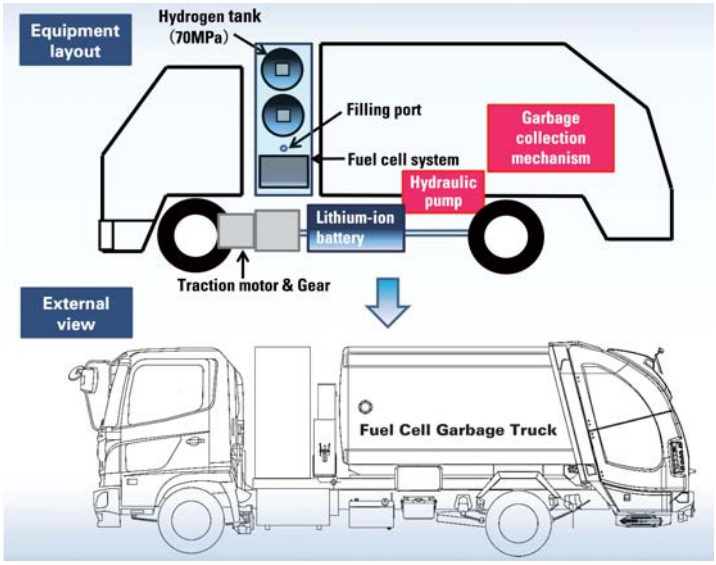
RD&D for Transportation

Fuel-cell-powered garbage collection vehicles to realize a hydrogen/recycling-oriented society

Contractor: Flat Field Co.,Ltd.
Duration: FY2015–FY2017 (planned)

Project outline

This project will develop a fuel-cell-powered garbage collection vehicle, with fuel efficiency 1.75 times that of standard diesel-powered garbage collection vehicles, and a corresponding reduction in CO_2 emissions. The new design will maintain all the practical functionality of standard vehicles, while improving fuel efficiency through various means, including the fuel cell system, improved deceleration rates while driving, methods for electrically powering the garbage collection components, and reduced power consumption through an optimized air conditioning system.
As another benefit of conversion to a fuel cell system, levels of noise produced by the new vehicle will be low. If it becomes possible to collect garbage in residential areas at night utilizing this low noise characteristic, the new vehicles might also help to ease traffic congestion, further reducing CO_2 emissions.
After conducting a vehicle performance assessment on the new vehicle, its practical functionality and CO_2 reduction effects will be assessed and validated starting in fiscal 2016 through operational trials, as a part of actual waste collection operations. Based on the data obtained, projections will be considered for achieving widespread popularization and use in other regions, as well as the business viability of the vehicle.

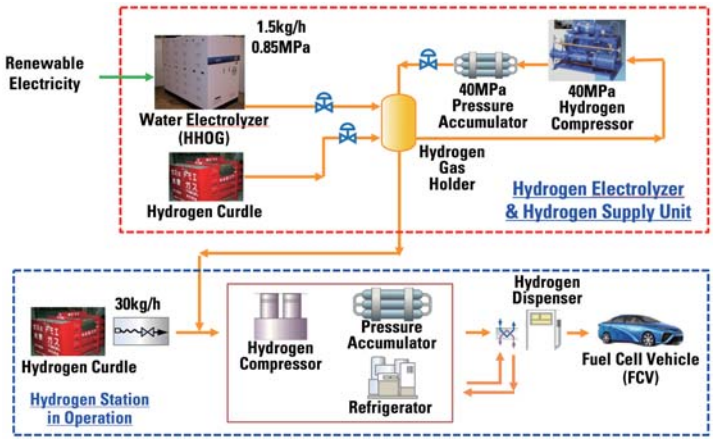


Hydrogen filling station using medium-scale (1.5 kg/h) water electrolyzer powered by renewable energy

Contractor: Kobe Steel, Ltd.
Duration: FY2016–FY2017 (planned)

Project outline

The use of hydrogen as an energy source has now commenced in Japan with the construction of a supply infrastructure involving a network of hydrogen filling stations, and popularization of fuel cell vehicles (FCV). At present, hydrogen is usually produced from fossil fuel sources. In the future, a low-carbon hydrogen supply chain involving only renewables will be needed, but challenges remain with technology, scale and cost—relating to the electrical power network, the system of water electrolysis, and the supply and storage of hydrogen.
To promote use of low-carbon hydrogen, a new system is being developed, consisting of a hydrogen station with a mid-scale water electrolysis component. By mixing hydrogen derived from fossil fuels with hydrogen derived from water electrolysis, the use of low-carbon hydrogen can be made practical while providing a constant and reliable supply.
Project activities include development of the basic design and operational method of the total hydrogen supply system using water electrolysis; design of the control system for pressure increase; and hydrogen storage to permit the later use of hydrogen produced by renewal energy. From FY2017 onward, demonstration experiments will verify the system and expand its social acceptance.



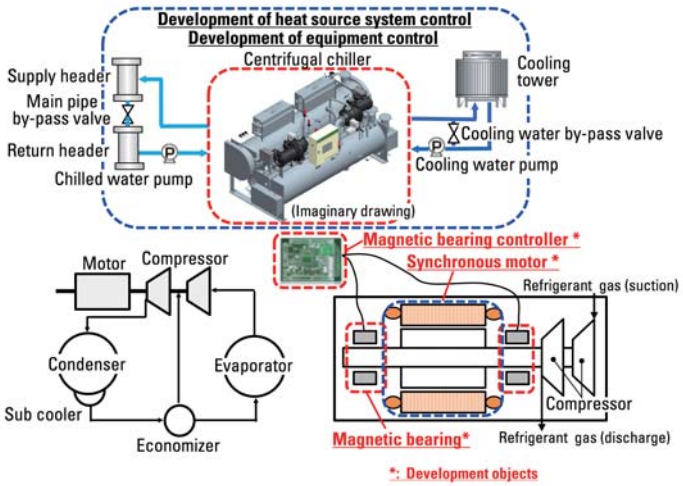
RD&D for Buildings

Centrifugal chiller for commercial use featuring low lifecycle costs, low loss, high efficiency

Contractor: Mitsubishi Heavy Industries, Ltd.
Duration: FY2015–FY2017 (planned)

Project outline

MHI will develop a high-efficiency centrifugal chiller to reduce CO_2 emissions from energy (mostly electrical) consumed in office buildings and commercial facilities. The purpose is to widely promote the chiller as a type of heat source equipment with high-efficiency performance in a wide range of operating temperatures and capacities, and with running costs significantly reduced by improving ease of maintenance. Two efforts will boost chiller efficiency: the development and employment of a dedicated magnetic bearing, and the development of a high-efficiency, low-loss compressor with a semi-hermetic motor. This gives the chiller high-efficiency performance even in a low-load operating range. MHI also aims to improve the rated coefficient of performance (COP) to 7 or more by improving the efficiency of heat exchangers and developing a low-cost double-cooling cycle. Regarding auxiliary machinery (e.g., chilled and cooling water pumps and cooling tower), MHI intends to improve efficiency through optimal control of a centrifugal chiller and entire heat source system. For the new chiller, MHI will also employ a refrigerant with a low global warming potential (GWP), to facilitate market acceptance of the product.

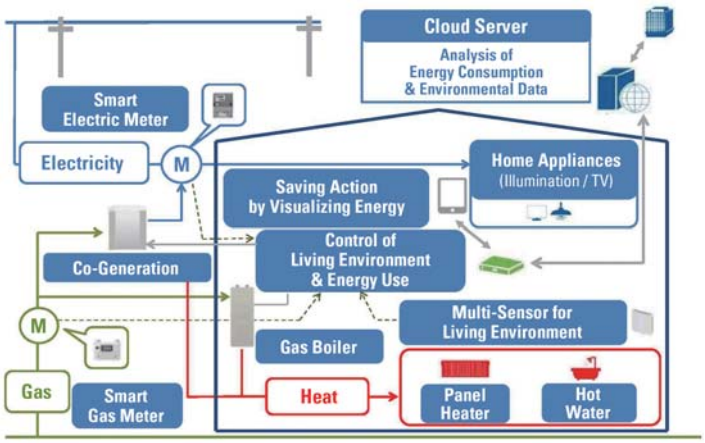


An Energy-saving support system utilizing lifestyle and living environment information

Contractor: Hokkaido Gas Co., Ltd.
Duration: FY2015–FY2017 (planned)

Project outline

Heating accounts for nearly half of home energy use in cold regions such as Hokkaido, Japan. When considering energy conservation in such a region, it is crucial to take into account not only electricity consumption but also heat.
This project aims to reduce CO_2 emissions by developing an energy saving support system which utilizes lifestyle activity environment information, which is closely related to the amount of energy used for heating. The system automatically controls home heating by analyzing lifestyle patterns, based on the data obtained from our "living environment multi-sensor" and energy consumption. Concurrently, residents are given easy-to-understand feedback based on behavioral science to encourage energy-saving actions and reduce CO_2 emissions.
The system will be installed in 100 homes to verify the energy-saving effect. Modifications will be made based on interviews and reflected in advice given to the participants. The aim is to commercialize the system in 2018.



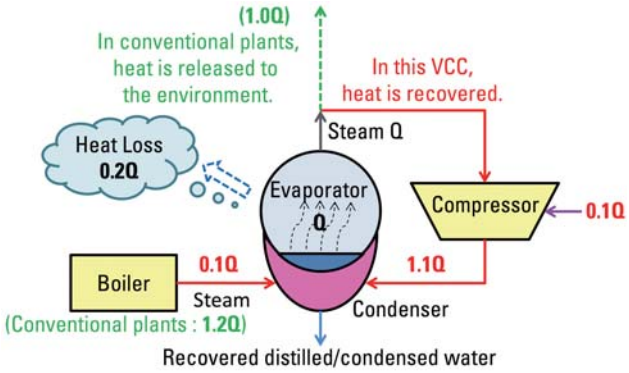
RD&D for Renewable and Distributed Energy

High-efficiency evaporator-crystallizer systems for 50% reduction of CO_2 emissions using thermal recovery of vapor latent heat

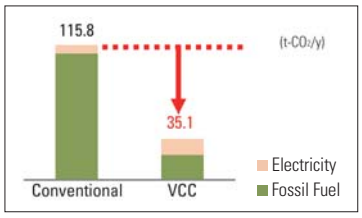
Contractor: Kajima Corporation (with Kajima Environmental Engineering)
Duration: FY2015–FY2017 (planned)

Project outline

Among technical innovations that enable the ever greater reduction of CO_2 emissions, Kajima focuses its attention on concentration and drying processes.
In general, these processes require thermal energy from fossil fuels, and emit large amounts of CO_2 and thermal energy into the air.
This project aims to develop and put vapor compression and condensation (VCC) into practical use by re-using high-temperature steam, and also to re-use the high temperature and pressure from a compressor as heat for evaporation, thereby halving CO_2 emissions and fossil fuel consumption compared to conventional systems.
Concentration and drying tests for high-concentration salt water were conducted with a VCC prototype unit at a leachate treatment plant. The results were reviewed for design, manufacture, verification, and assessment of the demonstration unit, whose performance is expected to be confirmed in FY2016 and 2017.
Market research regarding VCC was also carried out as part of this project, to help produce and market environmentally friendly evaporator-crystallizers that can cut CO_2 emissions in half, helping to realize a low-carbon society.




Trial Running at Treatment Plant



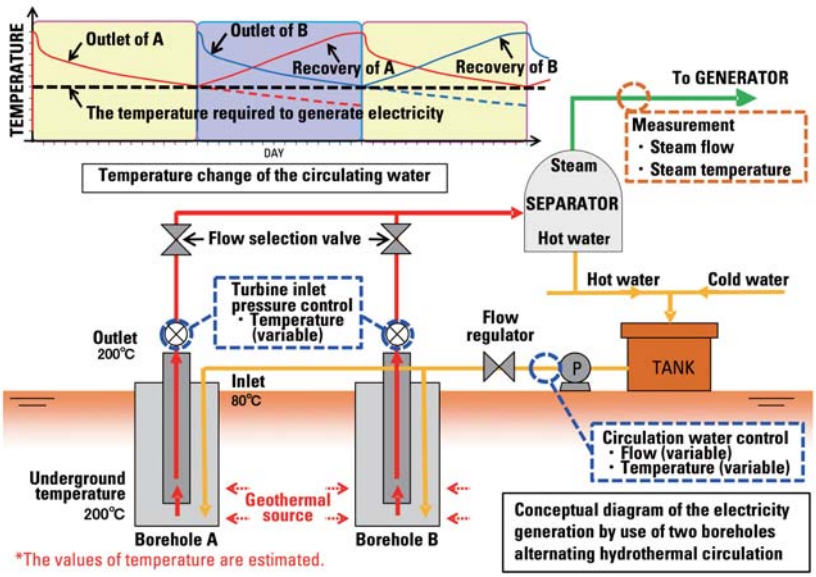
CO_2 Emission Comparison between the conventional and VCC ($2m^3/d$)

New geothermal power generation method using hydrothermal circulation system

Contractor: Obayashi Corporation
Duration: FY2016

Project outline

A demonstration study of a new geothermal power generation method called "hydrothermal circulation type power generation" was carried out under this project.
Instead of using steam from an underground geothermal fluid, water is circulated in a closed system where water is heated by the rock while traveling downward in the annulus between two pipes, and returned to the surface through the central pipe. This method makes it possible to develop sites where conditions for flash-type power generation are not fully met, such as insufficient amounts of water, or strongly acidic or alkaline conditions. The use of this method therefore reduces the business development risk, and can also alleviate the concerns of depleting nearby hot-spring resources. This project aims to reduce CO_2 emissions by promoting the development of geothermal resources and increasing the amount of electricity generated.



RD&D for Biomass and Recyclable Resources

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

Contractor: Japan Coal Energy Center
Duration: FY2015–2017 (planned)

Project outline

Municipal waste incineration facilities in Japan often use gasification melting furnaces due to their high environmental performance and ash volume reduction. This project tests bio-coke made from various types of biomass, fed into a furnace for several months as a substitute for coal coke. Bio-coke is considered to be a carbon-neutral fuel, and 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, respectively, so various types of biomass will be collected to provide a steady year-round supply of mixed feedstock); (2) development of effective and economic technology to produce bio-coke from mixed feedstock; (3) long-term demonstration of operations using bio-coke at Morioka/Shiwa District Environmental Facilities Association; and (4) investigation of the applicability of bio-coke from mixed feedstock in other industries.

Biomass fuel conversion technology to recycle mushroom cultivation waste for local energy production and consumption

Contractor: Ueno Village Mushroom Center Co., Ltd.
Duration: FY2016

Project outline

Mushroom cultivation produces large quantities of used cultivation beds, resulting in the problem of dealing with the waste. The objective of this project is to recycle the waste mushroom beds into biomass fuel, thereby reducing economic costs, and to reduce CO_2 emissions by reducing the use of fossil fuels, thereby reducing environmental impacts.
Waste mushroom beds are difficult to dry as they consist of water-retentive materials such as sawdust. This project will attempt to dry them at low cost by introducing a highly effective flash dryer. The target maximum cost of biomass fuel production is 20 yen/kg. The project will analyze the material in the waste mushroom beds, lifecycle assessment, and economic efficiency, in order to assess the effectiveness and future prospects of this approach.

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, 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 needed in every sector. Technological breakthroughs are needed to 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 support stronger future strategies against climate change.

Meanwhile, there is no guarantee that adequate progress would be made in research and development for the technologies needed to reduce CO_2 emissions if it 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 and energy conservation that can contribute to reductions in energy-derived CO_2 emissions in Japan.

Eligible Technology Areas and Priority Topics

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

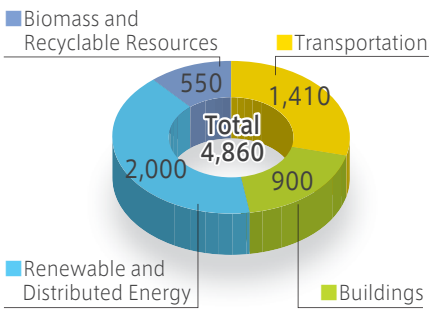
Research/development/demonstration to promote the introduction of renewable energy such as photovoltaic, wind, micro-hydro, geothermal energy, etc., and to improve energy efficiency such as through the development of independent and decentralized energy systems.

❹Low Carbon Biomass and Recyclable Resources

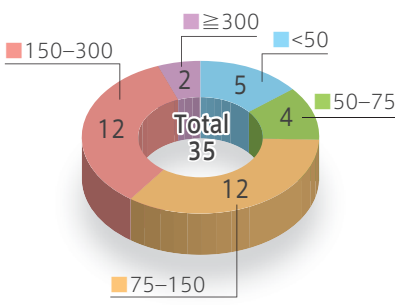
Research/development/demonstration to promote the utilization of biomass-from-waste technologies by creating low-carbon total systems to utilize biomass (including biomass collection/manufacturing methods) and reducing costs. (The Program is limited to biomass with an expected GHG emission reduction 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 in FY2016

Budget allocation for each field (million yen)



Number of projects by budget size (million yen)



Number of projects by type of representative organization