Initiatives Toward "Low-Carbon" Coal-Fired Thermal Power Generation

We continue to promote the development of technologies aimed at creating a "low-carbon" method of coal-fired thermal power generation, which remains an economically superior option and has plentiful resources available.

Utilizing State-of-the-Art Technology and Promoting Technical Development

New technologies will give our new coal-fired thermal power generator potential for further reductions in environmental impact

Matsuura Power Station Unit 2, which is currently under construction and scheduled to commence operations in December 2019, uses ultra-supercritical pressure milled coal, which involves new technology that boasts high thermal efficiency and reduces fuel consumption, thereby making it possible to reduce the facility's environmental impact.

Construction of Unit 2 is well underway (photo taken May 10, 2018)

■ Overview of Matsuura Power Station Unit 2 Development

Output	1 million kW
Power generation method	Ultra-supercritical pulverized coal combustion
Fuel	Coal
Thermal efficiency at the generating end (lower calorific value standard)	45% or more

Reference: Developing technologies pave the way for "low-carbon" coal-fired power generation

Advanced ultra-supercritical (A-USC) pressure coal-fired power generation

Higher temperatures and higher steam pressures in the coal burning process result in thermal efficiency levels 4 to 6 percent higher than conventional methods. Using these methods, we can greatly reduce fuel consumption and CO_2 emissions.

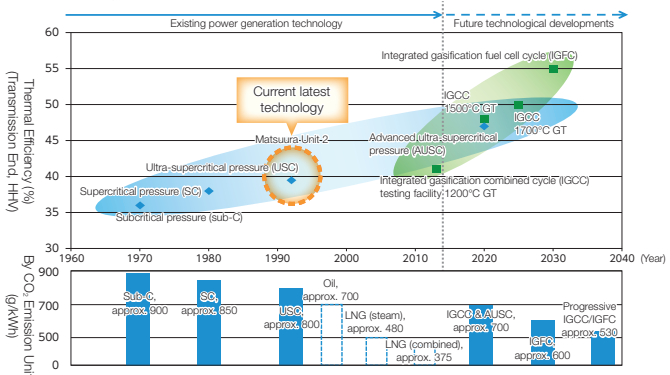
Integrated gasification combined cycle

This method combines two methods of generating electricity. First, coal is converted into gas, which is ignited to drive gas turbines. Second, the exhaust heat from the turbines is used to create high-temperature, high-pressure steam, which drives steam turbines. It is predicted that this method will achieve a generating efficiency level of between 46 and 50 percent, whereas conventional coal-fired generation reaches only about 39 to 42 percent.*

Meanwhile, work is underway to develop integrated gasification fuel cell cycle technology that combines IGCC with fuel cells to separate and recover the CO_2 prior to combustion, thus improving efficiency and environmental performance.

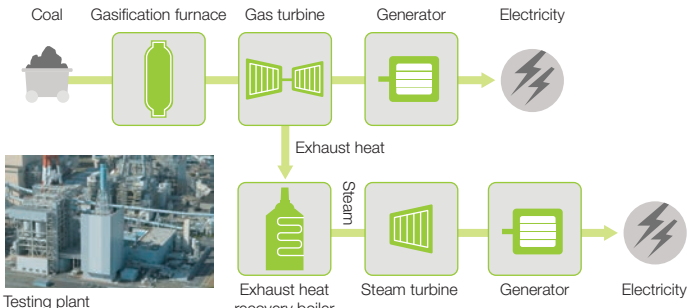
*Lower calorific value standard at the transmission end.

■ Improving Efficiency of Coal-fired Thermal Power Generation



Source: Compiled by Kyushu Electric Power based on materials from the Advisory Committee for Natural Resources and Energy, an organ of the Ministry of Economy, Trade and Industry, Agency for Natural Resources and Energy

■ IGCC system



Testing plant
(source: Central Research Institute of Electric Power Industry Review, Vol. 57)

Carbon Capture and Storage (CCS)

This is a technique for capturing the CO_2 generated by burning fossil fuels before it is released into the atmosphere, and storing it deep underground. Hopes are high that this innovative technique will be an effective weapon in the fight against global warming, but there are many challenges to overcome before it can be implemented. Research and technology development is promoted through national demonstration projects and other initiatives.

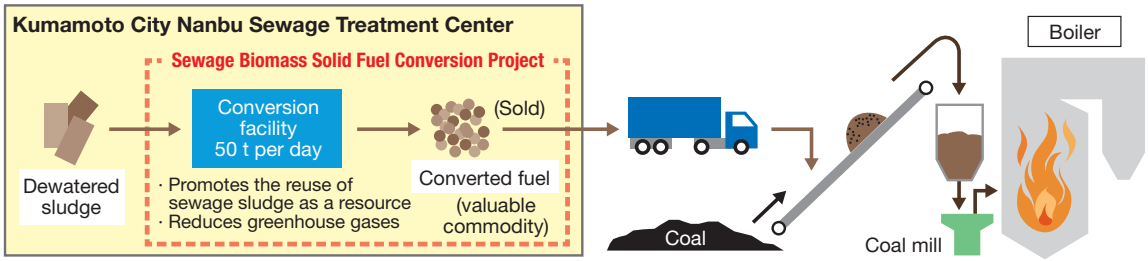
*For results of research into state-of-the-art coal-fired thermal power generation technologies, see the Central Research Institute of Electric Power Industry website.

CO_2 Emission Reduction through Operational Technology

Biomass-mixed combustion helps coal-fired thermal power stations reduce CO_2 emissions

Sewage Sludge Fuel Combustion at the Matsuura Power Station

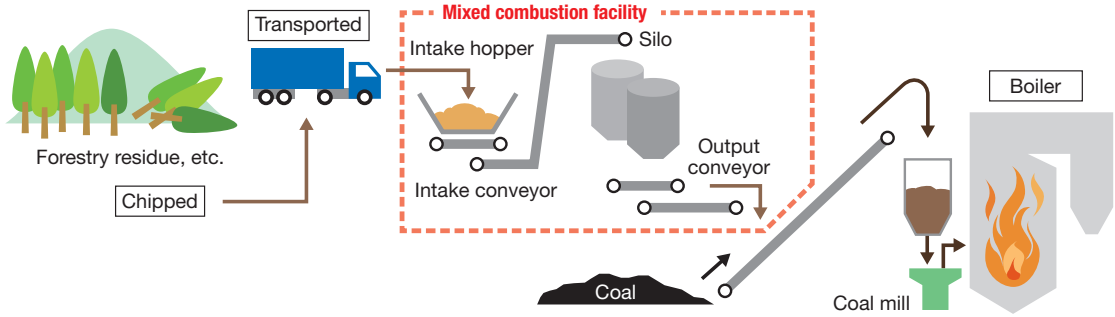
Since April 2013, dewatered sewage sludge from the sewage biomass fuel conversion project undertaken in Kumamoto City has been mixed into the coal used to generate electricity at the **Matsuura Power Station** in Matsuura City, Nagasaki Prefecture. In FY2017, the annual reduction in CO_2 emissions reached approximately 1,000 metric tons.



Woody Biomass Mixed Combustion at Reihoku Thermal Power Station

The **Reihoku Thermal Power Station** in Kumamoto Prefecture hosted a demonstration project* between FY2010 and FY2014 trialling mixed combustion featuring woody biomass (i.e., mainly unused resources such as forestry residue). Today, woody biomass is added to the coal (up to one percent of overall weight) used to generate electricity and, in FY2017, the annual reduction in CO_2 emissions reached approximately 9,000 metric tons.

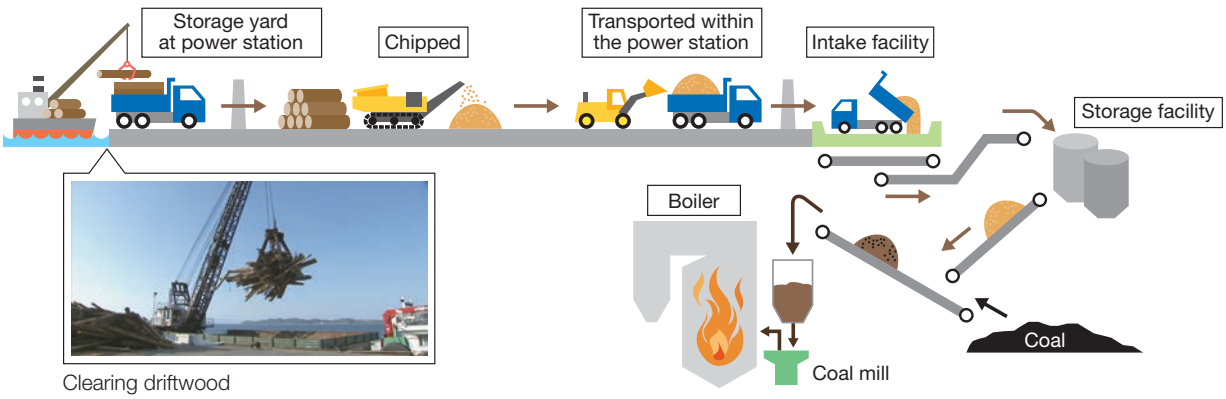
*The Demonstration Project for Testing Forestry Residue Woody Biomass and Coal Mixed Combustion Power Generation in FY2009 was the recipient of a government grant.



Community Activities | Landslide Debris Converted to Woody Biomass at Reihoku

The northern Kyushu area was devastated in July 2017 by torrential rains. The resulting landslides created a massive amount of driftwood. At Kyushu Electric Power, our Reihoku Thermal Power Station is helping to clear the mountains of logs by accepting these, chipping them on site, and using them for woody biomass-mixed combustion power generation.

■ Receiving, Processing, and Using Driftwood



Clearing driftwood