J-POWER's Coal-Fired Thermal Power Initiatives for Reducing CO_2 on a Global Scale

■ Topic 01

Coal-Fired Thermal Power Generation in the World Today

Coal-fired thermal power generation is the largest source of electric power in the world, accounting for approximately 40% of all power generated, while coal-fired thermal power produces around 30% of the world's carbon dioxide emissions. One of the keys to reducing CO_2 emissions on a global scale therefore is widespread conversion to a highly efficient form of coal-fired thermal power generation technology.

Coal is a major source of energy today and will continue to be in the future.

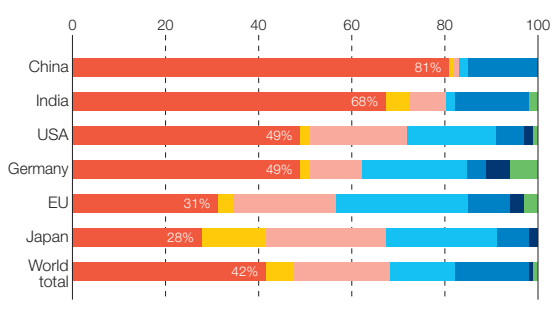
Coal deposits are extensive and dispersed broadly throughout the world. In terms of supply, it is the most stable and economical of all fossil fuels. Many countries around the world rely on coal as a primary power generation fuel source, including countries with high energy consumption. For example, China uses coal for approximately 80% of the power it generates, while in the United States the ratio is 50%. Even on a worldwide basis, coal is the most prevalent source of energy, accounting for roughly 40% of all electric power generated (Graph 1).

Coal-fired thermal power plants are only expected to increase in the years ahead (Graph 2). Coal-fired thermal power generation will remain an important energy

42%

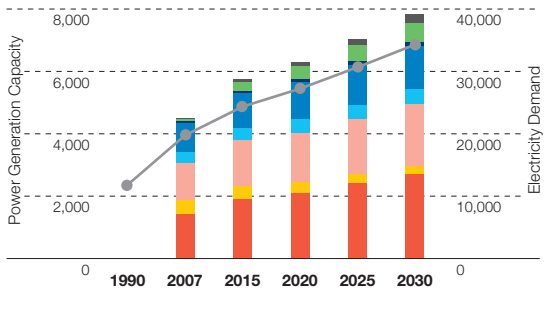
Coal-fired thermal power accounts for 42% of electricity generated in the world, the largest share of any power source. (Graph 1)

(Graph 1) **BREAKDOWN OF POWER GENERATION VOLUME BY POWER SOURCE FOR EACH COUNTRY/REGION (2007)**



Sources: IEA World Energy Outlook 2009, except for Germany, which is based on IEA Electricity Information 2009.

(Graph 2) **ESTIMATED POWER GENERATION CAPACITY BY POWER SOURCE**



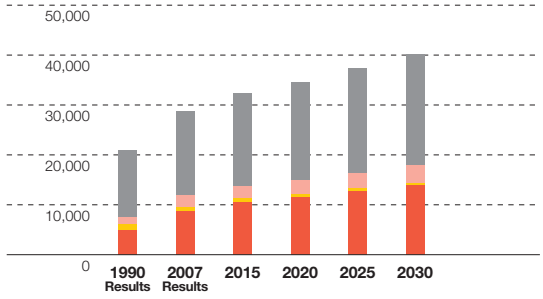
Sources: IEA World Energy Outlook 2009

source for meeting ever increasing worldwide demand into the future.

At the same time, coal and other fossil fuels emit carbon dioxide, a greenhouse gas, during combustion. CO_2 given off by the world's coal-fired thermal power plants, accounts for roughly 30% of the world's energy-derived CO_2 emissions (Graph 3).

Coal use by emerging countries like China and India and developing countries is projected to increase by a substantial margin, so reducing CO_2 emissions from coal-fired thermal power generation is one of the keys to reducing the world's CO_2 emissions.

(Graph 3) ESTIMATED ENERGY-DERIVED CO_2 EMISSIONS VOLUME BY EMISSIONS SOURCE



Source: IEA World Energy Outlook 2009

Widespread conversion to high-efficiency coal-fired thermal power holds major significance for reduction of worldwide CO_2 emissions.

Increasing generating efficiency is an effective way to reduce CO_2 emissions from thermal power plants. Coal-fired thermal power from J-POWER, and Japan in general, utilizes a method that raises steam turbine pressure and temperature to extremely high levels called Ultra Super Critical levels, providing higher generating efficiency than plants in Europe and Asia (Graph 4). J-POWER is proud to be a leader in coal-fired thermal power. The Isogo New No. 2 Thermal Power Plant, which commenced operations in July 2009, achieves the highest generating efficiency of any coal-fired power plant in Japan. Generating power at a high efficiency correspondingly reduces the amount of coal used, which serves to reduce CO_2 emissions.

If the best performing coal-fired thermal power technologies in Japan were to be used at all of the world's newly built and existing coal-fired thermal power plants, it is estimated that they would reduce annual CO_2 emissions by 1.87 billion tons-CO_2 worldwide in 2030. Widespread conversion to this kind of high-efficiency technology thus holds major significance for the reduction of worldwide CO_2 emissions and the conservation of energy resources. This conversion will be highly effective in reducing CO_2 emissions in Asia because coal-fired power generation facilities are projected to increase dramatically (Graph 5).

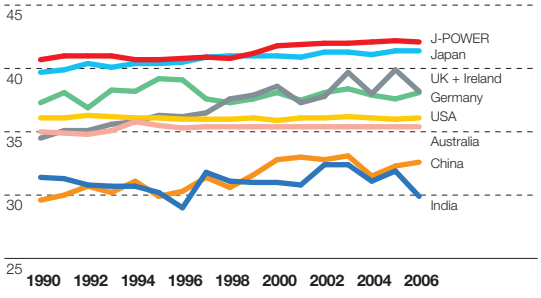
We will apply J-POWER's highly efficient coal-fired power generation technology not only in Japan, but also in countries and regions such as China, India and Southeast Asia, where the construction of additional coal-fired power generation facilities is expected in line with increases in power demand. In this manner, we intend to help drive economic growth while reducing CO_2 emissions volume in Japan and the rest of Asia.

−1.87 Billion Tons-CO_2

One estimate of the potential for reducing CO_2 emissions by introducing new technologies and enhancing operations at all of the world's coal-fired power plants shows that worldwide CO_2 emissions could be reduced by a total of 1.87 billion tons-CO_2 in 2030.

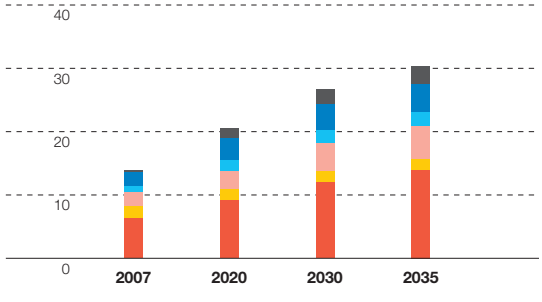
* Japan's total annual CO_2 emissions were 1.21 billion tons-CO_2 in fiscal 2008.

(Graph 4) TRENDS IN AVERAGE THERMAL EFFICIENCY OF THE WORLD'S COAL-FIRED THERMAL POWER PLANTS



Source: Ecofys International Comparison of Fossil Power Efficiency and CO_2 Intensity 2009

(Graph 5) ESTIMATED ASIAN POWER PLANT CAPACITY BY POWER SOURCE



Sources: The Institute of Energy Economics, Japan