Thermal Power Generation Falls below 50% in OECD Europe

Improvement in CO_2 emissions intensity for electricity remains limited

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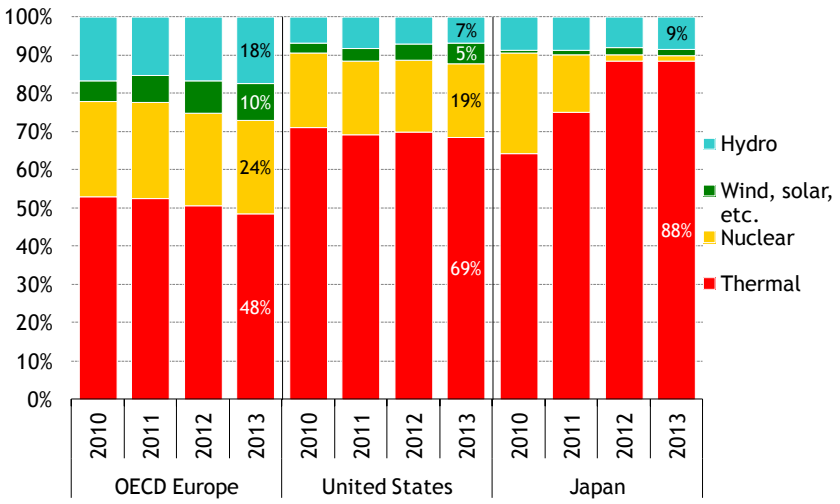
Majority of electricity now produced from non-thermal power in OECD Europe

In 2013, the ratio of thermal power in the power generation mix of OECD Europe[1] fell to 48%[2, 3], causing the ratio of zero carbon dioxide (CO_2) emission power sources to account for more than half of the electricity output (Figure 1). This compares sharply with the thermal power ratio of the United States at 69% and that of Japan, which soared significantly following the Great East Japan Earthquake to 88%.

Figure 1 Electricity generation mix of OECD Europe, United States and Japan



Note: Based on net generation (= gross generation minus own use)

Source: International Energy Agency "Monthly Electricity Statistics, December 2013"

This is attributed to the following trends of OECD Europe: (1) The rapid growth of wind and solar PV power bolstered by the Feed-in Tariff (FIT) system, (2) the decrease in nuclear

[1] OECD Europe refers to Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

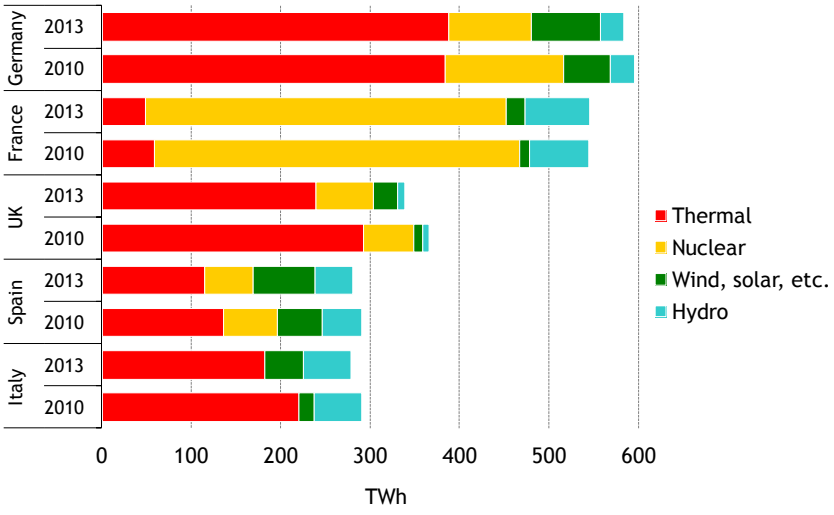
[2] Based on net generation (= gross generation minus own use).

[3] International Energy Agency "Monthly Electricity Statistics, December 2013"

power which remained minimal, and (3) the ratio of hydropower which is higher than that of the United States and Japan in France and Italy as well as in the Scandinavian and central European countries. The trend accelerated also due to the levelling off of overall electricity demand (the demand for 2013 was 2% lower than in 2010) resulting from the stagnant economy, which in turn pushed down the demand for thermal power as an adjustment power source.

Nevertheless, the situation varies by country even within OECD Europe. In Germany, which has the largest economy and electricity demand in the region, thermal power has grown in both volume and share in the last three years (2010-2013) (Figure 2). This is because the country failed to appropriately replace the drop in supply due to the shutdown of eight nuclear power plants after the Great East Japan Earthquake with other sources such as wind and solar PV power. In France, the increase in wind and solar PV power almost equals that of the drop in thermal power. The United Kingdom shed 53 TWh of thermal power, the highest in the region. This resulted from an increase in wind and solar PV power, decrease in demand for electricity, and the commencement of importing electricity from France[4] in addition to Netherlands. In Spain and Italy, amid a slump in demand for electricity due to the current severe economic situation, a solar power bubble emerged due to the overprotection of the energy through the FIT system. In Spain, the ratio of thermal power dropped to as low as 29% in April 2013.

Figure 2 Electricity generation mix of major OECD Europe countries



Note: Based on net generation (= gross generation minus own use)

Source: International Energy Agency “Monthly Electricity Statistics, December 2013”

[4] A 1-GW HVDC line was launched in April 2011.

Pros and cons of the rapid expansion of renewable electricity

The increase in renewable electricity and decrease in thermal power is resulting in less dependence on countries outside the region for energy. With its relationship with Russia worsening due to the Ukraine issue, the growth in energy production within the region is good news for Europe, which depends heavily on Russia for natural gas and oil.

However, the overly rapid change in generation mix due to the surge in renewable electricity, which is still immature in terms of technology and cost, is causing problems. For example, in Spain, whose capacity of grid connection with other countries is limited, the excessive increase in unstable power supplies such as solar PV and wind power and the dramatic decrease in thermal power, an adjustment power source, are threatening the stability of electricity supply. Further, Germany is now exporting more electricity as a means for adjustment due to the unsolved issue of the lack of infrastructure for transmitting the electricity from the wind power centres in the north to the demand areas in the south. This is raising concerns in the neighbouring Czech Republic and Poland as a risk that could destabilize the electricity supply in those countries.

The heavy economic burden is also an issue. In Germany, the FIT surcharge reaches €62/MWh for 2014, which equals an annual burden of €217 for an average household[5, 6]. However, this will eventually hit Japan even harder as the country is setting a much higher purchase price than Germany and other countries of OECD Europe.

Improvement in CO_2 emissions intensity for electricity remains limited due to the Shale Revolution

The decrease in thermal power and increase in renewable electricity help CO_2 emissions reduction. In the last three years, wind and solar PV power has grown by four percentage points while thermal power dropped by four percentage points, raising hopes for a significant contribution to reducing CO_2 emissions. In reality, however, the improvement in CO_2 emissions is estimated to be little (Figure 3).

[5] Electricity consumption of 3,500 kWh/year

[6] To maintain its international industrial competitiveness, Germany depends on households for the FIT surcharge burden.

Figure 3 CO_2 emissions intensity of electricity in OECD Europe

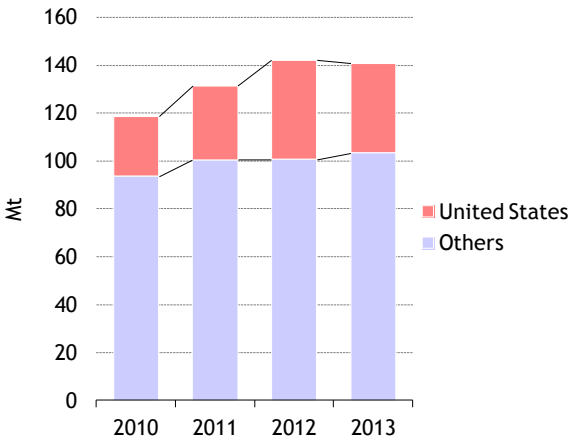
Note: Based on gross electricity generation

Source: Estimated based on: International Energy Agency "CO2 Emissions from Fuel Combustion, 2013" [up to 2011]; "Monthly Electricity Statistics, December 2013" and "Electricity Information, 2013" of the International Energy Agency, and ENTSO-E information [2012 onwards]

Behind this paradox lies the Shale Revolution of the United States.

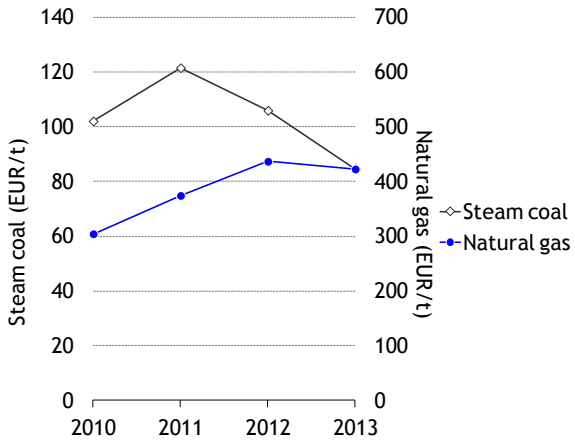
The United States is significantly raising its natural gas production. As a result, the coal that is being driven out of the power generation sector by the more price-competitive natural gas is being exported. One of the major export destinations is Europe across the Atlantic Ocean. Despite a small decrease in 2013 from the previous year, European imports of American fuel coal have increased by more than 12 million tonnes in total in the last three years (Figure 4). Due to the easing supply-demand balance of coal due to the inflow of American coal, the drop in the price of CO_2 emission credits due to the sluggish economy, and the rise in oil-linked natural gas import prices, coal is regaining competitiveness in Europe unlike in the United States, as natural gas becomes less competitive (Figure 5).

Figure 4 Steam coal imports of European Union



Source: Eurostat

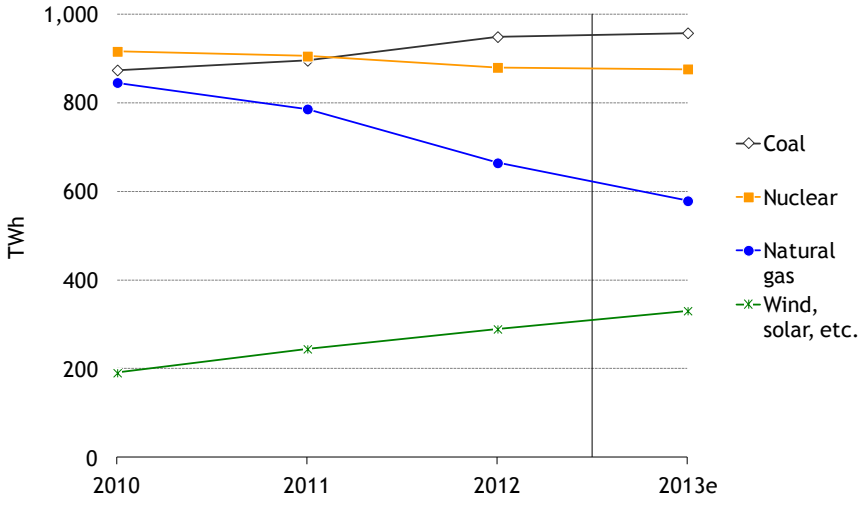
Figure 5 Import prices of steam coal and natural gas for European Union



Source: Estimated based on Eurostat

Accordingly, in the power generation sector in OECD Europe, coal is growing significantly and natural gas is declining (Figure 6). In 2012, the output of coal-fired thermal power surpassed that of nuclear power, which was the greatest until then, making coal the largest power source. On the other hand, the output of natural gas-fired power is estimated to have dropped by 30% in the last three years.

Figure 6 Power generation by major fuels in OECD Europe



Note: Based on gross electricity generation

Source: Estimated based on: International Energy Agency “Electricity Information, 2013” [up to 2012]; International Energy Agency “Monthly Electricity Statistics, December 2013”, ENTSO-E information [2013]

In OECD Europe, the ratio of zero emission power sources is evidently increasing. At the same time, among the thermal power fuels, the ratio of coal, whose CO_2 emissions intensity is high, is increasing, while that of natural gas, which has a low CO_2 emissions intensity, is falling. Consequently, the improvement in CO_2 emissions intensity of electricity remains small. It is somewhat disappointing that Europe, with its strong commitment to combat climate change, is not taking full advantage of its emissions reduction potential.

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