

Fossil Power Plant Capacity Utilization Rate Falling in China

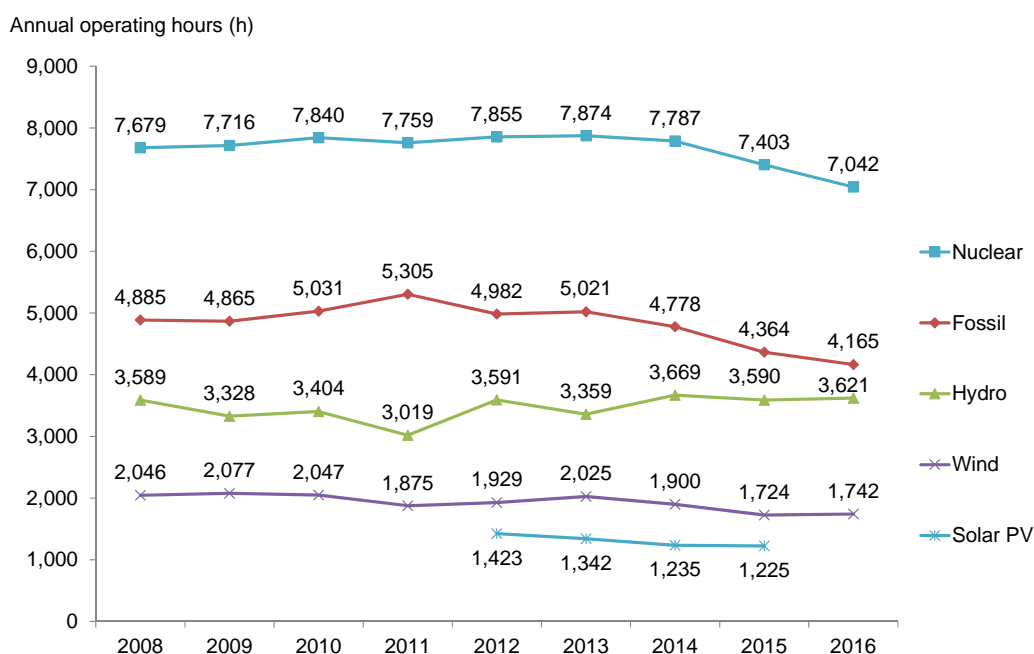
Lu Zheng

Energy Data and Modelling Center

Since 2014, the power plant capacity utilization rate has been falling in China. Particularly, a decline for fossil fuel power plants is remarkable. The fossil plant capacity utilization rate slipped below 50% in 2016. Annual operating hours for fossil power plants were limited to 4,165 hours, down 856 hours or 17% from 2013 (Figure 1).

This paper analyzes the background of the trend.

Figure 1 Average annual power plant operating hours by power source in China



Note: Data cover plants with installed capacity at 6,000 kW or more.

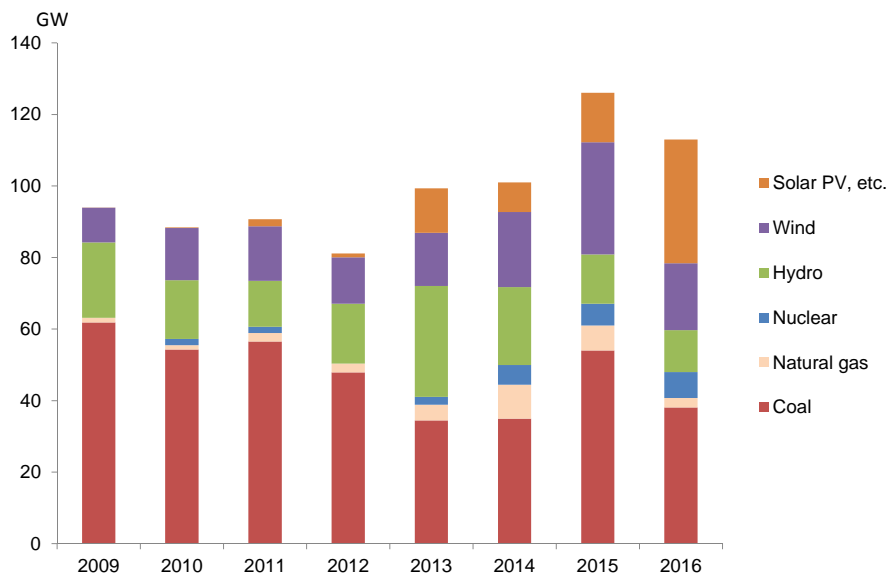
(Source) China Electricity Council

Under the slogan of deepening economic system reform from 2013, the Chinese government promoted deregulation, abolishing some approval and licensing systems and transferring some approval and licensing authority to local governments. Then, the authority for the construction of new fossil power plants with capacity at 600 MW or less was transferred from the central government to provincial governments. As the economic efficiency of coal power generation increased on a substantial fall in coal prices, local governments giving priority to economic growth approved the construction of massive coal power plants. Annual capacity growth for coal power plants accelerated substantially to 54 GW in 2015 after following a downward trend (Figure 2).

At the same time, renewable energy power generation capacity including solar photovoltaics generation steadily expanded as the government enhanced global warming measures and promoted new industries. Annual

growth in renewable energy generation capacity exceeded 50 GW for four years on end from 2013.

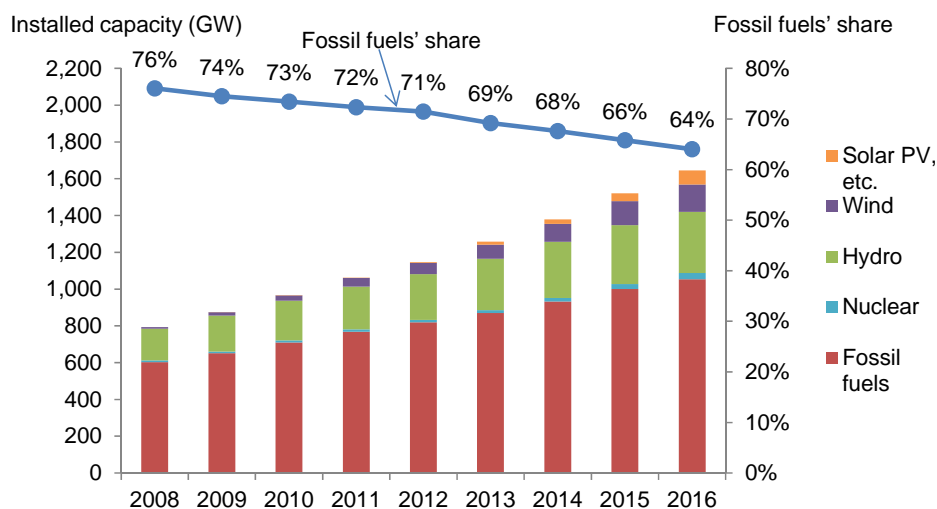
Figure 2 New Installed power plant capacity trends by power source in China



(Source) China Electricity Council

In the meantime, fossil power plants including inefficient small ones were recently shut down at an annual rate of some 10 GW. As a result, fossil power plants' share of total power generation continued to decline and reached 64% in 2016, while total installed capacity increased at an annual rate of some 10%. In contrast, wind and solar energy expanded their combined share of total power generation to 13.7% (Figure 3).

Figure 3 Installed power generation capacity by power source and fossil fuels' share

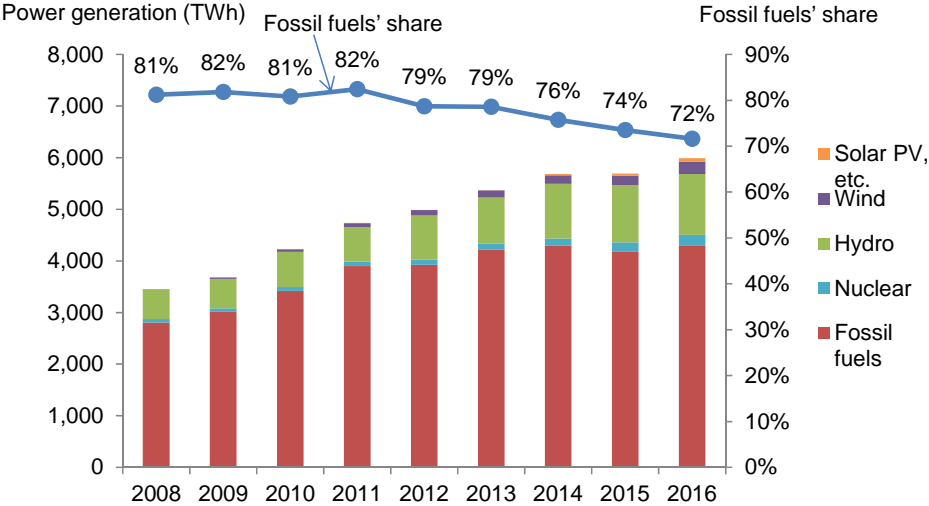


(Source) China Electricity Council

While installed power generation capacity has expanded robustly, electricity consumption growth has decelerated mainly in the manufacturing sector, with economic growth slowing down to 6-7% from around 10% under “New Normal” conditions. Annual electricity consumption growth was limited to 4% in 2014 and fell to 2.5% during 2015 and 2016.

China’s power supply rules give top priority to wind, solar PV and other renewable energy power generation and less priority to fossil power generation. While renewable power generation has robustly increased, coal power generation, which accounts for more than 90% of total fossil power generation, has roughly leveled off since 2013. In 2015, coal power generation decreased from the previous year. Fossil fuels’ share of total power generation has continued to decline, falling from 82% in 2011 to 72% in 2016 (Figure 4).

Figure 4 Power generation by source and fossil fuels’ share in China



(Source) China Electricity Council

The combination of expanding installed power generation capacity and decelerating growth in power demand and generation has brought about the substantial decline in the capacity utilization rate for fossil power plants. The rate has also decreased for nuclear plants. On wind and solar PV generation that is given priority in power supply, large-scale restrictions are imposed, with grid networks failing to absorb some of the fast-expanding generation.

The falling capacity utilization rate has affected earnings for power utilities. Using the average sales price of electricity generated by coal plants, steam coal prices, coal power generation efficiency and other data (Table 1) , the relationship between coal power plants’ annual operating hours and the internal rate of return is estimated in this study.

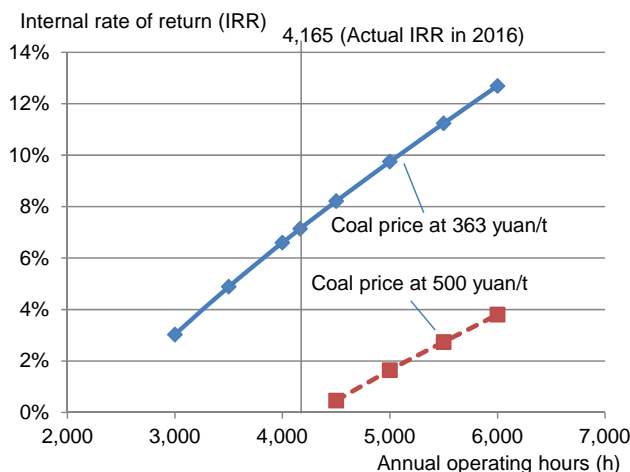
As a result, the internal rate of return on coal power generation came to about 10% for the annual operating hours at 5,000 hours and about 8% at 4,500 hours (Figure 5). A rough standard internal rate of return for fossil power plants in China is given at 8-10%. Given the annual operating hours at 4,165 hours in 2016, the internal rate of return at coal power plants comes to about 7%, slipping below the rough standard.

Table 1 Coal power plant assumptions used for estimation

Electricity sales price (excluding value added tax)	0.328	Yuan/kWh
Installed capacity	600	MW
Unit construction cost	4500	Yuan/kW
Operating period	30	Years
Power generation efficiency (generation end)	39.0	%
Power plant own use rate	6.94	%
Coal price (calorific value at 5,000 kcal/kg)	363	Yuan/t
Maintenance cost rate (as a percentage of initial investment)	2.0	%
Labor cost and others (as a percentage of initial investment)	2.0	%
Other operation costs	0.016	Yuan/kWh

(Source) Author's assumptions based on various data

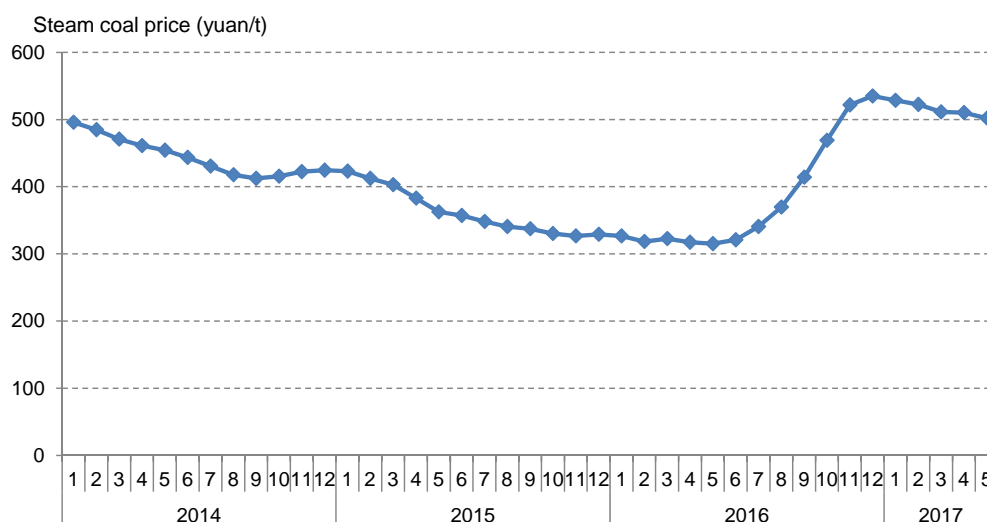
Figure 5 Relationship between annual operating hours and economic efficiency for coal power plants



(Source) Author's estimation results based on Table 1

Chinese coal prices have rapidly risen since the second half of 2016. At present, China's average steam coal price remains above 500 yuan/t (equivalent to 8,000 yen/t) (Figure 6). The price hike has further deteriorated the profitability of coal power generation, leading some 40% of major power utilities to suffer negative earnings in the first quarter of 2017, according to media reports.

Figure 6 Steam coal price in China



(Source) "Steam Coal Price Index," China National Development and Reform Commission

In China, non-fossil power plants are reportedly expected to cover power demand growth until 2030. Excessive capacity has brought about earnings deterioration at power utilities and waste renewable energy

resource. In a bid to mitigate these problems, the Chinese government has maintained the policy of dismantling inefficient fossil power plants and embarked on restrictions on coal power plant construction again. In order to absorb surplus renewable energy electricity supply, it has taken measures to increase electricity demand, including heat pump and other heating supply using electricity.

Even since the U.S. Trump administration's declaration to withdraw from the Paris climate change accord, the Chinese Government has indicated an attitude of maintaining global warming measures, solar PV power generation in China has risen at a pace exceeding the government target for 2020. Whether the excessive power generation capacity and fossil power generation firms' deteriorating earnings would affect the rapid expansion of renewable power generation will attract attention in the future.