CHINA'S NUCLEAR ENERGY PROGRAM: STATUS AND FUTURE

Christhian Rengifo, Ux Consulting Company, +17706427745, christhian.rengifo@uxc.com

Overview

China's economic growth model has entered a new normal, shifting from a high-growth to a medium-high growth economy. Meanwhile, the government is shifting away from a policy of increasing energy supply with little regard for environmental or social impacts to one that looks to enhance environmental protection while reducing greenhouse gas emissions. This economic and energy policy transition will also impact upon the supply and demand of electricity in the country. As China moves from using fossil fuels for electricity generation to cleaner methods of generation, questions will be raised about the energy sources that the country will develop to meet electricity demand. Nuclear energy is part of the government's toolbox to address climate change concerns and it has seen a rapid deployment in the last decade with additional reactors planned for construction over the next years. This paper aims to discuss the situation of nuclear energy in China in the larger context of the country's electricity supply/demand dynamics. More specifically, the paper aims to explain the current role of nuclear energy in the country's electricity supply and its potential role in the future.

Methods

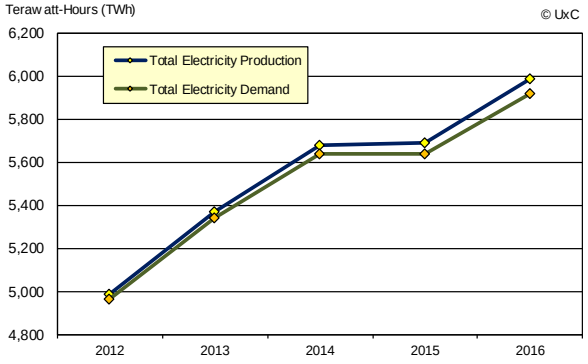
In order to analyze this topic, the paper will focus on three indicators, namely China's electricity supply/demand balance; the operational hours of power plants; and the load capacity of operating nuclear reactors. The analysis of these three indicators enables a discussion on the role of nuclear energy in China's electricity supply as well as its future prospects.

Results

Supply and Demand

As Figure 1 shows, China's electricity demand has been growing and generation has so far coped with this demand with some level of excess generation. Since 2013, demand and supply have remained in the range of 5,000-6,000 TWh. While there was a clear increase in demand during the period 2012-2014, there was a slowdown in 2014-2015. In 2015-2016, electricity demand and generation increased again.

Figure 1. Electricity Supply and Demand in China

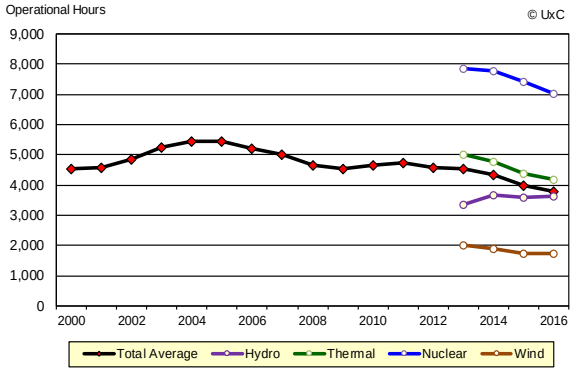


Source: China Electricity Council

Power Plant Operational Hours

Although there appears to be a good correlation between supply and demand, looking at the average operational hours of the plants that generated electricity in China, Figure 2 shows that Chinese power plants have operated at low operational hours for an extended period of time with nuclear power plants operating at higher hours when compared to the other electricity sources during the 2013-2016 period. The average operational time in 2016 was 3,785 hours, which was a decrease of 203 hours when compared to 2015. According to the China Electricity Council (CEC), this is the lowest number of operational hours since 1964.

Figure 2. Average Operational Hours of Power Plants in China

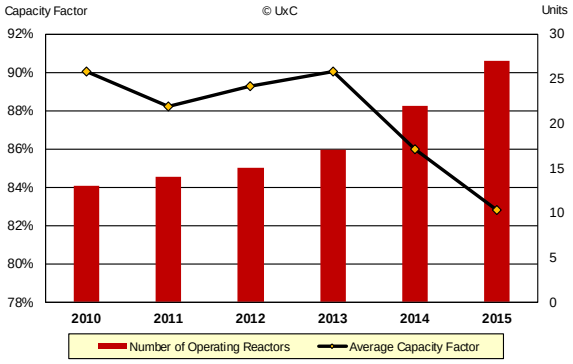


Source: China Electricity Council

Average Load Factors

The next Figure 3 shows the number of reactors in operation in China and the average load factors for these reactors. Following the trend of operational load hours in Figure 2, load factors have also seen a decrease since 2013.

Figure 3. Average Load Factors for Nuclear Reactors in China



Source: IAEA

As the above figures show, although China has been able to meet electricity demand this has been done by running, for example, thermal and hydropower plants at low operational hours. Despite plants operating at low operational hours, China has added more electricity capacity in the last years and is planning to add more capacity in the future. As there is electricity overcapacity in the Chinese market, more electric capacity may not to be the best approach to meet electricity demand. This electricity overcapacity may affect the operation and future deployment of nuclear reactors.

Conclusions

The current situation of the electricity market in China is one where there is overcapacity and this has a number of implications for nuclear energy. First, overcapacity in the electricity market can lead to the delay of nuclear reactor projects. For example, although the Hongyanhe Unit 4 reactor was connected to the grid in April 2016, the unit only started commercial operations in September of that year. CGN Power explained at the time that this delay was the result of the electricity market conditions of the region where the unit was located and the unit's production schedule. Second, nuclear reactors are not operating at full capacity. In 2016, CGN Power informed that its nuclear plants had an average utilization rate of 3,229 hours as compared with 3,279 hours during the first half of 2015. The decline was mainly due to the time for a unit being temporarily shut down for standby or temporarily operating at reduced load, which was longer in the first half of 2016 than in the first half of 2015. Moreover, in 2017, CGN Power reported that influenced by the winter heating period occurred in Northeast China and the decline in the demand for electricity in the region, some units of the Hongyanhe nuclear power plant were operating at lower load factors in 2016. Finally, overcapacity could also affect the construction of new projects as new capacity in a saturated market undermines the economics of nuclear projects. Such delays have serious implications for the Chinese nuclear energy policy and impact all companies that are involved in one way or another in the country's nuclear energy program.