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World Nuclear Industry Status as of 1 January 2018

Tuesday 9 January 2018, by Mycle Schneider

The Year 2017 for Global Nuclear Power in a nutshell : 4 reactor startups (12 less than scheduled), 3 shutdowns, 4 construction starts, 2 abandoned constructions, bankruptcy of Westinghouse, bailout and breakup of AREVA, significant financial and economic pressure on nuclear operators. Five new reactors entered long-term outage, and 3 were restarted. Globally, 405 reactors operating (1 less than a year ago), 52 under construction (3 less).

After ten reactor startups in both 2016 and 2015, only four new units—three in China, one in Pakistan (built by Chinese companies)—were connected to electricity grids in 2017. Tianwan-3, designed and built by Russian Rosatom, was connected to the Chinese grid on 30 December 2017. Since construction of this unit started only in December 2012, that is a remarkably low construction time. *The World Nuclear Industry Status Report 2017 (WNISR2017)* had listed Tianwan-3 as delayed with a planned startup in February 2018.

As of the beginning of 2017, 16 reactors were scheduled to be connected to the grid during the year (not including Tianwan-3). One year ago, WNISR wrote : "Of these 16 reactors, 11 are already behind schedule. The year 2017 will therefore be an interesting test case for the industry." The test did not go well. Only three of these units plus Tianwan-3 with a combined capacity of 3.3 GW generated their first power, all 13 others, including eight units in China, were delayed or further delayed. This compares with China's "eye watering installation rates" (PV Magazine) of solar capacity, as it added over 50 GW to its grid. Even taking into account lower productivity per installed GW, [1] this means that new solar plants in China alone in 2017 will generate significantly more power than all nuclear reactors started up in the same year in the entire world.

Globally, three reactors were permanently closed in 2017. In Germany, Gundremmingen-B was shut down as scheduled on 31 December 2017, as part of the country's nuclear phase-out policy. South Korea and Sweden both shut down their respectively oldest units, Kori-1 and Oskashamn-1. In addition, two more Japanese reactors, Ohi-1 and -2 were officially closed, after the operator abandoned plans for restart and lifetime extension. However, as the two units have not generated any power since 2011, the WNISR had listed them as in Long-Term Outage (LTO) [2], and now moved them to the shutdown category accounting for their closure in the respective years of last electricity

generation. This increases the number of units shut down worldwide in Fukushima-year 2011 to 25. Some of the 31 units, currently still in LTO in Japan, are likely to follow over the coming years. In addition to the Japanese stranded reactors, there are five units in LTO around the world, one each in Argentina, France, India, Switzerland and Taiwan. The Japanese government decided already in December 2016 to officially close the Monju fast breeder reactor, which did not generate any power since 1995. The International Atomic Energy Agency (IAEA) noted that decision in its online Power Reactor Information System (PRIS) only after a full year's delay. The IAEA also lists Santa Maria de Garona as closed in 2017. However, the Spanish reactor did not generate any power since 2012, and WNISR has considered it permanently shut down ever since.

As of 1 January 2018, there are 52 reactors under construction, three less than a year ago. Construction started on four reactors in 2017, one each in Bangladesh, China, India and South Korea. The Chinese project is a pilot fast reactor, launched on 25 December at the Xiapu site in Fujian province, and not a single new construction start for a commercial nuclear power plant was announced in the country. This raises the question, is this the sign of a major shift or slowdown in Chinese nuclear policy, which dominated world nuclear construction for the past 10 years, contributing over 60 percent of all new building sites since 2008 ?

The construction of Shin-Kori-5 in South Korea, launched in April 2017 (but only officialized months later), had been suspended in June following President Moon Jae-in's election in May, but resumed after a citizens' committee voted in favor of its completion. The South Korean nuclear ambitions remain in question after the Moon administration confirmed its long-term nuclear phase-out goal.

In March 2017, Toshiba-Westinghouse, historically the largest nuclear builder in the world, filed for bankruptcy protection in the U.S., and was bought for US$4.6 billion (subject to regulatory and court approval) by a subsidiary of Brookfield Asset Management, a Canadian holding company with no experience in the nuclear sector, specializing in the takeover of companies in difficulties. In July 2017, the owners of V.C. Summer in South Carolina pulled the plug on the construction of two AP1000 units designed by Westinghouse after spending an estimated US$9 billion. In the last days of the year, the only two other reactors under construction in the U.S., at the Vogtle site in Georgia, received the State Public Services Commission's permission to continue construction—for the time being.

The French state-owned nuclear builder and service company AREVA was bailed out by the government with a US$5.3 billion cash injection and subsequently broken up. AREVA's reactor building and servicing branch AREVA NP was taken over by state utility EDF, effective from the end of 2017, and relaunched in a "back to the future" (Reuters) initiative as *Framatome* (EDF 75.5%, Mitsubishi Heavy Industry 19.5%, Assystem 5%). After a loss of over 90 percent of its stock value since 2007, AREVA was delisted in August 2017. The year has also seen the French Nuclear Safety Authority ASN granting exceptional permission to EDF to use a sub-standard reactor pressure vessel at the Flamanville EPR, which is still under construction. The pressure vessel has been found with a level of carbon significantly exceeding technical specifications and is part of an ongoing quality-control scandal pointing to decades of irregularities and forged documents, impacting tens of thousands of pieces in dozens of nuclear plants around the world.

On top of the economic fallout of scandals and challenging ageing issues, nuclear operators struggled with low electricity prices and constantly dropping costs of their main competitors, wind and solar in particular. In countries like the United States, many nuclear power plants have continued to operate only because of massive government subsidies.

The WNISR2017 has been presented around the world since September, with events (in chronological order) in Salzburg (Austria), Astana (Kazakhstan), Ottawa (Canada), Washington D.C. (U.S.), Berlin (Germany), Macao and Beijing (China). For the first time, the entire 267-page report has been translated into Chinese.

The report has received broad acclaim and media coverage has been comprehensive. The Chinese version of the Summary & Conclusions will be made available on www.WorldNuclearReport.org shortly.

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Footnotes

[1] An operating nuclear plant can provide about eight to nine times more electricity per installed kilowatt than a photovoltaic plant.

[2] WNISR considers that a unit is in Long-Term Outage (LTO) if it produced zero power in the previous calendar year and in the first half of the current calendar year. This classification is applied retroactively starting on the day the unit is disconnected from the grid. WNISR counts the startup of a reactor from its day of grid connection, and its shutdown from the day of grid disconnection.