

Coping with growth: China's spent fuel management strategy

With the start of a massive economic expansion in the early 1990s, authorities in China consider nuclear energy a key element in the country's security of energy supply and lower carbon footprint. China has launched an ambitious nuclear power programme, which has grown over the years.

Currently, China is operating 46 nuclear reactors with a total electric power capacity of 45 GWe, producing about 4% of the country's electricity. With 11 new reactors under construction or planning, 20% of the world's nuclear reactors under construction are in China. China's nuclear capacity is expected to reach 150 GWe in 2035 and 300 GWe in 2050, according to estimates of the Chinese Academy of Engineering.

With such an expansion, the amount of spent fuel to manage will proportionally increase as well. China is therefore making progress in advancing its nuclear fuel cycle strategy, expanding its spent fuel and radioactive waste management infrastructure.

China has opted for a closed nuclear fuel cycle policy, including spent fuel storage either at-reactor or away-from-reactor facilities, then transporting fuel for recycling and eventual use in fast reactors. Its first prototype, the Chinese Experimental Fast Reactor (CEFR) with 65 MWe was

connected to the grid in 2011 and served as a basis for the development of a 600 MWe demonstration fast reactor which is currently under construction and is scheduled to be commissioned by 2023. Construction of the first commercial unit, with 1000 to 1200 MWe capacity, could start in December 2028 and start operation in around 2034. Fast reactor technology is expected to become predominant by mid-century, according to China's published nuclear power strategy.

In the meantime, the strategy is to reprocess spent fuel from existing pressurized water reactors (PWRs) and recycle them into mixed oxide fuel (MOX) to fuel PWRs. China already operates a pilot reprocessing plant in Gansu province with a capacity of 200 tonnes of Uranium per year (tU/y), and in January 2018, China and France signed an agreement for the construction of a reprocessing and recycling plant to produce MOX fuel for PWRs. In June 2018, Orano and the China National Nuclear Corporation launched the preparatory works for the spent fuel reprocessing plant, which will have a capacity of 800 tU/y.

Completion of a geological repository for the disposal of high-level waste is planned by 2050. Selection of the site for an underground laboratory has been completed and is planned to be built by 2026.

Spent fuel storage at China's Qinshan Nuclear Power Plant. The spent fuel is planned to be stored on site in protected and ventilated containers until China's facility for the recycling and reprocessing of spent nuclear fuel is completed.

(Photo: M. Gaspar/IAEA)

