

COMPARISON OF THE ECONOMIC EFFICIENCY OF NUCLEAR POWER PLANTS

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Now a large number of states around the world are starting to take a renewed interest in nuclear energy and are considering building their own nuclear power plants (NPPs). This is happening for several reasons: new safety measures have been introduced at NPPs, the proliferation of generation 3+ reactors has begun, and the fear of nuclear energy has gradually begun to take hold in states, which started after the explosion at the Chernobyl NPP and intensified with the accident at the Fukushima NPP.

At the moment, the largest nuclear construction sites in Europe are the “Akkuyu” NPP in Turkey and the “Hinkley Point C” NPP in the United Kingdom (UK). The “Akkuyu” station is being built by “Rosatom”. The “Hinkley Point C” station is being built by Nuclear New Build Generation Company, a subsidiary of EDF Energy, which is owned by the French EDF.

“Akkuyu” is a NPP with 4 power units with VVER-1200 reactors with a total capacity of 4,800 MW. It is the first station built on the principle of (Build – Own – Operate). The plant will generate up to 40 billion kWh of electric energy per year. The construction period of the station, with all delays, will be 7 years (this was influenced by the Covid-19 pandemic, European sanctions, and the 2023 earthquake in Turkey). The first power unit is scheduled to be launched in 2025, while the rest are under construction. The station will be able to provide up to 10% of Turkey's electricity consumption. The estimated service life is 60 years, with the possibility of extension for another 20 years. The cost of the entire project will be \$24-25 billion [1].

The “Hinkley Point C” project consists of two units with an EPR-1750 reproducer with a total capacity of 3,200 MW. It is the first third-generation NPP in the UK and has been under construction for the past

30 years. The plant will generate approximately 26 billion kWh of electric energy per year. The construction period of the station is not definitively known, at the moment commissioning is expected in 2029-2031, respectively, the construction period of the station will be about 13 years. The station will provide 7% of the UK's electricity consumption. The estimated service life is 60 years. At the moment, the cost of the project is \$62.6 billion [2].

After carrying out a number of calculations, it turns out that NPPs built according to the “Rosatom” project have a lower cost of 1 MW of power and 1 kWh of energy compared to NPPs built according to a joint project of the French and the British. As a result, 1 MW produced by the future Turkish NPP is 3.756 times cheaper than the same capacity at the future French-British NPP. Also a NPP with 4 VVER-1200 reactors spends 5,128 times less money on generating 1 kWh of electricity than a plant with 2 EPR-1750 reactors [3].

At the moment, NPPs are being built all over the world according to the projects of various companies, each of which has its own cost and characteristics. A comparison was made of the economic efficiency of the future “Akkuyu” and “Hinkley Point C” NPPs. As a result, it turns out that a station with 4 VVER-1200 reactors has several times lower cost of power and electricity than a station with 2 EPR-1750 reactors. For the cost of a two-unit French-British NPP, it is possible to build 9-10 power units with VVER-1200 reactors, which will have many times more power and generate many times more energy. This difference is due to the well-established large-scale production and construction of NPPs with VVER-1200 reactors around the world.

References

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