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Safety of Belarusian Nuclear Power Plant Is First

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In this paper the structural features of reactors, management and safety systems of the Chernobyl nuclear power plant and the Belarusian nuclear power plant are considered. The results of two power plants comparison in terms of the probability of an accident and complexity of its prevention are presented.

The launch of the nuclear power plant (further – NPP) on the territory of Belarus excited not only our citizens since the Republic of Belarus is the most affected country from the Chernobyl accident, but also neighboring countries.

The most important part of a nuclear power plant is a nuclear reactor in the reactor core of which a nuclear chain reaction (further – NCR) occurs. Soviet designed nuclear reactors RBMK–1000 were installed at the Chernobyl NPP. RBMK is a high-power channel-type reactor. It has one water circuit that cools the reactor core and rotates the generator turbine. The reactor core is a graphite cylinder with a height of 7 m and a diameter of 11.8 m [1]. NCR accelerates when there is not enough water in the reactor [2].

The accident at the 4th reactor of the Chernobyl NPP occurred on April 26, 1986. The accident occurred primarily due to the violation by the NPP personnel of the technological regulations for the operation of the reactor and the shortcomings of the reactor design [2].

The Belarusian NPP uses WWER–1200 type reactors. The WWER (or VVER) is a water-water energetic reactor. Its

shell is a cylindrical capsule. It reaches a height of 13 m and a diameter of 4 m. The reactor core itself is a space filled with water [3]. The reactor design allows the use of additional safety and management systems (emergency injection of boron into the cooling water circuit and a passive condensate cooling system) [4]. Also, a feature of the WWER reactor is the attenuation of the NRC with a lack of water.

Table 1. Comparative analysis of the structural features of the Chernobyl and Belarusian NPPs

Criteria	**Chernobyl NPP, RBMK — 1000 reactor**	**Belarusian NPP, WWER — 1200 reactor**
Behavior of the NCR with a lack of water	NCR is accelerating	NCR is fading
Reactor core management	Requires constant concentrated attention from an operator	Requires a normal operating level of concentration from an operator
The presence of flammable substances in the reactor core	Graphite in large quantities	Not available
NCR management system	Control rods	Control rods, boron injection
Safety systems against design basic accidents	One emergency reactor shutdown system; concrete reactor containment; reactor emergency cooling system	Double steel reactor shell; double concrete protective sheath of the reactor shell with prestressed fittings; emergency and passive condensate cooling

		system; reactor core catcher; two emergency reactor shutdown systems
Accidents at reactors of this type	1975, 1982, 1992 – rupture of canals; 1986 – mass rupture of canals and destruction of the reactor core	Not available

The main differences between the Belarusian NPP and the Chernobyl NPP are more sophisticated safety systems against design accidents at the Belarusian NPP, reduction of the human risk factor and constant control from the IAEA, which makes it possible to use international experience in the safe operation of nuclear power plants. A repeat of the Chernobyl accident at the Belarusian NPP is impossible due to structural differences between the plants. It is also impossible for an accident to occur with consequences of a similar scale.

References:

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