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PERSPECTIVES FOR DEVELOPMENT OF NUCLEAR POWER ENGINEERING IN UKRAINE IN MODERN SOCIO- ECONOMIC CONDITIONS

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During the work, a study was conducted on what types of nuclear reactors to replace today's thermal power plants working on hydrocarbon fuels.

Keywords: *nuclear power engineering, reactor, thermal power station, traditional power engineering.*

ПЕРСПЕКТИВИ РОЗВИТКУ ЯДЕРНОЇ ЕНЕРГЕТИКИ В УКРАЇНІ В СУЧАСНИХ СОЦІАЛЬНО-ЕКОНОМІЧНИХ УМОВАХ

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В роботі проведено дослідження щодо того, які типи ядерних реакторів замінять сучасні теплові електростанції, що працюють на вуглеводневому паливі.

Ключові слова: *атомна енергетика, реактор, теплова електростанція, традиційна енергетика.*

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Today, Ukraine's energy market is supported by most nuclear power plants, thermal power plants, combined heat and power plants and cogeneration units. Such types of energy complexes in the bundle give the opportunity to receive large power from nuclear power plants, and to compensate for peak loads through less inertial thermal power plants and thermal power plants. The percentage of electricity production by these two types of power plants is presented in Diagram 1:



Diagram 1

However, thermal power plants, in which the source of primary energy is hydrocarbon fuels, have low energy efficiency and cause enormous damage to the country's ecology. Taking into account all these disadvantages, their use

is due only to their low inertia - the ability to quickly enter the working mode and quickly reduce the power if necessary.

Power plants, in which the energy of the separation of the atomic nucleus as the source of primary energy is used, are much more energy-efficient and safe. But the existing types of power plants used in the energy industry do not allow to quickly change the power given by the station at moments of peak load.

Such a feature is due to many technical features of the design of the reactor. In particular, in the existing types of nuclear reactors as a working fluid, a liquid coolant (water, and solutions based on it) is used. Physical properties of the liquid do not allow it to be heated to a temperature at which it would be possible to quickly change the power supplied by the reactor.

In addition, thermal neutron reactors such as RBMK or WWER are not physically capable of such rapid changes in power.

In the middle of the last century, the task of creating a nuclear power plant with little inertia has become the designers of nuclear ships and submarines. Several types of nuclear reactors were developed in order to be able to quickly bring to power the power plants of such vessels in a working regime, where liquid metal (sodium) was used as the coolant of the first circuit. Later, an even more efficient and "fast" reactor with a lead-bismuth carrier was developed.

The use of sodium in such a reactor was refused due to its fire-safety. This kind of reactor works on fast or medium neutrons. Therefore, the use of bismuth becomes even more advantageous - it slowly slows average and fast neutrons.

The experience of using such reactors can be considered successful. In the 1970s, several submarines of the 705 series were manufactured, in which such a type of nuclear power plant was used.

The main disadvantage of this reactor is that it can not be stopped (to reduce power to zero). This will result in the

crystallization of the coolant and its freezing, which will cause pipeline ruptures and occlusion of some channels.

The use of a reactor of this type in the energy industry is beneficial mainly because its acceptance is close to the power plants using hydrocarbon fuels. At the same time, the energy efficiency of such a reactor can be compared with classical nuclear reactors such as WWER or RBMK.

From the foregoing it can be concluded that the use of reactors of this type in the energy industry will completely eliminate thermal power plants and thermal power plants. Disadvantages of such power plants are insignificant for industrial power. Nuclear reactors of the present have been operating for years without stopping. The use of such reactors can have a beneficial effect on the ecology of Ukraine and the conservation of mineral resources for more urgent and indispensable needs of society.

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