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BUILDING A NUCLEAR REACTOR IN YEMEN AND POTENTIAL AND APPROPRIATE PLACES TO BUILD A LIGHT WATER NUCLEAR REACTOR

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The light water reactor operates within a quiet seismic activity in the Shabwa governorate to cover Yemen's energy needs under the supervision of the active Russian design companies within the middle condition. The seismically calm desert can be generalized within two similar areas in terms of nuclear safety within the geographical proximity of the Yemeni governor.

Keywords: Nuclear Power; Nuclear Energy; reactors include; SMRs; Water Reactor; Reactor engineering.

СТРОИТЕЛЬСТВО ЯДЕРНОГО РЕАКТОРА В ЙЕМЕНЕ, А ТАКЖЕ ПОТЕНЦИАЛЬНО ПОДХОДЯЩИЕ МЕСТА ДЛЯ СТРОИТЕЛЬСТВА ЛЕГКОВОДНОГО ЯДЕРНОГО РЕАКТОРА

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Легководный реактор работает в условиях спокойной сейсмической активности в провинции Шабва для покрытия энергетических потребностей Йемена под руководством действующих российских проектных компаний в среднем состоянии. Сейсмически спокойную пустыню можно объединить в две аналогичные с точки зрения ядерной безопасности территории, расположенные в географической близости от губернатора Йемена.

Ключевые слова: атомная энергетика, ядерная энергия, реакторы включают, СМР, водяной реактор, реакторостроение.

Reactor engineering is a branch of nuclear engineering concerned with the design, analysis, and operation of nuclear reactors. Nuclear reactors are devices used to produce nuclear energy by nuclear reaction, whether for peaceful purposes such as generating electricity or for military purposes.

We need many decisive factors to choose a suitable site for the establishment of a peaceful nuclear reactor in any country, including Yemen. However, there are several factors to consider when selecting the appropriate location, as follows: Earthquakes: Areas subject to high seismic activity should be avoided. Areas that are stable and not prone to major earthquakes should be sought. Population spread: Reactor engineering the site must be far from densely populated areas, to maintain the safety of residents and reduce environmental and health risks. Water: It is preferred that there be sufficient water sources for cooling in the area surrounding the nuclear reactor. Political and security stability: The site must be in an area with high political and security stability, to ensure the safety of the reactor and prevent any security threats. Access to the electrical network: It is preferable that the site be close to the main electricity network to facilitate the distribution of electricity generated from the reactor. Flat Lands: There must be a flat and strong ground sufficient to support the nuclear reactor and its associated facilities. Based on these factors, I cannot specify a specific location for the establishment of a peaceful nuclear reactor in Yemen. The Yemeni government should seek the assistance of experts in nuclear energy and conduct careful and comprehensive studies to determine the most appropriate site based on local conditions and international nuclear safety standards. Involves many technical and engineering challenges. One of the most important of these challenges is the design of the reactor in a way that ensures its safety and security during operation. This requires designing an efficient cooling system for the reactor to maintain its proper temperature and avoid overheating that leads to uncontrolled nuclear reactions. Moreover, a precise control system must be designed to control the speed of the nuclear reaction and control energy production. There should also be a protection system that works automatically in emergency situations such as power outages or technical failures. In addition, the work of reactor engineers includes dealing with issues such as the safe and sustainable disposal of nuclear waste, the design of highly efficient nuclear materials and fuel, and the analysis of the impact of the reactor on the environment and radiation safety [1]. However, half of the world's operational RRs are now over 40 years old. The multidisciplinary research that RRs support has spawned new developments in nuclear power, radioisotope production and nuclear medicine, neutron beam research and applications, materials characterization and testing, computer code validation, various elemental analyses and capacity building for nuclear science and technology programmers. To date, some 774 RRs have been built, and of these, 243 reactors in 55 countries continue to operate in 2016. However, half of the world's operational RRs are now over 40 years old [2].

Fig. 1. A picture of the light water nuclear reactor [1]

This stunning image of a nuclear reactor reminds us of the power and complexity of nuclear technology. It embodies the scientific and engineering sophistication required to operate and manage such large systems. Seeing the raging flames and the tremendous energy generated impresses us and makes us aware of the challenges and benefits associated with the peaceful use of nuclear energy. However, we must also respect and understand the potential risks and work hard to ensure the safety of this technology and to protect the environment and society [3].

In Fig. 2, such as the appropriate site for the establishment of a nuclear reactor in Yemen the site shown in the picture represents a safe place from a geological point of view and a natural guarantee from seismic activities. Shabwa Governorate is in southern Yemen and is bordered on the south by the Gulf of Aden. As for the seismic belt, the region is in what is known outside the earthquake zone known as the “Arab earthquake belt”, which extends across southern Asia, the Indian subcontinent, southern Iran, the Persian Gulf, southern Yemen, and northeastern Africa.

Fig. 2. It represents the appropriate site for the establishment of a nuclear reactor in Yemen [1, 2]

The development of nuclear reactor engineering requires continuous research to enhance safety, efficiency, and sustainability. Research efforts in this field aim to address various aspects, including reactor design, materials science, waste management, and advanced fuel technologies. Reactor design research focuses on developing innovative reactor concepts that offer improved safety features, enhanced fuel utilization, and reduced waste production. Advanced reactor designs, such as small modular reactors (SMRs) and Generation IV reactors [4], are being explored to meet diverse energy needs while minimizing environmental impact. Materials science plays a crucial role in reactor engineering research. Scientists are investigating advanced materials that can withstand high temperatures, neutron bombardment, and corrosive environments. This research aims to enhance the durability and lifespan of reactor components, ensuring long-term operation and reducing maintenance requirements. Waste management is another critical area of research. Efforts are focused on developing effective strategies for the safe disposal or recycling of nuclear waste [5]. This includes exploring advanced techniques such as transmutation, where radioactive isotopes are converted into less hazardous or shorter-lived forms. Additionally, research in reactor engineering aims to improve fuel efficiency and develop alternative fuel cycles. Scientists are investigating advanced fuels, such as thorium-based fuels or mixed oxide fuels, to maximize energy extraction and reduce the generation of long-lived radioactive waste. Moreover, ongoing research focuses on reactor safety and accident mitigation. This involves studying severe accident scenarios, developing advanced emergency response systems, and incorporating passive safety features into reactor designs [6]. The goal is to enhance the inherent safety of reactors and minimize the potential consequences of accidents. This academic and professional abstract explores the field of nuclear reactor engineering, focusing on the importance of continuous research in enhancing safety, efficiency, and sustainability. Nuclear reactors are pivotal in producing nuclear energy for both peaceful and military applications. The primary challenge in reactor engineering lies in designing reactors that operate securely and safely. This entails developing efficient cooling systems to regulate temperature and prevent overheating, implementing precise control systems for nuclear reactions and energy production, and integrating automatic protection systems for emergencies. Moreover, reactor engineers tackle critical issues such as the safe disposal of nuclear waste, the design of efficient nuclear materials, fuel, and analyzing the environmental and radiation safety impact of reactors. Research efforts aim to push the boundaries of knowledge and innovation, with a focus on reactor design, materials science, waste management, and advanced fuel technologies. Reactor design research pursues innovative concepts that offer improved safety features, enhanced fuel utilization, and reduced waste production [7]. Scientists explore advanced materials that can withstand extreme conditions, ensuring the durability and longevity of reactor components while minimizing maintenance requirements. Waste management research focuses on developing effective strategies for the safe disposal or recycling of nuclear waste, including exploring techniques such as transmutation to convert radioactive isotopes into less hazardous forms. Fuel efficiency improvement and alternative fuel cycles are also areas of active research, with investigations into advanced fuels like thorium-based fuels or mixed oxide fuels to maximize energy extraction and reduce the generation of long-lived radioactive waste. Additionally, reactor safety research involves studying severe accident scenarios, developing advanced emergency response systems, and integrating passive safety features into reactor designs to enhance inherent safety and minimize the consequences of accidents [8].

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ПЕРСПЕКТИВНЫЕ НАПРАВЛЕНИЯ СОВЕРШЕНСТВОВАНИЯ МЕТИЗНОГО ПРОИЗВОДСТВА В РЕСПУБЛИКЕ БЕЛАРУСЬ

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Рассмотрены перспективные направления совершенствования метизного производства в области производства металлокорда из тонкой проволоки класса прочности МТ. Определены основные причины снижения производительности при изготовлении такого металлокорда. Предложены решения, которые позволят увеличить производительность промышленного производства металлокорда.

Ключевые слова: метизная продукция, металлокорд, производительность, волочение.