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SOME PROBLEMS OF NUCLEAR POWER STATION IN COMBAT ZONE

The approach to the construction of nuclear power plants (NPPs) and other nuclear facilities in various regions should be reevaluated due to the events 2022-2024 in Ukraine. Specifically, a comprehensive analysis of the resilience of NPPs to potential acts of aggression should be conducted.

In history, there have been numerous cases where nuclear energy facilities, including nuclear power plants (NPPs), have been at risk. For instance, in 1981, the Israeli Air Force destroyed the heavy water reactor 'Osirak' in Iraq. During the Iran-Iraq war from 1980 to 1988, the Iraqi Air Force conducted several high-impact airstrikes and launched cruise missiles at the under-construction Bushehr Nuclear Power Plant.

The approach to the construction of NPPs and other nuclear facilities in various regions should be reevaluated [4, 5, 6] taken into account combat events 2022-2024 in Ukraine. Specifically, a comprehensive analysis of NPP resilience to potential acts of aggression must be conducted. In the new reality, where a construction or operational NPP may become a target in a military conflict, the design approaches must be revised. It is evident that the primary targets could include spent and fresh fuel storage facilities, as well as radioactive waste storage facilities [2]. Consequently, these structures should have more fortified designs. Block transformers should also be protected. A backup control room should be located outside the reactor building. The fuel reserve for emergency diesel generators should be substantial. Hazardous components, such as hydrogen receivers, should be built separately for each block and placed on the periphery, away from logistical connections. Each turbine hall should have a highly secure shelter for personnel to take refuge in and evacuate in case of a significant fire or extensive damage. NPPs should have a fully independent fire suppression system, separate from on-site power sources. The security and defense systems of both the NPP and its vicinity should be reconsidered, including protection against aerial and maritime drones, stand-off munitions, underwater saboteurs, and more.

Conclusion. All the above mentioned applies not only to 'classic' NPPs with high-capacity turbines but also to NPPs with small modular reactors [7], as well as all enterprises with hazardous operations. The safety analysis results, considering all these aspects, should be outlined in a standard safety analysis report, typically developed by the design organization

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THE LATEST TRENDS IN THE DEVELOPMENT OF SCIENCE AND TECHNOLOGY

The latest trends in the development of science and technology for 2024 span across various domains, reflecting significant advancements and the continuous evolution of the sector. Key areas of focus include sustainable technology, healthcare innovations, space exploration, and advancements in artificial intelligence (AI) and machine learning (ML), among others.

1. Sustainable Technology and Environmental Conservation:

- Sustainable catalysts are gaining attention for their environmental benefits and less reliance on precious metals, aiming to reduce carbon footprints significantly.
- Lithium-ion battery recycling technologies are evolving, with over 800 patents published in 2023, focusing on enhancing battery safety, durability, and reducing environmental impact.
- New energy solutions are also a prominent trend, emphasizing greener transportation and energy usage, including electric vehicles and renewable energy sources. [1]

2. Healthcare Innovations:

- The rise of biomaterials, such as bioelectronic materials for biomedical applications and 3D-printed organs, promises to revolutionize patient care and treatment methods.
- Weight-loss drugs and treatments based on CRISPR gene-editing technology, which have seen significant advancements, including regulatory approvals for sickle-cell disease treatments. [2]

3. Space Exploration:

- The global Artemis program aims to land the first woman and the first person of color on the Moon by 2025, with further plans for sustainable human presence and exploration of other celestial bodies. [3]

4. Artificial Intelligence and Machine Learning:

- Tailored generative AI models are becoming more popular, catering to niche markets and specialized needs, offering privacy and security benefits over large, generalized models.
- The demand for AI and ML talent continues to grow, highlighting the need for professionals skilled in AI programming, data analysis, and machine learning operations (MLOps). [4]

5. Robotic Process Automation (RPA) and Edge Computing:

- RPA is automating repetitive tasks across various industries, while edge computing addresses the limitations of cloud computing by processing data closer to where it's needed. [5]

6. Quantum Computing, Virtual Reality (VR), and Augmented Reality (AR):

- Quantum computing is advancing rapidly, with potential applications in healthcare, finance, and more. VR and AR technologies are increasingly integrated into training and entertainment. [6]

These trends illustrate the dynamic nature of the technology landscape, with innovations aimed at addressing environmental concerns, improving healthcare outcomes, expanding human knowledge through space exploration, and leveraging AI and ML for efficiency and personalized solutions. The continuous demand for specialized talent in these areas underscores the importance of skill development and education in driving future technological advancements.