

Destroyed fourth unit of Chernobyl nuclear power plant –from Shelter to New Safe Confinement. Safety regulation

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The most severe accident in the world history of nuclear energy happened at the fourth unit of Chernobyl nuclear power plant in 1986. As a result of it the power unit was destroyed. A localizing building under ruined unit was erected in six months and equipped with specific systems for dust suppression, neutron absorbent solution spray, monitoring, etc. A great amount of nuclear and radioactive materials was buried inside. That facility is called the Shelter Object (hereinafter referred to as SO).

The Shelter Implementation Plan [1] (hereinafter referred to as SIP) has been implemented by the international community since 1997 and includes both urgent measures on stabilization and safety upgrading and long-term measures aimed at transforming the facility into an ecologically safe system. Currently the urgent measures have been completed and the major SIP project - the installation of the New Safe Confinement (hereinafter referred to as NSC) above the SO - is actively implemented.

In 1997 the Nuclear Regulatory Authority of Ukraine (currently the State Nuclear Regulatory Inspectorate of Ukraine –SNRIU) faced the challenge to provide adequate safety regulation of SIP implementation whereas no relevant experience existed in the world. This complicated task with the significant involvement of technical support organizations (hereinafter referred to as TSO) is being successfully carried out. One of key aspects of effective support rendered by TSOs to SNRIU is their comprehensive cooperation at the international level (between TSOs of Ukraine, Germany, France, the USA).

The regulatory approaches were declared in the Statement of Policy for SIP Safety Regulation [2]. Such approaches foresee that SNRIU establish purposes, principles and criteria for the SIP activities which are based on provisions for the use of nuclear energy. During the development of SIP projects the Licensee is obliged to demonstrate, that safety goals are gradually achieved and principles and criteria for safety are met with the planned projects. The issue of applicability of different specific regulatory safety requirements is reasonable to solve in the course of the licensing process by development and implementation of particular projects.

SNRIU also set forth the following three SIP fundamental safety principles [3]:

- 1) radiation safety and ALARA principle
- 2) application of proven technologies and advanced international experience and
- 3) introduction of quality management system by the Licensee.

Based on these principles, the safety cornerstones and the guidance for application of these principles were developed for the SIP safety regulation [4].

The safety cornerstones:

- SO structural integrity,
- accident prevention,
- emergency preparedness and mitigation of accidents consequences,
- nuclear safety (prevention of criticality),
- radiation protection of personnel, the public and the environment,
- radioactive waste management,
- quality management and safety culture.

Based on the above approaches, the Licensee implements specific projects on transformation SO into an ecologically safe system and demonstrates to the SNRIU and other regulatory authorities (RA) that safety goals

are step-by-step achieved and safety principles and criteria as well as technical requirements on safety are properly applied.

Successful implementation of SIP requires systematic constructive dialogue within a well-established licensing process between the Licensee/Contractors, on the one hand, and SNRIU/TSO's, on the other hand. Such licensing process was established at the beginning of SIP implementation and approved by all the parties involved. As experience was gained, the licensing process constantly improved and became more detailed.

Such step-by-step licensing process with a constructive day-to-day dialogue has minimized the risks of SIP projects and ensured optimization of SIP designs in terms of safety goals, minimization of personnel exposure, etc. A number of SIP early projects were approved by the SNRIU and progressed from the pre-design studies to detailed designs. They were essentially optimized, for example, the projects of SO structure stabilization, the integrated monitoring system and the new safe confinement. In the process of implementation of these projects at SO, the organization of construction and assembly work was also optimized, which reduced actual personnel exposure as compared to design-basis estimates.

REFERENCES

- [1] TACIS DG IA, EUROPEAN COMMISSION, USA MINISTRY of ENERGY, Shelter Implementation Plan, 1997
- [2] NUCLEAR REGULATORY ADMINISTRATION of UKRAINE, Statement of Policy for nuclear and radiation safety regulation for Chernobyl NPP Shelter Object, 1998
- [3] STATE NUCLEAR REGULATORY COMMITTEE of UKRAINE, "Fundamental Principles of safety activities within the Shelter Implementation Plan", 2005
- [4] STATE NUCLEAR REGULATORY COMMITTEE of UKRAINE, "Guidance on the application of the safety principles during regulatory activities within the Shelter Implementation Plan"

Country or International Organization

Ukraine

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