***Title: "Overview of Unit 1 Khmelnitskiy NPP Internal Events PRA"***

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***Objectives of KhISA Project***

The general objective of the KhISA Project is to assess the current safety level of Khmelnytskyy NPP through the performance of In-depth Safety Analyses. The analysis will use methodology and techniques comparable for those used for Western nuclear power plants. Because Khmelnytskyy is directed to use Zaporizhzhya Unit 5 as the lead plant, the KhNPP ISA will be performed using Zaporizhzhya deliverables as the base. The end result of the analysis will be a documented safety design basis and plant risk profile, which will provide support for safe plant operation and justification for proceeding with potential NPP improvements.
The project will also support the enhancement/development of safety analysis capabilities at the KhNPP and at supporting institutions and organizations in Ukraine. This will also include advanced training of KhISA personnel. It is expected that a separate effort will also be implemented to provide external Quality Assurance and Peer Review for the plant safety analysis and risk evaluation results and deliverables.

***Overview of "General concept for use of lead plant PRA elements during conduct of the KhISA project"***

Because of limitations in time, budget, and sustainable levels of Ukrainian technical effort, Ukrainian and American parties have agreed that Ukrainian In-Depth Safety Assessments (ISAs) will be performed using a "lead plant" concept. ISAs will be developed from scratch at three lead NPPs and subsequently modified to develop ISAs for non-lead (follow-on) NPPs. Zaporizhzhya NPP (ZNPP) Unit 5 has been designated as the lead plant for KhNPP.

It should be noted that the intent of a non-lead plant ISA project is to produce a stand-alone SAR that is specific to the non-lead plant. Specifically, the non-lead plant PRA results will be specific to the non-lead plant. Further, the non-lead plant PRA will be separately maintained from the lead plant's PRA. All references and supporting technical information used to develop the non-lead plant PRA will be stored at the non-lead plant. While the lead plant and non-lead plant PRAs may share a common set of references, their underlying analyses, results, and conclusions will be separate.

***Activity 1: Develop Data-Related Deliverables***

From the lead plant data-related deliverables and non-lead plant data sources, five plant-specific data-related deliverables will be produced for the non-lead plant:

1. Nuclear steam supply system (NSSS) database
2. Containment database
3. System design descriptions
4. Reliability database
5. Abnormal events and incidents database

During development of the NSSS database, the containment database, and the SDDs for the non-lead plant, differences between the lead plant and non-lead plant will be identified, confirmed, and recorded on difference forms.

***Activity 2: Develop Common Database of Differences***

The difference forms will be compiled into a common database, which provides the ability to:

1. Locate and reconcile duplicated differences (the same difference may be independently identified by many analysts during development of the non-lead plant data-related deliverables).
2. Sort differences according to various criteria.

It should be noted that the common database of differences will not contain all differences since it is based only on the NSSS database, the containment database, and the SDDs. Other differences, such as differences between the lead plant and non-lead plant emergency operating instructions (EOIs), need also be addressed during development of the non-lead plant PRA.

***Activity 3: Map Differences to PRA Elements***

Each difference in the common database of differences will be mapped to one or more PRA elements. Then, the common database of differences will be queried according to the mapping in order to produce lists of differences that are relevant to each PRA task. These lists will be used by the PRA Task Leaders and the Project Manager during development of the non-lead plant PRA to:

1. Ensure that all identified differences are addressed.
2. Coordinate the treatment of differences that potentially affect more than one PRA element.
3. Help estimate the amount of effort that will be required to complete the non-lead plant PRA.

***Activities 4 and 5: Develop Non-Lead Plant T/H Decks***

Plant-specific RELAP and CONTAIN input decks will be developed for the non-lead plant based on the lead plant input decks, the first two data-related deliverables and the relevant differences identified in Activity 3 above. It should be noted that T/H calculations will be performed during the non-lead plant ISA project to:

1. Support the deterministic safety assessment (DBA and BDBA).
2. Support the PRA in the areas of success criteria determination and accident sequence timing (a primary concern of the human reliability analysis).

***Activities 6-14: Develop Non-Lead Plant PRA***

The non-lead plant PRA will be developed by using lead plant PRA elements (e.g., success criteria, event trees, etc.) as templates, making modifications as needed to reflect the identified differences. This process is the essence of the lead plant PRA concept.

PRA is an iterative process and each PRA task interacts with many other tasks. Therefore, it is not possible to perform any PRA task in isolation of the other tasks. However, there are varying degrees of interactions among PRA tasks with respect to the lead plant PRA concept. Initiating event analysis, event tree development, and fault tree development are relatively self-contained tasks in the sense that the relevant lead plant PRA elements can be separately adopted and modified. In contrast, success criteria analysis and human reliability analysis make use of a common set of T/H analyses, which may either be taken from the lead plant or separately calculated using a plant-specific input deck for the non-lead plant. Therefore, the determination of lead plant T/H analysis reusability is a separate activity in the non-lead plant PRA.