

The SNSA surveillance of primary components according to established AMP at the Krško NPP

As part of the first Periodic safety review (PSR) at the Krško NPP, an Aging Management Program (AMP) was initiated with the objective to determine whether aging is being managed so that required safety margins are being effectively maintained. The AMP is based on USA practice and is in accordance with NRC requirements. Project phase of the AMP consists of Scoping and Screening of Structures, Systems and Components (SSC), Ageing Management Review (AMR) and Review of Time Limited Ageing Analyses (TLAA). The project phase of AMP was finished at the end of 2008. Under scope of AMP are “passive” and “long living” SSC. “Passive” SSCs perform their functions without moving parts or without change in configuration or properties. “Long living” SSCs those that are not subject of routine maintenance or replacement based on a qualified life or specified time period. In the scope for AMR there are totally 6531 mechanical, 1498 electrical and 694 civil components. In the frame of AMR each component was reviewed to find out, if ageing effects are satisfactory managed with existing plant activities and to identify needed improvements. All applicable issues defined in NUREG 1801 Generic Aging Lessons Learned (GALL) were analyzed in detail. Review of TLAA includes identification and evaluation of plant-specific aging analyses, which consider ageing effects and involve time-limited assumptions defined by the current operating term. Each of identified TLAA were reviewed to find out if particular TLAA will remain valid for the period of extended operation or additional activities for ageing management have to be introduced. Based on AMR and review of TLAA an action plan to develop new or revise existing plant programs and to introduce necessary new activities, was created. After the finishing of project phase of AMP the Krško NPP prepared proposal of Technical specifications (TS) and Safety analysis report (USAR) amendment which includes change of design lifetime from 40 to 60 years. An application for approval of this proposal was filed to the Slovenian nuclear safety administration (SNSA) in March 2009.

On 20 June 2012, the SNSA issued a decision approving the modifications that will enable long-term operation of the Krško NPP. By this, the extensive and long process, initiated after the first PSR of the Krško NPP in 2003, was completed. Approving the AMP of the NPP is a precondition for the extension of plant’s operation after the year 2023. In addition, the Krško NPP has to complete a comprehensive second PSR until mid-2013 and the third PSR in 2022 and 2023. Moreover, the Krško NPP has to carry out a series of safety improvements resulting from lessons learned after the accident in Fukushima in next few years. The basic precondition for the potential operation after 2023 is, of course, regular maintenance of operating equipment, well-trained operators and a good safety culture of all employees. All above mentioned conditions need to be fulfilled, if the owners of the Krško NPP want to extend the plant’s operation after the year 2023.

AMP connects existing programs and activities with few changes, some programs are developed as a new, some surveillance testing procedures and operating procedures are modified, but there were no need for SSCs’ modification or replacement after AMP was developed. There are also many programs for surveillance of primary components regarding ageing effects developed and now more systematically organized according to GALL. Very important is Inservice inspection program for 4th inspection interval from 2012 – 2022 with application of risk-informed methodology (RI-ISI) for class 1 and 2 piping. This program is one of the existing programs before AMP. Practically all inspections for previous inspection interval were implemented, only 2 locations will be inspected during outage 2013. Reactor vessel head and BMI penetrations surveillance program is also one of the important programs. After Reactor vessel head replacement in 2012 inspection requirements are reduced. There are also Reactor Vessel Irradiation Surveillance Program, Steam generators program and others

developed for primary components and of course other programs related to containment inspection, fire protection, civil structures, preventive maintenance of electric components, cable ageing, instrumentation equipment and other programs and implementing procedures. Some operational procedures are not in implementation phase yet or not yet fully developed. SNSA supervise Krško NPP programs implementation through thematic inspections.

To improve knowledge on ageing and to set up a list of potential SNSA activities in this area, the SNSA started the project "Managing of ageing processes in the Krško NPP", with the following topics:

- Overview of regulatory requirements and practices from other Europe countries and the USA,
- Theoretical basis of different ageing processes,
- Review of completed phases of AMP at the Krško NPP,
- Development of a SNSA procedure for supervision of ageing processes at the Krško NPP,
- Development of software for monitoring the condition of important SSCs at the Krško NPP.

The first three phases were finished in 2006. It was found out that the methodology from already finished phases of the Krško AMP in general suits the NRC requirements described in the License Renewal Program from 10 CFR 50.54 and together with implementation of the Maintenance Rule Program it suits the IAEA requirements as well. Presently the software for monitoring the condition of important systems, structures and components, and the SNSA procedure, which among other things governing its use is developed. We are trying to improve and extend the database. On the basis of data from surveillance testing, in-service inspection and maintenance activities the database provide trending, comparison with allowable values and alerts, and a review of corrective and preventive actions and also description of processes related to ageing. As mentioned we have developed procedure for monitoring of important NPP structures, systems and components for safe long-term NPP operation. The procedure is focused on SNSA thematic inspections at NPP related to ageing monitoring to get data also for our database. The methodology is done in several steps:

- Selection of components,
- Preparation for inspection,
- Inspection supervision at the Krško NPP,
- Evaluation of findings and input into the information system.

So there is combined approach for long term operation used at the Krško NPP with licence renewal application and periodic safety review. SNSA approved AMP and Safety analysis report changes in June 2012, which gives option for operation of NPP Krško beyond 2023. Krško NPP have started with AMP programs implementation. They will also finish some operational procedures, that still have to be developed. After established AMP also surveillance of primary components is more systematic with more completely organized programs, such as Inservice inspection program, Reactor vessel head and BMI penetrations surveillance program, Reactor Vessel Irradiation Surveillance Program, Steam generators program and others.

SNSA independently monitors aging management at the Krško NPP with developed procedure, thematic inspections and information database.