The Nuclear Licensing of the Service Life Extension at Paks Nuclear Power Plant
Major project tasks, their contents and milestones of the licensing process

In our former series of articles we concentrated on the tasks and events related to the preparation phases of the service life extension (sle) or were the required preconditions for receiving the nuclear permission (e.g. environment usage permission). In the forthcoming articles we will take a look at the essence of the most important tasks, and the results of the finished analysis and work in the nuclear licensing process. In order for the reader to see clearly why it is needed to deal with the presented tasks during a service life extension we have to introduce the domestic nuclear regulation environment.

According to the Nuclear Safety Regulations (NSR) Volume I, issued as a supplement of Government Decree no. 89/2005. (V.5), the Paks Nuclear Power Plant has the opportunity to acquire the licence for operating over the planned service life (30 years).

As the first step of the licensing process the licensee has to prepare the programme of the service life extension, which has to be handed in to the Nuclear Safety Department of the National Nuclear Energy Office (OAH NBI) at least four years before the current service life expires. The OAH NBI examines the programme. During the examination it looks for any circumstances which would exclude the service life extension, and seeks confirmation that the programme ensures the safe operation over the planned service life. It is the basic interest of Paks Nuclear Power Plant that the planning will be finished on time. If not, we could lose the licence for service life extension of that unit. The regulations allow us to initiate licensing for more than one unit at the same time. Since the Paks Nuclear Power Plant is willing to take advantage of this, the deadline for the preparation of the programme and handing it in to the OAH NBI is determined by the service licence of Unit 1, which expires in 2012. Counting four years down from that date, the deadline of finishing and handing in the SLE programme for Units 1-4 is 15 December 2008.

In the second step we need to request a new service licence, at least one year before the given unit's service licence expires. It is not possible to make these requisitions for more than one unit at the same time; they have to be initiated one-by-one. Sticking to the example of Unit 1, this deadline is 15 December 2011.

According to the NSR, the service life extension programme has to be based on the following principles:

- During preparation for the licensing of the service life extension and the operation over the planned service life, the safe operation of the given unit has to be guaranteed and maintained, in compliance with current legislation and official regulations. This means that the current problems occurring during the operation of the institution have to be dealt with according to the valid servicing licence of the institution.
- During the operation of the unit over its planned service life, exhaustion of the required safety reserves, taken into consideration in the safety analysis of the systems and system elements, can never be permitted due to the forthcoming end of the licensed service life.
- The licensee has to launch and carry on with activities needed to maintain the required technical state of the systems and system elements with safety functions within the

planned service life. Furthermore, the efficiency of these activities has to be systematically monitored and evaluated.

- The determination of safety enhancement measures deduced from the modern international requirements is done during the periodic safety supervision, in accordance with the relevant regulations.

The conditions of the OAH NBI for service life extension can be clearly seen from the aforesaid. Since the main topic of our article is directly related to the third phase, here we are only dealing with that. Recently the OAH NBI issued other regulations as well, not just those related to SLE. The licensee has to keep to these regulations independently of there being a service life extension or not (according to the prevailing service licence). These regulations mainly concern the exhaustion of systems and system elements, monitoring the efficiency of maintenance and the environment resistance classification of applications and maintaining this state. These are important considering the SLE, as these are in some way preconditions and required elements of a successful SLE licensing process. The requirements (as well as the ones concerning the SLE) derive from the American practice, with some domestic experience added. (With that we are saying that all elements of USA requirements can be found in the domestic national regulations, but the OAH NBI has added some parts, e.g. the monitoring of the deterministic indexes concerning monitoring the efficiency of maintenance, which goes beyond the practice in the USA.)

We have already referred to the fact that the essential elements of the SLE licensing derive from the regulations in the USA. The reasons behind this have been revealed to the reader in the article about the introduction of the feasibility study, so we are dealing only with the most important issues.

Amongst the world's states which use nuclear energy, only the USA has a systematic, logical, feasible and adaptable technical requirement system, and as a result of this the USA has a considerable number of successfully acquired service life extension licences. There is no unified practice in Europe which the individual countries should follow. Spain and Hungary are the two states using the practice of the USA. It is also a fact that while many countries are just "talking" about the SLE subject, they think that they will be able to use the system of the periodic safety supervision for these purposes. As the planned end of service life approaches and intentions turn more serious, the topic of periodic safety supervision is supplemented in many places with items similar to the practice in the USA.

The licensing of the SLE depends on two factors both in the USA and according to the requirements of the NSR:

1. The validity of those analyses which limit the service life in time have to be extended (or new ones put into practice). (The terminology in the USA is Time Limited Ageing Assessments (TLAAs), while the NSR adapted this as Korlátos Időtartamra Érvényes Biztonsági Elemzések (KIBE). These analyses include the exhaustion analysis, PTS analysis, as well as the supervisions in relation to the Ministry of the Interior.)
2. The programmes dealing with the exhaustion in the current servicing practice have to be supervised according to the modern technical requirements, and modifications are to be made if needed. This way we can ensure that by executing activities according to the programmes

dealing with exhaustion the presumed deterioration processes can be detected in time, and therefore the measures can be taken in time to stop or slow down these processes. During the SLE licensing process only those programmes need to be supervised which have basically non-replaceable systems and system elements with passive long life. The replaceable systems and system elements do not limit the licensable service life and active systems and system elements, these are dealt with according to the prevailing servicing licence (see required conditions for SLE).

This is also called comprehensive supervision, which suggests that the licensee proves that it is familiar with the exhaustion processes of systems and system elements related to the SLE licensing, and deals with these processes in a way that the systems and system elements function safely during the extended service life. (Naturally, this supervision cannot take place without evaluation of the current state.)

The NSR also determines the contents of the SLE programme document and the formal service licence. Interestingly, the two documents do not differ from each other in their contents; however, the difference lies in the fact that it is permitted not to present the elements itemized in the programme preparation period, it is enough to enlist the activities and their timing in order to achieve these items. There is no place for such ease when it comes to handing in the service licence.

The size of the SLE programme should be the followed according to the NSR:

- systems and system elements serving safety functions
- those non safety systems and system elements which can hinder the safety functions of other systems and system elements when malfunctioning
- systems and system elements ranked by casual authority decision (no known elements at present)

(In short: the SLE contains the ABOS 1-3 and the systems and system elements)

The SLE programme of Units 1-4 at Paks Nuclear Power Plant is prepared by the SLE project. The programme will ensure the desired 30+20 years of safe service with a 10-year reserve. (The 10 years of reserve is not strictly a NSR condition, but the requirement of the OAH NBI 4.14. guide.) The SLE programme will conclude all the ABOS 1-3 and systems and system elements involved in the licensing concerning their design, service, supervision and testing during service, maintenance, up keeping activities (including the placement of surplus radioactive, dangerous and industrial waste), ideas, programmes and tasks. It considers and adequately documents the actual physical state of systems and system elements in connection with the SLE programme. In the course of this we will pay extra attention to service life management and the characterization of our main activities: design, production, repairing, service, application rating, monitoring maintenance efficiency, exhaustion handling, maintenance, reconstruction, substitution programmes (including substitutions needed due to obsolescence), safety provision (e.g. safety evaluations, VBJ, IBJ, etc.).

The preparation of the SLE programme we will be based on the evaluations, documents and reports with the necessary additions.

Now let us take a look at how the tasks enlisted in the planned project serve these purposes!

Formally, the SLE project contains ten sections of propositions, which are the following:

1) Marking the size limits of the licensing and service life management, methodology.
   The size of the SLE licensing has been presented above. The following groups are formed within the proposition:
   - passive elements requiring exhaustion handling supervision (for an overall supervision)
   - the size of the KIBE application
   - size of monitoring the maintenance efficiency
   - size of the systems and system elements which require environment proof ranking
2) Thorough supervision of the exhaustion handling programmes: activities, evaluations, analysis.
   We review the exhaustion handling programme of systems and system elements used at present in the exhaustion handling supervision by fields of specialization (mechanical engineering, architecture, electricity and control systems, and system elements), and we determine the inevitable modifications and additions.
3) Emphasized tasks concerning service life extension and management: activities, evaluations and analysis.
   We grouped here the activities which need actual, technical analysis revealed in the SLE feasibility study.
4) Service life limit analysis (KIBE): stressed activities.
   The international practice enlists the PTS and exhaustion calculations here. The PTS analysis has to be done independently from the SLE, as it is also an IBJ task. The base of the exhaustion calculation is the static calculation. In this way it satisfies the previous authority requirement to execute actual calculations for the ABOS 1-2 systems and system elements, not just in the case of some outstanding systems and system elements. Otherwise Paks Nuclear Power Plant is carrying out an output increase, the effect of which has to be quantified based on these calculations (according to the agreement with the OAH NBI).
5) Other KIBE tasks:
   All the other analyses enlisted in the VBJ, but excluded from point 4). This task includes the reinterpretation and proving of the service limits of each unit, especially those which make the present service practice more difficult.
6) Known exhaustion handling measures
   We grouped here the tasks requiring actual exhaustion handling as revealed in the SLE feasibility study.
7) Project tasks in connection with the new maintenance regulations: evaluating and methodological work, programme preparation.
8) Project tasks in connection with application ranking: evaluating and methodological work, programme preparation.
9) Project tasks in connection with the upkeeping activities of the licensee.
10) Determination of the exhaustion handling measures based on the comprehensive supervision.

Tasks 7-10 are not tasks directly concerning the SLE programme and, as mentioned above, these have to be carried out by the licensee independently from the SLE goals (those required

for the SLE). The methodological, preparatory activities enlisted in the project plan serve the earliest possible successful introduction of the new requirements.

It can now be seen that NSR orders the required duties in detail to achieve and license SLE. The tasks of the project had to be determined and timed according to this. In the following articles the reader can get a picture of the finished analyses and their results.

Dr. Tamás Katona Sándor Rátkai Ferenc Kovács