

**PERIODICAL SAFETY REVIEW OF UNITS 1 AND 2 OF PAKS NPP****EXAMPLES FROM
SUMMARY REPORT**

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Qualification of the equipment

In course of preparation we got acquainted with the international – mainly American – practice of qualification, and with relevant IAEA recommendations. On the basis of those were the detailed guidelines of the qualification procedure developed and the qualification executed.

During qualification of equipment and rooms the items classified to 1st and 2nd safety classes of SCNPPE were used. Since the SCNPPE was, beyond having approved principles, not detailed and full for the civil engineering area at the beginning of the review, and furthermore it existed only for Unit 1 for every area, we have defined the number of the rooms belonging to the 1st and 2nd safety classes, and performed for each item their distribution for Unit 2 and identification.

So finally we got 13.113 items in scope of Units 1 and 2 belonging to the scope of equipment and rooms to be qualified. For them we carried out the necessary data collection. For sake of easier handling we prepared packages for items identical from the point of view of their safety functions and types. All together 778 qualification packages were made for Units 1 and 2.

From those packages 616 are related to mechanical area, 102 to electrical, 52 to I&C, 8 to civil areas. 83.7% of the total number of packages, that is 651 packages got qualification "suitable", 12.7%, that is 99 packages "partly suitable", and 3.6%, that is 28% "non suitable" qualification.

Main statements discovered during the qualification:

- in case of 443 mechanical equipment, all of which are manual drainers or deaerators (report number: G2) there was no documentation at all available. Since those equipment do not play active role in the investigated emergency situations we abandoned their qualification. In case of further 558 mechanical equipment (report number: G1) there was also no documentation available, however in case of those – due to their tasks to be fulfilled during emergency situations – the qualification has to be carried out following make up of the documentation.
- During determination of the environmental parameters such data of the existing mechanical, electrical, I&C, civil engineering documents were fully or partly missing (a certain part of those can be made up on the basis of engineering judgment, while some cannot be).
- In the mechanical area in case of many equipment – mostly valves – the preparation of maintenance procedures arose as a need.

- In the electrical and I&C areas there are such installation units, which might in case of emergencies get into unfavorable environment. The protection of them against environmental effects is not suitably assured. In case of some installation units the creation of the protection against environmental effects (e.g. modification of the ventilation system) will give a solution, while in other cases only after a more detailed investigation and performance of analysis can be decision made if the given installation unit should be replaced or not.
- In case of many valve motors (electrical area) the data necessary for qualification are missing. The qualification has to be carried out after obtaining them.
- In case of electrical and I&C cables the qualification status has to be explored. For this investigations are needed.
- A characteristic lack in civil engineering area is that the sealing of the doors, hatch covers within the hermetic area are not suitable they are to be replaced. The same statement is valid for the room coatings as well.
- In case of LOCA media from the hermetic area penetrates to transmitter rooms A204, A205, A252. The parameters developing in those rooms were determined on the basis of measurements, calculations, carried out in 1991. Those data indicate that the leakage data of the transmitter rooms are high and consequently the radiation dose is high as well. After this repairs were executed, not followed by repeated investigations, so it cannot be decided if the sealing should be repaired or the involved equipment replaced.
- The sealing of the field I&C cases and boxes is not sufficient at the present time in most of the cases.
- There is no full scope trend monitoring, trend analysis carried out in all areas, in many cases the process is ended by data collection. Trend monitoring is basically a tool for monitoring the changes in the technical functionality of the equipment, providing promotion in evaluation of the qualification condition as well.
- The determination of the rooms affected by the internal flooding was done, however the determination of the affected equipment and the evaluation of the effect of the flooding is still going on, and so this effect was not taken into consideration during qualification of the equipment.

One of the benefits of the carried out qualifications is that they pointed out some problems in mechanical, electrical, I&C and civil engineering areas in a well grounded way, which, though were mostly known, however not solved by now satisfactory.

In course of elaboration of a uniform qualification procedure in the future we are going to take into account the authority's opinion about the equipment qualification carried out by now and we would like include into the PSR guidelines for Units 3 and 4 the back-fitted experience, the more precise requirements and criteria as well.

Aging management

Domestic regulation and chronological correspondence to them

The PSR Guidelines are the first valid Hungarian authority regulation, in which the aging management of nuclear power plant structures, systems and installation units is mentioned, or better to say prescribed. The requirements need starting of a systematically performed procedure, that is following the not announced by now requests in one step nearly world level requirements are set up.

We have demonstrated that starting of such activity requires several years even in the practice of those countries which have a wide nuclear program. The preparation of regulatory background, clarification of the investigation limit conditions, the assurance of the necessary sources, controlling of the aging processes, but mostly the preparation of the potential operation beyond the designed life-time is in developing phase everywhere in the world. Consequently the time available for us was enough only to summarize our actions made in different areas - mostly on voluntary basis, and the grounding of the aging management program prepared by now, and to outline the regular to be carried out in the future.

Development of the life-time management intentions

At the time of commissioning of Unit 1, in 1982, the aging inspection program of the prior importance from safety point of view equipment was not included into the requirements. In spite of this, since 1988-1989 the intentions aimed for aging management can be traced in a well documented form in the NPP, which were segregated from each other at the beginning, according to the technical judgment and measures of the different areas, but spreading continuously (for example there are systematic life-time extension activities conducted in the area of control-rod drives, which are performed on the basis of the manufacturer's technology, but upon our own initiative).

Later on a uniform, concentrated activity with the aim of identification of the measures necessary to implement during the designed life-time of the units, and exploration of the reserves enveloped in the concerned critical components on the basis of complex point of view.

The life-time management nowadays is under development both from point of view of its organizational structure and applied methodology. However it is an important point, that the company started in due time the exploration of the necessary technical processes and to make the necessary corrective actions, having the positive effect of the latter even nowadays.

International experiences, our relating efforts

It can be well detected that we could make significant progress in utilization of the international experiences in development of targets, methodology and actions related to aging management basically since 1989, mainly due to joining the WANO and to our regular participation on international conferences organized in this topic.

The investigations conducted in certain countries might be used by other countries in many cases as references, and so the operators should not carry out basic researches. Furthermore, selection of 'pilot' power plants is widely used in practice of aging management. We are also

aiming, accordingly to this international practice to perform deep detailed analysis mainly for one unit and followingly adopt the results for the other units.

Moreover, the international practice indicates that only the close cooperation of the authority, the technical support institutes and the operators might lead to any result, within which the resolution of the disputes arising from time to time due to different interests gives way to develop a comprehensive national criteria system.

An outstandingly important source for exchange of experiences

The organized and coordinated by the International Atomic Energy Agency 'pilot' programs, in which we participate actively for several years played and play an outstandingly important role in the utilization of the international experiences. The participation in those programs gives us guidelines and shows the practices to be followed, in our strategy, and applied requirement system we are getting closer to the internationally anticipated technical level, while concerning the treatment of the discovered shortcomings the international practice appears in a direct form at our company.

Place of the developed practice compared to the international experiences

Concerning aging management Paks NPP is in the middle fields among the VVER operators. A number of operators have already actual monitoring system, recording of the cycle numbers is partly based on the automated stress monitoring system of the critical components, the surveillance calculations are performed on regular basis using internal or external sources.

Nevertheless, having on mind the age of the Paks units, and the proven favorable unique features of the equipment of our power plant, we are not in delay to start this process at our NPP, moreover some of the analysis executed in the frameworks of the AGNES project concerning aging management are beyond evaluations performed by other VVER operators.

Field experiences

The review indicated that there are shortcomings in the involved areas concerning uniform organizational treatment of the aging processes and in methodology interpretation. Those shortcomings might be eliminated only by development of a uniform company level interpretation and approach a basic element of which has to be the continuous training of our own personnel and the staff of the external support institutes.

At the same time it was noted that there are valuable partial results, those professional-organizational cores are existing which can be capable for coordinated systematic activities after development of the uniform company level aging management strategy. Concerning the aging management methods of different critical equipment supervised by different areas great emphasis should be given to the deep analysis of the profession specific problems, to the utilization of external experiences, for which several levels of information channels are available.

Periodic safety supervision of Paks NPP 1. and 2. units

The assessment of safety will be done with evaluation the next reports submitted by the NPP. The evaluation is performed by the NSI staff and TSO experts.

- Real technical conditions of the facility (civil structures, systems, equipment)
- Existing practice and proposals for equipment qualification, program for maintaining the existing quality
- Evaluation of existing safety reports, estimation of their validity up to the plant lifetime
- Ageing and ageing management - present status, proposals
- Feeding back of operational experiences
- Feeding back of research results and operational experiences from different facilities
- Procedures of operational, maintenance, supervision, etc.
- Organization and administration
- Safety impact of human factor, training, education, qualification of personnel
- Summarizing report

Shortcomings will be treated after negotiated proposals.

**Modifications of I&C systems
Licensing at Paks NPP Hungary
(RE: regulatory permission No.)**

Refueling neutron flux monitor (RE1607, RE1682) type: AKNP with old chambers and new pre-amplifiers	1992-1996
Steam Generator low range measuring system (RE985, RE997) type: Rosemount	1992-1995
In-core monitoring (Hindukus) system modernisation (Verona-U) (RE863, ...) type: M68000, mVAX, Hungarian SW	1992-1996
Pressure P and dP transmitters 1.-2.unit (RE1614, RE1803) type: Rosemount, H&B	1991-2001
Hermetic cable penetrations (RE1677, RE1695, RE1822) type: EHKA, SCHOTT/VISOLA (German/Hungarian)	1994-2002
Turbine power control system (RE1251, RE1503, RE1540) type: CEGELEC, frequency control, (connected to reactor power controller)	1994-1997
Primary to secondary leak detection, N16 (R & D and design)	1994-1999
Unit computer systems (RE1415, RE1478, RE1519, RE2004) type: SZM2M, SCADA (?) configurable SW	1994-2003
Electromech. comparators to Electronic (programable) (RE1220, RE1421) type: INDICOMP-3,-4	1993-1998
ECCS tanks level measuring redundant 2003 sensors (RE1909) changing capacity measuring to contact sensor due to operational experience type: Baluff to Phönix	1997-2000
Pneumatic actuators of isolation and control circuits (RE776) type: HERION controller	1997-2002
Analitic measurement of water chemistry (RE83, RE1485) type: Siemens	1992-1997
Reaktor Protection Refurbishment (RE1693, RE1899, RE1977) type: Siemens	1999-2002
Containment wide range gamma radiation detection (RE1802)	1995-1997