



## Information on Check of Welded Joints at Units 3&4 of NPP Mochovce

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The Nuclear Regulatory Authority of the Slovak Republic (ÚJD SR) was informed by representatives of Slovenské elektrárne, a. s. (SE, a. s.) that during visual inspections of the internal surfaces of the piping at Unit 4 of the Mochovce NPP, it was found that the surface of the root of one of the peripheral welded joints showed signs of surface corrosion. Subsequent analysis of the causes of corrosion showed that an unsuitable additive material of unalloyed ferritic structural steel was used for welding the root layer. This has an effect on the corrosion resistance of the welded joint and its mechanical properties. SE, a. s. decided to address the identified non-conformity on two parallel levels.

In the first place, it was necessary to minimize the number of such non-conforming welded joints; for this purpose, a reliable method to identify the use of other additive material was developed and validated. In parallel, a comprehensive assessment of the risk associated with such welds was carried out. Corrosion resistance tests, microstructural analyses, and mechanical property tests of the non-conforming welded joints were performed, from the results of which the maximum possible corrosion loss of the weld metal at the weld root was conservatively determined. On the basis of the maximum possible weld metal loss thus determined, all critical points of the piping systems were strength-calculated.

The whole process of solving the non-conformity of the use of incorrect additive material in the preparation of the root layer of some welded joints was independently verified by the Welding Research Institute in Bratislava. Specialists from the Faculty of Materials and Technology of STU in Bratislava, ÚJV Řež, DITI, MMV Ostrava, KP SAG and others, were involved in the solution of individual partial tasks. ÚJD SR has considered all relevant documents in terms of its competences and has agreed on the proposed solution concept. To check the cause of the non-conformity and the method of replacement of the non-conforming welded joints, the ÚJD SR set up a special inspection team. The possible occurrence of non-conformities of this nature in the operating units of NPP EBO and NPP EMO is also being investigated.

More than 7,000 welded joints were inspected at EMO Unit 3, and of these, 75 had non-conforming additive material in the root layer (or part of it). This non-conformity did not apply to the welded joints with the highest nuclear safety significance. All but five of the identified non-conforming welds were removed and replaced with new welds. These five non-conforming welds are located on auxiliary systems with no direct impact on safety and were retained for the purpose of monitoring the corrosion trend under realistic operating conditions. Weld joints of welders who made non-conforming welds at Mochovce Unit 3 were checked at the operating EMO and EBO units. A total of 7 such non-conforming welds were found and are now being replaced. However, none of them showed any signs of damage in relation to the required integrity or significant corrosion loss.

It was confirmed by experiments that in terms of basic mechanical properties the welded joints, where the additional material of unalloyed structural steel was used, meet the specified requirements, i.e. they have satisfactory strength, sufficiently high plasticity and also high impact toughness. The tests carried out and the information on corrosion resistance made it possible to determine the dynamics of the corrosion process.

The results of the verification confirmed that the welded joints at Unit 3 of Mochovce NPP are safe. SE, a. s., continues to further collect, refine and evaluate data, and longer-term laboratory tests, refining sensitivity analyses are underway to demonstrate the safety and reliability of long-term operation.