French Nuclear Safety Authority
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Regulatory Updates

Nuclear safety...

Stress corrosion phenomenon detected on Civaux 1 and 2, Chooz B2 and Penly 1 reactors

January 2022

On 21 October 2021, following ultrasonic checks scheduled during the second ten-yearly outage of Civaux NPP reactor 1 (1450 MWe reactor), EDF informed ASN that it had detected indications[1] on welds on the elbows of the safety injection system piping[2] of the reactor's main primary system.

As Civaux NPP reactor 2 was the only 1450 MWe reactor not yet to have undergone these types of checks, EDF shut it down in November 2021 so that they could be carried out ahead of the date initially scheduled for its second ten-yearly outage. The checks confirmed the presence of indications similar to those of reactor 1.

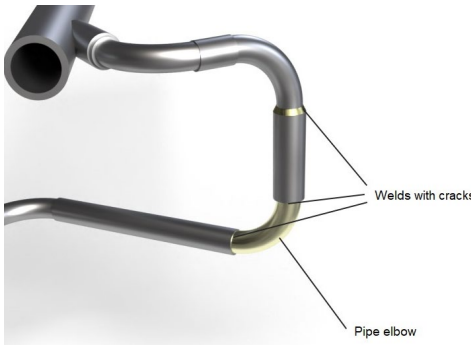
On 15 December 2021, EDF informed ASN that the metallurgical analyses conducted on the parts of the pipes removed from Civaux NPP reactor 1 had revealed the presence of cracking resulting from an unexpected stress corrosion phenomenon on the inner face of the piping, close to the weld bead.

The checks carried out during the ten-yearly outages aim to detect the presence of cracking by thermal fatigue, notably by means of ultrasonic inspections. This process is less effective at detecting stress corrosion cracking and may have led to the corresponding indications being classified as spurious. For the additional checks in progress, EDF optimised the process used in order to improve the detection of defects resulting from stress corrosion.

As indications classified as spurious had been detected during the checks previously conducted during the ten-yearly outage on the other two 1450 MWe reactors (Chooz NPP reactors B1 and B2), EDF shut them down in order to carry out additional checks. The initial results indicate the presence on reactor B2 of indications similar to those observed on Civaux. Checks are in progress on reactor B1.

At the same time, the check carried out during the third ten-yearly outage of Penly NPP reactor 1, the design of which is different (1300 MWe reactor), revealed indications on the same pipes. Laboratory analysis of the removed parts also concluded that stress corrosion cracking was present. The results currently available on this reactor show a smaller scale phenomenon than on Civaux NPP reactor 1.

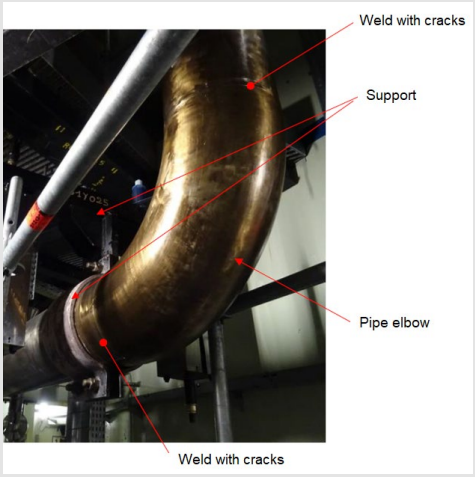
The four 1450 MWe reactors and Penly reactor 1 are currently shut down and are undergoing additional checks to determine which areas and systems are affected by the stress corrosion phenomenon. EDF is also continuing its investigations in order to determine the causes of this corrosion and identify the other areas and reactors that are potentially concerned. EDF is more particularly re-examining the results of the checks previously conducted on all of its reactors, in order to look for possible indications classified as spurious but could correspond to stress corrosion. Following these checks and investigations, EDF will submit a program that will prioritize reactors to be checked, on which ASN will issue a ruling.



©ASNP/Elbow and adjacent welds which underwent a ten-yearly outage inspection (N4 plant series)

The cut parts will be replaced by new parts. ASN conducted an inspection on the elbow cutting worksites on Civaux reactor 1.

The corresponding follow-up letter is available on the ASN website (in french).



©EDF/Photo showing the welds with cracks

In addition to regular technical exchanges with EDF, ASN conducted two inspections on the Civaux NPP and one on the Penly NPP. These inspections concerned the conditions for performance of the additional checks, the radiological exposure of the personnel involved and the conditions in which the cutting work of elbows for subsequent analysis was carried out. During an inspection on the Civaux site, control of the checks procedure was considered to be satisfactory. ASN will be continuing its inspection work.

Finally, ASN authorises cutting up of the systems concerned for subsequent analysis and will rule on any repair procedures and on return to service.

[1] An indication is a signal (typically an echo for ultrasound inspections) revealing the possible presence of a defect in the material being inspected.

[2] In the event of an accident causing a major break in the reactor's primary system, the safety injection system (RIS) enables pressurised borated water to be introduced into it in order to stifle the nuclear reaction and cool the core.

Stress corrosion phenomenon: ASN asks EDF for more in-depth analyses

March 2022

On 11 February 2022, EDF presented ASN with an updated review of the stress corrosion (CSC) phenomenon detected on several of its reactors, its analysis of the corresponding safety implications and its investigation and inspection programme.

Extension of the investigations to the N4 type reactors and to Penly NPP reactor 1 revealed indications that could correspond to CSC on the pipes of the residual heat removal system (RRA) of the main primary system.

As the question concerned the safety of the reactors in operation, EDF provided data to demonstrate the mechanical strength of the pipes concerned and data tending to show that the cracks only propagate through a limited thickness.

However, ASN considers that EDF must further demonstrate that the studies conducted cover all possible cases and that certain aspects of its safety analysis need to be examined in greater depth. ASN therefore sent EDF additional requests.

EDF also proposed an inspection strategy for all of its reactors. This programme is notably based on a review of the results of the inspections already carried out and which revealed indications classified as spurious, but which could in fact correspond to CSC.

EDF thus identified reactors it believes should be re-inspected in the short term. The inspections on these six priority reactors[3] will be carried out during outages starting no later than the end of April 2022.

Moreover, in order to improve its understanding of the CSC phenomenon, EDF will be carrying out extensive checks on reactors representative of the various models it operates[4]. These reactors are currently shut down.

Finally, EDF is continuing its studies to improve its knowledge of the phenomenon and has initiated the development of new ultrasonic inspection means capable of measuring the crack depths. EDF intends to inspect all of its reactors using these new means, from September 2022 up to the end of 2023.

With the assistance of IRSN, ASN has begun an examination of the data submitted by EDF in order to confirm the pertinence of the safety analyses transmitted, the programme of work proposed and the conditions in which it is carried out. ASN's Advisory Committee for Nuclear Pressure Equipment will be involved in this process.

In addition to regular technical exchanges with EDF, ASN conducted three inspections on the Civaux NPP and one on the Penly NPP.

These inspections concerned the conditions in which the weld checks are carried out, the radiological exposure of the personnel involved and the conditions in which the pipes to be analysed are cut.

[3] This concerns Bugey NPP reactors 3 and 4, Cattenom NPP reactor 3, Chinon NPP reactor B3 and Flamanville NPP reactors 1 and 2.

[4] In addition to Penly NPP reactor 1 and Civaux NPP reactor 1, on which the phenomenon was discovered, this concerns Chinon NPP reactor B3 and Fessenheim NPP reactor 2.

For further information:

ASN Letter of 24 february 2022 on the CSC – Requests for in-depth analysis

War in Ukraine: WENRA and HERCA conclusions on the consequences of a nuclear accident

March 2022

The on-going war increases the risk of a nuclear accident in Ukraine. WENRA and HERCA assessed the potential consequences of a severe accident, should it occur.

They considered that the accident scenarios from the "HERCA-WENRA approach for better cross-border coordination of protective actions during the early phase of a nuclear accident" issued in 2014 were a valid basis to be used for reference. In these scenarios, iodine prophylaxis could be recommended up to 20 km or up to around 100 km from the damaged plant, depending on the type of severe accident.

HERCA and WENRA will work to further contribute to a coordinated nuclear emergency response at the European level and provide support to the Ukrainian regulatory body, in link with ENSREG and the IAEA.

INRA offers its support to the Ukrainian nuclear safety authority (SNRIU)

March 2022

In the context of the war led by Russia in Ukraine, the International nuclear regulators' association (INRA), which brings together the Heads of 9 regulatory bodies from Germany, Canada, South Korea, Spain, the United States, France, Japan, the United Kingdom and Sweden, held an extraordinary meeting on 4 March 2022. Bernard Doroszczuk represented the ASN at this meeting.

Given the threats to the safety of Ukrainian civil nuclear installations, INRA has decided to offer its assistance to SNRIU, the Ukrainian nuclear safety authority. This proposal was formalized in a letter signed, on behalf of the association, by its president Toyoshi Fuketa, who is also president of the Japanese nuclear safety authority.

INRA is an association that provides its members with regular exchanges on current events in their countries and on international issues in terms to nuclear safety.

Read the INRA offer of regulatory and technical support

https://www.french-nuclear-safety.fr/content/download/182512/2049342

ENSREG's statement on the safety of nuclear installations in Ukraine

March 2022

In the context of the war led by Russia in Ukraine, the European Nuclear Safety REgulators Group (ENSREG) of the European Union met again on Thursday 10 March 2022, following the meetings of 27 February and 6 March 2022.

In the absence of Bernard Doroszczuk, ASN Chairman, Olivier Gupta, Director General, represented ASN at this extraordinary meeting. He also spoke as WENRA Chairperson. During this meeting, Oleg Korikov, Head of the Ukrainian nuclear safety authority (SNRIU) reviewed the situation of civil nuclear installations. A new statement of ENSREG was prepared during the meeting.

Read the release, presenting the ENSREG's statement on this situation:

https://www.ensreg.eu/document/ensreg-statement-ukraine-10-march-2022

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