

Discovery of damaged fuel rods during core unloading and fuel inspections

Posted on: 05 November 2013

Event Date: **08 October 2013**

Event Type: **Power Reactor**

Event Location: **Slovenia, KRSKO**

INES Rating: **0 (Final)**

In October 2013 the refuelling outage started in the Krško NPP. During transfer of fuel assemblies from the reactor to the spent fuel pool a 50 cm long segment of a fuel rod was found at the bottom of fuel transfer channel. Visual inspection of all fuel assemblies unloaded from reactor core showed open defects in 9 fuel rods cladding of 4 fuel assemblies. These 9 fuel rods were all broken with some parts of cladding and fuel pellets missing. The cause of such extensive fuel cladding failure is secondary degradation by zirconium hydride. The primary cause of fuel rods leakage is attributed to baffle jetting that can occur at these fuel assemblies' locations at the core baffle plate. Open fuel cladding defects were diagnosed from measurements of I-134 activity of the reactor coolant since July 2012, two months after the previous refuelling outage. The release of fission products from the damaged fuel occurred during the NPP operation. During refuelling outage in October and November 2013 there were no additional radioactive releases from the damaged fuel rods. There was no additional exposure to the workers during the fuel transportation.

Extensive inspection of fuel assemblies and the core baffle plate was carried out to determine the cause of fuel defects and to assure the integrity of the fuel assemblies to be reloaded into the new reactor core. Fuel reconstitution campaign was carried out to replace several fuel rods at exposed locations on the core baffle with stainless steel dummy rods that can resist to the baffle jetting. The root cause analysis of the fuel damage including the proposed corrective actions will be prepared by the fuel supplier and by the operator after the outage.

INES Rating: 0 - Below scale (Final) as per 05 November 2013

Impact on people and the environment

Release beyond authorized limits?	No
Overexposure of a member of the public?	No
Overexposure of a worker?	No

Impact on the radiological barriers and controls at facilities

Contamination spread within the facility?	No
Damage to radiological barriers (incl. fuel damage) within the facility?	No

Degradation of Defence In-Depth

Person injured physically or casualty?	No
Is there a continuing problem?	No

Justification of Rating

The event was rated based on the following criteria:

- Chapter 3 "Impact on radiological barriers and controls at facilities" for events involving reactor fuel. The gap release of 0.03 % of fuel rods in a reactor core was far below the criterion for level 4 of 0.1% of the core inventory. Therefore, the event rating is level 0.
- Chapter 5 "Impact on Defence in depth for events at power reactors while at power". The rating based on Table 9: For Initiator "Minor Fuel Handling Incident" in Annex II, the Category is "Expected". Safety Function Operability is "Full" for safety function Confining the radioactive material, because in Fuel handling

building the systems for providing confinement were all available: Ventillation with HEPA filters, Radiation monitors for the Fuel handling building, Spent fuel pool cleaning system (to clean the activity from the coolant) and procedures (AOP) for actions in case of fuel handling incident. According to Table 9 t event rating is level 0 ("Expected"+"Full").

The final INES rating for the event is Level 0.

Related Information

<http://www.ursjv.gov.si/en/info/news/article/4597/5762/f49e4ab1df88f614c68538827ccec6df/>

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