DETECTION OF QUASI-LAMINAR HYDROGEN FLAKING INDICATIONS IN THE REACTOR PRESSURE VESSEL FORGINGS AT THE BELGIAN DOEL 3 AND TIHANGE 2 PLANTS.

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Abstract

The Doel 3 and Tihange 2 units, Framatome 3-loop design PWRs, were maintained in cold shutdown in the summer of 2012 after the detection of numerous flaw indications in the core shells of their reactor pressure vessel (RPV). These indications, characterized as nearly-laminar and circular in shape, were attributed to hydrogen flaking which occurred during the forging process. This observed degradation of the material has a high safety significance since it could potentially affect the level of safety of the RPV, a component whose failure is not considered as a credible event.
The Licensee provided the Belgian Nuclear Safety Authorities (Federal Agency for Nuclear Control or FANC) with two Safety Cases (one per unit), complemented later by Addenda, in support of a request for restart of operation. The justification provided by the Licensee required numerous analyses and tests to validate the ultrasonic inspection and to demonstrate the serviceability of the RPVs. In May 2013 the FANC concluded that all the safety concerns had been solved in a satisfactory manner and, as a consequence, both the Doel 3 and Tihange 2 units could be restarted safely. In June 2013, the units resumed operation.