

Summary of observations from the public

ASN draft resolution authorising commissioning and operation of the Flamanville NPP EPR reactor pressure vessel (BNI 67)

**Opened to public consultation from 3rd to 24th September 2018
on the ASN website**

The French nuclear safety regulator (ASN) consulted the public on-line via its website, from 3rd to 24th September 2018, in order to collect observations about its draft resolution authorising the commissioning and operation of the EPR reactor pressure vessel in the Flamanville NPP.

During the course of this consultation, 571 contributions were submitted.

EDF and Framatome stated that they had no comments regarding the draft resolution.

The contributions can on the whole be broken down into the following categories:

- about 40% of the contributions expressed their opposition to the nuclear industry and to the Flamanville EPR reactor project;
- about 25% of the contributions expressed their opposition to commissioning of the pressure vessel of this reactor with its existing components;
- about 16% of the contributions expressed support for the ASN draft resolution;
- about 8% expressed their support for the nuclear industry or for the Flamanville EPR reactor project;
- the remaining 10% consisted of queries, questions or comments on various subjects related or unrelated to the draft resolution, along with value judgements.

The main queries, questions or comments relating to the draft resolution were as follows:

- the principle of the public consultation, which was widely challenged, either owing to the highly technical nature of the problem, or to mistrust with regard to ASN's actual purpose;
- the different treatment given to the bottom head and the closure head, leading to a 2024 time limit on operation of the closure head. Several contributors considered that it would be more reasonable to authorise the pressure vessel only once the replacement closure head is available, based on the precautionary principle and the delays that have accumulated in the construction of the reactor;
- the requirements regarding in-service inspections and the thermal ageing monitoring programme, for which clarifications are requested;
- the feasibility of replacing the vessel closure head and managing it as waste.

1) Many contributions challenge the principle of the public consultation on the draft resolution, either owing to the highly technical nature of the problem, or to mistrust with regard to ASN's actual purpose (suspicion of an attempt to shift responsibility to the public), or to misunderstanding of the changes which have occurred since the 2017 consultation on the ASN draft opinion regarding the anomaly in the composition of the steel in the Flamanville NPP EPR reactor pressure vessel bottom head and closure head.

Clarifications provided by ASN: the consultation of the public by ASN on this draft resolution is held pursuant to articles L. 120-1 and L. 120-1-1 of the Environment Code. Participation by the public aims to improve the quality of the resolution. It also helps identify those points requiring additional explanations from ASN.

This draft resolution is based on the ASN opinion of 10th October 2017 on the anomaly in the composition of the steel of the Flamanville NPP EPR reactor pressure vessel bottom head and closure head, for which the public consultation was part of a proactive approach to inform the public and ensure its participation.

Furthermore, the resolution opened for public consultation does not only concern the anomaly in the composition of the steel of the reactor pressure vessel bottom and closure heads, which was the subject of the above-mentioned opinion. It more broadly concerns the entire pressure vessel and more particularly draws on ASN's examination of compliance with the technical and regulatory requirements other than those concerning the chemical composition of the steel of the pressure vessel closure and bottom heads, and the review of the authorisation application submitted by the manufacturer.

2) Many contributions question the different treatment given to the bottom head and the closure head, leading to a 31st December 2024 time limit on operation of the closure head. Several contributors considered that it would be more reasonable to authorise the pressure vessel only once the replacement closure head is available, based on the precautionary principle and the delays that have accumulated in the construction of the reactor.

Clarifications provided by ASN: ASN considers that the anomaly in the chemical composition of the bottom and closure heads is not such as to compromise commissioning of the vessel, provided that the licensee carries out specific inspections during the operation of the facility, to ensure that no flaws appear.

For the bottom head, as the inspections ASN considers to be necessary are feasible, they are the subject of a binding requirement in article 3 of the draft resolution. These inspections are performed using non-destructive ultrasounds methods, capable of searching for potential flaws of any orientation perpendicular to the surface of the metal, within the first 20 millimetres from the inner and outer surfaces of the base metal.

Given that the inspections performed during manufacture of the bottom head revealed no flaw of a size greater than the detection limit and that no mechanism has been identified as being able to create or rapidly propagate a flaw during operation of the reactor, ASN considers that the performance of these inspections at each complete requalification of the main primary system, in other words every 10 years, is acceptable. Moreover, the licensee has also undertaken to perform an early inspection of this type, no later than 30 months following the first fuelling of the vessel.

For the vessel closure head, the state of knowledge and technology does not allow the performance of inspections on the same scale and with the same deadlines as for the vessel bottom head. ASN therefore considers that the service life of this closure head must be limited in time. The manufacturer has started the production of a new closure head which could be available by the end of 2024. Given that the inspections performed during manufacture of the closure head revealed no flaw of a size

greater than the detection limit and that no mechanism has been identified as being able to create or rapidly propagate a flaw during operation of the reactor, ASN considers that the operation of the closure head until this time is acceptable in terms of nuclear safety. Consequently, the 31st December 2024 time limit on the utilisation of the RPV closure head is the subject of a binding requirement in article 1 of the draft resolution.

3) Several contributors wished to obtain clarification of the in-service inspection programme and the thermal ageing monitoring programme on the steel in the residual carbon positive macro-segregation zone, specified in articles 2 and 3 of the draft resolution.

Clarifications provided by ASN: the serviceability of the vessel bottom and closure head is based on a demonstration of preclusion of the fast fracture risk. This demonstration is itself based in part on the mechanical properties of the steel with an excessively high carbon content. Throughout the operating life of the reactor, it is therefore essential to ensure that these mechanical properties remain within the limits of the hypotheses adopted for the demonstration, in accordance with article 12 of the amended order of 10th November 1999 concerning the monitoring of operation of the main primary system and main secondary systems of nuclear pressurised water reactors.

For the vessel bottom and closure heads, these mechanical properties are mainly affected by the thermal ageing phenomenon. Therefore, article 2 of the draft resolution requires the implementation of a programme to monitor this phenomenon. This programme consists in carrying out bending rupture energy tests on material representative of the pressure vessel bottom and closure head zones containing excess carbon. In the laboratory, this material is subjected to accelerated thermal ageing (over 17 years, capable of simulating about 60 years of operation), in order to obtain results ahead of the deadline set for the end of operation of the reactor.

This programme, proposed by EDF, was examined by ASN and its technical support organisation, IRSN, as well as by the ASN Advisory Committee for nuclear pressure equipment. Performance of this programme will be specifically monitored by ASN.

These public contributions led ASN to make clarifications in its resolution, which now refers to article 12 of the amended order of 10th November 1999 concerning the monitoring of operation of the main primary system and main secondary systems of nuclear pressurised water reactors, which requires monitoring of changes to the materials and which underpins the requirement given in article 2.

4) Several contributions complained about the absence of any recital covering the feasibility of replacing the vessel closure head and managing it as waste.

Clarifications provided by ASN: Framatome provided demonstration data in the file concerning the anomaly in the chemical composition of the Flamanville EPR reactor pressure vessel bottom and closure head domes. In addition, the licensee EDF has acquired considerable operating experience from the replacement of all the reactor vessel closure heads of the French 900 MWe and 1300 MWe reactors, between 1992 and 2009. Finally a management route has been set up for the used reactor vessel closure heads, which are to be disposed of in the Aube repository operated by the French national radioactive waste management agency (ANDRA).

These contributions from the public led ASN to clarify the recitals of its resolution to indicate that replacement of the closure head is a technically feasible operation.