

DIRECTION DES CENTRALES NUCLEAIRES

Paris, 4 avril 2012,

Ref. : CODEP-DCN-2011-052544

The Director
Nuclear Power Generation Division
EDF
Site Cap Ampère – 1 place Pleyel
93 282 SAINT-DENIS CEDEX

Subject: Nuclear Pressurized Water Reactors – Flamanville 3 EPR Project
Architecture of the I&C system and associated platforms

- Ref. :**
- [1] ASN Letter Dép-SD2/N°0171/2006 of 27 March 2006
 - [2] ASN Letter Dép-DCN-0568-2009 of 15 October 2009
 - [3] ASN Letter CODEP-DCN-2010-036901 of 9 July 2010
 - [4] EDF Letter /DIN of 23 December 2009 from the DIN Director
 - [5] ASN Letter CODEP-DCN-2011-035230 of 10 June 2011
 - [6] GPR Opinion CODEP-MEA-2011-038333 of 8 July 2011
 - [7] EDF Letter ECEP111402 of 10 June 2011

Dear Sir,

Prior to issuing authorisation decree n°2007-534 for the Flamanville 3 (FLA3) EPR reactor, the Advisory Committee for nuclear reactors (GPR) met on 1st December 2005 to examine the general principles adopted for the overall I&C architecture, which comprises two associated platforms:

- the "Téléperm XS" (TXS) platform, specifically developed for the nuclear industry and dedicated to reactor protection in incident or accident situations;
- the "SPPA T2000" platform, developed for conventional industrial purposes and primarily used for functions linked to normal reactor operations and for certain reactor protection operations in incident or accident situations.

The GPR took this opportunity also to examine the architecture of the protection system and the TXS platform. Following this meeting, ASN considered, in letter reference [1], that the choice of the TXS platform for the Flamanville 3 EPR reactor was an acceptable basis for the development of the reactor protection system.

On 18 June 2009, the GPR met to rule on the detailed design choices adopted by EDF for the definition and implementation of the Flamanville 3 EPR reactor I&C architecture. following this meeting, ASN issued a position statement in letter reference [2] concerning the I&C architecture and the suitability of the TXS and SPPA T2000 platforms for handling safety-classified functions:

- with regard to the TXS platform, ASN considered that its design was satisfactory and was able to handle F1A classified safety functions;

- however, ASN considered that the SPPA T2000 platform was not in conformity with the safety classification and asked you to define different design measures from those initially presented by EDF.

The examination of the ability of the SPPA T2000 platform to handle safety functions classified F2¹ and F1B² continued in 2010. In letter reference [3], ASN considered that the documents you transmitted contained the data necessary for demonstrating the ability of the SPPA-T2000 platform to handle safety functions classified F2, even if these data need to be analysed in greater detail. ASN did however consider that the demonstration of the platform's ability to handle safety functions classified F1B was not proven. ASN therefore asked you to implement the "different design measures" proposed in letter reference [4].

This led you to develop the system referred to as the "hard core", designed to deal with a total loss of the SPPA-T2000 platform, combined with certain accident situations. This system involved the introduction of a "hard-core I&C" system (CCND) into the TXS platform, containing some of the safety classified systems not previously included in this platform.

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Following letter reference [2], ASN sent letter reference [5] to the GPR, asking it to examine the qualification of the Flamanville 3 EPR reactor's SPPA-T2000 I&C platform and its impact on the hard core.

Based on the assessment report prepared by IRSN, at the request of ASN, the GPR thus examined questions concerning:

- the ability of the AS620B PLCs of the SPPA-T2000 platform to handle the safety functions classified F1B and F2,
- whether or not a safety classification should be given to the hard core, in the light of the conclusions of the previous point,
- a summary of the advantages and drawbacks of implementing the hard core in the I&C architecture,
- the review of the EDF answers to the ASN requests expressed in letter reference [2] and concerning:
 - the system for validating the orders from the Process Information and Control System (PICS) transmitted to the protection system,
 - the detection of PICS failures,
 - the conformity of the PICS with a validated configuration,
 - the non-disruption of the PICS, the bus terminal and the safety automation system (SAS) by equipment with a lower classification.

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The GPR submitted its opinion reference [6] to ASN, after the meeting of 16 June 2011.

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¹According to the Flamanville 3 preliminary safety report: "The safety functions needed to achieve and maintain a final state for RCC-A event sequences are classified F2"

² According to the Flamanville 3 preliminary safety report: "All the safety functions beyond attainment of the controlled state and needed to achieve safe shutdown state and maintain it after a PCC-2 to PCC-4 internal event, are classified F1B."

ASN's position

ASN considers that the answers provided by EDF concerning, on the one hand, the conformity of the AS620B PLCs of the SPPA-T2000 I&C platform with the technical requirements relating to classification level F1B and, on the other, with the requests expressed in letter reference [2], are satisfactory.

ASN therefore considers that the AS620B PLCs of the SPPA-T2000 platform are able to handle functions classified F1B and therefore necessarily those that are classified F2.

Provided that the request expressed in this letter is taken into account, ASN considers that there is no need to require a classification for the hard core, which constitutes a supplementary robustness feature of defence in depth. ASN draws your attention to the fact that the need for classification of the CCND system will be re-assessed further to the functional analysis to be performed at a later date.

The addition of a back-up system such as the CCND, increases the I&C architecture's tolerance to certain SAS failures, while increasing the complexity of the Flamanville 3 EPR reactor's I&C architecture. However, ASN considers that the advantages of introducing the CCND system and thus the hard core, outweigh the drawbacks.

ASN considers that the principle of the system validating the orders sent by the PICS to the protection system is acceptable.

ASN considers that the design and installation measures (application software loading and conformity check functions) proposed by EDF to guarantee the conformity of the PICS with a validated configuration are satisfactory.

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ASN request

The hard core comprises a limited number of functions for dealing with a combination of an incident or accident with total loss of functions classified F1B performed by the SPPA-T2000 platform. It consists of the protection system (PS), the reactor control, surveillance and limitation system (RCSL), the severe accident I&C system (CCAG) and the dedicated system called hard core I&C (CCND).

At the time of the examination, you stated that the hard core required no functional safety classification because it was designed to increase the tolerance of the I&C architecture to combinations of failures in addition to those postulated in the deterministic safety case, or to be taken into account in the probabilistic safety assessments. ASN nonetheless considers that the hard core must be covered by a set of maintenance and testing provisions, in order to guarantee the continuity of the functions it performs during the course of reactor operation.

ASN therefore asks you to take steps to guarantee the continuity of the hard core, by specifying formally its existence and requirements in the design documents and in the safety report, in particular with regard to in-service maintenance and testing.

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ASN observation

ASN has duly noted your undertaking to provide information and carry out the steps stipulated in letter reference [7].

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Kindly send me your comments and replies concerning these points within a time not to exceed **two months**.

Furthermore, I inform you that ASN presented its conclusions at an MDEP meeting in January 2012, with the regulators from the USA (NRC), Great Britain (ONR) and Finland (STUK).

Yours sincerely,

For the ASN Chairman,
by delegation,
the Director General,

Jean Christophe NIEL