



**ASN resolution 2012-DC-0286 of 26 June 2012**  
**instructing Électricité de France – Société Anonyme (EDF-SA)**  
**to comply with additional requirements applicable to the**  
**Gravelines NPP (Nord département)**  
**in the light of the conclusions of the Complementary Safety Assessments (CSAs) for**  
**BNIs 96, 97 and 122**

The Nuclear Safety Authority (ASN),

- Having regard to** the Environment Code, in particular its articles L. 592-20, L. 593-10 and L. 593-20;
- Having regard to** the Public Health Code;
- Having regard to** decree 77-1190 of 24 October 1977, amended by decree 2004-1324 of 29 November 2004 authorising Électricité de France to create reactors 1 to 4 (BNIs 96 and 97) at the Gravelines NPP in the Nord département;
- Having regard to** the decree of 18 December 1981, amended by decree 2007-1558 of 2 November 2007 authorising Électricité de France to create reactors 5 and 6 (BNI 122) at the Gravelines NPP in the Nord département;
- Having regard to** decree 2005-1158 of 13 September 2005 relative to the off-site emergency plans concerning certain structures or fixed installations and taken in application of article 15 of Act 2004-811 of 13 August 2004 relative to the modernisation of the civil security services;
- Having regard to** decree 2007-1557 of 2 November 2007 amended, relative to BNIs and to the regulation of the transport of radioactive substances in terms of nuclear safety, and its articles 18 and 25 in particular;
- Having regard to** the order of 10 August 1984 relative to the quality of the design, construction and operation of BNIs;
- Having regard to** the order of 31 December 1999 amended, setting the general technical regulations intended to prevent and mitigate off-site detrimental effects and risks resulting from the operation of BNIs;
- Having regard to** the order of 7th February 2012 setting out the general rules for BNIs
- Having regard to** ASN (French Nuclear Safety Authority) Resolution No. 2011-DC-0213 of 5 May 2011 instructing Electricité de France (EDF) to carry out a complementary safety assessment of certain of its basic nuclear installations in the light of the accident which occurred in the Fukushima Daiichi nuclear power plant
- Having regard to** basic safety rule I.3 b of 8 June 1984 concerning seismic instrumentation;
- Having regard to** EDF note D4550.31-06/1840 revision 0 of 12 October 2007;
- Having regard to** letter CODEP-DOA-2011-039969 of 21 July 2011, CODEP-DOA-2011-060526 of 27 October 2011, CODEP-DOA-2011-057631 of 13 October 2011, CODEP-DOA-2011-058940 of 19 October 2011 and CODEP-DOA-2011-060052 of 25 October 2011, sent by ASN to the Gravelines NPP following the inspections carried out on 21 June, 6 July, 22 September, 04 October, 10 October and 11 October 2011 as part of the

campaign of targeted inspections performed by ASN on priority nuclear facilities, concerning the topics related to the Fukushima-Daiichi accident;

**Having regard to** letter SIF-11058 BRSD/WXZ8 sent by EDF to ASN on 13 September 2011, transmitting the CSA report for the Gravelines NPP;

**Having regard to** letters DPI/DIN/EM/MRC/PC-11/021 of 2 November 2011 and DPI/DIN/EM/MRC/PC-11/022 of 17 November 2011 sent by EDF to ASN, transmitting the EDF position statements and actions concerning the review of the CSA reports;

**Having regard to** IRSN report N° 679 submitted on 4 November 2011;

**Having regard to** the opinion dated 10 November 2011 by ASN's Advisory Committees for reactors and for laboratories and plants concerning all these reports, transmitted by letter reference CODEP-MEA-2011-063263 of 16 November 2011;

**Having regard to** the ASN report of December 2011 on the Complementary Safety Assessments;

**Having regard to** ASN opinion 2012-AV-0139 of 3 January 2012 on the Complementary Safety Assessments for the priority nuclear facilities in the light of the accident which occurred in the Fukushima Daiichi NPP;

**Having regard to** EDF note D4550.31-12/1367 revision 0 of 30 March 2012;

**Having regard to** EDF note ETDOIL080038 revision G, sent by letter TIL11048 of 05 March 2012;

**Having regard to** letters referenced DPI/DIN/EM/MRC/PC-12/004 of 5 March 2012 and DPI/DIN/EM/MRC/PC-12/007 of 12 April 2012 sent by EDF to ASN;

**Whereas**, the CSA approach, initiated firstly for the 59 electrical power generating reactors in operation or under construction and the 20 other nuclear facilities considered to be priorities, is the first step in the process to incorporate the experience feedback from the Fukushima Daiichi accident which started on 11 March 2011 in Japan,

**Whereas**, following the CSAs on the priority nuclear facilities, the facilities examined offer a level of safety that is sufficient not to warrant immediate shutdown of any of them, and their continued operation requires that their robustness to extreme situations be increased as rapidly as possible beyond their existing safety margins,

**Whereas** social, organisational and human factors, which are key elements in safety, received particular attention during the CSAs,

### **Hereby issues the following resolution:**

#### **Article 1**

Following analysis of the CSA report on the facilities, this resolution determines the additional requirements to be met by Électricité de France (EDF-SA), hereinafter referred to as the licensee, with registered offices at 22-30, avenue de Wagram in Paris (75008), for the operation of BNIs 96, 97 and 122 of the Gravelines NPP (Nord département). These requirements are defined in the appendix.

#### **Article 2**

Before 30 June 2012, the licensee shall submit a draft calendar for implementation of all the measures it intends to take following the CSAs, as they appear in the CSA report for the facilities mentioned in article 1, in the light of the Fukushima-Daiichi NPP accident and in above-mentioned letters DPI/DIN/EM/MRC/PC-11/021 and DPI/DIN/EM/MRC/PC-11/022, in compliance with the requirements set out in the appendices. This calendar may be common to several sites. It shall define a final completion date for each measure and each reactor.

### **Article 3**

Before 31 December 2013, the licensee shall submit to ASN a summary of the lessons it has learned from the Fukushima-Daiichi NPP accident and shall submit proposals for inclusion in the baseline safety requirements.

### **Article 4**

This resolution takes effect as of its notification to the licensee.

### **Article 5**

The ASN Director General is tasked with implementation of this resolution, which shall be published in the ASN Official Bulletin.

Signed in Paris on 26 June 2012.

The ASN Commission,

*Signed*

**André-Claude LACOSTE**

**Marie-Pierre COMETS**

**Jean-Jacques DUMONT**

**Michel BOURGUIGNON**

**Philippe JAMET**

Appendix to ASN resolution 2011-DC-0286 of 26 June 2011 instructing Électricité de France – Société Anonyme (EDF-SA) to comply with the additional requirements applicable to the Gravelines NPP (Nord département) in the light of the conclusions of the CSAs on BNIs 96, 97 and 122

Requirements applicable to  
BNI 96 (reactors 1 and 2 of the Gravelines NPP)  
BNI 97 (reactors 3 and 4 of the Gravelines NPP)  
and BNI 122 (reactors 5 and 6 of the Gravelines NPP)

**Title III: Management of accident risks**

**Chapter 1: General**

**[EDF-GRA-1][ECS-1]**

I. Before 30 June 2012, the licensee shall propose to ASN a hardened safety core of robust material and organisational measures designed, for the extreme situations studied in the CSAs, to:

- a. prevent or mitigate the progress of an accident with fuel melt,
- b. mitigate large-scale radioactive releases,
- c. enable the licensee to perform its emergency management duties.

II. Within this same time-frame, the licensee shall submit to ASN the requirements applicable to this hardened safety core. In order to define these requirements, the licensee shall adopt significant fixed margins in relation to the requirements applicable on 1 January 2012. The systems, structures and components (SSCs) which are included in these measures shall be maintained in a functional state, in particular for the extreme situations studied by the CSAs. These SSCs shall be protected against the on-site and off-site hazards induced by these extreme situations, for example: falling loads, impacts from other components and structures, fires, explosions.

III. For this hardened safety core, the licensee shall install SSCs that are independent and diversified in relation to the existing SSCs, in order to limit common mode risks. As applicable, the licensee shall justify the use of undiversified or existing SSCs.

IV. The licensee shall take all necessary steps to ensure that the emergency organisation and resources are operational in the event of an accident affecting all or some of the facilities on a given site.

The licensee shall therefore include these steps in the hardened safety core defined in I. of this requirement and, in accordance with II of this requirement, shall issue stipulations concerning:

- the emergency situation management premises, so that they offer greater resistance to hazards and remain accessible and habitable at all times and during long-duration emergencies, including in the event of radioactive releases. These premises shall enable the emergency teams to diagnose the status of the facilities and control the resources of the hardened safety core;
- the availability and operability of the mobile devices vital for emergency management;

- the means of communication essential to emergency management, in particular comprising the means of alerting and informing the emergency teams and the public authorities and, should this prove necessary, the arrangements for alerting the population if the off-site emergency plan reflex phase is triggered by order of the Prefect;
- The availability of parameters used to diagnose the status of the facility, as well as meteorological and environmental measurements (radiological and chemical, inside and outside the emergency situation management premises) enabling the radiological impact on the workers and general public to be evaluated and predicted;
- the operational dosimetry resources, radiation protection measuring instruments and individual and collective protection resources. These resources shall be available in sufficient quantities by 31 December 2012.

#### **[EDF-GRA-2][ECS-19]**

I. As rapidly as possible, owing to the constraints of deployment across all the NPPs and, in any case, before 31 December 2016, the licensee shall install redundant means in the reactor pit, to detect vessel melt-through and redundant means in the containment to detect the presence of hydrogen.

Instrumentation in the control room shall indicate corium melt-through of the vessel.

II. Before 31 December 2013, the licensee shall propose final requirements to ASN for these provisions and shall indicate whether or not they are part of the hardened safety core.

#### **[EDF-GRA-3][ECS-20]**

I. Before 30 June 2012, the licensee shall present ASN with the modifications to be made, for measuring both the condition of the fuel storage pit (temperature and water level in the spent fuel pit) and the radiological atmosphere in the fuel building hall.

II. Pending their implementation:

- No later than 31 December 2012, the licensee shall make tables available to its national emergency response organisation which, depending on the residual power of the fuel stored in the spent fuel pit, give the time before boiling in the event of total loss of cooling.
- No later than 31 December 2013, the licensee shall ensure that the level measurement in the event of total loss of electrical power supplies is available.

### **Chapter 3: Management of other risks**

#### **[EDF-GRA-4][ECS-4]**

Before 31 December 2014, the licensee shall carry out work to protect the facilities against flooding, as mentioned in above-mentioned note ETDOIL080038 G.

#### **[EDF-GRA-5][ECS-5]**

No later than 30 June 2012, the licensee shall carry out work to ensure conformity of the volumetric protection mentioned in report D4550.31-12/1367- Revision 0. The licensee shall implement the organisation and the resources as described in the above-mentioned document D4550.31-06/1840 revision 0 of 12/10/2007 to ensure that, with the passage of time, the volumetric protection retains its efficiency as proven in the safety demonstration.

#### **[EDF-GRA-6][ECS-6]**

Before 31 December 2013, the licensee shall present ASN with the modifications it intends to make, so that before 31 December 2017 it will have reinforced the protection of the facilities against the risk of flooding beyond the baseline safety requirements in force on 1 January 2012, for example, by raising the volumetric protection in order to prevent the occurrence of total loss of the heatsink or electrical power supplies, in beyond design-basis scenarios, especially:

- maximum rainfall,
- flooding resulting from failure of on-site equipment under the effects of an earthquake.

**[EDF-GRA-7][ECS-8]**

Before 30 September 2012, the licensee shall check the conformity of its facilities with the provisions of RFS I.3.b, the application of which is stipulated in the safety analysis report. The licensees shall submit to ASN an exhaustive summary of this review and the corrected deviations, plus a plan of action listing the correction time-lines for any remaining deviations.

**[EDF-GRA-8][ECS-9]**

No later than 31 December 2012, the licensee shall take the necessary steps to prevent equipment required by the safety demonstration from being damaged by other equipment items in the event of an earthquake.

Before 31 December 2013, the licensee shall present ASN with a summary of the implementation of this approach, as well as an interim report before 30 June 2013.

**[EDF-GRA-9][ECS-10]**

Before 30 June 2012, the licensee shall send ASN a personnel training programme to enhance their level of preparedness for an earthquake. This programme shall in particular include regular in-situation training exercises. This programme shall have been followed by the reactor operating personnel in charge of the seismic instrumentation and of the associated operating measures no later than 31 December 2012. The other site operating teams shall receive information by 31 December 2012 and shall have followed the entire programme no later than 31 December 2013.

**[EDF-GRA-10][ECS-12]**

Before 30 December 2012, the licensee shall present to ASN:

- a study evaluating the resistance to a safe shutdown earthquake (SSE) of the structures and equipment contributing to nuclear safety, fire sectoring, fire detection and fixed extinguishing systems, subject to an operating basis earthquake resistance requirement,
- for items for which the ability to withstand the SSE cannot be proven, a programme of modifications to guarantee protection of fire safety functions in the event of an SSE.

**[EDF-GRA-11][ECS-13]**

Before 31 December 2012, the licensee shall submit to ASN a study of the advantages and drawbacks of implementing automatic scram of its reactors in the event of seismic loading, enabling the reactor to be shutdown to the safest state, if the seismic level corresponding to a spectrum with half the amplitude of the design response spectrum of the site is exceeded.

**[EDF-GRA-12][ECS-14]**

I. No later than 31 December 2012, the licensee shall supplement its on-going studies with the inclusion of the risk arising from activities taking place near the facilities, in the extreme situations studied by the CSAs and in conjunction with neighbouring licensees responsible for these activities (nuclear facilities, installations classified on environmental protection grounds or other facilities liable to constitute a hazard). At that time, the licensee shall propose any modifications to be made to its facilities or their operating procedures as a result of this analysis.

II. No later than 31 December 2012, the licensee shall take all steps, for example by means of agreements or detection and alert systems, to ensure that it is rapidly informed of any event liable to constitute an off-site hazard for its facilities, in order to protect its staff against these hazards and to ensure that emergency management is coordinated with the neighbouring licensees.

**[EDF-GRA-13][ECS-15]**

Before 30 June 2012, the licensee shall produce and submit to ASN an overall review of the design of the heat sink in relation to hazards with an impact on the flow and quality of water and the risk of clogging of the heat sink.

**[EDF-GRA-14][ECS-16]**

I. Before 31 December 2012, the licensee shall present ASN with the intended modifications for installing technical backup devices for long-term removal of residual power from the reactor and the spent fuel pool in the event of loss of the heat sink. These devices must meet the requirements concerning the hardened safety core presented in requirement [ECS-1] above. Pending the commissioning of the emergency electrical power supplies mentioned in paragraph II of requirement [ECS-18], these devices must be kept functional in the event of prolonged and complete loss of the electrical power supplies, using temporary electrical systems if necessary.

II. Before 31 December 2012, the licensee shall present ASN with the modifications it intends to make for the installation, before 31 December 2013 and, except where justified in particular, of systems to ensure the injection of borated water into the reactor core in the event of total loss of site electrical power supplies when the reactor primary coolant system is fully open.

Before 30 June 2013, the licensee shall propose final requirements to ASN for these provisions and shall indicate whether or not they are part of the hardened safety core.

**[EDF-GRA-15][ECS-17]**

No later than 31 December 2013, the licensee shall examine the requirements associated with the equipment needed to manage total loss of heat sink or total loss of electrical power situations, with regard to temperature resistance, resistance to earthquakes, flooding and the effects induced on the facility by these hazards.

Before 31 December 2013, the licensee shall submit a summary of this review to ASN, along with proposals for changes to the baseline safety requirements and the resulting facility reinforcements in order to deal with these situations, in particular for long-duration scenarios.

**[EDF-GRA-16][ECS-18]**

I. Before 30 June 2012, the licensee shall present ASN with the modifications it intends to make in order to significantly increase the operating time of the batteries used in the event of loss of the off-site and on-site electrical power supplies, by 31st December 2014.

II. As early as possible, in the light of the constraints involved in deployment across all the NPPs and, in any case, before 31 December 2018, the licensee shall, on each reactor on the site, install an additional electrical power supply capable, if the other off-site and on-site electrical power supplies are lost, of supplying the systems and components belonging to the hardened safety core covered by requirement [ECS-1] above.

These devices must meet the requirements concerning the hardened safety core presented in requirement [ECS-1] above.

III. In the meantime, and no later than 30 June 2013, the licensee shall install a temporary system on each reactor for supplying:

- the I&C (Instrumentation and Control system) necessary in the event of loss of the off-site and on-site electrical power supplies,
- the lighting of the control room

**[EDF-GRA-17][ECS-27]**

I. Before 31 December 2012, the licensee shall send ASN a feasibility study for the installation or renovation of a geotechnical containment or equivalent technical measure to prevent the transfer of radioactive contamination to groundwater and, by means of underground flow, to the surface waters, in the event of a severe accident leading to corium melt-through of the vessel.

II. Before 30 June 2013, the licensee shall submit to ASN an updated hydrogeological data sheet for the site, comprising current geological and hydrogeological data.

**[EDF-GRA-18][ECS-29]**

Before 31 December 2013, the licensee shall submit to ASN a detailed study of the possible improvements to the U5 venting-filtration system, taking account of the following points:

- resistance to hazards,
- limitation of hydrogen combustion risks,
- efficiency of filtration in the case of simultaneous use on two reactors,
- improved filtration of fission products, in particular iodines,
- radiological consequences of opening the device, in particular for accessibility of the site, and the radiological atmosphere of the emergency premises and control room.

**Title V: Management and removal of waste and spent fuels from a BNI**

**Chapter 4: Requirements concerning storage of waste and spent fuels**

**[EDF-GRA-19][ECS-22]**

Before 30 June 2012, the licensee shall present ASN with the modifications to be made to its facilities in order to reinforce prevention of the risk of accidental emptying of the fuel building pool:

- measures to prevent complete and rapid siphon emptying of the pool in the event of a break of a connected pipe
- automation of isolation of the cooling system intake line.

The measures to prevent complete and rapid siphon emptying of the pool in the event of a break of a connected pipe shall be performed before the end of March 2014.

Automation of cooling system intake line isolation shall be performed by 31 December 2016.

**[EDF-GRA-20][ECS-23]**

Before 30 June 2012, the licensee shall submit to ASN a study of the possible measures, in the event of total loss of electrical power supplies and accidental emptying, to ensure the safe positioning of a fuel assembly being handled in the fuel building, before the ambient conditions no longer allow access to the premises.

**[EDF-GRA-21][ECS-24]**

Before 31 December 2012, the licensee shall submit to ASN a study of the evolution versus time of the behaviour of the fuel and the water present in the spent fuel pool, in emptying and loss of



cooling situations. The licensee shall in particular evaluate the radiological ambient atmosphere in a pool boiling situation, along with the hydrogen concentrations, as a result of radiolysis, that could be reached in situations involving a loss of ventilation in the fuel building. At that time, the licensee shall propose and justify the steps that could be taken.

**[EDF-GRA-22][ECS-25]**

I. Before 31 December 2012, the licensee shall submit to ASN a study of the possible changes to equipment or operating conditions in order to prevent uncovering of the assemblies during handling, as the result of a break in the transfer tube between the pools in the reactor and fuel buildings or in the compartment drainage pipes.

II. Before 31 December 2012, the licensee shall present ASN with the possible changes to equipment or operating conditions to be made before 30 June 2013, in order to prevent the rapid loss of water inventory above the stored fuel assemblies, for example as the result of a break in the transfer tube between the pools in the reactor and fuel buildings or in the compartment drainage pipes.

## **Title VI: Management of emergency situations**

### **Chapter 1: General**

**[EDF-GRA-23][ECS-31]**

Before 31 December 2012, the licensee shall send ASN a file presenting the planned modifications on its site to ensure that in the event of a release of dangerous substances or opening of the U5 venting-filtration system, the operation and monitoring of all the facilities on the site is guaranteed, until a long-term safe state is reached, plus the associated deployment calendar.

**[EDF-GRA-24][ECS-32]**

Before 31 December 2012, the licensee shall reinforce its material and organisational measures to take account of accident situations simultaneously affecting all or some of the facilities on the site.

**[EDF-GRA-25][ECS-34]**

The licensee shall ensure that its agreements with neighbouring hospitals are updated every 5 years. These agreements shall be regularly tested during emergency exercises.

**[EDF-GRA-26][ECS-35]**

I. No later than 31st December 2012, the licensee shall define the human actions required for management of the extreme situations studied in the CSAs. It shall check that these actions can effectively be carried out given the intervention conditions likely to be encountered in such scenarios. It shall for instance take account of the relief of the emergency teams and the logistics necessary for the interventions. It shall specify any material or organisational adaptations envisaged. On the deadline date, the licensee shall transmit the summary of this work and the envisaged measures. On 30 June 2012, the licensee shall send ASN an interim report.

II. Before 31 December 2012, the licensee shall send ASN a list of the necessary emergency management skills, specifying whether these skills are liable to be held by outside contractors. The licensee shall provide proof that its organisation ensures the availability of the necessary skills in an emergency situation, including if outside contractors are used.

III. Before 30 September 2013, the licensee shall provide the personnel concerned with the training and preparation needed to enable them to respond to a particularly stressful accident situation. It shall ensure that the outside contractors liable to intervene in management of the emergency adopt similar requirements concerning the preparedness and training of their own staff.

IV. Before 30 September 2013, the licensee shall define the social and psychological care to be provided for the emergency teams, taking account of the family environment, implemented in a particularly stressful accident situation, to ensure working conditions allowing emergency management that is as effective as possible.

**[EDF-GRA-27][ECS-36]**

I. Before 30 June 2012, the licensee shall present ASN with the measures it intends to take in order to provide specialised teams capable of relieving the shift teams and deploying emergency response resources in less than 24 hours, with operations starting on the site within 12 hours following their mobilisation. This system may be common to several of the licensee's nuclear sites.

These teams shall be sized so that they can respond on all the reactors of the site and have measuring instruments that can be deployed as of their arrival. The licensee shall specify the organisation and sizing of these teams, in particular:

- the activation criteria,
- the tasks incumbent upon the teams,
- the material and human resources at their disposal,
- the individual protection equipment,
- the system put into place to ensure the maintenance of these material resources and their permanent operability and availability;
- the training of their staff and the skills currency process.

II. On 31 December 2012, this system will be deployable for use on a reactor on the site. It shall be able to intervene simultaneously on all the reactors of the site by the end of 2015.

III. Before 30 June 2012, the licensee shall also present the measures for adaptation of the system to simultaneous intervention on several of its nuclear sites.

**[EDF-GRA-28][ECS-30]**

I. The licensee shall ensure that the emergency situation management premises can withstand flooding in the event of the flood safety margin level being reached. Before 30 June 2012, it shall present ASN with the conclusions of this verification and any modifications considered to be necessary. Before 30 June 2013, it shall perform any necessary reinforcement works.

The licensee shall check that the emergency situation management premises can withstand the safe shutdown earthquake (SSE). Before 30 June 2012, it shall present ASN with the conclusions of this verification and any modifications considered to be necessary. Before 30 June 2013, it shall perform any necessary works accordingly.

II. No later than 30 June 2012, the licensee shall deploy independent communication resources allowing direct contact between the site and the national emergency organisation defined in the interministerial directive of 7 April 2005.

III. No later than 30 June 2013, the licensee shall store its mobile resources necessary for emergency management in appropriate premises or zones able to withstand the SSE and to withstand flooding in the event of the flood safety margin level being reached.