AUTORITÉ DE SÛRETÉ NUCLÉAIRE

RÉPUBLIQUE FRANÇAISE

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Complementary safety assessments of nuclear installations in the light of the Fukushima accident

1 - Experience feedback from the Fukushima accident

ASN[1] considers it essential to learn all lessons possible from the accident at the Fukushima Daiichi power plant, as it was case in the past from Three Mile Island and Chernobyl accidents.

As in the case of these previous accidents, in-depth experience feedback from the Fukushima accident will be a long process taking several years[2].

2 - Complementary safety assessments in France: European and French contexts

On the short term, ASN has decided to organise complementary safety assessments of French nuclear installations with respect to events similar to those occurring at Fukushima. These assessments are being conducted in addition to the safety procedure implemented permanently.

These complementary safety assessments are in a dual context: the carrying out of "stress tests" requested by the European Council at its meeting on 24 and 25 March, 2011, and conducting a safety audit of French nuclear installations with respect to the events of Fukushima, that the Prime Minister ordered ASN to carry out in application of Article 8 of law No. 2006-686 of 13 June, 2006 concerning transparency and security in the nuclear field (so-called "TSN act").

3 - The carrying out of complementary safety assessments

In accordance with the principle of the operator's responsibility, a basic precept of international nuclear safety, the complementary safety assessments will first result in each operator providing a report stipulated in the specifications issued by ASN; this will be done for each installation concerned.

In order to implement this phase, in application of Article 29 of the TSN act, ASN issued resolutions, on 5 May, on drawing up these reports by operators of basic nuclear installations according to a clearly defined schedule.

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[1] French Nuclear Safety Authority

[2] For example, after the Three Mile Island accident, six years were required to determine the proportion of reactor core meltdown.

Each report will then be examined by ASN with the technical support of the IRSN (Radioprotection and Nuclear Safety Institute). The conclusions of ASN will be made public and may lead to additional ASN requirements and possibly to government proposals for the measures which come within its control.

Consultations will be run during the entire process. Nationally, ASN proposed to the HCTISN (Commission for Transparency and Information of Nuclear Safety) to continue its participation according to mechanisms to be jointly defined. Locally, actions will be taken with Local Information Committees. The participation of French and/or foreign experts will be sought.

4 - **Specifications**

In order to ensure maximal consistency between the European and French approaches, the French specifications were prepared on the basis of the "Specifications of Stress Tests" project for power reactors drafted by the WENRA (Western European Nuclear Regulators Association) and that will soon be the subject of discussions by competent European authorities[3].

ASN has thus decided to extend complementary safety assessments to all nuclear installations that could be jeopardised in case of events of the same type as those of Fukushima, and not only for power reactors. This is why several initial adaptations of the French specifications were required with respect to the European document. Other worthwhile contributions were made during the detailed consultation conducted by the HCTISN which in particular led to the development of aspects concerning social/organisational and human factors. The HCTISN approved the French specifications on 3 May, 2011.

The complementary safety assessments will involve a targeted re-assessment of safety margins of nuclear installations in the light of the Fukushima events, i.e. extreme natural phenomena (earthquake, flooding and the conjunction of both of them) intended to test the safety functions of the installations and that could lead to a severe accident. The assessments will initially involve the effects of these natural phenomena and will then address the case of a loss of one or several safety functions implicated at Fukushima (electric power supplies and reactor cooling systems) regardless of the probability or cause of the loss of these functions. Finally, the assessments will deal with the management of severe accidents that could result from these events.

This complementary safety assessments will include three major aspects:

- Measures taken in the basis design of the installation and its compliance with applicable design requirements.
- The robustness of the installation beyond for what it was designed; in particular, the operator shall identify situations that could cause a sudden degradation of sequences implemented in case of accident “cliff effects” and will present measures to prevent them.
- Every modification possibility that could improve the installation's safety level.

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[3] In accordance with the conclusions of the European Council, the extent and mechanisms of European stress tests must be defined by European Nuclear Safety Regulators (ENSREG) and the European Commission "*by maximally profiting from available expertise (especially that of the WENRA)"*. ENSREG will held a meeting on this subject in Brussels on 12 and 13 May.

5 - Installations concerned and the schedule

The complementary safety assessments involve practically all basic nuclear installations[4].

They have been broken down into three categories depending on their vulnerability to phenomena causing the Fukushima accident and the magnitude of the consequences of an accident affecting these BNIs.

For priority installations (in particular all power reactors in operation or under construction), operators are required to submit a note to ASN by 1 June, 2011 describing the methodology adopted to conduct the complementary safety assessments, and a draft report no later than 15 September, 2011. ASN and its IRSN technical support will analyse these reports by 15 November, 2011.

For installations with lower priority, operators will have until 15 September, 2012 to conduct and present their complementary safety assessments. If a given operator is concerned by only low priority installations, his deadline for submitting his methodology note to ASN is 15 January, 2012.

Finally, non-priority installations will be dealt with by adapted requests by ASN, in particular at their next periodic 10 year safety re-assessment.

The list of French nuclear installations and their priority is given below.

[4] Are not included fewer than 10 installations whose dismantling is almost terminated.

Complementary safety assessments of nuclear installations in the light of the Fukushima accident

List of installations and sites as of 5 May, 2011

1) Priority installations and sites to be examined in 2011

- **Installations operated by Electricité de France - Power reactors**

1. Belleville power plant (BNI 127 and 128)
2. Blayais power plant (BNI 86 and 110)
3. Bugey power plant (BNI 78 and 89)
4. Cattenom power plant (BNI 124, 125, 126 and 137)
5. Chinon B power plant (BNI 107 and 132)
6. Chooz B power plant (BNI 139 and 144)
7. Civaux power plant (BNI 158 and 159)
8. Cruas power plant (BNI 111 and 112)
9. Dampierre power plant (BNI 84 and 85)
10. Fessenheim power plant (BNI 75)
11. Flamanville site, including Flamanville reactor 3 (BNI 108, 109 and 167)
12. Golfech power plant (BNI 135 and 142)
13. Gravelines power plant (BNI 96, 97 and 122)
14. Nogent power plant (BNI 129 and 130)
15. Paluel power plant (BNI 103, 104, 114 and 115)
16. Penly power plant (BNI 136 and 140)
17. Saint-Alban-Saint-Maurice power plant (BNI 119 and 120)
18. Saint Laurent B power plant (BNI 100)
19. Tricastin power plant (BNI 87 and 88)

- **Installations operated by the Alternative Energies and Atomic Energy Commission**

Cadarache	Jules Horowitz reactor (experimental reactor and irradiation) (BNI 172)
	Masurca (critical model) (BNI 39)
	ATPu (laboratory being dismantled) (BNI 32)
Saclay	OSIRIS (experimental reactor) (BNI 40)
Marcoule	Phenix (BNI 71)

- **Installations operated by the AREVA Group**

La Hague	UP3 (BNI 116)
AREVA NC	UP2 800 (BNI 117)
	UP2 400 (BNI 33)
	STE2 A silos (BNI 38)
	HAO (BNI 80)
	Elan 2B (BNI 47)
	STE3 (BNI 118)
	Site support functions
Marcoule	MELOX SA: Melox plant (BNI 151)
Tricastin	EURODIF SA: George Besse I plant and its ancillary (BNI 93)
	SET: George Besse II and plant and its ancillary RECII (BNI 168)
	AREVA NC: TU5 W plant (BNI 155)
	Comurhex - Tricastin plant (BNI 105)
	SOCATRI - Plant (BNI 138)
	Site support functions

Romans	FBFC: FBFC plant (BNI 98)

- **Installation operated by the Laue Langevin Institute**

Grenoble	High flux reactor (HFR) (BNI 67)

2) Installations and sites to be examined in 2012

- **Installations operated by the Alternative Energies and Atomic Energy Commission**

Cadarache	Rapsodie (BNI 25)
	MCMF (BNI 53)
	LECA (BNI 55)
	CHICADE (BNI 148)
	Cabri (BNI 24)
	PEGASE (BNI 22)
	Storage site (BNI 56)
	Site support functions
Saclay	Orphée (BNI 101)
Marcoule	Atalante (BNI 156)
	Site support functions

- **Installation operated by the AREVA Group**

Romans	FBFC - CERCA plant (BNI 63)

- **Installation operated by Cisbio International**

Saclay	Cisbio plant (BNI 29)

- **Electricité de France installations being dismantled**

Creys Malville	Superphenix including TNA (BNI 91)
	APEC (BNI 141)
Bugey power plant	Bugey 1 (BNI 45)
Chinon power plant	Chinon A1 (BNI 133)
	Chinon A2 (BNI 153)
	Chinon A3 (BNI 161)
Saint-Laurent power plant	Saint-Laurent A1 (BNI 46)
	Saint-Laurent A2 (BNI 46)
Chooz power plant	Chooz A (BNI 163)
Brennilis	Monts d'Arrée - EL4-D (BNI 162)

- **Installation planned by Iter Organization**

Cadarache	ITER

3) Other non-priority installations, to be examined according adapted requests by ASN, by also requesting possible, anticipated re-examinations

- **Installations operated by the Alternative Energies and Atomic Energy Commission**

Cadarache
- Phebus (BNI 92)
- EOLE (BNI 42)
- MINERVE (BNI 95)
- STAR (BNI 55)
- Magenta (BNI 169)
- CEDRA (BNI 164)
- LPC (BNI 54)
- LEFCA (BNI 123)
- CASCAD (BNI 22)
- AGATE (BNI 171)
- STEDS Treatment (BNI 37)

Saclay
- ISIS (BNI 40)
- LECI (BNI 50)
- Poseidon (BNI 77)
- LHA (BNI 49)
- ZGDS Storage (BNI 72)
- ZGEL Treatment and storage (BNI 35)

Grenoble
- STED (BNI 36)
- STED (BNI 79)
- LAMA (BNI 61)

Fontenay-aux-Roses
- BNI Process (BNI 165)
- BNI Support (BNI 166)

The following BNIs are not concerned by complementary safety assessments: ATUe (BNI 52) at Cadarache, Ulysse (BNI 18) at Saclay, Melusine (BNI 19) and Siloe (BNI 20) at Grenoble.

- **Installations operated by IONISOS**

- Dagneux (BNI 68)
- Pouzauges (BNI 146)
- Sablé sur Sarthe (BNI 154)

- **Installations operated by Andra**

- Centre de la Manche (BNI 66)
- CSFMA (BNI 149)

- **Installations operated by Electricité de France**

Tricastin
- Tricastin operational hot unit (BCOT in French) (BNI 157)

Chinon
Irradiated materials unit (BNI 94)
Interregional nuclear fuel storage facility (BNI 99)

Bugey
Interregional nuclear fuel storage facility (BNI 102)
ICEDA (BNI 173)

Saint- Laurent
St Laurent storage silos (BNI 74)

- **Installations operated by the AREVA Group**

Narbonne
Comurhex Malvesi (ECRIN) (authorisation application under way)

- **Other operators**

SOCODEI - Marcoule
Centraco (BNI 160)

SOMANU - Maubeuge
Nuclear maintenance unit (BNI 143)

GIE GANIL - Caen
GANIL (BNI 113)

ISOTRON
GAMMASTER - Marseille (BNI 147)
GAMMATEC - Chuslan (BNI 170)

The following BNIs are not concerned by complementary safety assessments: reactors at the University Louis Pasteur in Strasbourg (BNI 44), LURE (BNI 106) and SICN (BNI 65 and BNI 90).