Committed to life

IRE et les stress tests: quick win, prise en compte d'événements hors bases de conception, coûts et perspectives

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TOC

Introduction - I

Main activity of IRE : production of ^{99}Mo, ^{131}I, $^{90}Sr/^{90}Y$

Technology : Fission of HEU targets. Irradiation in high neutron flux reactors (e.g. BR2 of SCK).

The irradiated targets are dissolved and processed in hot cells in the production building (B6).

These hot cells are called « alpha-cells » with respect to their air leak tightness.

The ventilation system of the hot cells is designed to ensure their dynamic confinement (-> need of electrical power).

The solid U remaining of the process is stored temporarily on site in appropriate storage structures.

Safety function

Introduction - II

- **Static and dynamic confinement of the radioactive source term**
- **Maintain the sub criticality**

1. quick win

Quick win -I

Analyse de risque intuitive sur nos installations par rapport à des évènements extrêmes pour

- Augmenter le degré de sûreté
- Faciliter les interventions d'urgence sur les installations

Scénario

- Séisme de faible intensité
- Fortes pluies et trombes d'eau
- Chutes importantes de neige
- Vents violents
- Perte des alimentations électriques
- Perte d'alimentation en eau pour le dissolveur

Quick Win -II

- Fixation avec chevilles spécifiques des tableaux de régulation des ventilations
- Récupération des effluents en citernes mobiles
- Conteneur maritime contenant l'outillage de première nécessité
- Acquisition de 3 groupes motopompes 80 m³/h

Quick Win - III

- Acquisition d'un MB TRAC équipé d'une lame à neige et d'une épandeuse
- Groupes de secours mobiles permettant l'alimentation directe des équipements essentiels de sûreté
- Acquisition de lampes de chantiers portables

2. External events not in the original design basis

External events not in the original design basis- I

External events like :

Earthquake, aircraft crash (terrorist), tornado,…

=> not in the original design basis of the installation

Kashiwazaki-Kariwa earthquake 16/7/07

Level 6.8 on Richter scale; approximately PGA of 1 g >> RLE fleurus 0.16 g

External events not in the original design basis- II

For installations that were not designed to withstand external events, their resistance to those events is not easy to evaluate (lack of design details, etc.)

-> studies performed by contractors (TE, TEF, ROB,..).

ROB: probabilistic seismic-hazard assessment

TEF: seismic structural studies of the buildings

TE: SQUG and external flooding due to heavy rainfalls

+ support by NSSS on specific topics.

External events not in the original design basis- III

Considering the buildings earthquake resistance level the results are limited to:

For each building

- Up to a given magnitude (PGA) -> OK
- Above this value -> damages can not be excluded -> probability of damages with the PGA value

External events not in the original design basis- IV

GOOD NEWS

Existing installations are either (with limited improvements):

- able to resist to some external events.
- do not affect the safety functions (+ no abnormal radioactive release to environment)

Remark: Implementation of some limited improvements are still ongoing.

BUT: severe external events (e.g. high seismic acceleration) could endanger the performance of safety functions.

External events not in the original design basis- V

Action plan will improve the nuclear safety of the existing installations.

But if we take into account all the BESTA external events:

Existing installations are not compliant

- > new installations ? Which design basis external events ?

3. Costs

COSTS

The studies for the final report and quick win: 300 k€

Action plan (ongoing): estimation 1000 k€

New installations to produce radioisotopes is (order of magnitude) : 10^8 €

4. Perspectives

Perspectives

The safety improvements with respect to some events are really positive from a safety point of view.

The costs of the BEST A studies and corrective actions are significant.

The design of new installations will probably have to consider such external events. For the nuclear safety, it would be an improvement.

Nevertheless, the other radioisotope producers do not have to comply with the same safety requirements. From a marketing point of view and in the framework of the full cost recovery -> negative impact on the IRE prices !!