

RAPPORTEURS' REPORT - FRANCE
ENSREG NATIONAL ACTION PLANS WORKSHOP – 2015

1.0 ASSESSMENT OF THE STRUCTURE OF NATIONAL ACTION PLAN

1.1 Compliance of the national action plan with the ENSREG Action Plan:

The structure of the French National Action Plan mainly complies with the ENSREG Action Plan. Some of the subchapter titles differ from the wording used for the topics in the Compilation of recommendations and suggestions in the ENSREG-Report on the Peer review of stress tests performed on European nuclear power plants.

no changes

1.2 Adequacy of the information supplied, taking into account the guidance provided by ENSREG.

The information supplied is adequate in general. Where additional information was of interest, the countries asked specific questions ahead of the workshop.

no changes

2.0 ASSESSMENT OF THE CONTENT OF NATIONAL ACTION PLAN

2.1 How has the country addressed the recommendations of the ENSREG Action Plan?

France has defined tasks that either refer to safety analyses targeted to open issues or to corrective action that address these issues. The tasks are assigned to five thematic groups. France addresses the general recommendations from the Peer Review, those specifically addressed to France, and the CNS recommendations.

no changes

2.2. Schedule of the implementation of the NAcP

The schedule of actions to be performed by EDF covers the years 2012 to 2018. Taking into account that the concept of the hardened safety core will lead to substantial plant modifications and extensions, the time scale seems ambitious. Some of the tasks however, that are planned for the next PSR, will not be completed within this timeframe. This applies e.g. for extending the scope of probabilistic safety studies to external hazards. The regulator argues to have made a deliberate choice to prioritize concrete reinforcement measures (either fixed modifications of the plants, e.g. hardened safety core, or mobile means, e.g. the Nuclear Rapid Response Force).

The report contains additional information on the implementation schedule. The original schedule that covered the years 2012 to 2018 has been replaced by a schedule that dis-

tinguishes three phases for the remaining actions (phase 1 from 2012 to 2015, phase 2 from 2015 to 2020, and phase 3 from 2019 onwards in the context of the next periodic safety review of each plant). This implies an extension of the implementation time. Nevertheless, most of the actions based on temporary or mobile means or related to the Nuclear Rapid Response Force have been completed according to the original schedule.

2.3 Transparency of the NAcP and of the process of the implementation of the tasks identified within it

The NAcP and the process of implementation of the tasks are transparent. The state of progress of each task is presented in the report. The report is available on the regulator's website. The regulator will inform twice a year on the progress of implementation. Within the stress test, representatives of the French High Committee for Transparency and Information on Nuclear Security, the local information committees and several foreign safety regulatory bodies were invited to attend the technical meetings as observers and to take part in the targeted inspections.

no changes

2.4 Commendable aspects (good practices, experiences, interesting approaches) and challenges

The approach of the hardened safety core is focused on beyond design basis events. Its objectives are prevention of an accident with fuel melt or limiting its progression, limiting large-scale radioactive releases and enabling the licensee to fulfil its emergency management duties. The safety core consists of an additional ultimate electricity generating set and a diverse emergency cool-down water supply for each reactor, new crisis management premises for each site, mobile devices and means of communication essential to emergency management, as well as technical and environmental instrumentation. They will be designed to withstand extreme natural hazards with references that are well beyond current design basis. The functional perimeter of the hardened safety core, as proposed by EDF, was presented to the Advisory Committee of Experts on 13 December 2012. The Advisory Committee of Experts recommended to complement the concept with additional mitigating functions.

Decisions on the replacement of filtered containment venting will be taken after studies by the licensee, that are to be completed by the end of 2013. The goal is mainly to improve filtration of iodine. This improvement should be considered with greater priority.

An offsite "rapid nuclear response force" is already operational and will be fully deployed for a four reactor site in 2014, with both mobile equipment and specialized crews which could intervene within 24 hours simultaneously on all units of an affected site.

France extended the stress test to all 150 nuclear installations (58 NPPs, NPPs under construction, fuel cycle facilities, research reactors, etc.). As a result of this extended scope new waste storage facilities will be built.

The social, organisational and human factors, which are key elements in safety, received particular attention during the stress tests performed in France. The regulator focuses on the renewal of the licensees' workforce and skills as well as the organisation of subcontracting, particularly the role of subcontractors in crisis management.

The design approach for the hardened safety core is a good practice. The hardened safety core is designed to withstand a probabilistically defined increased seismic hazard (return period of 20,000 years), an updated flooding reference level where needed, and additional external hazards.

The implementation of the hardened safety core approach proves to be challenging. Already the concept and design phases require a process lasting several years. It is evidence of wisdom that when fixing deadlines, ASN takes into account the impact on safety of the operator's workload due to simultaneous modifications of NPPs.

2.5 Technical basis related to main changes and relevant outcomes of studies and analyses

Based on a suggestion by the operator, the strategy with regard to reinforcement of the U5 venting-filtration system ("sand-bed filter") will be split up into two stages:

In the first stage (within phase 2 of NAcP actions), two measures will be taken: Sodium tetraborate baskets to reduce the emission of gaseous iodine in accident situations at NPPs that do not have silver-indium-cadmium-alloy control-rod-clusters will be installed. The seismic robustness of the sand-bed-filters will be increased to the lower regulatory seismic level.

In the second stage (within phase 3 of NAcP actions), either modifications within the hardened core approach (basemat thickening in combination with an improved heat removal system) will be implemented to manage a Fukushima-like event without a need for containment-venting or a retrofit of a filtered venting-system against the higher regulatory seismic level will be done. The decision for either alternative will depend on the results of the safety analyses.

The study of the feasibility of installing a geotechnical containment has led to a noteworthy result currently being examined by ASN. The operator regards a geotechnical containment as not feasible at an economically acceptable cost. ASN mentions that geotechnical containment is usually built before civil engineering starts. The term geotechnical containment designates a not totally leak tight barrier to limit migration of contaminated water from outside the containment to the soil.

3.0 PEER-REVIEW CONCLUSIONS

The structure of the French National Action Plan complies with the ENSREG Action Plan. The information supplied is adequate in general. Where additional information was of interest, the countries *and the public* asked specific questions ahead of the workshop.

The actions that France has defined address all recommendations, i.e. the general recommendations from the Peer Review, those specifically addressed to France, and the CNS recommendations. The measures defined are the basis for significant improvements of overall nuclear safety of French NPPs.

The NAcP and the process of implementation of the actions are transparent. The state of progress of each action is presented in the report. The report is available on the regulator's website. The regulator will inform twice a year on the progress of implementation. Within the stress tests, representatives of the French High Committee for Transparency and Information on Nuclear Security, the local information committees and several foreign safety regulatory bodies were invited to attend the technical meetings as observers and to take part in the targeted inspections.

The implementation of the NAcP has been rescheduled. Actions have been assigned to 3 phases: phase 1 from 2012 to 2015, phase 2 from 2015 to 2020, and phase 3 from 2019 onwards in the context of the next periodic safety review of each plant. Most of the actions based on temporary or mobile means or related to the Nuclear Rapid Response Force have been completed according to the original schedule.

France *had* extended the stress test to all of its 150 nuclear installations (58 NPPs, NPPs under construction, fuel cycle facilities, research reactors, etc.). As a result of this extended scope new waste storage facilities will be built. France also *addressed* social, organisational and human factors, which are key elements in safety. The regulator focuses on the renewal of the licensees' workforce and skills as well as the organisation of subcontracting, particularly the role of subcontractors in crisis management.

The actions that France has defined allow significant improvements of overall nuclear safety of the French NPPs and they are mainly focused on preventive and mitigative accident management in case of extreme natural hazards. They *have been or* will be designed with references that are well beyond current design basis.

There are two commendable aspects which deserve to be highlighted, i.e. the approach of the hardened safety core and the deployment of a nuclear rapid response force (FARN).

The approach of the hardened safety core is focused on beyond design basis events. Its objectives are prevention of an accident with fuel melt or limiting its progression, limiting large-scale radioactive releases and enabling the licensee to fulfill its emergency management duties. The safety core will include an additional ultimate electricity generating set for each reactor, a diverse emergency cool-down water supply for each reactor, new crisis management premises for each site, mobile devices and means of communication essential to emergency management, as well as technical and environmental instrumentation. *The hardened safety core is designed to withstand a probabilistically defined increased seismic hazard (return period of 20,000 years), an updated flooding reference level where needed, and addition external hazards. The implementation of the hardened safety core approach proves to be challenging. Already the concept and design phases require a process lasting several years.*

The rapid nuclear response force consists of specialized crews equipped with mobile equipment which can intervene within 24 hours simultaneously on all units of an affected site. It is already capable to intervene on a 4 plant-unit site. By the end of 2015 it will have a 6 plant-unit intervention capability.