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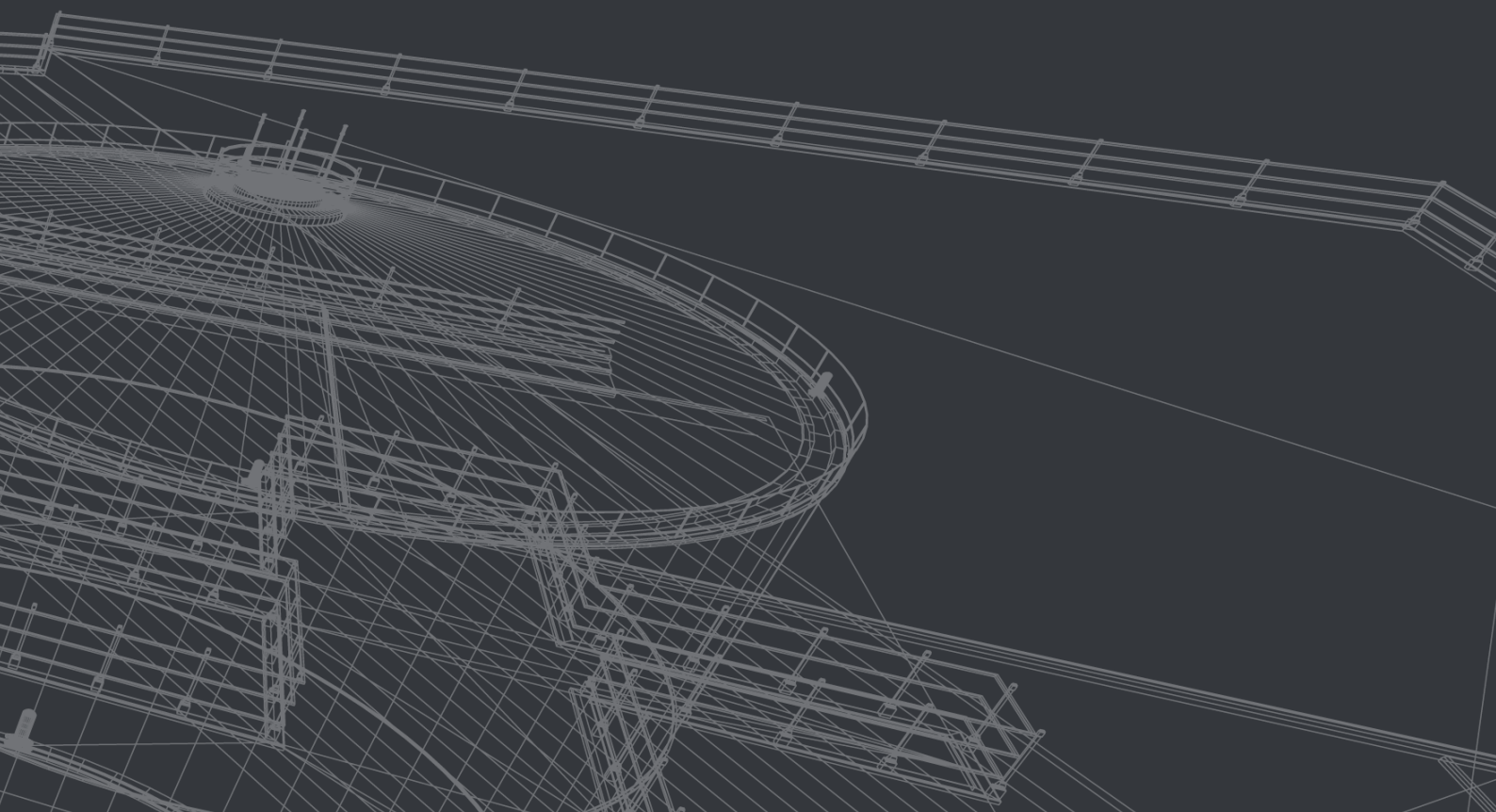
Swiss Federal Nuclear Safety Inspectorate ENSI

Action Plan Fukushima 2014



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1 Introduction

Immediately after the reactor accidents at the Fukushima Dai-ichi nuclear power plant in Japan on 11 March 2011, ENSI initiated measures to review the safety of Switzerland's nuclear power plants. The measures were contained in four formal orders issued by ENSI. The first three formal orders (dated 18 March, 1 April and 5 May 2011) called for immediate measures and supplementary analyses.

The immediate measures comprised the construction of a joint external emergency storage facility for the Swiss nuclear power plants, including the necessary plant-specific hook-up points for Accident Management (AM) equipment, and backfits to provide external injection into the spent fuel pools. The additional reassessments focused on the design of the Swiss nuclear power plants against earthquakes, external flooding and a combination thereof. Screening investigations were also requested regarding the coolant supply for the safety and auxiliary systems and the spent fuel pools.

In parallel with these investigations by the licensees, ENSI itself conducted topical inspections during 2011, entailing reviews of the cooling systems already in place for spent fuel pools, protection against external flooding and systems for filtered containment venting. These topical inspections were continued during 2012: they included the plants' strategies in case of a prolonged loss of power supply, processes for the assessment of external operating experience, and the emergency rooms available in the Swiss plants. The radiation protection equipment available on site, which is a basic prerequisite for coping with a serious accident, was inspected at all the nuclear power plants during 2013. Radiation protection equipment is also essential so that the emergency rooms can be used by the emergency response organisation in the longer term.

The results of ENSI's reviews confirmed that the Swiss nuclear power plants display high levels of protection against the impacts of earthquakes, flooding and combinations thereof, and that appropriate precautions have been put in place to cope with a loss of power supply and of the ultimate heat sink. The safety case has been demonstrated for all the analysed accidents on the basis of the hazard assumptions that are currently applicable. This means that compliance with the basic statutory requirements for fulfilling the fundamental safety functions (reactivity control, cooling of the fuel elements and confinement of radioactive substances) is guaranteed. In order to continue improving safety, however, ENSI has stipulated a series of additional requirements for substantial backfits, e.g. a requirement for a flood-proof and earthquake-resistant diversified ultimate heat sink. ENSI is supervising the work carried out by the nuclear power plants to meet these requirements in the course of its ongoing supervisory activities, either by drawing up reviews, issuing permits or carrying out on-site inspections and checks.

In its fourth formal order issued on 1 June 2011, ENSI requested the licensees to take part in the EU stress tests. ENSI reviewed the documentation for the EU stress tests submitted by the licensees in the Swiss country report on the EU stress tests (ENSI-AN-7798 dated 31 December 2011). On 10 January 2012, further formal orders were issued requiring clarification of three major open points arising from the analysis of the final reports by the Swiss nuclear power plants for the EU stress tests. Switzerland's submissions for the EU stress tests then underwent a peer review process. The results of the peer review at European level confirm ENSI's conclusions regarding the safety of Swiss nuclear power plants, and they also provide an overview of the condition of plants in Europe. ENSI is currently implementing the two recommendations made by the peer review team for Switzerland, which relate to scenarios beyond the design basis. In addition, ENSI is participating in the follow-up work on the EU stress tests in order to track implementation of the recommended measures in Europe, and it is actively collaborating on the optimisation of the WENRA Safety Reference Levels.

In parallel with the activities mentioned above, ENSI published four reports during 2011 in relation to the event analysis of the Fukushima accident:

- Fukushima sequence 11032011, Event Sequences at Fukushima Dai-ichi and Dai-ni following the Tohoku-Chihou-Taiheiyou-Oki Earthquake on 11.03.2011, ENSI-AN-7614 Rev. 1 (26 August 2011)
- Fukushima analysis 11032011, In-depth Analysis of the Accident at Fukushima on 11 March 2011, With Special Consideration of Human and Organisational Factors, ENSI-AN-7669 (29 August 2011)
- Fukushima lessons 11032011, Lessons Learned and Checkpoints based on the Nuclear Accidents at Fukushima, ENSI-AN-7746 (29 October 2011)
- Fukushima impact 11032011, Radiological Effects of the Nuclear Accidents at Fukushima on 11.03.2011, ENSI-AN-7800 (16 December 2011)

The knowledge obtained from analysing the events of the accident at Fukushima was reviewed to determine its applicability to Switzerland, and a summary was compiled in the ENSI report entitled "Lessons Learned" in the form of a series of checkpoints. Further points were added on completion of the analyses for the EU stress tests. The current overview can be found in Annexes 1 and 2. The list of points identified is reviewed continuously on the basis of the latest findings and is updated as necessary. Processing of the checkpoints will probably be completed by 2015.

At the end of 2013, BKW (BKW Energy Ltd.) notified ENSI that it has decided to permanently cease operations of the Mühleberg nuclear power plant (KKM) in 2019. This decision not to continue the unlimited long-term operation of KKM impacts the implementation of the planned backfits, part of which ordered on the basis of Fukushima (see the comments on this aspect in section 2).

The Fukushima action plans serve the purpose of ensuring transparency as regards processing of the identified points until they are implemented. They also provide an instrument for the planning of supervisory work and the assessment of new knowledge gained from the Fukushima accident. Progress with processing the identified points is documented and published. The action plan itself is updated by February of the year in progress by identifying key issues for that year. ENSI's annual reporting also provides information about the processing status. Beyond that, the public may be informed on specific issues should the need arise.

ENSI report	**Publication**
Fukushima Action Plan	February
Oversight Report, Radiological Protection Report, Research and Experience Report	April - June
National Action Plan for Follow-Up to the EU Stress Tests (as instructed by ENSREG)	December-January

2 Definitive cessation of operations of the Mühleberg nuclear power plant (KKM) in 2019

In its statement regarding the long-term operation of KKM, ENSI concluded in December 2012 that there are no safety-related objections against the operation of KKM beyond a period of 40 years, provided that the improvement potentials identified by ENSI are addressed promptly. ENSI's statement also called for the backfits ordered on the basis of Fukushima to be implemented on a staggered basis by 2017. BKW planned to carry out these backfits within the specified timeframe under the auspices of the DIWANAS project. The DIWANAS project intended to implement a diverse cooling water supply, an additional cooling system for the spent fuel pool and a further residual heat removal system.

Given that proceedings before the Federal Supreme Court were still pending when ENSI's statement on long-term operation was published, ENSI refrained from issuing a formal order to enforce its requirements at the end of 2012. In its ruling on 28 March 2013, the Federal Supreme Court rescinded the time limitation on the operating licence for KKM. KKM therefore has a time-unlimited operating licence. Among other points, the Federal Supreme Court stipulated that ongoing supervision should ensure that safety is guaranteed throughout the entire term and that, where appropriate, backfits should be implemented to improve safety. ENSI is responsible for ordering the backfits as part of its ongoing supervisory activities. ENSI then prepared a formal order regarding the long-term operation of KKM. ENSI submitted the draft formal order with the requirements regarding long-term operation to BKW on 25 October 2013, in the course of the legal hearing on the statement. In its statement in connection with the legal hearing dated 8 November 2013, BKW informed ENSI that it had decided to definitively cease operations of KKM in 2019.

The requirements in ENSI's statement on the long-term operation of KKM in connection with the DIWANAS project relate to the backfits which must be implemented by the end of the 2017 annual refuelling and maintenance outage. If permanent cessation of operations were to take place in 2019, these backfits would only be effective for a further two years of power operation. The additional cooling system for the spent fuel pool will actually also be required after power operation comes to an end, during the first years of the definitive shutdown. In view of the changed background, the question arose as to how far it is necessary to adhere to the requirements covered by the DIWANAS project stipulated in ENSI's statement on long-term operation. It was not possible to assess this question conclusively at the time when ENSI's formal order was issued (November 2013) because the basis for a decision was insufficient. ENSI therefore directed BKW to submit a reasoned application for the necessary backfits taking account of the definitive cessation of operations in 2019, in addition to updated planning documents regarding the post-operative phase and the decommissioning. If BKW intends to diverge from the requirements included in the DIWANAS project (which is geared to long-term operation), it must demonstrate by the end of June 2014 how an adequate gain in safety can be achieved even if these requirements are not implemented, taking account of the remaining operational period. On the basis of the documentation to be submitted by BKW, ENSI will examine the safety conditions under which operation until 2019 can be accepted by the end of 2014.

ENSI has reported its decisions regarding the definitive cessation of operations of KKM in 2019 to the public in detail (http://www.ensi.ch/de/tag/muehleberg/). ENSI will continue to provide detailed reports about its supervisory activities as part of its comprehensive communication strategy, for example by answering questions within the Technical Forum on Nuclear Power Plants.

3 Retrospective of 2013

3.1 Earthquakes

In a complex process led by swissnuclear, the umbrella organisation of the Swiss nuclear power plant licensees, recognised international experts from Switzerland and other countries have re-analysed the seismic hazard for the nuclear power plant sites in Switzerland. The new study represents a refinement of the analyses in the PEGASOS project completed in 2004. The licensees submitted the final report on their seismic study (the PEGASOS Refinement Project, PRP) to the Federal Nuclear Safety Inspectorate (ENSI) at the end of 2013. ENSI is currently reviewing these reports. As part of its usual reporting, ENSI will provide information on the results of the review of the final PRP reports and also the definition of the new site-specific seismic hazards and additional related supervisory activities.

In 2013, ENSI developed the methodology for the deterministic seismic safety case to be provided by the Swiss nuclear power plants on the basis of the new site-specific seismic hazards. Completion of the report on the methodological requirements is scheduled for the first quarter of 2014. The methodology developed for the deterministic seismic safety case consists of a more specific version of the safety case following the reactor accident at Fukushima. In this regard, ENSI specifies that adequate safety of the Swiss nuclear power plants must be proven deterministically for earthquakes with frequencies of 10^{-3} per year and 10^{-4} per year (mean values). ENSI's requirements for these representative earthquakes in accident categories 2 and 3 as per the Hazard Assumption Ordinance (SR 732.112.2) stipulate:

- the seismic impacts to be considered;
- the scope of consideration for the structures, systems and components (SSC);
- determination of the seismically induced impacts on the SSC;
- proof of adequate seismic capacity for the SSC;
- the technical and radiological accident analyses; and
- the quality of the documentation.

In the course of analyses for the EU stress tests, ENSI became aware that automatic scrams triggered upstream by means of the seismic instrumentation proved advantageous in the Japanese nuclear power plants during severe earthquakes. In mid-2013, ENSI therefore set up a working group to examine whether automatic scrams should be implemented upstream by means of the seismic instrumentation in Swiss nuclear power plants. In a first step, the current seismic instrumentation and its integration into the emergency procedures were documented for each Swiss nuclear power plant. The latest scientific and technical developments in seismic early warning systems were also surveyed, and information from international sources regarding the use of seismic instrumentation for automatic scrams was gathered. Additional information about the international situation is currently being collected (see 4.1 for the further activities).

3.2 Containment integrity

a) Seismic robustness of the containment venting systems at Gösgen and Leibstadt

The licensees of the Swiss nuclear power plants submitted the required studies on schedule. ENSI has reviewed the submitted proof and concludes in its statement that the containment venting systems at KKG and KKL display adequate seismic robustness based on the current seismic hazard assumptions (what is known as the "Intermediate Hazard" in the PEGASOS Refinement Project, PRP-IH). KKL nevertheless plans a further increase in the seismic robustness of the system. The corresponding improvement measures will be carried out during the annual refuelling and maintenance outage in 2014. ENSI has confirmed compliance with point 3.2 of the formal order dated 10 January 2012.

b) Seismic robustness of the isolation for the containment and the primary circuit

After reviewing the evidence, which was submitted on schedule, ENSI concludes in its statement that the isolation for the containment and primary circuit in all the Swiss nuclear power plants displays adequate seismic robustness on the basis of the current seismic hazard assumptions (PRP-IH). KKG will make further improvements to the seismic robustness of the emergency diesel generator units that are required for complete isolation of the containment in 2014 and 2015. ENSI has confirmed compliance with point 3.1 of the formal order dated 10 January 2012.

c) Requirements for containment integrity

A more extensive review of containment integrity at the Swiss nuclear power plants was postponed until new coordinated requirements are available at European level. In the main, these requirements are to be developed by the Reactor Harmonisation Working Group (RHWG) of WENRA. For this purpose and in order to revise the WENRA Reactor Safety Reference Levels (SRLs), several sub-groups of the RHWG were set up, and ENSI has been actively participating in them. The explanatory report on the revised WENRA SRL F (Design Extension of Existing Reactors) was adopted in Brussels in November 2013. WENRA then published the revised SRLs on its website: http://www.wenra.org/archives/consultation-revised-wenra-safety-reference-levels/ for public consultation over a period of three months until 28 February 2014. The new requirements will be implemented in the Swiss nuclear power plants once the relevant new WENRA SRLs have been definitively adopted. ENSI will provide prompt information to the public on this matter.

The previous issues arising from the Fukushima Action Plan 2013 have therefore been completed. The action point regarding "Containment integrity" is carried forward into the 2014 action plan with a new issue for investigation (see 4.2).

3.3 Extreme weather conditions

In 2012, ENSI defined the requirements for the probabilistic hazard analyses and safety case needed to demonstrate adequate protection of plants against extreme weather conditions. Quantitative analyses must be undertaken regarding the hazards of extreme winds, tornadoes, extreme air and river water temperatures, heavy rain on the plant site and snow depths. The following hazards, however, can be given qualitative treatment: hail, sleet (frozen rain), drought, forest fire, icing and combinations of exceptionally harsh winter conditions, as well as extremely harsh summer conditions.

The design-basis values for the buildings and equipment required to cope with the hazard in question must be presented as proof of adequate plant protection. It is also necessary to demonstrate that these values can withstand the expected loads. The margin in relation to the design basis must also be stated.

The concept for the safety case needed to demonstrate adequate protection against extreme weather conditions was submitted promptly by the licensees at the end of 2012 and was reviewed by ENSI. Implementation of the concept (under the direction of swissnuclear) entails obtaining the necessary meteorological and/or historical data, mathematical processing of the data, as well as site-specific presentations and plant-specific assessments of the impact on plant safety.

Delays to the project arose during 2013, so full completion has therefore been postponed until the end of 2014 (see 4.3). The delays were caused by factors such as underestimation of the effort and expense of obtaining data, and bottlenecks affecting the experts called in.

3.4 Increase in safety margins

The requirements and boundary conditions for the analyses regarding increasing safety margins were drawn up by ENSI in the second quarter of 2013, and were finalised in September 2013 after obtaining statements from the licensees. As numerous tasks still remained to be completed by the licensees, and the requirements for the flooding analysis were broadened as compared to the original plans (analysis of building uplift), the deadline for the submission of analyses for increasing safety margins was extended until 30 April 2014. The analyses cover earthquakes and external flooding.

At the same time as the requirements for the analyses regarding increasing safety margins were being drawn up, ENSI reviewed more extensive requirements (e.g. design-basis requirements or test intervals) for accident management equipment under conditions resulting from extreme external events. These requirements should not merely be limited to accident management components, but should be broadened to cover emergency equipment in general. Corresponding requirements in the form of a first draft were incorporated into Guideline ENSI-G02 "Design bases for existing nuclear power plants" (currently in progress) as a basis for discussion. Discussions and consultations on these requirements are yet to take place within ENSI.

3.5 Hydrogen management

a) *Containment venting*

In connection with the topical inspection on filtered containment venting in 2011, ENSI specified requirements which were processed by the licensees. Documents on this aspect were submitted to ENSI by KKG and KKB at the end of 2012. ENSI has reviewed the concept submitted by KKG regarding the improvement of displays in the emergency control room. This concept contains measures to improve the control of accidents beyond the design basis and to mitigate them. ENSI requested clarification of possibilities for further improvements to the measurement technology, and it will continue to follow this work up in the course of its ongoing supervisory activities.

ENSI has also reviewed the Post-LOCA study that was updated by KKB. These so-called Post-LOCA studies examine to what extent the plant is still accessible due to the radiological situation after a serious accident so that the accident can be brought under control and accident management measures can be implemented. The revised version of the Post-LOCA study submitted by KKB shows a very advanced level of development. KKB furnished radiological proof of compliance with the 50 mSv dose limit when filtered containment venting is initiated from the local actuation point.

b) Hydrogen management

In connection with precautions against accidents beyond the design basis, ENSI specified the requirements for the review of the hydrogen hazard in case of severe accidents in the reactor. As complex and costly analyses are sometimes necessary for the required investigations, the deadline for the licensees to submit the studies was set as the end of June 2014 (see 4.5).

3.6 Severe Accident Management (SAM)

The licensees submitted the requested reports on the deployment strategy of their emergency response organisations on schedule in February 2013. These reports set out the deployment strategy for the working locations of the emergency staff and supporting elements, with a view to a prolonged deployment lasting days or weeks. In addition to the main control room and the emergency rooms, a bunkered emergency control room and a bunkered substitute emergency rooms are also available to the emergency response organisation on the plant site in the event that the former are unavailable. Individual nuclear plants have already implemented precautionary measures so that additional emergency rooms can be occupied outside of the plant site if required.

According to the licensees' deployment strategy, the presence of adequate quantities of radiation protection equipment on site – and hence the possibility for the emergency response organisation to make use of the emergency rooms in the longer term – is a basic requirement in order to bring a serious accident under control. In 2013, an inspection was therefore carried out of this equipment, which is also available in the emergency rooms. The inspections showed that adequate equipment is present on the plant site in order to provide personal protective equipment that is fit for purpose for the planned staffing level in the first phase after an event. The review of the reports on the deployment strategy is still ongoing (see 4.6).

During the course of the general emergency exercise in 2013 at KKL, tests of the procedures from activation and making ready of the equipment through to its transportation from the Reitnau external storage facility to the plant were carried out. A transportation flight from the Reitnau

storage facility to KKL for verification purposes was already carried out in May 2013. The experience gathered with the equipment held at the Reitnau storage facility is being assessed as part of the overall evaluation of the 2013 general emergency exercise.

3.7 Emergency management at Swiss national level

a) IDA-NOMEX

The working group convened by ENSI to consider measure 14 (Review of the reference scenarios) of IDA-NOMEX (the Interdepartmental Working Group to Review Emergency Preparedness Measures in case of Extreme Events in Switzerland) has completed its work and reported its findings. On the basis of the analyses conducted by ENSI, the working group examined the consequences of various scenarios for emergency preparedness. The working group opted for an approach based on measures, focusing on the immediate measures that would be implemented in case of a severe accident in a nuclear power plant according to the Dose Measures Concept (Annex 1 of the NBCN Operations Ordinance, SR 520.17). Wide-ranging scenarios were taken as the basis for issuing recommendations on the preparation of emergency preparedness measures. The working group considered that measures specified in the Dose Measures Concept for rapid protection of the population were, and still are, expedient and adequate. However, there is a need to take action as regards the preparation's provisions. The recommendations refer to targeted alarms for parts of zone 3, the advance distribution of potassium iodide tablets and precautionary evacuation in zone 2. At the end of 2013, ENSI forwarded the relevant report for consultation by the cantons, Federal agencies and offices, the licensees' organisations and the relevant Federal commissions.

To review the emergency planning zones (EPZ) concept, ENSI convened the same working group that had already carried out the review of the reference scenarios. Based on the results of IDA-NOMEX measure 14, this group discussed the EPZ concept and weighed up the advantages and drawbacks of changing the zones. The majority of the bodies represented in the working group took the view that the currently valid EPZ concept is expedient and adequate as regards the number and extent of the zones. One recommendation concerns the overlapping sectors defined for zone 2: the working group regards a definition of the sectors without overlapping as more beneficial and easier to understand. A central factor in the working group's line of argument was that changes to the EPZ concept must produce perceptible added value in terms of the rapid implementation of emergency preparedness measures. The working group also ascertained that the EPZ concept in its current form enjoys high levels of acceptance and awareness.

In connection with the classification of emergencies according to an IAEA classification system devised specifically for emergencies, ENSI requested the licensees of the nuclear power plants to submit a study on the possible application of an IAEA emergency classification system. On the basis of initial reviews, the study was carried out at the appropriate level on a largely generic basis, and was submitted to ENSI at the end of October 2013. It includes a proposal for the system to be applied, a presentation of the various aspects of its application and a draft project plan for implementing the emergency classification. ENSI has launched an internal project to follow-up on the implementation of the IRRS recommendation asking ENSI to align its processes to a classification system specifically created for emergencies. A report on further progress will be submitted to the IAEA in connection with the IRRS follow-up mission (planned for 2015). ENSI is consistently implementing its mandate to provide the general public with transparent information by publishing the results of the international peer review missions.

In order to increase the redundancy of communication equipment in crisis situations, ENSI collaborated with the cantons where the plants are sited, the Swiss National Emergency Operations Centre (NEOC) and the licensees of the nuclear plants to effectively introduce the Swiss POLYCOM security radio network as an alternative communication system on 1 November 2013. ENSI was able to rely on support from the Federal Office for Civil Protection (FOCP) for this purpose. POLYCOM was successfully deployed during the 2013 general emergency exercise at KKL. In 2013, consideration of the option of satellite-based communication between the emergency preparedness partners was postponed until 2014 in favour of the introduction of the POLYCOM system in the short term. The issue of ensuring communication between the emergency preparedness partners in case of extensive power outages and also in case of an earthquake is already receiving attention at national level (cf. the SiKom project undertaken by the Federal Office for Civil Protection), so ENSI will refrain from defining objectives for 2014 in this regard.

The requirements for redundant and reliable measurement and forecasting systems used in the emergency response organisation were identified in a study whose results were approved in a report submitted to the Federal NBCN Crisis Management Board (BST ABCN) at the end of January 2013. The procedure adopted in this case was as follows: based on the immediate measures to be recommended by the emergency response organisation and the products of the emergency response organisation required for this purpose, the minimum requirements (i.e. the maximum downtimes, the sustainable duration and the minimum quality) were defined for the extreme damage/loss scenario (severe earthquake and potential flooding triggered by the earthquake and power outage over large areas). The analysis showed that these minimum requirements are met by the presence of one trained specialist each for forecasting the condition of the plant, the area affected and the dose for the population. If additional forecasting and measurement systems are available, they will improve the quality of the products. Priorities and specific requirements were defined for these systems, especially in respect of seismic safety, flooding, the power supply, telecommunication, maximum downtimes and minimum data storage. Measurement data are of enormous importance following a release. As the events at Fukushima also demonstrated, it must be possible to rely on automatic measurement systems to assess the radiological situation in the surrounding area. The requirements for the measuring systems are therefore very high. The requirements for the extreme loss/damage scenario must be met by the systems as a whole, but they may be reduced if alternative options and redundancies are available (ENSI is currently analysing alternative option(s) of this sort and the utilisation of synergies together with other Federal emergency response organisations in a Business Continuity Management project).

In connection with the assessment of the seismic robustness of the dose rate measurement sensors, a report by the manufacturer on tests with a vibration table is now available. The assessment of this report in relation to earthquakes has yet to be undertaken.

An initial analysis of the dose rate measuring system identified particular weaknesses regarding telecommunication, the infrastructure and the power supply. These findings have been incorporated into the strategic planning for the coming years.

Following an examination of the need to update Guideline ENSI-B12, the newly required 1E-class spent fuel pool accident instrumentation (for temperature and level) is to be included in ENSI-B12. In addition, the seismic requirements on the transmission of plant parameters are to be defined in specific terms. These adaptations will be incorporated according to the normal process for the revision of guidelines, and will be handled as per the instructions specified for that purpose.

b) Dispersion of contaminants in watercourses

At the end of 2013, the nuclear power plants submitted plant-specific reports regarding the assessment of the release of activity via the water path in case of abnormal operation and design-basis accidents. Also at the end of 2013, the Group of Swiss Nuclear Power Plant Managers (GSKL) submitted the concept for measures in case of a contaminant entering groundwater and watercourses in accidents beyond the design basis. ENSI is currently reviewing the documents that were submitted (see section 4.7).

In 2013, ENSI examined the dispersion of waterborne radioactive discharges in case of nuclear power plant accidents and, at the same time, reviewed emergency preparedness with all the Federal agencies and cantons concerned. During normal operation and in case of abnormal operation, radioactive discharge into rivers takes place via controlled and monitored paths. These releases are reported to ENSI each month in writing, and they are published in the annual reports of ENSI and the Federal Office of Public Health (FOPH). In case of accidents, there is a possibility that radioactive substances could reach the rivers in an uncontrolled manner. The analysis shows that, in these cases, the statutory regulations and the existing emergency preparedness procedures and measures are basically suitable in order to protect people and the environment. However, there is still a need to review a small number of points (see 4.7 b).

3.8 Experience feedback

KKM and KKL promptly submitted the finalised guidance documents for the analysis of external operating experience and for the derivation of measures. ENSI has reviewed the documents and has confirmed compliance with the requirements in the reports on the topical inspections carried out in 2012. In addition, KKL has adapted its instructions for reporting to ENSI as per Guideline ENSI-B02. ENSI has reviewed the new instructions and has determined that they meet the requirements stated in the Guideline.

KKG has stated that the requirements in Guideline ENSI-B02 do not need to be supplemented by internal instructions as long as the former requirements are implemented directly and permanently in the monthly reports. The new practice will be reviewed as part of ENSI's ongoing supervisory activities.

In December 2013, KKB promptly submitted the amplified documentation in response to the requirement arising from the topical inspection. ENSI has reviewed the documents and has confirmed implementation of the requirements of Guideline ENSI-B02.

ENSI's collaboration with the European Clearinghouse on NPP Operational Experience Feedback has been substantially stepped up now that ENSI has taken on the chairmanship of this body. The internal procedure for processing foreign operating experience has been examined in order to identify potential for improvement and has been adapted accordingly. New appointments were made to the functions of INES Officer and IRS Coordinator as of the beginning of 2014.

3.9 EU stress tests follow-up

All seventeen countries involved in the EU stress tests from the outset took part in the EU stress tests follow-up by drawing up national action plans as of the end of 2012. The peer review of the EU stress tests follow-up national action plans was carried out in the first half of 2013. Questions were collected from international experts and from the general public, and these were then answered by the respective countries. This peer review ended with a workshop staged by ENSREG (the European Nuclear Safety Regulators Group) from 22 to 26 April 2013 in Brussels, where the action plans were discussed in detail and a summary report of comments compiled: http://www.ensreg.eu/sites/default/files/NAcP%20Workshop%20Summary%20Report.pdf. The Swiss action plan was assessed positively during the peer review. The action plan shows how Switzerland is improving the safety of its nuclear power plants in accordance with the recommendations arising from the stress tests and the conclusions of the Convention on Nuclear Safety (CNS) Review Meeting. The Swiss measures following Fukushima, such as the rapid implementation of the storage facility at Reitnau to provide auxiliary equipment for dealing with a severe accident or the assignment of the working group to review emergency measures in Switzerland (IDA NOMEX), were singled out for praise by the experts ("good practice"). The peer review emphasised the importance of restoring containment integrity in case of a total loss of AC power during refuelling and maintenance outages, which Switzerland had identified as an open point in connection with the EU stress tests (ENSI-AN-7798 dated December 2011), and it advised ENSI to assign higher priority to dealing with this aspect. ENSI has thus added a key issue for 2014 (see 4.2).

The workshop also concluded that another peer review on the EU stress tests follow-up should be considered for 2015, focusing on the status of activities in the participating countries. ENSREG has incorporated this review into its work plan. Accordingly, ENSI will update its Swiss action plan for the EU stress tests follow-up as of the end of 2014 in compliance with ENSREG's instructions (see 4.8).

4 Key issues in 2014

Based on their importance in relation to safety, and on synergies with ongoing projects, the following key issues were specified for ENSI's follow-up activities in view of Fukushima during 2014:

1. Seismic instrumentation
2. Containment integrity during outages
3. Extreme weather conditions
4. Increase in safety margins
5. Hydrogen management
6. Severe Accident Management
7. Emergency management at national Swiss level
8. EU stress tests follow-up

4.1 Seismic instrumentation

In the course of analyses for the EU stress tests, ENSI became aware that automatic scrams triggered upstream by means of the seismic instrumentation proved advantageous in the Japanese nuclear power plants during severe earthquakes. Triggering of this sort has not yet been implemented in the Swiss nuclear power plants. In 2013, ENSI set up a working group to document the actual state and to examine the advantages and drawbacks of upstream automatic scrams by means of seismic instrumentation for the Swiss nuclear power plants. The working group will adopt a report on this subject in 2014.

Milestones:

4th quarter of 2014	ENSI: Report on the advantages and drawbacks of upstream automatic scrams by means of seismic instrumentation.

4.2 Containment integrity during outages

Fairly large containment openings are present for a specified period during shutdowns in connection with the annual refuelling and maintenance outages in order to transport material and equipment or to allow access by individuals. If an accident involving a prolonged loss of the power supply (Station Blackout, SBO) occurs during this period, it must be expected that the restoration of containment integrity will have to be carried out under more difficult conditions.
In its National Report on the EU stress tests, ENSI therefore identified an open point on whether restoring containment integrity during shutdown in case of an SBO represents a time-critical measure (OP6-2, see Annex 2). Action will be taken in 2014 to address this issue, which was also mentioned in ENSREG's report on the EU stress tests follow-up workshop (see section 3.9). ENSI has begun to review the documents already available on this aspect and the existing measures, and it will specify the scope of the clarifications needed at the start of 2014.

Milestones:

1st quarter of 2014	ENSI: Specify scope of clarification.
4th quarter of 2014	NPPs: Submit answers and documents for clarification.

4.3 Extreme weather conditions

ENSI defined the requirements for the probabilistic hazard analyses and safety case needed to demonstrate adequate protection of plants against extreme weather conditions in greater detail during 2012. In response to the application for an extension of the specified period, ENSI has allowed the licensees more time to submit the safety case. The licensees must complete the safety case in 2014 in the following stages:

- Definition of plant-specific hazard curves.
- First step in compiling the plant-specific safety case: all hazards are taken into account, except for air and river water temperatures.
- Second step in compiling the plant-specific safety case: air and river water temperatures.

ENSI will then review the proof. Completion of the review is scheduled for 2015.

Milestones:

1st quarter of 2014	NPPs: Submission of the plant-specific hazard curves.
2nd quarter of 2014	NPPs: Submission of the plant-specific safety case, all hazards except for air and river water temperatures.
4th quarter of 2014	ENSI: Review of the submitted safety cases except for air and river water temperatures.
4th quarter of 2014	NPPs: Submission of the plant-specific safety cases in case of extreme air and river water temperatures.

4.4 Increase in safety margins

In accordance with the status of the key issue "Increase in safety margins" as described in section 3.4, the licensees' analyses for increasing safety margins in case of earthquakes and external flooding will be submitted at the end of April 2014, and will be reviewed and assessed by ENSI. Depending on the results of the review, more extensive measures will be required by ENSI as appropriate. Also in 2014, ENSI will examine whether an extension of these analyses, for example to include internal flooding, could contribute to a further increase in safety margins.

In connection with the definition of the requirements for emergency equipment, ENSI will specify the equipment to be considered and the requirements for functionality and operational readiness. The relevant requirements will be incorporated into Guideline ENSI-G02 "Design principles for existing nuclear power plants" still to be drawn up.

Milestones:

2nd quarter of 2014	NPPs: Analyses for increasing safety margins (earthquake and external flooding).
4th quarter of 2014	ENSI: Assessment of the analyses for increasing safety margins (earthquake and external flooding).
4th quarter of 2014	ENSI: Definitions regarding the continuation and expansion of the ERSIM project by adding additional analyses for increasing safety margins.
4th quarter of 2014	ENSI: The requirements for emergency equipment will be incorporated into Guideline ENSI-G02 "Design principles for existing nuclear power plants".

4.5 Hydrogen management

Based on a conclusion drawn from the EU stress tests and the NSC's report on Fukushima (see the Fukushima Action Plan 2013), various aspects of the hydrogen hazard in case of severe accidents in the reactor should be reconsidered. These investigations will complement other extensive studies which have already been completed in connection with the probabilistic safety analysis. The new aspects were stated in the 2013 action plan. The relevant studies are to be submitted by the licensees in 2014. ENSI will then review these studies.

Milestones:

2nd quarter of 2014	NPPs: Submission of studies regarding the hydrogen hazard in case of severe accidents in the reactor.
4th quarter of 2014	ENSI: Review of the studies regarding the hydrogen hazard in case of severe accidents in the reactor submitted in the second quarter.

4.6 Severe Accident Management

ENSI will complete its review of the reports submitted by the nuclear plant licensees on the deployment strategy for their emergency response organisation by the end of 2014. The availability of emergency rooms outside of the plant site is viewed by ENSI as an reasonable addition to the existing infrastructure. Depending on the results of the review, more extensive measures will be required by ENSI as appropriate.

Milestones:

4th quarter of 2014	ENSI: Review of the reports submitted by the nuclear plant licensees on the deployment strategy of their emergency response organisations.

4.7 Emergency management at national Swiss level

a) IDA NOMEX

The report by the working group on the review of the reference scenarios (IDA NOMEX measure 14) was forwarded for consultation by ENSI at the end of 2013, and it will be presented to the Federal

NBCN Crisis Management Board (BST ABCN) together with the consultation report in the second quarter of 2014.

The report by the working group on the review of the emergency planning zone (EPZ) concept (IDA NOMEX measure 18) is currently being drafted; consultation and presentation to the BST ABCN are planned during the course of 2014.

As regards the measurement and forecasting systems for the emergency response organisation, the ongoing procedure includes an assessment of the systems currently in place and an evaluation of improvement measures. An initial cursory review of ENSI's dose rate measurement system has been carried out. Improvement measures in order to develop and/or maintain the dose rate measurement system were incorporated into the strategic planning for the coming years. As regards ENSI's system for calculating doses resulting from the dispersion of radioactive substances in the areas surrounding nuclear power plants, preparatory steps are being taken to provide a redundancy that is currently missing by replacing the ADPIC system with JRODOS/LASAT and with the help of the Business Continuity Management project. These steps should be implemented in the course of the usual maintenance and renewal work in the coming years. The requirements for the automatic transmission of plant parameters are to be specified in Guideline ENSI-B12 and must then be implemented. In this regard, attention will be paid at all times to ensure that the overall system meets the requirements. Experience suggests that telecommunications pose the greatest challenge.

Milestones:

2nd quarter of 2014	ENSI: Consultation report regarding the working group's report on the review of the reference scenarios (IDA NOMEX measure 14). Presentation of the working group's report and the consultation report to the BST ABCN.
4th quarter of 2014	ENSI: Working group's report on the review of the EPZ concept (IDA NOMEX measure 18). Consultation on the working group's report. Presentation of the working group's report and the consultation report to the BST ABCN.

b) Dispersion of contaminants in watercourses

On the basis of the Fukushima Action Plan, ENSI is reviewing the existing procedures and measures to determine their effectiveness in protecting drinking water. ENSI has collaborated with the Federal agencies involved in emergency preparedness (NEOC, FOPH, and FOEN) and the cantons concerned to carry out a situation analysis (see section 3.7 b). Four points require review by the nuclear power plants, ENSI, the FOPH and the NEOC. A status report on the results of these reviews will be drawn up by the end of 2014.

The nuclear power plants' concept for measures in case of a contaminant entering groundwater and watercourses in accidents beyond the design basis submitted at the end of 2013 differentiates four loss/damage conditions and, as regards the detailed plant-specific analyses, stipulates that there should be a symptom-oriented breakdown of the consequences of the accident relating to the process leading to and location of a core melt-down. ENSI will comment on the concept in the second quarter of 2014.

Milestones:

2nd quarter of 2014	ENSI: Statement on the nuclear power plants' concept for measures in case of a contaminant entering groundwater and watercourses in accidents beyond the design basis.

2nd quarter of 2014	ENSI: Statement on the plant-specific documents in case of a contaminant entering groundwater and watercourses in the design basis accidents.
4th quarter of 2014	ENSI: Status report on measures implemented to monitor watercourses for radioactivity, and the alarm system.

4.8 EU stress tests follow-up

The European Nuclear Safety Regulators' Group (ENSREG) approved an action plan for follow-up measures to the EU stress tests in 2012. This plan required the participating countries to draw up their own national action plans for the implementation of the measures resulting from the EU stress tests and to update these plans at regular intervals. In addition to the Fukushima Action Plan that is published each year, ENSI drew up a status report for ENSREG on the implemented and planned measures as per end of 2012; this report underwent a peer review in 2013 (see section 3.9). As per ENSREG's instructions, reporting on progress achieved during 2013 was completed in condensed form at the start of 2014 and this material will be published at European level.

ENSI plans to prepare an update of the status report for submission to ENSREG at the end of 2014. The corresponding peer review involving all participating countries is scheduled for 2015.

Milestones:

4th quarter of 2014	ENSI: Status report on progress with the EU stress tests and post-Fukushima measures.

5 Annexes

Legenda to column 3 (status/action plan)

2014 Key issue of the action plan for 2014
LA Issue has been incorporated into ongoing supervisory activities
NI Issue yet to be initiated
B Issue dependent on IDA NOMEX

5.1 Annex 1: List of checkpoints from "Lessons Learned"

No.	Designation	Status / action plan	**Description**	Implementation text
1	PP1	2014	**The hazard assumptions for earthquakes and external flooding, and also for extreme weather conditions, must be re-evaluated to take account of the latest knowledge.**	Earthquakes: the first review of the seismic safety case based on intermediate hazard assumptions was completed in June 2012. Determination of the definitive hazard was completed in the course of the PRP project in 2013. In 2014, the hazard assumptions for each site will be redefined by ENSI on the basis of the Pegasos Refinement Project (PRP), completed at the end of 2013. External flooding: hazard assumptions were reviewed in 2011. Combination of earthquakes/earthquake-induced flooding was covered in 2012. Extreme weather conditions: a concept for implementation was submitted by the licensees. Due to delays in obtaining and evaluating meteorological data, the safety cases will not be completed by the licensees until 2014.
2	PP2	LA	**The control strategies for a prolonged loss of electric power supply must be re-evaluated on the basis of knowledge gained from Fukushima.**	The strategies were reviewed during topical inspections in all NPPs at the end of 2012: the plants have effectively continued to develop their existing strategies on a targeted basis and adequate resources for AM are available in order to prevent core damage after an SBO. Work will be followed up as part of ongoing supervisory activities.

No.	Designation	Status / action plan	**Description**	Implementation text
3	PP3	LA	**It should be checked whether the coolant supply for the safety systems and the associated auxiliary systems is guaranteed from a diverse source which is safe against earthquakes, flooding and contamination.**	Screening analyses of coolant supply were completed in 2012; at all plants except Mühleberg, adequate redundancies are available in order to guarantee the coolant supply. KKM must backfit a diverse coolant supply. The applications for alternative backfits (if any) which KKM must implement in order to operate until 2019 will be submitted in mid-2014.
4	PP4	LA	**It should be checked whether the requisite tightness of buildings containing important safety equipment is guaranteed in case of flooding of the site.**	The safety cases for the 10,000-year flood were accepted by ENSI in 2011. Other additional requirements were incorporated and followed up in the course of ongoing supervisory activities.
5	PP5	2014	**On the basis of experience gained from the Fukushima accident, it should be checked whether the availability of the instrumentation required to assess the condition of the plant is guaranteed adequately even in extreme situations.**	Backfitting of instrumentation to monitor the spent fuel pools was required in the formal order dated 05.05.2011. Backfitting projects for this purpose are in progress in all NPPs; permits for these have been issued by ENSI, which also supervises the implementation. Activities in connection with accident instrumentation are covered in section 3.7. ENSI's review of extended requirements for SAM equipment is scheduled for 2014.
6	PP6	LA	**It should be checked whether control of leaks and the long-term cooling of the spent fuel pools are guaranteed in case of severe accidents.**	Reviews took place in 2011 and 2012. Permits for backfitting projects at the Beznau and Mühleberg NPPs are being issued by ENSI, which also supervises the implementation.
7	PP7	2014	**It should be checked whether tests and inspections regarding the prevention of hydrogen explosions should be extended to additional areas of the plants beyond the primary containment.**	In 2013, ENSI required a reconsideration of various aspects of the hydrogen hazard in case of severe accidents in the reactor. Topics are: analyses of the hydrogen hazard, including propagation of hydrogen from the containment into other buildings of the nuclear power plant, robustness and scope of the measuring equipment, measures and procedures in place, review of the containment venting path. Now that ENSI has drawn up the specific requirements for the review of the hydrogen hazard in case of severe accidents in the reactor, the licensees must submit the plant-specific studies by the end of June 2014.
8	PP8	LA	**The design and operation of the systems for filtered venting of the containment must be addressed again.**	The filtered venting system was examined both in the EU stress tests ("Measures and design to protect containment integrity") and in the course of topical inspections by ENSI which relate specifically to knowledge gained from the accident at Fukushima-Dai-ichi. The reviews have confirmed the suitability of these systems. Aspects of hydrogen management related to the filtered venting systems are considered under PP7.

No.	Designation	Status / action plan	**Description**	Implementation text
9	PP9	LA	**It is necessary to carry out a new review of the earthquake and flood design of the monitoring network for automatic dose rate measurement in the vicinity of nuclear power plants (MADUK), in relation to experience gained from the Fukushima accident.**	ENSI has reviewed the specific requirements on the basis of knowledge acquired through IDA NOMEX. This knowledge was taken as the basis for a study to derive the requirements for redundant and reliable measurement and forecasting systems used in the emergency response organisation (see PP5 and section 3.7).
10	PP10	2014	**It should be checked whether the emergency control center (ECC) and the substitute ECC at the Swiss nuclear power plants still meet the requirements, based on the experience gained from the Fukushima accident.**	Requirements for technical emergency preparedness equipment at nuclear installations are stipulated in ENSI guideline B12. Inspections were conducted at all NPPs in 2012 and 2013 covering the emergency rooms and the radiation protection equipment that could be deployed in case of an event. The review of the deployment strategies for the emergency response organisations submitted by the NPPs will be issued in 2014 (also see section 4.7).
11	PP11	LA	**The access control system for nuclear power plants and the associated arrangements must be reviewed to determine the accessibility of rooms where intervention is required in case of severe accidents, while maintaining appropriate plant security. Monitoring of radiation protection must continue to be guaranteed in this context.**	This issue was initially addressed in the course of existing supervisory activities taking into consideration the additional knowledge gained from the Fukushima accident. Follow-up will continue in the course of ongoing supervisory activities.
12	PP12	LA	**The emergency measures for heat removal in case of a complete failure of the cooling water supply must be reviewed and verified under conditions resulting from the disruption of the infrastructure and the power supply.**	After the construction of the Reitnau external storage facility, resources were already made available in June 2011 for use in a situation of this sort in order to maintain the cooling function independently of the permanently installed safety systems. In addition, this issue was analysed as part of the EU stress tests. Topical inspections were carried out on the issue of a complete failure of the AC power supply, and improvements were implemented in the plants. The comprehensive review of the deployment of resources from the Reitnau external storage facility took place in 2013 in connection with an alarm exercise and the 2013 general emergency exercise.
13	PP13	LA	**It should be checked whether the alternative supply of water and power for emergencies is ensured.**	Operational resources have been held in readiness at a central point at the Reitnau storage facility since 2011; in addition, storage facilities with appropriate emergency resources have been set up at the NPP sites. Hook-up points at the NPPs have been backfitted as necessary. The plants' provisions for water injection in case of an SBO were successfully reviewed by ENSI on the basis of inspections. Regular reviews are conducted as part of the regular emergency exercises.
14	PP14	LA	**It is necessary to examine the water resources that can be made available to supply the reactor pressure vessel, the spent fuel pools and the containment.**	Available reserves of water have already been reviewed and are already documented in the existing emergency procedures. This topic will be reconsidered again as part of the "Increase in safety margins" key issue (see section 4.4).

No.	Designation	Status / action plan	**Description**	Implementation text
15	PP15	B 2014	**Emergency management must be reviewed to determine further potential for improvement.**	Implementation is taking place under the auspices of IDA NOMEX, e.g. as part of IDA NOMEX measure 4 "Personnel and materials" and IDA NOMEX measure 24 "Obligations on individuals". The resultant specific requirements for nuclear installations are being supervised by ENSI. In addition, the deployment strategies for the NPPs' emergency response organisations are being reviewed in 2014 to determine their potential for improvement.
16	PP16	LA	**ENSI has identified the following issues for improving emergency planning and emergency exercises:** **a The decision-making guidance for emergency management in case of severe accidents (SAMG) at nuclear power plants, including the newly planned checkpoints to deal with severe accidents, must be reviewed on the basis of knowledge gained from the Fukushima accident. In this regard, it is particularly necessary to check:** **- whether adequate consideration is given to a prolonged Station Blackout (SBO) and the simultaneous occurrence of events in multiple-unit plants;** **- whether there is any need for measures, auxiliary resources and equipment that must be available to ensure subcriticality in the long term in case of severe accidents.** **b Consideration given to accidents involving a prolonged SBO in the planning of emergency exercises.** **c Examination of whether the procedures are trained often enough during emergency exercises. Particular attention should given here to a functioning inter-organisation chain of communication across the various organisations.**	The Swiss NPPs have a comprehensive system of accident and emergency procedures, complemented by the SAMG. ENSI considers that a new assessment in the light of events at Fukushima would serve the interests of safety. In the course of ongoing supervisory activities, there will be re-assessments of the regulatory requirements (ENSI-B12) and the implementation of the SAMG in the plants. In connection with the implementation of ENSI's formal order dated 18.03.2011, an external emergency storage facility (Reitnau) for all NPPs in Switzerland was already established on 01.06.2011. Among other items, stocks of boron compounds are kept in readiness here to ensure the long-term maintenance of subcriticality. Guideline ENSI-B11 has been amplified since 2011 so that, as a new feature, the planning must also include recurring emergency exercises focusing on the deployment of the fire brigades and the security forces. In addition, the option of conducting longer exercises has been incorporated into ENSI-B11. The cross-organisational and cross-border communication chain is especially being examined during general emergency exercises.
17	PP17	B 2014	**It should be checked whether and to what extent the communication facilities are designed with adequate redundancy and diversity.**	Implementation will take place under the auspices of IDA NOMEX. The resultant specific requirements for nuclear plants will be supervised by ENSI. In 2013, the Swiss POLYCOM security radio network was introduced at ENSI as an alternative communication system. The option of satellite-based communication is under examination (see section 3.7).
18	PP18	B 2014	**It must be ensured that adequate staff is available at all times to accomplish all necessary emergency management activities.**	Implementation will take place under the auspices of IDA NOMEX (also see PP15). The resultant specific requirements for nuclear plants will be supervised by ENSI. The review of the deployment strategies for the emergency response organisations submitted by the NPPs will be issued in 2014 (also see section 4.7).

No.	Designation	Status / action plan	**Description**	Implementation text
19	PP19	LA	**Measures that increase the organisation's ability to react to unexpected events must be reviewed again on the basis of experience gained from Fukushima.**	Actions related to this issue are followed up by the Human and Organisational Factors section in the course of ongoing supervisory activities.
20	PP20	LA	**Transmission of plant parameter data must be re-evaluated with respect to an alternative, independent means of data transmission.**	The specific requirements are being drawn up by ENSI on the basis of knowledge acquired through IDA NOMEX. In 2013, the Swiss POLYCOM security radio network was introduced as an alternative communication system.
21	PP21	B 2014	**The evacuation concepts must be reviewed, taking account of knowledge gained from the Fukushima accident.**	Implementation will take place under the auspices of IDA NOMEX by the FOCP.
22	PP22	B 2014	**Coordination with other international partners is required to determine whether and how an international network for central international emergency support can be set up.**	Implementation will take place under the auspices of IDA NOMEX. The resultant specific requirements for nuclear plants will be supervised by ENSI. Switzerland specified arrangements for collaboration with RANET (Response and Assistance Network) in 2013, and it should become a member in 2014. Since September 2013, the FOPH has been a member of the Radiation Emergency Medical Preparedness and Assistance Network (REMPAN) within the WHO.
23	PP23	LA	**It should be checked whether the necessary information regarding forecasts of releases and radiation exposure is provided in a timely and continuous manner in case of accident.**	In 2013, the requirements for redundant and reliable measurement and forecasting systems were specified in connection with IDA NOMEX measure 10 (see section 3.7). The transmission of forecasts was reviewed again in the course of the 2013 general emergency exercise.

No.	Designation	Status / action plan	**Description**	Implementation text
24	PP24	B 2014	**The following improvement measures were identified regarding information provided to the general public:** **a It must be ensured not only that the requisite infrastructure and the necessary individuals and/or organisations and equipment are available for crisis communication, but also that the necessary means of communication are in place. The relevant precautions must be taken. Regular training must be provided on the associated procedures. This point also includes a functioning network of experts who are available to the media to supply neutral and objective information.** **b It should be checked whether the organisational responsibilities for informing the public as well as the local authorities and support staff are clearly stipulated, and are uniformly understood by all involved parties.** **c It should be checked whether the timely communication of radiological effects, including calculated forecasts, is also ensured beyond Switzerland's borders.**	Implementation will take place under the auspices of IDA NOMEX (e.g. in connection with IDA NOMEX measure 116 "Information agreement, information in the event of an NPP accident within Switzerland", which is being handled by the FOCP). In 2013, ENSI introduced the Swiss POLYCOM security radio network as an alternative communication system. The option of satellite-based communication is under examination (see section 3.7). Prompt transmission of information on radiological effects, including forecasts, is examined on a recurring basis in the course of general emergency exercises. The last examination of this sort took place during the 2013 general emergency exercise.
25	PP25	NI	**It is necessary to examine the extent to which the release of non-nuclear hazardous substances in case of beyond design basis accidents could exert an additional influence on the accident sequence, and which counter-measures are required.**	-
26	PP26	LA	**The process of evaluating and examining the applicability of national and international operating experience must be optimised on the basis of knowledge gained from the Fukushima accident.**	ENSI has continued to optimise the relevant internal structures. The internal processes have been adapted on the basis of operating experience feedback from international events. The effectiveness of these optimisation measures will be reviewed during the usual audits of ENSI's management system.
27	PP27	LA	**It must be guaranteed that the knowledge gained from national and international operating experience (event analysis) in the licensees' organisations reaches all the relevant individuals and units (including those at group level).**	Inspections of this aspect were carried out by ENSI at all NPPs in the fourth quarter of 2012. The plants have processed the requirements derived. ENSI will follow this issue up in the course of its ongoing supervisory activities.
28	PP28	LA	**It must be ensured that internationally harmonised assessment criteria for nuclear safety are established at the highest level of safety.**	Switzerland collaborates continuously in the Safety Standards Groups (SSC) and other important IAEA bodies. Under the auspices of WENRA, ENSI advocates the development of harmonised Safety Reference Levels (SRL) and their implementation in European countries that use nuclear energy. In 2013, six new working groups within the RHWG (Reactor Harmonisation Working Group) drew up proposals for the integration of new knowledge from the EU stress tests into the SRLs. In November 2013, the revised SRLs were published by WENRA for public consultation. In all probability, the revised SRLs will be adopted in 2014.

No.	Designation	Status / action plan	**Description**	Implementation text
29	PP29	LA	**Greater importance should be accorded also at international level to the recommendations resulting from international reviews (IRRS, OSART) and from the regular Periodic Safety Reviews (PSR). The transparency of ENSI's supervision and of the operators' safety-related activities must be increased.**	An OSART mission was carried out at KKM in October 2012. On the basis of the recommendations and suggestions ENSI got during the 2011 IRRS mission, ENSI has (by the end of 2012) developed an action plan for the follow-up mission which will probably take place in 2015. In August 2013, by the specified deadline, Switzerland submitted its country report for the sixth Convention on Nuclear Safety (CNS) Review Meeting. The Review Meeting will take place in March/April 2014. Through its active participation in the IAEA's Working Group on Effectiveness and Transparency, Switzerland continued to advocate improvements to the CNS and its processes.
30	PP30	LA	**ENSI is reviewing the significance of the lessons from the Fukushima accident for its supervisory activities.**	ENSI adopted a questioning attitude regarding its own supervisory strategy well before the accident in Japan. In this context, ENSI is currently carrying out an internal project on the topic of supervisory culture. The review of the regulatory framework will continue in the course of ongoing supervisory activities. Specific issues are covered by other checkpoints.
31	PP31	LA	**Additional operational resources must be kept in readiness for radiation protection in case of severe accidents.**	Additional radiation protection equipment has been held at the Reitnau external storage facility since 2011. Reviews to determine the adequacy of the resources held in readiness are conducted at regular intervals. In 2013, inspections of the radiation protection equipment stored at the NPP sites were carried out.
32	PP32	LA	**It is necessary to examine whether the emission and immission measurements in place on the power plant sites in order to determine the activity releases are guaranteed in case of loss of offsite power or loss of normal emergency power.**	The review is being carried out as part of the Periodic Safety Reviews (PSR). KKM met the requirement for the high dose rate sensor in the stack, which is used as incident instrumentation, at the start of 2014. Work on the required improvements is under way at KKL. At KKB, ENSI will carry out the assessment during the current PSR. For KKG, the review will be anticipated as part of the ongoing supervisory activities (inspection in 2014).
33	PP33	LA	**It is necessary to examine the extent to which the availability of the meteorological data required for dispersion calculations is guaranteed in case of extreme natural events.**	In 2013, the requirements for redundant and reliable measurement and forecasting systems were specified in connection with IDA NOMEX measure 10 (see section 3.7).
34	PP34	B 2014	**It is necessary to stipulate arrangements for dealing with contamination in the area surrounding nuclear installation following severe accidents.**	On the basis of knowledge acquired from IDA NOMEX, the specific requirements for checking adequate implementation in relation to this issue are being defined in connection with the revision of the Radiological Protection Ordinance.

No.	Designation	Status / action plan	**Description**	Implementation text
35	PP35	2014	**It is necessary to examine how to deal with large volumes of contaminated water, radioactive waste or environmentally hazardous substances in case of severe accidents.**	At the end of 2013, the NPPs submitted a concept for dealing with the input of radioactive contaminants into groundwater and watercourses in case of beyond design basis accidents; ENSI's review and its statement will follow in 2014 (also see section 4.7).
36	PP36	2014	**As part of the emergency planning for severe accidents, it must be ensured that sufficient radiation protection staff is available on site.**	ENSI will issue a statement on this aspect as part of the review of the deployment strategies for the emergency response organisations (also see section 4.7).
37	PP37	LA	**The knowledge gained from the Fukushima accident must be taken into account in the programmes to foster and develop the safety culture in Swiss nuclear power plants.**	Knowledge gained from the accident at Fukushima was integrated into the activities related to safety culture at the NPPs and at ENSI during 2012, and this will be continued in subsequent years as part of the regular activities related to safety culture.

5.2 Annex 2: List of open points from the EU stress tests

No.	Designation	Status / action plan	**Description**	Implementation text
38	OP2-1	2014	**ENSI will follow up on the question as to whether in the Swiss nuclear power plants automatic scrams should be triggered by the seismic instrumentation.**	An upstream automatic scram by means of seismic instrumentation has not yet been implemented in Swiss nuclear power plants. A working group was set up at ENSI in 2013. A report on the advantages and drawbacks of an upstream automatic scram by means of seismic instrumentation will be completed by the end of 2014.
39	OP2-2	LA	**In respect of seismic proof that has still to be supplied, ENSI will follow up on a more detailed examination of the seismic robustness of the isolation of the containment and the primary circuit.**	Proof was submitted by the licensees in 2012 and the cursory review by ENSI was completed. The subsequent detailed review by ENSI was completed by mid-2013. Based on the positive results from the review, it was possible to close OP2-2.
40	OP2-3	LA	**ENSI will follow up on measures to improve the seismic stability of the containment venting systems in case of beyond design basis accidents for KKG and KKL.**	Proof was submitted by the licensees in 2012 and the cursory review by ENSI was completed. The subsequent detailed review by ENSI was completed by mid-2013. Based on the positive results from the review, it was possible to close OP2-3.
41	OP3-1	LA	**ENSI will follow up on the impacts of a total debris blockage of hydraulic engineering installations.**	Proof was submitted by the licensees (KKB, KKG and KKM) in 2012. For KKB and KKM, ENSI determines that no cliff-edge effects from debris blockage are to be expected. At the end of 2013, the licensees (KKB, KKG and KKM) submitted refined analyses based on 2D model calculations in combination with the transport of solid matter. ENSI will comment on these analyses in 2014.
42	OP4-1	2014	**ENSI will follow up on the proofs of protection against extreme weather conditions, including combinations thereof.**	Requirements were defined by ENSI in 2012. The licensees' implementation concept was reviewed by ENSI in 2013. Due to delays in obtaining and evaluating meteorological data, the safety cases will not be completed by the licensees until 2014.
43	OP5-1	LA	**ENSI will follow up on the development of a comprehensive strategy for the targeted deployment of the mobile accident management emergency diesels in order to secure selected direct current and/or alternating current consumers in the long term under total SBO (or an SBO) conditions.**	Inspections of this aspect were carried out by ENSI in the fourth quarter of 2012. The results were assessed in the first quarter of 2013. Follow-up measures will continue to be implemented by ENSI in the course of its ongoing supervisory activities.
44	OP6-1	2014	**From the point of view of risk minimisation, ENSI will follow up on the extent to which the current deployment strategies for the venting systems in severe accidents should be retained.**	The deployment strategy for the containment venting systems in case of severe accidents will be re-examined during 2014 in connection with the issue of hydrogen management.

No.	Point Designation	Status / action plan	**Description**	Implementation text:
45	OP6-2	2014	**ENSI will follow up on whether restoring containment integrity during shutdown in case of a total SBO represents a time-critical measure.**	The issue of containment integrity during outages is a key issue in 2014.
46	PRT-1	2014	**The peer review team recommends considering the assessment of margins with respect to extreme weather conditions exceeding the design bases, e.g. by extending the scope of future PSRs.**	ENSI specified detailed requirements for the probabilistic hazard analyses and the proof of adequate protection of plants against extreme weather conditions in 2012. In 2014, the licensees will submit their safety cases to ENSI, including an appreciation on the availability of safety margins.
47	PRT-2	2014	**It is recommended that the regulator assesses the opportunity of requiring more reliance on passive systems for hydrogen management for severe accident conditions. It is also recommended that the regulator considers further studies on the hydrogen management for the venting systems.**	In 2013, ENSI required a reconsideration of various aspects of the hydrogen hazard in case of severe accidents in the reactor. The topics are: analyses of the hydrogen hazard, including the propagation of hydrogen from the containment into other buildings of the nuclear power plant, robustness and scope of the measuring equipment, measures and procedures in place, and review of the containment venting path. Now that ENSI has drawn up the specific requirements for the review of the hydrogen hazard in case of severe accidents in the reactor, the licensees must submit the plant-specific studies by the end of June 2014.

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Swiss Federal Nuclear Safety Inspectorate ENSI

Issued by
Swiss Federal Nuclear Safety Inspectorate ENSI
Industriestrasse 19
CH-5200 Brugg
Phone +41 (0)56 460 84 00
Fax +41 (0)56 460 84 99
info@ensi.ch
www.ensi.ch

ENSI-AN-8711
Published 28.02.2014