

**Updated German Action Plan
for the implementation of measures
after the Fukushima
reactor accident**

December 2014

Action plan

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Introduction

Immediately after the reactor accidents at the Japanese Fukushima Dai-ichi nuclear power plant site, actions were initiated in Germany to review the safety of German nuclear power plants (NPPs). Actions were taken by the competent nuclear regulatory authorities of the Länder (federal states), the Federal Government, and the operators of the German nuclear power plants.

The Reactor Safety Commission (RSK) was asked by the Federal Government as early as in the middle of March 2011 to carry out a safety review of the operating nuclear power plants, to test their robustness.

Tasked by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), its technical support organisation Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) evaluated the lessons learned from the Fukushima accidents. GRS made recommendations for possible improvement of robustness in an Information Notice (WLN).

At European level, the European Council declared at the end of March 2011 that the safety of all nuclear installations in the EU should be reviewed by means of a comprehensive and transparent risk and safety assessment ("stress test"). Subsequent to the reviews carried out by the European Nuclear Safety Regulators Group (ENSREG), an Action Plan for the further procedure was prepared.

The ENSREG Action Plan provides that each country shall prepare a National Action Plan on the basis of its own findings, the recommendations and suggestions made in connection with the EU stress test as well as the recommendations of the extraordinary meeting of the Contracting Parties to the Convention on Nuclear Safety (CNS) in August 2012 and publish this report by the end of 2012.

The recommendations identified in the national studies take the recommendations of the EU stress test into account. This overall provides the basis of the German National Action Plan.

The German National Action Plan follows the structure recommended by ENSREG. By making reference to the topic areas of the extraordinary meeting of the CNS other topic areas than the reviews of the nuclear power plants are also included.

This structure was devised especially for the measures in nuclear power plants in order to enable the reader to follow the development of the recommendations and suggestions of the EU stress test regarding the enhancement of safety from their assessment and applicability in the national context up to their plant-specific implementation if required. Figure 0-1 below serves for the illustration of this development.

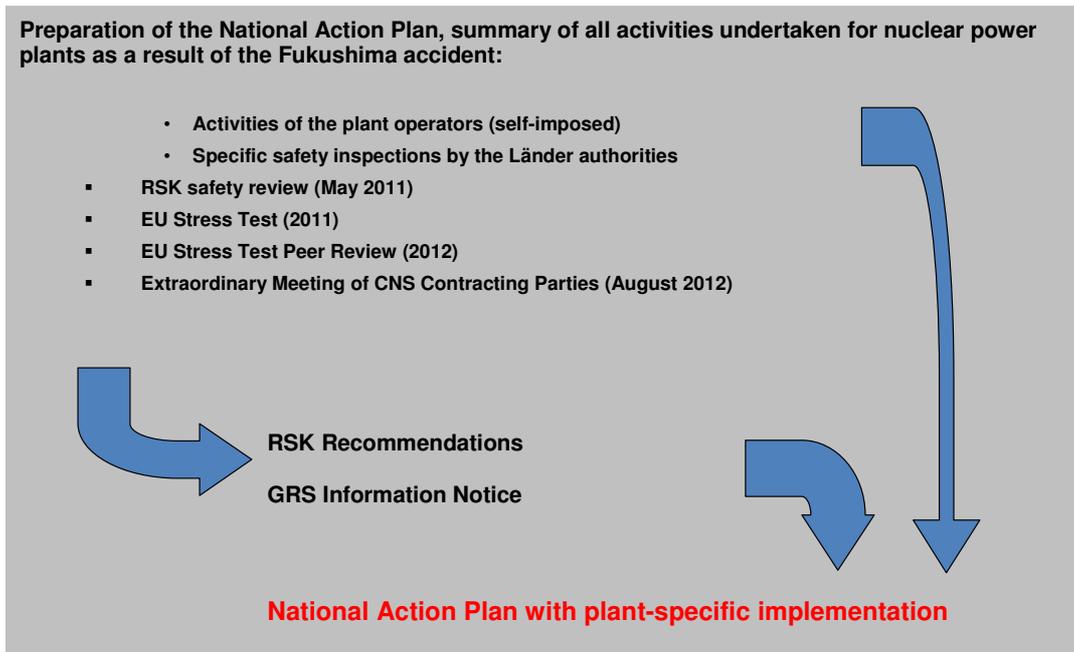


Figure 0-1: Structure of the German Action Plan for measures in the nuclear power plants

The German National Action Plan for measures in the nuclear power plants was prepared by the BMUB in collaboration with the regulatory authorities of the Länder with consideration of the residual operating times of the nuclear power plants resulting from the phase-out of the use of nuclear power for the generation of electricity decided in Germany. It was first published on 31 December 2012.

In April 2013, the German Action Plan was presented at an ENSREG workshop and discussed with the audience. The assessments of all participating states are published in the final report of the workshops "ENSREG National Action Plans Workshop – Summary Report" (see <http://www.ensreg.eu>).

This version represents the second update following the publication of the German Action Plan of 2012, describing die current status towards the end of 2014.

1 Decisions on the future use of nuclear power in Germany

The accidents at the Fukushima Dai-ichi nuclear power plant site in Japan on 11 March 2011 led to a renewed political debate about the risks involved in nuclear power and subsequently to a watershed in the use of nuclear power in Germany.

Under the impression of the reactor accidents at Fukushima, the Federal Government – together with the Minister-Presidents of the Länder operating NPPs – ordered a review of the safety of all German NPPs by the Reactor Safety Commission (RSK) and set up an Ethics Commission on "Secure Energy Supply", which prepared and presented a statement on possible future energy supply.

Taking all the results into account, the Federal Government decided to terminate the use of nuclear power as soon as possible. The amendments of the Atomic Energy Act that came into force on 6 August 2011 lay down the gradual phase-out of electricity production by NPPs in Germany by the end of the year 2022.

2 National safety reviews, studies and measures relating to nuclear power plants

Immediately after the accident at Fukushima, the competent nuclear regulatory authorities of the Länder carried out specific inspections and plant walk-downs in order to determine the need for immediate action to enhance safety and order further safety assessments by expert commissions.

Based on their responsibility for the safety of the plants, the operators of the German nuclear power plants carried out their own assessments immediately after the Fukushima accidents. From the perspective of the operator these initial studies yielded no indications of any design deficits. Potential for further optimisation was identified in the beyond-design area, so that some measures were taken immediately after the events at Fukushima.

A few days after the earthquake in Japan, the RSK was ordered to carry out a review of the safety of the operating German NPPs in the light of the Japanese events.

According to the catalogue of questions prepared by the RSK for the plant-specific reviews of the German NPPs, it had to be identified above all to what extent the general protection goals of "reactivity control", "cooling of the fuel assemblies in the reactor pressure vessel as well as in the spent fuel pool" and "limitation of the release of radioactive materials (maintenance of barrier integrity)" would be achieved in the case of the occurrence of external hazards beyond those postulated so far and still to be regarded as valid design requirements. To assess the robustness of the plants, three respective topic-specifically defined degrees of protection were introduced. In particular, natural hazards (earthquakes, weather-induced effects as well as their simultaneous occurrences), postulated unavailabilities of safety and emergency systems (e.g. longer-term loss of the electrical power supply incl. emergency power supply or unavailability of the auxiliary service water supply) that are independent of specific event sequences and severe boundary conditions for the execution of emergency measures were considered. Man-made hazards were also examined, such as aircraft crash, blast wave and possible impacts from neighbouring units.

In a summarising assessment, the RSK concluded in its statement on 16 May 2011 that compared with the Fukushima Dai-ichi NPP, a higher level of precaution can be ascertained for German plants with regard to the electrical power supply and the con-

sideration of flooding events. Further robustness assessments showed that there is no consistent result for all plants in terms of the type or age of the plant. Plants that originally had a less robust design were backfitted with partly autonomous emergency systems to ensure vital functions. In its statement of 16 May 2011 already, the RSK made first recommendations, which were followed up in the supervisory procedures. Subsequent to the statement of 16 May 2011, the RSK continued its discussions regarding the assessment of robustness. On the basis of these further consultations, the RSK supplemented its recommendation on the robustness of the German nuclear power plants on 26 and 27 September 2012. The results of the discussions of the RSK were published in the following papers:

- RSK Statement "Plant-specific safety review (RSK-SÜ) of German nuclear power plants in the light of the events in Fukushima-1 (Japan)" from the 437th RSK meeting from 11 to 14 May 2011, adopted on 16 May 2011
- RSK Statement "Loss of the primary ultimate heat sink" from the 446th RSK meeting on 5 April 2012
- RSK Recommendation "Recommendations of the RSK on the robustness of the German nuclear power plants" from the 450th RSK meeting on 26 and 27 September 2012
- RSK Statement "Minimum value of 0.1g (approx. 1.0 m/s²) for the maximum horizontal ground acceleration in earthquakes", from the 457th RSK meeting on 11 April 2013
- RSK Statement "Assessment of the coverage of extreme weather conditions by the existing design" from the 462nd RSK meeting on 6 November 2013.

In this Statement, the RSK made a recommendation that the proof in the design basis area of the control of weather conditions should be furnished with a recurrence frequency of 10⁻⁴/a. It was also suggested that in terms of robustness, any hazards beyond those of the design basis should be considered using engineering judgement to determine safety margins.

In the course, the RSK also considered in its reports the recommendations of the Peer Review process of the ENSREG EU stress test (see <http://www.ensreg.eu/eu-stress-tests>) and took them into account in the preparation of national recommendations.

Other studies and discussions of the RSK on the topics of "crash of commercial airliners" and on hydrogen release in rooms outside the containment" have not yet been concluded.

In 2013, the RSK looked at potential impacts of toxic gases on nuclear power plants in more detail. The result was that there was no further need for regulation regarding the mitigation of the potential impact of hazardous substances on nuclear power plants.

In addition, GRS prepared an Information Notice (WLN) by order of the BMUB on the conclusions drawn from the Fukushima accident for German NPPs. In the recommendations, measures are addressed to further improve control of beyond-design-basis events.

For the plant-specific implementation of the mentioned recommendations in a systematic manner, the operators of the German NPPs together with the German power plant operators organisation VGB initiated an analysis of the safety provisions of their nuclear power plants regarding the robustness of the effectiveness of the safety functions that are essential for the prevention and limitation of releases of radioactive materials (vital safety functions) under beyond-design-basis conditions. The results of VGB have been available to the RSK since December 2013 and are included in the plant-specific Tables (Table 5-2). The RSK is currently discussing the underlying concept of VGB with regard to its recommendations.

The above-mentioned studies and resulting recommendations serve for the enhancement of the robustness of German plants and are listed in Table 5-1. Despite the fact that some of the recommendations of the RSK and those contained in the Information Notice are very similar, they are nevertheless listed separately. The formulation of the individual recommendations was adapted to ensure their comprehensibility in the tabular representation. In the last column of Table 5-1, there are cross-references to the corresponding recommendations and suggestions from the results of the ENSREG EU stress test from the topic areas 1 to 3 of the extraordinary meeting of the Contracting Parties to the Convention on Nuclear Safety (CNS) in August 2012, which are listed in the Annex.

3 Studies at international level

The European Council declared at the end of March 2011 that the safety of all nuclear installations in the EU should be reviewed by means of a transparent risk and safety assessment (stress test). The European Nuclear Safety Regulators Group (ENSREG) took charge of the execution of these studies. Taking part were the nuclear-power-operating Member States of the European Union as well as the Ukraine and Switzerland.

ENSREG published corresponding specifications on 13 May 2011 according to which all NPPs in Europe assessed their robustness against extreme external hazards (CNS Topic 1) and in connection with a loss of safety functions (CNS Topic 2) as well as the measures provided to cope with severe accidents (CNS Topic 3). In the context of these studies, the first step included the preparation of plant-specific reports by the plant operators. These reports were reviewed and assessed by the respective national regulatory authorities, and the results were summarised in a National Report. All National Reports were published by 31 December 2011. Subsequently, the National Reports were subjected first to a topic-specific and then to a country-specific European Peer Review. For each participating country, a Country Peer Review Report was prepared, containing concrete recommendations and findings. The findings obtained from all these reviews were summarised in an overall report on the EU stress test. In supplement, ENSREG published a summary of the essential recommendations and a „Compilation of Recommendations and Suggestions from the Review of the European Stress Test“. In October 2012, the European Commission published a report to the European Council and the European Parliament based on the results of the European stress test. The errors in this report were rectified in a revised version published in 2013. All results and reports on the EU stress test are available on the Internet at <http://www.ensreg.eu/eu-stress-tests>.

The recommendations and suggestions from the EU stress test are described and commented on in the Annex Table 7-1. Here, details are provided about how these recommendations were adopted for the German nuclear power plants in terms of further actions.

The BMUB tasked the RSK with evaluating the results of the EU stress test for the German nuclear power plants and considering them in its further discussions about possible enhancements of safety. The RSK adopted and published its Recommenda-

tion on 27 September 2012. Both the RSK recommendation and an Information Notice (February 2012) of Gesellschaft für Anlagen und Reaktorsicherheit formed the basis of the safety-related assessments and measures yet to be carried out. Corresponding allocations to the national recommendations (RSK) are given in Table 5-1. This way, the international and the national findings from the reviews of the nuclear power plants have been joined together. On this basis, the Federal Environment Ministry, together with the competent nuclear regulatory authority of the Länder, drew up the National Action Plan. It was submitted to ENSREG in English by the end of 2012, uploaded to the ENSREG website and published in German on the BMUB website.

The 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety CNS, 27 – 31 August 2012, dealt with the measures taken by Contracting Parties. The measures were discussed in six groups of topics (CNS Topics):

1. External Events
2. Design Issues
3. Severe Accident Management
4. National Organizations
5. Emergency Preparedness and Response
6. International Cooperation

Topic areas 1-3 of the extraordinary CNS conference cover the technical issues of the EU stress test. The CNS recommendations relating to topic areas 1-3 do not reach beyond the recommendations of the EU stress test and are contained in Table 7-1. They are referred to via a special entry in the column "Source".

The recommendations of the extraordinary CNS conference relating to topic areas 4 to 6 are of a general nature. They are described and commented on in Table 7-2 in the Annex. Here, information is given about how the recommendations were included in the on-going discussions about specific measures.

In a comprehensive project, the German Commission on Radiological Protection (SSK) is currently reviewing the existing regulations for emergency preparedness and is preparing recommendations. These topics of discussion are presented in Table 6-1 and provided with references to the international recommendations contained in Table 7-2.

This way, the international and the national findings in these topic areas have also been joined together.

To review the implementation of the stress test measures, ENSREG organised a workshop from 22 until 26 April 2013 under German leadership. Here, the participating countries explained their plans and presented the state of implementation of the results of the European stress tests. The aim was that the participating countries should agree on a level of risk reduction regarding extreme events in nuclear power plants that would be as harmonised as possible while maintaining the countries' own responsibility for nuclear safety. 68 experts from 21 European Member States, the Ukraine and Switzerland as well as 11 observers from three other countries (Armenia, Canada and Taiwan) and the IAEA took part. Experiences were exchanged and the coming challenges within the European countries identified. It was shown in a transparent manner that lessons were learned from the nuclear accident at Fukushima. Necessary measures have already been implemented or are to be realised in the coming years, sometimes following ambitious targets, and in some countries by 2020 at the latest. All participants felt obliged to this transparent approach and agreed to subject their Action Plans to another mutual review in 2015. The final report of the workshop was approved by ENSREG at the end of May and published in the ENSREG website on 10 June 2013.

A renewed mutual presentation of the status of implementation of all measures and the National Action Plans will take place as part of an ENSREG workshop from 20 until 24 April 2015 under Spanish leadership. For the purpose of preparation, the National Action Plans of all participating countries are to be submitted in English to ENSREG by the end of 2015. All National Action Plans will be uploaded to the ENSREG website. In addition, the German Action Plan will be published in German on the BMUB website.

4 Action plan and WENRA Reference Levels

Following the events at Fukushima, the Reference Levels of WENRA were revised and supplemented. These Reference Levels contain requirements for design and operation as well as provisions against emergencies in nuclear power plants. The additional requirements of the WENRA Reference Levels are either fulfilled by the requirements stipulated in the German regulations or are specified further by the recommendations that have been included within the framework of the German National Action Plan.

The Reference Levels under Issue F, Design Extension of Existing Reactors, contain recommendations for extending the plants to protect them against beyond-design-basis events. The functions to be ensured according to WENRA comprise the entirety of all installations provided for fulfilling the protection goals of reactivity control, residual-heat removal, and the safe enclosure of radioactive materials. Corresponding requirements regarding beyond-design-basis events are made in recommendations N-2, N-4, N-8, N-9 and N-23 of the National Action Plan.

The Reference Levels under Issue LM, Emergency Operating Procedures and Severe Accident Management Guidelines, stipulate the preparation and introduction of Emergency Operating Procedures and SAMG, as required in recommendation N-23 of the National Action Plan.

In Issue R, On-Site Emergency Preparedness, it is in particular organisational and preparatory measures and provisions for emergencies that are described. This concerns the provision of necessary mobile equipment for controlling the event, the clear allocation of tasks and trained procedures, especially also in the co-operation with external agencies, and proof that the intended actions can also be carried out under adverse conditions (e.g. with difficult access). Requirements of this kind are contained in recommendations N-1 – N-5, N-10, N-11 and N-19 – N-22 of the National Action Plan.

Issue T, Natural Hazards, describes the procedure for considering external natural hazards in nuclear power plants. Recommendations N-13 – N-17 and N-24 of the National Action Plan deal with beyond-design-basis aspects of natural hazards as they are described in the WENRA Reference Levels under Issue T.

5 Actions Plan for the implementation of measures to increase robustness in the German nuclear power plants (CNS Topics 1-3)

The national safety reviews and studies mentioned in the previous chapters contain recommendations to enhance the robustness for beyond-design-basis events. They are compiled in Table 5-1.

These recommendations form the basis for the measures so far defined plant-specifically for the nuclear power plants. These measures are/will be implemented within the framework of the supervisory procedure. They are compiled in Table 5-2.

Table 5-1 and Table 5-2 together represent the Action Plan for the implementation of measures to improve the robustness of German NPPs in the beyond design area in consequence of the Fukushima nuclear accident.

Table 5-1 contains the national recommendations from the GRS Information Notice and from all RSK Recommendation as well as RSK Statements relating to Fukushima. Not all of the recommendations shown are relevant for all plants. In supplement to the recommendation proper and the reference to its source, Table 5-1 also refers to the CNS Topic and the associated recommendation from the ENSREG "Compilation of Recommendations and Suggestions".

Table 5-2 shows for each plant the already implemented measures as well as the planned measures and their current status of implementation, and their reference to the recommendations from the national reviews and studies mentioned in Table 5-1. Here, first the plants with valid licences for power operation and then the plants in post-operational state are listed alphabetically.

The recommendations and measures listed in Table 5-1 and Table 5-2 will be adapted and, if need be, supplemented in the further course of the discussions and assessments.

Regarding the significance of the recommendations and their implementation in the plants, the nuclear regulatory authorities of the Länder have stated and confirmed that there are no design deficits and that the necessary precaution against damage as required by the Atomic Energy Act has been taken in all German nuclear power plants.

The operators endeavour to further increase the existing safety margins by appropriate measures even further. To do so, they have taken action at an early stage already.

By way of the analyses that have been carried out, the robustness of the nuclear power plants was assessed in depth against the background of the events at the Fukushima NPP. The potentials and measures for a further enhancement of robustness were recognised. In the ENSREG report on the follow-up fact-finding site visit to the Gundremmingen nuclear power plant, this procedure is explicitly welcomed.

The plants that were taken out of operation in 2011 also carried out the European stress test under "power operation" conditions before the amendment of the Atomic Energy Act came into force. For these plants that are now in permanent shutdown condition, all recommendations of the Action Plan have been assessed. Table 5-2 lists only those measures that from a safety-related point of view are relevant for the current plant state.

In the meantime, various further preventive emergency measures have been implemented – next to the already existing ones – in all plants that are in power operation. For example, there have been activities going on in the area of the electrical energy supply. In order to be able to re-establish the AC power supply in an emergency scenario, one or several mobile diesel generator sets were installed at the plants, and suitable external connection points for these generator sets were created. With the help of these diesel generator sets it is also possible in the beyond-design-basis area to ensure the DC power supply within the first ten hours of an event. As regards the removal of residual heat from the core and the fuel pool, the existing emergency measures have also been supplemented or optimised. To do so, mobile pumps and hoses have been provided in some plants to allow the establishment of corresponding mobile residual-heat removal chains. The emergency measures for the fuel pools were extended and optimised, and cooling water sources that are independent of the ultimate heat sink were established.

The operators of the German nuclear power plants additionally developed a generic concept for dealing with severe accidents (SAMG – severe accident management guidelines) in the form of a "Manual for mitigating emergency measures" (HMN) as a supplement to the existing emergency manuals (NHB) and presented it to the RSK. This concept is now being introduced in all plants in power operation and is subject to continuous improvement.

Fulfilling their responsibility for nuclear safety, the operators have carried out supplementary analyses of the safety provisions of their nuclear power plants regarding the robustness and effectiveness of the vital safety functions for preventing and limiting releases of radioactive substances under beyond-design-basis impacts.

In the above-mentioned analyses, the corresponding recommendations of the RSK on the subject matter, scope and procedure of the systematic robustness analyses were taken into account.

The operators' robustness analyses confirmed the extraordinarily high level of robustness of the plants. Due to the already existing very high degree of protection of the plants, it was necessary to postulate extremely unlikely scenarios in the robustness analyses to be able to clarify safety margins to cliff edge effects in the beyond-design-basis area or to identify potential optimisations.

All in all it was shown that cliff edge effects can generally already be prevented by the existing precautionary and emergency measures. If systematically determined additional robustness-increasing measures are taken into account, robustness in the beyond-design-basis area is further increased and the control of beyond-design-basis events improved.

Whether or not the competent nuclear supervisory authorities of the Länder still see a need for review regarding the measures listed in Table 5-2 can be seen in said Table. In addition, the BMUB asked the RSK for a generic review of the implementation of the RSK Recommendations referred to in Table 5-1.

Table 5-1: Recommendations of the action plan for nuclear power plants

No.	Recommendation	CNS Topic	Source	Related European recommendation
N-1	In the event of a station blackout, it has to be ensured that the plant can be kept in a stable subcritical state, and the residual heat can be removed safely for at least 10 hours by all means and personnel available at the plant. The power supply required for this (e.g. batteries) as well as the power supply of the accident overview measuring systems and the necessary lighting have to be ensured.	2	Information Notice 02/2012	E-16, E-18
N-2	In the event of a station blackout, accident management measures have to be provided by which, with an additional emergency power generator, a three-phase supply can be established within 10 hours. The emergency power generator has to be capable of supplying all systems that are required for plant shutdown and heat removal from the reactor core and the fuel pool. If additional operating agents and auxiliary equipment are required, their availability has also to be ensured. For connection of the emergency power generator, there have to be two physically separated connections points, such that preferably one of these points will still be available in case of a beyond-design-basis hazard. The emergency power generator, too, has to be available in case of a beyond-design-basis hazard, especially in case of earthquakes, flooding and damage to plant-internal and external infrastructure. The service fluids supply to the emergency power generator and to all essential systems has to be ensured accordingly, and all required tools and connection cables have to be kept ready.	2	Information Notice 02/2012	E-15, E-17
N-3	A service water supply, independent regarding its power supply and the required auxiliary systems, has to be available at the site. This has to be independent of the circulating water intake available by design, and both the residual heat and the waste heat of required systems (e.g. diesels) have to be removed by it in the long-term. Its availability in case of design-basis natural hazards has to be ensured.	2	Information Notice 02/2012	E-14
N-4	As emergency measure, a pump designed against beyond-design-basis events, which commensurate with its task is mobile and independent of the power supply of the plant, has to be provided. For the connection of this pump, two physically sufficiently separated connection points at different redundancies of the protected component cooling system have to be available. The latter have to be usable for core	2	Information Notice 02/2012	E-26

No.	Recommendation	CNS Topic	Source	Related European recommendation
	cooling including fuel pool cooling.			
N-5	For PWR plants, there should be a possibility of a reactor pressure vessel injection with borated water that is independent of the active emergency cooling system, taking account of the existing safety-related design. Here, special attention has to be paid to its non-reactiveness.	2	Information Notice 02/2012	
N-6	The filtered containment venting is to be designed such that it can be operated under proposed boundary conditions in case of emergency situations, like e.g. Station-blackout with additional loss of direct-current supply, and also under unfavourable radiological conditions. Potential hydrogen combustion processes related to containment venting have to be excluded in venting lines and possibly in exhaust air collecting areas or in other containment building areas. Effective precautions have to be taken against direct impacts to a neighbouring unit e.g. by transmission of hydrogen or radionuclides via shared systems or lines. A long-term operating of the containment venting systems is to be provided. In case of remote operation of the venting system, erroneous initiations have to be reliably prevented. In case of exclusive manual actuation, accessibility has to be ensured.	3	Information Notice 02/2012	E-28, E-32, E-47, E-53
N-7	In case that fuel elements are stored in the spent fuel pool outside the containment, but inside the containment building, it has to be examined if an accumulation of hydrogen is possible in this area. To prevent hydrogen accumulation, which can lead to formation of explosive gas mixtures, passive safety installations (e.g. catalytic recombiners) have to be available in this area to ensure their functionality also in cases of a station-blackout lasting longer than 10 hours.	3	Information Notice 02/2012	E-23, E-40
N-8	As an emergency measure, systems for fuel pool cooling have to be permanently installed, so that in case of demand, there is no need to enter endangered areas. Maloperation and erroneous tripping have to be excluded.	3	Information Notice 02/2012	E-23
N-9	For accident management measures, which have to be initiated from the control room, the possibility to initiate these from the remote shutdown station, too, has to be provided. If necessary, functions in the remote shutdown station have to be extended and the necessary information for the initiation of these measures has to be made available.	3	Information Notice 02/2012	E-22

No.	Recommendation	CNS Topic	Source	Related European recommendation
N-10	At the alternative location for the emergency response staff, means of communication for communication to the remote shutdown station and to the control room have to be available in case of emergency.	3	Information Notice 02/2012	E-22, E-39
N-11	Auxiliary equipment has to be available e.g. to provide access to buildings after external events. If this equipment is stored outside the plant, it has to be ensured that also in crisis situations with infrastructure interference, also outside the plant, they can reach the plant within the time required for each measure. In the organisation of accident management, it should be considered that the access to the plant can be interrupted, at least for a short time, in case of external events.	3	Information Notice 02/2012	E-26
N-12	Measures to review and, where required, improve the reliability of the ultimate heat sink with regard to blockage of the cooling water intake to strengthen the reliability of the ultimate heat sink with regard to the occurrence of rare external hazards and to control the loss of the ultimate heat sink.	2	RSK Statement – Loss of the ultimate heat sink	E-4, E-14, E-30, E-50
N-13	To ensure the vital safety functions in case of beyond design basis external or internal hazards, a systematic analysis should be conducted. For this purpose, the design margins in the existing safety installations or emergency systems are to be assessed with regard to whether and when the required safety function of safety installations or emergency systems may be endangered in case of increased (beyond design basis) assumptions on external and internal hazards. Here, the criteria from the RSK safety review for at least Robustness Level 1 or Degree of Protection 2 for man-made hazards are to be referred to. On this basis, it is then to be assessed whether robustness can be increased by appropriate measures to upgrade existing safety installations or emergency systems or by existing or additional accident management measures. With these accident management measures, it will then be possible to derive appropriate accident management measures to compensate for possibly occurring failures in the safety-related auxiliary functions.	1, 2	Recommendation of the RSK on the robustness of the German nuclear power plants – Part 1	E-1, E-5, E-12, E-13, E-24, E-25, E-30, E-32, E-33, E-45, E-46, E-54
N-14	<u>Further specification of recommendation N-13 on earthquakes</u> The robustness to beyond design basis earthquake impacts is to be assessed on the basis of the criteria from the RSK safety review for at least Robustness Level 1. For plants with earthquake PSA, the assessment should be based on the HCLPF	1	Recommendation of the RSK on the robustness of the German nuclear	E-6, E-49

No.	Recommendation	CNS Topic	Source	Related European recommendation
	<p>(HCLPF (High Confidence for Low Probability of Failure) values of the buildings and structures required to ensure the vital safety functions. For plants without earthquake PSA, the assessment should be performed by means of applicability considerations. The superposition of operating conditions during low-power and shutdown operation of short duration with an earthquake should be considered, which goes beyond the requirements specified in the existing rules and regulations. It is to be demonstrated that this will not lead to significant impacts in the environment. For plants that are permanently in low-power and shutdown operation, the proof of robustness is to be provided for longer lasting states also for beyond design basis earthquakes.</p> <p>If, at a corresponding robustness, a site-specific PGA value < 0.1 g should be determined, the RSK recommends that the safety margins of the design for a postulated PGA value of 0.1 g should be determined.</p>		<p>power plants – Part 1</p> <p>RSK Statement on the "Minimum value of 0.1g (PGA)"</p>	
N-15	<p><u>Further specification of recommendation N-13 on flooding</u></p> <p>If a water level that may endanger vital safety functions cannot be excluded due to site-specific conditions, the criteria specified in the RSK safety review for at least Level 1 shall be referred to. Alternatively, it may be demonstrated on the basis of site-specific conditions that a postulated discharge quantity, which is determined by extrapolation of existing probabilistic curves to an occurrence frequency of $10^{-5}/a$, will not result in the loss of vital safety function. For sites located near tidal waters, an analogous approach is to be applied. In this respect, the uplift resistance of canals and buildings is to be considered.</p>	1	<p>Recommendation of the RSK on the robustness of the German nuclear power plants – Part 1</p>	
N-16	<p><u>Further specification of recommendation N-13 on flooding of the annulus</u></p> <p>The impacts of a beyond-design-basis annulus flooding with a flooding level of 2 m at the lower annulus level on safety-relevant installations should be clarified, in particular with regard to transducers and other electrical and I&C equipment. In addition, it is to be specified what measures will be reliably available in the different operating phases for the prevention of impermissible losses.</p>	2	<p>Recommendation of the RSK on the robustness of the German nuclear power plants – Part 1</p>	

No.	Recommendation	CNS Topic	Source	Related European recommendation
N-17	<u>Further specification of recommendation N-13 on load drop</u> It is recommended to analyse the impacts of the drop of a fuel element transport cask into the fuel pool, the impacts of the drop of loads into the RPV or onto the connection between RPV and fuel pool established during low-power and shutdown operation and, where appropriate, inadmissible retroactive effects on the reactor coolant pressure boundary or damage affecting more than one redundancy.	2	Recommendation of the RSK on the robustness of the German nuclear power plants – Part 1	
N-18	It should be clarified whether the safety objectives of the accident management measures can also be achieved during or after natural external design basis hazards. In particular, the following aspects should be considered: limitations of the accessibility of the power plant area and power plant buildings that may have to be postulated, operability of the accident management measures, and availability of the remote shutdown and control station.	1, 3	Recommendation of the RSK on the robustness of the German nuclear power plants – Part 2	E-4, E-22, E-33, E-43
N-19	It is to be demonstrated that the supply of three-phase alternating current required for the vital safety functions is ensured even if there is no grid connection available for up to a week. In the case of a postulated station blackout, the vital safety functions have to be maintained or re-established in time before reaching “cliff-edge” effects (direct current supply if three-phase alternating current supply is not available for up to 10 h, layout of standardised hook-up points protected against external hazards outside of the buildings, and a mobile emergency power generator protected against external hazards for at least one redundant residual heat removal train).	2	Recommendation of the RSK on the robustness of the German nuclear power plants – Part 2	E-15, E-16
N-20	Review of the accident management concept with regard to injection possibilities for the cooling of fuel assemblies and for ensuring subcriticality under the aspects of storage of mobile equipment and of chemicals protected against external hazards, water intake points whose availability is also ensured after an external impact, and possibilities of injecting water into steam generators, the reactor coolant system and, if required, the without the need to enter areas with high risk potential.	3	Recommendation of the RSK on the robustness of the German nuclear power plants – Part 2	E-33
N-21	The filtered containment venting system is to be designed so that depressurisation can also be repeatedly performed during or after natural external design basis hazards and in the event of a station blackout Furthermore, the effectiveness of installations to reduce hydrogen in the containment is to be ensured accordingly.	3	Recommendation of the RSK on the robustness of the German nuclear	E-33, E-47, E-53

No.	Recommendation	CNS Topic	Source	Related European recommendation
			power plants – Part 2	
N-22	Increased consideration of wet storage of fuel assemblies in the accident management concept, taking into account the following aspects: possibilities of injecting water into the spent fuel pool without the need to enter areas with high risk potential, and ensuring evaporation cooling (safety demonstrations for the fuel pool, reactor cavity, setdown pool, reactor cavity seal liner at boiling temperature).	3	Recommendation of the RSK on the robustness of the German nuclear power plants – Part 2	E-23, E-30
N-23	Implementation of the Severe Accident Management Guidelines (SAMG) in the short term.	3	Recommendation of the RSK on the robustness of the German nuclear power plants – Part 2	E-29, E-31, E-34, E-35, E-36, E-37, E-38, E-46, E-52
N-24	Against the background of the recommendations of the ENSREG Stress Test Peer Review, it should be examined by the operators in an engineering assessment to be carried out as part of the robustness assessment whether any vital safety functions may be impermissibly impaired by impacts due to extreme weather conditions as listed in the RSK Statement "Assessment of the coverage of extreme weather conditions by the existing design".	1	RSK Statement - Assessment of the coverage of extreme weather conditions by the existing design	E-4, E-6, E-9, E-11, E-13

Table 5-2: Activities and measures in German nuclear power plants

Plants in power operation

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
GKN II/ PWR	1	Battery capacities by plant design are higher than 10 h (BW ¹ 1)	N- 1	done	²
GKN II/ PWR	2	Obtaining and providing two mobile diesel generators at the site: Their operability was demonstrated in the 2012 refuelling outage. Technical description and procedures available. Further information is required. (BW 2-3)	N- 2, N-19	done	
GKN II/ PWR	3	A statement exists on fuel cooling. The multiple-cell coolers are the ultimate heat sink. The river Neckar is a diverse heat sink. Further information is required. (BW 5-6)	N- 3, N-12	done	2015
GKN II/ PWR	4	A statement exists on fuel cooling. An additional option for injection into the component cooling system does not contribute meaningfully from a safety-related point of view due to the availability of the diverse heat sink. The RSK was asked for a supplementary statement.	N- 4	in progress	2015
GKN II/ PWR	5	An assessment of reactor pressure vessel injection is available. The RSK was asked for a supplementary statement. (BW 4, 9)	N- 5, N-20	in progress	2015
GKN II/ PWR	6	Possibility of filtered containment venting without electricity supply has been demonstrated. Additional studies into hydrogen propagation and seismic safety have been carried out. Additional studies into seismic safety are in progress. (BW 17-18)	N- 6, N-21	done	
				in progress	2014

¹ Numbers indicated refer to the serial number in the Action Plan of Baden-Wurttemberg (BW), as at 31/10/2014

² All dates relating to the GKN I, GKN II, KKP 1 and KKP 2 nuclear power plants correspond to the Action Plan of Baden-Wurttemberg (BW), as at 31/10/2014

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
GKN II/ PWR	7	Measure for injecting into the spent-fuel pool and operability demonstrated during 2012 refuelling outage, technical description and procedures have been prepared. An evaporation cooling concept has been presented.	N-8, N-22	done	
		Further information is required. (BW 10-11)		in progress	2015
GKN II/ PWR	8	Description of the as-is condition for the initiation of emergency measures in case of a loss of the main control room in 2012, with additional information provided in 2013. The supervisory authority is in the act of checking whether further information is needed. (BW 19)	N-9	done	
GKN II/ PWR	9	Equal means of communication have been installed and are ready for operation. (BW 20)	N-10	done	
GKN II/ PWR	10	Listing and assessment of aids for regaining access to buildings 2012, with additional information provided in 2013.	N-11	done	
		The supervisory authority is in the act of checking whether further information is needed. (BW 21)			
GKN II/ PWR	11	For the GKN II plant, no CCF potential for the loss of the circulating water return structures was identified (BW 12)	N-12	done	
GKN II/ PWR	12	A statement on the reliability of the ultimate heat sink has been presented.	N-12	done	
		Further information is required. (BW 30)		in progress	2015
GKN II/ PWR	13	Additional assessment of the safety margins of the auxiliary service water and ventilation systems under extreme weather conditions. Supplementary requirements due to the RSK Statement of 6 November 2013. A statement by the operator is available.	N-13, N-24	done	
		The supervisory authority is in the act of checking whether further information is needed. (BW 26)			
GKN II/ PWR	14	Specification of boundary conditions for ensuring the feasibility of emergency measures	N-13, N-18	done	
		For selected emergency procedures with special relevance (primary bleed, secondary bleed, filtered venting, external fuel pool injection and creation of a mobile emergency			

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		power supply), there was a positive assessment of the operability in the event of external design impacts.		in progress	2014
		Performance of a robustness analysis. (BW 13-15)			
GKN II/ PWR	15	Accessibility and safety under flooding conditions are ensured. (BW 24-25)	N-15	done	
GKN II/ PWR	16	The operability in an emergency of the permanently installed installations for fuel pool cooling has been demonstrated. An evaporation cooling concept has been presented.	N-22	done	
		The supervisory authority is in the act of checking whether further information is needed. (BW 10)			
GKN II/ PWR	17	Severe Accident Management Guidelines (SAMG) for power operation and for low-power and shutdown states have been prepared and implemented. (BW 16)	N-23	done	
KBR/ PWR	1	Preparation of a comprehensive and integrated concept for postulated station black-out (SBO) scenarios. The concept was prepared and contains i.a. the measures KBR/2, KBR/3 and KBR/4 (see below).	N- 1, N- 2, N-19	done	
KBR/ PWR	2	Establishment of connection points for connecting mobile emergency diesel generators with protection against external hazards in the area of the emergency feedwater building and in the area of the 3 rd grid connection.	N- 1, N- 2, N-19	done	
KBR/ PWR	3	Obtaining and providing a mobile emergency diesel generator for the supply of vital I&C installations, steam generator emergency feeding, and battery support. Design done and order placed, generator set has been delivered and installed.	N- 1, N-19	done	
KBR/ PWR	4	Obtaining and providing a mobile emergency diesel generator in the long-term range to supply an emergency RHR chain. Design done and order placed, generator set has been delivered and installed.	N- 2, N-19	done	
KBR/ PWR	5	Development of an emergency measure for injecting coolant into the component cooling system to cool the reactor pressure vessel and the spent fuel pool in case of a loss of the ultimate heat sink (emergency measure "mobile shortened residual-heat removal chain" developed).	N- 3, N- 4	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KBR/ PWR	6	Creation of a diverse source of cooling water (water intake from a source other than the river).	N- 3, N-12	done	
KBR/ PWR	7	Obtaining and providing mobile pumps as well as other injection equipment. Equipment for pumping over fuel, electrical pump for steam generator feeding available, injection equipment for mobile shortened residual-heat removal chain available.	N- 4, N- 8, N-20	done	
KBR/ PWR	8	A systematic review of the robustness of emergency measures with consideration of external hazards has been carried out as part of a robustness analysis. With the existing and the new emergency measures it is possible to maintain/re-establish the vital functions even in the case of beyond-design-basis events.	N- 5, N- 13, N- 20, N-18	done	
KBR/ PWR	9	Review and optimisation if necessary of the requirements for the containment venting system with consideration of station blackout conditions, adverse radiological conditions and the effectiveness following natural external design impacts.	N- 6, N-21	in progress, as at 05/12/2014	2014
KBR/ PWR	10	Creation of a permanently installed injection path into the spent fuel pool that is accessible from outside the containment. This injection path exists.	N- 8, N-22	done	
KBR/ PWR	11	Preparation of comprehensive analyses and development of emergency measures regarding the loss of spent fuel pool cooling during beyond-design-basis accidents. Analyses comprise e.g. structural analyses of the spent fuel pool at increased temperatures, pressure build-up in the containment, radiology and heat-up and grace periods as well as the derivation of corresponding emergency measures (i.a. KBR/10).	N- 8, N-22	done	
KBR/ PWR	12	Examination of the need to be able to initiate additional accident management measures from the remote shutdown and control station, too.	N- 9	done	
KBR/ PWR	13	Provision of suitable means of communication to increase the robustness of the communication between crisis team, control room, remote shutdown and control station, and the supervisory and disaster control authorities. Equipment with satellite telephones has been done.	N-10	done	
KBR/ PWR	14	Review and improvement of the accessibility of the plant grounds and the plant itself after an earthquake and flooding. Accessibility is ensured by the existing and new measures.	N-11	done	
KBR/ PWR	15	Assessment of the CCF potential for the loss of the circulating water return structures and derivation of measures if necessary. The existing measures ensure sufficient precaution against CCFs.	N-12	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KBR/ PWR	16	Review of the safety clearances of safety-relevant buildings. The existing safety clearances of the buildings remain sufficient.	N-13	done	
KBR/ PWR	17	Installation of seismic instrumentation.	N-14	done	
KBR/ PWR	18	A systematic review of the robustness of the plant in the event of a beyond-design earthquake and flood (objective: guarantee of vital functions) has been carried out as part of a robustness analysis. With the existing and the new emergency measures it is possible to maintain/re-establish the vital functions even in the case of beyond-design-basis events.	N-14, N-15	done	
KBR/ PWR	19	Review and improvement of flood protection. The design against flooding was reviewed. Sufficient protection is ensured by the measures that have been implemented.	N-15	done	
KBR/ PWR	20	A systematic review of the robustness of the plant in the event of a beyond-design flooding of the annulus (objective: guarantee of vital functions) has been carried out as part of a robustness analysis. With the existing and the new emergency measures it is possible to maintain/re-establish the vital functions even in the case of beyond-design-basis events.	N-16	done	
KBR/ PWR	21	Review of the robustness of the plant regarding load crash events. For this purpose, an assessment of the existing precautionary measures and the robustness of the plant in connection with postulated load crash events was carried out. No further measures were derived.	N-17	done	
KBR/ PWR	22	Examination of the flooding-safe storage of safety-relevant equipment. Flooding-safe storage is ensured.	N-18	done	
KBR/ PWR	23	Review of the availability of the remote shutdown and control station. The remote shutdown and control station meets the requirements.	N-18	done	
KBR/ PWR	24	Review and optimisation if necessary of the robustness of the emergency measure "secondary bleed and feed". The review of the optimisation options was concluded and a concept was prepared. Its implementation has been concluded (in combination with KBR/3 and KBR/7).	N-18	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KBR/ PWR	25	Storage or stockage of equipment for pumping over or transporting secured fuel from depots. A concept was prepared. The implementation of the measures has been concluded (see KBR/7).	N-19	done	
KBR/ PWR	26	Storage or stockage of fuels and lubricants. Sufficient fuels and lubricants are available at the plant, these are also available during flooding or in earthquakes.	N-19	done	
KBR/ PWR	27	Measures and procedures to prolong the operating times of emergency diesel generators, using secured fuel stocks. A concept was prepared. The implementation of the measures has been concluded.	N-19	done	
KBR/ PWR	28	Integrity verifications were prepared for the structures of the spent fuel pool for higher temperatures. No measures were derived.	N-22	done	
KBR/ PWR	29	Development and preparation of Severe Accident Management Guidelines (SAMG), as well as introduction and instruction at the plant. Development, plant-specific adaptation and instruction nearly completed.	N-23	done	
KBR/ PWR	30	Review of the robustness of vital safety functions in terms of the RSK Statement "Assessment of the coverage of extreme weather conditions by the existing design" with regard to whether it is possible that additional measures may make a contribution to further risk precaution that is not merely slight. No further measures are intended.	N-24	in progress, as at 05/12/2014	2014
KKE/ PWR	1	Obtaining and providing a mobile emergency power generator set. These are designed such that they can provide the necessary power supply for the mentioned tasks. The mobile emergency power generator set are ready for operation. It is furthermore possible by the intentional shutdown of emergency power generator sets and consumers to ensure the AC power supply at the plant for more than 7 days, using the available secured fuel supplies.	N- 1, N- 2, N-19	done	
KKE/ PWR	2	A self-contained, independent auxiliary service water supply (multiple-cell cooler) is available within the plant grounds. Hence a failure of the auxiliary service water supply need not be postulated even in the case of design natural hazards.	N-3	no activity/measure necessary	
KKE/ PWR	3	The plant already has an independent, diverse auxiliary service water supply (see KKE/2). Analyses have shown that further installations could not make a contribution to further risk precaution that would not merely be slight.	N-4	no activity/measure necessary	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKE/ PWR	4	A systematic review of the robustness of emergency measures with consideration of external hazards was carried out. As a result it can be stated that it is generally possible to avoid cliff edge effects with the existing emergency measures, even in highly unlikely, beyond-design-basis events. The review of the activity/measure by the supervisory authority has not yet been concluded.	N- 5, N- 6, N- 9, N-13	done	
KKE/ PWR	5	Introduction of an emergency measure for initiating accumulator injection in mid-loop operation. The measure has been implemented and the execution of the individual steps is described in the corresponding document. The review of the activity/measure by the supervisory authority has not yet been concluded.	N- 5, N-13	done	
KKE/ PWR	6	Use of the GRS-developed QPRO code as a diagnostic and prediction aid for source term calculation. The code was obtained and tested.	N- 6, N-18, N-23	done	
KKE/ PWR	7	Not relevant in connection with KKE.	N- 7	no activity/measure necessary	
KKE/ PWR	8	Creation of a permanently installed injection path into the spent fuel pool that is accessible from outside the containment. These injection options have been implemented. The associated operational documents have been prepared.	N- 8, N-22	done	
KKE/ PWR	9	Further means of communication have been provided to increase the robustness of the communication between crisis team, control room, remote shutdown and control station, and the supervisory and disaster control authorities. This has included the equipment with satellite phones.	N-10	done	
KKE/ PWR	10	Detailed information on aids by which the access to buildings can be regained after external hazards are contained i.a. in the Final EU Stress test Report. Here, accessibility following external hazards was also assessed.	N-11	done	
KKE/ PWR	11	A review of the ultimate heat sink regarding any blockages of the cooling water inlet, the reliability upon the onset of rare external hazards and the control of the loss of the ultimate heat sink has shown that due to the plant-specific presence of the multi-cell coolers, the ultimate heat sink is highly reliable. Any losses of the ultimate heat sink	N-12	no activity/measure necessary	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		are controlled by the independent auxiliary service water supply.			
KKE/ PWR	12	Robustness regarding a beyond-design-basis earthquake was reviewed as part of the robustness analysis. As a result it can be stated that no contribution to further risk precaution for the general public that would not be merely slight can be achieved by further adequate safety precautions beyond the comprehensive technical as well as administrative measures that have already been implemented. The review of the activity/measure by the supervisory authority has not yet been concluded.	N-14	done	
KKE/ PWR	13	Not relevant in connection with KKE as the site of the reactor plant is to be considered as absolutely flooding-free. The design flood lies clearly below the zero elevation of the reactor plant.	N-15	no activity/measure necessary	
KKE/ PWR	14	A review of the robustness and an assessment of the consequences in the event of a beyond-design flooding of the annulus including the cooling of the spent fuel pool has been carried out. Owing to the limited coolant inventory in the auxiliary service water system, the effects of a flooding of the annulus remain slight. The supervisory authority is currently in the process of checking whether further information is necessary.	N-16	done	
KKE/ PWR	15	The review of this point has shown that the mentioned scenarios are safely prevented due to the technical and administrative measures taken.	N-17	no activity/measure necessary	
KKE/ PWR	16	A review of the availability of the remote shutdown and control station was carried out. Potential for optimisation was recognised and acted upon by the relocation of the remote shutdown and control station.	N-18	done	
KKE/ PWR	17	Storage or stockage of equipment for pumping over or transporting secured fuel from depots. Sufficient fuels and lubricants are available at the plant. The equipment is stored in a correspondingly secure location. The review of the activity/measure by the supervisory authority has not yet been concluded.	N-19	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKE/ PWR	18	Obtaining a further fire engine, with the option of choosing separate locations for the two vehicles within the plant grounds, so that access to equipment and aids is ensured in different locations within the plant grounds on demand. The additional fire engine has in the meantime been obtained.	N-20	done	
KKE/ PWR	19	Venting is possible in most external design hazards and during a station blackout. The effectiveness of the installations for hydrogen reduction was demonstrated by the installation of the H2 recombiners. The effectiveness of filtered venting in an earthquake was assessed in qualified inspections. The review of the activity/measure by the supervisory authority has not yet been concluded.	N-21	in progress	2015
KKE/ PWR	20	Development and preparation of Severe Accident Management Guidelines (SAMG), as well as introduction and instruction at the plant. For this purpose, the manual for mitigating emergency measures was introduced.	N-23	done	
KKE/ PWR	21	Review of the robustness of vital safety functions by means of the RSK Statement "Coverage of extreme weather conditions" with regard to whether it is possible that additional measures can make a contribution to further risk prevention that is not merely slight. The review of the activity/measure by the supervisory authority has not yet been concluded.	N-24	done	
KKG/ PWR	1	Preparation of a comprehensive and integrated concept for postulated station black-out scenarios. The concept was prepared and includes i.a. the measures KKG/1, KKG/3 and KKG/4 (see below).	N- 1, N- 2, N-19	done	
KKG/ PWR	2	Establishment of connections points for connecting mobile emergency diesel generators with protection against external hazards in the area of the emergency feedwater building. The design, planning and realisation of the feed points was concluded.	N- 1, N- 2, N-19	done	
KKG/ PWR	3	Obtaining and providing a mobile emergency diesel generator for the supply of vital I&C installations, SG emergency feeding, and battery support. Design done and order placed, generator set has been delivered and installed.	N- 1, N-19	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKG/ PWR	4	Obtaining and providing a mobile emergency diesel generator in the long-term range to supply an emergency RHR chain. Design done and order placed, generator set has been delivered and installed. Conclusion of the review by the supervisory authority is expected shortly.	N- 2, N-19	done	
KKG/ PWR	5	Development of an emergency measures for injecting coolant into the component cooling system to cool the reactor pressure vessel and the spent fuel pool in case of a loss of the ultimate heat sink (emergency measure "mobile shortened residual-heat removal chain" developed).	N- 3, N- 4	done	
KKG/ PWR	6	Creation of a diverse source of cooling water (water intake from a source other than the river)	N- 3, N-12	done	
KKG/ PWR	7	Obtaining and providing mobile pumps as well as other injection equipment. An electrical pump for steam generator injection was obtained, the injection equipment for the mobile shortened residual-heat removal chain was delivered completely.	N- 4, N- 8, N-20	done	
KKG/ PWR	8	A systematic review of the robustness of emergency measures with consideration of external hazards was carried out as part of a robustness analysis. With the existing and the new emergency measures it is possible to maintain/re-establish the vital functions even in beyond-design-basis events.	N- 5, N- 6, N- 9, N-13, N-20	done	
KKG/ PWR	9	Review and optimisation if necessary of the requirements for the containment venting system with consideration of station blackout conditions, adverse radiological conditions and the effectiveness following external natural design hazards.	N- 6, N-21	done	
KKG/ PWR	10	A permanently installed injection path into the spent fuel pool that is accessible from outside the containment has been created.	N- 8, N-22	done	
KKG/ PWR	11	Preparation of comprehensive analyses and development of emergency measures regarding the loss of spent fuel pool cooling during beyond-design-basis accidents. The analyses comprise e.g. structural analyses of the spent fuel pool at increased temperatures, pressure build-up in the containment, radiology and heat-up and grace periods as well as the derivation of corresponding emergency measures (i.a. KKG/10).	N- 8, N-22	done	
KKG/ PWR	12	Examination of the need to be able to initiate additional accident management measures from the remote shutdown and control station, too.	N-9	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKG/ PWR	13	Provision of suitable means of communication to increase the robustness of the communication between crisis team, control room, remote shutdown and control station, and the supervisory and disaster control authorities. Satellite phones have been obtained for this purpose.	N-10	done	
KKG/ PWR	14	Review and improvement of the accessibility of the plant grounds and the plant itself after an earthquake and flooding. Accessibility is ensured by the existing and the new measures.	N-11	done	
KKG/ PWR	15	Assessment of the CCF potential for the loss of the circulating water return structures. The existing measures provide sufficient precautions against CCFs.	N-12	done	
KKG/ PWR	16	Review of the safety clearances of safety-relevant buildings. The existing safety clearances continue to be sufficient.	N-13	done	
KKG/ PWR	17	A systematic review of the robustness of the plant in the event of a beyond-design earthquake and flood (objective: guarantee of vital functions) was carried out as part of a robustness analysis. With the existing and the new emergency measures it is possible to maintain/re-establish the vital functions even in beyond-design-basis events. Conclusion of the review by the supervisory authority is expected shortly.	N-14, N-15	done	
KKG/ PWR	18	The flood protection design was reviewed. The measures that have been implemented ensure sufficient protection.	N-15	done	
KKG/ PWR	19	A systematic review of the robustness of the plant in the event of a beyond-design flooding of the annulus (objective: guarantee of vital functions) was carried out as part of a robustness analysis. With the existing and the new emergency measures it is possible to maintain/re-establish the vital functions even in beyond-design-basis events.	N-16	done	
KKG/ PWR	20	Review of the robustness of the plant regarding load crash events. For this purpose, an assessment of the existing precautionary measures and the robustness of the plant in connection with postulated load crash events was carried out. No further measures were derived. Conclusion of the review by the supervisory authority is expected shortly.	N-17	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKG/ PWR	21	Examination of the flooding-safe storage of safety-relevant equipment. Flooding-safe storage is ensured.	N-18	done	
KKG/ PWR	22	Review of the availability of the remote shutdown and control station. The remote shutdown and control station meets the requirements.	N-18	done	
KKG/ PWR	23	Review and optimisation if necessary of the robustness of the emergency measure "secondary bleed and feed". The review of the optimisation possibilities has been concluded and a concept has been prepared and implemented (in combination with KKG/3 and KKG7).	N-18	done	
KKG/ PWR	24	Storage or stockage of equipment for pumping over or transporting secured fuel from depots. No other measures than the ones already implemented are necessary.	N-19	done	
KKG/ PWR	25	Storage or stockage of fuels and lubricants. Sufficient fuels and lubricants are available at the plant which are also available in the event of a flood or an earthquake.	N-19	done	
KKG/ PWR	26	Measures and procedures to prolong the operating times of emergency diesel generators, using secured fuel stocks. A concept has been prepared and the measures have been implemented completely.	N-19	done	
		Conclusion of the review by the supervisory authority is expected shortly.			
KKG/ PWR	27	Integrity verifications for the structures of the spent fuel pool for higher temperatures have been prepared. There are no further measures necessary.	N-22	done	
KKG/ PWR	28	Development and preparation of Severe Accident Management Guidelines (SAMG), as well as introduction and instruction at the plant. Development, preparation, plant-specific adaptation, introduction and instruction completed.	N-23	done	
KKG/ PWR	29	Review of the robustness of vital safety functions by means of the RSK Statement "Coverage of extreme weather conditions by the existing design" with regard to whether it is possible that additional measures can make a contribution to further risk prevention that is not merely slight. No further measures are intended.	N-24	done	
KKI-2/ PWR	1	Preparation of a comprehensive and integrated concept for postulated SBO scenarios. The concept has been prepared and contains i.a. the measures KKI-2/2, KKI-2/3 and KKI-2/4 (see below).	N- 1, N- 2, N-19	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKI-2/ PWR	2	Obtaining and providing a mobile emergency diesel generator for the supply of vital I&C installations, SG emergency feeding, and battery support. Design done and order placed, generator set has been delivered and installed.	N- 1, N-19	done	
KKI-2/ PWR	3	Obtaining and providing a mobile emergency diesel generator in the long-term range to supply an emergency RHR chain.	N- 2, N-19	done	
KKI-2/ PWR	4	Establishment of connections points for connecting mobile emergency diesel generators with protection against external hazards in the area of the emergency feedwater building and in the area of the 3rd grid connection, design and planning concluded, connecting points have been established.	N- 2, N-19	done	
KKI-2/ PWR	5	Development of an emergency measures for injecting coolant into the component cooling system to cool the reactor pressure vessel and the spent fuel pool in case of a loss of the ultimate heat sink (emergency measures mobile shortened residual-heat removal chain developed).	N- 3, N- 4	done	
KKI-2/ PWR	6	Creation of a diverse source of cooling water (water intake from a source other than the river).	N- 3, N-12	done	
KKI-2/ PWR	7	Obtaining and providing mobile pumps as well as other injection equipment. An electrical pump for steam generator injection was obtained, the injection equipment for the mobile shortened residual-heat removal chain was delivered completely.	N- 4, N- 8, N-20	done	
KKI-2/ PWR	8	A systematic review of the robustness of emergency measures with consideration of external hazards has been carried out as part of a robustness analysis. With the existing and the new emergency measures it is possible to maintain/re-establish the vital functions even in the case of beyond-design-basis events.	N- 5, N- 6, N- 9, N-13	done	
KKI-2/ PWR	9	Review and optimisation if necessary of the requirements for the containment venting system with consideration of station blackout conditions, adverse radiological conditions and the effectiveness following external natural design hazards.	N- 6, N-21	done	
KKI-2/ PWR	10	Creation of a permanently installed injection path into the spent fuel pool that is accessible from outside the containment. This injection path now exists.	N- 8, N-22	done	
KKI-2/ PWR	11	Preparation of comprehensive analyses and development of emergency measures regarding the loss of spent fuel pool cooling during beyond-design-basis accidents. The analyses comprise e.g. structural analyses of the spent fuel pool at increased temperatures, pressure build-up in the containment, radiology and heat-up and grace	N- 8, N-22	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		periods as well as the derivation of corresponding emergency measures (i.a. KKI-2/10).			
KKI-2/ PWR	12	Examination of the need to be able to initiate additional accident management measures from the remote shutdown and control station, too.	N-9	done	
KKI-2/ PWR	13	Provision of suitable means of communication to increase the robustness of the communication between crisis team, control room, remote shutdown and control station, and the supervisory and disaster control authorities. For this purpose, satellite phones have been obtained.	N-10	done	
KKI-2/ PWR	14	Review and improvement of the accessibility of the plant grounds and the plant itself after an earthquake and flooding. Accessibility is ensured by the existing measures.	N-11	done	
KKI-2/ PWR	15	An assessment of the CCF potential for the loss of the circulating water return structures was carried out. Sufficient precautions against CCFs are provided by the existing measures.	N-12	done	
KKI-2/ PWR	16	Review of the safety clearances of safety-relevant buildings. The existing safety clearances of the buildings continue to be sufficient.	N-13	done	
KKI-2/ PWR	17	A systematic review of the robustness of the plant in the event of a beyond-design-basis earthquake and flood (objective: guarantee of vital functions) was carried out as part of a robustness analysis. With the existing and the new emergency measures it is possible to maintain/re-establish the vital functions even in beyond-design-basis events.	N-14, N-15	done	
		Conclusion of the review by the supervisory authority is expected shortly.			
KKI-2/ PWR	18	A review and improvement of flood protection has been carried out. To do so, a new expert opinion on flooding was prepared which confirmed the existing design values.	N-15	done	
KKI-2/ PWR	19	A systematic review of the robustness of the plant in the event of a beyond-design flooding of the annulus (objective: guarantee of vital functions) was carried out as part of a robustness analysis. With the existing and the new emergency measures it is possible to maintain/re-establish the vital functions even in beyond-design-basis events.	N-16	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKI-2/ PWR	20	Review of the robustness of the plant regarding load crash events. For this purpose, an assessment of the existing precautionary measures and the robustness of the plant in connection with postulated load crash events was carried out. No further measures were derived. Conclusion of the review by the supervisory authority is expected shortly.	N-17	done	
KKI-2/ PWR	21	Examination of the flooding-safe storage of safety-relevant equipment. Flooding-safe storage is ensured.	N-18	done	
KKI-2/ PWR	22	A review of the availability of the remote shutdown and control station was carried out. A new remote shutdown and control station was established which meets the requirements.	N-18	done	
KKI-2/ PWR	23	Review of the robustness of the emergency measure "secondary bleed and feed". The review of the optimisation possibilities has been concluded and a concept has been prepared and implemented (in combination with KKI-2/2 KKI-2/7).	N-18	done	
KKI-2/ PWR	24	Storage or stockage of equipment for pumping over or transporting secured fuel from depots, equipment is available.	N-19	done	
KKI-2/ PWR	25	Storage or stockage of fuels and lubricants. Sufficient fuels and lubricants are available at the plant which are also available in the event of a flood or an earthquake.	N-19	done	
KKI-2/ PWR	26	Measures and procedures are planned to prolong the operating times of emergency diesel generators, using secured fuel stocks. A concept has been prepared and the implementation of the measures is in progress.	N-19	in progress	04/2015
KKI-2/ PWR	27	Integrity verifications have been prepared for the structures of the spent fuel pool for higher temperatures. No further measures are necessary.	N-22	done	
KKI-2/ PWR	28	Development and preparation of Severe Accident Management Guidelines (SAMG), as well as introduction and instruction at the plant. Development, preparation, plant-specific adaptation, introduction and instruction completed.	N-23	done	
KKI-2/ PWR	29	Review of the robustness of vital safety functions by means of the RSK Statement "Coverage of extreme weather conditions by the existing design" with regard to whether it is possible that additional measures can make a contribution to further risk prevention that is not merely slight. No further measures are intended.	N-24	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKP 2/ PWR	1	Assurance of DC power supply over a period of 10 h with the help of an on-site mobile diesel generator. Operability was demonstrated in the 2012 refuelling outage. Technical description and procedures are available. (BW ³ 1)	N- 1	done	⁴
KKP 2/ PWR	2	Obtaining and providing two mobile diesel generators at the site: Operability was demonstrated in the 2012 refuelling outage. Technical description and procedures available. Additional information is required. (BW 2-3)	N- 2, N-19	done	
KKP 2/ PWR	3	A statement on fuel cooling has been prepared. The diverse heat sink is a well. Additional information is required. (BW 5-6)	N- 3, N-12	done	
KKP 2/ PWR	4	A statement on fuel cooling has been prepared. An additional option of injecting into the component cooling system would not make a meaningful contribution due to the available diverse heat sink. The RSK was asked for a supplementary statement. (BW 7-8)	N- 4	in progress	2015
KKP 2/ PWR	5	An assessment of reactor pressure vessel injection is available. The RSK was asked for a supplementary statement. (BW 4, 9)	N- 5, N-20	in progress	2015
KKP 2/ PWR	6	Possibility of containment venting without electricity supply has been verified, additional studies into hydrogen propagation have been carried out. Additional studies into seismic resistance are in progress. (BW 17-18)	N- 6, N-21	done	
KKP 2/ PWR	7	Measure for injecting into the spent-fuel pool and operability demonstrated during the 2012 refuelling outage, technical description and procedures have been prepared. A concept for evaporation cooling has been presented. Additional information is required. (BW 10-11)	N- 8, N-22	done	
				in progress	2015

³ Numbers indicated refer to the serial number in the Action Plan of Baden-Wurttemberg (BW), as at 31/10/2014

⁴ All dates relating to the GKN I, GKN II, KKP 1 and KKP 2 nuclear power plants correspond to the Action Plan of Baden-Wurttemberg (BW), as at 31/10/2014

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKP 2/ PWR	8	Description of the as-is condition regarding the initiation of emergency measures in the event of a loss of the main control room has been done. Final assessment in progress (BW 19)	N- 9	done	
KKP 2/ PWR	9	Equal means of communication are installed and ready for operation. (BW 20)	N-10	done	
KKP 2/ PWR	10	Listing and assessment of aids for regaining access to buildings in 2012 with additional information in 2013. The supervisory authority is in the process of checking whether further information is needed. (BW 21)	N-11	done	
KKP 2/ PWR	11	For the KKP II plant, no CCF potential for the loss of the circulating water return structures was identified (BW 12)	N-12	done	
KKP 2/ PWR	12	A statement on the reliability of the ultimate heat sink has been presented. Additional information is required. (BW 30)	N-12	done in progress	 2015
KKP 2/ PWR	13	An additional assessment of the safety margins of the auxiliary service water and ventilation systems under extreme weather conditions has been presented. Supplementary requirements due to the RSK Statement of 6 November 2013. A statement by the operator is available. The supervisory authority is in the process of checking whether further information is needed. (BW 26)	N-13, N-24	done	
KKP 2/ PWR	14	Specification of boundary conditions for ensuring the feasibility of emergency measures For selected emergency procedures with special relevance (primary bleed, secondary bleed, filtered venting, external injection into the spent fuel pool and creation of a mobile emergency power supply), there was a positive assessment of the operability in the event of external design impacts. Performance of a robustness analysis. (BW 13-15)	N-13, N-18	done in progress	 2014

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKP 2/ PWR	15	Accessibility and safety under flooding conditions are ensured. (BW 23-25)	N-15	done	
KKP 2/ PWR	16	Assurance of residual-heat removal through installation of a nozzle for steam generator feeding with mobile pump. (BW 4)	N-20	done	
KKP 2/ PWR	17	The operability in an emergency of the permanently installed installations for fuel pool cooling has been verified. A concept for evaporation cooling has been presented. The supervisory authority is in the process of checking whether further information is needed. (BW 10)	N-22	done	
KKP 2/ PWR	18	Severe Accident Management Guidelines (SAMG) for power operation and for low-power and shutdown states have been prepared and implemented. (BW 16)	N-23	done	
KRB B+C/ BWR	1	Mobile diesel generators have been obtained. These are dimensioned such that they can provide the necessary power for the supply of consumers of the battery system, ventilation and lighting distribution of a safety subsystem. Preparation of the corresponding chapters of the emergency manual and the determination of the scope of in-service inspection has been concluded.	N- 1, N- 2, N-19	done	
KRB B+C/ BWR	2	Systematic review of the robustness of emergency measures with consideration of external hazards. A corresponding report has been prepared.	N- 5, N- 6, N- 9, N-13	done	
KRB B+C/ BWR	3	Use of the GRS-developed QPRO code as a diagnostic and prediction aid for source term calculation. The code is being adapted on the basis of results of the plant-specific Level 2 PSA. A scenario for the validation of QPRO was developed and the code was fully introduced in an exercise in June 2014.	N- 6, N-18, N-23	done	
KRB B+C/ BWR	4	Passive autocatalytic H ₂ recombiners are installed in the area of the spent fuel pool as a safety-related measure. This has been done successfully in both units.	N- 7	done	
KRB B+C/ BWR	5	Introduction of new/optimisation of existing emergency measures: - Early opening of motorised pressure relief valves. - Increase of the possible pressure of reactor pressure vessel injection via mobile pumps. - Additional option of using fire engines as mobile pumps for reactor pressure vessel	N- 8, N-18, N-19	done done done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		injection. - Early switch-off of individual diesel generators to conserve fuel supplies. - Quicker execution of the emergency measure for injecting into the spent fuel pool.		done done done	
KRB B+C/ BWR	6	Creation of a permanently installed injection path into the spent fuel pool that is accessible from outside the reactor building. Additional to the already existing emergency measure (connection of a fire extinguishing hose to the fire extinguishing line of the spent fuel pools), an installation is permanently installed as an emergency measure for spent fuel cooling so there is no need in case of a challenge to enter any rooms that are at risk.	N- 8, N-22	in progress	04/2015
KRB B+C/ BWR	7	Obtaining further means of communication to increase the robustness of the communication between crisis team, control room, remote shutdown and control station, and the supervisory and disaster control authorities. The control room and, amongst others, the emergency organisation, have been equipped with satellite phones. Hence communication in an emergency is ensured.	N-10	done	
KRB B+C/ BWR	8	Obtaining boats to improve accessibility of the plant grounds in a flood. Three boats for conveyance of passengers have been obtained.	N-13, N-15	done	
KRB B+C/ BWR	9	Review and improvement of flood protection. Recent studies have shown that the site will not be flooded in a design flood (discharge amount from the postulated underlying the construction). The safety margins until the design flooding levels are reached are greater than originally assumed. Notwithstanding, provisions have been made for the temporary installation of mobile sheet pile walls to improve the accessibility of those access doors for which structural flooding protection (staircases) has been realised within the buildings.	N-15	done	
KRB B+C/ BWR	10	A review of the availability of the remote shutdown and control station was carried out. Afterwards, a new remote shutdown station was set up, which represents an improvement as regards availability. Its equipment was completed.	N-18	done	
KRB B+C/ BWR	11	Storage or stockage of equipment for pumping over or transporting secured fuel from depots. A central fuel installation was established. In a challenge, the fuel will be transported to the HydroSub pumps or the mobile emergency power generator units by suitable vehicles.	N-19	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		Conclusion of the review by the supervisory authority is expected shortly.			
KRB B+C/ BWR	12	Integrity demonstration for spent fuel pools at 100 °C and assessment of the heat transport. Compliance with the protection goals "Spent fuel pool cooling through evaporation and make-up feeding of water in beyond-design-basis events" has been demonstrated.	N-22	done	
KRB B+C/ BWR	13	Development and preparation of Severe Accident Management Guidelines (SAMG), as well as introduction and instruction at the plant. The Severe Accident Management Guidelines (SAMG) were prepared in the form of a manual for mitigating accident management measures (HMN) and adopted into the operating rules of KRB II. They were successfully validated in an emergency exercise in June 2014.	N-23	done	
KRB B+C/ BWR	14	Review of the robustness of vital safety functions by means of the RSK Statement with regard to whether it is possible that additional measures can make a contribution to further risk prevention that is not merely slight. This review was carried out.	N-24	done	
KWG/ PWR	1	Preparation of a comprehensive and integrated concept regarding postulated station blackout scenarios. The concept was prepared and comprises i.a. the measure KWG/2 and the optimisation of KWG/3 and KWG/4 (see below).	N- 1, N- 2, N-19	done	
KWG/ PWR	2	Obtaining and providing a mobile emergency diesel generator for the supply of vital I&C installations, SG emergency feeding, and battery support (implementation of a further-reaching concept throughout the business group in 2013).	N- 1, N-19	done	
KWG/ PWR	3	Obtaining and providing a mobile emergency diesel generator in the long-term range to supply an emergency RHR chain (implementation of a further-reaching business-group-wide concept in 2013). The review of the activity/measure by the supervisory authority has not yet been concluded.	N- 2, N-19	done	
KWG/ PWR	4	Establishment of connections points for connecting mobile emergency diesel generators with protection against external hazards in the area of the emergency feedwater	N- 2, N-19	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		building. Design and planning concluded, injection points have been realised.			
KWG/ PWR	5	Development of an emergency measures for injecting coolant into the component cooling system to cool the reactor pressure vessel and the spent fuel pool in case of a loss of the ultimate heat sink (emergency measure shortened mobile residual-heat removal chain developed). The review of the activity/measure by the supervisory authority has not yet been concluded.	N- 3, N- 4	done	
KWG/ PWR	6	Creation of a diverse source of cooling water (a diverse water intake from the river is used).	N- 3, N-12	done	
KWG/ PWR	7	Obtaining and providing mobile pumps and other injection equipment. Obtaining and providing mobile pumps as well as other injection equipment. Equipment for pumping over fuel, electrical pump for steam generator feeding available, injection equipment for mobile shortened residual-heat removal chain available.	N- 4, N- 8, N-20	done	
KWG/ PWR	8	A systematic review of the robustness of emergency measures with consideration of external hazards has been carried out as part of a robustness analysis. With the existing and the new emergency measures it is possible to maintain/re-establish the vital functions even in the case of beyond-design-basis events.	N- 5, N- 6, N- 9, N-13	done	
KWG/ PWR	9	Review and optimisation if necessary of the requirements for the containment venting system with consideration of station blackout conditions, adverse radiological conditions and the effectiveness following natural external design impacts.	N- 6, N-21	done	
KWG/ PWR	10	Creation of a permanently installed injection path into the spent fuel pool that is accessible from outside the containment.	N- 8, N-22	done	
KWG/ PWR	11	Preparation of comprehensive analyses and development of emergency measures regarding the loss of spent fuel pool cooling during beyond-design-basis accidents. Analyses comprise e.g. structural analyses of the spent fuel pool at increased temperatures, pressure build-up in the containment, radiology and heat-up and grace periods as well as the derivation of corresponding emergency measures (i.a. KWG/10). The review of the activity/measure by the supervisory authority has not yet been con-	N- 8, N-22	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		cluded.			
KWG/ PWR	12	Examination of the need to be able to initiate additional accident management measures from the remote shutdown and control station, too.	N-9	done	
KWG/ PWR	13	Provision of suitable means of communication to increase the robustness of the communication between crisis team, control room, remote shutdown and control station, and the supervisory and disaster control authorities. Equipment with satellite telephones has been done.	N-10	done	
KWG/ PWR	14	Review and improvement of the accessibility of the plant grounds and the plant itself after an earthquake and flooding. Accessibility is ensured by the existing and new measures.	N-11	done	
KWG/ PWR	15	Assessment of the CCF potential for the loss of the circulating water return structures and derivation of measures if necessary. The existing measures ensure sufficient precaution against CCFs.	N-12	done	
KWG/ PWR	16	Review of the safety clearances of safety-relevant buildings. The existing safety clearances of the buildings remain sufficient.	N-13	done	
KWG/ PWR	17	A systematic review of the robustness of the plant in the event of a beyond-design earthquake and flood (objective: guarantee of vital functions) has been carried out as part of a robustness analysis. With the existing and the new emergency measures it is possible to maintain/re-establish the vital functions even in the case of beyond-design-basis events.	N-14, N-15	done	
KWG/ PWR	18	Review and improvement of flood protection. The design against flooding was reviewed. Sufficient protection is ensured by the measures that have been implemented.	N-15	done	
KWG/ PWR	19	A systematic review of the robustness of the plant in the event of a beyond-design flooding of the annulus (objective: guarantee of vital functions) has been carried out as part of a robustness analysis. With the existing and the new emergency measures it is possible to maintain/re-establish the vital functions even in the case of beyond-design-basis events.	N-16	done	
KWG/ PWR	20	Review of the robustness of the plant regarding load crash events. For this purpose, an assessment of the existing precautionary measures and the robustness of the	N-17	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		plant in connection with postulated load crash events was carried out. No further measures were derived.			
KWG/ PWR	21	Examination of the flooding-safe storage of safety-relevant equipment. Flooding-safe storage is ensured.	N-18	done	
KWG/ PWR	22	Review of the availability of the remote shutdown and control station. The remote shutdown and control station meets the requirements.	N-18	done	
KWG/ PWR	23	Review and optimisation if necessary of the robustness of the emergency measure "secondary bleed and feed". The review of the optimisation options was concluded and a concept was prepared. Its implementation has been concluded (in combination with KWG/3 and KWG/7).	N-18	done	
KWG/ PWR	24	Storage or stockage of equipment for pumping over or transporting secured fuel from depots. Corresponding equipment is available.	N-19	done	
KWG/ PWR	25	Storage or stockage of fuels and lubricants. Sufficient fuels and lubricants are available at the plant, these are also available during flooding or in earthquakes.	N-19	done	
		The review of the activity/measure by the supervisory authority has not yet been concluded.			
KWG/ PWR	26	Measures and procedures to prolong the operating times of emergency diesel generators, using secured fuel stocks. A concept has been prepared, the measures have been implemented.	N-19	done	
KWG/ PWR	27	Integrity verifications for the structures of the spent fuel pool for higher temperatures have been provided. No measures are required.	N-22	done	
KWG/ PWR	28	Development and preparation of Severe Accident Management Guidelines (SAMG), as well as introduction and instruction at the plant. Development, preparation, plant-specific adaptation as well as introduction and instruction completed.	N-23	done	
KWG/ PWR	29	Review of the robustness of vital safety functions in terms of the RSK Statement "Assessment of the coverage of extreme weather conditions by the existing design" with regard to whether it is possible that additional measures may make a contribution to further risk precaution that is not merely slight. No further measures are intended.	N-24	done	

Plants in post-operation

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
GKN I/ PWR	1	Statement on the maintenance of the electricity supply on the basis of a safety analysis.	N- 1, N- 2, N-19	done	
		Additional information is required. (BW ⁵ 1-3)		in progress	2015 ⁶
GKN I/ PWR	2	A statement on fuel cooling on the basis of a safety analysis has been presented. A diverse heat sink (well) exists. (BW 5-6)	N- 3, N-12	done	
GKN I/ PWR	3	A statement on additional component cooling system injection on the basis of a safety analysis has been presented. In the event of multiple failures, there is an alternative technical option for heat removal from the spent fuel pool. (BW 7-8)	N- 4	done	
GKN I/ PWR	4	A statement on more stringent requirements for filtered containment venting on the basis of a safety analysis has been presented. Due to the plant state, no further measures are required. (BW 17-18)	N- 6, N-21	done	
GKN I/ PWR	5	Measure for injecting into the spent-fuel pool and operability was established. Function testing has been done. (BW 10-11)	N- 8, N-22	done	
GKN I/ PWR	6	A statement on the initiation of emergency measures in the event of a loss of the main control room on the basis of a safety analysis has been presented. Due to the plant state, no further measures are required. The post-operating manual has been presented.	N- 9	done	
		The supervisory authority is in the act of checking whether further information is needed. (BW 19)			

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⁶ All dates relating to the GKN I, GKN II, KKP 1 and KKP 2 nuclear power plants correspond to the Action Plan of Baden-Wurttemberg (BW), as at 31/10/2014

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
GKN I/ PWR	7	Equal means of communication have been installed and are ready for operation. (BW 20)	N-10	done	
GKN I/ PWR	8	Listing and assessment of aids for regaining access to buildings carried out in 2012, with additional information provided in 2013. The supervisory authority is in the act of checking whether further information is needed. (BW 21)	N-11	done	
GKN I/ PWR	9	For the GKN I plant, no CCF potential for the loss of the circulating water return structures was identified. (BW 12)	N-12	done	
GKN I/ PWR	10	Statement on the reliability of the ultimate heat sink on the basis of a safety analysis. (BW 30)	N-12	done	
GKN I/ PWR	11	Additional estimates of the safety margins of auxiliary service water and ventilation under extreme weather conditions. Additional requirements due to the RSK Statement of 6 November 2013. A statement by the operator is available. The supervisory authority is in the act of checking whether further information is needed. (BW 26)	N-13, N-24	done	
GKN I/ PWR	12	Statement on the assurance of the feasibility of emergency measures on the basis of a safety analysis. Performance of an adapted robustness analysis. (BW 13-15)	N-13, N-18	done	2014
GKN I/ PWR	13	Accessibility and safety during flooding are ensured. (BW 23-25)	N-15	done	
GKN I/ PWR	14	An additional option of injecting into the reactor coolant system is not relevant for GKN I as all fuel assemblies are in the spent fuel pool (BW 4)	N-20	done	
GKN I/ PWR	15	Statement on evaporation cooling on the basis of a safety analysis. The supervisory authority is in the act of checking whether further information is needed. (BW 10)	N-22	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
GKN I/ PWR	16	Severe Accident Management Guidelines (SAMG) have already been introduced for power operation prior to 2012. GKN I has developed manual actions for low-power and shutdown operation that can also be used as recommended actions within the framework of Severe Accident Management (SAM). (BW 16)	N-23	done	
KKB/ BWR	1	Analyses and statements within the framework of the optimisation of post-operation have been carried out. This concept comprises the safety-related installations and measures necessary for post-operation, taking the aspects resulting from the national Action Plan into account.	N- 1 to N-23	done	
KKB/ BWR	2	Analysis of the accident behaviour of fuel assemblies in the spent fuel pool. Considering the decay heat output of 120 kW, the heat sinks through evaporation, heat transfer via the pool walls, heat transfer to the room air and radiation exchange with the ceiling of the building, grace periods of more than 40 days ensue. Within this time, situation-dependent manual actions can be taken to resume heat removal or coolant make-up. Hence the recommendation yields no need for any action regarding the KKB plant.	N- 7	done	
KKB/ BWR	3	Different statements on the recommendations regarding station blackout, functions of the remote shutdown and control station, influence of external hazards on emergency measures, etc. Parallel to the preparation of the post-operation concept, the issues referred to were addressed in corresponding statements: Due to the existing long grace periods, there is sufficient time available for the execution of necessary safety-related measures. With the its independent emergency system (UNS), the KKB plant disposes of a system that is able to ensure sufficient injection and heat removal in a manner that is diverse from the emergency core cooling and residual-heat removal systems. Against this background there is no need for action for the plant.	N- 1 to N- 4, N- 6 to N-11	done	
KKB/ BWR	4	Statement on the RSK recommendation regarding a reinforcement of the ultimate heat sink. With the its UNS system, the KKB plant disposes of a system that removes the resid-	N-12	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		ual heat via air coolers in a manner that is diverse from the ultimate heat sink and which hence ensures sufficient residual-heat removal. This system is designed to withstand external hazards. Against this background, there is no resulting need for action for the plant.			
KKB/ BWR	5	Statement on the RSK recommendation regarding the assessment of robustness. Against the background of the current state of the plant in post-operation, the existing design safety margins and the low seismic activity of the site, the plant shows a correspondingly high robustness against external hazards. An increase of the intensity by one level to I=7, which correlates approximately with a PGA value of 0.1 g, does not result in any damage to structures and installations that would impair their functions. In our opinion, it is furthermore possible if necessary to carry out emergency and repair measures to ensure fuel cooling within the existing grace periods until acceptance criteria are transgressed. Hence these considerations to not lead any conclusions regarding an enhancement of the degree of robustness.	N-13 to N-23	done	
KKB/ BWR	6	Study of external hazards, optimisation of fuel assembly storage. The development of the post-operation concept also included the optimisation of fuel assembly storage. Additional considerations in connection with the measures for flooding protection led to supplementary additions to the emergency manual.	N-14 to N-18	done	
KKI-1/ BWR	1	Assessment of the robustness of the emergency measures regarding heat removal from the spent fuel pool in the event of a station blackout, implementation of emergency measures.	N- 1, N- 2, N-13, N-22	done	
KKI-1/ BWR	2	Creation of a diverse source of cooling water.	N- 3, N-12	done	
KKI-1/ BWR	3	Assessment of the consequences of a loss of the ultimate primary heat sink regarding the cooling of the spent fuel pool.	N- 3, N-4, N-12, N-22	done	
KKI-1/ BWR	4	Obtaining and providing mobile pumps and other injection equipment.	N- 4, N-20	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKI-1/ BWR	5	Optimisation and supplementation of emergency measures regarding the feeding/overfeeding of the spent fuel pool.	N- 8, N-22	done	
KKI-1/ BWR	6	Assessment of the robustness of the emergency measures regarding heat removal from the spent fuel pool.	N- 9, N-13, N-22	done	
KKI-1/ BWR	7	Provision of suitable means of communication to increase the robustness of the communication between crisis team, control room, remote shutdown and control station, and the supervisory and disaster control authorities.	N-10	done	
KKI-1/ BWR	8	Review and improvement of the accessibility of the plant grounds and the plant itself after an earthquake and flooding.	N-11	done	
KKI-1/ BWR	9	Assessment of the CCF potential for the loss of the circulating water return structures and derivation of measures if necessary.	N-12	done	
KKI-1/ BWR	10	Review of the safety clearances of safety-relevant buildings.	N-13	done	
KKI-1/ BWR	11	Review of flood protection.	N-15	done	
KKI-1/ BWR	12	Examination of the flooding-safe storage of safety-relevant equipment.	N-18	done	
KKI-1/ BWR	13	Review of the availability of the remote shutdown and control station.	N-18	done	
KKI-1/ BWR	14	Storage or stockage of equipment for pumping over or transporting secured fuel from depots.	N-19	done	
KKI-1/ BWR	15	Storage or stockage of fuels and lubricants.	N-19	done	
KKI-1/ BWR	16	Development of procedures and measures for the prevention and mitigation of beyond-design-basis accidents in the area of the spent fuel pool.	N-22	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKI-1/ SWR	17	Evaluation of whether the RSK Statement "Assessment of the coverage of extreme weather conditions by the existing design" is relevant for the current plant state. Result: The recommendation is not relevant for the current plant state with little decay heat in the spent fuel pool.	N-24	done	
KKK/ BWR	1	Different statements on recommendations regarding station blackout, cooling water supply, filtered venting, H2 production, emergency measures, etc. Considering the decay heat output of less than 300 kW, grace periods of more than 6 days ensue under conservative boundary conditions until an accident-induced temperature of 60°C is reached. Within this time-span, situation-dependent manual actions can be taken to resume heat removal or coolant make-up.	N- 1, N- 3, N- 4, N- 6, N- 7, N- 8, N-10, N-11	done	
KKK/ BWR	2	Statement on the recommendations regarding station blackout, functions of the remote shutdown and control station, influence of external hazards on emergency measures. Considering the decay heat output of less than 300 kW, grace periods of more than 6 days ensue under conservative boundary conditions until an accident-induced temperature of 60°C is reached. Within this time-span, situation-dependent manual actions can be taken to resume heat removal or coolant make-up. For the emergency power generator units, the emergency measure "repeat of diesel start-up" was added for the remote shutdown and control station (control unit for operation and monitoring in case of specific external hazards). Accessibility of the plant buildings and the execution of emergency measures are assured at any time by the existing grace periods.	N- 2, N- 9, N-18	done	
KKK/ BWR	3	Analysis of the accident behaviour of fuel assemblies in the spent fuel pool. Considering the long grace periods (approx. two weeks for a heat-up of the fuel pool water from 25 to 80 °C or approx. 3 months for the evaporation of the fuel pool water down to the upper edge of the fuel assemblies), it is not necessary to employ passive installations for avoiding hydrogen accumulations in the reactor building above the spent fuel pool. The long grace periods allow the timely implementation of measures for the re-establishment of the necessary heat removal.	N- 7	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKK/ BWR	4	Development of measures for the additional injection into the spent fuel pool. The installations are largely permanently installed, and the rooms that need to be entered in a challenge are physically separate from the spent fuel pool. The emergency manual was supplemented by a further measure for injecting into the spent fuel pool. The accessibility of the plant buildings and the execution of emergency measures are ensured at any time due to the existing grace periods.	N- 8, N-18	done	
KKK/ BWR	5	Statement on the RSK recommendation regarding a reinforcement of the ultimate primary heat sink. Considering the decay heat output of less than 300 kW, grace periods of more than 6 days ensue under conservative boundary conditions until an accident-induced temperature of 60°C is reached. Within this time-span, situation-dependent manual actions can be taken to resume heat removal or coolant make-up.	N-12	done	
KKK/ BWR	6	Statement on the RSK recommendation regarding the assessment of robustness. The KKK plant has been designed to withstand an aircraft crash. This load case leads the way with regard to the earthquake load case. At present, a corresponding delta analysis is underway to verify the robustness of the plant against an earthquake that is one intensity level stronger (0,1 g) than the design earthquake.	N-13 - N-17, N-19, N-20, N-22, N-23	in progress	2014
KKK/ BWR	7	Review of the instrumentation in the area of the spent fuel pool. Irrespective of the fact that the current plant state provides a sufficiently long grace period for re-establishing spent fuel pool cooling, an additional wide-range level measurement has been installed for providing diverse level measurement.	N-20	done	
KKP 1/ BWR	1	Statement on the maintenance of the electricity supply on the basis of a safety analysis. An additional mobile emergency power generator set has been obtained.	N- 1, N- 2, N-19	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		Additional information is required. (BW ⁷ 1-3)		in progress	2015 ⁸
KKP 1/ BWR	2	Statement on fuel cooling on the basis of a safety analysis. The diverse heat sink is a well. (BW 5-6)	N- 3, N-12	done	
KKP 1/ BWR	3	A statement on additional component cooling system injection on the basis of a safety analysis has been presented. If multiple failures occur, there exists an alternative technical option for heat removal from the spent fuel pool. (BW 7-8)	N- 4	done	
KKP 1/ BWR	4	Statement on more stringent requirements for filtered containment venting on the basis of a safety analysis. The recommendation for KKP 1 is irrelevant because the spent fuel pool is located outside the containment. (BW 17-18)	N- 6, N-21	done	
KKP 1/ BWR	5	Statement regarding the avoidance of hydrogen accumulations in the case of spent fuel pools situated outside the containment. Owing to the little decay heat output of the fuel assemblies there is no need for action. (BW 22)	N- 7	done	
KKP 1/ BWR	6	Measure for injecting into the spent-fuel pool and operability was established. The technical conditions for return feeding and additional injection in to the spent fuel pool in the case of evaporation cooling are given. (BW 10-11)	N- 8, N-22	done	
KKP 1/ BWR	7	Statement on the initiation of emergency measures in the event of a loss of the main control room on the basis of a safety analysis. From the independent sabotage and accident protection system (USUS control centre) it is possible to initiate emergency measures that are relevant for the respective plant state. (BW 19)	N- 9	done	
KKP 1/ BWR	8	Equal means of communication have been installed and are ready for operation. (BW 20)	N-10	done	

⁷ Numbers indicated refer to the serial number in the Action Plan of Baden-Wurttemberg (BW), as at 31/10/2013

⁸ All dates relating to the GKN I, GKN II, KKP 1 and KKP 2 nuclear power plants correspond to the Action Plan of Baden-Wurttemberg (BW), as at 31/10/2013

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKP 1/ BWR	9	Description of as-is condition regarding access to buildings was provided in 2012, 1ith additional information in 2013. Examination by regulatory authority whether further information is needed. (BW 21)	N-11	done	
KKP 1/ BWR	10	For the KKP I plant, no CCF potential for the loss of the circulating water return structures was identified. (BW 12)	N-12	done	
KKP 1/ BWR	11	Statement on the reliability of the primary ultimate heat sink on the basis of a safety analysis. (BW 30)	N-12	done	
KKP 1/ BWR	12	Additional estimates of the safety margins of the auxiliary service water and ventilation systems under extreme weather conditions. Additional requirements as a result of the RSK Statement of 6 November 2013. A statement by the operator is available. The supervisory authority is in the act of checking whether further information is needed. (BW 26)	N-13, N-24	done	
KKP 1/ BWR	13	Statement on the assurance of the feasibility of emergency measures on the basis of a safety analysis. Performance of an adapted robustness analysis. (BW 13-15)	N-13, N-18	done	
KKP 1/ BWR	14	Review of the availability of equipment in the event of a flood (BW 23-25)	N-15	done	2014
KKP 1/ BWR	15	An additional injection option into the reactor coolant system is irrelevant for KKP 1 as all fuel assemblies are in the spent fuel pool. (BW 4)	N-20	done	
KKP 1/ BWR	16	Statement on evaporation cooling on the basis of a safety analysis. The technical conditions for return feeding and additional injection in to the spent fuel pool in the case of evaporation cooling are given. (BW 10)	N-22	done	
KKP 1/ BWR	17	Statement on the introduction of Severe Accident Management Guidelines (SAMG) on the basis of a safety analysis. Owing to the low decay heat output in the post-operational phase and only few disturbance scenarios, no potential for the crisis team can be derived from the SAMG. There are operational measures in place at KKP 1 that may be classified as SAMG due to their character. (BW 16)	N-23	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKU/ PWR	1	Assessment of the robustness of the emergency measures regarding heat removal from the spent fuel pool in the event of a station blackout, implementation of emergency measures.	N- 1, N- 2, N-13, N-22	done	
KKU/ PWR	2	Creation of a diverse source of cooling water.	N- 3, N-12	done	
KKU/ PWR	3	Assessment of the consequences of a loss of the ultimate primary heat sink regarding the cooling of the spent fuel pool.	N- 3, N- 4, N-12, N-22	done	
KKU/ PWR	4	Obtaining and providing mobile pumps and other injection equipment.	N- 4, N-20	done	
KKU/ PWR	5	Creation of a permanently installed injection path into the spent fuel pool that is accessible from outside the containment.	N- 8, N-22	done	
KKU/ PWR	6	Assessment of the robustness of the emergency measures regarding heat removal from the spent fuel pool.	N- 9, N-13, N-22	done	
KKU/ PWR	7	Provision of suitable means of communication to increase the robustness of the communication between crisis team, control room, remote shutdown and control station, and the supervisory and disaster control authorities.	N-10	done	
KKU/ PWR	8	Review and improvement of the accessibility of the plant grounds and the plant itself after an earthquake and flooding.	N-11	done	
KKU/ PWR	9	Assessment of the CCF potential for the loss of the circulating water return structures and derivation of measures if necessary.	N-12	done	
KKU/ PWR	10	Review of the safety clearances of safety-relevant buildings.	N-13	done	
KKU/ PWR	11	Review of flood protection.	N-15	done	
KKU/ PWR	12	Assessment of the consequences of flooding of the annulus regarding the cooling of the spent fuel pool.	N-16	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKU/ PWR	13	Examination of the flooding-safe storage of safety-relevant equipment.	N-18	done	
KKU/ PWR	14	Review of the availability of the remote shutdown and control station.	N-18	done	
KKU/ PWR	15	Storage or stockage of equipment for pumping over or transporting secured fuel from depots.	N-19	done	
KKU/ PWR	16	Storage or stockage of fuels and lubricants.	N-19	done	
KKU/ PWR	17	Development of procedures and measures for the prevention and mitigation of beyond-design-basis accidents in the area of the spent fuel pool.	N-22	done	
KKU/ PWR	18	Evaluation of whether the RSK Statement "Assessment of the coverage of extreme weather conditions by the existing design" is relevant for the current plant state. Result: The recommendation is not relevant for the current plant state with little decay heat in the spent fuel pool.	N-24	done	
KWB A+B/ PWR	1	<p>Within 10 hours, no active measures are necessary with the present plant state. The grace periods in Units A and B are currently more than 7 days until the design temperature of 80 °C is reached in the spent fuel pools. As regards the case of a long-lasting failure of the grid connection, it was found during the course of the review that the fuel stocks for the emergency diesel generator sets are sufficient and are stored in a suitable manner.</p> <p>Notwithstanding, for each Unit there exists a mobile emergency power generator set with 400 kVA including the requisite operating agents and supplementary means at the site. Physically separate feed points have been created in the switchgear for establishing an AC power supply.</p> <p>Accessibility of the installations needed for the execution of the measures under station blackout conditions is ensured.</p> <p>Even in beyond-design-basis events involving the destruction of the plant-internal as well as the external infrastructure suitable measures can be taken in the time available.</p>	N-1, N- 2, N-19	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KWB A+B/ PWR	2	<p>Cooling of the pool cooling system via the fire-extinguishing system is possible. In addition, mobile (fire-extinguishing) pumps as well as physically separated connection options are available in the annulus for the pool cooling system. Hence accessibility of the rooms is given.</p> <p>There are various options for cooling water intake available (seal well, river Rhine, wells). The cooling water is returned via the seal well. The procedures have been determined (emergency manual, core damage frequency) and can be carried out in the grace periods available.</p>	N-3, N-4, N-8, N-12, N-22	done	
KWB A+B/ PWR	3	No longer relevant for the present plant state.	N- 5	done	
KWB A+B/ PWR	4	With the current plant state, a scenario that would require filtered venting can be excluded. What is only possible is a very slow pressure build-up below the design limits. Notwithstanding the above, filtered venting would still be generally ensured in a station blackout; potential H2 deflagrations can be excluded.	N- 6	done	
KWB A+B/ PWR	5	This recommendation is irrelevant for the Biblis NPP. The spent fuel pool is located inside the containment. Passive autocatalytic recombiners are available inside the containment.	N-7	done	
KWB A+B/ PWR	6	Emergency measures are predominantly initiated on-site. In combination with manual actions on site, fuel pool cooling can also be carried out from the remote shutdown and control station. The existing concept is adequate for the prevailing plant state.	N-9	done	
KWB A+B/ PWR	7	The remote shutdown and control station is located within the grounds of BASF Lampertheim and disposes of all aids needed for disaster control. Means of communication to contact the remote shutdown and control station are available. Communication between the remote shutdown and control stations and the control rooms (twin unit plant) is possible (mobile phone reception (D-Netz), satellite phones, walkie-talkies).	N-10	done	
KWB A+B/ PWR	8	<p>Review and improvement of the accessibility of the plant grounds and the plant itself after an earthquake and flooding:</p> <p>Unimogs, stackers, excavators and wheeled loaders are permanently available in decentralised locations at the site. Machinery is also provided by external contractors.</p>	N-11	done	
KWB A+B/ PWR	9	<p><u>Blockage of cooling water intake:</u></p> <p>The Biblis NPP fulfils the assessment criteria of robustness levels 1, 2 and 3 with regard to flooding protection.</p>	N-12, N-15	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		<p>In low-power and shutdown operation, a considerably smaller amount of coolant is required. Due to the existing provisions of</p> <ul style="list-style-type: none"> -cleaning system (coarse screen, fine screen, travelling screen machine, mechanical water purification plant, clamshells for sand accumulations). -physical separation of the purification plants -cooling water accumulations in lower-lying strata -daily walk-down of the cleaning lines trains; if necessary, constant manning <p>a complete blockage of the cleaning lines need not be assumed. Due to the long grace periods, further counter-measures can be taken independently.</p> <p><u>Icing:</u> According to the operator, icing need not be assumed for the Biblis NPP:</p> <ul style="list-style-type: none"> -Water temperatures do not fall below 1 °C according to long-standing statistical records. -Freezing point below 0 °C due to salinization. -Suction from lower-lying strata. <p>As the suction of cooling water is from lower-lying strata, no impairment of the cooling water system needs to be assumed event in the case of postulated icing on the surface of the water. Icing in or on components is recognised in time by administrative measures (e.g. inspection rounds).</p> <p><u>Operability of heat exchangers:</u> Slow blockage can be excluded due to type and inspection. The operability of safety-relevant coolers is monitored by measurements. Sudden blockage due to previous deposition mechanisms is excluded. even if heat exchangers fail, the protection goals will not be violated due to the existing grace periods.</p> <p><u>Additional water intake:</u> The availability of water intake locations after a design earthquake is given (receiving water, seal well, wells).</p>			
KWB A+B/ PWR	10	The safety functions that are still relevant (vital) in the current plant state of "low-power and shutdown operation" of Units A and B of the Biblis nuclear power plant are heat removal from the spent fuel pool and maintenance of subcriticality. They ca be	N-13, N-14	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		<p>ensured by the emergency measures for emergency pool cooling described in the crisis team manual, even in the case of beyond-design-basis impacts. The suitability of these measures for the control of beyond-design-basis scenarios (e.g. station black-out, earthquake, loss of the ultimate heat sink, flooding) were positively assessed. Subcriticality in the spent fuel pool has also been verified for a boron concentration of 0 ppm.</p> <p>No systematic analysis needs to be carried out with the aim to determine the effects of beyond-design-basis external or internal hazards on the existing safety and emergency systems needed for the fulfilment of vital safety functions in Units A and B, which are in low-power and shutdown operation.</p>			
KWB A+B/ PWR	11	<p>Flooding of the annulus at an order of magnitude that would impair the availability of safety-relevant systems is only conceivable in connection with large leaks in the auxiliary service water (VE) system or in the fire-extinguishing (UJ) system. The occurrence of subcritical cracks in these low-energy systems is highly unlikely. Furthermore, the two penetrations of the UJ pipes with large diameters into the annulus are normally isolated in normal operation in the Biblis power plant. Moreover, an accumulation of water in the annulus would be detected in time by the existing monitoring systems.</p> <p>Owing to the long grace periods for Units and B and the fact that, due to the postulate considered here, there is no impairment of further installations outside the annulus, it has to be assumed that fuel pool cooling can be re-established by way of the emergency measures described in the crisis team manual so that fulfilment of the protection goals "heat removal from the spent fuel pool" is not at risk.</p>	N-16	done	
KWB A+B/ PWR	12	<p>The crash of a fuel assembly transport cask into the spent fuel pool is practically excluded by the existing precautionary measures regarding hoisting gear and load attaching points.</p> <p>In this recommendation, the crash of a fuel assembly transport cask into the spent fuel pool is to be treated as a postulated event.</p> <p>Having carried out corresponding analyses, the plant operator has arrived at the conclusion that the stability and the requisite leaktightness of the spent fuel pool have been demonstrated for a postulated crash of a loaded fuel assembly transport cask from the greatest possible height into the spent fuel pool.</p>	N-17	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		The supervisory authority is currently in the process of checking whether further information is necessary.			
KWB A+B/ PWR	13	<p>With the help of the available equipment it is possible to regain access to the relevant buildings, especially as an immediate re-establishment of fuel pool cooling is not necessary due to the long grace periods.</p> <p>The operability of the emergency measures after the external hazards considered here has been assessed positively.</p> <p>With the current plant state of "low-power and shutdown operation" and the existing grace periods available for implementing the emergency measures described in the crisis team manual in connection with the events considered here (design earthquake, flooding, station blackout, blast pressure wave, loss of ultimate heat sink), no relevant radiological effects are expected that would require any actions from the remote shutdown and control station.</p>	N-18	done	
KWB A+B/ PWR	14	<p>Mobile pumps including injection equipment as well as the necessary stocks of fuel and lubricant are available within the plant grounds and housed in structures that are protected against external hazards. The accessibility of the installations necessary for performing the measures under the postulated boundary conditions has been reviewed and found to be ensured.</p> <p>The stockage of boron is not necessary since it has been demonstrated that subcriticality of the fuel assemblies present in the spent fuel pool is also ensured without any additional boron in the cooling water.</p> <p>The availability of a water source following a design earthquake is given (receiving water, seal well, wells).</p> <p>Permanently installed and physically separated options for injecting water into the components indicated are not necessary in the low-power and shutdown operating state and with consideration of the long grace periods.</p> <p>The options for injecting water (leakage make-up) into the spent fuel pool following an external hazard is ensured by several different emergency measures.</p>	N-20	done	
KWB A+B/ PWR	15	<p>Due to the present "low-power and shutdown operation" state and the very long grace periods until impermissible conditions are reached in the spent fuel pool, it is no longer necessary to postulate fuel damage and hence hydrogen releases or a relevant pressure increase in the containment. After a design earthquake or a station blackout it is possible to initiate counter-measures in time.</p>	N-21	done	

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KWB A+B/ PWR	16	<p>Emergency measures for spent fuel pool cooling, alternative cooling or pool/component coolers (TG/TF) or for injection into the pool cooling system (TG) from different locations are permanently installed. The accessibility of the installations necessary for performing the measures under the postulated boundary conditions has been reviewed and found to be ensured.</p> <p>The different variants of emergency pool cooling measures are described in the operating manual as well as in the emergency manual and the crisis team manual. If necessary, additional pool cooling using flexible hoses is possible.</p> <p>In the present plant state, the grace period is more than 7 days until the design temperature of the fuel pool of 80 °C is reached, which means that counter-measures can be carried out. No further verifications of how evaporation cooling is ensured are necessary.</p>	N-22	done	
KWB A+B/ PWR	17	<p>Considering the current "low-power and shutdown operation" plant state and the existing grace periods, the emergency measures described in the crisis team manual for the control of the events considered here are sufficient. According to the operator, SAMGs are neither necessary nor appropriate under these conditions.</p> <p>The general decision logic specified in the crisis team manual for the event of a loss of spent fuel pool cooling in Unit B is suitable as an introduction to the further emergency measures described in the crisis team manual.</p>	N-23	done	
KWB A+B/ PWR	18	<p>The plant operator has presented an assessment of how extreme weather conditions are covered by the existing design. The operator's assessment has shown a high degree of robustness in connection with the fulfilment of the vital safety functions.</p> <p>The supervisory authority is currently in the process of checking whether further information is necessary.</p>	N-24	done	

6 Action Plan for the implementation of further measures (CNS Topics 4-6)

The recommendations regarding topic areas 4 - 6 of the 2nd Extraordinary Meeting of Contracting Parties to the Convention on Nuclear Safety (CNS) were formulated during the conference by the rapporteurs of the topic groups as a result of the discussion and are of a general nature. They are compiled and commented on in Table 7-2 in the Annex. Here, information is given about how these recommendations are adopted and included in the already on-going discussions about measures after Fukushima.

Topic 4 – National Organizations and Topic 6 – International Cooperation

Even before the Fukushima accidents, the activities discussed at the extraordinary CNS conference had already been part of the continuous efforts established in Germany to ensure a thorough and appropriate supervision of the nuclear installations and their operation. The lessons learned from Fukushima are translated into concrete actions. In the same way, the continuous activities regarding the further development of the German nuclear regulations as well as the international regulations and the Global Nuclear Safety and Security Networks (GNSSN), the international networks aimed at exchanging experiences and evaluating operating experience, and the collaboration on the committees and other instruments of international co-operation set up by the IAEO, the EU, and the OECD/NEA are also an important part of the work of the German nuclear regulatory authorities and the operators of nuclear installations. Bilateral commissions with the neighbouring countries are instruments for exchanging information on the topics of nuclear safety, waste management, and emergency preparedness. In 2008/2011, an IRRS Mission and the Follow-up Mission were carried out in Germany.

Topic 5 – Emergency Preparedness and Response

After the reactor accidents at Fukushima, a great deal had been learned with respect to off-site emergency preparedness and response. Experiences were gathered and analyses carried out that can also be used for improving emergency preparedness planning in Germany. This also applies to coping with emergency situations in the areas of disaster response and precautionary radiation protection.

To be able to draw conclusions for emergency preparedness in the vicinity of nuclear installations, the German Commission on Radiological Protection (SSK) was tasked with the review of the complete technical regulations regarding off-site nuclear emergency preparedness and response.

This review was to include i.e. the following questions:

- In the light of the events at Fukushima, are the requirements and criteria contained in the German regulations in line with the state of the art in science and technology?
- Are there any individual regulations in need of an adaptation or supplementation?
- Are there any gaps in the regulations that have come to light as a result of the reactor accident itself or from the combination of natural disasters?
- Do any new regulations or draft regulations of international organisations (EU, IAEA, WHO) have to be considered additionally?

The existing regulations and basic fundamentals regarding off-site emergency preparedness and response in Germany are currently being reviewed by an SSK working group (A 510) in a comprehensive project, and recommendations for further-reaching measures are being prepared. According to the current schedule, the discussion among the SSK is to be concluded at the end of 2014.

During the course of the year 2014, the SSK has already published first results:

- *Basic Radiological Principles for Decisions on Measures for the Protection of the Population against Incidents involving Releases of Radionuclides*, Recommendation by the German Commission on Radiological Protection
The SSK has adapted the Basic Radiological Principles, which were last revised in 2009, to the current ICRP recommendations.
- *Planning Areas for Emergency Response near Nuclear Power Plants and Planning of Iodine Saturation near Decommissioned Nuclear Power Plants*, Recommendation by the German Commission on Radiological Protection
The range of accidents included in the contingency planning was redefined to more closely reflect an accident's potential impact rather than its likelihood. This review has shown that the emergency preparedness planning areas near nuclear power plants must be revised.

The unresolved topics of discussion are listed in Table 6-1 with the corresponding references to the recommendations of the extraordinary CNS conference (Table 7-2). This way, the international and the national findings have been joined together.

Table 6-1: Activities of the Action Plan for the implementation of further measures

No.	Activity	CNS Topic	Source	Status	Related CNS recommendation
M-1	<p>Revision of the SSK Recommendation Volume 61 "Basic radiological fundamentals for decision-making regarding measures to protect the population in the event of accidental releases of radionuclides" with</p> <p>"General guidelines for emergency protection in the vicinity of nuclear installations"</p> <p>and</p> <p>"Guideline for the information of the public in case of nuclear accidents"</p> <p>(English translation planned)</p>	5	Commission on Radiological Protection	<p>The revision of the "Basic radiological fundamentals" has been concluded.</p> <p>The Federal Environment Ministry examines whether the "Basic radiological fundamentals" can be updated at short notice or whether an amendment at the due date of the implementation of Directive 2013/59/Euratom (Euratom basic standards) is appropriate</p>	C-5, C-25, C-26
M-2	Revision of the SSK Recommendation Volume 60 "Survey of Measures for the Reduction of Radiation Exposure after Events with Significant Radiological Consequences"	5	Commission on Radiological Protection		C-26
M-3	<p>SSK Working Group A 510 Work Package "Fundamental Issues":</p> <p>The work focuses on the review of German regulations and guidelines in the light of the lessons learned.</p> <p>Review of the lessons learned in Japan, Germany and also in other countries and examination of their possible application to the objectives and boundary conditions of emergency preparedness and the associated regulations and guidelines in Germany.</p>	5		<p>On-going project of the Commission on Radiological Protection:</p> <p>Review of German regulation and guidelines for off-site emergency response</p> <p>SSK-A 510</p> <p>Planned conclusion: 2014</p>	C-4

No.	Activity	CNS Topic	Source	Status	Related CNS recommendation
	Definition of objectives and boundary conditions – development of a system of objectives.				
M-4	<p>SSK Working Group A 510 Work Package "Accident Management and Emergency Preparedness": The focus here is on the interfaces between on-site and off-site emergency management. Both parts have to interact and thus have to be optimally matched at the interfaces. On-site emergency management measures form an important basis for successful off-site emergency preparedness like e.g. the determination and prediction of the situation and also the alarming of the disaster response authority on the basis of alarm criteria. Implementation: Review and supplementation of the "Criteria for the alert of the emergency services by the operators of nuclear plants" (concluded) Review of the "General guidelines for emergency planning by nuclear power plant operators" (currently no need for amendment)</p>	5	<p>Criteria for the alert of the emergency services by the operators of nuclear plants Joint statement of the Reactor Safety Commission (RSK) and the Commission on Radiological Protection (SSK) Adopted at the 186th Meeting of the SSK on 11/12-09-2003 and at the 366th Meeting of the RSK on 16-10-2003 Supplement adopted at the 453rd Meeting of the RSK on 13-12-2012 and at the 186th Meeting of the SSK on 18-02-2013</p>	<p>On-going project of the Commission on Radiological Protection: Review of German regulation and guidelines for off-site emergency response SSK-A 510 Planned conclusion: 2014</p>	C-14, C-21, C-24
M-5	<p>SSK Working Group A 510 Work Package "Off-site Emergency Preparedness and response including Precautionary Radiation Protection": Here, the focus is on the guidance levels and measures to guarantee the protection of the population, Catalogue of Measures (SSK Volume 60) and Medical Emergency</p>	5		<p>On-going project of the Commission on Radiological Protection: Review of German regulation and guidelines for off-site emergency response</p>	C-18, C-19, C-26

No.	Activity	CNS Topic	Source	Status	Related CNS recommendation
	<p>Management.</p> <p>Review of the relevant aspects of emergency preparedness and accident management according to the Basic Recommendations for "Emergency Preparedness" and the associated regulations and aids.</p> <p>Review of the measures to be taken in Germany in the case of an accident abroad, both in a neighbouring country and further away.</p> <p>Comparison of the precautionary radiological protection measures implemented in Japan with the recommendations of the Catalogue of Measures</p>			<p>SSK-A 510</p> <p>Planned conclusion: 2014</p>	
M-6	<p>SSK Working Group A 510 Work Package "Emergency Management (wide-range)":</p> <p>Aspects of the radiological situation: Determination of the Source Term with the support of on-site and off-site methods.</p> <p>Review of emergency preparedness and response in connection with the topics: measuring- and decision support systems, radiological measurement and sampling programmes as well as situation reporting and estimation methods for the radiological situation. A further central topic is the protection of the emergency staff, both within and outside nuclear installations.</p> <p>Measures for quality assurance such as qualification and training, additional requirements for training and exercises relating to on-site and off-site emergency management have to be identified.</p>	5		<p>On-going project of the Commission on Radiological Protection:</p> <p>Review of German regulation and guidelines for off-site emergency response</p> <p>SSK-A 510</p> <p>The recommendation on measuring and sampling programmes has been postponed for the time being in the course of the prioritisation of work in connection with the implementation of Directive 2013/59/Euratom.</p>	C-8, C-9, C-13, C-15, C-20, C-22, C-25
M-7	<p>SSK Working Group A 510 Work Package "Communication and Information in an Emergency (National and International)":</p> <p>Examination of the most important "tools" of emergency</p>	5		<p>On-going project of the Commission on Radiological Protection:</p> <p>Review of German regulation</p>	C-5, C-14

No.	Activity	CNS Topic	Source	Status	Related CNS recommendation
	<p>preparedness and response regarding communication and information. Requirements for information technology to be used in case of an emergency. Review of the German communication concept including risk communication. Part of the work program is also the development of a website with preliminary information for the public. Review of the information leaflets distributed by the operators of the nuclear installations to the population in the neighbourhoods.</p>			<p>and guidelines for off-site emergency response SSK-A 510 Planned conclusion: 2014</p>	
M-8	<p>SSK Working Group A 510 Work Package "Co-operation (National, International)" The international exchange of information on the situation and on measures taken is to be assessed in the light of the lessons learned, and improvement measures are to be suggested. A further aspect is the preparation and performance of missions of national organisations abroad.</p>	5		<p>On-going project of the Commission on Radiological Protection: Review of German regulation and guidelines for off-site emergency response SSK-A 510 Planned conclusion: 2014</p>	C-4, C-23

7 Annex

Table 7-1: ENSREG Compilation of Recommendations and Suggestions and CNS Topics 1, 2 and 3 in relation to the national recommendations

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
E-1	<p>The peer review Board recommends that WENRA, involving the best available expertise from Europe, develop guidance on natural hazards assessments, including earthquake, flooding and extreme weather conditions, as well as corresponding guidance on the assessment of margins beyond the design basis and cliff-edge effects.</p> <p>Thereby the harmonization of licensing basis methods, the use of deterministic and probabilistic methods, the definition of probabilistic thresholds and clarification of the BDBA/DEC scenarios considered in the safety assessment should be integrated. Further studies should use state-of-the-art data and methods and address trends in hazard data.</p> <p>It should be stated, that safety assessments should benefit from timely operational experience feedback and include organizational and human aspects, and that regulations and regulatory guidance should be regularly updated. In order to avoid blind spots, a peer review of assessments should be considered.</p>	<p>partly already implemented – pre-Fukushima, guidance to be written by WENRA with German Participation remaining topics addressed by N-13, N-14, N-15, N24</p>	<p>general</p>	<p>ENSREG Compilation of Recommendations, xCNS</p>	<p>2.1</p>

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
E-2	The peer review Board recommends that ENSREG underline the importance of periodic safety review. In particular, ENSREG should highlight the necessity to re-evaluate natural hazards and relevant plant provisions as often as appropriate but at least every 10 years. External hazards and their influence on the licensing basis should be reassessed periodically using state-of-the-art data and methods. PSR was identified as one good tool.	already implemented - pre-Fukushima only few PSRs will be commenced due to the limited life time	general	ENSREG Compilation of Recommendations, xCNS	2.2
E-3	Urgent implementation of the recognized measures to protect containment integrity is a finding of the peer review that national regulators should consider.	already implemented - pre-Fukushima further measures under discussion has to be considered in SAMG implementation N-6, N-23	general	ENSREG Compilation of Recommendations, xCNS	2.3
E-4	Necessary implementation of measures allowing prevention of accidents and limitation of their consequences in case of extreme natural hazards is a finding of the peer review that national regulators should consider.	partly already implemented - pre-Fukushima, remaining topics addressed by N-12, N-18, N-24	general	ENSREG Compilation of Recommendations	2.4
E-5	Deterministic methods should form the basis for hazard assessment. Probabilistic methods, including probabilistic safety assessment (PSA), are useful to supplement the deterministic methods.	partly already implemented - pre-Fukushima remaining topics addressed by N-13	natural hazards	xCNS	x1.3
E-6	Hazard Frequency The use a return frequency of 10E-4 per annum (0.1 g minimum peak ground acceleration for earthquakes) for plant reviews/backfitting with respect to external hazards safety cases.	partly already implemented, remaining topics addressed by N-14, N-24	natural hazards	ENSREG Compilation of Recommendations, xCNS	3.1.1
E-7	Secondary Effects of Earthquakes The possible secondary effects of seismic events, such as flood or fire arising as a result of the event, in future assessments.	already implemented - pre-Fukushima	natural hazards	ENSREG Compilation of Recommendations	3.1.2

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
E-8	Protected Volume Approach The use of a protected volume approach to demonstrate flood protection for identified rooms or spaces.	partly already implemented - pre-Fukushima, remaining topics addressed by N-24	natural hazards	ENSREG Compilation of Recommendations	3.1.3
E-9	Early Warning Notifications The implementation of advanced warning systems for deteriorating weather, as well as the provision of appropriate procedures to be followed by operators when warnings are made.	already implemented - pre-Fukushima, remaining topics addressed by N-2	natural hazards	ENSREG Compilation of Recommendations	3.1.4
E-10	Seismic Monitoring The installation of seismic monitoring systems with related procedures and training.	partly already implemented - pre-Fukushima, remaining topics addressed by N-14	natural hazards	ENSREG Compilation of Recommendations	3.1.5
E-11	Qualified Walk downs The development of standards to address qualified plant walk downs with regard to earthquake, flooding and extreme weather – to provide a more systematic search for non-conformities and correct them (e.g. appropriate storage of equipment, particularly for temporary and mobile plant and tools used to mitigate beyond design basis (BDB) external events).	partly already implemented - pre-Fukushima, walk downs after design basis hazards implemented remaining topics addressed by N-4, N-11, N24	natural hazards	ENSREG Compilation of Recommendations	3.1.6
E-12	Flooding Margin Assessments The analysis of incrementally increased flood levels beyond the design basis and identification of potential improvements, as required by the initial ENSREG specification for the stress tests.	part of EU stress test further discussion in N-13, N-15	natural hazards	ENSREG Compilation of Recommendations	3.1.7
E-13	External Hazard Margins In conjunction with recommendation E-1 and E-12, the formal assessment of margins for all external hazards including, seismic, flooding and severe weather, and identification of potential improvements. Licensing basis protection against external hazards	N-13, N-14, N-15, N-24	natural hazards	ENSREG Compilation of Recommendations, xCNS	3.1.8

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
	(e.g. flood seals and seismic supports) should be verified to be effective. Margin assessments should be based on periodic re-evaluation of licensing basis for external events considering possible cliff-edge effects and grace periods.				
E-14	Alternate Cooling and Heat Sink The provision of alternative means of cooling including alternate heat sinks.	already implemented - pre-Fukushima in most plants N-3, N-12	design issues	ENSREG Compilation of Recommendations, xCNS	3.2.1
E-15	AC Power Supplies The enhancement of the on-site and off-site power supplies.	mostly already implemented - pre-Fukushima remaining topics addressed by N-2, N-19	design issues	ENSREG Compilation of Recommendations, xCNS	3.2.2
E-16	DC Power Supplies The enhancement of the DC power supply.	partly implemented - post-Fukushima remaining topics addressed by N-1, N-19	design issues	ENSREG Compilation of Recommendations, xCNS	3.2.3
E-17	Operational and Preparatory Actions Implementation of operational or preparatory actions with respect to the availability of operational consumables.	partly already implemented - pre-Fukushima remaining topics addressed by N-1, N-2, N-3	design issues	ENSREG Compilation of Recommendations	3.2.4
E-18	Instrumentation and Monitoring The enhancement of instrumentation and monitoring.	N-1	design issues	ENSREG Compilation of Recommendations, xCNS	3.2.5
E-19	Shutdown Improvements The enhancement of safety in shutdown states and mid-loop operation.	already implemented - pre-Fukushima, remaining topics addressed by Safety Standards and Safety Requirements	design issues	ENSREG Compilation of Recommendations	3.2.6
E-20	Reactor Coolant Pump Seals The use of temperature-resistant (leak-proof) primary pump seals. Study of RCP pump seal leakage following long term AC power failure.	already implemented - pre-Fukushima, design feature	design issues	ENSREG Compilation of Recommendations, xCNS	3.2.7

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
E-21	Ventilation The enhancement of ventilation capacity during SBO to ensure equipment operability.	N-1	design issues	ENSREG Compilation of Recommendations	3.2.8
E-22	Main and Emergency Control Rooms The enhancement of the main control room (MCR), the emergency control room (ECR) and emergency control centre (ECC) to ensure continued operability and adequate habitability conditions in the event of a station black-out (SBO) and in the event of the loss of DC (this also applies to Topic 3 recommendations). Habitability of control rooms/emergency centres under DEC conditions.	already implemented - pre-Fukushima N-9, N-10, N-18	design issues	ENSREG Compilation of Recommendations, xCNS	3.2.9
E-23	Spent Fuel Pool The improvement of the robustness of the spent fuel pool (SFP).	N-4, N-7, N-8, N-22	design issues	ENSREG Compilation of Recommendations, xCNS	3.2.10
E-24	Separation and Independence The enhancement of the functional separation and independence of safety systems.	already implemented - pre-Fukushima N-3, N-4, N-13	design issues	ENSREG Compilation of Recommendations	3.2.11
E-25	Flow Path and Access Availability The verification of assured flow paths and access under SBO conditions. Ensure that the state in which isolation valves fail and remain, when motive and control power is lost, is carefully considered to maximize safety. Enhance and extend the availability of DC power and instrument air (e.g. by installing additional or larger accumulators on the valves). Ensure access to critical equipment in all circumstances, specifically when electrically operated turnstiles are interlocked.	already implemented - pre-Fukushima N-1, N-2, N-19	design issues	ENSREG Compilation of Recommendations	3.2.12
E-26	Mobile Devices The provision of mobile pumps, power supplies and air compressors with prepared quick connec-	partly already implemented - pre-Fukushima remaining topics addressed by	design issues	ENSREG Compilation of Recommendations, xCNS	3.2.13

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
	tions, procedures, and staff training with drills.	N-4, N-11			
E-27	Bunkered/Hardened Systems The provision for a bunkered or “hardened” system to provide an additional level of protection with trained staff and procedures designed to cope with a wide variety of extreme events including those beyond the design basis (this also applies to Topic 3 recommendations).	already implemented - pre-Fukushima	design issues	ENSREG Compilation of Recommendations	3.2.14
E-28	Multiple Accidents The enhancement of the capability for addressing accidents occurring simultaneously on all plants of the site and consideration of the site as a whole for a multi-units site in the safety assessment.	Incident and Accident control since beginning separately for each unit remaining topics addressed by N-6	design issues	ENSREG Compilation of Recommendations, xCNS	3.2.15
E-29	Equipment Inspection and Training Programs The establishment of regular programs for inspections to ensure that a variety of additional equipment and mobile devices are properly installed and maintained, particularly for temporary and mobile equipment and tools used for mitigation of BDB external events. Development of relevant staff training programs for deployment of such devices.	already implemented - pre-Fukushima remaining topics addressed by N-4, N-11, N-20, N-23	design issues	ENSREG Compilation of Recommendations	3.2.16
E-30	Further Studies to Address Uncertainties The performance of further studies in areas where there are uncertainties. Uncertainties may exist in the following areas: · The integrity of the SFP and its liner in the event of boiling or external impact. · The functionality of control equipment (feed water control valves and SG relief valves, main steam safety valves, isolation condenser flow path, containment isolation valves as well as depressurization valves) during the SBO to ensure that cooling	N- 2, N-11, N-12, N-13, N-19, N-22	design issues	ENSREG Compilation of Recommendations	3.2.17

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
	<p>using natural circulation would not be interrupted in a SBO.</p> <ul style="list-style-type: none"> The performance of additional studies to assess operation in the event of widespread damage, for example, the need different equipment (e.g. bulldozers) to clear the route to the most critical locations or equipment. This includes the logistics of the external support and related arrangements (storage of equipment, use of national defence resources, etc.). 				
E-31	<p>WENRA Reference Levels The incorporation of the WENRA reference levels related to severe accident management (SAM) into their national legal frameworks, and ensure their implementation in the installations as soon as possible.</p>	<p>partly already implemented - pre-Fukushima remaining topics addressed by N-23</p>	<p>severe accident management</p>	<p>ENSREG Compilation of Recommendations</p>	<p>3.3.1.</p>
E-32	<p>SAM Hardware Provisions Adequate hardware provisions that will survive external hazards (e.g. by means of qualification against extreme external hazards, storage in a safe location) and the severe accident environment (e.g. engineering substantiation and/or qualification against high pressures, temperatures, radiation levels, etc.), in place, to perform the selected strategies.</p>	<p>partly already implemented - pre-Fukushima remaining topics addressed by N-6, N-13</p>	<p>severe accident management</p>	<p>ENSREG Compilation of Recommendations</p>	<p>3.3.2</p>
E-33	<p>Review of SAM Provisions Following Severe External Events The systematic review of SAM provisions focusing on the availability and appropriate operation of plant equipment in the relevant circumstances, taking account of accident initiating events, in particular extreme external hazards and the potential harsh working environment.</p>	<p>N-13, N-18, N-20, N-21</p>	<p>severe accident management</p>	<p>ENSREG Compilation of Recommendations</p>	<p>3.3.3</p>

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
E-34	Enhancement of Severe Accident Management Guidelines (SAMG) In conjunction with the recommendation 4, the enhancement of SAMGs taking into account additional scenarios, including, a significantly damaged infrastructure, including the disruption of plant level, corporate-level and national-level communication, long-duration accidents (several days) and accidents affecting multiple units and nearby industrial facilities at the same time.	N-23	severe accident management	ENSREG Compilation of Recommendations, xCNS	3.3.4
E-35	SAMG Validation The validation of the enhanced SAMGs.	N-23	severe accident management	ENSREG Compilation of Recommendations	3.3.5
E-36	SAM Exercises Exercises aimed at checking the adequacy of SAM procedures and organizational measures, including extended aspects such as the need for corporate and nation level coordinated arrangements and long-duration events.	partly already implemented - pre-Fukushima remaining topics addressed by N-23	severe accident management	ENSREG Compilation of Recommendations	3.3.6
E-37	SAM Training Regular and realistic SAM training exercises aimed at training staff. Training exercises should include the use of equipment and the consideration of multi-unit accidents and long-duration events. The use of the existing NPP simulators is considered as being a useful tool but needs to be enhanced to cover all possible accident scenarios.	N-23	severe accident management	ENSREG Compilation of Recommendations	3.3.7
E-38	Extension of SAMGs to All Plant States The extension of existing SAMGs to all plant states (full and low-power, shutdown), including accidents initiated in SFPs.	N-23	severe accident management	ENSREG Compilation of Recommendations	3.3.8

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
E-39	Improved Communications The improvement of communication systems, both internal and external, including transfer of severe accident related plant parameters and radiological data to all emergency and technical support centres and regulatory premises.	partly already implemented - pre-Fukushima remaining topics addressed by N-10	severe accident management	ENSREG Compilation of Recommendations	3.3.9
E-40	Presence of Hydrogen in Unexpected Places The preparation for the potential for migration of hydrogen, with adequate countermeasures, into spaces beyond where it is produced in the primary containment, as well as hydrogen production in SFPs.	already implemented - pre-Fukushima N-7	severe accident management	ENSREG Compilation of Recommendations, xCNS	3.3.10
E-41	Large Volumes of Contaminated Water The conceptual preparations of solutions for post-accident contamination and the treatment of potentially large volumes of contaminated water.	N-23	severe accident management	ENSREG Compilation of Recommendations	3.3.11
E-42	Radiation Protection The provision for radiation protection of operators and all other staff involved in the SAM and emergency arrangements.	already implemented - pre-Fukushima N-8, N-20, N-23	severe accident management	ENSREG Compilation of Recommendations	3.3.12
E-43	On Site Emergency Centre The provision of an on-site emergency centre protected against severe natural hazards and radioactive releases, allowing operators to stay onsite to manage a severe accident.	already implemented - pre-Fukushima N-18	severe accident management	ENSREG Compilation of Recommendations	3.3.13
E-44	Support to Local Operators Rescue teams and adequate equipment to be quickly brought on site in order to provide support to local operators in case of a severe situation.	already implemented - pre-Fukushima Nuclear Intervention Force (KHG) in place since 1977	severe accident management	ENSREG Compilation of Recommendations	3.3.14
E-45	Level 2 Probabilistic Safety Assessments (PSAs) A comprehensive Level 2 PSA as a tool for the identification of plant vulnerabilities, quantification of potential releases, determination of candidate high-level actions and their effects and prioritizing	partly already implemented - pre-Fukushima remaining topics addressed by N-13 stipulated by Safety Standards and	severe accident management	ENSREG Compilation of Recommendations	3.3.15

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
	the order of proposed safety improvements. Although PSA is an essential tool for screening and prioritizing improvements and for assessing the completeness of SAM implementation, low numerical risk estimates should not be used as the basis for excluding scenarios from consideration of SAM especially if the consequences are very high.	Safety Requirements			
E-46	Severe Accident Studies The performance of further studies to improve SAMGs.	N-13, N-23	severe accident management	ENSREG Compilation of Recommendations	3.3.16
E-47	Containment venting for new NPPs	No new NPPs are going to be built in DE Consideration of venting in N-6, N-21	severe accident management	xCNS	x2.2
E-48	Analysis of human resources, communication, personnel training and guidance during severe long term accidents (esp. multi-unit) and validation of effectiveness through exercises.	N-23	severe accident management	xCNS	Conclusion Topic 3
E-49	Only 4 of the NPPs have performed a seismic PSA. The next round of PSRs might be used to review the seismic hazard and design for all plants, which remain in operation.	N-14	natural hazards	ENSREG Country Peer Review Report	
E-50	The RSK is currently studying the possible safety issue of impact of extreme low temperature when a NPP is not in operation (and therefore not producing heat). As some of the plants rely on recirculation of condenser/service water for the heat-up of water intake, this could become an issue during long periods of extreme low temperature.	N-12	natural hazards	ENSREG Country Peer Review Report	
E-51	Also, the extension and revision of the Accident Management concepts for NPPs, which do not continue the power operation, shall be performed.	N-23	severe accident management	ENSREG Country Peer Review Report	

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
E-52	It is expected that SAMGs will be available at all plants.	N-23	severe accident management	ENSREG Country Peer Review Report	
E-53	re-check/extension of AM measures with respect to Safe release of off-gases containing combustible gases by the existing filtered containment venting system	already implemented - pre-Fukushima N-6, N-21	severe accident management	ENSREG Country Peer Review Report	
E-54	Review additional requirements on accident management and the optimization of available measures.	N-13, N-14, N-15, N-16, N-17	severe accident management	ENSREG Country Peer Review Report	

Table 7-2: Recommendations and Suggestions of the German National Action Plan with relation to CNS-Topics 4, 5 and 6

No.	Recommendation/Suggestion	Comment/related national activity	Topic	Source
C-1	<p>Review and revision of nuclear Laws, Regulations and Guides.</p> <ul style="list-style-type: none"> • Where the RB is constituted of more than one entity, it is important to ensure efficient coordination. • Emphasis on the need for comprehensive periodic reviews of safety, using state-of-the-art techniques. • To remind CP that national safety frameworks include the RB, TSO and Operating Organizations. <ul style="list-style-type: none"> - Wide participation in safety networks for operating organizations, RB and TSOs will strengthen them. 	<p>The already on-going revision of the German Safety Criteria for NPPs (issued 1977) was reviewed in the light of the Fukushima accident. Related safety requirements were incorporated. The "Safety Requirements for Nuclear Power Plants" were finally approved by BMUB and the Länder on 20th November 2012. Periodic Safety Reviews are legally required since 2002.</p>	National Organizations	xCNS
C-2	<p>Changes to functions and responsibilities of the RB.</p> <ul style="list-style-type: none"> • Effective independence of the RB is essential, including the following aspects: <ul style="list-style-type: none"> - Transparency in communicating its regulatory decisions to the public. - Competent and sufficient human resources. - Adequate legal powers (e.g. suspend operation). - Financial resources. 	<p>Realized - pre-Fukushima</p> <p>The issues mentioned are addressed in the German Report to the 5th RM and to the 2nd extraordinary meeting of the CNS. No measures for changing the structure or responsibilities of the regulatory bodies are planned</p>	National Organizations	xCNS
C-3	<p>Importance of inviting IRRS missions, and to:</p> <ul style="list-style-type: none"> • Effectively implement the findings. • Make the findings and their means of resolution publicly available. • Invite follow -up missions. 	<p><u>Realized - pre-Fukushima</u></p> <p>Germany IRRS mission was carried out in 2008 and a follow-up mission in 2011. Most findings were implemented, some are considered as appropriate.</p>	National Organizations	xCNS

No.	Recommendation/Suggestion	Comment/related national activity	Topic	Source
C-4	Review and improvements to aspects of National EP&R <ul style="list-style-type: none"> • How to routinely exercise: <ul style="list-style-type: none"> - All involved organizations, up to ministerial level - Scenarios based on events at multi-unit sites • How to train intervention personal for potentially severe Accident conditions • Rapid intervention team to provide support to sites • Determination of the size of the EPZ is variable • Trans-border arrangements need to be further considered and exercised • The use of regional centres to provide support to sites • Education of the public and the media in aspects related to emergencies (e.g. radiation does and their effects) 	On-going discussion in the Commission on Radiological Protection (SSK) M-3 to M-8	National Organisations	xCNS
C-5	Openness, transparency and communication improvements: <ul style="list-style-type: none"> • Communication with stakeholders is a continuous activity not just in an emergency • Active stakeholder engagement in the decision-making process builds public confidence • International bilateral cooperation can be beneficial (e.g. joint regulatory inspections) • The proper balance of understandable information provided to informed groups and the general public needs to be addressed • The transparency of the operators' activities needs to be enhanced. 	On-going discussion in the Commission on Radiological Protection (SSK) 1. M-1 2. M-7 BMUB provides understandable information to the public through the internet and written publications such as the BMUB periodical "UMWELT"	National Organisations	xCNS
C-6	Post-Fukushima safety reassessments and action plans. <ul style="list-style-type: none"> • All CP should perform a safety reassessment and the resolution of their findings should be progressed through a national action plan or other transparent means and should not be limited to NPPs in operation. • Established safety networks should be efficiently used by CP to disseminate and share relevant information. 	With this document implemented ----- <u>Realized - pre-Fukushima</u> Germany is participating in all established safety relevant networks and shares all safety relevant information. No further actions are needed.	National Organisations	xCNS

No.	Recommendation/Suggestion	Comment/related national activity	Topic	Source
C-7	Human and organizational factors (HOF) <ul style="list-style-type: none"> • There is a need to further develop human resource capacity and competence across all organizations in the field of nuclear safety. • Governmental level commitment is needed to ensure a long-term approach is developed for capacity building. • Collaborative work is needed in the area of improving and assessing HOF, including safety culture. • The role of sub-contractors may be important; can they be harnessed quickly? 	Issue is well recognized since many years, activities are taken by all stakeholders. <u>Realized - pre-Fukushima</u> The roles of the regulator and of the licensee in purchasing service by contractors and subcontractors are well established as a regular instrument to assure quality and safety.	National Organizations	xCNS
C-8	Expansion of the set of scenarios on which the plan was based – NPP PLUS Infrastructure/NPP PLUS chemical plant	<u>Realized - pre-Fukushima</u> 1. Continuous further development of existing set of scenarios (Research Project). 2. Infrastructure and chemical Plant are not included because no such scenario expected in Germany. ----- On-going discussion in the Commission on Radiological Protection (SSK) M-6	Emergency Preparedness and Response	xCNS
C-9	Increasing the scope of off-site exercise programs to reflect NPP plus external infrastructure simultaneous problems	<u>Realized - pre-Fukushima</u> Continuous further development of off-site exercise programs (Research Project). ----- On-going discussion in the Commission on Radiological Protection (SSK) M-6	Emergency Preparedness and Response	xCNS

No.	Recommendation/Suggestion	Comment/related national activity	Topic	Source
C-10	Blending mobile resources into planning and drill programs	<p><u>Realized - pre-Fukushima</u></p> <p>Example: Mobile resources – provided by Kerntechnische Hilfsdienst GmbH (KHG) - blended into planning and drill programs.</p> <p>KHG offers technical equipment in the areas:</p> <ul style="list-style-type: none"> • Radiation measurements inside and outside of a nuclear facility • Radiation protection monitoring of personnel, especially operational staff • Recovering of radioactive material, as well as inspection and work at locations with maximum local dose rates, using remote-controlled manipulator vehicles • Decontamination of personnel, equipment and enclosed areas • Filtering waste air with mobile equipment • Collection of low-level radioactive waste water • Equipping operational personnel with protective clothing and respiratory devices 	Emergency Preparedness and Response	xCNS
C-11	Increasing emphasis on drilling with neighbouring countries	<p><u>Realized - pre-Fukushima</u></p> <p>Exercises in cooperation with neighbouring countries (e.g. Swiss, France) already done or planned. Such cooperation exists on regular basis.</p>	Emergency Preparedness and Response	xCNS
C-12	Exercising all interface points (national, regional, municipal,..)	<p><u>Realized - pre-Fukushima</u></p> <p>1. All interface points participate in exercises at appropriate intervals.</p>	Emergency Preparedness and Response	xCNS

No.	Recommendation/Suggestion	Comment/related national activity	Topic	Source
		2. Continuous further development of off-site exercise programs (Research Project).		
C-13	Performing of longer term exercises to reflect the challenges of extreme events	<p><u>Realized - pre-Fukushima</u> Continuous further development of off-site exercise programs (Research Project).</p> <p><u>Post Fukushima</u> 1. First exercise to test measuring capabilities in long lasting events in November 2012. 2. M-6</p>	Emergency Preparedness and Response	xCNS
C-14	Enhancing radiation monitoring and communication systems by additional diversification/redundancy	<p><u>Realized - pre-Fukushima</u> Different monitoring systems according to REI, KFÜ, StrVG complement each other and provide a certain degree of redundancy. In addition they are supplemented by monitoring systems of the German Länder.</p> <p>On-going discussion in the Commission on Radiological Protection (SSK)</p> <p>1. M-4 2. M-7</p>	Emergency Preparedness and Response	xCNS
C-15	Development of a common source term estimation approach	<p>M-6 Recommendations for implementation of common source term estimation methods by utilities have been drafted and are currently being discussed by SSK working groups.</p>	Emergency Preparedness and Response	xCNS

No.	Recommendation/Suggestion	Comment/related national activity	Topic	Source
C-16	Provide access to a “big picture” (international picture) of radiological conditions	<u>Realized - pre-Fukushima</u> Information already provided via system ELAN. Access for foreign states is possible on request.	Emergency Preparedness and Response	xCNS
C-17	Development of reference level for trans-border processing of goods and services such as container transport	<u>Realized - pre-Fukushima</u> Covered by EU Regulation.	Emergency Preparedness and Response	xCNS
C-18	Re-examination of approach and associated limits to govern the “remediation” phase	On-going discussion in the Commission on Radiological Protection (SSK) M-5	Emergency Preparedness and Response	xCNS
C-19	Develop criteria for the return to evacuated area and criteria for return to normal from emergency state	On-going discussion in the Commission on Radiological Protection (SSK) M-5	Emergency Preparedness and Response	xCNS
C-20	Improvement of the approach to establish contamination monitoring protocols and locations during the recovery phase	<u>Realized - pre-Fukushima</u> Monitoring protocols in place (IMIS System) More than 60 German Federal and State laboratories participate in this routine measuring program. Measuring networks that operate continuously are equipped for monitoring radioactivity in the atmosphere, in the federal waterways and in the North and Baltic Seas. During routine operation, more than 10.000 individual measurements are performed each year all over Germany, in air, water, soil, food and animal feed. On-going discussion in the Commission on Radiological Protection (SSK), draft recommendations on monitoring programmes	Emergency Preparedness and Response	xCNS

No.	Recommendation/Suggestion	Comment/related national activity	Topic	Source
		in preparation		
		M-6		
C-21	Hardening of support infrastructure (Emergency Response Centres, Sheltering facilities, essential support facilities (like Corporate Offices) with back-up power, environmental radiological filtering, etc.	On-going discussion in the Commission on Radiological Protection (SSK)	Emergency Preparedness and Response	xCNS
		M-4		
C-22	Analysing medical and human aspects of response to support Emergency workers	On-going discussion in the Commission on Radiological Protection (SSK)	Emergency Preparedness and Response	xCNS
		M-6		
C-23	Implementation of processes to enable access to inter-country support including customs processes for access for diplomats and emergency response personal	<u>Realized - pre-Fukushima</u> Already in place. Provided by Federal Office for Foreign Affairs.	Emergency Preparedness and Response	xCNS
		On-going discussion in the Commission on Radiological Protection (SSK)		
		M-8		
C-24	Systematic assessment of all aspects of organizations that contribute to emergency response using tools like job and task analysis	On-going discussion in the Commission on Radiological Protection (SSK)	Emergency Preparedness and Response	xCNS
		M-4		
C-25	Develop radiological reference levels for rescue and emergency response personnel in extreme events	<u>Realized - pre-Fukushima</u> Reference level already exist: § 53 und 59 StrlSchV/Feuerwehr Dienstvorschrift 500 (FwDV 500)/Leitfaden LF 450 der Polizei	Emergency Preparedness and Response	xCNS
		On-going discussion in the Commission on Radiological Protection (SSK)		
		1.M-1		

No.	Recommendation/Suggestion	Comment/related national activity	Topic	Source
		2.M-6		
C-26	Develop reference levels for the application of immediate countermeasures such as sheltering, iodine distribution and evacuation	<u>Realized - pre-Fukushima</u> Reference Levels exist.	Emergency Preparedness and Response	xCNS
		1.M-1		
		2.M-2		
		3.M-5		
C-27	Strengthening the peer reviews process of CNS and of missions (IAEA, WANO and Industry) <ul style="list-style-type: none"> Effectiveness of IAEA peer review processes should be reviewed in response to concerns raised by the public and Non-Governmental Organizations. The CNS national reports should include how peer reviews and mission findings have been addressed. Processes and initiatives should be strengthened to ensure implementation of findings of the peer review and missions. CNS review meetings should ensure robust peer reviews and reporting of peer review results and findings. 	Realized – pre-Fukushima Germany actively cooperates in all IAEA committees and commissions. The German CNS report includes the findings of the IRRS mission. Germany plays an active role in further developing the peer review mechanisms and instruments of the CNS and will participate in the CNS Working Group on Transparency and Efficiency.	International Cooperation	xCNS
C-28	Strengthening the peer reviews process of CNS and of missions (IAEA, WANO and Industry) - continue <ul style="list-style-type: none"> Plant design safety features and related modifications should be considered in WANO and OSART missions. Better coordination of WANO and IAEA peer review activities should be established. International experience gained from the review of Russian designs after Chernobyl could be considered as an example of good international practice. 	Realized – pre-Fukushima The German operating organizations commit themselves to the WANO peer review activities.	International Cooperation	xCNS

No.	Recommendation/Suggestion	Comment/related national activity	Topic	Source
C-29	<p>Optimization of the Global Safety Regime</p> <ul style="list-style-type: none"> • Primary responsibility for safety remains with operators. • The collective responsibility of the various institutions and organizations should be optimized. • The growing number of international meetings, assessments, peer reviews and expanding mandates is placing high demands on existing human resources, which may become counterproductive. • Efforts should be continued to reduce duplication of initiatives and actions by various organizations such as IAEA, NEA, EU, WANO, etc. • The respective roles and objectives of the various organizations, institutions and missions should be recognized in the optimization process. 	<p>Realized – pre-Fukushima</p> <p>Germany continues to play an active part in all international organizations, committees and working groups.</p>	International Cooperation	xCNS
C-30	<p>Strengthening communication mechanisms through regional and bilateral cooperation</p> <ul style="list-style-type: none"> • Initiatives relating to the Regional Crisis centre for operators of NPPs with VVER type reactors as being implemented by Moscow WANO Centre and also considered by some other vendor countries. • Bilateral agreements between vendor countries and new embarking countries, complemented by IAEA Standards and review processes, have been reported to be effective and should be encouraged. • Strong support of political leaders is important to establish the necessary nuclear safety infrastructure. • Countries with established nuclear programs should assist with the establishment of nuclear and regulatory infrastructure. • Countries should cooperate with neighbouring and regional countries and exchange information on their civil nuclear power programs. 	<p>Realized – pre-Fukushima</p> <p>Germany has established active cooperation instruments with neighbouring countries since many years. Standing committees and working groups exist with France, Switzerland, Czech Republic and the Netherlands. Topics for mutual information exchange are in the fields of nuclear safety, waste management and emergency preparedness.</p> <p>A particular intensive and technically sound cooperation has been established with the countries emerged from the former Soviet Union.</p>	International Cooperation	xCNS

No.	Recommendation/Suggestion	Comment/related national activity	Topic	Source
C-31	<p>Effectiveness of experience feedback mechanisms</p> <ul style="list-style-type: none"> Information exchange and feedback should be enhanced by using the established mechanisms (e.g. IRS, INES) and organizations (e.g. WANO). The sharing and utilization of information is limited and not always necessarily well-coordinated or disseminated. This has been identified as an area for improvement. All nuclear power plants should share Operating Experience. The current focus is on reporting events and not necessarily on learning from the events. Effectiveness of Operating Experience Feedback should be assessed and its implementation should be included in peer reviews. 	<p>Realized – pre-Fukushima</p> <p>Active role of Germany in using the established IRS, INES systems for operation experience exchange at several levels.</p>	International Cooperation	xCNS
C-32	<p>Strengthening and expanded use of IAEA Safety Standards</p> <ul style="list-style-type: none"> The Safety Fundamentals remain appropriate as a sound basis for nuclear safety when properly implemented. Implementation should strike the right balance between prevention and mitigation. The IAEA Safety Standards should be taken into account in developing national nuclear safety regulations. These Safety Standards have a role to play in seeking continuous improvements to safety at existing nuclear power plants. 	<p><u>Realized - pre-Fukushima</u></p> <p>Active participation in CSS, NUSSC, WASSC, RASSC and TRANSC. The IAEA safety standards were taken into account during the revision process of the German Safety Criteria from 1977 and the development of the newly finalized "Safety Requirements for NPPS".</p>	International Cooperation	xCNS
C-33	Public discussion of safety issues should be encouraged (Transparency)	Continuous working principle of the German regulatory bodies, as well as basic element of the regulatory oversight process	cross-cutting issues	xCNS
C-34	An open and trustful relationship between regulators, operators and the public with keeping in mind their respective roles and functions is essential	<u>Realized - pre-Fukushima</u> Continuous working principle of the German regulatory bodies	cross-cutting issues	xCNS
C-35	Recognizing differences in national cultures, each CPs should define appropriate actions to ensure that the desired safety culture characteristics are achieved in the regulatory and operational organizations	<u>Realized - pre-Fukushima</u> Continuous effort within the regulatory oversight process	cross-cutting issues	xCNS

