



Federal Ministry for the
Environment, Nature Conservation
and Nuclear Safety

**German Action Plan
for the implementation of measures
after the Fukushima Dai-ichi
reactor accident**

31 December 2012

Action plan

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Introduction

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

The Reactor Safety Commission (RSK) was asked by the Federal Government 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 and Nuclear Safety (BMU), its technical support organisation Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) started immediately to evaluate 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 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.

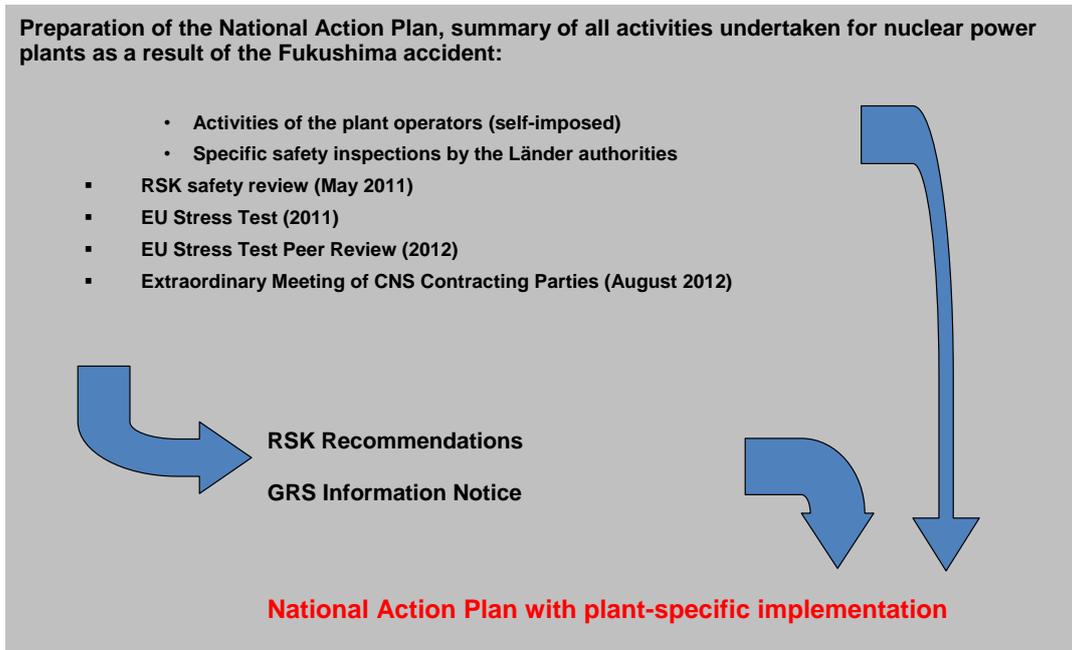


Figure 0-1: Structure of the German Action Plan for measures in the nuclear power plants

The German National Action Plan for measures in the nuclear power plants was prepared by the BMU 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.

1 Decisions on the future use of nuclear power in Germany

The accidents at the Fukushima Dai-ichi NPPs 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 abandonment 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 Dai-ichi accidents. 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 Fukushima Dai-ichi accidents the RSK was ordered to carry out a review of the safety of the operating German NPPs in the light of the 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 simultaneous occurrences), postulated unavailabilities of safety and emergency systems (e.g. longer-term loss of the electrical AC power supply incl. emergency power supply or unavailability of the auxiliary service water supply) that are independent of specific event sequences and aggravated 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 consideration of flooding events. Further robustness assessments showed that here is no

general result for all plants in dependence of 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 the robustness assessment performed here, this selectively leads to evidentially high degrees of robustness. 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 three 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
- 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.

In the course, the RSK also considered 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", "extreme weather conditions", "toxic gases" and on "seismic design" have not yet been concluded or are currently in preparation.

In addition, GRS prepared an Information Notice (WLN) by order of the BMU on the conclusions drawn from the Fukushima Dai-ichi 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 above-mentioned studies and resulting recommendations serve for the enhancement of the robustness of German plants and are listed in Table 4-1. 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 4-1, 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 2nd extraordinary meeting of the Contracting Parties to the Convention on Nuclear Safety (CNS), which are listed in the Annex.

3 Studies at international level

At European level, the European Council declared at the end of March 2012 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). The European Nuclear Safety Regulators Group (ENSREG) assumed the leadership for the execution of these studies.

Germany participated actively in this EU stress test. ENSREG published corresponding specifications on 13 May 2011 according to which all NPPs in Europe assessed their robustness against extreme external hazards (Topic 1) and in connection with a loss of safety functions (Topic 2) as well as the measures provided to cope with severe accidents (Topic 3). In the context of these studies, the first step included the preparation of plant-specific reports by the plant operators, following the ENSREG specifications. 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 at the end of the year 2011. The nuclear-power-operating countries of the European Union as well as Switzerland and the Ukraine had taken part. Subsequently, all 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 on the European stress test. 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 Table 6-1. Here, details are provided about which of these recommendations were adopted for the German nuclear power plants in terms of further actions. By having been discussed within the RSK, these have entered into the national recommendations. They are indicated with corresponding references to the national recommendations given in Table 4-1. This way, the international and the national findings from the reviews of the nuclear power plants have been joined together. The 2nd extraordinary CNS conference dealt with the measures taken by the Contracting Par-

ties in the light of the lessons already learned from the reactor accidents at Fukushima. These measures were discussed in the following topic areas (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 6-1. 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 6-2 in the Annex. Here, too, information is given about how these recommendations are adopted and included in the already on-going discussions about measures after Fukushima. In a comprehensive project, the German Commission on Radiological Protection (SSK) is currently re-assessing the existing regulations for emergency preparedness in the light of the events at Fukushima and is preparing recommendations for further-reaching measures. These topics of discussion are presented in Table 5-1 and provided with references to the international recommendations contained in Table 6-2. This way, the international and the national findings in these topic areas have also been joined together.

4 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 4-1.

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 4-2.

Table 4-1 and Table 4-2 together represent the Action Plan for the implementation of measures to improve the robustness of German NPPs in the beyond design area.

Table 4-1 contains the national recommendations from the GRS Information Notice and from all RSK Recommendations 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 4-1 also refers to the CNS Topic and the associated recommendation from the ENSREG "Compilation of Recommendations and Suggestions".

Table 4-2 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 4-1. 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 4-1 and Table 4-2 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 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 increase the existing safety margins by appropriate measures even further. To do so, they have taken action at an early stage already.

Exercising their responsibility for nuclear safety, the operators initiated a supplementary analysis of the safety precautions at their respective 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.

In a first step, the vital safety functions of the nuclear power plants are designated. In a second step, a description is given of how these safety functions are ensured by existing operational installations, safety installations or emergency measures.

In a third step, an assessment is made of to what extent the vital safety functions remain available in the event of

- a) natural beyond-design-basis hazards
- b) man-made hazards
- c) a postulated common-cause failure of an active safety installation affecting several redundant system trains

in a way that any abrupt deterioration of the event sequence (cliff-edge effect) is avoided. A simultaneous occurrence of the three above-mentioned criteria is not considered. Moreover, the robustness of precautionary measures is assessed. Should there be any concern about a failure of precautionary measures under the conditions mentioned, then this will be postulated.

By way of these analyses, the robustness of the nuclear power plants is assessed in depth against the background of the events at the Fukushima Dai-ichi NPPs; the potentials for a not just slight but appropriate enhancement of robustness are 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 will be assessed. Table 4-2 lists only those measures that from a safety-related point of view are relevant for the current plant state.

Table 4-1: Recommendations and suggestions of the action plan for nuclear power plants

No.	Recommendation/suggestion	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, the three-phase supply can be re-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 connecting nozzles at different redundancies of the protected component cooling system have to be available. The latter have to be usable for	2	Information Notice 02/2012	E-26

No.	Recommendation/suggestion	CNS Topic	Source	Related European recommendation
	core 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 that the venting system is controlled remotely, 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 a fortification 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 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/suggestion	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 placed 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 excess 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 the 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 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/suggestion	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.</p> <p>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>		power plants – Part 1	
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.</p> <p>In this respect, the uplift resistance of canals and buildings is to be considered.</p>	1	Recommendation of the RSK on the robustness of the German nuclear power plants – Part 1	
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	Recommendation of the RSK on the robustness of the German nuclear power plants – Part 1	
N-17	<p><u>Further specification of recommendation N-13 on load drop</u></p> <p>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.</p>	2	Recommendation of the RSK on the robustness of the German nuclear power plants – Part 1	

No.	Recommendation/suggestion	CNS Topic	Source	Related European recommendation
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 pressure relief 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 power plants – Part 2	E-33, E-47, E-53
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	3	Recommendation of the RSK on the robustness of the German nuclear	E-23, E-30

No.	Recommendation/suggestion	CNS Topic	Source	Related European recommendation
	cavity, setdown pool, reactor cavity seal liner at boiling temperature).		power plants – Part 2	
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

Table 4-2: 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 capacity by plant design higher than 10 h (BW ¹ 1)	N- 1	done	2012 ²
GKN II/ PWR	2	Obtaining and providing two mobile diesel generators at the site: Operability was demonstrated in 2012 refuelling outage. Technical description and procedures available. Full completion of connections points and of the documentation. (BW 2-3)	N- 2, N-19	done in progress	2012 2013
GKN II/ PWR	3	Statement on fuel cooling - diverse heat sink (BW 5-6) Examination with regard to supplementary aspects	N- 3, N-12	in progress in progress	2012 2013
GKN II/ PWR	4	Statement on fuel cooling- Additional component cooling system injection (BW 7-8) Examination with regard to supplementary aspects	N- 4	in progress in progress	2012 2013
GKN II/ PWR	5	Assessment of RPV injection in progress, the further discussions of the RSK have to be considered or awaited (BW 4, 9)	N- 5, N-20	in progress	2012
GKN II/ PWR	6	Possibility of venting without electricity supply has been demonstrated. Analysis of the accessibility of the installations upon manual operation under adverse radiological conditions and of long-term operation in progress (BW 17-18)	N- 6, N-21	done in progress	2012 2013
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. Further optimisation without accessing certain room areas. (BW 10-11)	N- 8, N-22	done in progress	2012 2013

¹ Numbers indicated refer to the serial number in the Action Plan of Baden-Wurttemberg (BW), as at 31/10/2012

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 31/10/2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
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	N- 9	done	2012
		Final assessment in progress (BW 19)		in progress	2013
GKN II/ PWR	9	Description of the as-is condition regarding means of communication at the remote shutdown and control station for the crisis team has been done. Supplementary means of communication were obtained as part of the actions taken in connection with the RSK's basic recommendation for the planning of emergency control measures.	N-10	done	2012
		State of implementation of measures as well as final assessment in progress. (BW 20)		in progress	2013
GKN II/ PWR	10	Listing and assessment of aids for regaining access to buildings.	N-11	done	2012
		Examination by regulatory authority whether additional aids are necessary. (BW 21)		in progress	2013
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	2012
GKN II/ PWR	12	Statement on the reliability of the primary ultimate heat sink (BW 30)	N-12	in progress	2012
GKN II/ PWR	13	Additional assessment of the safety margins of the auxiliary service water and ventilation systems under extreme weather conditions (BW 26)	N-13	in progress	2013
GKN II/ PWR	14	Specification of boundary conditions for ensuring the feasibility of emergency measures For selected emergency procedures with special relevance (primary bleed, secondary bleed), assessment of the operability in the event of external design impacts. (BW 13-15)	N-13, N-18	in progress	2012
GKN II/ PWR	15	Examination of the availability of equipment under flooding conditions (BW 24-25)	N-15	in progress	2012
GKN II/ PWR	16	Analyses regarding the guarantee of evaporation cooling and integrity verifications (BW 10)	N-22	in progress	2012
GKN II/ PWR	17	Draft generic SAMG are available. Plant-specific adaptation in progress. (BW 16)	N-23	in progress	2013

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KBR/ PWR	1	Preparation of a comprehensive and integrated concept for postulated SBO scenarios	N- 1, N- 2, N-19	done	2012
KBR/ PWR	2	Establishment of connections points for connecting mobile emergency diesel genera- tors with protection against external hazards	N- 1, N- 2, N-19	in progress	2013
KBR/ PWR	3	Obtaining and providing a mobile emergency diesel generator for the supply of vital I&C installations, SG emergency feeding, and battery support	N- 1, N-19	in progress	2013
KBR/ PWR	4	Obtaining and providing a mobile emergency diesel generator in the long-term range to supply an emergency RHR chain	N- 2, N-19	in progress	2013
KBR/ PWR	5	Development of an emergency measures for injecting coolant into the component cooling system to cool the RPV and the spent fuel pool in case of a loss of the ulti- mate primary heat sink	N- 3, N- 4	in progress	2013
KBR/ PWR	6	Creation of a diverse source of cooling water	N- 3, N-12	done	before 2012
KBR/ PWR	7	Obtaining and providing mobile pumps and other injection equipment	N- 4, N- 8, N-20	in progress	2013
KBR/ PWR	8	Systematic review of the robustness of emergency measures with consideration of ex- ternal hazards	N- 5, N- 6, N- 9, N-13	in progress	2013
KBR/ PWR	9	Review and optimisation if necessary of the requirements for the containment venting system with consideration of SBO and adverse radiological conditions	N- 6, N-21	in progress	2013
KBR/ PWR	10	Creation of a permanently installed injection path into the spent fuel pool that is ac- cessible from outside the containment	N- 8, N-22	in progress	2013
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	N- 8, N-22	in progress	2013
KBR/ PWR	12	Provision of suitable means of communication to increase the robustness of the communication between crisis team, control room, remote shutdown and control sta- tion, and the supervisory and disaster control authorities	N-10	done	2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KBR/ PWR	13	Review and improvement of the accessibility of the plant grounds and the plant itself after an earthquake and flooding	N-11	done	2012
KBR/ PWR	14	Assessment of the CCF potential for the loss of the circulating water return structures and derivation of measures if necessary	N-12	done	before 2012
KBR/ PWR	15	Review of the safety clearances of safety-relevant buildings	N-13	done	2012
KBR/ PWR	16	Installation of seismic instrumentation	N-14	in progress	2013
KBR/ PWR	17	Systematic review of the robustness of the plant in the event of a beyond-design earthquake and flood (objective: guarantee of vital functions)	N-14, N-15	in progress	2013
KBR/ PWR	18	Review and improvement of flood protection	N-15	in progress	2013
KBR/ PWR	19	Systematic review of the robustness of the plant in the event of a beyond-design flooding of the annulus (objective: guarantee of vital functions)	N-16	in progress	2013
KBR/ PWR	20	Examination of the flooding-safe storage of safety-relevant equipment	N-18	done	2012
KBR/ PWR	21	Review of the availability of the remote shutdown and control station	N-18	done	before 2012
KBR/ PWR	22	Review and optimisation if necessary of the robustness of the emergency measure "secondary bleed and feed"	N-18	in progress	2013
KBR/ PWR	23	Storage or stockage of equipment for pumping over or transporting secured fuel from depots	N-19	in progress	2013
KBR/ PWR	24	Storage or stockage of fuels and lubricants	N-19	done	2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KBR/ PWR	25	Measures and procedures to prolong the operating times of emergency diesel generators, using secured fuel stocks	N-19	In progress	2013
KBR/ PWR	26	Integrity verifications for the structures of the spent fuel pool for higher temperatures	N-22	in progress	2013
KBR/ PWR	27	Development and preparation of Severe Accident Management Guidelines (SAMG), as well as introduction and instruction at the plant	N-23	in progress	2013
KKE/ PWR	1	Obtaining and providing a mobile emergency power generator and connections points protected against external hazards e.g. for the supply of the accident overview measuring systems, the SG emergency feeding system and the spent fuel cooling system	N- 1, N- 2, N-19	partly done	2012/2013
KKE/ PWR	2	Systematic review of the robustness of emergency measures with consideration of external hazards	N- 5, N- 6, N- 9, N-13	in progress	2013
KKE/ PWR	3	Introduction of an emergency measure for initiating accumulator injection in mid-loop operation	N- 5, N-13	done	2012
KKE/ PWR	4	Use of the GRS-developed QPRO code as a diagnostic and prediction aid for source term calculation	N- 6, N-18, N-23	in progress	2013
KKE/ 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	partly done	2012/2013
KKE/ PWR	6	Provision of 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	N-10	done	2012
KKE/ PWR	7	Review of the availability of the remote shutdown and control station, if necessary relocation	N-18	planned	2013/2014
KKE/ PWR	8	Storage or stockage of equipment for pumping over or transporting secured fuel from depots	N-19	done	2012
KKE/ PWR	9	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 en-	N-20	In progress	2013

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
		sured in different locations within the plant grounds on demand.			
KKE/ PWR	10	Development and preparation of Severe Accident Management Guidelines (SAMG), as well as introduction and instruction at the plant	N-23	in progress	2013
KKG/ PWR	1	Preparation of a comprehensive and integrated concept for postulated SBO scenarios	N- 1, N- 2, N-19	done	2012
KKG/ PWR	2	Establishment of connections points for connecting mobile emergency diesel generators with protection against external hazards	N- 1, N- 2, N-19	In progress	2013
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	N- 1, N-19	In progress	2013
KKG/ PWR	4	Obtaining and providing a mobile emergency diesel generator in the long-term range to supply an emergency RHR chain	N- 2, N-19	In progress	2013
KKG/ PWR	5	Development of an emergency measures for injecting coolant into the component cooling system to cool the RPV and the spent fuel pool in case of a loss of the ultimate primary heat sink	N- 3, N- 4	In progress	2013
KKG/ PWR	6	Creation of a diverse source of cooling water	N- 3, N-12	done	before 2012
KKG/ PWR	7	Obtaining and providing mobile pumps and other injection equipment	N- 4, N- 8, N-20	In progress	2013
KKG/ PWR	8	Systematic review of the robustness of emergency measures with consideration of external hazards	N- 5, N- 6, N- 9, N-13	In progress	2013
KKG/ PWR	9	Review and optimisation if necessary of the requirements for the containment venting system with consideration of SBO and adverse radiological conditions	N- 6, N-21	In progress	2013
KKG/ 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	In progress	2013

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
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	N- 8, N-22	In progress	2013
KKG/ PWR	12	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	2012
KKG/ PWR	13	Review and improvement of the accessibility of the plant grounds and the plant itself after an earthquake and flooding	N-11	done	2012
KKG/ PWR	14	Assessment of the CCF potential for the loss of the circulating water return structures and derivation of measures if necessary	N-12	done	2012
KKG/ PWR	15	Review of the safety clearances of safety-relevant buildings	N-13	done	before 2012
KKG/ PWR	16	Systematic review of the robustness of the plant in the event of a beyond-design earthquake and flood (objective: guarantee of vital functions)	N-14, N-15	In progress	2013
KKG/ PWR	17	Review and improvement of flood protection	N-15	done	before 2012
KKG/ PWR	18	Systematic review of the robustness of the plant in the event of a beyond-design flooding of the annulus (objective: guarantee of vital functions)	N-16	In progress	2013
KKG/ PWR	19	Examination of the flooding-safe storage of safety-relevant equipment	N-18	done	before 2012
KKG/ PWR	20	Review of the availability of the remote shutdown and control station	N-18	done	before 2012
KKG/ PWR	21	Review and optimisation if necessary of the robustness of the emergency measure "secondary bleed and feed"	N-18	In progress	2013
KKG/ PWR	22	Storage or stockage of equipment for pumping over or transporting secured fuel from depots	N-19	done	2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKG/ PWR	23	Storage or stockage of fuels and lubricants	N-19	done	2012
KKG/ PWR	24	Measures and procedures to prolong the operating times of emergency diesel generators, using secured fuel stocks	N-19	In progress	2013
KKG/ PWR	25	Integrity verifications for the structures of the spent fuel pool for higher temperatures	N-22	In progress	2013
KKG/ PWR	26	Development and preparation of Severe Accident Management Guidelines (SAMG), as well as introduction and instruction at the plant	N-23	In progress	2013
KKI-2/ PWR	1	Preparation of a comprehensive and integrated concept for postulated SBO scenarios	N- 1, N- 2, N-19	done	2012
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	N- 1, N-19	In progress	2013
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	before 2012
KKI-2/ PWR	4	Establishment of connections points for connecting mobile emergency diesel generators with protection against external hazards	N- 2, N-19	In progress	2013
KKI-2/ PWR	5	Development of an emergency measures for injecting coolant into the component cooling system to cool the RPV and the spent fuel pool in case of a loss of the ultimate primary heat sink	N- 3, N- 4	In progress	2013
KKI-2/ PWR	6	Creation of a diverse source of cooling water	N- 3, N-12	done	before 2012
KKI-2/ PWR	7	Obtaining and providing mobile pumps and other injection equipment	N- 4, N- 8, N-20	In progress	2013
KKI-2/ PWR	8	Systematic review of the robustness of emergency measures with consideration of external hazards	N- 5, N- 6, N- 9, N-13	In progress	2013
KKI-2/ PWR	9	Review and optimisation if necessary of the requirements for the containment venting system with consideration of SBO and adverse radiological conditions	N- 6, N-21	In progress	2013

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKI-2/ 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	In progress	2013
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	N- 8, N-22	done	2012
KKI-2/ PWR	12	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	2012
KKI-2/ PWR	13	Review and improvement of the accessibility of the plant grounds and the plant itself after an earthquake and flooding	N-11	done	2012
KKI-2/ PWR	14	Assessment of the CCF potential for the loss of the circulating water return structures and derivation of measures if necessary	N-12	done	2012
KKI-2/ PWR	15	Review of the safety clearances of safety-relevant buildings	N-13	done	2012
KKI-2/ PWR	16	Systematic review of the robustness of the plant in the event of a beyond-design earthquake and flood (objective: guarantee of vital functions)	N-14, N-15	In progress	2013
KKI-2/ PWR	17	Review and improvement of flood protection	N-15	done	2012
KKI-2/ PWR	18	Systematic review of the robustness of the plant in the event of a beyond-design flooding of the annulus (objective: guarantee of vital functions)	N-16	In progress	2013
KKI-2/ PWR	19	Examination of the flooding-safe storage of safety-relevant equipment	N-18	done	2012
KKI-2/ PWR	20	Review of the availability of the remote shutdown and control station	N-18	done	before 2012
KKI-2/ PWR	21	Review and optimisation if necessary of the robustness of the emergency measure "secondary bleed and feed"	N-18	In progress	2013
KKI-2/ PWR	22	Storage or stockage of equipment for pumping over or transporting secured fuel from depots	N-19	done	2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKI-2/ PWR	23	Storage or stockage of fuels and lubricants	N-19	done	2012
KKI-2/ PWR	24	Measures and procedures to prolong the operating times of emergency diesel generators, using secured fuel stocks	N-19	in progress	2013
KKI-2/ PWR	25	Integrity verifications for the structures of the spent fuel pool for higher temperatures	N-22	done	2012
KKI-2/ PWR	26	Development and preparation of Severe Accident Management Guidelines (SAMG), as well as introduction and instruction at the plant	N-23	in progress	2013
KKP 2/ PWR	1	Assurance of DC power supply for up to 10 h with the help of an on-site mobile diesel generator: operability was demonstrated in 2012 refuelling outage. Technical description and procedures are available. Full completion of the connections points and the documentation (BW ³ 1)	N- 1	done in progress	2012 ⁴ 2013
KKP 2/ PWR	2	Obtaining and providing two mobile diesel generators at the site: Operability was demonstrated in 2012 refuelling outage. Technical description and procedures available. Full completion of the connections points and the documentation (BW 2-3)	N- 2, N-19	done in progress	2012 2013
KKP 2/ PWR	3	Statement on fuel cooling - diverse heat sink (BW 5-6) Examination with regard to supplementary aspects	N- 3, N-12	in progress in progress	2012 2013
KKP 2/ PWR	4	Statement on fuel cooling- Additional component cooling system injection in progress Examination with regard to supplementary aspects (BW 7-8)	N- 4	in progress in progress	2012 2013
KKP 2/ PWR	5	Assessment of RPV injection in progress, the further discussions of the RSK have to be considered or awaited (BW 4, 9)	N- 5, N-20	in progress	2012

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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 31/10/2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKP 2/ PWR	6	Possibility of venting without electricity supply has been demonstrated.	N- 6, N-21	done	2012
		Analysis of the accessibility of the installations upon manual operation under adverse radiological conditions and of long-term operation in progress (BW 17-18)		in progress	2013
KKP 2/ PWR	7	Measure for injecting into the spent-fuel pool and operability demonstrated during 2012 refuelling outage, technical description and procedures have been prepared.	N- 8, N-22	done	2012
		Further optimisation without accessing certain room areas. (BW 10-11)		in progress	2013
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.	N- 9	done	2012
		Final assessment in progress (BW 19)		in progress	2013
KKP 2/ PWR	9	Description of the as-is condition regarding means of communication at the remote shutdown and control station for the crisis team has been done. Supplementary means of communication were obtained as part of the actions taken in connection with the RSK's basic recommendation for the planning of emergency control measures.	N-10	done	2012
		State of implementation of measures as well as final assessment in progress. (BW 20)		in progress	2013
KKP 2/ PWR	10	Listing and assessment of aids for regaining access to buildings.	N-11	done	2012
		Examination by regulatory authority whether additional aids are necessary. (BW 21)		in progress	2013
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	2012
KKP 2/ PWR	12	Statement on the reliability of the primary ultimate heat sink (BW 30)	N-12	in progress	2012
KKP 2/ PWR	13	Additional assessment of the safety margins of the auxiliary service water and ventilation systems under extreme weather conditions (BW 26)	N-13	in progress	2013
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), assessment of the operability in the event of external design impacts. (BW 13-15))	N-13, N-18	in progress	2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKP 2/ PWR	15	Examination of the availability of equipment/accessibility under flooding conditions (BW 24-25)	N-15	in progress	2012
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	in progress	2012
KKP 2/ PWR	17	Analyses regarding the guarantee of evaporation cooling and integrity verifications (BW 10)	N-22	in progress	2012
KKP 2/ PWR	18	Draft SAMG available. Instruction has already taken place. Soon to be introduced. (BW 16)	N-23	in progress	2012
KRB B+C/ BWR	1	Obtaining and providing a mobile emergency power generator and connections points protected against external hazards for the supply of the accident overview measuring systems and for RPV feeding	N- 1, N- 2, N-19	in progress	2012/2013
KRB B+C/ BWR	2	Systematic review of the robustness of emergency measures with consideration of external hazards	N- 5, N- 6, N- 9, N-13	in progress	2013
KRB B+C/ BWR	3	Use of the GRS-developed QPRO code as a diagnostic and prediction aid for source term calculation	N- 6, N-18, N-23	in progress	2013
KRB B+C/ BWR	4	Backfitting of H2 recombiners in the area of the spent fuel pool	N- 7	in progress	2013/14
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 RPV injection via mobile pumps - additional option of using fire engines as mobile pumps for RPV 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	N- 8, N-18, N-19	done/in pro- gress	2012/2013
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	N- 8, N-22	in progress	2013
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	N-10	done	2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KRB B+C/ BWR	8	Obtaining boats to improve accessibility of the plant grounds in a flood	N-13, N-15	done	2012
KRB B+C/ BWR	9	Review and improvement of flood protection	N-15	in progress	2012
KRB B+C/ BWR	10	Review of the availability of the remote shutdown and control station, if necessary re- location	N-18	planned	2013/14
KRB B+C/ BWR	11	Storage or stockage of equipment for pumping over or transporting secured fuel from depots	N-19	in progress	2013
KRB B+C/ BWR	12	Integrity demonstration for spent fuel pools at 100 °C and assessment of the heat transport.	N-22	in progress	2013
KRB B+C/ BWR	13	Development and preparation of Severe Accident Management Guidelines (SAMG), as well as introduction and instruction at the plant.	N-23	in progress	2013
KWG/ PWR	1	Preparation of a comprehensive and integrated concept regarding postulated SBO scenarios	N- 1, N- 2, N-19	done	2012
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	before 2012
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)	N- 2, N-19	done	before 2012
KWG/ PWR	4	Establishment of connections points for connecting mobile emergency diesel genera- tors with protection against external hazards	N- 2, N-19	in progress	2013
KWG/ PWR	5	Development of an emergency measures for injecting coolant into the component cooling system to cool the RPV and the spent fuel pool in case of a loss of the ulti- mate primary heat sink	N- 3, N- 4	done	2012
KWG/ PWR	6	Creation of a diverse source of cooling water	N- 3, N-12	done	before 2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KWG/ PWR	7	Obtaining and providing mobile pumps and other injection equipment	N- 4, N- 8, N-20	in progress	2013
KWG/ PWR	8	Systematic review of the robustness of emergency measures with consideration of external hazards	N- 5, N- 6, N- 9, N-13	in progress	2013
KWG/ PWR	9	Review and optimisation if necessary of the requirements for the containment venting system with consideration of SBO and adverse radiological conditions	N- 6, N-21	in progress	2013
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	in progress	2013
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	N- 8, N-22	in progress	2013
KWG/ PWR	12	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	2012
KWG/ PWR	13	Review and improvement of the accessibility of the plant grounds and the plant itself after an earthquake and flooding	N-11	done	2012
KWG/ PWR	14	Assessment of the CCF potential for the loss of the circulating water return structures and derivation of measures if necessary	N-12	in progress	2012
KWG/ PWR	15	Review of the safety clearances of safety-relevant buildings	N-13	done	2012
KWG/ PWR	16	Systematic review of the robustness of the plant in the event of a beyond-design earthquake and flood (objective: guarantee of vital functions)	N-14, N-15	partly done	2012/2013
KWG/ PWR	17	Review and improvement of flood protection	N-15	done	2012
KWG/ PWR	18	Systematic review of the robustness of the plant in the event of a beyond-design flooding of the annulus (objective: guarantee of vital functions)	N-16	in progress	2013

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KWG/ PWR	19	Examination of the flooding-safe storage of safety-relevant equipment	N-18	done	2012
KWG/ PWR	20	Review of the availability of the remote shutdown and control station	N-18	done	before 2012
KWG/ PWR	21	Review and optimisation if necessary of the robustness of the emergency measure "secondary bleed and feed"	N-18	in progress	2013
KWG/ PWR	22	Storage or stockage of equipment for pumping over or transporting secured fuel from depots	N-19	done	2012
KWG/ PWR	23	Storage or stockage of fuels and lubricants	N-19	done	2012
KWG/ PWR	24	Measures and procedures to prolong the operating times of emergency diesel generators, using secured fuel stocks	N-19	in progress	2013
KWG/ PWR	25	Integrity verifications for the structures of the spent fuel pool for higher temperatures	N-22	in progress	2013
KWG/ PWR	26	Development and preparation of Severe Accident Management Guidelines (SAMG), as well as introduction and instruction at the plant	N-23	in progress	2013/2014

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 (BW ⁵ 1-3)	N- 1, N- 2, N-19	in progress	2013 ⁶
GKN I/ PWR	2	Statement on fuel cooling – diverse heat sink on the basis of a safety analysis (BW 5-6)	N- 3, N-12	in progress	2013
GKN I/ PWR	3	Statement on fuel cooling – additional component cooling system injection on the basis of a safety analysis (BW 7-8)	N- 4	in progress	2013
GKN I/ PWR	4	Statement on more stringent requirements for filtered containment venting on the basis of a safety analysis (BW 17-18)	N- 6, N-21	in progress	2013
GKN I/ PWR	5	Measure for injecting into the spent-fuel pool and operability was established. The regulatory authority is examining whether the safety-related objective of the recommendation has been reached by the measure. (BW 10-11)	N- 8, N-22	done in progress	2012 2013
GKN I/ PWR	6	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 (BW 19)	N- 9	in progress	2013
GKN I/ PWR	7	Description of the state of implementation of measures as well as final assessment regarding means of communication in the remote shutdown and control station for the crisis team (BW 20)	N-10	in progress	2013
GKN I/ PWR	8	Listing and assessment of aids for regaining access to buildings. Examination by regulatory authority whether additional aids are necessary. (BW 21)	N-11	done in progress	2012 2013
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	2012

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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 31/10/2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
GKN I/ PWR	10	Statement on the reliability of the primary ultimate heat sink on the basis of a safety analysis (BW 30)	N-12	in progress	2013
GKN I/ PWR	11	Additional estimates, e.g. regarding icing-up in the receiving water as a result of extreme weather conditions (BW 26)	N-13	in progress	2013
GKN I/ PWR	12	Statement on the assurance of the feasibility of emergency measures on the basis of a safety analysis (BW 13-15)	N-13, N-18	in progress	2013
GKN I/ PWR	13	Review and improvement if necessary of flood protection (BW 23-25) Assessment regarding a longer-lasting flood. Assessment of the accessibility of buildings.	N-15	in progress	2013
GKN I/ PWR	14	Additional option of injecting into the reactor coolant system: all fuel assemblies are in the spent fuel pool (BW 4)	N-20	done	2012
GKN I/ PWR	15	Statement on evaporation cooling on the basis of a safety analysis (BW 10)	N-22	in progress	2013
GKN I/ PWR	16	Severe Accident Management Guidelines (SAMG): already introduced for power operation prior to 2012. Statement on the introduction of the Severe Accident Management Guidelines (SAMG) on the basis of a safety analysis (BW 16):	N-23	done in progress	before 2012 2013
KKB/ BWR	1	Analyses and statements within the framework of the optimisation of post-operation Adaptation of the emergency measures	N- 1 - N-23	in progress	2013
KKB/ BWR	2	Analysis of the accident behaviour of fuel assemblies in the spent fuel pool	N- 7	done	2012
KKB/ BWR	3	Different statements on Information Notice WLN 2012/02, dealing with the recommendations regarding SBO, functions of the remote shutdown and control station, influence of external hazards on emergency measures, etc.	N- 1 - N- 4, N- 6 - N-11	done	2012
KKB/ BWR	4	Statement on the RSK recommendation regarding a reinforcement of the ultimate primary heat sink	N-12	in progress	2013

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKB/ BWR	5	Statement on the RSK recommendation regarding the assessment of robustness	N-13 - N-23	in progress	2013
KKB/ BWR	6	Study of external hazards, optimisation of fuel assembly storage	N-14 - N-18	in progress	2013
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 SBO, implementation of emergency measures	N- 1, N- 2, N-13, N-22	done	before 2012
KKI-1/ BWR	2	Creation of a diverse source of cooling water	N- 3, N-12	done	before 2012
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	2012
KKI-1/ BWR	4	Obtaining and providing mobile pumps and other injection equipment	N- 4, N-20	done	before 2012
KKI-1/ BWR	5	Optimisation and supplementation of emergency measures regarding the feeding/overfeeding of the spent fuel pool	N- 8, N-22	done	2012
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	2012
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	2012
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	before 2012
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	before 2012
KKI-1/ BWR	10	Review of the safety clearances of safety-relevant buildings	N-13	done	before 2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKI-1/ BWR	11	Review of flood protection	N-15	done	before 2012
KKI-1/ BWR	12	Examination of the flooding-safe storage of safety-relevant equipment	N-18	done	before 2012
KKI-1/ BWR	13	Review of the availability of the remote shutdown and control station	N-18	done	before 2012
KKI-1/ BWR	14	Storage or stockage of equipment for pumping over or transporting secured fuel from depots	N-19	done	before 2012
KKI-1/ BWR	15	Storage or stockage of fuels and lubricants	N-19	done	before 2012
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	in progress	2013
KKK/ BWR	1	Different statements on recommendations of Information Notice WLN 2012/02 regarding SBO, cooling water supply, venting, H2 production, emergency measures, etc.	N- 1, N- 3, N- 4, N- 6, N- 7, N- 8, N-10, N-11	done	2012
KKK/ BWR	2	Different statements on Information Notice WLN 2012/02, dealing with the recommendations regarding SBO, functions of the remote shutdown and control station, influence of external hazards on emergency measures	N- 2, N- 9, N-18	in progress	2013
KKK/ BWR	3	Analysis of the accident behaviour of fuel assemblies in the spent fuel pool	N- 7	done	2012
KKK/ BWR	4	Development of measures for the additional injection into the spent fuel pool	N- 8, N-18	done	2011
KKK/ BWR	5	Statement on the RSK recommendation regarding a reinforcement of the ultimate primary heat sink	N-12	in progress	2013

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKK/ BWR	6	Statement on the RSK recommendation regarding the assessment of robustness	N-13 - N-17, N-19, N-20, N-22, N-23	in progress	2013
KKK/ BWR	7	Review of the instrumentation in the area of the spent fuel pool	N-20	in progress	2013
KKP 1/ BWR	1	Statement on the maintenance of the electricity supply on the basis of a safety analysis (BW ⁷ 1-3)	N- 1, N- 2, N-19	in progress	2013 ⁸
KKP 1/ BWR	2	Statement on fuel cooling – diverse heat sink on the basis of a safety analysis (BW 5-6)	N- 3, N-12	in progress	2013
KKP 1/ BWR	3	Statement on fuel cooling – additional component cooling system injection on the basis of a safety analysis (BW 7-8)	N- 4	in progress	2013
KKP 1/ BWR	4	Statement on more stringent requirements for filtered containment venting on the basis of a safety analysis (BW 17-18)	N- 6, N-21	in progress	2013
KKP 1/ BWR	5	Statement regarding the avoidance of hydrogen accumulations in the case of spent fuel pools situated outside the containment (BW 22)	N- 7	in progress	2013
KKP 1/ BWR	6	Measure for injecting into the spent-fuel pool and operability was established. The regulatory authority is examining whether the safety-related objective of the recommendation has been reached by the measure. (BW 10-11)	N- 8, N-22	done in progress	before 2012 2013
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 (BW 19)	N- 9	in progress	2013
KKP 1/ BWR	8	Description of the state of implementation of measures as well as final assessment regarding means of communication in the remote shutdown and control station for the crisis team (BW 20)	N-10	in progress	2013

⁷ Numbers indicated refer to the serial number in the Action Plan of Baden-Wurttemberg (BW), as at 31/10/2012

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 31/10/2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKP 1/ BWR	9	Description of as-is condition regarding access to buildings. (BW 21) Examination by regulatory authority whether additional aids are necessary.	N-11	done in progress	2012 2013
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	2012
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	in progress	2013
KKP 1/ BWR	12	Additional estimates, e.g. regarding icing-up in the receiving water as a result of extreme weather conditions (BW 26)	N-13	in progress	2013
KKP 1/ BWR	13	Statement on the assurance of the feasibility of emergency measures on the basis of a safety analysis (BW 13-15)	N-13, N-18	in progress	2013
KKP 1/ BWR	14	Review of the availability of equipment in the event of a flood (BW 23-25) Assessment regarding a longer-lasting flood. Assessment of the accessibility of buildings.	N-15	in progress	2012
KKP 1/ BWR	15	Additional injection options: all fuel assemblies are in the spent fuel pool (BW 4)	N-20	done	2012
KKP 1/ BWR	16	Statement on evaporation cooling on the basis of a safety analysis (BW 10)	N-22	in progress	2013
KKP 1/ BWR	17	Statement on the introduction of Severe Accident Management Guidelines (SAMG) on the basis of a safety analysis (BW 16)	N-23	in progress	2013
KKU/ PWR	1	Assessment of the robustness of the emergency measures regarding heat removal from the spent fuel pool in the event of a SBO, implementation of emergency measures	N- 1, N- 2, N-13, N-22	done	before 2012
KKU/ PWR	2	Creation of a diverse source of cooling water	N- 3, N-12	done	before 2012
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	2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKU/ PWR	4	Obtaining and providing mobile pumps and other injection equipment	N- 4, N-20	done	before 2012
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	before 2012
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	2012
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	before 2012
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	before 2012
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	before 2012
KKU/ PWR	10	Review of the safety clearances of safety-relevant buildings	N-13	done	before 2012
KKU/ PWR	11	Review of flood protection	N-15	done	before 2012
KKU/ PWR	12	Assessment of the consequences of flooding of the annulus regarding the cooling of the spent fuel pool	N-16	done	2012
KKU/ PWR	13	Examination of the flooding-safe storage of safety-relevant equipment	N-18	done	before 2012
KKU/ PWR	14	Review of the availability of the remote shutdown and control station	N-18	done	before 2012
KKU/ PWR	15	Storage or stockage of equipment for pumping over or transporting secured fuel from depots	N-19	done	before 2012

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KKU/ PWR	16	Storage or stockage of fuels and lubricants	N-19	done	before 2012
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	in progress	2013
KWB A+B/ PWR	1	Provision of two mobile emergency power generators with 400 kVA each including the necessary auxiliary and operating supplies	N- 1, N- 2	done	2011
KWB A+B/ PWR	2	Creation of physically separate connections points in the switchgear for establishing an AC power supply	N- 2, N-19	done	2012
KWB A+B/ PWR	3	Creation of a diverse source of cooling water	N- 3, N-12	done	2011
KWB A+B/ PWR	4	Preparation of an emergency measure for RPV feeding	N- 5	done	2011
KWB A+B/ PWR	5	Systematic review of the robustness of emergency measures with consideration of external hazards	N- 5, N- 6, N- 9, N-13	done	2011
KWB A+B/ PWR	6	Preparation of an emergency measure for inertising the pressure relief line for Unit A	N- 6, N-21	done	2011
KWB A+B/ PWR	7	Creation of a permanently installed injection path into the spent fuel pool that is accessible from outside the containment	N- 8, N-22	done	2012
KWB A+B/ PWR	8	Preparation of comprehensive analyses and development of emergency measures regarding the loss of spent fuel pool cooling during beyond-design-basis accidents	N- 8, N-22	done	2012
KWB A+B/ PWR	9	Extension of the function of the remote shutdown and control station	N- 9	done	2011
KWB A+B/ PWR	10	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	N-10	done	2011

Plant/ type	No.	Activity/measure	Related recommenda- tion	Status	Finalisation
KWB A+B/ PWR	11	Review and improvement if necessary of the accessibility of the plant grounds and the plant itself after an earthquake and flooding <i>et al.</i>	N-11	done	2011
KWB A+B/ PWR	12	Assessment of the robustness of the emergency measures regarding heat removal from the spent fuel pool	N-13, N-22	done	2012
KWB A+B/ PWR	13	Measures and procedures to prolong the operating times of emergency diesel generators, using secured fuel stocks	N-19	done	2012
KWB A+B/ PWR	14	Installation of additional diesel storage tanks within the plant grounds to increase the existing diesel supplies by 70 m ³	N-19	done	2011
KWB A+B/ PWR	15	Operator's own examination with regard to the need for SAMGs for the post-operational phase of the Biblis nuclear power plant	N-23	in progress	2012/2013

5 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 6-2 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 in the year 2015.

The topics of discussion are listed in Table 5-1 with the corresponding references to the recommendations of the extraordinary CNS conference (Table 6-2). This way, the international and the national findings have been joined together.

Table 5-1: Activities of the Action Plan for the implementation of further measures

No.	Activity	CNS Topic	Source	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	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": 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> <p>Definition of objectives and boundary conditions – development of a system of objectives.</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: 2015</p>	C-4
M-4	<p>SSK Working Group A 510 Work Package "Accident Management and Emergency Preparedness":</p> <p>The focus here is on the interfaces between on-site and off-site emer-</p>	5	On-going project of the Commission on Radiological Protection:	C-14, C-21, C-24

No.	Activity	CNS Topic	Source	Related CNS recommendation
	<p>gency 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.</p>		<p>Review of German regulation and guidelines for off-site emergency response SSK-A 510 Planned conclusion: 2015</p>	
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 Management. 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. 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>	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: 2015</p>	C-18, C-19, C-26
M-6	<p>SSK Working Group A 510 Work Package "Emergency Management (wide-range)": Aspects of the radiological situation: Determination of the Source Term with the support of on-site and off-site methods. 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. 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: Review of German regulation and guidelines for off-site emergency response SSK-A 510 Planned conclusion: 2015</p>	C-8, C-9, C-13, C-15, C-20, C-22, C-25

No.	Activity	CNS Topic	Source	Related CNS recommendation
M-7	<p>SSK Working Group A 510 Work Package "Communication and Information in an Emergency (National and International)": Examination of the most important "tools" of emergency preparedness and response regarding communication and information. Requirements for information technology to be used in case of an emergency.</p> <p>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.</p> <p>Review of the information leaflets distributed by the operators of the nuclear installations to the population in the neighbourhoods.</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: 2015</p>	C-5, C-14
M-8	<p>SSK Working Group A 510 Work Package "Co-operation (National, International)"</p> <p>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:</p> <p>Review of German regulation and guidelines for off-site emergency response</p> <p>SSK-A 510</p> <p>Planned conclusion: 2015</p>	C-4, C-23

6 Annex

Table 6-1: Recommendations and suggestions of the German National Action Plan with relation to the ENSREG Compilation of Recommendations and Suggestions and CNS Topics 1, 2 and 3

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</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	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, further discussion on-going remaining topics addressed by N-12, N-18	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, further discussion on PGA and on extreme weather conditions remaining topics addressed by N-14	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, further discussion on-going with regard to beyond design basis flooding	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, further discussion on-going with regard to beyond design basis weather events	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, stipulated by Safety Standards and Safety Requirements, RSK discussion on-going	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 concerning extreme weather further discussion in RSK is on-going	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	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 improve-	N-13 further discussion on severe weather	natural hazards	ENSREG Compilation of Recommendations, xCNS	3.1.8

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
	ments. Licensing basis protection against external hazards (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-2	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, stipulated by Safety Standards and Safety Requirements, further enhancements on-going	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	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
	term AC power failure.				
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-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-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-19	design issues	ENSREG Compilation of Recommendations	3.2.12

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
E-26	<p>Mobile Devices</p> <p>The provision of mobile pumps, power supplies and air compressors with prepared quick connections, procedures, and staff training with drills.</p>	<p>partly already implemented - pre-Fukushima</p> <p>remaining topics addressed by N-4, N-11</p>	design issues	ENSREG Compilation of Recommendations, xCNS	3.2.13
E-27	<p>Bunkered/Hardened Systems</p> <p>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).</p>	<p>already implemented - pre-Fukushima</p>	design issues	ENSREG Compilation of Recommendations	3.2.14
E-28	<p>Multiple Accidents</p> <p>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.</p>	<p>Incident and Accident control since beginning separately for each unit</p> <p>remaining topics addressed by N-6</p>	design issues	ENSREG Compilation of Recommendations, xCNS	3.2.15
E-29	<p>Equipment Inspection and Training Programs</p> <p>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.</p>	<p>already implemented - pre-Fukushima</p> <p>N-23</p> <p>realized for existing measures, has to be considered in SAMG Development</p>	design issues	ENSREG Compilation of Recommendations	3.2.16
E-30	<p>Further Studies to Address Uncertainties</p> <p>The performance of further studies in areas where there are uncertainties. Uncertainties may exist in the following areas:</p> <ul style="list-style-type: none"> · 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 depressuriza- 	<p>N- 2, N-11, N-12, N-13, N-19, N-22</p>	design issues	ENSREG Compilation of Recommendations	3.2.17

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
	<p>tion valves) during the SBO to ensure that cooling 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</p> <p>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</p> <p>remaining topics addressed by N-23</p> <p>has to be considered in SAMG Development</p>	severe accident management	ENSREG Compilation of Recommendations	3.3.1.
E-32	<p>SAM Hardware Provisions</p> <p>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</p> <p>remaining topics addressed by N-6, N-13</p>	severe accident management	ENSREG Compilation of Recommendations	3.3.2
E-33	<p>Review of SAM Provisions Following Severe External Events</p> <p>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>	N-13, N-18, N-20, N-21	severe accident management	ENSREG Compilation of Recommendations	3.3.3

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
E-34	<p>Enhancement of Severe Accident Management Guidelines (SAMG)</p> <p>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.</p>	N-23	severe accident management	ENSREG Compilation of Recommendations, xCNS	3.3.4
E-35	<p>SAMG Validation</p> <p>The validation of the enhanced SAMGs.</p>	N-23 further discussion on-going has to be considered in SAMG Development	severe accident management	ENSREG Compilation of Recommendations	3.3.5
E-36	<p>SAM Exercises</p> <p>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.</p>	<p>partly already implemented - pre-Fukushima remaining topics addressed by N-23 realized for existing measures, has to be considered in SAMG Development</p>	severe accident management	ENSREG Compilation of Recommendations	3.3.6
E-37	<p>SAM Training</p> <p>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.</p>	N-23 realized for existing measures, has to be considered in SAMG Development	severe accident management	ENSREG Compilation of Recommendations	3.3.7
E-38	<p>Extension of SAMGs to All Plant States</p> <p>The extension of existing SAMGs to all plant states (full and low-power, shutdown), including accidents initiated in SFPs.</p>	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 has to be considered in SAMG Development	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-23 realized for existing measures, has to be considered in SAMG Development	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	partly already implemented - pre-Fukushima remaining topics addressed by	severe accident management	ENSREG Compilation of Recommendations	3.3.15

No.	Recommendation/Suggestion	Relevant national recommendation	Topic	Source	Paragraph
	of potential releases, determination of candidate high-level actions and their effects and prioritizing 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.	N-13 stipulated by Safety Standards and Safety Requirements			
E-46	Severe Accident Studies The performance of further studies to improve SAMGs.	N-13, N-23 has to be considered in SAMG development	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 has to be considered in SAMG development	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 has to be considered in SAMG development	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	severe accident management	ENSREG Country Peer Review Report	

Table 6-2: 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 BMU 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 BMU provides understandable information to the public through the internet and written publications such as the BMU 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	M-6	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)	Emergency Preparedness and Response	xCNS

No.	Recommendation/Suggestion	Comment/related national activity	Topic	Source
		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	<p><u>Realized - pre-Fukushima</u> Reference Levels exist.</p> <p>On-going discussion in the Commission on Radiological Protection (SSK)</p>	Emergency Preparedness and Response	xCNS
		1.M-1		
		2.M-2		
		3.M-5		
C-27	<p>Strengthening the peer reviews process of CNS and of missions (IAEA, WANO and Industry)</p> <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. 	<p>Realized – pre-Fukushima</p> <p>Germany actively cooperates in all IAEA committees and commissions. The German CNS report includes the findings of the IRRS mission.</p> <p>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.</p>	International Cooperation	xCNS
C-28	<p>Strengthening the peer reviews process of CNS and of missions (IAEA, WANO and Industry) - continue</p> <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. 	<p>Realized – pre-Fukushima</p> <p>The German operating organizations commit themselves to the WANO peer review activities.</p>	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. 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	<p><u>Realized - pre-Fukushima</u></p> <p>Continuous working principle of the German regulatory bodies</p>	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	<p><u>Realized - pre-Fukushima</u></p> <p>Continuous effort within the regulatory oversight process</p>	cross-cutting issues	xCNS

