



**INTEGRATED
REGULATORY
REVIEW SERVICE
(IRRS)
FOLLOW UP MISSION**



TO

GERMANY

Bonn and Stuttgart, Germany

4 to 10 September 2011

DEPARTMENT OF NUCLEAR SAFETY AND SECURITY





REPORT

INTEGRATED REGULATORY REVIEW SERVICE (IRRS)

REPORT TO

THE GOVERNMENT OF GERMANY

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THE GOVERNMENT OF GERMANY
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Mission date: 4 to 10 September 2011
Regulatory body: BMU and UM BW
Location: BMU, Headquarters Bonn and UM BW, Headquarters Stuttgart, Germany
Regulated facilities and practices: Nuclear power plants
Organized by: International Atomic Energy Agency (IAEA)

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The number of recommendations, suggestions and good practices is in no way a measure of the status of the regulatory body. Comparisons of such numbers between IRRS reports from different countries should not be attempted.

CONTENTS

EXECUTIVE SUMMARY	6
I. INTRODUCTION	9
II. OBJECTIVE AND SCOPE.....	11
III. BASIS FOR THE REVIEW	12
1. LEGISLATIVE AND GOVERNMENTAL RESPONSIBILITIES	14
2. AUTHORITY, RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY	18
3. ORGANIZATION OF THE REGULATORY BODY.....	21
4. AUTHORIZATION	25
5. REVIEW AND ASSESSMENT	29
6. INSPECTION AND ENFORCEMENT	34
6.2 UM BW ENFORCEMENT PROGRAMME.....	34
7. DEVELOPMENT OF REGULATIONS AND GUIDES.....	39
PROCESSES FOR ISSUING REGULATORY DOCUMENTS	39
STRATEGY FOR THE DEVELOPMENT OF REGULATIONS AND GUIDES.....	41
8. MANAGEMENT SYSTEM OF THE COMPONENT PARTS OF THE REGULATORY BODY.....	47
9. REGULATORY IMPLICATIONS OF THE TEPCO FUKUSHIMA DAI-ICHI ACCIDENT.....	54
9.1. ACTIONS TAKEN BY THE REGULATORY BODY IN THE AFTERMATH OF THE TEPCO FUKUSHIMA DAI-ICHI ACCIDENT	54
9.2. PLANS FOR UP-COMING ACTIONS TO FURTHER ADDRESS THE REGULATORY IMPLICATIONS OF THE TEPCO FUKUSHIMA DAI-ICHI ACCIDENT 56	
9.3. SIGNIFICANCE OF REGULATORY IMPLICATIONS OF THE TEPCO FUKUSHIMA ACCIDENT ACROSS REVIEWED AREAS.....	57
APPENDIX I – LIST OF PARTICIPANTS	66
APPENDIX II – MISSION PROGRAMME.....	67
APPENDIX III – RECOMMENDATIONS/SUGGESTIONS/GOOD PRACTICES FROM THE 2011 IRRS FOLLOW UP MISSION	69
APPENDIX IV – REFERENCE MATERIAL PROVIDED BY BMU AND UM BW	74
APPENDIX V – IAEA REFERENCE MATERIAL USED FOR THE REVIEW.....	78
APPENDIX VI – ORGANIZATIONAL CHART BMU.....	79

EXECUTIVE SUMMARY

At the request of the Government of the Federal Republic of Germany, an international team of experts in nuclear safety visited the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit BMU) and the Ministry of the Environment of Baden-Württemberg (Umweltministerium Baden-Württemberg UM BW) from 8th to 18th September 2008. The purpose of the visit was to conduct an Integrated Regulatory Review Service (IRRS) mission in Germany. The IRRS mission involves a peer review of the regulatory framework of Germany against the IAEA Safety Standards, and provides the opportunity to exchange information and experience on safety regulation.

In April 2010, the Government of the Federal Republic of Germany requested a Follow-Up IRRS mission to review the actions taken in response to the recommendations and suggestions presented in the report of the 2008 IRRS mission, and the changes in the German regulatory system since the 2008 mission. The review was conducted from 4th to 10th September 2011, and consisted of 6 external senior regulatory experts from 6 Member States, three staff members from the IAEA, and an IAEA administrative assistant. In advance of the mission, Germany submitted to the IAEA an information package on a dedicated extranet web-site, including a comprehensive action plan for improving its regulatory effectiveness considering the 2008 Recommendations and Suggestions. The IRRS activities, which took place at BMU, Headquarters in Bonn and UM BW, Headquarters in Stuttgart, included a series of interviews and discussions between the experts and the German counterparts.

In response to the TEPCO Fukushima Dai-ichi Nuclear Power Plant (Fukushima) accident, the IAEA developed a new module within the framework of the IRRS programme to review the response of the German nuclear safety regulatory body, the current lessons learned from the accident, and its application to the German regulatory system. The Fukushima accident was one of the most serious nuclear accidents ever to occur and will be regarded as a seminal event in the history of nuclear power. The accident underscored the importance of having an independent, credible nuclear safety regulator equipped with the human, financial, technical and scientific support resources needed to fulfil its responsibilities. It also emphasized the need for the safety regulator to constantly strive for excellence in its continuing efforts to ensure the protection of the public and the environment.

In striving for excellence, the regulator's focus on fulfilling its safety mission must be unimpeded. The regulator should clearly define its organizational goals, objectives, values, and management system; attract and retain people with an acumen and passion for nuclear safety to carry out key safety functions; and cultivate an environment of continuous improvement, wherein questions can be raised freely and safety decisions challenged.

With this in mind, it is noteworthy that the Recommendations and Suggestions from the 2008 Integrated Regulatory Review Service IRRS mission have been taken into account systematically, and important progress has been made in several areas to continue to improve the regulatory system of at BMU and at UM BW. It is the hope of the IRRS team, that the Recommendations and Suggestions contained in this follow-up report will be considered in this same context - a commitment to continuous improvement.

Of particular note, the IRRS Team recognized the presence of representatives from the nuclear safety regulator of four other Länder, Bavaria, Hesse, Niedersachsen and Schleswig-Holstein during portions of the mission. The representatives indicated that they consider the IAEA IRRS missions to be an important tool for the international exchange of nuclear safety experience and a means to improve nuclear safety regulation. In addition, the Länder representatives noted that they closely

monitored the outcome of the 2008 IRRS mission and are considering options to further improve nuclear safety regulation in their own Land. This initiative represents noteworthy progress towards further engagement and harmonization among the safety regulators of the nuclear power Länder in Germany.

The IRRS Team also noted that in 2010, the Federal and Länder regulators reached agreement on a position paper that outlines the overarching roles and responsibilities of the respective regulatory bodies. The IRRS Team observed that this high level clarification of duties has led to improved cooperation between the Federal and Länder regulators, a noteworthy and positive change since the 2008 IRRS mission.

The recent 13th Amendment to the Atomic Energy Act of Germany immediately reduced the number of operational nuclear power plants (NPPs) and stipulated that all will be shut down to a programme by 2022. In light of this decision, the IRRS team noted that the regulatory authorities of the Länder with operating or shut down NPPs should continue to provide strong safety oversight and ensure the application of the highest nuclear safety standards throughout the closure programme. In addition, the regulator must address the challenge of assuring that utilities continue to invest in operational plant safety by providing sufficient resources for personnel, equipment, processes, procedures, and the work environment - despite the shut down programme.

Regarding the findings of the IRRS Team, it was determined that two of the Recommendations and sixteen of the Suggestions made by the 2008 IRRS mission had been effectively addressed by BMU and were considered closed. For UM BW, the IRRS Team determined that all of the (four) Recommendations and (twenty-one) Suggestions from the 2008 IRRS mission had been effectively addressed and were considered closed.

For the remaining findings from the 2008 IRRS mission report, the IRRS Team found that further action was needed at BMU to close eight Recommendations and three Suggestions. In addition, the IRRS team identified three new Recommendations and two new Suggestions.

The 2008 IRRS mission identified several strengths of the German regulatory body. The 2011 IRRS team identified the following additional strengths:

- UM BW demonstrated commitment to continuous improvement as evidenced by its responsiveness to the Recommendations and Suggestions from the 2008 IRRS mission.
- BMU has implemented a comprehensive IT knowledge management approach to support the activities of the regulatory body and its stakeholders. The approach contains a broad spectrum of nuclear safety information, including technical descriptions of nuclear power plants and resources for creating legislation, rule making and research. The availability of this up-to-date online information to all involved parties has contributed to mutual trust and shared understanding among all stakeholders.
- The prompt and coordinated incident response activities at BMU and UM BW to the Fukushima accident are commendable. The environmental radiation monitoring programme and the communication to the public and interested parties were carried out in an exemplary manner. The extensive programme of evaluations that were initiated by the German regulatory body cover a wide range of issues raised by the Fukushima accident.

As indicated above, this report also includes new Recommendations and Suggestions to further strengthen the regulatory body in Germany. Examples include:

- BMU should ensure its ability to carry out work in such a manner that safety related activities are not diverted by other ministerial responsibilities, pressures or constraints.

- BMU should increase the priority for completing the Federal Oversight Manual and allocate resources accordingly in order to achieve the targeted issuance date of 2012.
- The development of regulations and guides should be considered as a key function at BMU.
- BMU should publish the “*Safety Requirements for Nuclear Power Plant*” document in a timely manner to establish a common and harmonized set of safety requirements and criteria for use by the Länder.

I. INTRODUCTION

BACKGROUND FROM 2008 IRRS MISSION:

At the request of the Government of the Federal Republic of Germany, an international team of experts in nuclear safety visited the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit BMU) and the Ministry of the Environment of Baden-Württemberg (Umweltministerium Baden-Württemberg UM BW) from September 8th to 18th, 2008. The purpose of the visit was to conduct an Integrated Regulatory Review Service (IRRS) mission in Germany. The IRRS Review Team consisted of 12 external senior regulatory experts from 11 Member States, two staff members from the IAEA and an IAEA administrative assistant.

The purpose of the IRRS mission, which was limited to the regulation of operating nuclear power plants, was to review the German regulatory framework, functions and activities; to assess the effectiveness of the application of the regulatory framework, functions and activities; and to exchange information and experiences in the areas covered by the IRRS. IAEA safety standards served as the basis for the IRRS review.

The federal structure of the German state is founded on a division of authorities between the Federation ('Bund') and 16 federal states ('Länder'). For the purpose of the IRRS mission, the German regulatory system was represented by BMU at the federal level and UM BW at the state level (Baden-Württemberg). BMU and the nuclear regulatory bodies in each state, form the system of authorities designated by the government as having legal and competent authority in matters pertaining to nuclear safety and radiation protection in Germany. Together the federal regulatory body and the state regulatory body form the regulatory body as defined in the IAEA Safety Standards. UM BW is one of the five Länder in Germany that currently have operating nuclear power plants; representatives of the regulatory bodies in the other four Länder that have operating nuclear power plants did not participate in the mission.

The IRRS mission addressed both regulatory technical and policy issues. The relevant regulatory areas discussed included: legislative and governmental responsibilities; responsibilities and functions of the regulatory body; organization of the regulatory body; activities and functions of the regulatory body, including the authorization process, review and assessment, inspection and enforcement and the development of regulations and guides; and the management system. The policy issues that were discussed included: human resources and knowledge management; use of insights from operating experience feedback in the regulatory process; enhancing regulatory effectiveness and competence; ageing management for nuclear power plants; management of safety; maximizing nuclear safety through cooperation, mutual understanding and respect; and communicating with stakeholders, particularly the public.

The mission included a series of interviews and discussions with key personnel at BMU and UM BW, observation of an inspection by the regulator at Neckarwestheim 1 Nuclear Power Plant (GKN1), and discussions with the operator of GKN1, and senior management of EnKK, the operating company. The IRRS Review Team also had discussions with representatives of other organizations, including the Federal Office for Radiation Protection (BfS), the Reactor Safety Commission (RSK), BMU's technical support organization Gesellschaft für Anlagen- und Reaktorsicherheit (GRS), the Nuclear Safety Standards Commission (KTA), the relevant technical support organizations in Baden-Württemberg (TÜV SÜD and KeTAG), and the International Commission on Nuclear Technology (ILK). Senior members of the IRRS Review Team also met with the responsible ministers of both BMU and UM BW to discuss regulatory matters of mutual importance.

The report was published in 2008 and it was made publicly available.

IRRS FOLLOW-UP MISSION:

In April 2010 the Government of the Federal Republic of Germany requested a Follow-Up IRRS mission, to review the measures undertaken following the recommendations and suggestions presented in the report of the 2008 IRRS mission and the changes in the German regulatory system since 2008 mission. Those areas where no suggestions or recommendations were made on 2008 IRRS mission were not included in the scope of the follow-up mission.

After the occurrence of the TEPCO Fukushima Dai-ichi nuclear accident the IAEA developed, within the framework of the IRRS programme, a new module to take into account in the regulatory bodies the current lessons learned from the accident and its application to the German regulatory system for safety.

The review was conducted from 4 to 10 September 2011 and consisted of 6 senior regulatory experts from 6 Member States, three staff members from the IAEA, and an IAEA administrative assistant (Appendix I). IRRS activities took place at the BMU, Headquarters in Bonn and UM BW, Headquarters in Stuttgart.

During the IRRS follow-up mission, BMU at the federal level and UM BW at the Land level actively participated and discussed the status of the suggestions and recommendations made in 2008. However, as a significant change in comparison with 2008, the rest of the Länder in Germany regulating nuclear power plants participated as observers during the mission.

II. OBJECTIVE AND SCOPE

The purpose of the IRRS follow-up mission was to continue the work of improving regulatory effectiveness by reviewing the progress of the German regulatory system in response to IRRS mission recommendations and suggestions, identification of new good practices and to exchange information and experience among German counterparts and the IRRS team with a view to contributing to harmonizing regulatory approaches and creating mutual learning opportunities among regulators.

The IRRS mission was structured in order to take into account the progress in implementing improvements resulting from recommendations and suggestions made in the IRRS 2008 mission, reviewing the areas of significant regulatory changes since the last mission and the regulatory actions/implications taken in the light of Fukushima Dai-Ichi accident.

Those areas where no suggestions or recommendations were issued on 2008 IRRS mission were not included in the scope of the follow-up mission.

The general key objectives of the IRRS mission are to enhance the regulatory effectiveness by:

- Providing the host country (regulatory body and governmental authorities) with a review of their regulatory issues, in particular those highlighted in the 2008 mission;
- Providing the host country with an objective evaluation of their regulatory practices with respect to international safety standards;
- Contributing to the harmonization of regulatory approaches among Member States;
- Promoting sharing of experience and exchange of lessons learnt;
- Providing key staff in the host country with an opportunity to discuss their practices and action plans considering the 2008 findings with reviewers who have experience of other practices in the same field;
- Providing the host country with recommendations and suggestions for improvement;
- Providing other States with information regarding new good practices identified in the course of the review;
- Providing reviewers from States and the IAEA staff with opportunities to broaden their experience and knowledge of their own field ,in particular on how the host country is implementing the improvements; and
- Providing the host country through completion of the IRRS self-assessment of a comparison of its activities against IAEA safety standards and thereby identifying potential areas for improvement their action plan.

III. BASIS FOR THE REVIEW

A) PREPARATORY WORK AND IAEA REVIEW TEAM

The preparatory work for the mission was carried out by the IRRS IAEA Coordinator Mr Gustavo Caruso, Section Head-Nuclear Safety of Nuclear Installations NSNI/ IAEA and the appointed Liaison Officers, Mr Michael Hertrich representing BMU and Mr Axel Kern representing UM BW.

An IRRS preparatory meeting was held on 8-9 December 2010 to discuss the technical and administrative details of the follow up mission to Germany. It took place at BMU headquarters in Bonn with the participation of the appointed IRRS Team Leader Mr Mike Weightman, HM Chief Inspector HSE United Kingdom, Mr. Peter Addison, Principal Inspector, International Coordination Officer from the same organization (assisting the team leader) and Mr Gustavo Caruso, the IAEA IRRS coordinator.

The preparatory meeting was opened by Mr Hennenhofer BMU Director General of Safety of Nuclear Installations, Radiological Protection and Nuclear fuel cycle and Mr Grözinger Head of the division nuclear supervision and radiation protection, UM BW.

During the preparatory meeting discussions it was agreed that the advance reference material (ARM), including the output from the self-assessment, would be provided to the IAEA in May/June 2011. In addition, the scope of the follow-up IRRS mission was agreed to include: progress made to address the 2008 IRRS mission findings and considering the changes since 2008 mission in those areas where recommendations or suggestion were issued. The ARM and the main agenda items were discussed and agreed.

This IRRS follow-up mission was the first Follow-up conducted after the occurrence of the TEPCO Fukushima Dai-ichi nuclear accident. Accordingly, special consideration was taken for the regulatory implications of the Fukushima accident in the German regulatory system for safety, as part of a newly developed core IRRS module.

In accordance with the request from Germany, and taking into account the scope of the Follow-up mission as indicated above, it was agreed that the IAEA review team would comprise of 6 Senior regulators from 6 Member States (namely: Finland, France, Netherlands, Switzerland, UK and USA) who already participated in the 2008 mission, under the IAEA coordination and an IAEA administrative assistant (see Appendix I).

The ARM documents were made available to the IAEA review team through a dedicated web-site. In particular, the main document about the status of actions related to recommendations and suggestions from 2008 IRRS mission were provided

The reviewers and the IAEA staff prepared before the mission the initial impressions on the ARM, reviewed the BMU and UM BW activities and prepared for the interviews during the mission with the counterparts.

An initial IAEA team meeting took place on Sunday 4th September 2011 and was attended by the IRRS Review Team and the German Liaison Officers, Mr Hertrich and Mr Kern. The IRRS Team Leader and the IRRS IAEA Coordinator discussed specific aspects of the mission and the background and main issues from the IRRS in 2008, the basis for the review, context and objectives of the IRRS and IRRS methodology for the review and the evaluation were also agreed among all of the mission reviewers. The Liaison Officer presented the logistical and other aspects of the follow-up mission.

B) REFERENCES FOR THE REVIEW

The main reference documents provided by BMU and UM BW for the review mission are indicated in Appendix IV. The most relevant IAEA Safety Standards and other reference documents used for the review are indicated in Appendix V.

C) CONDUCT OF THE REVIEW

The entrance meeting was held on Monday 5th September 2011 with the participation of Mr Hennenhofer BMU Director General of Safety of Nuclear Installations, Radiological Protection and Nuclear fuel cycle and Mr Grözinger Head of the division nuclear supervision and radiation protection, UM BW, BMU and UM BW Technical Director and other participating staff contributing to the Follow-up mission.

Opening remarks were made by Mr Hennenhofer, Mr Grozinger, Mr McCree and Mr Caruso. Several presentations were carried out and discussed during the Entrance meeting made by the management staff

The status of implementation of recommendations and suggestions was discussed in detail in order to understand the current situation and delineate the initial main areas to be discussed during the interviews with the counterparts.

In addition, presentations on the regulatory implications in Germany of the Fukushima Dai-Ichi accident were presented. A representative of the Reactor Safety Commission (RSK) presented a number of aspects related to the “safety review” evaluation carrying out in Germany.

During the mission, a systematic review was conducted of all recommendations and suggestions from the IRRS in 2008 with the objective of establishing progress made in the German regulatory system in response to the 2008 mission, as well as identifying new good practices for the review stated in the scope of the mission. The review was conducted in topical areas taking into account the previous experience of the experts in the 2008 mission, through meetings, interviews and discussions with the counterparts. The team performed its activities in accordance with the Mission Programme, outlined in Appendix II.

The exit meeting was held on Saturday 10th September 2011 with the participation of Mr Hennenhofer and Mr Grözinger, Technical Directors, all Deputy Directors, all counterparts and the BMU and UM BWs management staff.

The main conclusions of the follow-up IRRS mission were presented by the IRRS Team Leader Mr V. McCree and closing remarks were made by Mr Jim Lyons, Director of Nuclear Installations Safety, Department of Nuclear Safety and Security and by Mr Hennenhofer and Mr Grözinger.

The draft technical notes were handed over to BMU and UM BW at the end of the meeting.

1. LEGISLATIVE AND GOVERNMENTAL RESPONSIBILITIES

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

- (1) **BASIS:** GS-R-1 § 2.2. (4) states that *the regulatory body shall be provided with adequate authority and power, and it shall be ensured that it has adequate staffing and financial resources to discharge its assigned responsibilities.*
- (2) **BASIS:** GS-R-1 § 2.4. (5) states that *legislation shall arrange for adequate funding of the regulatory body.*

R1 **Recommendation:** The German Government should make arrangements to establish adequate resources at a federal level in the future to ensure that it can discharge its determined and agreed roles and responsibilities for nuclear safety, in addition to those assigned by law.

This Recommendation should be read in conjunction with proposals regarding the need to determine roles and responsibilities in Chapter 3.

Changes since the 2008 IRRS Mission

Recommendation 1: During the IAEA IRRS Mission to Germany in 2008, reviewers addressed in some detail the issue of the division of tasks and responsibilities between the Federation and the Länder. One outcome was Recommendation 4, which stated that:

“In the interest of nuclear safety BMU DG RS and UM BW should cooperate in order to improve mutual trust by the development of an agreement at the LAA (possibly aided or led by a facilitator) to address all relevant topics, including:

- *clarification and understanding of the respective roles and responsibility of the BMU DG RS and the Länder, and the execution of these roles and responsibilities;*
- *identification of the means of communication between BMU DG RS and the Länder;*
- *identification of the rules of the exchange of information regarding the supervision of nuclear safety. These rules should take regard of needs, in such a way that BMU DG RS has confidence in the data content and accuracy and it is able to:*
 - *use the data without the need for further technical analysis; and*
 - *assure itself that each Land is carrying out its regulatory responsibilities appropriately.*
- *secondment of staff between BMU DG RS and the Länder to improve mutual understanding and experience.*
- *the establishment of a strategic nuclear safety research plan for the existing NPPs”*

In 2009, other Länder with nuclear power plants (Bavaria, Hesse, Niedersachsen and Schleswig-Holstein) were informed of the results of the IRRS mission at special sessions of the Länder Committee for Nuclear Energy (LAA) including the issue addressed under Recommendation 4. In 2010, the LAA took the decision:

“The Länder Committee for Nuclear Energy – main committee – takes note of the report of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety emphasises that, within the framework of the execution of the Länder on federal commission with regard to nuclear power plants and other nuclear installations, licensing and supervision falls within the competence of the Land authorities. The oversight of the Land authorities by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety mainly serves to ensure uniform execution of the law at federal level.”

This is a statement, at the highest cooperative level, of a common understanding between Federation and Land without any change to the legal positions of either party within the German Constitution.

However, it has had the effect of confirming that the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) does not claim to have any other management and control function or own supervision competences in relation to nuclear power plants in Germany. Consequently, the licensing and supervision of nuclear power plants, as well as the enforcement of regulations and provisions, is the sole responsibility of the nuclear authorities of the Länder.

This clarification has a number of beneficial results. Only the nuclear authorities of the Länder act towards the licensees; the risk of duplication of effort between the Länder and the BMU is minimised; the relationship between the BMU and the Länder is improved; and the resources of the BMU can be reconsidered in the light of the newly understood relationship.

The IRRS Follow-up Mission 2011 was informed that the subsequent effect of this new relationship for BMU is that it no longer needs to increase staff numbers for regulatory supervision, as was indicated in 2008, beyond its current scope. However, the Recommendation 1 refers to the need for BMU to have adequate resources to “*discharge its determined and agreed roles and responsibilities for nuclear safety, in addition to those assigned by law*” which extends beyond the regulatory supervision activities. Indeed, as a result of the LAA agreement, the BMU staff may now require different skill sets than previously identified in 2008.

The BMU, in light of the information regarding Recommendation 4 above, claim that as the regulatory supervision of nuclear power plants, in terms of the IRRS mission, is the responsibility of the Länder there is no further need to provide additional resources for BMU (for the regulatory supervision of nuclear power plants) and therefore Recommendation 1 may be considered not implemented but redundant. This view is not endorsed by the IRRS reviewers who consider that further actions regarding Recommendation 1, taking account of comments on Recommendations 2, 4, 11 and 12, are still necessary.

Recommendation 1 (R1): is Open

New findings from the 2011 Mission

General

The Federal Republic of Germany comprises 16 federal states (Länder), in four of which there are a total of 9 operating nuclear power plants (NPP). This compares with 17 NPPs, distributed over 12 sites and five Länder in 2008. Germany’s Regulatory Body is structured to reflect this national federal system with a federal component provided by the Directorate-General RS - Safety of Nuclear Installations, Radiological Protection and the Fuel Cycle (DG-RS) within the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), and five Länder government authorities. The IRRS mission was supported by the Division for Nuclear Supervision and Environmental Radioactivity (Division 3) within the Ministry of Environment, Baden-Württemberg (UM BW) which provided an example of the Land component of the Regulatory Body. The Land

of Baden-Württemberg has 2 operating nuclear power plants and 2 shut-down nuclear power plants on 2 sites.

The Länder of Bayern, Hessen, Niedersachsen and Schleswig-Holstein whilst not participating directly in the original IRRS mission to Germany in 2008, nonetheless have closely monitored the outcome paying particular attention to options to further improve the regulation of nuclear safety in their own Land. They participated as observers during the entrance meeting and interviews of the 2011 Follow-up Mission and were available to give a presentation about the situation in their Land. They stated that they consider IAEA IRRS Missions to be an important tool for the international exchange of experience and as a process to review and, where appropriate, to improve the regulation of nuclear safety.

The Team were very pleased to see this positive demonstration of the commitment of all Germany Länder with NPPs to the continuous improvement of nuclear safety particularly in the light of the recent 13th Amendment to the Atomic Energy Act, which immediately reduced the number of operational nuclear power and that all will be shut down to a programme by 2022. The Team consider that it is vital to ensure that the regulatory authorities in all five Länder, with operating or shut down NPPs, continue to provide strong regulatory oversight and apply the highest nuclear safety standards throughout the closure programme.

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Legislative and statutory framework

The German constitution (or ‘basic law’) has not changed, in relation to nuclear safety, since the 2008 Mission.

The Act on the Peaceful Utilization of Atomic Energy and the Protection against its Hazards (Atomic Energy Act), originally promulgated on 23 December 1959 and subsequently amended and promulgated a number of times, has received three further amendments since 2008.

The purpose of the Atomic Energy Act after the amendment of 2002 was to end the use of nuclear energy for the commercial production of electricity in a structured manner and to ensure on-going operation up until the date of discontinuation, and Article 7 specified that, inter alia, no further licences will be issued for the construction and operation of nuclear installations.

11th Amendment – the 11th amendment to the Atomic Energy Act entered in to force on 14 December 2010. The main elements of this amendment were to:

- extend the operating lives of the 17 German NPPs (operating at that time) by allocating additional electricity volumes to each NPP. This had the effect for:
 - NPPs commissioned up to and including 1980 – 8 years added; and
 - NPPs commissioned after 1980 – 14 years added.

12th Amendment - the 12th amendment to the Atomic Energy Act entered in to force in December 2010. This amendment was, inter alia, to implement the transposition of the European Directive 2009/71/Euratom (establishing a Community framework for the safety of nuclear installations) in those areas where existing legislation did not already exist in Germany.

13th Amendment – the 13th amendment to the Atomic Energy Act entered in to force on 6 August 2011. The main elements of this amendment were to:

- cancel the electricity production ‘rights’ previously approved in the 11th amendment;
- terminate the right to produce electricity for commercial purposes for the 8 shut down NPPs immediately;

- set dates for the termination of operating licences for all other NPPs; and

allow the future transfer of electricity ‘volumes’ provided the items above are still complied with.

Ordinances

During the period since 2008, a number of Ordinances have been implemented including one where the requirements for reporting of events at nuclear installations were modified to differentiate between the levels of reporting for NPPs; research reactor; fuel cycle facilities; nfor decommissioned nuclear installations; and for spent fuel storage.

2. AUTHORITY, RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

- R2 **Recommendation:** BMU DG-RS should develop its Federal Supervision Manual as it has proposed. The Supervision Manual should include arrangements for cooperation and interaction with the Länder in order to develop consensual processes (whether required by the law or voluntary) to continuously improve nuclear safety.
- S1 **Suggestion:** DG-RS and UM BW should ensure that their commitments to develop and share participation in international activities are included in their respective organisation management manuals.

Changes since the 2008 IRRS Mission

Recommendation 2: The BMU established a project group in 2010 to develop the Federal Oversight Manual (previously described as the Supervision Manual). The group asked for and received examples of similar manuals from the nuclear safety regulatory bodies of France, Switzerland and USA. They also drew heavily, for document structure and framework from the supervision manuals of the Land authorities in Baden-Württemberg and Hesse.

The objectives of the Federal Oversight Manual are proposed to include:

- transparency, to allow internal and external sight of the working methods of the federal supervision;
- communication, by BMU, of how it perceives its role in interacting with the supervisory authorities of the Länder; and
- increasing the quality, effectiveness and efficiency of federal oversight activities.

A two page outline document describing the objectives and format of the Manual has been produced by BMU and shared with UM BW. Some further development of the individual chapters has started and it had been planned to discuss these developments at an LAA meeting in May 2011. However, due to the TEPCO Fukushima Dai-ichi (Fukushima) accident, the discussion will now take place later in this year. Once the necessary discussions have taken place, BMU hopes to publish the final document in 2012.

In the view of the Team, the progress in developing this important Manual has been inadequately resourced, possibly due to being allocated a low priority in the work programme of BMU. In view of the necessity for BMU to develop the document in cooperation with the Länder, through the LAA (or a subsidiary working group) which only meets twice a year, the Team consider that the 2012 target is not achievable without increasing the resource allocated to this activity.

The Team consider that whilst BMU appears committed to producing the Manual we have limited confidence that it will eventually be produced based on the evidence of this topic not being included in the BMU Annual Action List. These comments should be read in conjunction with findings on Recommendations 1, 4, 11 and 12; and the new recommendation below.

Recommendation 2 (R2): is Open

Suggestion S1: The federal competence for international activities remains the responsibility of BMU, which has two Divisions dedicated to this function. The BMU quality manual identifies the specific roles and participants against various international commitments. The BMU shares

information about, and learning from, international activities and events with counterparts in the Länder through the LAA Technical Committees.

The UM BW has significantly increased its international activities since 2008. Staff now participate, inter alia, in meetings of international Conventions; OECD-NEA and the European Commission. In addition, collaborative bi-lateral international programmes are being encouraged. The UM BW Organisational Manual identifies the membership of each national; international; and bi-lateral meeting together with a description of the tasks involved. New staff of UM BW are actively being trained for participation in international activities.

Suggestion 1 (S1): is closed.

New findings from the 2011 Mission

The Team noted the lack of progress achieved by the BMU in developing a Federal Oversight Manual and believe that, unless sufficient resources are allocated to this work, there is little likelihood of achieving the declared target date of 2012.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2011 FOLLOW UP MISSION

- (1) **BASIS:** GSR Part 1 Requirement 19, 4.17, states that *The management system shall specify, in a coherent manner, the planned and systematic actions necessary to provide confidence that the statutory obligations placed on the regulatory body are being fulfilled.*
- SF **Suggestion:** BMU DG-RS should increase the priority for completing the Federal Oversight Manual and allocate resources accordingly in order to achieve the 2012 target date.

The Team also consider that, during the development of the Federal Oversight Manual, BMU should work closely with the Länder authorities to check the Federal Manual against the relevant Länder Manuals. The purpose being to ensure that, as a set of documents, they are mutually consistent, complementary, and that no areas of supervision are missed and there are no areas of duplications of responsibilities.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2011 FOLLOW UP MISSION

- (1) **BASIS:** GSR Part 1 Requirement 7 states that *“Where several authorities have responsibilities for safety within the regulatory framework for safety, the government shall make provision for the effective coordination of their regulatory functions, to avoid any omissions or undue duplication and to avoid conflicting requirements being placed on authorised parties.”*
- SF **Suggestion:** BMU DG-RS should develop its Federal Oversight Manual, as it has proposed, in cooperation and interaction with the Länder in order to ensure that it is mutually consistent with the relevant Länder Manuals.

Communication with and provision of information to the Public

Since 2008, UM BW has significantly improved its website and initiated a programme to establish ‘information commissions’ – modelled on similar bodies in France - at each of the NPP sites in Baden-Württemberg. The ‘information commissions’ will be made up of representatives of the local communities, trades unions and local organisations. They will meet on a regular basis, be

open to the public, and will receive information on the work of the site operators and the regulatory authority. It is hoped to set up a working group before the end of 2011, with a view to establish the commissions in 2012.

The new UM BW website provides comprehensive information on the organisation, supervision and activities of the regulatory authority; information about, and selected data from, nuclear installations; information on radiation monitoring including data from radiation monitoring sites; information on radioactive waste management; and information on emergency arrangements. A large proportion of the website is available in English translation. This is a very good example of how a regulatory authority can share its information with the public and is commended by the Team. UM BW should be encouraged to continue this good work and further develop the content including timely regulatory reports.

3. ORGANIZATION OF THE REGULATORY BODY

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

- S2 **Suggestion:** UM BW division 3 should introduce a near-term recruitment and staffing plan, as well as a long-term succession planning strategy. UM BW should develop a competence matrix to support the plan and strategy. These plans and strategies should be periodically reviewed and used to develop the training program. The process should be incorporated in the management system.
- S3 **Suggestion:** BMU and UM BW should execute their plans to acquire additional staff to supplement the current staff, thereby enabling management's flexibility to support advanced training, develop regulatory infrastructure, and benchmark best practices of other regulatory bodies.
- S4 **Suggestion:** BMU and UM BW should consider introducing means to adapt to market conditions to ensure that the required level of staffing is achieved and secured for the future.
- R3 **Recommendation:** BMU should introduce a near-term recruitment and staffing plan, as well as a long-term succession planning strategy. Both the plan and strategy should include a competence matrix based on the agreed roles and responsibilities. (as referenced in this and other chapters). These plans and strategies should be periodically reviewed, used to develop the training programme, and the process should be incorporated in the management system.
- S5 **Suggestion:** BMU should evaluate the assignments of tasks of the regulatory body at the federal level to further improve effectiveness and efficiency, and avoid unnecessary duplication.
- R4 **Recommendation:** In the interest of nuclear safety BMU DG RS and UM BW should cooperate in order to improve mutual trust by the development of an agreement at the LAA (possibly aided or led by a facilitator) to address all relevant topics, including:
- clarification and understanding of the respective roles and responsibility of the BMU DG RS and the Länder, and the execution of these roles and responsibilities;
 - identification of the means of communication between BMU DG RS and the Länder;
 - identification of the rules of the exchange of information regarding the supervision of nuclear safety. These rules should take regard of needs, in such a way that BMU DG RS has confidence in the data content and accuracy and it is able to:
 - use the data without the need for further technical analysis; and
 - assure itself that each Land is carrying out its regulatory responsibilities appropriately.
 - Secondment of staff between BMU DG RS and the Länder to improve mutual understanding and experience.
 - The establishment of a strategic nuclear safety research plan for the existing NPPs

Changes since the 2008 IRRS Mission

Suggestion 2: In the Staffing Plan for the whole UM BW, the number of staff in Division 3 Nuclear Supervision, Radiation Protection is fixed at 50 persons. On top of that it is allowed to have a maximum of 5 more positions in anticipation of retirements during the next two years. These numbers are valid until there is a formal change made. In the staff reduction processes the resources of UM BW has not been reduced due to the fact that the licensees fund their activities. Within these limitations UM BW carries out strategic planning on an annual basis. From the strategy plan action plans with varying durations are generated. These plans feed the annual planning process.

There is no list of retirements and it is considered not necessary because the organization is so small.

In 2010 a competence matrix was constructed. The main purpose of the matrix is to ensure that there are enough experts in all the eight specified areas. The matrix identified that there were areas such as I&C and HOF where there was only one expert. Recruitment to these areas had already been made before the IRRS follow up mission. The competence list is to be reviewed periodically.

There are also eight specialist areas where technical coordinators have been nominated. These experts are tasked to keep the knowledge in UM BW at the state-of-the-art level.

The training of staff of the UM BW is systematic and covers both soft and technical competences. The training programmes compose internal training, on job training and external courses as appropriate.

Suggestion 2 (S2): is closed.

Suggestion 3:

BMU

The background to the Suggestion was both to fill the existing vacancies and also to increase the number of people according to the 2008 – 2011 staffing plan. Based on the 2010 agreement on the roles for the two parts of the regulatory body the IRRS Team accepted the BMU position that additional staff is not needed for the federal oversight function. On the other hand, the IRRS Team was informed that there are important vacancies still open at the time of the IRRS Follow-up mission, some of which have existed for quite a long time. Additionally a number of experienced people are due to retire. During the current government process of the so called ‘critical review of tasks’, in principle, recruitment is prohibited, with some exceptions. Therefore the IRRS Team form the opinion that the Suggestion is only partially fulfilled.

At the Federal level the BfS and GRS support the BMU oversight. The support given by these two organizations plays an essential role in the federal level supervision.

UM BW

See Suggestion 2 regarding the competence matrix, from which UM BW found areas which needed further resources. Therefore, new experts were recruited.

The TSOs play an important role in the German regulatory system. It has been estimated that the manpower available for the TSO to assist in oversight is five times that of UM BW. There is more flexibility in the assignment of TSO resources compared to UM BW own resources.

Suggestion 3 (S3): is Closed

Suggestion 4: The salaries of governmental organizations such as BMU and UM BW are fixed but in some very special circumstances there is a possibility to have an extra supplement to the basic salary. However, there are no possibilities to increase the general level of staff salaries.

Suggestion 4 (S4): is Closed

Recommendation 3: The number of staff of BMU is defined at the ministerial level. The governments' critical review of resources in the ministries is currently under preparation. This activity was last time carried out 10 years ago. The current review has a general goal to reduce the governments' resources by 10%.

For the annual government budgeting processes a global staffing plan is needed. In 2008 a plan for 2008 - 2011 was delivered to the government. This plan was based on the situation before the agreement between Länder and BMU on their respective roles. The need for more staff with technical competences was presented.

The planning of the BMU has been adjusted according to the current understanding of the roles between BMU and the Länder. Apart from a small reorganisation nothing has changed in the official formation since 2008.

With respect to the Recommendation the IRRS Team found evidence that a projection of retirements has only been carried out up until the year 2014. This activity was started after the IRRS mission 2008. However, at the time of IRRS follow up mission the recruitment and staffing planning process, based on the long term plan of the skills needed for the regulatory functions, has not yet taken place.

Recommendation 3 (R3): is Open

Suggestion 5: The discussion was on the use of BfS and GRS resources in the areas of nuclear safety research and event handling. A report in 2008 was discussed with the involved parties and it was found out that there is no real duplication of the work in spite of the fact that both organizations work with these two areas.

The annual planning of the activities of BMU also includes a discussion of the activities of the BfS and GRS. BfS work is to support BMU to steer the GRS research. BfS does not carry out regulatory research itself.

Suggestion 5 (S5): is Closed

Recommendation 4:

BMU

A high level agreement (position paper) on the roles of the regulatory bodies at Federal and Länder level was achieved in 2010. The first bullet of the recommendation says "clarification and understanding of the respective roles and responsibility of the BMU DG RS and the Länder, *and the execution of these roles and responsibilities*". Therefore this agreement should be reflected in the activities and the QM manual of the BMU.

The IRRS Team found that the current QM descriptions of BMU remain the same as during the IRRS mission in 2008. Thus far the agreement is not reflected in the BMU processes. Both BMU and UM BW consider that the Federal Oversight Manual is a vital document and consider its completion as an essential further step to clarify the execution of roles and responsibilities in a transparent way.

In the ARM it is stated that one of BMU's goal is to publish the Federal Oversight Manual in 2012. However the development of the manual is, at the time of the IRRS Follow-up mission, in a very early stage. The original resource allocated to developing the manual was reallocated and not replaced. Subsequently there has been a very low allocation of resources to progress this activity.

Such a major revision of part of the management system as the Federal Oversight Manual requires the allocation of adequate resources based on an action plan, with responsibilities and milestones defined.

The proposed new Federal Oversight Manual describes major change in the BMU way of working after the LAA agreement. It is not foreseen that with current allocation of resources there is any chance of BMU meeting their goal of finishing the manual in 2012. Also extra time and resources will be needed to discuss the Federal Supervision in the LAA. (See Suggestions SF1 and SF2)

UM BW

The interfaces between BMU and UM BW are described in the management system of UM BW. The activities include participation in different committees, international cooperation and operating experience feedback. UM BW perceives that their cooperation with BMU has improved after the agreement on the roles of both regulatory bodies.

Recommendation 4 (R4): is closed for UM BW and is closed on the basis of progress and confidence for BMU

New findings from the 2011 Mission

Significant progress on Recommendation 4 has been made on the majority of the issues. Those areas not yet fully resolved for this Recommendation will now be progressed through Recommendation 2 and new Suggestions SF1 and SF2.

There were no new findings in the 2011 IRRS Follow up Mission.

4. AUTHORIZATION

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

- S6 **Suggestion:** The UM BW should take into account probabilistic insights where appropriate, in addition to existing deterministic criteria, in decision-making on authorizations.
- S7 **Suggestion:** For all categories of non-essential modifications, the UM BW should also include the bases and the rationale for the regulatory decisions in the documentation that is referenced in the authorization.
- S8 **Suggestion:** The UM BW should track all issues that require regulatory body action related to authorizations by using its instruments systematically. Also, for the lower level issues the use of an appropriate tracking tool should be mandatory and not be up to individual persons.

Changes since the 2008 IRRS Mission

Suggestion 6: In response to suggestion 6 from module 4 “Authorization” as well as suggestion 12 from module 5 “Review and Assessment” and suggestions 25 and 26 from module 7 “Development of Regulations and Guides”, the UM BW developed a concept for the use of probabilistic assessments in supervision and authorization. The goals of the concept are

- the completion of deterministic assessments of plant modifications
- the assessment of event related safety issues (e.g. reportable events, disturbances, failures of operating systems, repair times)
- the determination of the significance of safety functions as well as systems and components important to safety
- the safety optimization of test and maintenance strategies
- the identification of weaknesses in the plant designs
- the evaluation of the need and commensurability of measures

In a first step, the UM BW revised the Land-wide standardized modification procedure. The Land-wide standardized modification procedure now requires probabilistic considerations for modifications of the categories A and B. These categories are the ones with the highest safety significance. Category-A-modifications are subject to nuclear licensing according to § 7 of the Atomic Energy Act. Category-B-modifications require the approval by the supervisory authority. When applying for these modifications, the operator must additionally submit probabilistic studies or demonstrate that the applicable PSA will not be significantly changed by the planned modification and no deterioration of the results of the PSA will follow. In other words, it has to be demonstrated that they do not lead to an increased risk. The authorized expert developed detailed concepts for the concrete implementation of these specifications on behalf of UM BW.

By introducing the new requirement in the Land-wide standardized modification procedure to submit, for modifications of the categories A and B, probabilistic studies or to demonstrate that the modification will not deteriorate the results of the PSA, the intention of suggestion 6 is met.

Suggestion 6 (S6): is closed.

Suggestion 7: In order to include – also for all categories of non-essential modifications – the bases and the rationale for the regulatory decisions, the UM BW determined to what extent the existing

classification criteria needed additional specification and discussed possible improvements with regard to comprehensibility and clarity of the procedure with authorized experts and licensees. As a result, the UM BW revised the Land-wide standard modification procedure in the supervision manual. The supervision manual also contains a sample letter for the authorization of non-essential modifications that need an approval by the UM BW (category B). Such authorizations now contain explicitly:

- a justification why the submitted modification is non-essential according to § 7 of the Atomic Energy Act and therefore needs no further license and
- a technical justification based on the assessment done by the authorized expert according to § 20 of the Atomic Energy Act.

The revision of the Land-wide standard modification procedure led to a complete restructuring of the content with the aim to organize it as a user manual. In some areas the content was extended: Document modifications are now covered separately. This is also the case for modifications in the field of civil engineering because in this field even not safety related modifications (e.g. the construction or modification of office buildings) have to be formally treated like essential modifications. The content now also explicitly covers the post operation phase, decommissioning, and intermediate fuel storage facilities. Finally, as presented on suggestion 6, the procedure also contains requirements to provide probabilistic information for modifications of categories A and B.

By providing formal and technical justifications for the regulatory decisions on non-essential modifications in the letters sent to the licensees, the UM BW has implemented the intention of suggestion 7. By completely restructuring the Land-wide standard modification procedure in a systematic way and extending its content to the new situation after Fukushima, the UM BW has gone far beyond the suggestion, which is appreciated by the Review Team.

Suggestion 7 (S7): is closed.

Suggestion 8: To track all issues that require regulatory body action related to authorizations, the UM BW has critically examined the existing approach within its own organization and collected information on the workflow systems used by its authorized experts and the licensees. It also evaluated possibilities to develop a new process tracking system with an integrated electronic workflow. Since the UM BW as a part of the Land administration is obliged to use the overall IT infrastructure of the Land, it came to the conclusion that the introduction of a integrated electronic workflow system with a corresponding electronic document management system is not possible for the time being. Therefore, the UM BW focused on further development of the existing database system for tracking open issues.

So far, the existing database system covered the processes relating to the fulfillment of conditions, modifications (categories A, B, and C), supervision, reports from the integrated safety information system (ISIS) and the remote monitoring system for nuclear power plants (KFÜ), GRS Information Notices, obligations to report on a regular basis and reportable events. In response to suggestion 8, the existing database system was extended by the processes related to the plant walk-downs by the authorized expert KeTAG (Nuclear Technology Assessment Consortium for Baden-Württemberg) and safety reviews not included before. In addition, in the modified software for each process the required fields are specified that have to be filled in by all users. The modified software provides additional query options so that both the needs of the collaborators and the management are covered.

In a first step, the modified and extended IT solution has been introduced for the supervision of one NPP unit. As soon as the new solution is debugged and optimized enough, its use will be extended

to all nuclear installations supervised by the UM BW. Its use will be made compulsory for all collaborators by corresponding modifications of the supervision manual.

The old IT solution consisted of a separate database for each nuclear facility, each with a specific structure. The new solution includes one comprehensive database for all facilities. Database and query interface are separate and can be separately replaced when technological developments make it necessary. Information from all the relevant supervision processes that can lead to issues that require regulatory body action and tracking can be processed.

The use of the tracking tool has been made mandatory (supervision manual, document MS-AH-400-R, chapter 2.3).

By modifying the tracking database software, the prerequisites for a systematic tracking of all issues that require regulatory body action have been improved. However, the use of the new software is still in a pilot phase limited to one NPP unit. The intention to further optimize the tool and to extend its compulsory use to all nuclear installations shows that suggestion 8 has been addressed and is in the process of being completed.

Suggestion 8 (S8): Closed on the basis of progress and confidence.

New findings from the 2011 Mission

There were no new findings in the 2011 IRRS Follow up Mission.

ISSUES APPLICABLE TO THE BMU AND THE UM BW

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

R5 **Recommendation:** The BMU should initiate the development, in collaboration with the Länder regulators, of formal guidance to define how the operators categorize modifications and apply for the authorization of modifications. This should include all the criteria and definitions that are necessary.

Changes since the 2008 IRRS Mission

Recommendation 5: The recommendation to initiate the countrywide development of guidance on the categorization of plant modifications triggered an analysis of the present situation by the Reactor Safety Technical Committee (FARS) of the Länder Committee for Nuclear Energy (LAA). All Länder came unanimously to the conclusion that:

- The distinction between modifications subject to nuclear licensing according to § 7 of the Atomic Energy Act and modifications classified as non-essential according to § 7 of the Atomic Energy Act is sufficiently defined in § 4 of the Ordinance on the Procedure for Licensing of Installations under § 7 of the Atomic Energy Act (Nuclear Licensing Procedure Ordinance).
- In all Länder categorisation of non-essential modifications takes place according to the safety significance of the planned modification.
- The categories and applicable modification procedures are defined for each plant in a legally binding manner by the licence or the respective operating manuals.

The Reactor Safety Technical Committee saw no need for a complete harmonization of the categorizations of non-essential modifications. Taking into account that now, after Fukushima, residual times of operation of the German NPPs are planned to be relatively short, a national

harmonization of all the conditions that are defined for each plant in a legally binding manner by the licence or the respective operating manuals would not be commensurate.

The Reactor Safety Technical Committee accepted the following rules:

I. Bindingness of the modification procedures

The categories have to be applied. Procedures are specified by the corresponding operating manuals.

II. Categories of **non-essential** modifications and procedures to be applied

Non-essential modifications are categorised according to the safety significance of the planned modification. The procedure to be applied depends on the respective category. The different categories and procedures are as follows:

- Category 1: non-essential modifications with increased safety significance
Approval procedure: prior to implementation of the planned measure, the supervisory authority has to give its approval.
- Category 2: non-essential modifications of medium safety significance
Clearance procedure: prior to implementation of the planned measure, an assessment and positive statement by the nuclear authorised expert consulted is needed.
- Category 3: non-essential modifications of low safety significance (not applicable to all Länder)
Notification procedure: the modification must be notified to the supervisory authority and categorisation confirmed by an authorised expert.
- Category 4: non-essential modifications without safety significance (other modifications)
No procedure: the plant operator performs the modification under his own responsibility. The terms and definitions used may vary in particular cases.

With the analysis of the present situation and the definition of basic rules for the categorization of plant modifications to be respected by all Länder, the intention of recommendation 5 is sufficiently considered.

Recommendation 5 (R5): is closed.

New findings from the 2011 Mission

There are no new findings from the 2011 IRRS Follow up mission

5. REVIEW AND ASSESSMENT

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008

- S9 **Suggestion:** BMU and UM BW should agree on the information to be shared before UM BW's formal examination of a PSR report is completed. The PSR, including PSA, should be shared more timely to all the relevant organizations so that they will have a common view on the "current" state of safety of the plants.
- S10 **Suggestion:** BMU DG-RS and UM BW should cooperate in progressing an agreement by the LAA of a process to ensure that the information required by BMU to fulfil its function regarding OEF, such as IRS and WL (Information Notice), is provided in a suitable format and content by each Land. The objective of this agreement should be to give DG-RS confidence in the data accuracy and to enable it to contribute more input and strengthen the OEF process within Germany. The agreement should include a mechanism to enable communications between DG-RS and each Land (including their respective advisory bodies) to clarify the details of the events.
- S11 **Suggestion:** BMU should complete its action plan to develop the guide for ageing management.
- S12 **Suggestion:** UM BW should develop an approach to the inspection and assessment process that facilitates a more systematic and consistent method to assess operator performance. In considering such an approach, due regard should be given to the benefits of using state of the art evaluative tools, including probabilistic safety assessment (PSA), to plan inspections, determine the safety significance of inspection findings, assess the significance of operational events and plant conditions.

Changes since the 2008 IRRS Mission

Suggestion 9: The suggestion that BMU and UM BW should agree on the information to be shared before UM BW's formal examination of a PSR report is completed, was based on the understanding of its role the BMU had in 2008. The BMU and the UM BW have come to a general agreement. Accordingly, the early forwarding of important information of the PSR, including PSA, to relevant institutions (BMU, BfS, GRS and authorized experts) is possible.

The responsibility for licensing and supervision of the nuclear power plants lies with the nuclear regulatory authorities of the Länder. Accordingly, the results of the PSRs carried out by the plant operators are reviewed and assessed by the supervisory authorities of the Länder on the basis of the safety review guidelines. For the assessment of the PSR, the UM BW consults authorised experts. As a basis for the PSR, the respective latest state of the art in science and technology has to be taken into account. After overall assessment of the PSR with due consideration of the opinion of the authorized experts, the UM BW defines the necessary measures and provisions. The UM BW reports to the BMU on the results of the PSR and its regulatory assessment, accompanied by the relevant documents. Should the UM BW gain new knowledge on optimization potential already during the review, corresponding measures will be implemented without delay. Independent of the further proceeding, findings that are of nation-wide importance are fed into the corresponding advisory committees at the federal level through the BMU, such as the technical committees of the LAA or the RSK, and discussed there.

With its action number 9 in its action plan, the BMU established a documentation system to give the entire regulatory body direct electronic access to all important technical documents. The aim was that all important information affecting the safety of the nuclear installations as well as all important information on generic safety issues will be exchanged between Federation and Länder.

To achieve this aim, the BMU is building up a web-based nuclear safety platform. At the present stage, the platform allows the exchange of information on national and international operational experience, symposia, work groups, information notices, regulation, bilateral committees, and the EU stress test. Depending on the subject, access is provided to the Länder authorities, GRS, BfS, authorized experts and the BMU. The platform, however, is not used for plant specific technical documentation. Therefore, the goal of BMU's action number 9 is only partially achieved.

Nevertheless, based on the agreement reached on the respective tasks and responsibilities of the competent nuclear authorities at the federal and the Länder level, the goal of suggestion 9 is achieved.

Suggestion 9 (S9): is closed.

Suggestion 10: The suggestion to achieve an agreement to ensure that the information required by BMU to fulfil its function regarding OEF, such as IRS and WL (Information Notices), is provided in a suitable format and content by each Land led to a number of measures. The Länder Committee for Nuclear Energy – General Committee – approved the recommendation “Structuring reporting on implementation of recommendations expressed in the information notices of the GRS”. According to this recommendation, the following points have to be handled in a transparent manner:

1. Facts in respect of the subject of the information notice

a. Plant condition in terms of technical and personnel/administrative resources: description of the as-is condition of the plant in terms of the state of affairs and the recommendations of the information notice. Any differences in plant technology must be described (specification of general statements, e.g. that states of affairs cannot be transferred, without more detailed explanation of the corresponding plant condition).

b. Similarities and differences in comparison with the case on which the information notice is based (transferability): Description of the transferability, of the state of affairs, event sequence and recommendations presented in the information notice, to the plant in question. The state of affairs must be described in sufficient detail to enable the assessment of the state of affairs to be repeated. Where there is no transferability, further reporting can be dispensed with.

2. Assessment: The assessment contains the following specifications:

a) Scope and depth of inspection

b) Comments on the recommendations of GRS Comments must be provided on the recommendations of GRS

c) Assessment of transferability

3. Measures

a) Measures already taken by the operator

b) Measures envisaged by the operator with time of implementation

c) Investigations or measures still to be performed, with time frame (particularly in the case of a provisional reply)

On behalf of and in consultation with the federal oversight, GRS requests the nuclear supervisory authorities of the Länder to provide plant-specific experience feedback on information notices with corresponding safety-related significance. The supervisory authorities transmit the reports to GRS.

An agreement that the Länder submit the required information in an appropriate format and content with regard to operating experience feedback (OEF) has been achieved.

Suggestion 10 (S10): is closed.

Suggestion 11: In response to the suggestion that the BMU should complete its action plan to develop the guide for ageing management, a KTA safety standard on ageing management was developed based on an RSK recommendation and the international state of the art in science and technology in the years 2008 to 2010 by a KTA working group. The KTA safety standard on ageing management was adopted in November 2010 by the KTA and published in the Federal Gazette in December 2010. Like all KTA standards, this KTA standard will be checked for validity every five years, including whether it is up-to-date.

The new safety standard KTA 1403 defines general principles of ageing management and specific procedures on the ageing of mechanical systems and components, technical facilities of the electrical and instrumentation and control equipment, structural facilities as well as auxiliary and operating media. In addition it defines procedures of the ageing-management regarding non-technical aspects, that is to say of personnel qualification and maintaining their competency and know-how, ageing of the plant documentation and finally the documentation of data from the information systems and operation management systems. In part it refers to the respective safety standards KTA 1402 (management systems) and KTA 1404 (documentation). The standard also specifies a reporting system. The reporting consists of a plant specific basis report, a status report, a structure condition report and annual status reports. The basis report and the status reports are parts of the structured knowledge base for ageing-management.

The basis report shall comprise information on the following aspects:

- description of the technical and administrative procedures
- structure of the knowledge base
- pursuing and evaluating ageing-related findings: state of science and technology, experience feedback
- ageing-management of the technical facilities including auxiliary and operating media: extent of ageing-related observation and classification, potential relevant damage mechanisms, mitigating measures regarding these damage mechanisms, monitoring the effectiveness
- ageing-management with regard to non-technical aspects: personnel, documentation, information systems and operation management systems

When developing the safety standard KTA 1403, the IAEA Safety Standard NS-G-2.12 (2009), the IAEA-EBP-SALTO-Report “Final Report of the Programme on Safety Aspects of Long Term Operation of Water Moderated Reactors” (2007), the Report “Harmonization of Reactor Safety in WENRA Countries” by the WENRA Reactor Harmonization Working Group (2006) and a number of national guidelines were taken into account as well as the former guideline of Baden-Wuerttemberg (ISSN 0721-4529) by the Materials Testing Institute, University of Stuttgart.

By completing the safety standard KTA 1403, the aim of suggestion 11 has been fully achieved.

Suggestion 11 (S11): is closed.

Suggestion 12: The suggestion that the UM BW should develop an approach to the inspection and assessment process that facilitates a more systematic and consistent method to assess operator performance led to measures in four areas: inspection planning, classification of inspection findings,

use of probabilistic methods, and safety classification. These measures are topically linked to module IV “Inspection and Enforcement”.

Optimisation of inspection planning

For inspection planning, there is a process at the UM BW that is outlined in the supervision manual (chapter 7.3.2.1.1/1). To ensure that findings from other supervisory activities (e.g. evaluation of the KOMFORT data or safety performance indicators) are considered in the inspection planning in a timely and systematic manner, the processes have been revised and better coordinated. For this purpose, the supervision manual has been supplemented accordingly (see suggestion S16 in module VI).

Optimisation of classification of inspection findings

A concept for the classification of inspection findings has been developed which distinguishes four categories: deficiency 1, deficiency 2, deviation and advice (see recommendation R6 in module VI).

Discussion of increased use of probabilistic methods

The discussion in the UM BW following suggestions S6 and S12 on the increased use of the PSA in the licensing and supervisory procedure in Baden- Württemberg is still ongoing. Concepts, for which the UM BW commissioned PSA experts from the TÜV, showed both the possibilities in principle and the prerequisites for an extended PSA use. As a main prerequisite for safety assessments, up-to-dateness of the PSA is mentioned there. However, the German nuclear rules and regulations do not require that after submission of the safety review according to § 19a of the Atomic Energy Act, the PSA contained in it will be continued as a living PSA. Thus, for the UM BW as nuclear supervisory authority, there is no legal basis yet according to which the plant operator could be obliged regarding a living PSA. The possibility of probabilistic assessments of inspection findings, operational events and plant conditions in Baden-Württemberg is currently under discussion at the UM BW with the assistance by the TÜV. Final results on this issue are not yet available so far. The idea of a risk-based inspection planning is no longer pursued by the UM BW. The optimisation of inspection planning mentioned above is deemed to be sufficient.

Safety classification

On behalf of the KTA subcommittee on programme-related and fundamental issues, the safety classification working group proposed a concept for the safety classification of SSCs (systems, structures and components) in nuclear power plants. Based on the recommendations of this working group, the KTA initiated the new safety standard project KTA 3001 “Categorization and Classification of SSCs in Nuclear Power Plants”. The aim of the new KTA safety standard was to standardize and systemize safety classifications of the individual plants, which have developed over time in the course of the individual licensing processes, under consideration of the international state of the art. The UM BW was represented in the working group and monitored the progress of the work of the KTA.

After the accident at Fukushima, the older nuclear power plants for which the need for harmonization of safety classification was paramount were all shut down. Because the residual operation times of the remaining nuclear power plants are relatively short and the new KTA standard would not be available before the year 2015 even in the most optimistic case, the project was put on hold.

The measures taken in the context of “Inspection and Enforcement” are assessed in module VI. The development of a concept for the use of probabilistic assessments in supervision and authorization was assessed in module IV (suggestion 6). Whereas the goals with regard to authorization are achieved, the efforts to make use of probabilistic assessments in review and assessment have to

continue. The suggested cancellation of the harmonization of safety classification is commensurate with the new post-Fukushima-situation in Germany.

Suggestion 12 (S12): Closed on the basis of progress and confidence.

New findings from the 2011 Mission

There are no new findings from the 2011 IRRS Follow up mission

6. INSPECTION AND ENFORCEMENT

6.2 UM BW ENFORCEMENT PROGRAMME

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

- R6 **Recommendation:** UM BW should review and enhance the enforcement system to ensure that deviations from, or violations of, requirements are documented in writing to the operator.
- S13 **Suggestion:** UM BW should review and expand the scope of the inspection programme, as appropriate, to assure that all areas of regulatory responsibility are covered.
- S14 **Suggestion:** UM BW should develop more detailed procedures for inspection activities to enhance the consistency of inspections. Such detailed procedures would be particularly helpful in the context of a future work force that includes staff with less experience than the current staff.
- S15 **Suggestion:** UM BW should enhance the content of inspection reports to include reference to the applicable regulatory requirements associated with inspection findings.
- S16 **Suggestion:** UM BW should enhance the annual assessment process used to evaluate plant performance and define the inspection program for the upcoming year, such that it more clearly and systematically incorporates relevant performance information available to the regulator (e.g., the annual operator reports on the Safety Management System Performance, the KOMFORT system data, the results of inspections and enforcement, as well as performance indicators). Particular attention should be given to the schedule and activities for obtaining all relevant information to enable an integrated assessment.
- S17 **Suggestion:** UM BW should review its performance indicators to confirm that the (72) safety indicators and the (8) safety culture indicators provide relevant and meaningful insights. The regulator should inspect the inputs used for the operators' performance indicators to verify their accuracy. The merits of a more frequent (e.g., quarterly) review and trending of the safety performance indicators should be considered to enable a more timely response to a declining trend in operator performance. In addition, UM BW should consider the merits of bench-marking the use of safety culture attributes of other regulatory bodies to optimize its approach to assessing safety culture.
- S18 **Suggestion:** UM BW should develop a procedure, that include criteria, for reactive inspections
- S19 **Suggestion:** UM BW should plan and schedule inspections outside the normal working hours (i.e., nights and weekends), and increase the number of such inspections.
- S20 **Suggestion:** The BMU and UM BW should review the *enforcement tools available to assure* proportionality between enforcement actions and the safety significance of violations.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

S21 **Suggestion:** UM BW should develop administrative procedures and guidelines for implementation of the enforcement process. UM BW inspectors and staff should be trained on the use and application of these documents.

Changes since the 2008 IRRS Mission

Inspection Program

Following Suggestion 13 of the 2008 IRRS report, the scope of the inspection program has been reviewed by UM BW. The UM BW review confirmed that its inspection program covers all areas of IAEA guides GS-G 1.3 and that no expansion of the scope of the program is necessary.

Unannounced inspections are integrated in the annual program of inspection, as detailed in the supervision manual. Following the 2008 IRRS suggestion 19 (S19), unannounced inspections during nights and week-ends have been initiated. UM BW put a corresponding quantitative objective into the annual Strategic goal paper, which is monitored by the top management. UM BW has to perform one unannounced inspection during the night or at week-ends per plant and per year. This target was exceeded in 2010.

Suggestions 13 (S13) and 19 (S19) can therefore be considered as closed.

Guidance for inspection

The objective of Suggestion 14 (S14) of the 2008 IRRS report was to demonstrate that the authority has to ensure by appropriate methods that several inspections carried out in the same topical area shall have consistent results.

The consistency of existing procedures has been analyzed by UM BW and no need for further changes have been identified. The procedure for on-site inspections (MS-AH-501-R), revised in February 2011, gives general guidance for inspectors to perform an inspection. In addition, separate guidance gives lists of possible points to be checked in each technical area of inspection. The 2011 IRRS Team reviewed the guidance for radiation protection as an example, concluding that it provides enough details for preparing effectively for an inspection.

The technical checks or audits performed on sites by external organizations (TÜV and KeTAG) on behalf of UM BW are performed following a highly formalized procedure, including check lists.

Moreover, UM BW ensures consistency between different inspection through:

- ~ training of inspectors;
- ~ supervision of young inspectors by experienced inspectors;
- ~ workshops on supervisory practices; and
- ~ a culture of collective decision making for inspection findings.

Suggestion 14 (S14) can therefore be considered as closed. BMU could however consider reviewing the inspection practices among the Länder to ensure consistency across Germany in this field.

Reactive inspections

Event-induced supervision, including reactive inspections, is described in the UM BW Supervision Manual. The 2008 IRRS Team suggested to clarify the criteria for reactive inspections (S18). Following this suggestion, UM BW has reviewed its practice and documented a clear decision tree for organizing reactive inspections for individuals, team inspection and to determine oversight

priority following a notified event. New aspects have been added in the procedure for event-induced supervision, including the use of a PSA when applicable.

The modified procedure was applied in the Fukushima case and after a few events having occurred in Baden-Württemberg. It has not shown any difficulty for implementation.

Suggestion 18 (S18) can therefore be considered as closed. In its supervision role, the BMU could help by sharing best practices among Länder regulatory authority to ensure consistency in Germany in this field, particularly by establishing guidance on the procedure to follow in case of a generic event.

Inspection Indicators

UM BW has implemented two types of indicators to evaluate plant performance and to identify inspection priorities:

- Safety performance indicators, based on the safety management system of the plant ; and
- Safety culture indicators, documented electronically by inspectors after each inspections following a multiple choice questionnaire called “KOMFORT system”.

As suggested by the 2008 IRRS report (suggestion 17), UM BW has reviewed these indicators, with regard to validity, use for supervision and possible difficulties in data acquisition. This review, which included meeting with the operator, concluded the need:

- for a new set of 42 Safety Performance Indicators, which has now been defined (instead of more than 70 before the review), with no general change in the frequency of evaluation ;
- to replace a safety culture indicator on training, which provided poor statistics, by a working climate indicator in the “KOMFORT” system.

Experience on safety culture indicators has been shared internationally through workshops, symposiums or through a VVER working group.

Suggestion 17 (S17) can be considered as closed.

UM BW has moreover reviewed the assessment process of the indicators, as requested by suggestion 16 (S16) of 2008 IRRS report. The process has been revised to include a mid-year reevaluation of the inspection program:

- an internal procedure requires an interim annual report to be issued on the N-1 inspections and safety indicators, and to be used to define the annual inspection program for the year N ;
- additional assessment of Safety Performance Indicators is performed during the first semester after having received all annual data from the operator. Results of the whole assessment of the year N-1, including SPI, KOMFORT indicators, integrated event analysis, are discussed during a meeting with the operator, which is organized at the end of the first semester.
- major points of the analysis of SPI, safety culture indicators and event analysis shared with the operator is provided in a table. The top management of UM BW reviews the table to identify if one of these points have consequences for the inspection program for the 6 remaining months of the year.

The modified process, introduced in practice in 2011 answers quite clearly to the 2008 IRRS suggestion 16. UM BW should consider to review it after one or two years of implementation. Suggestion 16 (S16) can be considered as closed.

Enforcement actions

UM BW has reviewed the system towards legally defined sanction catalogues. The following range of instruments can be used in Baden-Württemberg to enforce legally binding issues and regulatory decisions :

- Legal sanctions :
 - Criminal code contains a series of relevant punishable offences according to which intentional or negligent offences in the construction and operation of nuclear power plants are subjected to imprisonment of up to five years ;
 - The Atomic Energy act in conjunction with the Administrative Offences Act imposes fines up to 50 000€ for the violation of a variety of plant operators duties, which are imposed on those who act contrary to duty, or directly on the operating company. These sanctions for minor gravity acts can be imposed by the nuclear authority.
- Administrative enforcement instruments :
 - UM BW has the responsibility to ensure that legality is restored, should the operator violates legal provisions or regulatory requirements. It can issue orders. Penalty payment can be imposed for any act of infringement of an administrative order to the amount of up to 50 000€. The penalty payment is determined in proportion to the severity of the violation and to the public interest in enforcement of the administrative order.
 - UM BW is empowered to order to suspend operation if any significant safety related issue is raised by inspectors. Order can be done orally but have to be confirmed later in a written form.
 - UM BW is empowered to revoke a license.

These legal instruments comply with IAEA safety requirements but have almost never been used. Thus only one case of enforcement procedure has been recorded in the last ten years.

The enforcement system is based in a cooperative relation between the operator and the regulatory authority. UM BW has clarified and enhanced the non-legally binding enforcement instruments commonly used by the inspectors. A system to classify the deviation or deficiency observed has been developed after an international benchmarking. A corresponding graded approach has been defined for actions to be taken :

- 2 levels of “deficiency” are used to classify findings with potential direct safety impact. These deficiencies are notified in writing to the operator, requiring immediate response from the operator and event notification,;
- “Deviation” is the category used for findings with indirect risk to safe operation, but which requires corrective actions. Following 2008 IRRS suggestion, such deviation are now notified by a writing letter to the operator ;
- Findings that have no influence on the safe operation by themselves but which should be remedied by the operator for reasons of good safety culture are notified orally at the end of the inspection as “advice”.

All findings, which require corrective actions from the operator, including “*advices*” are recorded in the UMBW “AGAVE” database as an “*open point*” to ensure monitoring of corrective actions by the regulatory body. UM BW checks whether the open points are progressively closed by the operator through inspections, phone calls and through annual meetings with the operators, during which the list of all remaining open points are being examined.

Since the implementation of this categorization and according graded response approach, about 10% of the 50 performed inspections have lead to a written deviation notification. The IRRS Team

noticed that no deadline is given for corrective actions in the letters. Even if the system for tracking open points through AGAVE system seems to be effective, UM BW could consider mentioning more systematically a deadline for implementing corrective action in the letter.

It was called to the attention of UM BW that the INES scale is a worldwide tool for communicating to the public in a consistent way the safety significance of nuclear and radiological events. The classification on the INES scale is a consequence of the safety significance evaluation to help with communication to the public. Therefore it has not to serve as a criteria for evaluation. The IRRS Team considers that the INES scale classification should not be listed in the criteria for inspection findings categorization. It can however remain mentioned in the further proceeding of the procedure.

Therefore recommendation 6 (R6), suggestion 15 (S15), suggestion 20 (S20) and suggestion 21 (S21) can be considered as closed.

Recommendation 6 (R6) and Suggestions 13 to 21 are closed

New findings from the 2011 Mission

Inspection processes was already considered as a strength of UM BW in 2008. Progress is substantial in the areas of:

- the assessment of indicators through a more comprehensive process,
- the categorization of inspection findings, and
- the process introduced for reactive inspections.

The IRRS Team has reviewed how information is communicated to the public concerning UM BW's inspection activities.

A considerable amount of information is already available on the safety status of NPPs in Baden-Württemberg on the UM BW website. In particular, UM BW publishes a monthly notice for each NPP. Information is given on the inspection activities in terms of staff-days on site during the month. UM BW might consider expanding further the information on inspections performed during the month (e.g. area of inspections or major findings).

The annual UM BW report published on each NPP gives some additional information on the inspection activities. Further information on assessment methodology through SPI and KOMFORT indicators and some findings of this assessment might be developed in this report or on the website.

The IRRS Team noted the systematic and effective approach of UM BW to the implementation of the suggestions and recommendations of the 2008 Mission. The regulatory body took full advantage of the 2008 Mission observations in a constructive and efficient way. Furthermore, the IRRS Team noted the organized and efficient presentation of the results.

7. DEVELOPMENT OF REGULATIONS AND GUIDES

PROCESSES FOR ISSUING REGULATORY DOCUMENTS

BMU regulatory documents

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

- R7 **Recommendation:** The existing administrative process to issue BMU regulatory documents should be reviewed and modified in order to ensure that regulations can be issued and implemented in a timely manner.

Changes since the 2008 IRRS Mission

The processes to issue BMU regulatory documents have been described in the IRRS 2008 mission report and remain unchanged. They are well documented in the BMU quality manual. They are based on a cooperative decision making and, as a consequence, they require a mutual understanding between the Federation and the Länder. As the mission observed a lack of mutual trust between both parties, it was concluded in 2008 that no mechanism was in place to ensure documents are developed and approved in accordance with appropriate time-scale.

The BMU and the Länder have reviewed this recommendation through the LAA. Taking into account that the German Basic Law requires consensus between all parties before issuing regulation, a more efficient alternative is to strive for a consensus through the existing process. The Federation and the Länder have agreed to increase cooperation to increase its efficiency rather to modify it.

The leading role of the BMU in the process to issue regulatory documents has been reaffirmed and is now recognized by all parties. The BMU on its side has experimented with other ways to involve Länder and Technical Support Organization in the process:

- a. clear terms of reference have been developed by the BMU for mandating GRS to work on the revision of the draft BMU document “*Safety Requirements for Nuclear Power Plant*”. For future documents, it is foreseen to consult the Länder on the term of references when a similar external support is needed for drafting them ;
- b. it was decided to test the implementation of the draft BMU document “*Safety Requirements for Nuclear Power Plant*” in the Länder to get more input from them for revising the document. The modules of the draft regulation had been distributed among the Länder and the drafts of the new rules were applied from October 2009 until July 2010 in agreed test procedures, in parallel with the existing rules. The nuclear supervisory authorities of the Länder transmitted their field reports to the BMU for the 4th quarter of 2010, having also the opportunity to discuss their conclusions with GRS, which is charged to write a new draft. This way to assess the impact of the requirements through an experimental phase is seen by the IRRS Team as a very positive experience by the Federation and the Länder.

Recommendation 7 (R7): is closed

New findings from the 2011 Mission

It is too early to evaluate the efficiency of the process to issue BMU regulations and to revise them in relation to the recent changes of working methods, and to the increasing mutual trust between the Länder and the Federation. On one hand, it has to be stated that no BMU document has been issued

since 2005 (PSA guidelines) but, on the other hand, revision E of the document “*Safety Requirements for Nuclear Power Plant*” seems to be in a final phase of adoption. As soon as the document is adopted, efforts have to be maintained at the BMU level in the development of regulation and guides. This has to become a continuing activity of the BMU with constant involvement of the Länder to ensure common understanding on the objectives of the regulation and on the way to proceed to draft them and to revise them. To ensure that regulations are kept up to date in the future, a commitment has to be made at the highest level of the federation to determine a quantitative objective for reviewing it. The review period of five years used in the KTA process, could be considered as a basis for a similar review period for BMU’s regulations.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2011 FOLLOW UP MISSION

- (1) **BASIS:** GS-R-part 1 requirement 2 § 2.5 states that “*The government shall establish and maintain an appropriate governmental, legal and regulatory framework for safety within which responsibilities are clearly allocated. 2.5 (...) this framework shall set out the following :*
- (9) the authority and responsibility of the regulatory body for promulgating (or preparing for the enactment of) regulations and preparing guidance for their implementation”*
- (2) **BASIS:** GS-R-part 1 § 4.3. states that “*The objective of regulatory functions is the verification and assessment of safety in compliance with regulatory requirements. (...)The regulatory process shall provide a high degree of confidence, until the release of facilities and activities from regulatory control, that:*
- (...)*
- (b) Safety assessments carried out for facilities and activities demonstrate (...) that the objectives and criteria for safety established by (...) the regulatory body have been met .*
- (...)”*
- (3) **BASIS:** GS-R-part 1 § 4.27 states that “*The regulatory body shall emphasize the continuous enhancement of safety as a general objective. However, it shall also recognize the risks associated with making modifications to well established practices. Prospective changes in regulatory requirements shall be subject to careful scrutiny, to evaluate the possible enhancements in safety that are to be achieved. The regulatory body shall also inform and consult interested parties in relation to the basis for such proposed changes in regulatory requirements.”*

F1 R Recommendation: The development of regulations and guides shall be considered as one of the key functions of the BMU to discharge Germany’s responsibilities to assess the safety of Nuclear Power Plant. This function includes the definition at the highest level of :

- short and long term objectives for the development of new documents ;
- a period for reviewing existing documents ;
- necessary internal and external resources.

STRATEGY FOR THE DEVELOPMENT OF REGULATIONS AND GUIDES

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

S22 **Suggestion:** A federal strategy should be adopted in consultation with all Länder hosting nuclear power plants for the production and the revision of regulations and guides, including all BMU and RSK documents. This strategy should include the following elements:

- determination of the need for the new regulations or the revision of the existing documents, including all relevant information (IAEA, generic safety issues, operating experience, etc...);
- setting the priority for development of the regulations;
- determination of the scope of the proposed regulations or revisions; and
- determination of the resources to be employed, depending on the resources available and on the time-scale for the preparation and establishment of regulations and guides

As a part of the strategy, the steering role of BMU should be strengthened. Furthermore, a formal document review process should be developed and implemented to assure that the documents remain consistent with the current national and international practice.

Changes since the 2008 IRRS Mission

A strategy paper for preparing and revising regulations and guidelines including BMU and RSK documents has been issued by the BMU, after consultation of the LAA at the end of 2010.

This paper is a first attempt to describe the roles and responsibilities of each parties in the development of regulation and guides, it underlines the central steering role of the BMU but it doesn't address all issues raised by the suggestion 22 insofar as:

- the paper should include a list of existing document and documents to be created;
- the paper should include a systematic screening of existing documents to define need for reviewing documents. For instance, it is stated that "*the BMU will routinely ask the LAA every five years whether the rules and regulations need to be updated*", but the status of the PSA guidelines, issued six years ago and not reviewed since, is not précised. The document has not been reviewed yet;
- priorities for development of new documents and revising existing one are not mentioned in the paper ;
- resources needed to fit the priorities fixed have not been evaluated;

The strategy paper should be considered as a federal working program in the field of regulation and guides. Therefore, it has to be referenced with a date and revised on a periodic basis.

Consequently the suggestion remains valid and has to be addressed as a matter of priority, in association with the new recommendation RF3 above.

Suggestion 22 (S22): is open.

Nuclear Safety Ordinance

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

R8 **Recommendation:** An ordinance on nuclear safety should be adopted as soon as possible to provide a legally binding basis for the fundamental safety objectives and basic requirements corresponding to these objectives.

Changes since the 2008 IRRS Mission

Work to issue an Ordinance for nuclear safety was initiated in 2006. An ordinance was seen as necessary to describe the qualitative and quantitative safety goals and requirements to define the adequate, legally-enforceable level of safety for the existing nuclear power plants.

An ordinance on nuclear safety is not formally required by the German legal system but the Atomic Energy Law contains that legal basis for issuing an ordinance.

The BMU and the Länder have discussed the recommendation 8 and came to the conclusion that the first priority for Germany is to issue detailed regulatory requirements and criteria through a BMU non-binding regulatory document (see below).

From a legal point of view, the BMU and the Länder consider that there is no urgent need to issue an ordinance on nuclear safety to enforce the regulation because:

- an additional provision has been added in December 2010 in the Atomic Energy Act, stating that “*The holder of a licence to operate an installation for the fission of nuclear fuel for commercial electricity production shall provide the realisation of safety measures according to the ongoing state-of-the-art of science and technology (...)*”, which gives indirectly an obligation to comply with non-mandatory regulatory requirements ;
- requirements and guidance documents are implemented in a legally binding way through listing them in the licensing acts.

Moreover the legal process to adopt an ordinance is complicated and an ordinance could therefore only include very general and high level safety goals and requirements in order not to hinder flexible and quick reactions and measures in the case of new technical developments.

Nevertheless, the work on developing the Nuclear Ordinance should be continued.

Recommendation 8 (R8): is open.

Safety limits and criteria

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

S23 **Suggestion:** The proposed regulatory guide entitled “Sicherheitsanforderungen für KKW”, outlining safety reference levels and criteria corresponding to the state of the art in science and technology should be used to define the fundamental safety objectives and basic requirements in the nuclear safety ordinance.

S24 **Suggestion:** To assist with the interpretation and implementation of proposed safety reference levels and criteria to define regulatory safety targets and potential safety improvements to existing power plants, it should also be considered to issue a non-mandatory guide on identification and disposition of any deviations identified as a result of the safety review. Both documents should be issued and implemented in a timely manner.

Changes since the 2008 IRRS Mission

In 2003, BMU initiated a project to modernize the regulatory framework by revising the existing safety criteria and guidelines and by developing new requirements to ensure compliance with the state of the art in science and technology, as reflected by national and international practice and experience. The 2008 IRRS Mission recognized that the approach used to develop the basis for these safety reference levels and criteria was very systematic and comprehensive and that the consultation process to invite comments from all interested parties was very transparent and far reaching.

However disagreements between the BMU and the Länder on the objectives of the documents lead to a situation of a statu quo in the evaluation of the revision B of the document “*safety requirements for Nuclear Power Plant*”. Considering the 2008 IRRS report conclusions, the BMU initiated discussions in the LAA to define a cooperative process strive for consensus on the document. As a result:

- the objectives of the document have been changed. The BMU gave GRS the task to rewrite the document not only to describe the state of the art as it was in the revision B but also to define safety criteria and requirements to help the Länder to define a graded approach when identifying deviation with the state of the art ;
- the initial document has been divided in 2 parts. The first part on the new version has been written on the basis of the former Module 1 “*Fundamental Safety Requirements*”, the former Module 3 “*Events to be considered for PWRs and BWRs*” and former module 6 “*Requirements for Safety Demonstration*”. This first part is considered as a first priority for the regulatory work in Germany. Other Modules, containing more detailed technical requirements will be considered in the future as a possible input for revision of KTA Standards and as a possible input for future BMU guides.

Consequently:

- the first part of the document, when adopted, will be as way to temporarily make up for the lack of an ordinance on nuclear safety and to answer to suggestion 23 ;
- A procedure for application to existing NPPs, including the assessment in the case of deviations, is included in Module 6, chapter 7, answering to suggestion 24 ;
- the rewriting on the document with modified terms of reference makes the regulatory reference levels and criteria less subject to interpretation as in previous version. The Länder and the BMU consider accordingly no complementary guidance is necessary to assist with the use of the “*Safety Requirements for Nuclear Power Plant*”.

The draft document in version E is almost finalized but has still to be adopted by the LAA before being published and implemented.

Suggestion 23 (S23) and Suggestion 24 (S24): are closed in the basis of progress and confidence

New findings from the 2011 Mission

The discussions between the BMU and the Länder on the draft “*Safety Requirements for Nuclear Power Plant*” seem to lead to possible consensus to a new version E before the end of the year.

Drafting of “*Safety Requirements for NPPs*” (Rev. E) with a modified structure, typical wording for standards has been completed by GRS and will soon be sent to the Länder and RSK for final discussion and approval. RSK has planed to review the final draft to check against recent developments and insights after the Fukushima accident such as:

- systematic inclusion of the internal and external hazards including combinations, in the whole safety concept, also in accident management,
- long-term energy supply, in particular in case of external hazards,
- long-term heat removal from reactor core and the fuel pool, also in case of external hazards

No major changes to be implemented to the text is expected by the experts.

An approval from the Länder on the document possibly amended following RSK recommendations is expected for October 2011 and publication as a BMU document should be completed before the end of year 2011

The planned publication of the document “*Safety Requirements for Nuclear Power Plant*” should be progressed as a matter of priority as there is an urgent need for Germany to have a common set of high level safety requirements, particularly concerning the list of initiating events (including beyond design events) to be considered. This is particularly important as there is also a need for a complementary Nuclear Ordinance which has also been delayed (see recommendation 8).

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2011 FOLLOW UP MISSION

- (1) **BASIS:** GS-R-1 § 3.2 states that “In fulfilling its statutory obligations, the regulatory body: (1) shall establish, promote or adopt regulations and guides upon which its regulatory actions are based”
- (2) **BASIS:** GS-R-1 § 5.25 states that “The main purpose of the regulation is to establish with which all operators must comply. Such regulations shall provide a framework for more detailed conditions and requirements to be incorporated into individual authorization.

F2 R Recommendation: BMU should publish the document “*Safety Requirements for Nuclear Power Plant*” as a matter of priority to fill in the gap in the German regulatory framework and to answer to the urgent need for a common and harmonized set of safety requirements and criteria to be used for review and assessment by the Länder.

Risk-informed approach

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

- S25 **Suggestion:** A policy document should be developed on the use of risk insights in the regulatory framework and decision making to achieve a proper balance between deterministic and performance based approaches.
- S26 **Suggestion:** The PSR and PSA guidelines should be reviewed and revised, as necessary, according to the policy document on the use of risk insights in the regulatory oversight, to clarify the role of PSA in the current regulatory framework.

Changes since the 2008 IRRS Mission

The existing framework is largely based on deterministic approach. A guide was established in 2005 to establish, to some extent, the role of Probabilistic Safety Assessment (PSA). The guide outlines the methodology which should be used but provides little guidance on the use of the result.

UM BW, with the support of Tüv Süd, has experimented with the use implementation of PSA in its decision making processes. A paper called “*Konzept zur Nutzung probabilistischer Untersuchungen*”

in Aufsichts- und Genehmigungsverfahren : Zielsetzung und Anwendung von dem Hintergrund der Empfehlung und Hinweise aus der IRRS Mission” has been written to report on the practices in Baden-Württemberg concerning the use of probabilistic approach in its review processes.

To answer to suggestions 25 and 26, BMU has mandated to review best practices concerning the possible use of probabilistic methods in the safety assessment (Risk Informed Decision Making - RIDM). GRS has initiated a work in 3 steps:

- Review of international available documents and practices in Western Europe and North America (report issued in October 2010) ;
- Review of the practices and approaches in the Länder (report issued in August 2011);
- Proposal for a RIDM Guide in Germany (proposal to be sent to the BMU in 2012).

BMU should not delay the draft of a guidance on the basis of the GRS proposal as soon as it is available, as the guidance is required to harmonize the practices in Germany.

Suggestion 25 (S25) and Suggestion 26 (S26): are closed on the basis of progress and confidence

Strategy for reviewing and updating regulatory documents

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

R9 **Recommendation:** The existing administrative process to issue and update BMU regulatory documents should be modified to include internal procedures to account for the feedback of experience from all interested parties, in relation to the use of regulatory documents.

Changes since the 2008 IRRS Mission

In 2008, it was stated that there is no supporting process for reviewing and updating the existing BMU regulatory documents and RSK recommendations. In consequence, the majority of the regulatory documents that have been issued since the 1970s are not up to date.

No changes have been introduced in the process. The task to review all regulatory documents on a regular basis – every five years like the KTA standards for instance – and to revise them if necessary should officially be accepted by the BMU as a priority matter and resources allocated accordingly.

Recommendation 9 (R9) : is open

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

S27 **Suggestion:** It is suggested to perform an impact assessment of the proposed safety reference levels and criteria on the existing regulatory framework. In particular, the documents that may require revision on the basis of the proposed requirements need to be clearly identified and an action plan developed for inclusion in the overall strategy for the development of regulatory documents.

Changes since the 2008 IRRS Mission

GRS took all the existing regulatory or guidance documents as an input to draft the successive versions of the document “*Safety Requirements for Nuclear Power Plant*” to be published soon. However, the impact of the final version has not yet been evaluated in a systematic way. According

to its steering role, the BMU should review the existing documents to decide if the documents has to be repealed or if a revision is needed. For instance, a review and revision of the PSA guidelines is expected to be necessary after publication of the “*Safety Requirements for Nuclear Power Plant*”. Therefore the suggestion remains open.

Suggestion 27 (S27): is open.

8. MANAGEMENT SYSTEM OF THE COMPONENT PARTS OF THE REGULATORY BODY

RECOMMENDATIONS AND SUGGESTIONS FROM THE 2008 MISSION

R10 **Recommendation:** BMU DG RS and UM BW should incorporate the work identified in the suggestions and recommendations of all chapters of this report into their management systems.

Changes since the 2008 IRRS Mission

BMU

Recommendation 10: BMU presented in the Advanced Reference Material that the changes needed following the recommendations and suggestions of the IRRS mission in 2008 and the IRRS follow up mission in 2011 will be made after the latter mission. To date there has been no action plan to address the implications of the IRRS 2008 mission to the management system. The annual planning of the BMU includes a list of activities to be carried out without being supported by a detailed allocation of resources. No information has been found in the Annual Action List regarding revisions to the BMU QM manual.

UM BW

After the IRRS 2008 mission UM BW created an action plan and, based on the recommendations and suggestions, all the necessary procedures were amended. A list of the relevant procedures, cross referenced to the recommendations and suggestions, was presented to the IRRS Team. The training for the new management system took place in January 2011 and the new integrated management system has been implemented.

Recommendation 10 (R10): is Closed for UM BW and Open for BMU

New findings from the 2011 Mission

There were no new findings in the 2011 IRRS Follow up Mission.

RECOMMENDATIONS AND SUGGESTIONS FROM THE 2008 MISSION

RECOMMENDATIONS AND SUGGESTIONS FROM THE 2008 MISSION

- R11 **Recommendation:** BMU DG RS should continue in developing the management system using the IAEA safety requirements GS-R-3 in respect to the following aspects:
- an integrated management system covering policy statements, description of the organization and the processes for regulatory functions of the BMU DG RS as well the support functions important for the management to achieve the goals of BMU DG RS;
 - incorporate into the management system a process describing the development and maintenance of the management system;.
 - incorporate into management system a document describing the format and content of the management system descriptions; and
 - implement a transparent, systematic way of assessing compliance and effectiveness of the management system and looking for possibilities for improvements.
- S28 **Suggestion:** BMU DG RS should consider on the basis of the good practice of international regulatory bodies and the experience of the UM BW to develop a method to assess its own safety culture.
- S29 **Suggestion:** BMU DG RS should review its safety goals and quality principles to take account of the recommendations of the IRRS review and then incorporate these, in the QM manual. The manual should include an explanation of how these goals and principles are expected to be implemented in the work and interaction of BMU DG RS with stakeholders.
- S30 **Suggestion:** BMU DG RS should collect, in a systematic manner, the expectation of its stakeholders, including Länder regulatory bodies, to improve its regulatory processes.
- R12 **Recommendation:** BMU DG RS should develop its long and short term planning processes so that:
- a strategy plan is developed covering several years ahead along with the related programme of tasks to implement this plan; and
 - all the activities of the BMU DG RS, with the needed resources, are included in the annual plan.
- S31 **Suggestion:** BMU DG RS should consider the commissioning of the appropriate knowledge management system and incorporate it into the QM handbook.
- S32 **Suggestion:** BMU DG RS should develop a records management system which supports their experts work.

Changes since the 2008 IRRS Mission

Recommendation 11: The QM descriptions of BMU remain the same as in 2008. Whilst there are some enhancements to the processes, no changes have been made regarding the agreement of the respective roles of Federal and Länder regulatory bodies.

One of the administrative divisions has been made responsible for the development of the management system. The review and assessment of the management system does not meet the expectation presented in the requirements of GS-R-3. In particular, there have been no internal audits in the last 2 years. The management system review process was written down in 2005, however, it has not been completely implemented. Annually the needs from other divisions are collected and an enhancement plan is developed.

The Division which is responsible for the Federal Supervision of NPPs, has elaborated some initial views on the content of the proposed Federal Oversight Manual and its core processes. Their proposals for the Federal Oversight Manual core processes address maintenance of competences (including the GRS Academy), national and international operating experience, strategy for updating of rules and regulations, knowledge management, document management, information events and Green Paper Process.

The Annual Action List 2011 of the DG-RS does not include any activities related to the enhancement of the management system.

Recommendation 11 (R11): is Open

Recommendation 12: The planning and control process of BMU exists, but does not include the preparation of a strategy plan covering several years. The planning of the DG-RS is made at the ministerial level and the fix number of staff is defined. It is assumed that the annual objectives (Action List), which is the output of the planning process, are carried out with these resources. The further allocation of the resources to the activities does not comply with the Recommendation R12.

The strategy planning is not documented and the adequacy of the resources has not been justified based on the tasks of the regulatory body. However the current critical review of the ministries should produce such a document at the DG-RS level. A considerable percentage of work is needed for ad hoc ministerial activities, thereby regularly having a large impact on the available resources for the regulatory body duties. Ensuring the resources for regulatory body activities is thus a big challenge at BMU, a situation which has not changed since 2008. In the mission report of 2008 the IRRS Team advised BMU to consider a clear separation between the two activities. This has not been done.

Recommendation 12 (R12): is Open

Suggestion 28: BMU has discussed with GRS the safety culture assessment but no actions have yet been taken. GRS has reviewed the good practices in safety culture assessment following the IRRS mission. None of the applied methods to establish criteria to review and assess safety culture were considered appropriate for the BMU. The UM BW plans to make a self-assessment of safety culture after the IRRS follow up mission. BMU will use that experience for their safety culture assessment.

Suggestion 28 (S28): is Closed on the basis of progress and confidence

Suggestion 29: BMU has a plan to start the action after IRRS follow up mission. This action is part of the management system development.

Suggestion 29 (S29): is Open

Suggestion 30: BMU concept of a process for collecting stakeholder expectations has been elaborated at the end of year 2010. In the process the results will be presented in the LAA and it will make a decision of the actions to be taken together with BMU. The goal of the system is to improve the overall German regulatory system. BMU publishes the agreed actions on its web site.

Suggestion 30 (S30): is Closed

Suggestion 31 and Suggestion 32: BMU has developed and put in operation an outstanding knowledge management system that supports the activities of the regulatory body and its stakeholders. This system contains broad spectrum of nuclear safety information from legislation and rule making to research and technical descriptions of the nuclear power plants. The system is available to stakeholders to share up to date information of the activities. Also international committee member have an access to the system. The Länder have found this system very useful. The system enhances the use of expert resources in all of the organizations. The Länder have good experience of the use of the knowledge management system. The availability of up to date information to all of the involved parties has built up mutual trust.

In the current, new situation of nuclear energy phase out the created knowledge management – system remains very important.

Suggestion 31 (S31) and Suggestion 32 (S32): are Closed

New findings from the 2011 Mission

The IT knowledge management and record keeping system as described in the resolution of suggestions 31 and 32 and demonstrated during the follow up mission is an example for other regulatory bodies. Up-to-date, online information and collaboration facilities are available for stakeholders through a BMU/GRS portal. This includes access for researchers, committees, standardization groups and the Länder working groups. This is a major development for the whole regulatory system in Germany and an example for other regulatory bodies in the areas of management system development, knowledge management and training, document generation and record keeping, national and international cooperation and project management.

The advice in the 2008 mission report to evaluate the distribution of tasks of the Government (ministerial work) and Regulatory Body (safety related activities) was meant to improve the effectiveness and efficiency of the whole organization. In 2011 the IRRS Follow up Mission concluded, based on the lack of completion or sufficient progress of the recommendations and suggestions from the 2008 report, and verbal evidence that the situation has not changed at all and that the safety related activities are being diverted by non safety related activities.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2011 FOLLOW UP MISSION

- (1) **BASIS:** GSR Part 1, Requirement 35: Safety related records states that *“The regulatory body shall make provisions for establishing, maintaining and retrieving adequate records relating to the safety of facilities and activities”*.
 - (2) **BASIS:** GS-R-3, 4.2 states that *“The information and knowledge of the organization shall be managed as a resource”*.
 - (3) **BASIS:** GS-R-3, 5.21 states that *“Records shall be specified in the process documentation and shall be controlled. All records shall be readable, complete, identifiable and easily retrievable”*.
- GPF1 Good Practice:** Up-to-date, online information and collaboration facilities are available for stakeholders through a BMU/GRS portal. This includes access for researchers, committees, standardization groups and the Länder working groups.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2011 FOLLOW UP MISSION

- (1) **BASIS: GSR Part 1 Requirement 3: Establishment of a Regulatory Body para 2.7** states that “...regulatory body will not be entirely separate from other governmental bodies. The government has the ultimate responsibility for involving those with legitimate and recognized interests in its decision making. However, the government shall ensure that the regulatory body is able to make decisions under its statutory obligation for the regulatory control of facilities and activities and is able to perform its functions without undue pressure or constraint.”
- (2) **BASIS: GSR Part 1 Requirement 3: Establishment of a Regulatory Body para 2.8** states that “...the regulatory body shall have sufficient authority and sufficient staffing and shall have access to sufficient financial resources for the proper discharge of its assigned responsibilities. The regulatory body shall be able to make independent regulatory judgments and decisions, free from any undue influences that might compromise safety, such as pressures associated with changing political circumstances or economic conditions, or pressures from government departments or from other organizations. ...”.
- RF3 **Recommendation:** BMU should ensure its ability to carry out its work in such a manner that safety related activities are not diverted by other ministerial responsibilities, pressures or constraints.

UM BW

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

- R13 **Recommendation:** UM BW should continue the development of its management system using the IAEA safety requirements document GS-R-3 in the following respect:
- include the processes needed to manage the organization into the management system;
 - include the processes for the development and maintenance of the management system;
 - describe its strategic and annual planning process in the management system;
 - develop a standard format and content of the management system descriptions;
 - implement a transparent, systematic way of assessing compliance and effectiveness of the management system and looking for possibilities for improvements; and
 - develop a process for reviewing in regular basis the changes in the regulations and guides as well as implementing into the oversight.
- S33 **Suggestion:** UM BW should consider collecting in a systematic manner the expectation of its stakeholders, including the federal regulatory body, to improve its regulatory processes.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES FROM THE 2008 MISSION

- S34 **Suggestion:** UM BW should investigate in the AGAVE enhancement process possibilities to improve the interface with the official record keeping so that inspectors need to spend as little as possible time feeding record keeping data and that the requirements to the licensee can be easily followed.

Changes since the 2008 IRRS Mission

Recommendation 13: UM BW has established an integrated management system, which came into effect on the 1st of February 2011. It consists of a general part, mission statement, supervision concept and regulatory supervision manual, organization manual and emergency preparedness manual. Below the processes in these manuals there are descriptions of the tools used.

There are three main processes of UM BW: for the first Supervision, monitoring, licensing, for the second dealing with extraordinary events and for the third ministerial and administrative activities. There are four management processes such as management review and objectives, organizational specification and modifications, staffing and human resources management and information and communication. The support processes consist of four activities: knowledge management, management system documentation, assessment of the management system and official record preparation including recordkeeping.

UM BW does strategic planning on continuous basis. Annually the strategy plan is updated and the related action plans are elaborated. The action plans define the activities and allocation of the resources. Also annually the resources are reviewed. Longterm projects are to be handled with an action plan for several years. Similar approach was used for the corrective actions of the IRRS mission 2008.

The UM BW management system Supervision, monitoring and licensing process presents the annual planning of the inspections, review of the outcome of the inspections in the middle of the year to verify the appropriate content of the program. The output of the program is annual assessment of the safety at the nuclear power plants, related decisions and possible needs to enhance the process.

Supervision is main core process connecting the detailed tasks. These task description related to regulatory supervision have not changed during the development of new integrated management system in general. However the improvements have been implemented e.g. after the to IRRS mission 2008 and management reviews.

As part of the annual planning process for UM BW there is a management review for which section heads prepare their assessment of the functionality of the management system. The list produced covers all the topics required in the IAEA GS-R-3 management review requirements, with the exception of internal audits (which are not carried out at the moment). The result of the management review is an action plan for the UM BW. The requirements of the action plan are subsequently transferred into the plans of the Sections.

TSO support is important resource to UM BW. The amount of work done in the TSOs is about five times that in UM BW for the oversight of the nuclear facilities. A long-term agreement is concluded between UM BW and TSOs. One input to the planning process is the results of the discussions with licensees and TSOs of major modifications and further strategies.

There are documents showing the interconnection of the UM BW management system to the regulations for the whole Land administration.

As written above, there is no internal auditing of the management system in place. The management system should describe that independent reviews should be carried out, covering the whole system, within five years by either internal or external audits. UM BW stated that they prefer external review every 5 years which, as an example, they consider an IRRS mission or its follow up to be. However, the IRRS Team consider that these missions, whilst useful and supporting, are not meant to replace independent external reviews of a management system. As part of the annual planning process for UM BW there is a management review for which section heads prepare their assessment of the functionality of the management system.

IAEA Member States have extensive and positive experiences of the benefit of internal audits for their management systems. Thus it is suggested that UM BW initiate this activity to further enhance their management system. Such internal audits benefit the organization by spreading modern “quality management” thinking within the staff and provides a platform for internal benchmarking. It is not necessary to create a special organisational function for this.

Recommendation 13(R13): is closed

Suggestion 33: One topic of the management review addresses the expectations of the stakeholders. There is a process description presenting the list of stakeholders and the methods by which UM BW gets feedback such as discussions, meetings, requests etc. The new review form has been used for the first time in the beginning of 2011.

Results from Eurostat surveys are also used because, as was stated, there is not sufficient budget available for such purposes. However the IRRS Team is of opinion that more accurate information can be achieved by using a dedicated questionnaire for circulation in the areas around the nuclear facilities. The experience in other countries is that the costs of such an exercise are bearable.

Suggestion 33(S33): is closed

Suggestion 34: The official record keeping system of the Baden-Württemberg Land administration is old and interconnection with the AGAVE information management system is not possible. However the AGAVE information management system has been adapted to satisfy the needs of expert work done at UM BW. The IRRS Team has concluded that this solution satisfies the goal of the suggestion.

Suggestion 34 (S34): is closed

New findings from the 2011 Mission

There were no new findings in the 2011 IRRS Follow up Mission.

9. REGULATORY IMPLICATIONS OF THE TEPCO FUKUSHIMA DAI-ICHI ACCIDENT

The TEPCO Fukushima Dai-ichi NPP accident in Japan has had an important implication on German Energy Policy. As a result of the accident, the German Government (Federal and Länder with NPPs) decided on a 3-month moratorium on the recently decided extension to the operating lives of German NPPs. Additionally, 7 NPPs would be shut down, and one retained in a shut-down state, during the period of that moratorium. This decision was implemented by the Länder for NPPs in their State. It was also decided by the Federal government that a safety review would be carried out for all NPPs within two months. The Federal Government asked the independent Reactor Safety Commission (RSK) to carry out the safety review. The RSK started its work on 15 March 2011.

On 17 May 2011, the RSK published their report on the findings of the safety review which, inter alia, came to the conclusion that, with regard to electricity supply and external flooding, the German NPPs are more robust than had been the case at Fukushima. A similar conclusion was reached for a number of other assessment topics.

Subsequently, on 6 June 2011, the Federal Cabinet adopted a 13th amendment to the Atomic Energy Act which, after due process, entered in to force on 6 August 2011. Thus, the main elements of this amendment were to:

- cancel the electricity production ‘rights’ previously approved in the 11th amendment;
- terminate the right to produce electricity for commercial purposes for the 8 shut down NPPs immediately;
- set dates for the termination of operating licences for all other NPPs; and
- allow the future transfer of electricity ‘volumes’ provided the items above are still complied with.

Beyond the political decisions, the Fukushima accident has also had significant implications on the German regulatory safety framework. This chapter brings together the information accumulated by the IRRS Team on Fukushima implications on regulatory during the course of the review mission and contains the views and conclusions of the IRRS Team for each of the standard modules of the IRRS follow-up mission.

9.1. ACTIONS TAKEN BY THE REGULATORY BODY IN THE AFTERMATH OF THE TEPCO FUKUSHIMA DAI-ICHI ACCIDENT

A. IMMEDIATE ACTIONS TAKEN BY THE REGULATORY BODY

In aftermath of the Fukushima accident, at federal level, the BMU and the GRS manned and activated their situation centres. Continuous contact between both organizations was ensured. The main tasks of these centres were to keep track of incoming Fukushima related information, such as information provided by press releases, European clearinghouse, NIS, the IAEA and the TEPCO press releases, and to keep informed the public, Federal and Länder Authorities, including UM BW. The information was provided to the public essentially through their Websites and a dedicated hotline set up to answer questions of the citizens. Regular press conferences were also organised on Ministerial level. To provide information to the relevant authorities, information had been also systematically provided through the Federal Electronic Situation Display (ELAN), Internet portal operated by the Federal Office for Radiation Protection (BfS) and accessible in the situation centres.

Contacts with the international community were pursued. The BMU sent an expert of radiation

protection upon request of the Federal Foreign Office in Berlin to provide advices and support the German Embassy in Tokyo. The BMU and the GRS contacted on regular basis relevant foreign organizations such as the IRSN, US-NRC, IAEA, EU, regulatory bodies and technical support organizations.

Even if the criteria to activate the emergency centres, based on the severity of the radiological consequences to the local public, were not met, as the BMU and the GRS, the UM BW activated on 11 March its situation centre to contribute to inform the public based on information provided by the BMU, the GRS, the IAEA and the press releases of TEPCO.

From 13 March, a dedicated hotline was set up to answer questions and to provide information to the public and updated radiation measurements from the environmental monitoring network were made permanently available on the UM BW Website. In parallel, an ordinance was implemented by the Federal and Länder Authorities to ensure proper radiological contamination checks of persons, goods and aircrafts coming from Japan.

On 14th March, the UM BW has promptly reacted to the Fukushima accident in the field of inspection. Targeted inspections and expert investigations (commission of experts Baden-Württemberg) were focused on the most important immediate lessons learned from the accident.

CONCLUSION

The IRRS Team considers that the prompt and coordinated response of the governments and their regulatory body to the Fukushima accident is commendable. The IRRS Team considers that the environmental radiation monitoring programme and the communication to the public and interested parties were carried out in an exemplary manner.

B. TECHNICAL ISSUES CONSIDERED IN THE LIGHT OF THE FUKUSHIMA ACCIDENT

Response to the Fukushima accident

An Independent Expert Commission was appointed on 14 March by the state of the Baden-Württemberg in order to perform an analysis of the events in Japan, to examine the applicability to the facilities in Baden-Württemberg and to consider and assess the scope of risk prevention in the design of nuclear facilities in Baden-Württemberg. In light of Fukushima accident, the Baden-Württemberg Expert Commission considered the following five topics:

- Earthquake;
- Loss of auxiliary service water supply;
- Grid connection / electrical energy supply;
- Infrastructure and autarchy; and
- Accident management measures.

The Expert Commission identified some first suggestions to further increase the safety level of the plants against beyond design basis events. The UM BW has committed to follow-up these suggestions for the above mentioned topics which have also been communicated to the Federal Level.

Plant specific safety review

Upon governmental request, on 17 March 2011, the BMU called upon the RSK to develop a catalogue of requirements, in light of the Fukushima accident, and perform a safety review the NPPs and assess the results of the review based on these requirements. The scope of the review included the followings:

- Natural events such as earthquakes and flooding as well as possible simultaneous occurrences,
- Postulates that are independent of concrete event sequences, such as failures affecting several redundant system trains, (common-cause failures, systematic failures), station blackout for longer than two hours, long-lasting loss of auxiliary service water supply,
- Aggravating boundary conditions for the performance of emergency measures, such as unavailability of electricity supply, explosion risk and accessibility restriction due to high radiation levels.

The conclusions of this review were requested to be available by the end of the temporary cessation period aforesaid and were actually presented on 15 May and published on 17 May. Inter alia, the RSK came to conclusions that, with regard to electricity supply and external flooding, the German NPPs were more robust for design basis accidents than had been the case at Fukushima. The RSK provided also recommendations for further analyses and measures from the results of the plant-specific review. In this respect, on July 2011, based on the plant-specific safety review, the RSK agreed on the following topics to be further reviewed in the future: earthquake, flood, station blackout, loss of offsite power, loss of service water supply, accident management measures, aircraft crashes, explosion, toxic gases, load crashes, domino effects and other generic issues such as grid stability or long term operation of the fuel pools.

C. OTHER ISSUES CONSIDERED IN THE LIGHT OF THE FUKUSHIMA ACCIDENT

Situation centres activated have been considered to work well at Federal and Länder level including to inform the public in a coordinated manner. However, it has been recognized to examine possible future improvements of the national organisation. This issue will be discussed within the Federal-Länder committees.

As a consequence of the Fukushima accident, it has also been decided to establish local information commissions for GKN and KKP NPP in order to enhance the information of the public, including those residing in the vicinity of the nuclear power plants.

9.2. PLANS FOR UP-COMING ACTIONS TO FURTHER ADDRESS THE REGULATORY IMPLICATIONS OF THE TEPCO FUKUSHIMA DAI-ICHI ACCIDENT

GRS assessment

GRS received an approval from the BMU to carry out analyses and assessments over the next 3 years. The objective is to better understand what happened at Fukushima site by considering different aspects such as external and internal hazards, gradual loss of safety functions and also emergency measures implemented to mitigate the accident and its consequences.

Requested by the BMU, detail technical reports and information notice will be prepared accordingly.

EU NPP stress tests

Upon request of European Council on May 2011, the European Nuclear Safety Regulators Group (ENSREG) developed and reached a consensus on the scope and modalities of a comprehensive and transparent risk and safety assessments of European nuclear power plant, so-called stress tests. In this respect, the Western European Nuclear Regulators Association (WENRA) submitted to ENSREG a scope and methodology to perform the stress tests. After public consultation, a consensus about the definition, the scope and the methodology to implement stress tests to all NPPs across Europe was reached between ENSREG members. The agreed stress test consists:

- in an evaluation of the response of a nuclear power plant when facing a set of extreme situations (earthquake, flooding, loss of one or several safety functions...);

- in a verification of the preventive and mitigative measures chosen following a defence-in-depth logic: initiating events, consequential loss of safety functions, severe accident management).

During a meeting held on 30 June 2011, the BMU, the Länders and the plant operators agreed on the arrangements to implement the stress test in timely manner.

CONCLUSION

Germany started an extensive programme of evaluations that largely covers the issues raised by the Fukushima accident at present and go far beyond. This programme includes the participation in the EU stress test. The reviews performed in the aftermath of Fukushima accident were valuable first steps in a process which will last for many more years, as additional analysis is completed and further lessons are learned from the Fukushima accident worldwide.

9.3. SIGNIFICANCE OF REGULATORY IMPLICATIONS OF THE TEPCO FUKUSHIMA ACCIDENT ACROSS REVIEWED AREAS

Note: The significance of Fukushima implications was considered as part of the review of each IRRS module (following the new structure of the IRRS Guidelines Edition 2011).

Module 1: Responsibilities and Functions of the Government

The legislative and regulatory framework in Germany for the safety of nuclear installations and radiological protection is based on a well-established hierarchical system that clearly identifies all of the authorities involved and allocates appropriate responsibilities. The interfaces between each of these authorities are also clearly specified for both routine and emergency situations.

Emergency Arrangements are not a part of the considerations of this Follow-up Mission, but sufficient information was provided to demonstrate that these arrangements worked satisfactorily in response to the Fukushima accident. It was further demonstrated that the regulatory authority response, at both Federal and Land (for Baden-Württemberg) level, was proportionate to the event.

As a result of the Fukushima accident, the German Government (Federal and Länder with NPPs) decided on a 3-month moratorium on the recently decided extension to the operating lives of German NPPs. Additionally, 7 NPPs would be shut down, and one retained in a shut-down state, during the period of that moratorium. This decision was implemented by the Länder for NPPs in their state. It was also decided by the federal government that a safety review would be carried out for all NPPs within two months. The federal government asked the independent Reactor Safety Commission (RSK) to carry out the safety review. The RSK started its work on 15 March 2011.

On 17 May 2011, the RSK published their report on the findings of the safety review which, inter alia, came to the conclusion that, with regard to electricity supply and external flooding, the German NPPs were more robust for design basis accidents than had been the case at Fukushima. A similar conclusion was reached for a number of other assessment topics.

Subsequently, on 6 June 2011, the Federal Cabinet adopted a 13th amendment to the Atomic Energy Act which, after due process, entered in to force on 6 August 2011. The main elements of this amendment were to:

- cancel the electricity production ‘rights’ previously approved in the 11th amendment;
- terminate the operating licences for 8 shut down NPPs immediately;
- set dates for the termination of operating licences for all other NPPs; and
- allow the future transfer of electricity ‘volumes’ provided the items above are still complied

with.

The RSK has identified further topics for consideration and the federal government has initiated further work to analyse the insights available from the Fukushima accident. In parallel, Germany is also responding to a European initiative to carry out ‘stress tests’ on all operating NPPs.

CONCLUSION

The IRRS Team did not identify elements regarding the responsibilities and function of the government, which would raise particular concern in the light of the Fukushima accident.

Module 2: Global Nuclear Safety Regime

Germany has ratified the major international treaties and conventions in the area of nuclear safety and emergency preparedness, including the Convention on Nuclear Safety and the Convention on Early Notification of a Nuclear Safety.

Germany actively promotes the multilateral and bilateral cooperation to enhance safety by means of harmonized approaches, in particular regarding emergency response and accident management. As already mentioned in the previous IRRS mission, there are agreements and arrangement for cooperation in nuclear safety and emergency preparedness with many countries in particular with neighbouring countries between the BMU and the respective foreign authorities. UM BW also takes part in the bilateral committees with Switzerland and France on the subjects of emergency preparedness, nuclear safety and radiation protection. Moreover, the BMU and UM BW cooperate with other countries in many forums: ENSREG, WENRA, IAEA and OECD/NEA.

The regulatory body and its TSOs take into consideration IAEA safety standards and relevant codes of conduct, including when developing the KTA technical requirements. Furthermore, some IAEA peer review safety missions such as IRRS and OSART have been already received in Germany. On the other hand, Emergency Preparedness Review (EPREV) mission, independent appraisal of preparedness for a radiation incident or emergency in Member States, has not been invited yet in Germany.

CONCLUSION

The IRRS Team did not identify elements regarding the Global Nuclear Safety Framework which would raise particular concern in the light of the Fukushima accident. The cooperation in nuclear emergency preparedness with neighbouring countries, to protect the public in case of nuclear or radiological emergency within or outside the territories and jurisdiction of the State, is commendable.

Module 3: Responsibilities and Functions of the Regulatory Body

The effective independence of the regulatory authority in Germany, and its ability to exercise its authority in a timely way under normal and emergency situations, was sufficiently demonstrated in the original IRRS mission and nothing has changed to alter that view. Similarly, the comprehensive availability of external and independent experts to provide technical advice was also sufficiently demonstrated.

Emergency Arrangements are not a part of the considerations of this Follow-up Mission, but the aspects of communications, both within and between elements of the relevant parts of the regulatory authority and other parties were briefly reviewed in regard to both normal and emergency situations.

The IRRS Team noted that both BMU and UM BW have clearly defined and codified responsibilities for actions in the event of nuclear emergencies which are contained in their

respective management documentation. The actions of both parties in response to the Fukushima accident demonstrate that these arrangements are both comprehensive and capable of implementation.

The relevant guidance for information to the public in the case of nuclear emergencies sets out the specific arrangements to be followed, these were fully implemented. In particular, the website of the BMU and the UM BW clearly provides information to the public on emergency arrangements and data on readings at radiation monitoring sites in the Land and the Federal.

In the IRRS Team's view, the German Government and the regulatory authorities took highly effective actions to inform interested parties and the public in a transparent manner following the Fukushima accident.

CONCLUSION

The IRRS Team did not identify elements regarding the responsibilities and functions of the regulatory body which would raise particular concern in the light of the Fukushima accident. The IRRS Team considers that the environmental radiation monitoring programme and the communication to the public and interested parties were carried out in an exemplary manner.

Module 4: Management System of the Regulatory Body

The BMU management system still needs to be developed taking account of lessons learned from Fukushima and bringing together the already existing process arrangements, such as the Federal Oversight Manual drafted and planned to be published in 2012. In parallel, the strategic plan recommended in 2008 should be also developed and take into account the lessons learned from Fukushima accident so far. In short term, the existing Annual Action List should be revised in order to incorporate Fukushima accident-related actions.

The arrangements implemented in aftermath of the Fukushima accident by the BMU and the GRS have worked well to keep track of the Fukushima accident and to conduct safety reviews, and to deal with the concerns of the public through a pro-active communication. As appropriate, these arrangements are laid down in the emergency response manual and should be included in the management system. Moreover, actions have been taken to keep learning from Fukushima accident such as the project approved by BMU to carry on the analysis and assessment of Fukushima accident over the next three years. In due course, the lessons learned should be addressed through the continuous improvement process of the regulatory body including through the annual plan and, as necessary, the above mentioned strategic plan.

The UM BW has initiated several Fukushima accident-related activities. It has been considered there is no need to form an overarching project related to Fukushima activities. All these activities are carried out as separate actions with allocated responsibilities in the different sections and monitored by the section heads in the weekly management meetings.

Part of these activities, the UM BW has established a working group, according to the relevant Management System arrangements, to review the emergency arrangements implemented in aftermath of the Fukushima accident by the UM BW even if they have been considered to work well. For instance, the criteria to activate the emergency organization are being reviewed; currently only based on the severity of the radiological consequences to the local public. It is intended to address events that concern the German public. A similar review of the emergency preparedness organisation is also being performed by the competent authorities in Baden-Württemberg.

Regarding the public information, as a consequence of the Fukushima accident following the French model, local information commissions will be established for GKN and KKP in order to enhance

the information of the public residing in the vicinity of the nuclear power plants.

The indirect effect of Fukushima accident has an impact on the work of the Länder. The motivation of personnel at the NPPs and the regulator is one of the new challenges of future use of nuclear energy in Germany. The UM BW has already developed a new indicator “work climate” (“Betriebsklima”) to monitor this during its yearly inspections. The fast closure of some of the nuclear unit is reflected the scope of oversight of the Länder. For instance in Hesse there is no more operating nuclear units. Therefore, it has been concluded that their Management System should be modified dramatically in order to reflect the new situation.

The UM BW feels that there should be a German approach to license the decommissioning of the newly shut down nuclear unit and start the activities of waste management. The UM BW has formed a taskforce for this purpose. Ensuring the competence will be an extra challenge for the German nuclear safety society.

CONCLUSION

The IRRS Team concludes the BMU should develop Management System together with a strategic plan in light of Fukushima accident. Moreover, lessons learned from this accident should be addressed through the continuous improvement process.

On the other hand, the UM BW has made significant progress to establish a Management System which includes processes to take into account the impact of Fukushima accident. These have been used for instance to reschedule the annual activities and the evaluation of emergency preparedness.

Module 5: Authorization

Since according to § 7 of the Atomic Energy Act no further licences will be issued for the construction and operation of installations for the fission of nuclear fuel for the commercial generation of electricity or of facilities for the reprocessing of irradiated nuclear fuel, questions with regard to the siting of nuclear power plants in the authorization process are not applicable to Germany.

General requirements such as “physical separation” and “functional independence” are fixed in the “Nuclear Power Plant Safety Criteria” (Revision D, Modules 1 and 2) or in the “Nuclear Power Plant Safety Criteria 1977” (Criteria 1.1) whereas detailed requirements for system design and equipment technology such as “fault tolerance”, “redundancy” and “independence” are fixed in KTA rules. In addition there are a number of requirements in the “RSK Guidelines for Pressurized Water Reactors”. The fulfilment of the requirements is checked in the licensing procedure and prior to non-essential modifications.

As the ongoing analyses of the Fukushima accident provide new insights, the national requirements will be updated appropriately.

CONCLUSION

The IRRS Team did not identify elements regarding the responsibilities and functions of the regulatory body which would raise particular concern in the light of the Fukushima accident.

Module 6: Review and Assessment

Following the Fukushima accident, Germany started an extensive programme of evaluations that cover all the issues raised by SSR 2.1 and SSR 2.2 standards.

As described above, on 14 March 2011, the Baden-Württemberg Land Government appointed a Commission of Experts to perform an analysis of this event, to examine the applicability to the facilities in Baden-Württemberg and to consider and assess the scope of risk prevention in the design of nuclear facilities in Baden-Württemberg. Bavaria regulatory body performed also its own review and reached very similar findings to those made by UM BW Team whereas the other Länder relied on the federal level information.

In parallel, the BMU called upon the Reactor Safety Commission (RSK) to carry out a plant-specific safety review. Based on the results of this review, a new safety review has been decided to further examine the following topics:

- consideration of all conditions of low-power and shutdown operation;
- new curves for the determination of the probabilities of seismic acceleration loads at specific sites that might lead to a higher level of design earthquakes;
- protection of canals and buildings regarding the intrusion of water and the floating resistance in the case of a higher level flood;
- accessibility of the plant buildings in the case of longer-term flooding;
- specific examination of low-power and shutdown operation and storage of the fuel assemblies in the fuel pool;
- long-lasting loss of offsite power, superimposition of an aftershock with operation of the emergency diesels;
- robustness of the existing service water supply requirements taking into consideration current operating experience, also taking into account the cooling of the fuel assemblies both in the fuel pool and in the reactor core during low power and shutdown operation;
- in-depth examination of precautionary measures to prevent load crashes in the area of the primary system and the fuel pool;
- generic aspects of “flooding of the annulus in PWR plants”;
- further development of the accident management concept under external hazard conditions;
- supplementation of the requirements on accident management;
- optimization of available measures;
- consequential mechanical effects due to an aircraft crash that lead to a limited loss of coolant;
- protection of the fuel pool of decommissioned plants;
- verification of adherence to safety margins in the case of blast waves and site-specific consideration of toxic gases;
- based on the damage states of a power plant unit, the consequences for the maintenance of the vital functions of the unaffected unit are to be examined;
- superimposition of events with system operating conditions of short duration;
- long-term operation and post-operational phase of the fuel pools; and
- impact on grid stability.

At last, upon request of the European Council in May 2011, the European Nuclear Safety Regulators Group (ENSREG) developed and reached a consensus on the scope and modalities of assessments of European nuclear power plant, so-called stress tests. Starting on 1 June 2011, all the operators of nuclear power plants in the EU have to review the response of their nuclear plants to extreme situations, in particular operators will have to check and improve mitigation measures available after a potential loss of safety functions, caused by any reason.

The BMU invited representatives of the Länder and the plant operators to meet on 30 June 2011 to discuss the modalities of the European stress tests. At this meeting, it was agreed that the BMU will provide the structure of the operators’ reports and a concept for the German national report.

Furthermore, the proposal of the WENRA Chairperson for the operator reports and the national report was distributed. The plant operators were given the opportunity to comment on it. It was agreed that the operators' reports should be suitable for publication. Specific detailed information that is to be treated as confidential, should be documented separately. Currently there is an ongoing exchange and cooperation of the regulating authorities, expert organizations and licensees to perform the agreed working programme in time.

CONCLUSION

Germany started an extensive programme of evaluations that cover largely the issues raised by the Fukushima accident at present and go far beyond. This programme includes the participation in the EU stress test. The reviews performed in the aftermath of Fukushima accident were valuable first steps in a process which will last for many more years, as additional analysis is completed and further lessons are learned from the Fukushima accident worldwide.

The IRRS Team did not identify elements regarding the responsibilities and functions of the regulatory body which would raise particular concern in the light of the Fukushima accident.

Module 7: Inspection

As an immediate follow-up of the Fukushima accident, UM BW has initiated an inspection at the nuclear power plants in BW. The inspection was focused on the emergency power supply capabilities of the NPPs. Shortly afterwards the Government of BW has appointed a Commission of Expert to perform an analysis of events in Fukushima and their possible impacts on the NPPs in BW. The Commission has also made investigations in the facilities. Furthermore RSK has also been requested by BMU to perform plant specific reviews for all German NPPs in the light of the accident. All these investigations and considerations may have implications on the future inspection activity of UM BW. Accordingly UM BW may be lead to readjust its inspection plan in view of these results and requirements set by these investigations. On the basis of the insights gained so far, the UM BW does not deem it necessary to make changes in the actual inspection schedule.

Counterparts of the IRRS Team have offered the following answers to the issues in the questionnaire:

- To detect precursor events the operators of the NPPs have established an integrated event analysis system. The operator informs the regulator on the results of event evaluations in a regular basis. The inspection program of the regulatory body is adjusted to the findings of the event analyses once in every half year. This makes it possible to react at an early phase on any unfavorable development. In addition to that GRS is contracted to perform a precursor analysis using information on the international and all national events. The analysis is made available to UM BW. More on this issue is given in the discussion related to Suggestion 18 in the Inspection chapter of this report
- Targeted inspections related to the implications of the Fukushima accident have been performed as discussed in the introductory part above.

CONCLUSION

The IRRS Team did not identify any particular issue in connection with the inspection practice of the German regulatory body that would raise concern in the light of the Fukushima accident.

CONCLUSION

The BMU and the UM BW have promptly reacted to the Fukushima accident also in the field of inspection. Targeted inspections and expert investigations were focused on the most important immediate lessons learned from the accident. No urgent tasks to perform have been identified. However, the lessons learned from the Fukushima should be considered when developing future inspection programmes.

Module 8: Enforcement

The lessons learned from Fukushima accident may only have very remote and indirect relationship with the enforcement policy and practice of the regulatory body. The IRRS Team has not identified any particular element of the enforcement activity in Germany that could be directly related to the Fukushima accident.

Counterparts of the IRRS Team have offered the following answers to the questionnaire related to the Fukushima lessons learned:

- graded enforcement policy is an essential element of the German legal system in general and its application to nuclear safety in particular. As such it is suitable to provide independent graded implementation of the enforcement policy also in the light of the Fukushima consequences;
- for the case of the appearance of unforeseen radiation in German NPPs (as happened in Fukushima), the operators as well as the regulator in BW assess the implications of the Fukushima events. If any issue appears in this assessment that had not been previously implemented in the German regulatory practice, the implementation of the corresponding necessary measure shall be initiated by BMU or UM BW. At this moment the actual enforcement regime of UM BW seems to be appropriate for handling the issues foreseen.
- The same as said above applies to the process to ensure that corrective actions related to the Fukushima accident are implemented as appropriate by the operator.

CONCLUSION

The existing German enforcement practice is adequate to be applied in case of any issue that might arise in an accident having similarities to the Fukushima event. Therefore the IRRS Team concludes that no particular concern may be raised related to the enforcement activity of the German regulators in the light of the lessons learned from the Fukushima accident.

Module 9: Regulations and Guides

The majority of the on-going activities related to nuclear safety regulations and guides in Germany pertain to the revision and issuance of the long-time prepared Safety Requirements as discussed in Chapter 7 of this Report. Counterparts of the IRRS Team in this subject stated that most of the consequences of the Fukushima accident on the German regulations and guides are being addressed in the framework of the revision process of the Safety Requirements. In specific this applies to requirements and guidance on assessment of external hazards. In this respect it is to be noted that the revision of the KTA standard on flooding has been performed in 2005, the one on seismic design has been initiated in 2011 independently from the Fukushima accident. In general the Atomic Law requires that the guides reflect the best available knowledge and this shall be realized as soon as the revised Safety Requirements are published.

From the answers to the questionnaire related to the implications of the Fukushima accident on the

German regulations and guides the following conclusions are drawn:

- the methods applied to characterize external hazards during siting and the related regulations are considered robust enough, nevertheless the RSK is required to review the current margins whether they should be changed. Any change deemed necessary needs to be harmonized with the Safety Requirements to be revised and published;
- the set of postulated initiating events is currently defined in the incident guidelines and in the PSR guidelines. Its systematic revision has been decided prior to the Fukushima accident and a comprehensive list of postulating initiating events is now given in an appendix to the Safety Requirements to be published by the end of 2011;
- The internal and external events are considered to be adequately addressed by the actual design provisions. Nevertheless the BMU has requested RSK to revise the issue. Recommendations by RSK shall be taken into account in the revision of the Safety Requirements. The revision of the specific KTA standards as mentioned above also relates to this issue;
- The design extension conditions presently are addressed in the incident guidelines and in the PSR guidelines. Their revision is performed parallel to that of the Safety Requirements;
- The existing procedures meant to prevent the unfavourable interactions of systems important to safety are planned to be revised in the course of the review of the PSR guidelines;
- Establishment of a supplementary control room is a license condition for nuclear power plants in Germany, thus no further measures are needed in this respect;
- Similarly, post-accident sampling systems are required in all NPPs;
- Procedures and documentation necessary in case of emergency conditions are dully required by the regulations; and
- Methodologies to address beyond design basis accident have been extensively developed after the TMI and Chernobyl accidents. Additional methodologies are under consideration by RSK; however, no important developments are expected in this issue in the near future.

CONCLUSION

The IRRS Team did not identify elements regarding the responsibilities and functions of the regulatory body which would raise particular concern in the light of the Fukushima accident. Development of regulations, guides and standards is an on-going process in Germany. Most of the issues raised by the lessons learned from the Fukushima accident have been covered by regulations and guides also prior to the event. Moreover RSK was requested to revisit the most important documents and the resulting recommendations shall be taken into account in the revision of the Safety Requirements to be published soon as consensus guidance.



APPENDIX I – LIST OF PARTICIPANTS

INTERNATIONAL EXPERTS:		
1. Victor McCREE	US Nuclear Regulatory Commission	Victor.McCree@nrc.gov
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OFFICIAL CSN LIAISON OFFICER:		
1. Michael Hertrich	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Error! Hyperlink reference not valid.
2. Axel Kern	Ministry of the Environment, Climate Protection and the Energy Sector	axel.kern@um.bwl.de

APPENDIX II – MISSION PROGRAMME

BONN, Sunday, 4 th September 2011		
→13:00	Arrival of the Reviewers at the MARITIM Hotel in Bonn	<i>Reviewers</i>
14:00 - 18:00	Opening Team Meeting	<i>IRRS Team, LOs</i>
BONN, Monday, 5 th September 2011		
09:00 - 16:30	Entrance Meeting	<i>IRRS Review Team, LOs, CPs,</i>
16:30 - 18:00	Interviews session with counterpart on Module I	
18:00 - 20:00	Daily Team Meeting	<i>IRRS Team, LOs</i>
BONN, Tuesday, 6 th September 2011		
09:00 - 13:30	Interviews session with counterpart on Module II Interviews session with counterpart on Module IV Interviews session with counterpart on Module VIII	<i>IRRS Team, LOs</i>
13:30 – 17:00	Interviews session with counterpart on Module III Interviews session with counterpart on Module V Interviews session with counterpart on Module VII	<i>IRRS Review Team, LOs, CPs,</i>
17:00 - 18:45	Daily Team Meeting	<i>IRRS Team, LOs</i>
19:15	Transfer to Siegburg	<i>IRRS Team and German Counterparts</i>
20:12	ICE to Stuttgart	
22:09	Arrival Stuttgart	
STUTTGART, Wednesday, 7 th September 2011		
09:00 - 13:30	Interviews session with counterpart on Module III Interviews session with counterpart on Module V Interviews session with counterpart on Module VI	<i>IRRS Team, LOs</i>
13:30 – 18:00	Interviews session with counterpart on Module III Interviews session with counterpart on Module VIII Interviews session with counterpart on Module V Interviews session with counterpart on Module VI	<i>IRRS Review Team, LOs, CPs,</i>
18:30	Daily Team Meeting	<i>IRRS Review Team, LOs</i>
STUTTGART, Thursday, 8 th September 2011		
09:00 - 17:00	Interviews session with counterpart on Module III Interviews session with counterpart on Module V Interviews session with counterpart on Module VI	<i>IRRS Review Team, LOs, CPs,</i>
13:00	Meeting with Parliamentary State Secretary Ms Ursula Heinen-Esser (in Berlin)	<i>IRRS Team Leader, IAEA IRRS Team Coordinator and German Counterparts</i>
17:00	Daily Team Meeting	<i>IRRS Team, LO</i>

STUTTGART, Friday, 9th September 2011		
09:00 – 12:30	German Counterparts Review of Draft IRRS Follow up Mission Report	<i>BMU and UM BW</i>
10:00 – 12:30	Meeting with UM BW Minister Mr Franz Untersteller	<i>IRRS Team Leader, IAEA IRRS Team Coordinator and German Counterparts</i>
13:30 - 17:00	Plenary Session discussions between German Counterpart and IRRS Review Team on Draft IRRS Follow up Mission report	<i>IRRS Review Team, LOs, CPs,</i>
STUTTGART, Saturday, 10th September 2011		
09:00 - 12:30	Discussion on Mission Report, Finalization of IRRS Follow up Report to Germany	<i>IRRS Review Team, LOs, CPs,</i>
13:00 - 17:00	Exit Meeting	<i>IRRS Review Team, LOs, CPs,</i>

APPENDIX III – RECOMMENDATIONS/SUGGESTIONS/GOOD PRACTICES FROM THE 2011 IRRS follow up MISSION

Subject Area	Rec/Sug/GP Number	Recommendations, Suggestions or Good Practices from 2011 follow up mission
LEGISLATIVE AND GOVERNMENTAL RESPONSIBILITIES	<i>There were no new findings in the 2011 IRRS Follow up Mission.</i>	
RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY	SF1	Suggestion: BMU DG-RS should increase the priority for completing the Federal Oversight Manual and allocate resources accordingly in order to achieve the 2012 target date.
	SF2	Suggestion: BMU DG-RS should develop its Federal Oversight Manual, as it has proposed, in cooperation and interaction with the Länder in order to ensure that it is mutually consistent with the relevant Länder Manuals.
ORGANIZATION OF THE REGULATORY BODY	<i>There were no new findings in the 2011 IRRS Follow up Mission.</i>	
AUTHORIZATION	<i>There are no new findings from the 2011 IRRS Follow up mission</i>	
REVIEW AND ASSESSMENT	<i>There are no new findings from the 2011 IRRS Follow up mission</i>	
INSPECTION AND ENFORCEMENT	<i>There are no new findings from the 2011 IRRS Follow up mission</i>	

Subject Area	Rec/Sug/GP Number	Recommendations, Suggestions or Good Practices from 2011 follow up mission
REGULATIONS AND GUIDES	RF1	<p>Recommendation: The development of regulations and guides shall be considered as one of the key functions of the BMU to discharge Germany's responsibilities to assess the safety of Nuclear Power Plant. This function includes the definition at the highest level of :</p> <ul style="list-style-type: none"> - short and long term objectives for the development of new documents ; - a period for reviewing existing documents ; - necessary internal and external resources.
	RF2	<p>Recommendation: BMU should publish the document "<i>Safety Requirements for Nuclear Power Plant</i>" as a matter of priority to fill in the gap in the German regulatory framework and to answer to the urgent need for a common and harmonized set of safety requirements and criteria to be used for review and assessment by the Länder.</p>
MANAGEMENT SYSTEM FOR REGULATORY BODY	GPF1	<p>Good Practice: Up-to-date, online information and collaboration facilities are available for stakeholders through a BMU/GRS portal. This includes access for researchers, committees, standardization groups and the Länder working groups.</p>
	RF3	<p>Recommendation: BMU should ensure its ability to carry out its work in such a manner that safety related activities are not diverted by other ministerial responsibilities, pressures or constraints.</p>

**REGULATORY IMPLICATIONS OF THE TEPCO
FUKUSHIMA DAI-ICHI ACCIDENT
CONCLUSIONS**

	<p>The IRRS Team considers that the prompt and coordinated response of the governments and their regulatory body to the Fukushima accident is commendable. The IRRS Team considers that the environmental radiation monitoring programme and the communication to the public and interested parties were carried out in an exemplary manner.</p>
	<p>Germany started an extensive programme of evaluations that largely covers the issues raised by the Fukushima accident at present and go far beyond. This programme includes the participation in the EU stress test. The reviews performed in the aftermath of Fukushima accident were valuable first steps in a process which will last for many more years, as additional analysis is completed and further lessons are learned from the Fukushima accident worldwide.</p>
	<p>The IRRS Team did not identify elements regarding the responsibilities and function of the government, which would raise particular concern in the light of the Fukushima accident.</p>
	<p>The IRRS Team did not identify elements regarding the Global Nuclear Safety Framework which would raise particular concern in the light of the Fukushima accident. The cooperation in nuclear emergency preparedness with neighbouring countries, to protect the public in case of nuclear or radiological emergency within or outside the territories and jurisdiction of the State, is commendable.</p>
	<p>The IRRS Team did not identify elements regarding the responsibilities and functions of the regulatory body which would raise particular concern in the light of the Fukushima accident. The IRRS Team considers that the environmental radiation monitoring programme and the communication to the public and interested parties were carried out in an exemplary manner.</p>

	<p>The IRRS Team concludes the BMU should develop Management System together with a strategic plan in light of Fukushima accident. Moreover, lessons learned from this accident should be addressed through the continuous improvement process.</p> <p>On the other hand, the UM BW has made significant progress to establish a Management System which includes processes to take into account the impact of Fukushima accident. These have been used for instance to reschedule the annual activities and the evaluation of emergency preparedness.</p>
	<p>The IRRS Team did not identify elements regarding the responsibilities and functions of the regulatory body which would raise particular concern in the light of the Fukushima accident.</p>
	<p>Germany started an extensive programme of evaluations that cover largely the issues raised by the Fukushima accident at present and go far beyond. This programme includes the participation in the EU stress test. The reviews performed in the aftermath of Fukushima accident were valuable first steps in a process which will last for many more years, as additional analysis is completed and further lessons are learned from the Fukushima accident worldwide.</p>
	<p>The IRRS Team did not identify elements regarding the responsibilities and functions of the regulatory body which would raise particular concern in the light of the Fukushima accident.</p>
	<p>The IRRS Team did not identify any particular issue in connection with the inspection practice of the German regulatory body that would raise concern in the light of the Fukushima accident.</p>
	<p>The existing German enforcement practice is adequate to be applied in case of any issue that might arise in an accident having similarities to the Fukushima event. Therefore the IRRS Team concludes that no particular concern may be raised related to the enforcement activity of the German regulators in the light of the lessons learned from the Fukushima accident.</p>

The IRRS Team did not identify elements regarding the responsibilities and functions of the regulatory body which would raise particular concern in the light of the Fukushima accident. Development of regulations, guides and standards is an on-going process in Germany. Most of the issues raised by the lessons learned from the Fukushima accident have been covered by regulations and guides also prior to the event. Moreover RSK was requested to revisit the most important documents and the resulting recommendations shall be taken into account in the revision of the Safety Requirements to be published soon as consensus guidance.

APPENDIX IV – REFERENCE MATERIAL PROVIDED BY BMU AND UM BW

GENERAL REFERENCE MATERIAL

Aarhus Convention
Act on Precautionary Radiation Protection StrVG
Act on the Convention of 20 September 1994 on Nuclear Safety
Act on the Establishment of a Federal Office for Radiation Protection 199707
Act on the Establishment of a Federal Office for Radiation Protection 200005
Act on the IAEA Conventions of 26 September 1986 on Early Notification
Atomic Energy Act 200802 bfs AtG
Atomic Energy Act 201012 bfs AtG
Basic Law Germany - excerpts
Basic principles for authorised experts commissioned by federal supervisory authorities for NPP
Basic Recommendations for Disaster Control in the Vicinity of Nuclear Facilities bfs
CNS 2011 - Report of the Federal Republic of Germany
CNS 2011_Q117_Answer-Support-Document
CNS 2011_questions posed to germany with answers
Code of administrative court procedure VwGO
Commercial Code 249 Handelsgesetzbuch - HGB
Compilation of Information Required for Review Purposes
Cost Ordinance under the Atomic Energy Act - AtKostV
Council Directive 2009 71 EURATOM
Council Directive 2009 71 EURATOM kla
Criminal Code excerpts
Framework Agreement between BMU and GRS
Framework Guideline on the Preparation of Expert Opinions in Nuclear Administrative Procedures
Framework Recommendations for Remote Monitoring of Nuclear Power Stations
Fundamentals safety Management
Guideline concerning emission and immission monitoring of nuclear installations - REI
Guideline Proof of Technical Qualification
Guidelines Concerning the Requirements for Safety Specification
Guides for the Periodic Safety Review of Nuclear Power Plants
Industrial Code 139b
Interpretations Safety Criteria Single Failure
Joint Rules of Procedure for federal ministries GGO
KTA - Legal Basis and Procedures
Notification of a recommendation of the SSK - use of iodine tablets for thyroid blocking
NPP Safety Criteria
Ordinance Concerning the Financial Security Pursuant to the Atomic Energy Act – AtDeckV 199907
Ordinance Concerning the Financial Security Pursuant to the Atomic Energy Act – AtDeckV 200711
Ordinance on nuclear reliability verification - AtZüV
Ordinance on Radiation Protection_200712_ebfs - StrlSchV
Ordinance on Radiation Protection_200712_ebfs – StrlSchV annex
Ordinance on Repository Prepayment Endlager VIV
Ordinance on the Nuclear Safety Officer and the Reporting of Accidents and other Events - AtSMV
Ordinance on the Procedure for Licensing of Installations under p 7 of the Atomic Energy Act- AtVfV.pdf
Ordinance on the shipment of radioactive waste - AtAV

Principles Regarding the Awarding of Subcontracts by Authorised Experts
Principles Licensees Technical Documentation
Radiological Fundamentals on Measures for the Protection of the Population
Report of the Ethics Commission_20110530
Report under the Joint Convention 2009 - Germany
RSK Catalogue of Requirements - Preface_20110330
RSK Catalogue of Requirements_20110330
RSK Guidelines PWR
RSK Summarising assessment and recommendations safety review 20110520
RSK-recommendation on Ageing_rev2004
RSK-Statutes
Safety Criteria for NPPs revD 200906
Safety Review for Nuclear Power Plants pursuant to p 19a AtG - Guide Probabilistic Safety Analysis
Treaty establishing the European Atomic Energy Community (EURATOM)
WENRA Action Plan Germany

BMU

Draft of a Federal Oversight Manual
Training measures for the maintenance of competence of the BMU and BfS staff
trainee programme 2010/2011
Procedure for non-essential modifications in nuclear power plants
Meeting of the Reactor Safety Technical Committee December 2010 Excerpt from the minutes
Strategy for preparing and revising regulations and guidelines including BMU and RSK documents
Supplementary document to R11 and R12:
2011 Annual Objectives of the Directorate-General RS
Process Description Planning and control in the Directorate-General RS
Schedule of responsibilities for Division RS I 4:International
Affairs
of Nuclear Safety, Radiation Protection
and Nuclear Fuel Supply and Waste Management
Bilateral co-operation
Process of EU legislation according to EURATOM - Treaty (EAEC) Directorate-General RS
Document:
Process of preparation of periodic international reports Directorate-General RS
Process of fulfilment of obligations under international conventions
Process of international events led by other ministries Directorate-General RS
Process of international events led by the BMU
Structuring reporting on implementation of recommendations expressed in the information notices of
the GRS
The German Operating Experience Feedback (OEF) Process
Resolution of the Länder Committee for Nuclear Energy - General Committee "Experience
Feedback from Information Notices"
Ageing-Management in Nuclear Power Plants
Status of the Implementation of Suggestions for the Extended Use of Probabilistic Studies
Concept for the determination of the expectations of the interested parties, including the authorities
of the Federation and the Länder
The RS Intranet Portal as Part of the Future BMU Intranet
Operation and Refinement of the RS Portal

UM BW

Coping with special events
Organisational structure of Task Force N

Coping with special events
Regulation of coping with special events
Graphical process representation on coping with special events
Tasks of Task Force N
Organisational structure of Task Force N
On-call duty in Division 3
Regulation on the organisation of on-call duty
On-call duty list (current)
On-call duty list (new)
Regulation of the person on on-call duty – initiations in the event of an alarm
Flow chart – initiations by the person on on-call duty in the event of an alarm
Flow chart for the information obligations in case of disturbances or events
Memcon “Special events in a nuclear installation”
Memcon “Occurrence during the transport of nuclear fuel”
Alarming list
Task force organisation and tasks of the task forces
Regulations on the tasks of Task Force N leader
Graphical process representation on the tasks of Task Force N leader
Regulations on the tasks of Task Force K
Graphical process representation on the tasks of Task Force K
Regulations on the tasks of Task Force S
Graphical process representation on the tasks of Task Force S
Regulations on the tasks of Task Force T
Graphical process representation on the tasks of Task Force T
Task in case of special events during transports
Infrastructure/documents/phone lists
Summary of the most important phone numbers for Division 3
Staff members competent for nuclear installation, transports, after-care
Overview of the offices involved/availability in cases of after-care
Phone list with the most important phone numbers of UVM, plant operators, TÜV
Phone list with the most important phone numbers of UVM, regional councils
Phone list with the most important phone numbers of UVM, LUBW
Report on a nuclear emergency (form sheet)
Basic principles, structure and content of the management system
Mission Statement
Structure of the management system
Overview of the processes of the management system
Managements System Manual
Overview of the persons in charge of the processes
Organizational Manual
Concept for regulatory supervision of nuclear power plants in Baden-Württemberg
Supervision Manual
ILK Report on the Assessment of Nuclear Oversight Activities of the Ministry of Environment, Baden-Württemberg
Workshop on supervisory practice

Basic seminar: Contribution of human behaviour to safety Advanced seminar: Influence of management on safety - Possibilities of information acquisition during plant visits
Procedure for non-essential modifications in nuclear power plants
Meeting of the Reactor Safety Technical Committee
Summary evaluation of the approaches of selected Länder and the KeTAG
Concept for the further development of the management system (MS) of Division 3 on the basis of the results of the IRRS mission
(Agenda item TOP4 Federation-Länder participation in the work relating to IAEA standards and in other international committees)
Competence matrix and staffing plan
Status of the Implementation of Suggestions for the Extended Use of Probabilistic Studies
Structuring reporting on implementation of recommendations expressed in the information notices of the GRS
The German Operating Experience Feedback (OEF) Process
Resolution of the Länder Committee for Nuclear Energy - General Committee "Experience Feedback from Information Notices"
KTA Nuclear Safety Standards Commission Abstract from the Status Report Elaboration of a Concept for Safety Classification of SSCs in Nuclear Power Plants Pursuing International Developments
Issued: 25th August 2010
Definition of the safety performance indicators
Strategic orientation and objectives of the Nuclear Supervision, Radiation Protection Division
Nuclear energy supervision and radiation protection in Baden-Württemberg Activity report 2010

APPENDIX V – IAEA REFERENCE MATERIAL USED FOR THE REVIEW

- [1.] **IAEA SAFETY STANDARD SERIES GS-R-1** - *Legislative and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety*
- [2.] **IAEA SAFETY STANDARD SERIES GS-G-1.1** - *Organization and Staffing of the Regulatory Body for Nuclear Facilities*
- [3.] **IAEA SAFETY STANDARD SERIES GS-G-1.2** - *Review and Assessment of Nuclear Facilities by the Regulatory Body*
- [4.] **IAEA SAFETY STANDARD SERIES GS-G-1.3** - *Regulatory Inspection of Nuclear Facilities and Enforcement by the Regulatory Body*
- [5.] **IAEA SAFETY STANDARD SERIES GS-G-1.4** - *Documentation for use in Regulation of Nuclear Facilities*
- [6.] **IAEA SAFETY STANDARD SERIES GS-R-2** - *Preparedness and Response for a Nuclear or Radiological Emergency Safety Requirements*
- [7.] **IAEA SAFETY STANDARD SERIES GS-R-3** - *Management System for Facilities and Activities*
- [8.] **IAEA SAFETY STANDARD SERIES GS-G-3.1** -
- [9.] **IAEA SAFETY STANDARD SERIES NS-R-1** - *Safety of Nuclear Power Plants: Design Safety Requirements*
- [10.] **IAEA SAFETY STANDARD SERIES NS-R-2** - *Safety of Nuclear Power Plants: Operation Safety Requirements*
- [11.] **IAEA SAFETY STANDARD SERIES NS-R-4** - *Safety of Research Reactors*
- [12.] **IAEA SAFETY STANDARD SERIES NS-G-4.1** - *Commissioning of Research Reactors*

APPENDIX VI – ORGANIZATIONAL CHART BMU



APPENDIX VII – ORGANIZATIONAL CHART UM BW

