Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

Questions and Comments in 2012 on the National Report posed to Germany

Question/ Comment	What are the planned activities in the area of RAW and SF management caused by the political decision to shut down all NPPs in Germany till 2022. Provide details mainly on: - definition of the national policy and strategy, - potential safety impacts of earlier that expected shut downs of NPPs, - availability of sufficient storage and disposal capacities, - availability of human and financial resources (see cz-de-8, 9), - plans to construct new or update existing RAW and SF facilities,…		
Answer	The 13th Amendment of the German Atomic Energy Act foresees the shutdown of all German Nuclear Power Plants until 2022. This decision has no impact on the policy and strategy of the management of radioactive waste and spent fuel. Comparing the prolongation of the lifetime of the NPP in the 11th Amendment of the Atomic Energy Act from December 2010 by an average of twelve years with the 13th Amendment in August 2011, the necessary storage capacity for spent fuel was reduced to about 4,000 tonnes of spent fuel and about 10,000 cubic metres of radioactive waste resulting from the shorter operational life. The challenge regarding the spent fuel from the eight NPPs which were shutdown in 2011 by law is not the sufficient storage capacity but the low burn-up of the assemblies from the last revision of the plants. For these assemblies with a burn-up of a few hundred up to a few thousand Megawatt days per tonne of heavy metal (compared to about 50,000 MWd/t of spent fuel as usual burn-up) the criticality safety during the further steps of spent fuel management must be carefully assessed. The radioactive waste resulting from the decommissioning of NPPs is almost independent from the lifetime of the plant. Necessary storage capacities for the decommissioning waste until the disposal facility Konrad will be in operation (not before the year 2019) must be assessed within the licensing procedure for decommissioning of the plants. Within the licensing procedure for decommissioning of the plants the processing of the resulting radioactive waste from decommissioning is also to be assessed. As a consequence of the Fukushima accident, the Atomic Energy Act (AtG) was amended in August 2011. For eight NPPs the part of the operating licence concerning power generation expired immediately. These NPPs are in the post-operational period (i.e. the phase of transition between operation and decommissioning). The operators will apply for a licence for decommissioning within the next few years. This is a complete new situation for the licencees and the regulators and there might be problems to conduct several decommissioning projects at the same time. Decommissioning and dismantling have to be funded by the owner of the NPP.		

Question/ Comment	After the Fukushima accident, the 13th amendment to the Atomic Energy Act of 6 August 2011 terminated the licenses of several nuclear power plants. - Will this situation lead to simultaneous large-scale decommissioning activities in the near future? If yes, has already Germany plans to efficiently manage these		

	decommissioning activities? - How will this situation impact the foreseen capacities of interim storage and disposal facilities? How will that impact the current planning of putting into operation the disposal facilities? Will Germany need additional facilities?
Answer	- It is in the responsibility of the operator to file an application for a decommissioning licence. Until the end of 2011 no application for a decommissioning licence was filed for one of the eight shut down nuclear power plants. Furthermore it is in the responsibility of the operator to manage the decommissioning activities including application, planning and construction of required interim storage facilities. - The on-site interim storage facilities are dry storage facilities for spent fuel elements in transport and storage casks that are kept in storage halls or tunnel sections, respectively. In all already licenced storage facilities, CASTOR® V/19 or CASTOR® V/52 type casks are used initially. The granted licences for all on-site interim storage facilities applied for until 2000 permit the storage of spent fuel elements with a mass of heavy metal amounting to altogether 14,025 Mg on 1,435 storing positions for transport and storage casks of the CASTOR® type. On the basis of the residual operating time, which were defined for the nuclear power plants in the year 2002, the capacity has been dimensioned in such a way that all spent fuel elements accruing could be accepted until nuclear power plant operation has been discontinued and that they can remain there beyond the time the nuclear power plant has been decommissioned. The storage time for the casks is currently limited to 40 years. Because with commencement of the 13th amendment of the Atomic Energy Law from 31 July 2011 the right for power operation of altogether eight nuclear power plants has expired to the 6 August 2011 and concurrently the residual operating time of the other nuclear power plants will end at latest in the year 2022, the capacities of the on-site interim storage facilities will not be bailed out by the storage of the fuel elements accruing in the future. - Previous prognoses of the arisings of radioactive waste with negligible heat generation were based on the nuclear phase-out stipulated in the agreement between the Federal Government and the major German power utilities, negotiated in June 2000 and signed in June 2001. The prognosis after the Fukushima accident is very similarly to previous forecasts. Radioactive waste from decommissioning of nuclear power plants (NPP) will arise in the same order of magnitude as originally planned but in different periods of time. Furthermore it is in the responsibility of the operator of a NPP to plan and to construct the required storage facilities. Germany does not need additional disposal facilities for this type of radioactive waste.
Question/ Comment	How do the Mobile conditioning installations for the treatment and packaging of operational waste condition the waste?
Answer	Reliable mobile conditioning installations are available for the following applications and radioactive waste types: (1) - Treatment: Compaction of solid waste - Facility name: High-pressure hydraulic press FAKIR - Conditioning method: Processing of loose waste or compressible drums with combustion residues or solid waste to compacted pellets with the aid of metal cartridges; waste volume reduction up to factor 10

	(2) - Treatment: Drying (2.1) - Facility name: Drying facility of the PETRA type - Conditioning method: Drying of humid or wet solid radioactive waste or sludges being packaged in 200-, 280- and 400-l drums is based on the principle of vacuum drying. The Petra facility can be used downstream for drying the compacted pellets from FAKIR being packaged in 200-l drums. (2.2) - Facility name: Drying facility of the FAVORIT type - Conditioning method: The treatment of radioactive liquid waste as evaporator concentrates and sludges is based on the principle of vacuum drying. The volume reduction depends on the amount of solid in the liquid. The liquid can be filled into MOSAIK®-casks which are subjected to jacket heating. (2.3) - Facility name: Drying facility of the KETRA type - Conditioning method: Drying of humid solid radioactive waste (e.g. core scrap) being packaged in MOSAIK®-casks which are subjected to jacket heating. (3) - Treatment: Dewatering (3.1) - Facility name: Decanting facility of the FAFNIR type - Conditioning method: Decanting of radioactive resins (e.g. bead resins) from filled containers into MOSAIK®-casks is based on vacuum extraction. (3.2) - Facility name: Final dewatering facility of the NEWA type - Conditioning method: Final dewatering of decanted radioactive resins (e.g. powder and bead resins) is based on the vacuum extraction of liquids. (4) - Treatment: Underwater disassembling - Facility name: Underwater shear of the UWS type - Conditioning method: Underwater disassembly/ shearing of core scrap (5) - Treatment Combining underwater disassembling and pre-compaction - Facility name: Disassembling and pre-compaction facility of the ZVA type - Conditioning method: Underwater disassembly/ shearing of core scrap with subsequent high-pressure compaction in insert baskets		
Question/ Comment	When would you expect the Gorleben pilot conditioning plant (PKA) to become operational for the conditioning of spent fuel?		
Answer	According to a collateral clause in the licence of the Gorleben pilot conditioning plant (PKA), its operation is currently restricted to the repair of defective transport and storage casks for spent nuclear fuel assemblies and HAW glass canisters. If a repository site for heat-generating waste will be selected in future, the PKA may start its operation conditioning spent nuclear fuel. At present, a revised approach to the disposal of heat-generating radioactive waste including a site-selection procedure and amended or new legislation is prepared. Thus, an indicative schedule for spent nuclear fuel conditioning can currently not be provided.		
Question/	What are the next steps for the decommissioning of the Asse II mine?		

Comment

Answer The next steps for the decommissioning of Asse II mine are - according to the plan of action resulting from the comparison of options:
(1) The plannings of the waste retrieval are to be completed until they reach execution level.
(2) By examining the actual conditions of the emplacement chambers, comprehensive possibilities are to be created for a systematic evaluation of the critical uncertainties (fact finding).
(3) Parallel to this, all technically feasible measures to stabilize the mine need to be carried on.
(4) At the same time, emergency measures to limit the impacts of an uncontrollable water influx need to be taken. This includes an assessment of its consequences for long-term safety.
Current works relating to retrieval are taking place in two areas:
- Fact finding
- Technical planning
The trial phase (fact finding) is the first step of the overall task “retrieval of the radioactive waste”. This would typically be followed by planning works for retrieval. Both parts need to be pursued in parallel, however. Due to the state of the mine (inflow of saline solution, deformation) this procedure is mandatory for decommissioning the Asse mine. A special challenge of this approach consists in the fact that initial planning works already start although essential fundamentals can only be derived from the results of the fact finding.
Current works in terms of retrieval planning comprise
- conceptual planning of an interim storage facility,
- renewal of the existing hoisting plant,
- sinking of a new mine shaft.
In order for retrieval being successful, even under the unfavourable site conditions and/or the beyond-design water influx that cannot be ruled out, precautionary measures and the establishment of an emergency response need to be prepared and implemented, in case an uncontrollable water influx should occur. These works are also carried out parallel to the fact finding and planning of retrieval.

Question/ Comment Ireland would like to thank Germany for preparing a comprehensive national report on the implementation of its obligations under the Joint Convention.

Answer Germany thanks […] for this statement. The German national report is not only produced for the review meetings of the contracting parties of the Joint Convention but also as a comprehensive report on waste and spent fuel management for the German parliament and the public in lieu of the National Waste Management Plan or Programme which is not yet finalized.

Question/ Comment It is stated in Section A.2. for the Konrad mine that "Parts of the emplacement area are being prepared. Emplacement operation is expected to start in 2019".

Is the determination of emplacement area by the implementor also part of objectives or roles o,† the regulation?
If so, how has the regulation been involved in the determination?

Answer At the present stage, construction of the repository is not expected to be completed before 2019. The emplacement areas within the Konrad repository are already

	determined by the plan approval licence. The implementer is preparing the emplacement area in accordance with this plan approval licence.		
Question/ Comment	Summary states that the clearance level was revised according to the revision of the Waste Law. - What are the dominant revisions for clearance? - What is the regulatory procedure of the clearance for radioactive waste?		
Answer	The regulatory procedure for clearance has been described in the German report in detail in section F.4.5 (pp. 159 - 162). Clearance is subject to a licence of the competent authority. The revision of the clearance regulations in the Radiation Protection Ordinance (StrlSchV) mainly consisted in the replacement of the set of clearance levels for waste for disposal on landfill sites (col. 9 in Table F-3) by four different value sets (col. 9a - 9d) for clearance of wastes with quantities of not more than 100 Mg/a or not more than 1,000 Mg/a for disposal or for incineration. These values have been based on updated radiological models taking into account changes in the legislation on disposal of (conventional) waste, such as requirements on the construction of landfills or on the composition of wastes.		
Question/ Comment	Summary states that - There are conceptual considerations regarding the design of a repository. - The concept of direct disposal provides that following interim storage of several decades, spent fuel will be packed into containers suitable for disposal and that these will be sealed leak-tight and emplaced in drifts or boreholes in deep geological formations. - The prototype of a facility for packaging spent fuel in containers suitable for disposal has been built. - The aim is to commission a repository around the year 2035. - What is the plan for site selection of spent fuel repository?		
Answer	As part of the work of AKEnd (Working Group for the Selection Procedure for Repository Sites) a principle approach for a site selection process for a repository in geological formations for highly radioactive waste, including spent nuclear fuel, has been developed. One of the major points was to determine how the public can be involved in the decision making process. In recent years the proposed approach has been developed further to a site selection process. The plan is to enshrine this site selection process in legislation so that there is a regulatory basis for using this process. Currently negotiations between the federal and the states (Länder) governments take place about a first draft law for a site selection process. Aim is to select a site until 2027.		
Question/ Comment	What is your operation experience in dry storage of the spent fuel?		
Answer	Since 1970 dual-purpose casks for transport and storage of spent fuel have been developed, tested, fabricated and licenced in Germany and since 1995 the dual-purpose casks loaded with spent fuel from German nuclear power plants have been stored in interim dry storage facilities. The original plan was to store them in the		

two centralized storage facilities at Gorleben and Ahaus, which were constructed accordingly, licenced and built. Due to an agreement between the German utilities and the government in June 2001 any transport of spent fuel from German nuclear power plants to the two central storage facilities is prohibited. Consequently, 12 decentralized interim storage facilities close to the reactor sites were newly erected and taken into operation. With the simultaneous ban of any delivery of spent fuel to the reprocessing plants abroad from July 2005 onwards the intermediate storage of spent fuel is the only step in practice in Germany today. Consequently, a great experience in loading and processing of dual purpose casks, especially of the type CASTOR® V, and their dry storage has been gained especially regarding the drying of the wet loaded casks prior to long-term intermediate storage. From 2006 approximately 35 to 45 CASTOR® V-casks were loaded yearly, thereof on average 2/3 CASTOR® V/19-casks with 19 PWR-fuel assemblies and 1/3 CASTOR® V/52-casks with 52 PWR-fuel assemblies. The loaded casks are linked to a cask monitoring system which monitors the leak tightness of each loaded cask during the intermediate storage period. The pressure switch enables a continuous monitoring of the pressure in the space between primary and secondary lid. In case of a pressure drop below the specified limit an alarm of the pressure switch will be triggered. During the operating time from 1995 up to now there was no unallowable pressure drop in the inter-lid space due to increased leak rates beyond the specification. Every alarm which occurred in Germany so far was an alarm which had been caused by the pressure switch itself. As a self-monitoring system a defect of the pressure switch is indicated, too. None of the alarms so far were triggered by external influences which are independent from the function of the pressure switch.

Question/ Comment	The chapter F.4.1. Basis states that “The basic radiation protection standards of the IAEA [IAEO 96] and the recommendations of the ICRP are taken into account. The ALARA principle is taken into account by § 6 StrlSchV which forbids any unnecessary radiation exposures and contamination of man and the environment and which contains an obligation to keep the contamination of man and the environment as low as possible, even below the limits (imperative of minimization), by taking into account the state of the art in science and technology and consideration of all circumstances of the individual case”. Question 1: Regarding the implementation of the Radiation Protection Ordinance(§ 6 StrlSchV) in nuclear installations for spent fuel management or radioactive waste facilities in Germany, how is the ALARA principle implemented under the organizational point of view (e.g. ALARA Committee, procedures…)? Question 2: How are the inspections to spent fuel and radioactive waste facilities and decommissioning activities carried out in Germany, on the aspects of occupational radiation protection and on the application of the ALARA principle (e.g. technical guides, procedures…)?		
Answer	Regarding Question 1: Implementation of the ALARA principle (or minimization according to § 6 StrlSchV) is part of the duties of the radiation protection supervisor and of the radiation protection commissioner, who are responsible for the minimization of radiation exposure even below the given threshold values, should suitable measures be identified. Suitability has to be checked individually. Procedures for this are addressed in the operating manuals of the respective facility. Germany has put into force a technical guideline for optimisation processes at different working places.		

	This guideline will be part of the licence. Regarding Question 2: Responsible for supervision of all nuclear installations are the Laender (federal states). Extent and manner of supervision is mostly commensurate to the magnitude and likelihood of exposure resulting from the practice (graded approach).
Question/ Comment	Radiation exposure of occupationally exposed individuals: Question 3: Does Germany publish periodically the results of the dosimetry control to exposed workers from spent fuel and radioactive waste facilities and decommissioning activities? How frequently? Does Germany publish the results of consecutive years? Could you provide reference to any document/s where this information could be looked up and updated? Additionally, we would appreciate receiving a summary of maximum and collective doses for the last five years as well as bar charts, if possible.
Answer	Regarding Question 3: The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) publishes yearly a general report on environmental radioactivity and radiation exposure (“Umweltradioaktivität und Strahlenbelastung”), which also contains an overview of data for occupationally exposed persons employed in nuclear facilities. Each report refers to data for the last 10 consecutive years. Individual data are collected by the competent authority, but not published. The latest report, referring to data of the year 2009, has been published in March 2011. It is available via http://doris.bfs.de/jspui/bitstream/urn:nbn:de:0221-201103025410/3/JB_Umweltradioaktivitaet_2009.pdf Some summarized information can be gained from the formal parliamentary information, which is available via http://doris.bfs.de/jspui/bitstream/urn:nbn:de:0221-201103305424/1/Parlamentsbericht2009.pdf
Question/ Comment	The German report doesn't give any information about depleted uranium. Could Germany specify if depleted uranium is considered as a potentially valuable product or as a waste that falls within the scope of the Convention?
Answer	At present depleted uranium hexafluoride is considered as a potentially valuable product and not as a waste to be disposed of. Thus, it does not fall into the scope of the Joint Convention. Depleted uranium oxide which could be considered as radioactive waste is currently not stored in Germany. A storage facility for depleted uranium oxide at the site of the German enrichment plant is under construction.
Question/ Comment	The report states that “… spent fuel from German nuclear power plants and research reactors which are intermediately stored with the intention of disposal. That German spent fuel which was delivered to France or the United Kingdom for reprocessing do not fall within the scope of this Article, and is therefore not subject to reporting”. Could Germany provide more information on its strategy in respect of SF reprocessing?
Answer	As described in Chapter D.2.1 (Table D-3), Germany delivered approximately 6,300 tHM of spent fuel until 30 June 2005 to reprocessing plants in France and the

UK. All residues will be taken back as vitrified HAW canisters, vitrified process residues and highly-compacted technological waste in universal canisters. For the spent fuel the licencees must provide evidence of the non-hazardous re-use of the plutonium separated during reprocessing. This shall ensure that throughout the remaining operating lives of the nuclear power plants, all separated plutonium will be processed to MOX fuel and then re-used. The uranium from reprocessing will be mainly re-used as enriched reprocessed uranium (ERU) fuel.

Question/ Comment: What is the meaning of the last sentence on page 184 ("Due to optimized strategies…")?

Answer: Due to optimized strategies for the use of nuclear fuel in German nuclear power plants, the accumulation of spent fuel has been reduced in the last years. This means that with higher fuel enrichment and higher burn-up, less spent fuel will be produced.

Question/ Comment: In Section G.1.7., it is described that interim storage (of spent fuels) is limitted to a maximum of 40 years.
In Section G.2.2., it is described that the PSR of interim storage facilities is to be conducted ten years after commisioning, this means after the first emplacement operation and then (it will be done) every ten years.
In Summary of this report (page 22), (2) Interim storage facilities at Gorleben and Ahaus, the situations with regard to application and granting of licence are described.

For clarification, we would like to ask the following questions.
(1) When was the first emplacement of spent fuels carried out or wiil be carried out in Goreleben and in Ahaus? If the first emplacement of fuel was already carried out, when the first PSR will be conducted? What will be done after 40 years?
(2) In the interim storage facilities of Goreleben, the emplacement of vitrified HAW glass canister was already done in the year of 2010. Will the PSR be done only for spent fuels or also for the vitrified HAW glass canisters which are placed in the same repository?

Answer: (1) The first emplacement of a dual-purpose cask has been carried out in 1992 in Ahaus and in 1995 in Gorleben. As a result of the WENRA (Western European Nuclear Regulator's Association) process and of the transposition of the COUNCIL DIRECTIVE 2009/71/EURATOM of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations, periodic safety reviews (PSR) of spent fuel storage facilities are newly introduced in Germany. The first PSR in Germany will be a pilot periodic safety review and is currently in preparation for two interim storage facilities to be performed during the next two years. All other interim storages will follow shortly. The commissioning of a repository for the disposal of spent fuel and heat-generating waste is planned around the year 2035. The storage period has to be extended if there will be no

repository available in time.
(2) The PSR refers to the interim storage facility and its stored casks regardless of their content. The PSR treats all issues related to safety relevant changes during the last ten years. The following aspects have to be taken into account: safety-relevant changes carried out or occurred during the review period (i.e. changed regulatory requirements, modifications of the facility, changes in the operating conditions or in the site conditions, organisational changes), evaluation of operating experience, review and (if necessary) update of the accident analysis, ageing management and safety management (organizational and personnel measures).

Question/ Comment: Section G.2.2. states that "The overall aim of the Periodic Safety Review (PSR) of interim storage facilities is to review the safety levels of nuclear installations regularly according to the state of the art in science and technology, to assess the determined deficiencies and to remedy the identified deficiencies".

In case of what findings are identified, are the deficiencies improved? And, how are the findings obtained?

Answer: The operator has to show by a detailed documentation that all safety related requirements have been fulfilled during the ten-year review period. The PSR and its results as well as any measures derived have to be documented by the licencee and presented to the competent supervisory authority. The documentation will be reviewed by the supervisory authority and independent experts. The results of the PSR have to show that the main protection goals (i.e. confinement of radioactive material, radiation shielding, maintenance of sub-criticality, removal of decay heat) and the requirements derived therefrom are achieved for the remaining licenced period of operation. All identified deficiencies have to be corrected by the licencee. The improvement measures to be taken are specified by the licencee in agreement with the supervisory authority.

Question/ Comment: The text states that the preliminary safety analysis for the German repository will be peer reviewed by international experts. Please describe how the review process will be implemented. What is the public's role in the safety analysis review?

Answer: Taking into account new developments in Germany's radioactive waste management policy the preliminary safety analysis for the Gorleben site and the international Peer Review on the results of this preliminary safety analysis will be focused on a nationwide site selection process for a repository site for heat generating radioactive waste. In this context general procedures and the performance of the preliminary safety analysis for the Gorleben site can be regarded as a demonstration of existing competences particularly concerning the site characterisation and safety analyses for a potential repository site in the host rock salt in Germany. The knowledge gained by performing the preliminary safety analysis will be applied for a site selection procedure on the basis of comparative safety analyses for different sites and different host rocks. The preliminary safety analysis is laid out in substance as a scientific project. Therefore the preliminary safety analysis will not work on issues regarding the licensing procedure of a repository for heat generating waste in deep geological formations, or on legal aspects of operating a repository nor on aspects of managing radioactive waste. Within the scientific project of the preliminary safety analysis Gorleben there is a

	scientific debate among experts and also public information e.g. via the Gorleben-Dialog but no public involvement. The preliminary safety analysis will be accomplished by the end of 2012. According to the timetable of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety an International Peer Review will in 2013 investigate methodical aspects of the preliminary safety analysis and of the evaluation of the repository concept. The Peer Review will thus result in a valuation of the required competences and methods, the required geoscientific data as well as the demand for research- and development-work for future comparative site investigations. Before that in 2012 so called “Terms of Reference” for the International Peer Review have to be developed. These “Terms of Reference” will be publicly debated with national experts and stakeholder. Currently the specifications for the International Peer Review and the process for the public involvement are to be worked out.
Question/ Comment	Which organization represents Germany in FINES system and how does it communicate with the operators of SF management facilities? What kind of significant incident have occurred in SF storage facilities since the last review meeting of JC?
Answer	(1) The National FINAS (Fuel Incident Notification and Analysis System) Coordinator is located at the Federal Office for Radiation Protection (BfS). (2) The communication between the management of spent fuel facilities and the National FINAS Coordinator is implemented by a complex reporting system, as described below. This process is applied in the same manner to all FINAS reports in all facilities of the nuclear fuel cycle. In Germany there is an obligation of the operators of all nuclear installations to report on accidents, incidents or other events relevant to safety (reportable events), according to the Nuclear Safety Officer and Reporting Ordinance (AtSMV). An event in a spent fuel facility is reportable if it meets the criteria of the AtSMV specified in Appendix 5. If such an event occurs, the operator has to report this to the competent supervisory authority. The supervisory authority, in turn, after its initial evaluation of the circumstances, will report the event to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and, in parallel, to the Federal Office for Radiation Protection (BfS) as the central registration agency and to the Gesellschaft für Anlagen- und Reaktorsicherheit (GRS), an expert organisation working on behalf of the BMU. The categorisation of the event is reviewed by the BfS also at the federal level. After receipt of the final report of the event, the National FINAS Coordinator and the Incident Registration Centre at BfS evaluate, if FINAS reporting criteria are fulfilled. If the FINAS reporting criteria are met, a report is created by the Incident Registration Centre and the National FINAS Coordinator. The final FINAS report is sent to the operator, to review the information in the report only with respect to company know-how or production knowledge. After the approval by the BMU, the FINAS report is sent to the IAEA/NEA FINAS Secretariat. (3) Since the last meeting, in German interim storage facilities there were 11 events (evaluation period 1 January 2009 20 February 2012), which were reportable according to the German reporting criteria (see AtSMV Appendix 5). No event had any safety significance or met the FINAS reporting criteria. All events are rated at INES level 0.
Question/	In regard to the life expectancy of an interim storage facility, what is the likelihood

Comment of extending the license to beyond 40 years? What are the technical, regulatory, and public involvement requirements that must be addressed to carry this out?

Answer The necessity of extending the on-site interim storage facilities' time of operation depends on taking into operation a repository for heat-generating waste in due time. The federal government intends to take into operation a repository for spent fuel and heat-generating waste around 2035. For the central interim storage facilities the licences for the storage of nuclear fuels will expire in 2034 (TBL Gorleben), 2036 (TBL Ahaus) and 2039 (ZLN near Rubenow). It is thus necessary to extend the central interim storage facilities' time of operation. The operation of the storage facilities on the nuclear power plant sites is licenced until between 2042 and 2047. The licensing procedures for the extension of the operating time are to be accomplished in sufficient time before deadline accordant to the same legal boundary conditions as for the first licences. In the assessment for the prolongation of the operation licences in particular the operation experiences of the next decades have to be taken into account.

Question/ Comment The site-specific safety analysis covering a period of one million years is required for the plan approval procedure of the disposal facility.
Question:
How can an analysis realistically cover that large a period of time?

Answer The determination that the site-specific safety analysis should cover a period of one million years is based on the recommendations of the AkEnd (Committee on a Site Selection Procedure for Repository Sites) issued in 2002. In its final report the AkEnd linked the period of one million years to the ability to predict the development of the isolation rock zone of a well chosen site:
"The aim of disposal is to isolate the waste safely from the environment. The quality of the isolation decisively depends on the period during which the radioactive material is retained in the isolating rock zone of the repository. The site shall be selected in a manner that a longest possible isolation period is achieved. In this respect, both the time periods of radiotoxicity and the half-lives of the radionuclides in the respective waste spectrum as well as the geological time periods have to be considered, for which practically reasonable predictions can be made according to the state of scientific knowledge.
The objective of the selection procedure is to find sites which have favourable overall geological settings for the implementation of a repository for all types of radioactive waste. The radioactive waste also contains radionuclides with half-lives which are longer, by far, than the periods for which practically reasonable predictions on geological developments can be made. This applies, in particular, to the uranium contained in the spent fuel elements. Nature shows that a number of uranium ore deposits can be enclosed by rocks over geological periods of time without negative effects on the biosphere.
With regard to the requirement of isolation of radioactive waste from the biosphere it can be stated that certain rock formations only show low permeabilities for fluid phases or that they are even water tight in the technical sense due to their physical and chemical properties and to the type of rock formation. Any well-founded predictions of the future evolution of such rock formations and their properties can only be made if the geological setting and its geological history are taken into account. Here, the prediction period is closely related to knowledge of geological evolution in the past. If the evolution of such a geological system can be traced back over many millions of years and can be scientifically interpreted and if

furthermore no major changes of the safety-relevant features of this geological system are registered, justified predictions about its future evolution can be made that lie within an order of magnitude of one million years. This is the case for large areas in Germany.
The Committee is of the opinion that, according to scientific knowledge, practical and reasonable predictions of the geological evolution of sites in favourable areas, as they exist in Germany, can be made for a period in the order of magnitude of one million years. These are the prerequisites for furnishing proof on the long-term safety of a repository in a licensing procedure at a later stage.
For the development of quantitative criteria for the identification of repository sites with favourable overall geological settings, the Committee defined that the isolation period shall lie within an order of magnitude of one million years.“ (from: Site Selection Procedure for Repository Sites, Recommendations of the AkEnd - Committee on a Site Selection Procedure for Repository Sites, 2002, p. 27-29)

Question/ Comment
It is described in Section G.7. that the site-specific safety analysis covering a period of one million years is required.

On what basis is the time period of one million years determined ? There may have been a lot of discussions on this point. What kind of opinions have there been on this point ?

Answer
The time period for the long term safety assessment is broadly accepted in the scientific community in Germany.
The determination that the site-specific safety analysis should cover a period of one million years is based on the recommendations of the AkEnd (Committee on a Site Selection Procedure for Repository Sites) issued in 2002. In its final report the AkEnd linked the period of one million years to the ability to predict the geologic development of the isolation rock zone of a well chosen site. In Germany the relative best sites should be able to comply with this criterion. Here, the prediction period is closely related to knowledge of geological evolution in the past. If the evolution of such a geological system can be traced back over many millions of years and can be scientifically interpreted and if furthermore no major changes of the safety-relevant features of this geological system are registered, justified predictions about its future evolution can be made that lie within an order of magnitude of one million years. This is the case for large areas in Germany.
A realistic calculation of radiological consequences is not required up to 1 million years after closure. It has to be demonstrated, that the dose constraints can be meet with high reliability.

Question/ Comment
It is described in Section G.7. that it must be guaranteed that the waste containers can be retrieved for a period of 500 years after the closure of the repository in case of emergency.

On what basis is the time period of 500 years determined ? There may have been a lot of discussions on this point. What kind of opinions have there been on this point?

Answer	It is required, that waste containers for heat generating waste can be handled for a period of 500 years after closure. Retrieval of heat generating waste has to be guaranteed for operational phase only. The requirement for retrieval is a result of the societal perception of the risks from the Asse mine. Supported by former research results it is assumed, that waste containers can be constructed as mechanical resistant up 500 years even in a salty environment. The scientific and societal discussion about retrieval is still not finished. Fear of loss of control after emplacement of waste is a societal motivation for the requirement. Restriction for retrieveability to operational phase is of economic reasons. Restriction for recoverability up to 500 years is of technical reasons.
Question/ Comment	Isolating rock zone: radioactive waste must be isolated in such a way that it remains in situ, at best only minimal quantities of substances are able to exit this rock zone. What does “minimal quantities” means”? Can you quantify it? The retrieval of waste is required for a period of 500 years after closure of the repository. What are the reasons from a safety perspective and what are the justifications for these 500 years?
Answer	The Safety Requirements on the Disposal of Heat-generating Radioactive Waste as of September 30, 2010, state that radioactive waste must be isolated in the isolating rock zone in such a way that it remains in situ and, at best, only minimal quantities of substances are able to exit this rock zone. At present, an advising body of the Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU, Federal Ministry for Environment, Nature Conservation and Nuclear Safety) is preparing a more detailed definition or description of the term “minimal quantities” in order to enhance its appreciation or understanding and, thus, to provide clarification. It is required, that waste containers for heat generating waste can be handled for a period of 500 years after closure. Retrieval of heat generating waste has to be guaranteed for operational phase only. The requirement for retrieval is a result of the societal perception of the risks from the Asse mine. Supported by former research results it is assumed, that waste containers can be constructed as mechanical resistant up 500 years even in a salty environment. The scientific and societal discussion about retrieval is still not finished The time period of 500 years is linked to a working hypothesis which was taken in R & D work on waste containers for spent nuclear fuel performed in the mid-1980s. The time period do not result from a conceptual or site-specific safety assessment for a repository in geological formations. Respective investigations are currently performed within the Gorleben preliminary safety assessment.
Question/ Comment	How are the interdependencies among the different steps in radioactive waste management taken into account, especially how it is assured that currently stored RAW will comply with WAC for disposal?
Answer	The Konrad Waste Acceptance Require¬ments are the guidelines for the conditioning of currently stored radioactive waste with negligible heat generation. The term “conditioning” describes the measures for the production of radioactive waste packages suitable for disposal in the Konrad repository. Radioactive waste with negligible heat generation of all waste generators must be conditioned

	according to the Konrad requirements. The fulfilment of the Konrad waste acceptance requirements must be demonstrated prior to the shipment of waste packages to the repository.
Question/ Comment	Past practices. Could Germany indicate how the chemical toxicity of uranium is also taken into account to define the end of the site remediation?
Answer	Chemical toxicity is not taken into separate account for rehabilitation measures that have already been running for quite some time. The reasons for this are as follows: - Other heavy metals (e.g. copper, nickel, cobalt) and arsenic were taken into account in the chemotoxic assessment of aqueous effluents. In comparison with these metals the chemotoxic relevance of uranium was of minor importance. - In addition, the installation and use of private wells in particularly endangered zones (settlement in the vicinity, located directly downstream from a deposit) is prohibited. When the licence for the proposed site rehabilitation was issued, water law had yet to determine a reference value for uranium. In instances where uranium has been subject to separate chemotoxic analysis, this must therefore be seen as case by case decision by the regulatory authority.
Question/ Comment	The national report states that radioactive waste that is delivered to the Land collecting facilities is subjected to visual inspection of the outer surfaces of certain waste packages. It would be appreciated if Germany would clarify what is meant by “visual inspection” and whether it includes actions such as dose rate measurements and surface contamination checks?
Answer	Prior to emplacement of the radioactive waste packages in the storage building of the Land collecting facility Mitterteich, the following inspections of the waste packages are performed: - dose rate measurement, - checks for surface contamination, - visual inspection of the waste package with respect to discernible damage and correct labelling. However, the explanations in the national report refer to the visual inspections of the waste packages already in storage. In the Land collecting facility Mitterteich, these inspections are performed four times per year on waste packages, which are directly accessible. These inspections comprise: - visual inspection of the accessible surface (lid and body) of the waste package with respect to corrosion - visual inspection of the waste package with respect to deformation, and - spot-checks on any other peculiarities and anomalies. In addition, the regulator selects “reference waste packages” for further inspections, comprising an annual check for surface contamination and the abstraction of a gas sample every three years, in addition to the visual inspections.
Question/ Comment	The national report states that the general public are involved at the licensing stage for planned radioactive waste management facilities or installations. It would be appreciated if Germany could provide additional information as to what this public involvement consists of?

Answer	The public involvement in the licensing stage for planned radioactive waste management facilities or installations is ensured by means of the Environmental Impact Assessment Act (UVPG) and the Atomic Energy Act (AtG) including ordinances. For example, projects to construct a spent fuel management facility are publicly announced and the documents are publicly displayed. At a later stage of the procedure the previously filed objections against the planned work are discussed, under participation of the authority, the objectors and the applicant. In this so called public hearing it is intended to provide those who have raised objections within a specific period of time with the opportunity to explain their objections.

Question/ Comment	What is the scientific justification of effective dose limits applied for the post-closure phase of disposal facility lifetime in case of probable (10 ƒÝSv/y) and less probable (0,1 mSv/y) developments? These values are almost one order of magnitude lower that values recommended by the IAEA, other international organizations and national regulators and their implementation may lead to unjustified reduction of the inventory of disposed RAW. What was the reason to close the disposal facility in Morsleben?
Answer	Question 1: The dose constraints are orientated on best performance of deep geologic disposal as documented in reports about long term safety of geologic disposals in other countries. It is expected, that a geologic disposal can meet this dose constraints due to the very stable geologic conditions in Germany. The dose constraint of “in the order of 10 µSv” corresponds to the negligible annual dose “in the order of some 10 µSv a year” for release from regulatory control. From the German point of view the risk by exposure of the public during the post-operational phase after repository closure without oversight should be comparable to the exposure situation where no further regulatory control is needed (negligible annual dose). Question 2: Because of the actual situation in the end of the 1990s (enhanced techniques for conditioning of radioactive waste, coming-next plan-approval for KONRAD-repository) and because the disposal of radioactive waste in the Morsleben repository was no longer acceptable for safety reasons the BfS decided to finish emplacement of radioactive waste and to restrict the further work to decommissioning of the ERAM-repository. With letter dated 12 April 2001, the Federal Office for Radiation Protection irrevocably waived the acceptance of further radioactive waste and its disposal in the Morsleben repository. With decision of the “Deutscher Bundestag” at 14 December 2001, the German Atomic Energy Act was changed so that acceptance and disposal of radioactive waste in the ERAM-repository is no longer allowed.

Question/ Comment	It is described in Section H.4.3. that the potential radiological exposure in the post-closure phase should not exceed an individual effective dose of 0.1mSv per year in the case of probable developments and of 1 mSv per year in the case of less probable developments. Please provide us with clear definition of the case of probable developments and the case of less probable developments.
Answer	The SSK recommendation of 15 December 2010 on the Morsleben repository for

radioactive waste (ERAM) states that the potential radiological exposure in the post-closure phase should not exceed an individual effective dose of 0.1 mSv per year in the case of probable developments and of 1 mSv per year in the case of less probable developments. According to the safety requirements, it is to be demonstrated for a repository for heat-generating radioactive waste to be constructed that in the post-closure phase an additional effective dose in the range of 10 ìSv per year in the case of probable developments and of 0.1 mSv per year in the case of less probable developments will not be exceeded.
In the definitions section of the German Safety Requirements for the Disposal of Heat-Generating Radioactive Waste probable and less probable developments of a disposal system are defined as follows:
“Probable developments refer to normal developments forecasted for this site, and developments normally observed at comparable locations or similar geological situations. The forecasted normal development of properties should be used as a basis when considering the technical components of the final repository. If quantitative data on the probability of a certain development occurring is available, and the probability of it occurring in relation to the reference period is at least 10%, this shall be considered a probable development.
Less probable developments refer to developments which may occur for this site under unfavourable geological or climatic assumptions and which have rarely occurred in comparable locations or comparable geological situations. A consideration of the technical components of the final repository should be based on the normal forecasted development of their properties upon occurrence of the respective geological development. Any unfavourable developments in the properties of the technical components that deviate from normal development should also be investigated. Repercussions on the geological environment should be considered. Apart from such repercussions, anticipated geological developments should also be taken into account. Within such a development, the simultaneous occurrence of several unrelated faults should not be assumed. If it is possible to make a quantitative statement on the probability of a certain development or an unfavourable development in a technical component’s properties, this should be taken into account if the probability in relation to the reference period is at least 1%.” (from: Safety Requirements Governing the Final Disposal of Heat-Generating Radioactive Waste, as at 30 September 2010)

Question/ Comment	What is the timeframe for the decommissioning of Asse II mine (“without delay”)? Did the operator of Asse II mine performed updated safety assessment taking into account the new hydrogeological situation in the mine and if yes, what were the results? Do the results of the safety assessment justify the need to decommission Asse II mine? How does the proposed retrieval of all disposed RAW comply with the ALARA principle?		
Answer	The comparison of options for decommissioning of the Asse II mine was based on preliminary feasibility studies for technical realization. Recent estimations of the duration for decommissioning including total retrieval tend toward time frames up to 40 years. Uncertainties regarding the actual condition of the waste repositories, the necessary recovery technique and licensing procedure may prolong time substantially. Updated safety assessments were performed taking into account the beyond-design		

	event of uncontrollable water influx (natural flooding). In this case, and without the realization of any precautionary measures and measures of hazard control, the limiting values for maximum public exposure could not be met. However, it could be demonstrated that the realization of precautionary measures and measures of hazard control improves potential radiological impacts by two orders of magnitude. Updated long-term safety assessments for alternative decommissioning options besides waste retrieval have not yet been carried out. Taking into account the present state of knowledge, only the retrieval option results in the justified expectation that a proof of long-term safety may be provided. Preliminary feasibility studies for the waste retrieval lead to the expectation that radiological impacts during operation and aftercare fall below limiting values.
Question/ Comment	How is the “longer interim storage” defined (time span)?
Answer	The term “longer interim storage” for radioactive waste is not defined within the requirements of the Reactor Safety Commission (RSK). Currently the storage of radioactive waste licence is for a period of time between ten years and unlimited depending on the application of the licence. As described in the German report, the repository Konrad will start operation at the end of this decade (not before the year 2019) and the waste generators or the operators of the storage facilities are legally bound to deliver the radioactive waste to the repository. This means that the radioactive waste with negligible heat generation which is recently stored in the facilities will be disposed of during the next decades.
Question/ Comment	Interim) storage is defined in the JC “means the holding of spent fuel or of radioactive waste in a facility that provides for its containment, with the intention of retrieval.” How does the practice to issue licenses for RAW storage facilities for unlimited period comply with this definition?
Answer	Currently the storage of radioactive waste licence is for a period of time between ten years and unlimited, depending on the application of the licence. The reason for the unlimited licences of some storage facilities is historical, at that time nobody could foresee the start of operation of a disposal facility. As described in the German report, the repository Konrad will start operation at the end of this decade (not before the year 2019) and the waste generators or the operators of the storage facilities are legally bound to deliver the radioactive waste to the repository. This means that the radioactive waste with negligible heat generation which is recently stored in the facilities will be disposed of during the next decades. Because of the clear legal position there is no doubt about the retrievability of the radioactive waste even in storage facilities with unlimited periods for the storage. Regarding the storage facilities for spent fuel, the storage licence is currently limited to 40 years.
Question/ Comment	The national report notes that adaptations to the state of the art in science and technology were demanded and carried out in the past due to false declarations in the documentation of waste. It would be informative if Germany could provide further information relating to this false declaration, including whether it was intentional and any sanctions taken against the operators of the waste management facility.

Answer	This part of the report refers in general to the improvement of licensing requirements for waste packages and interim storage facilities due to the developing state of the art in science & technology as well as experiences gained during operation and supervision. One example of false declaration refers to experiences made in 2000, when waste packages, originating from paste practices dating back in the late 1970's, and stored in the Land collecting facility in Geesthacht, were analyzed in order to reassess their status and evaluate the necessity of repackaging and reconditioning measures. During this campaign, 28 waste drums have been opened and their content documented and compared to the waste documentation provided on delivery. The findings were that for 16 drums the content deviated significantly from the original waste documentation, concerning activity, chemical reactivity, liquid content and conditioning. All drums could be traced back to a single deliverer. The findings led to the conclusion of an intentional violation of waste acceptance criteria. Consequently, and in due consideration of the time span of more than 20 years since the deliverance of the waste packages, a penal charge was pressed against unknown. Lessons learned from this incident have been used to further improve the waste documentation procedures.
Question/ Comment	Section H.6.3 states that "Regulatory supervision ensures observance of the procedures on operation, maintenance, monitoring, inspection and testing established in the nuclear licencing procedure for a radioactive waste management facility (cf. Table L-5 to Table L-13) as well as the consideration of the safety requirements for the longer-term interim storage of low- and medium-active waste [4-3])". Please provide more detailed information about "Compliance with established values". Is the waste returned from France inclueded in the target of "Compliance with established values"?
Answer	- Section H.6.3. of the German National Report provides a comprehensive description of the mechanisms to check the compliance of procedures related to the operation, maintenance, monitoring, inspection and testing with the determinations laid down in the licence. As this is a very broad area, it is not possible to describe each specific aspect in full detail in the report. If the information given is not sufficient, it should be specified by bilateral contact, for which issue more detailed information is requested. - The waste returned from France is included in the target of "Compliance with established values". - To make sure, that the waste products comply with the national regulations defined for transport, interim storage and disposal in Germany, independent quality assurance measures in addition to the already implemented quality management system had to be developed. Process qualification with subsequent inspection is accepted to be a suitable method to ensure the quality of radioactive waste products. Since a final decision on the repository site for heat generating radioactive waste in Germany is not taken, the assessment on the suitability for

	storage and disposal is based on a list of properties and characteristic values of HAW/MAW glass and compacted MAW products relevant for disposal. These properties and characteristic values were determined by an expert group on behalf of the former German Federal Ministry of Research and Technology.
Question/ Comment	According to Section H.6.9. there seems to be a lot of difficulties in stabilizing Asse II mine.The adequate stabilization of Asse II mine with the use of salt rocks seems to be not achieved due to the formation of horizontal clefts by appllying compression forces for eliminating the tapped air. However, the filling of remaining cavities with a special type of concrete (Sorel concrete) seems to be successful for slowing down rock deformation. Certain degree of stabilization of underground workings is needed even the option for the retrieval of the radioactive waste is taken. How has the reliability of the method using the Sorel concrete been confirmed? Is the method reliable enough to implement the option of the radioactive waste retrieval?
Answer	The deformation rates of the load bearing system of Asse II mine have been declining over the past years. It is, however, not possible to quantify the proportion of present stabilization measures (backfilling with sorel concrete) on this effect. Stress measurements within the compacted salt grit backfill also account for gradually increasing load bearing capacity of filled caverns. The stabilization measures with sorel concrete are part of an assembly of progressive precautionary measures to avoid uncontrolled water influx during operation and limiting its potential environmental impacts. The precautionary measures are therefore executed independently of the implementation of any decommissioning option, such as waste retrieval.
Question/ Comment	Section H.6.9. states that "As a result of the comparison of options, the BfS concluded that, taking the present state of knowledge into account, the preferred closure option would be the retrieval of the waste." about three closure options of Asse II mine. Please provide more information about what natures of Asse II mine mainly worked on the decision.
Answer	Taking into account the present state of knowledge, only the retrieval option results in the justified expectation that a proof of long-term safety may be provided. According to the current state of knowledge the complete retrieval of all waste is the best option for the further handling of the radioactive waste disposed of in the Asse II mine, as currently no proof of long-term safety is available. Long-term safety will only be ensured after the radioactive waste has been removed.
Question/ Comment	What was the scientific aim to emplace in total 140’787 waste containers in the Asse-II research mine? How do you justify this quantity in a research facility?
Answer	The aim of the research at Asse II mine was to develop and demonstrate techniques for the emplacement and storage of radioactive waste in underground salt

formations. However, from 1971 Asse II was virtually not merely used as trial storage facility but was used as final repository for the disposal of the major part of the low-level and intermediate-level radioactive waste of the Federal Republic of Germany until 1978. Hence, the total quantity of 125,787 emplaced drums and waste packages are not entirely justified by the scientific exploration of waste disposal techniques.

Question/ Comment	Three options for closing the Asse II repository were examined: waste retrieval, relocation elsewhere in the mine, and complete backfilling of the mine. What were the "predetermined criteria" used to evaluate the options? Did this evaluation involve a cost/benefit analysis, and if so please describe? What were the radiological impacts of the three options?		
Answer	The predetermined criteria used to evaluate the options for closing the Asse II repository were subdivided into five groups of subject areas: (1) safety of operation (2) environmental impacts of uncontrollable water influx (3) preliminary long term safety assessment (4) feasibility (5) time requirement A cost/benefit analysis was not performed. The dedicated criteria for subject area 1 “safety of operation” were: - radiological impacts of the specified normal operation - vulnerability to accidents - vulnerability to interference from the outside The dedicated criteria for subject area 2 “environmental impacts of uncontrollable water influx” were: - radiological impacts of uncontrollable influx - chemical / toxic impacts of uncontrollable influx - compliance with mining safety requirements - interaction with precautionary measures The dedicated criteria for subject area 3 “preliminary long term safety assessment” were: - long-term radiological impacts - long-term chemical / toxic impacts - human intrusion impacts - robustness of the option - verifiability of the long-term safety - compliance with mining safety requirements The dedicated criteria for subject area 4 “feasibility” were: - technical feasibility - legal feasibility - additional environmental impacts The dedicated criteria for subject area 5 “time requirement” were: - time requirement as a hazard control measure - time requirement with plan approval procedure The evaluation of options did not involve a cost/benefit analysis. With respect to radiological impacts can be stated that for all three options radiological impacts during operation fall below limiting values. Regarding long-term radiological impacts it has to be conceded that, taking into account the present state of knowledge, only the retrieval option leads to the		

	justified expectation that a proof of long-term safety may be provided. According to the current state of knowledge the complete retrieval of all waste is the best option for the further handling of the radioactive waste stored in the Asse II mine, as currently no proof of long-term safety is available. Long-term safety will only be ensured after the radioactive waste has been removed.		
Question/ Comment	How is the institutional control of any disposal facility defined in regulatory documents? Who will be responsible for active and passive institutional control of Konrad disposal facility and how is or will be this process regulated?		
Answer	As a basis or framework for the planning work of a repository in geological formations, two documents are of importance in the Federal Republic of Germany: With respect to the disposal of radioactive waste with negligible heat generation (i.e., low-level and intermediate-level radioactive waste) the Konrad repository planning work was based on the Safety Criteria for the Final Disposal of Radioactive Waste in a Mine as of 5 January 1983. Chapter 10.1 of these Safety Criteria states that the “Construction, operation, and decommissioning of the repository mine are to be performed and monitored such that no particular control and monitoring program is necessary in the post-operational phase. Routinely performed, general environmental measurements as well as topographic measurements will give information about the radiology and the long-term thermo-mechanical behaviour of the repository formation, the overburden, and the host rock.” With respect to the future disposal of heat-generating radioactive waste (i.e., radioactive waste originating from reprocessing and spent nuclear fuel), the “Safety Requirements Governing the Final Disposal of Heat-Generating Radioactive Waste” as of 30 September 2010 provide the respective basis or framework for the planning work. Chapter 4.6 states that “The final repository shall be constructed and operated in such a way that no intervention or maintenance work is required during the post-closure phase to ensure the reliable long-term containment of the radioactive waste in the isolating rock zone.” Thus, according to the German approach to radioactive waste disposal, there are no arrangements to be made concerning active and passive institutional control of a closed repository in the meaning of Article 17 ii).		
Question/ Comment	The text states that no special control and surveillance is envisaged for the period following closure of the Konrad repository. How will the appropriate authorities ensure that no human intrusion will take place in the vicinity of the repository that could compromise the safety of the area, e.g. drilling for natural resources or conducting other ground disturbing activities? Does Germany envision including such considerations in plans for other waste disposal facilities, and if so, please explain the implementation strategy?		
Answer	Due to the fact that Germany has decided to dispose of any kind of radioactive waste only in deep geological formations, the repository will be at a depth that provides for the required safety. Therefore access restrictions are unnecessary for the surface area above the repository. To provide protection against possible human activities that could lead to unwanted contact with the waste disposed of, the information about the disposal site has to be passed on to future generations. To ensure this, the Konrad Plan Approval stipulates that at least two long-term documentations have to be kept in different places. It is thought that their		

	information will remain available for at least 500 years. This will be the same for any repository for heat generating waste or for waste with negligible heat generation. A natural barrier against human intrusion besides any institutional measures is the deep level of the disposal site itself, like the 850 - 1000 meters in the case of the planned Konrad Repository. The discussion about protecting a geologic disposal against jeopardizing human actions is still ongoing and has to be finalized before closing the repository.		
Question/ Comment	The national report states that in order to ensure safety, the supervisory authority monitors, with the aid of its authorised experts or other authorities, the trustworthiness of the responsible individuals working at the installation. It would be appreciated if Germany would elaborate on how it assesses the trustworthiness of these individuals?		
Answer	The trustworthiness of individuals working at installations for the safekeeping and disposal of radioactive waste (i.e. repositories) is assessed through a verification procedure laid down in para. 12b Atomic Energy Act and the Nuclear Reliability Assessment Ordinance [‘reliability’ is used in the Report for the Fourth Review Meeting synonymously with ‘trustworthiness’, cp. pp. 141 and 143]. It falls within the responsibility of the unit “Repository Surveillance” to carry out the verification procedure. The units within the Federal Office for Radiation Protection (BfS) charged with erecting and operating repositories are required to file a request for verification. The request must include a declaration of consent of the individual to be assessed and must be filed before the individual starts working or enters the installation. Depending on the areas within the repository the individual is supposed to access and taking into account his or her responsibilities with regard to the installation, a comprehensive assessment, an expanded assessment, or a basic assessment is carried out. Comprehensive assessments are required, e.g., for radiation protection commissioners or members of the physical protection service. Measures include identity checks, checking his or her criminal records at law enforcement agencies for the past ten years, enquiring at domestic intelligence agencies for any findings, and retrieving information from the Federal Central Criminal Register. If necessary in individual cases, “Repository Surveillance” may also enquire for any findings at the Military Counter-Intelligence Service, the Federal Intelligence Service, and the Central Office of the German Customs Investigation Service. In individual cases concerning a person born before 1 January 1970, “Repository Surveillance” may also check if the assessed person has a history with the State Security Service of former East Germany. If the request for a verification procedure concerns a foreigner, enquires for any relevant findings will be made to the Central Register of Foreigners and the Foreigners Authority. Expanded assessments are conducted for personnel accessing the inner security area of the installation; personnel accessing the less sensitive outer security area of the installation are subjected to a basic assessment. Compared to a comprehensive assessment, the measures employed in an expanded assessment are slightly less intensive. They are further reduced in basic assessments. Doubts concerning an individual’s trustworthiness may arise from any criminal conviction which - due to its underlying facts or by experience - constitutes a source of concern that he or she may act irresponsibly and thus affect the nuclear safety of the installation. Other findings may also give rise to concern: i.e.		

membership in or support of anti-constitutional organisations, circumstances indicating an inclination towards politically motivated violence, mental disorder or retardation, indication of alcohol or drug abuse, debt overload, or administrative penalties due to breach of provisions of the Atomic Energy Act or similar laws concerning activities requiring trustworthy personnel (e.g. transportation of dangerous goods, handling of weapons or explosives). Additional data may also be taken into account in the assessment: this includes information stemming from criminal convictions unrelated to nuclear safety or trustworthiness, current or cancelled criminal investigations, contacts to foreign intelligence services, or any circumstance making the individual susceptible to blackmail.
If doubts regarding an individual's trustworthiness arise, "Repository Surveillance" informs the individual, giving him or her an opportunity to comment. Should doubts remain, "Repository Surveillance" informs the unit requesting the assessment, without stating reasons. The individual will be given an explanation why the doubts persisted. If no doubts concerning the trustworthiness arise - which happens in 9 out of 10 assessments - "Repository Surveillance" informs the requesting unit.
Generally, assessments have to be repeated every 5 years. "Repository Surveillance" may determine shorter cycles.

Question/ Comment	The report states, that European legislative process of the EURATOM Directive on the management of spent nuclear fuel and radioactive waste has not been finalised yet. Please explain the possible changes in irradiated spent fuel and radioactive waste management during implementation the COUNCIL DIRECTIVE 2011/70/EURATOM.		
Answer	The new regulations of the Council Directive 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste have no direct impact for the technical solutions regarding the management of radioactive waste and spent fuel. The main impact is the clear separation of the operational functions of the Federal Office for Radiation Protection for the disposal of radioactive waste and spent fuel from the supervisory functions and the comprehensive description of the waste and spent fuel management programme, laid down in Articles 5 and 11 of the Directive. The national programmes, which shall set out how the Member States intend to implement their national policies for the responsible and safe management of spent fuel and radioactive waste, include the overall objectives of the Member State's national policy in this respect, significant milestones and clear timeframes for achieving the national programme´s objectives, and concepts or plans and technical solutions for spent fuel and radioactive waste management from generation to disposal.		
Question/ Comment	Licensing system: spent fuel storage licensing. As stated in the national report, spent fuel storage facilities are licensed according to Article 6 of AtG "which does not represent a plan license but a license related to a practice". Could you briefly explain the differences between the licensing process of facilities under Article 7 and facilities under Article 6 of AtG? A construction license of storage facilities is referred in relation to Article 6 of AtG; Could Germany provide additional information on the whole licensing		

process of storage facilities? Is an operational licence, and a closure license needed according to the AtG? Is the storage facility construction licensing submitted to the process of public participation described in page 125?

Answer In the past, § 7 AtG was the basis for granting of the licences for the construction and operation of the nuclear power plants. The licences according to § 7 AtG were granted in a stepped procedure (assessment of the site, construction of the buildings, operation licence). The construction licence was enclosed in the licence according to § 7 AtG.
The basis for the licensing of decentralized and central interim storage facilities is § 6 AtG. The licence pursuant to § 6 AtG is an operation licence for a specific period of time. The construction licence is not enclosed and not governed by the AtG. A licence for decommissioning according to § 6 AtG is not envisaged.
In the performance of licensing procedures according to § 6 AtG and § 7 AtG the public is involved on the same basis of the Nuclear Licensing Procedure Ordinance (AtVfV). For the process of public participation within the building legislation also specific rules according to the respective federal state building regulations are in force.

Question/ Licensing system: disposal facilities
Comment Construction and operation of radioactive waste repositories requires special licence under article 9 of AtG, known as Plan approval procedure.
Could Germany provide additional information on these licensing steps and other disposal steps that need to be licensed according to the AtG?
How is foreseen to accommodate public information and participation process within the siting and licensing process, according to the European SEA Directive?

Answer The answer proceeds on the assumption that the first question is defined more precisely by the second question and does not demand a description of the entire plan approval procedure. The answers' focus will be on the implementation of the public information and participation process. Its starting point is the differentiation between a plan approval procedure, a regional plan and a regional planning procedure.
I. Plan approval procedure
As described on p. 126 ff. of the National Report, the construction and operation of a repository for radioactive waste in Germany requires a plan approval under § 9b of the Atomic Energy Act (AtG) [1A-3]. Regarding the plan approval procedure in general, § 9b, para. 5 AtG refers to the provisions of §§ 72 to 75, 77 and 78 of the Administrative Procedures Act (VwVfG). In § 73 VwVfG, rules for the hearing of authorities and the public affected by the project are laid down. The general provisions of the VwVfG are supplemented by specific legislation such as the AtG and the Environmental Impact Assessment Act (UVPG) [1B-14].
According to § 9b, para. 5 No. 1 AtG, the announcement of the project and of the date of the hearing, the disclosure of the plan for public inspection, the raising of objections, the performance of the public hearing and the service of the decisions shall be provided for in accordance with the provisions of the Nuclear Licensing Procedure Ordinance (AtVfV) [1A-10]. The provisions of the AtVfV concerning the participation of the general public are described on p. 125 of the report.
According to Appendix 1, No. 11.2 of the UVPG, an environmental impact assessment is necessary for the construction and operation of an installation for the long-term storage and disposal of radioactive waste. The environmental impact assessment procedure pursuant to § 9 UVPG includes an involvement of the public,

too.
By the Public Participation Act (so-called “Öffentlichkeitsbeteiligungsgesetz”) of 9 December 2006, the provisions of the AtVfV and of the UVPG have been adapted to the requirements of the Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC (Public Participation Directive).
The plan approval procedure is a procedure for consent to projects in the sense of the Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment (EIA Directive). Installations solely designed for the permanent storage or disposal of radioactive waste are listed in Annex I No. 3 of the EIA Directive. A plan approval procedure has to be distinguished from plans falling under the provisions of the Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment (SEA Directive).
II. Regional Plan
The provisions of the SEA Directive were transposed into German law by means of the so-called “SUP-Gesetz” of 25 June 2005. They were incorporated in the UVPG. §§ 14a ff UVPG to specify the strategic impact assessment. Concerning public participation, § 14i UVPG refers to the regulation set out in § 9 UVPG. Plans and programmes that need a strategic impact assessment are listed in Appendix 3 of the UVPG. No. 1.5 involves regional plans in the sense of § 8 Regional Planning Act (ROG) [1B-2] that set the framework for future development of the spatial structure.
III. Regional Planning Procedure
According to § 15 ROG, the competent authority has to check compliance of regionally significant projects with regional plans. The process is called regional planning procedure. It is not a plan in the sense of the SEA Directive, but a preceding step in the approval process of a project. The cases in which a regional planning procedure shall be carried out, are listed in § 1 of the Regional Planning Ordinance (ROV). With No. 3, the list contains the construction of an installation for the long-term storage and disposal of radioactive waste that requires a plan approval under § 9b AtG. In cases like this, the regional planning procedure shall include an environmental impact assessment, as follows from § 16 UVPG.

Question/ Comment	The Federal Office for Radiation Protection (BfS) is on one hand applicant/ operator of a final repository, on the other hand BfS acts as a supervisor for construction, operation and final closure (regulatory functions). How can Germany fulfill article 20 which requires effective independence of the regulatory functions from implementing functions?		
Answer	The Federal Office for Radiation Protection (BfS) is the operator for the repositories Morsleben and Konrad, the Asse mine and the Exploratory Mine Gorleben. Within the Federal Office a division is also responsible for the oversight for all activities of the operation departments of the Federal Office. This division is largely separated from the operational departments and fulfils the requirements of the Joint Convention laid down in Article 20 paragraph 2, where it is stated that each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of		

	the regulatory functions from other functions where organizations are involved in both spent fuel or radioactive waste management and in their regulation. Furthermore, the Federal Office for Radiation Protection is under supervision of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). A different situation occurs with the requirements laid down in the COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste which requires in Article 6 paragraph 2 that Member States shall ensure that the competent regulatory authority is functionally separate from any other body or organisation concerned with the promotion or utilisation of nuclear energy or radioactive material, including electricity production and radioisotope applications, or with the management of spent fuel and radioactive waste, in order to ensure effective independence from undue influence on its regulatory function. The Directive clearly requires the separation of regulatory and operational functions. Germany is currently considering an implementation of Article 6 paragraph 2 within its regulatory and organisational framework. Germany welcomes these binding regulations and supported them during the negotiations in the Council of the European Union. The Directive shall be transposed into German nuclear regulations until mid 2013.
Question/ Comment	The text states that by the end of 2011, the Federal Government will put forward proposed legislation for geologic suitability criteria and possible waste management options. Did the government meet this deadline, and if so, please provide an update of the status of the legislation.
Answer	After a national consensus about the termination of the usage of nuclear power for the commercial generation of electricity had been reached and a finishing date had been fixed in 2011, it is intended to find a solution for the disposal of heat-generating radioactive wastes in a broad national consensus between the federal and state governments, society, and citizens. For the construction of a repository in particular for heat generating wastes, a siting process including extensive site investigation and exploration is to be codified. Discussions concerning this matter are currently under way.
Question/ Comment	Licensing procedures require, among other things, an environmental assessment. With Länder having “supreme authority” how are issues on the adequacy of the assessment raised by other Länder resolved? For instance a "Land" may license a facility requiring transport from and through other Länder. How would this issue be resolved?
Answer	According to Article 7 of the Environmental Impact Assessment Act (UVPG), it is part of the Environmental Impact Assessment that the competent authority informs other authorities whose environmentally relevant field of responsibility is affected by the facility. The competent authority transmits documentation relevant to the issue to these other authorities and requests statements from them. This also applies to authorities from other Länder, whose field of responsibility is affected. When summarizing the environmental impacts of the project pursuant to Article 11 of the Environmental Impact Assessment Act, the competent authority has to consider the statements made by the authorities, whose field of responsibility is affected. This participation of authorities’ purpose is to avoid issues on the adequacy of the assessment even before they emerge.

	To prevent an inadequate assessment of the environmental impacts of a facility, pursuant to Article 7 of the Atomic Energy Act (AtG), by the competent authority of the Land, the Federation has the power to instruct the competent authority of the Land to change the assessment of the environmental impacts. The reason for this is that the Atomic Energy Act is a law, which is executed by the Länder on federal commission, so that the federal oversight extends to the legality and appropriateness of execution of the law by the Länder. In practice, however, the Federation rarely uses the right to issue binding directives to the Land authority. Regarding the example of a licenced facility, which requires transports from and through other Länder, it should be noted, that the licensing of the transportation must be strictly separated from the licensing of the facility. The necessary transportation is not included in the licensing procedures pursuant to Article 7 of the Atomic Energy Act. In contrast to the licence, pursuant to Article 7 of the Atomic Energy Act, the competence for the licence for the transportation of nuclear fuel lies not with the authorities of the Länder, but with the federal authorities.
Question/ Comment	Which human resources are assigned to the “Repository Surveillance” unit for the supervision task? Are there also other independent organisational units at the BfS?
Answer	As of March 2012, the unit “Repository Surveillance” has a technical and administrative staff of 13. BfS-internal Rules of Procedure stipulate that - like “Repository Surveillance” - the unit “Quality Management” operates technically independent. “Quality Management” administers and develops the BfS-internal quality management system.
Question/ Comment	BfS operates and at the same time regulates the Asse II mine. This situation can be considered as non-compliance with Article 20 (2) of JC; ie with the requirement that “Each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organizations are involved in both spent fuel or radioactive waste management and in their regulation”.
Answer	The Federal Office for Radiation Protection (BfS) is the operator for the repositories Morsleben and Konrad, the Asse mine and the Exploratory Mine Gorleben. Within the Federal Office a division is also responsible for the oversight for all activities of the operation departments of the Federal Office. This division is largely separated from the operational departments and fulfils the requirements of the Joint Convention laid down in Article 20 paragraph 2, where it is stated that each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organizations are involved in both spent fuel or radioactive waste management and in their regulation. Furthermore, the Federal Office for Radiation Protection is under supervision of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). A different situation occurs with the requirements laid down in the COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste which requires in Article 6 paragraph 2 that Member States shall ensure that the competent regulatory authority is functionally separate from any other body or organisation concerned with the promotion or utilisation of nuclear energy or

radioactive material, including electricity production and radioisotope applications, or with the management of spent fuel and radioactive waste, in order to ensure effective independence from undue influence on its regulatory function. The Directive clearly requires the separation of regulatory and operational functions. Germany is currently considering an implementation of Article 6 paragraph 2 within its regulatory and organisational framework.
Germany welcomes these binding regulations and supported them during the negotiations in the Council of the European Union. The Directive shall be transposed into German nuclear regulations until mid 2013.

Question/ Comment	Bfs is operator of all repositories in Germany. Bfs is also responsible for supervision and oversight for these repositories. Although this last function is managed by a Bfs unit independent from the Bfs units in charge of construction and operation of the repositories and having its own budget, this situation can be considered as an issue, from the independence point of view, for the regulatory functions.		
Answer	The Federal Office for Radiation Protection (BfS) is the operator for the repositories Morsleben and Konrad, the Asse mine and the Exploratory Mine Gorleben. Within the Federal Office a division is also responsible for the oversight for all activities of the operation departments of the Federal Office. This division is largely separated from the operational departments and fulfils the requirements of the Joint Convention laid down in Article 20 paragraph 2, where it is stated that each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organizations are involved in both spent fuel or radioactive waste management and in their regulation. Furthermore, the Federal Office for Radiation Protection is under supervision of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). A different situation occurs with the requirements laid down in the COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste which requires in Article 6 paragraph 2 that Member States shall ensure that the competent regulatory authority is functionally separate from any other body or organisation concerned with the promotion or utilisation of nuclear energy or radioactive material, including electricity production and radioisotope applications, or with the management of spent fuel and radioactive waste, in order to ensure effective independence from undue influence on its regulatory function. The Directive clearly requires the separation of regulatory and operational functions. Germany is currently considering an implementation of Article 6 paragraph 2 within its regulatory and organisational framework. Germany welcomes these binding regulations and supported them during the negotiations in the Council of the European Union. The Directive shall be transposed into German nuclear regulations until mid 2013.		

Question/ Comment	The national report indicates that BfS is responsible for construction and operation of federal facilities for the safekeeping and disposal of radioactive waste and the Asse II mine, as well as the licensing of nuclear fuel storage outside of federal custody. Yet, the regulatory authority is shared between the BMU and the Länder. On page 136, it states that the BfS supports the BMU technically and by scientific		

	research in its responsibility, among others, regarding the disposal of radioactive waste. Please provide an explanation of how the BMU "independently" reviews the BfS construction and operation of spent fuel and waste disposal facilities without unduly influencing the BfS "applications for authorization" and the operation of spent fuel and radioactive waste management activities.
Answer	The Federal Office for Radiation Protection (BfS) is the operator for the repositories Morsleben and Konrad, the Asse mine and the Exploratory Mine Gorleben. Within the Federal Office a division is also responsible for the oversight for all activities of the operation departments of the Federal Office. This division is largely separated from the operational departments. Furthermore, the Federal Office for Radiation Protection is under supervision of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). Nevertheless, this situation does not fulfil the requirements laid down in the Council Directive 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste which requires in Article 6 paragraph 2 that Member States shall ensure that the competent regulatory authority is functionally separate from any other body or organisation concerned with the promotion or utilisation of nuclear energy or radioactive material, including electricity production and radioisotope applications, or with the management of spent fuel and radioactive waste, in order to ensure effective independence from undue influence on its regulatory function. Germany is currently considering how an implementation of Article 6 paragraph 2 might look like. Germany welcomes these binding regulations and supported them during the negotiations in the Council of the European Union. The Directive shall be transposed into German nuclear regulations until mid 2013.
Question/ Comment	Do you encounter any difficulties in finding sufficient competent candidates to be employed in the various LÃ¤nder-authorities?
Answer	New candidates with professional experience in the field of disposal of radioactive waste are sometimes not easy to find. However, if needed, committed candidates (preferably physicists, engineers or chemists) can be recruited and trained on the job.
Question/ Comment	The report states that as subordinate authority of the BMU, the BfS performs implementation tasks of the Federation in accordance with the Atomic Energy Act and the Radiation Protection Ordinance, fulfils thus regulatory tasks. The BfS is also the operator of the repository mine Asse II where the regulatory control is of the responsibility of the corresponding Land authority. Although this seems to guarantee an effective separation from a legal point of view, would you not agree that such overlapping of responsibilities of the different state bodies in Germany is in conflict with regards to the spirit of Article 20.2.? Is anything foreseen to have these functions more clearly separated during the implementation of Council Directive 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste?
Answer	The Federal Office for Radiation Protection (BfS) is the operator for the repositories Morsleben and Konrad, the Asse mine and the Exploratory Mine Gorleben. Within the Federal Office a division is also responsible for the oversight for all activities of the operation departments of the Federal Office. This division is

largely separated from the operational departments and fulfils the requirements of the Joint Convention laid down in Article 20 paragraph 2, where it is stated that each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organizations are involved in both spent fuel or radioactive waste management and in their regulation.
Furthermore, the Federal Office for Radiation Protection is under supervision of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).
A different situation occurs with the requirements laid down in the COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste which requires in Article 6 paragraph 2 that Member States shall ensure that the competent regulatory authority is functionally separate from any other body or organisation concerned with the promotion or utilisation of nuclear energy or radioactive material, including electricity production and radioisotope applications, or with the management of spent fuel and radioactive waste, in order to ensure effective independence from undue influence on its regulatory function. The Directive clearly requires the separation of regulatory and operational functions. Germany is currently considering an implementation of Article 6 paragraph 2 within its regulatory and organisational framework.
Germany welcomes these binding regulations and supported them during the negotiations in the Council of the European Union. The Directive shall be transposed into German nuclear regulations until mid 2013.

Question/ Comment
When performing their tasks, the radiation protection commissioners, together with the nuclear safety officer, act independently from the company hierarchy. Consequently, in such cases, any proceedings relating to an administrative or criminal offence will be directed at individual persons (cf. comments on Article 19 (2)v).
Questions:
The radiation protection commissioners would be held responsible for non-compliances but not the company?
How do the radiation protection commissioners stay independent from the company who pays them?

Answer
1. The German law system does not provide for a criminal liability of legal persons. Consequently, the proceedings relating to an administrative or criminal offence can solely be directed at individual persons. Concerning radiation protection obligations, the responsible individual usually is the CEO or the nominated person from the circle of authorized board members who assumes the role of radiation protection supervisor. Only when a responsible radiation protection commissioner has not met his/her respective obligations, the proceeding will be directed at him/her personally.
2. As described on page 142, the radiation protection commissioners act independently from the company hierarchy when performing their tasks. This means, that they are not subject to the instructions of their immediate superiors but nonetheless to the instructions of the radiation protection supervisor. By preventing the influence of third parties, the radiation protection commissioners stay independent when performing radiation protection measures. The independency is only necessary within the scope of their functions and authorization concerning

	radiation protection. As members of the stuff, they are not completely independent from the company who pays them. However, they shall not be put at any disadvantage due to their additional function. According to § 32, para. 5 of the Radiation Protection Ordinance (StrlSchV), the radiation protection commissioners must not be hindered in the performance of their duties or suffer any disadvantages by virtue of their activities.
Question/ Comment	Provide details on availability of human resources and funding of decommissioning projects for NPPs already shut down by political decision as a result of Fukushima accident.
Answer	As a consequence of the Fukushima accident, the Atomic Energy Act (AtG) was amended in August 2011. For eight NPPs the part of the operating licence concerning power generation expired immediately. These NPPs are in the post-operational period (i.e. the phase of transition between operation and decommissioning). The operators will apply for a licence for decommissioning within the next few years. Availability of human resources will be included in the decision making process on the time scale. Financial means for the decommissioning and the dismantling have to be assured by the owner of the NPP.
Question/ Comment	Who will bear the responsibility for financial losses in decommissioning funds caused by unplanned shutdown of all commercial NPPs in Germany?
Answer	In Germany, financial provisions for the costs of the decommissioning and dismantling of nuclear power plants are made by the operators of the nuclear power plants or their parent companies. The operators are obligated to continuously take changes in legislation into account and respectively to adapt the reserves for the decommissioning and the dismantling. As a result of the decommissioning taking place at an earlier date than foreseen in the previous plans, we expect some increase in the total amount of reserves. It should be noted that based on profit transfer and control agreements (or similar agreements) not only the operating company of a nuclear power plant but also its parent company is liable for the decommissioning and dismantling costs. Thus, financing is also ensured in case that a nuclear power plant is no longer able to make profits from its operations. We wish to point out that only eight of the 17 German nuclear power plants have immediately lost authorisation to generate power due to the amendment to the Atomic Energy Act of 2011. The remaining nine nuclear power plants will progressively be taken off the grid by 2022 at the latest.
Question/ Comment	Germany guarantees the necessary financial resources, technical expertise, required level of human resources, and suitability of the regulatory authorities who will ensure the operators comply. – Can Germany indicate how it realises these guarantees?
Answer	The funding of the public bodies entrusted with various functions with respect to the disposal of radioactive wastes and spent nuclear fuel is secured by the timely long-term financial planning of the federal and state budgets. The federal and state governments ensure the required technical expertise and human resources by a strategic personnel planning.
Question/	Please explain the financial responsibilities and practices in Germany for site

Comment	selection and site assessment activities concerning a potential final geological repository?
Answer	The polluter-pays principle applies to the financial means dedicated to the disposal of spent fuel and radioactive waste. The necessary expenditures of those obliged to hand over the waste to plan, explore and construct a repository are refinanced by the Federation via advance payments on contributions. The use of repositories is refinanced via charges and fees that the delivering parties have to pay.
Question/ Comment	Will the ongoing revision of the KTA Nuclear Safety Standard implement the requirements of the IAEA Safety Requirements GS-R-3?
Answer	The newly developed KTA 1402 “Integrated Management Systems for the Safe Operation of Nuclear Power Plants” (“Integriertes Managementsystem zum sicheren Betrieb von Kernkraftwerken”), which is presently a draft nuclear safety standard (issued in November 2011), takes into account the IAEA Safety Requirements GS-R-3 “The management system for facilities and activities”. The implementation of the requirements within that document is part of the original assignment of the KTA regarding the development of KTA 1402.
Question/ Comment	It is affirmed that Radiation Protection Ordinance needs to be amended, with consequently changes in the clearance conditions. Could Germany elaborate on the reasons of the necessary changes and give more details on the modification that will be introduced?
Answer	The amendment of the Radiation Protection Ordinance (StrlSchV) has been completed in November 2011. The most prominent amendment of the StrlSchV with respect to clearance was the replacement of the set of clearance levels for waste for disposal on landfill sites (col. 9 in Table F-3) by four different value sets (col. 9a - 9d) for clearance of wastes with quantities of not more than 100 Mg/a or not more than 1,000 Mg/a for disposal or for incineration. These values have been based on updated radiological models taking into account changes in the legislation on disposal of (conventional) waste, such as requirements on the construction of landfills or on the composition of wastes.
Question/ Comment	Section F.4.5. states that Appendix III Table 1 StrlSchV contains clearance levels. Dose Germany have any future plan to adopt clearance levels which are set in the IAEA report?
Answer	The IAEA Safety Guide RS-G-1.7 “Application of the Concepts of Exclusion, Exemption and Clearance” (based on IAEA Safety Reports Series No. 44) contains clearance levels for unconditional clearance. These levels are part of the draft “Proposal for a Council Directive laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation”, COM(2011)593,, which is still under discussion in the Council Working Party. Once set into force, new EURATOM Basic Safety Standards (BSS) will have to be transformed into national legislation within a certain period of time including the exemption and clearance levels of the BSS.
Question/ Comment	Section F.4.5. states that their (operator's) performance is supervised by the authority, and clearance is only complete once the step in question has been

brought to a close or has been irreversibly initiated.

Please provide specific example of the confirmation method to judge whether operators follow clearance option.

Answer Methods for supervising the clearance process vary between the Länder (federal states) of Germany, as the licensing procedure is within the jurisdiction of the authorities of the federal states. The federal states are also responsible for supervision of the licencee. This may include temporary presence of independent expert during clearance campaigns, execution of control measurements, control of clearance documentation for completeness and plausibility and other measures. Clearance of metals for the purpose of (conventional) melting or clearance of wastes for disposal on landfill sites requires that the material actually will reach its prescribed destination. This can be controlled by sporadically following the truck with the material to its destination, by control of the documentation, but auditing the melter or the landfill site for compliance with contracts etc.

Question/ Comment Section F.4.2 states that the maximum effective dose for the individual's entire working life is 400mSv/lifetime.

What is the basis for this?

Answer The maximum effective dose for the individual´s entire working life was introduced into the German Radiation Protection Ordinance (StrlSchV) in 1989 when the annual effective dose limit for workers was 50 mSv. The lifetime risk of the employees should be thereby limited to an acceptable value. Regarding radiation risk for leukaemia a threshold of 400 mSv has been provided.

Question/ Comment What is the representative sampling methods of bending waste such as piping, etc. ?

Answer There is no unified method available that can be used to handle all types of bending waste. To assess if bending residual materials are suitable for either direct clearance or if clearance is attainable upon surface decontamination three methods are commonly applied, depending on the size of the pipe diameter and the number of samples to be analysed. There are three options:
The first option is that pipes with a low diameter are sheared and melted, if there is only a small number of pipes, they are pressed and treated as waste. Upon the homogenization process samples of the melted mass are taken to determine the specific radioactivity. Depending on whether the maximum permissible value is reached or not, the liquefied pipes are subjected to clearance or treated as radioactive waste
Secondly, pipes with such a big diameter that a person can move through may be measured manually using non-standard probe heads specially manufactured and fitted to the specified radius of the pipe/ sample.
The third option is to cut the pipes lengthwise into two half-shells. These pipe pieces are collected in 1 cubic metre sized baskets which correspond to the standard volume of a clearance measurement facility. This method is economical if the sample number is high because the method requires an extensive calibration considering the density and geometry of the material as well as the nuclide

expected to be detected in the sample. The nuclide-specific analysis is based on the energy output of the individual nuclides and therefore on their different half-lives which have to be taken into account for setting the measuring period.

Question/ Comment: Section F.4.5 states that the annual dose limit on the discharge of nuclear facilities is 0.3mSv (42, para. 1 strlschV).

What is the basis for this?

Answer: In section 47 of the German Radiation Protection Ordinance (StrlSchV) it is laid down that the effective dose by discharges into the air and into water has to be limited to 0.3 mSv per year on each pathway. The total dose limit for members of the public is 1 mSv per year and includes also the dose by direct radiation. The annual dose of 0.3 mSv corresponds with the variation of the natural radiation exposure in Germany.

Question/ Comment: In the report it is mentioned, that women of child-bearing age must not receive a cumulative dose of more than 2 mSv per month to the womb.
What age for child-bearing in maximum is normally determined for women and who defines this?
Does a dose limit exist for breast-feeding women? If yes, what is the value?
This regulating can lead to discrimination at the worst. Have there been already claims or legal measures taken against this law?
How often the authority was asked for an increase of a permit to effective doses of up to 6 mSv during a calendar year for minors between the ages of 16 to 18?
What are the doses accumulated of minors between the ages of 16 to 18 given such a permit?

Answer: For radiation protection purposes, a maximum age of child-bearing women is not determined. A special dose limit for breast-feeding women is not defined but there is a ban for incorporation dose in general. Generally, the dose limit of 20 mSv/a for the effective dose for occupationally exposed individuals is applicable.
Regarding discrimination, preventive occupational health measures are in general not seen as discrimination. Claims or other legal measures against this regulation are not known.
Permits for an increase of the dose limit for apprentices with ages under 18 have only rarely been granted by the authorities, because the training guidelines for the apprentices often include the lower dose limits.

Question/ Comment: Figure F-5 shows the interactions between the concerned entities in case of emergency preparedness.

Could Germany specify the concrete organisation (headquarters, emergency cells) put in place, which permits the intervention of these entities?
Are global exercises regularly organized to test the efficient coordination of these entities?

Answer: There are different kinds of regularly organized exercises. Nuclear power plant specific exercises are carried out nearby the plants and with the organizations responsible there. Other exercises are organized by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), involving the Federal Office for Radiation Protection (BfS), advisory committees and Land

	authorities if necessary. These exercises concern emergency situations in German and foreign facilities, transport accidents and other emergency situations.
Question/ Comment	Concerning emergency response planning and the coordination effort among the various authorities, how are the communication aspects handled in conducting periodic drills? Is there a central communication center established that houses the points of contact for each group? Please describe the effectiveness of the preparedness program.
Answer	In 2000 the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) asked the Federal Office for Radiation Protection (BfS) to develop a supportive information and communication system which should help all federal and state policymakers in Germany to be informed quickly and comprehensively in a case of any event or emergency and which should serve as the basis for the assessment of the radiological situation and its consequences of the impact on humans and the environment as well as for initiation of necessary protective measures. The system is intended to allow all participants to simultaneously access a central server to all the information necessary both in real emergency situations and in conducting drills and exercises. Since then the resulting system ELAN ("Elektronische Lagedarstellung" = Electronic Situation Display for emergencies) meets the special requirements of an emergency and allows the assessment of even large-scale, dynamic emergency situations. ELAN has mastered different test scenarios successfully for several years and is in productive use, especially as a central communication centre in drills and exercises. ELAN is a web-based, non-public internet platform for the competent authorities in emergency response, providing the information and content and let users access information. According to an initiative of the International Atomic Energy Agency (IAEA), ELAN has been developed for international use as “ELAN-E” (which stands for "English-ELAN") based on open source and web-based software. This “English version” is now in operation in Romania.
Question/ Comment	Several nuclear power plants have been or are being dismantled. The decommissioning licenses are issued in separate phases. (for example 4 phases for the KRB-A NPP, 3 phases for the KMK NPP) Could Germany elaborate about the policy and the strategy behind the phased/stepwise approach of licensing the decommissioning of NPPs ?
Answer	Depending upon the type of application, the decommissioning measures for nuclear facilities can be regulated by a single licence but can also be divided into steps which are licenced separately with their own licences as defined in § 7, para. 3 of the Atomic Energy Act. In the procedures which have taken place so far it has proven useful for large projects, such as the dismantling of nuclear power plants or nuclear fuel cycle facilities, to divide the decommissioning procedure into technically delimited steps. Dividing up the decommissioning sequence means that new techniques can be introduced and experience which has been gained in the previously completed phases can be applied. Assessment of the next step can also take place in parallel to execution of the phase which has already been licenced. In certain circumstances this approach can also result in a time saving on the overall project.

Question/ Comment	Section D.5.2 states that non-restrictive release is approved for the site and building of Kahl Experimental Nuclear Power Plant (VAK). What is the regulatory standard for the free release of the building and site?
Answer	The free release (or unconditional clearance) of a site of a (former) nuclear installation is subject to a licence. Depending on the application of the licencee, the generic clearance levels of Annex III Table 1 col. 7 Radiation Protection Ordinance (cf. Table F-3, p. 161) or site-specific values may be used. In any case, the criterion for clearance of sites is 10 µSv/a for the individual effective dose, as for any other type of clearance in Germany.
Question/ Comment	- Is public participation required in the process of licensing the decommissioning of nuclear facilities? -If so, how does the public participate in the process?
Answer	Yes, public participation is required in the process of licensing the decommissioning of nuclear facilities. The decommissioning licence must be applied by the operator (§7 AtG). The licencee has to demonstrate that the project does not conflict with overriding public interests particular in view of its environmental impacts. The licensing authority involves the general public in the licensing procedure. The project is published in the official Publication Gazettes and local newspapers to inform where and when the application and other relevant information on the planned project are available for public inspection. During a public hearing anyone who raised objections has the opportunity to explain them. More details are described in Chapter E.2.3 of our report.
Question/ Comment	Section F.6.2 describes the reserve for the decommissioning. - Is there a regulation that requires the confirmation of the appropriateness of this reserve by the regulatory authority? - How often is this reserve renewed?
Answer	The appropriateness of the reserves is regularly checked and certified by auditors within the scope of the annual accounts audit. If the accounts audit by auditors shows that the reserves are too low, the responsible company is obligated to add appropriate amounts to the reserves; otherwise, the annual accounts cannot be certified. The auditors are obligated to independently perform their tasks (Art. 43, Para. 1 of the Auditors Act). A separate official confirmation of the appropriateness of the reserves will not be provided. However, the formation of reserves is subject to review by the tax authorities.
Question/ Comment	What decommissioning options (immediate dismantling after shut down, delayed dismantling, other) are permitted by the national regulator for different facilities? Who makes the final decision?
Answer	The Atomic Energy Act and the German legal regulations consider the decommissioning strategies “immediate dismantling” and “safe enclosure” to be equivalent. Decommissioning strategies may also be a combination of these fundamental alternatives (e.g. decay storage of large components). It is the decision of the operator which decommissioning strategy shall be applied.

Question/ Comment	Do you have the stringent legal requirement to remove/process all operational waste from the nuclear installation before granting the decommissioning authorization?
Answer	The German regulatory framework includes no legal requirement to remove/process all operational waste from the nuclear installation before granting the decommissioning authorization.

Question/ Comment	The financial resources for the decommissioning are provided in the form of reserves built up during the operational phase. As a consequence of the events in Japan the licenses to operate 8 power plants expired prematurely. Could you please develop how the financial resources for the decommissioning of these 8 facilities will be guaranteed?
Answer	In Germany, financial provisions for the costs of the decommissioning and dismantling of nuclear power plants are made by the operators of the nuclear power plants or their parent companies, which set aside reserves for these costs. The operators are obligated to continuously take changes in legislation into account, also when setting aside reserves. It should be noted that based on profit transfer and control agreements (or similar agreements) not only the operating company of a nuclear power plant but also its parent company is liable for the decommissioning and dismantling costs. Thus, financing is also ensured in the event that a nuclear power plant is no longer able to make profits from its operations.

Question/ Comment	German response to the Fukushima incident was to terminate operation of eight reactors and abandon nuclear power within 11 years. Decommissioning funds for these privately-operated nuclear power plants would have been accumulated through reserves built up during continuing operations. As a result, please describe how early nuclear power plant shut down impacts decommissioning funds and schedules.
Answer	Due to the latest amendment to the Atomic Energy Act, nuclear power plants in Germany will be taken off the grid at an earlier date than this would have been the case under the previous legislation. The nuclear power plant operators set aside reserves for the decommissioning and dismantling of the nuclear power plants. They are obligated to take changes in legislation into account, and respectively to adapt the reserves for the decommissioning and the dismantling. As a result of the decommissioning taking place at an earlier date than foreseen in the previous plans, we expect some increase in the total amount of reserves. It should be noted that based on of profit transfer and control agreements (or similar agreements) not only the operating company of a nuclear power plant but also its parent company is liable for the decommissioning and dismantling costs. Thus, financing is also ensured in case that a nuclear power plant is no longer able to make profits from its operations.

Question/ Comment	The report indicates that the total amount of costs for the decommissioning is estimated from cost studies which are updated regularly. Could you please specify what is the frequency of these regularly updates?
Answer	The operating companies commission an external expert with the drafting of a reference expert opinion that identifies the costs for the various steps of the decommissioning and dismantling based upon the chosen decommissioning

	concept. Plant-related expert opinions provide detailed information about the costs for the respective power plant. The plant-related expert opinions are updated annually so that price developments can continuously be taken into account and experiences gathered from ongoing dismantling projects can be used for further developing the cost forecasts. The operating companies also calculate the costs for the disposal of radioactive waste on the basis of an expert opinion, in which the basic data for nuclear disposal obligations is identified and listed. This basic data is updated annually.
Question/ Comment	Section J.1.1 states that the high activity sealed source is managed at the state level through the HASS Register managed by BfS. What is the total activity of the sealed sources excluded in the HASS Register compared with the total activity of HASS?
Answer	The German register on high-activity sealed radioactive sources (HASS) covers all sources with an activity of at least A1 / 100 (one hundredth), where A1 is the activity limit for Type A packages according to international transport regulations. The HASS register has been established in 2006 in order to meet the requirements of the Council Directive 2003/122/EURATOM of 22 December 2003 on the control of high-activity sealed radioactive sources and orphan sources. Currently, the database contains more than 20,000 sources.
Question/ Comment	The national report discusses re-entry of disused sealed sources and notes that EURATOM's HASS directive's definition of high-active sources deviates from the categorization scheme included in the IAEA's Code of Conduct. How has Germany worked out the difference between the two on a national level? What is Germany's role in coming to a common understanding of the two for implementation in the European community? How might the differing threshold values be harmonized internationally?
Answer	With the “Proposal for a Council Directive laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation”, COM(2011)593, the definition of high-active sources included in the IAEA's Code of Conduct shall be adopted in the European Union. Germany has worked towards this goal and welcomes the harmonization of the activity values defining high-activity sealed sources. Germany has adopted special regulations for the import and export of high active sources with an activity of 100 times the values of the EURATOM's HASS directive to or from states outside of the European Union. Regarding radionuclides of practical importance there is no relevant discrepancy between these values and the Category 1 values of the IAEA's Code of Conduct.
Question/ Comment	After the Fukushima accident£¬what kind of new considerations have been drawn on the safety of spent fuel management and the safety of radioactive waste management in Germany?
Answer	Germany has asked the Waste Management Commission (ESK) to prepare a safety assessment comparable to the “stress test” for nuclear power plants at national level or at the level of the European Union. The preparation of the safety assessment has started in Summer 2011 but is not yet finalized. Germany assumes that the results of the safety assessment for the waste and spent fuel management facilities by the

ESK will be presented at the end of 2012.

Question/ Comment	It is showed in Figure D-18 that the amounts of conditioned radioactive waste produced by nuclear power plants in 2000 and 2010 are much lower than that produced in other years. What are the reasons?
Answer	In Figure D-18 only the amounts of conditioned radioactive waste are shown. The decrease in 2000 resulted from the fact that no more radioactive waste could be disposed of in the Morsleben repository. In addition to that, waste packages that had originally been classified as suitable for being disposed of, were re-classified as interim products and many waste packages had to be reconditioned because of the age of the waste. Likewise, this implicated that the waste producers' classification had been changed from conditioned waste to interim products. Even though the amounts of conditioned radioactive waste decreased, the amount of radioactive interim products increased.

Question/ Comment	What was the reason of introduction a prohibition of SF reprocessing in an amendment to the AtG in 2002?
Answer	The amendment of the German Atomic Energy Act from 2002 states that the delivery of spent fuel to reprocessing facilities is banned from mid of the year 2005. The reason behind this regulation was that one of the products of reprocessing, the plutonium, must be used as mixed oxide fuel during the lifetime of the Nuclear Power Plants. In connection with the decision to phase out the use of nuclear power in the same amendment of the Atomic Energy Act it led to a balance between the production of plutonium and its consumption as nuclear fuel.

Question/ Comment	Is it really true that spent fuel and RAW will be only stored in deep geological formations?
Answer	In the sentence "In Germany, the intention is that all types of radioactive waste should be stored in deep geological formations" the verb "to store" is to be understood in the meaning of "to dispose of", not in the meaning of interim storage. This becomes clear from the following paragraph, starting "The intention to dispose of all types of radioactive waste in deep geological formations…".

Question/ Comment	Does Germany have an official national policy and strategy on RAW and SF management approved by the Government or other governmental bodies?
Answer	Germany started to prepare a National Waste Management Plan (NWMP) in 2002, but this plan was not finalized because of open questions regarding the disposal of spent fuel. Additionally, the preparation of the NWMP was stopped because of the negotiations of the Council Directive 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste. It is now decided to prepare a National Waste Management Programme by 2015 fulfilling the obligations of the mentioned Directive. This Programme and the report to the Commission of the European Union will be approved by the Government. But nevertheless every national report for the review meetings of the Joint Convention was approved by the Government.

Question/ Comment	What is the technical / scientific rationalization of the decision to dispose all RAW in deep geological formations?

Answer	Deep geologic disposal is seen as the safest option for the long term. There is no demand for the separation of very low radioactive waste until now, due to the ongoing practice of unconditional release of very low level waste. The capacity of the geologic disposal “KONRAD” allows to deposit an amount of approximately 300.000 cubicmeter radioactive waste with negligible heat production. This amount is sufficient for nearly all the low- und intermediate level waste up to the year 2080. But this situation can change, if the unconditional release of very low active material has to be finished by practical reasons or by regulations. Even the retrieval of radioactive waste from the Asse mine could change the policy.

Question/ Comment	Figure B-1 indicates, that VLLW, which according to the IAEA General Safety Guide GSG-1 may exceed clearance levels and therefore are suitable for disposal in engineered surface landfill type facilities, are disposed in conventional landfill site. Does it mean that in Germany some RAW streams are managed as conventional waste and are not expected to be disposed in Konrad repository?
Answer	This interpretation is not correct. The material in question is not VLLW according to German legislation, and, therefore, no radioactive waste is disposed of outside a designated repository (in this case: Konrad repository for radioactive waste with negligible heat generation). Germany has defined clearance levels for several purposes (cf. p.161 of the German report, in particular Table F-3). These include those for clearance of waste for conventional disposal on landfill sites (or conventional incineration). Once the material has been cleared for this purpose and has been sent to the landfill site, it is no longer radioactive according to § 2 of the Atomic Energy Act (AtG). As explained in Section B.1.5, Germany does not use the IAEA criteria for radioactive waste definition.

Question/ Comment	What is the status of decommissioning projects for NPPs shut down by political decision as a result of Fukushima accident?
Answer	As a consequence of the Fukushima accident, for the seven oldest reactors and the NPP Krümmel the authorisation for power operation was terminated by law (Atomic Energy Act was amended and put into force on 6 August 2011). These eight NPPs were shut down permanently and they are still under the operational licence. Until the end of 2011 no application for a decommissioning licence was filed for one of the eight permanently shut down NPPs and the fuel is still in the facilities (reactor pressure vessel and spent fuel pool).

Question/ Comment	Operators have provided the evidence of the safe storage of all uranium issued from reprocessing. The German report does not detail plans for the long term management of this uranium. Could Germany indicate if this uranium is considered as a potentially valuable product or is its final storage planed?
Answer	The strategy for the management of the uranium from reprocessing depends on the nuclear utilities. Since the 1980’s uranium extracted from reprocessing of irradiated nuclear fuel has been re-used as ERU (enriched reprocessed uranium) fuel in six German power reactors. Parts of the uranium stock have been converted into stable uranium oxide compounds awaiting later re-use. The plan is to recycle nearly all uranium as ERU fuel assemblies in German NPP before the expiration of the

operating licences.

Question/ Comment	The spent nuclear fuel delivered to France and to the United Kingdom until 30 June 2005 will be reprocessed. Since the last report, the operators of the nuclear power plants have provided evidence of the safe re-use of all the plutonium generated by means of its re-use as MOX fuel in reactors. After the events in Japan, the licence of 8 NPPs have expired and the other 9 NPPs are still in operation but should be finally shut down between 2015 and 2022. Could Germany indicate if the total re-use of plutonium is challenged by this decision?		
Answer	The re-use of plutonium from reprocessing as MOX fuel is not affected by the shut-down of eight NPPs in 2011. In seven operating NPPs the use of MOX fuel is licenced and planned during the next years.		
Question/ Comment	The NUKEM-A fuel cycle facility located at Hanau has not yet been released from nuclear regulatory control while the facility for ground water remediation remains in operation. Can you explain what the long term plan for this facility is, and associated time lines, in order that it may be released from regulatory control?		
Answer	The previous operation of the NUKEM-A as a facility for production of fuel elements caused contamination of the soil on the site. The facility is dismantled and in May 2006 the radiological remediation of the soil of the NUKEM-A site concluded. The entire premises, with the exception of 1,000 square metres, were released from regulatory control. The partial area will remain under regulatory control for the operation of a groundwater restoration plant. The groundwater is pumped from a remediation well to a cleaner and then it is delivered to the clarification plant of the industrial area for final treatment. Groundwater restoration will still take several years until the (conventional) restauration level of 20 µg uranium/l on the basis of a notification under water right will be achieved.		
Question/ Comment	Could Germany give more details on the Land collecting facilities that accept heat generating radioactive waste. How many of this kind of facilities are operated, who is the Operator and what is the origin of this waste?		
Answer	The regional Land collecting facilities store radioactive waste originating in particular from smaller waste generators such as hospitals, industry or universities. There is only one Land collecting facility accepting heat-generating radioactive waste - Baden-Württemberg. The operator is the Central Decontamination Department (HDB) of the “Wiederaufarbeitungsanlage Karlsruhe Rückbau- und Entsorgungs-GmbH” (abbreviated WAK GmbH). The waste stored in this facility originates from the Karlsruhe Institute for Technology (formerly Karlsruhe nuclear research establishment) and the European Institute for Transuranium Elements (ITU).		
Question/ Comment	It is affirmed that the Konrad waste acceptance criteria were recently modified. Could Germany provide more details on this? Is there an English version of the reference BfS 10?		
Answer	The Konrad waste acceptance requirements were revised in October 2010. The revision of this document was carried out in order to incorporate the additional		

requirements imposed by the licensing authority in the Konrad licence. These requirements particularly address the criticality safety of waste packages including fissile material.
In addition, the Konrad licence includes in its Annex 4 the water law permit for the disposal of radioactive waste in the Konrad repository. The permit states that BfS as licencee and operator of the Konrad repository has to monitor the radioactive waste intended for disposal in this facility with respect to its chemical composition, i.e., with respect to the non-radioactive waste package constituents which may be harmful to groundwater. Regarding compliance with the respective requirement given in the Konrad water law permit practicable measures serving the waste generators / conditioners and BfS have been developed resulting, i.a., in the revision of the Konrad waste acceptance requirements.
An English language version of the Konrad waste acceptance requirements is being prepared and should be available in the second half of 2012.

Question/ Comment	Section B.1.3 states the possibility of retrieval of radioactive waste during the operational phase of the repository. By what criteria is the possibility of retrieval reviewed?		
Answer	The Safety Requirements on the Disposal of Heat-generating Radioactive Waste as of September 30, 2010, state that retrieval of waste packages must be possible during the operational phase of a geological repository. Criteria for the possibility of waste retrieval are still to be defined. First time in a preliminary safety analyses for a heat generating waste repository in the Gorleben salt dome the technical requirements for retrieving waste are investigated. Results are expected by end of the year 2012.		

Question/ Comment	Section B.1.5. states that "The term "radioactive waste with negligible heat generation" was quantified within the scope of the planning work for the Konrad repository. This was based on the postulate that the temperature conditions prevailing underground should only be influenced to a negligible extent by the waste packages emplaced". And, 3 Kelvin on average is shown which must not be exceeded as the increase in temperature at the wall of the disposal chamber. The difference of 3 Kelvin in temperature substantially has no effect on the physical and chemical properties of materials including infillings, rock-forming minerals and interstitial waters. This shows consequences of long-term safety assessment have hardly anything to do with the difference of 3 Kelvin in temperature. If based on such circumstances, what does the quantitative stipulation of 3 Kelvin in temperature mean from the regulatory point of view with regard to securing long-term safety?		
Answer	The planning work for the Konrad repository was originally based on the political requirement that only low-level radioactive waste and radioactive waste originating from decommissioning and dismantling of nuclear facilities or installations should		

be disposed of in the Konrad repository.
In the “Safety Criteria for the Final Disposal of Radioactive Waste in a Mine” as of 5 January 1983 it was stated that the safety of a repository in geological formations must be demonstrated in a site-specific safety assessment comprising the operational phase and post-closure phase as well. Thus, in order to perform such a safety assessment, the qualitative requirement only to dispose of low-level radioactive waste and radioactive waste originating from decommissioning and dismantling of nuclear facilities and installations must be transferred into a quantitative requirement or prerequisite for further safety-related and facility-related planning work. That was the reason why the approach of radioactive waste with negligible heat generation was developed and the thermal limitation of 3 Kelvin for the permissible temperature difference between the waste packages in an emplacement room of the Konrad repository and the host rock was introduced. The value of 3 Kelvin corresponds to the geothermal gradient of 3°/100 meter depth and is comparatively small with respect to temperature changes induced by the mine ventilation system.
It must be pointed out that there are no links between the 3 Kelvin requirement and the long-term safety of the Konrad repository at all.

Question/ Comment	Section B.1.5 describes the radioactive wastes by type. - What is the disposal cost for each type of radioactive waste and/or radioactive nuclide concentration classified by the report? - Which organization is responsible for the disposal cost and management of radioactive wastes except for wastes generated from nuclear utilization facilities? - What is the long-term management plan for disused sealed sources?		
Answer	- The disposal costs for radioactive waste with negligible heat generation for the Konrad repository have not been determined finally because the usage agreement between the waste generators and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety is not closed yet. The disposal costs will refer to the waste package volume only (Euro per cubic metre), not to radioactive nuclide concentration. - The Federal Office for Radiation Protection (BfS) is in charge of the disposal of all types of radioactive waste and therefore also for the setting of costs (prices) for waste packages to dispose of. The polluter-pays principle applies to the financing of spent fuel and radioactive waste management activities including conditioning, storage, shipments and disposal. Waste generators from the use and handling of radioisotopes in research, industry and medicine, are responsible for the management of their radioactive waste themselves. This waste may be delivered to eleven regional Land collecting facilities which are operated by or on behalf of the Länder (federal states). It is either accepted as primary waste and then conditioned on site, or has already been conditioned and is delivered in a form suitable for disposal. The Federal Government is obliged to accept the waste from these storage facilities for disposal if it cannot be released after the radioactivity has decayed. - The long-term management plan for disused sealed sources is to dispose them as radioactive waste in the Konrad repository. This waste may be packaged together with other radioactive waste in standardized containers.		

Question/ Comment
Section D.5.4 states that
- Four of these five fuel fabrication plants have been completely removed
- At the NUKEM-A site, a facility for groundwater remediation remains in operation, which is the reason that the site has not yet been released from nuclear regulatory control

- What causes the contamination of the groundwater, and what are the scope and degree of groundwater contamination?
- How is groundwater remediated, and how serious is the soil contamination?

Answer
The previous operation of the NUKEM-A as a facility for production of fuel elements caused contamination of the soil on the site. The facility is dismantled and in May 2006 the radiological remediation of the soil of the NUKEM-A site concluded. The entire premises, with the exception of 1000 square metres, were released from regulatory control. The partial area will remain under regulatory control for the operation of a groundwater restoration plant. The groundwater is pumped from a remediation well to a cleaner and then it is delivered to the clarification plant of the industrial area for final treatment. Groundwater restoration will still take several years until the (conventional) restauration level of 20 µg uranium/l on the basis of a notification under water right will be achieved.

Question/ Comment
Section D.4.2 describes the nuclide inventory disposed of in the disposal facilities.

What is the method for evaluating the difficult-to-measure nuclide in the disposed of nuclide inventory?

Answer
The operators of nuclear power plants particularly apply the method of isotopic vectors to facilitate the determination of radioactive inventories in waste packages. This method is based on correlation calculations between easy- and difficult-to-measure radionuclides. Difficult-to-measure nuclides are calculated using the key radionuclide concept and KORIGEN calculations.

Question/ Comment
- Do you have experience in transferring waste that does not fit the container among decommissioning wastes?
- How is safety secured during the transportation?

Answer
Examples for waste items that will not fit into an ISO container are large components (steam generators, reactor pressure vessels (RPV) etc.) that need to be transported.
In such a case, the component may form a Type IP-2 package (pursuant to the IAEA Safety Requirements TS-R-1 “Regulations for the Safe Transport of Radioactive Material”) of its own. The component may require additional shielding during transport. Figure D-15 on p. 62 of the German report to the Third Review Meeting for the Joint Convention (2009) provides an example of an RPV being transported via public rail tracks over several hundred km as such a package from Rheinsberg to Greifswald.

Question/ Comment
The report ststes that the Federal Governments concept envisages that in future spent fuel is without exception to be placed in interim storage at the reactor sites where it is generated.
How long time period is foreseen for the spent fuel interim storage at the reactor

	sites? Please describe the final solution for the spent fuel disposal.
Answer	The licence to store spent fuel at the reactor site in dry dual-purpose casks is limited to 40 years, beginning with the first emplacement of a cask. This time span will be used for siting, licensing, construction and commissioning of a repository in deep geological formations. If there will be no repository available until 2035, the interim storage period has to be prolonged. Chapter D.1 of the German report describes in detail the pilot conditioning plant and the reference concept for direct disposal of spent fuel.

Question/ Comment	A diagram presenting prognosis in waste generation up to 2080 is shown on page 89. The diagram shows rather constant increase of RW amounts from nuclear power plants in the years 2005 - 2040. How does this refer to the announcement to withdraw from nuclear power and shutdown the NPPs up to the year 2022?
Answer	The rather constant increase of radioactive waste amounts in this diagram is not very realistic. There are no concrete time frames for the decommissioning of several nuclear power plants in Germany so the diagram represents more a rough estimate.

Question/ Comment	Policies and practices: Spent fuel management policy and heat generating radioactive policy According to the report, the commission of a repository in deep geological formations for the disposal of heat generating radioactive waste around the year 2035 is foreseen. Could Germany inform if the deadline of 2035 for having available a geological repository has been formally set by the German Government or Parliament or other institution with decision-making power in this area? In case of a positive response, could you please provide the reference of the documentation where this date has been set?
Answer	A deadline for having available a repository in deep geological formations for the heat generating radioactive waste has never been fixed in any legislative documentation. From the limited operation time of the local interim storage facilities there is a need for a repository around 2035. Interim storage of spent fuel elements is necessary in order to allow for the decay of the high-level radioactive fuel elements. Originally, no time limit was intended for the operation of interim storage facilities in the vicinity of nuclear power plants. However, requests were made to restrict the storage time of each container to 40 years counted from loading. The German Federal Government expects to have a repository for final storage available after this period of time. As the first of in total twelve local interim storage facilities is in operation since the year 2002, a repository should be available in 2035.

Question/ Comment	According to the report the operators of the nuclear power plants have provided evidence of the safe re-use of all plutonium generated by means of its re-use as MOX fuel in reactors, and the safe storage of all uranium. Will all the uranium separated during reprocessing be returned to Germany? Is it planned to reuse it?
Answer	In order to fulfil the requirements of the Atomic Energy Act (AtG) with reference to the uranium from reprocessing, its safekeeping has to be proven by realistic projections showing the availability of adequate interim storage capacities.

	In addition to long-term storage, uranium extracted from reprocessing of irradiated nuclear fuel has been re-used as ERU (enriched reprocessed uranium) fuel in six German reactors since the 1980's. The strategy for the management of the uranium from reprocessing - recycling as ERU fuel or long-term storage - depends on the nuclear utilities.
Question/ Comment	The Konrad repository has a maximum waste package volume of 303000 cubic meters. The projected cumulative waste storage graph on page 89 shows there is little contingency for potential increase of waste requiring disposal. Is this volume a legislative limit? Is the particular repository geology suitable for expansion beyond 303000 cubic meters? What technical and legislative requirements would have to be considered for the capacity of the Konrad repository to be expanded?
Answer	The plan approval notice for the Konrad repository was issued for the disposal of up to 303,000 cubic metres waste package volume. This waste package volume is the result of a prognosis of future arisings until 2080 which was performed in 1999. This result was stipulated in the licence by the regulatory body. Within the scope of the Konrad site-specific safety assessment the Federal Office for Radiation Protection (BfS) demonstrated the safety of the repository for a waste package volume up to 650,000 cubic metres. This volume served as waste-related basis for the Konrad repository planning work. If a decision should be made to expand the capacity of the Konrad repository, a new licence will have to be applied for.
Question/ Comment	The Fukushima accident has reminded us of potential risks associated to the on-site storage of SF. The report states that SF is now stored intermediately at the sites where it was generated in order to avoid the transportation of spent fuel. Since we know that transports of radioactive material in Europe have excellent safety records, please explain the rational beyond this German decision?
Answer	In its 2001 amendment the German Atomic Act banned the reprocessing of spent fuel from 1 July 2005. Due to the ban and the fact that the number of transports of nuclear waste should be minimized, the nuclear power plant operators as waste producers have been obliged to store the spent nuclear fuel in interim storage facilities on the premises of their plants. Generally, the radioactive waste in these interim storages is stored dry in dual-purpose casks which are constructed for transport and storage. These casks are designed for extensive mechanical and thermal loads and fulfil the stringent requirements for accident-proof Type B(U) package design approval pursuant to the IAEA Safety Requirements TS-R-1 "Regulations for the Safe Transport of Radioactive Material". We also recognize the excellent safety records of radioactive material transports in Europe, however, the public opinion of the German society is not in favour of such transports.
Question/ Comment	The report states that since 1 July 2005, delivery of spent fuel to other European countries for reprocessing has been ended, spent fuel is kept on the premises of the nuclear power plants in interim storage facilities until their delivery to a federal facility for the disposal of radioactive waste. It is also stated that the Gorleben pilot conditioning plant (PKA), has been designed as of 2000 for the conditioning of spent fuel for direct disposal, but that the conditioning procedure still needs to be approved by the BfS. Could you provide in indicative schedule for when conditioning of SF may actually be done?

Answer	The licensing procedure for the Gorleben pilot conditioning plant (PKA) was concluded in December 2000 with the granting of the 3rd partial construction license. According to a collateral clause in the license, its operation is currently restricted to the repair of defective transport and storage casks for spent nuclear fuel assemblies and HAW glass canisters. If a repository site for heat-generating waste will be selected in future, the PKA may start its operation conditioning fuel assemblies at an annual throughput of up to 35 Mg HM. In the Federal Republic of Germany only one site has been investigated for its suitability to host a repository for heat-generating radioactive waste (i.e., waste originating from reprocessing and spent nuclear fuel). At present, a revised approach to the disposal of heat-generating radioactive waste including a site-selection procedure and amended or new legislation is prepared. Thus, an indicative schedule for spent nuclear fuel conditioning can currently not be provided.
Question/ Comment	As a consequence of the events in Japan, the licence to operate 8 NPP expired. Could you please specify the long term management policy of the spent fuel located in theses NPPs that has not yet reached its final burn-up?
Answer	As a consequence of the Fukushima accident for the seven oldest reactors and the NPP Krümmel the authorisation for power operation was terminated by law (Atomic Energy Act was amended and put into force on 6 August 2011). These eight NPPs were shut down permanently and they are still under the operational licence. Until the end of 2011 no application for a decommissioning licence was filed for one of the eight permanently shut down NPPs and the fuel is still in the facilities (spent fuel pool). The German regulatory framework includes no deadline for filing an application for a decommissioning licence after permanent shut down.
Question/ Comment	The report notices the plan for an on-site dry storage facility in the Obrigheim NPP. However the table A-2 mentions the construction of a wet storage facility. Could you please confirm that only a dry storage facility is planned in Obrigheim?
Answer	Presently, the spent fuel from the NPP Obrigheim is stored under water in a separate storage pool at the reactor site. For decommissioning and dismantling of the reactor the operator applied for a licence to store the spent fuel in dual-purpose casks in a dry interim storage facility at the Obrigheim site.
Question/ Comment	The report indicates that existing dedicated disposal space in external interim storage facilities are sufficient for the dismantling of the MuÌˆlheim-KÃ¤rlich facility, except the reactor pressure vessel and the biological shield. Please indicate what plans exist for the management of these wastes?
Answer	The decommissioning project of NPP Mülheim-Kärlich (KMK) is scheduled in such a way that the conditioned radioactive waste, including the reactor pressure vessel and the biological shield, can be brought directly into the Konrad repository after it will be operable in about 2019. This means that the original plan to construct an interim storage facility at the site has been abandoned for the time being.
Question/ Comment	It is showed in Figure D-9 that the total amounts of spent fuel will be 17 000 Mg HM by the end of 2027 until the final closure of all plants. How will the plicy of final closure of all plants impact on the enriched boron nulear power plants?

Answer	In Germany the spent fuel management strategy is to store all spent fuel dry in dual-purpose casks for interim storage to await direct disposal in a repository. When the reactor has been shut down, spent fuel is transferred to the cooling pond. After a sufficient cooling time (usually 3 - 5 years), the spent fuel assemblies are packed into dual-purpose casks for transport and storage. Due to the dry storage technology there is no impact on enriched boron in the NPP.
Question/ Comment	The report mentions that apart from the interim storage of radioactive residues, another aim of interim storage is the radioactive decay of the waste to allow an easier processing at a later stage and perhaps the release of the materials so that the demand for the necessary repository volume can be reduced. Could you please specify the regulation for this aim (e.g. temporal limitation, characterisation of waste, concept for the processing)?
Answer	The time during which radioactive material may be held in interim storage is not limited a priori, provided that this storage is in accordance with the licence of the storage facility and the condition of the waste is safe. This means that it can be decided at any time to release part of this material by clearance. Databases that allow planning of the date when clearance levels will be complied with assist the operator of such a storage facility in this decision. When it is decided to bring part of the stored material to clearance, a normal clearance procedure is carried out in accordance with the current site licence (e.g. in the case when it is an interim storage facility at a NPP). This approach does therefore not require a specific regulation.
Question/ Comment	The Tables D-5 and D-8 did not report the same volumes of conditioned radioactive waste (Heat-generating). Could you please explain this discrepancy?
Answer	The volume of conditioned heat-generating radioactive waste in Table D-5 has falsely been transferred, i.e., Table D-5 has to be corrected. The volume of conditioned heat generating radioactive waste amounts to 673 cubic metres (see Table D-8).
Question/ Comment	The report notices a distinction between NPPs shut down and NPPs with license terminated according to the 13th Act on the Revision of the Atomic Energy Act. What is the difference? Are the NPPs with license terminated in the process of being decommissioned?
Answer	The 13th amendment of the Atomic Energy Act (AtG) prohibits the authorization of power operation for eight NPP. The operating licences of these NPPs are still valid and the NPPs are in the post-operational period (i.e. the phase of transition between operation and decommissioning). The operators will apply for a licence for decommissioning within the next few years.
Question/ Comment	As a consequence of the events in Japan the licenses to operate 8 power plants expired prematurely. Could you please specify if the post-operational phase of these plants already started and if deadlines for the submission of the decommissioning license applications exist?
Answer	The challenge regarding the spent fuel from the eight NPPs which were shutdown in 2011 by law is the low burn-up of the fuel assemblies from the last revision of the plants. For this fuel assemblies with a burn-up of a few hundred up to a few

thousand Megawatt days per Mg of heavy metal (compared to about 50,000 MWd/Mg of spent fuel as usual burn-up) the criticality safety during the further steps of spent fuel management must be carefully assessed. The first result of an assessment of the Waste Management Commission (ESK) was that the low burn-up will not affect long term management policy in a way that storage in transport and storage casks and the direct disposal of this fuel is not possible.