Questions and Answers on the National Report of GERMANY

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
1	3.1	C/ Page 18, Item (1)	Article 3.1 of the JC takes the SF out of the scope when it is in reprocessing plants. It would be useful to clarify why only interim stored spent fuels with the intention of disposal are included in the scope of the National Report.	Only the interim stored spent fuel are under the safety regime of German regulation and thus scope of the national report. The spent fuel which are not intended to be disposed are brought to reprocessing plants abroad. As a result of this they are leaving the validity range of German regulations.
2	3.3	C	According to the report (section C, Article 3c) waste from defence programs is subject to the same provisions as those applied to the civil sectors. Please provide a specification of the radioactive waste from the defence programs ?	The waste coming from defence programs consists of: • sighting devices (notch and bead) with luminous paint containing Pm-147, • waste from electron valves containing Th • radiation test sources with Sr-90, Cs-137, Co-60, Pm-147 • radiation sources for educational purposes with Kr-85, Ra-226, Na-22 • ice warning devices with Sr-90 from air-planes and helicopters • contaminated soil with Co-60 • C-14 sources • laboratory wastes with H-3, Ra-226 • ceramic tubes with H-3, Cs-137, Ra-226 • parts of disused instruments with H-3, Pm-147, Ra-226
3	4	§ G-4 (iii) Page 94	Who has the responsibility to approve the waste acceptance requirements both for interim storage and disposal? Who is responsible to supervise compliance with the waste acceptance requirements?	The waste acceptance requirements for interim storage facilities and disposal are approved by the Federal Office for Radiation Protection. Compliance with waste disposal acceptance requirements will be supervised by the Federal Office for Radiation Protection. The compliance with the waste acceptance requirements for interim storages is supervised by the authority of the Federal State, where a storage is being located in.
4	4 (i)	G; p. 93	What are the quantitative values related to the criticality and heat removal requirements for wet and dry SF storage facilities (in KTA 3602, 3303 or others)?	KTA 3602 requires the calculated k-eff not to exceed 0.95 for normal operation of wet SF storage, assuming specified conditions and assumptions. For incidents, to be taken into account, subcriticality has to be ensured. (Note: the current revision of KTA 3602 in case of the incidents basically requires k-eff not to exceed 0.95, and in well-founded cases 0.98). KTA 3303 limits the storage pond temperature to 45°C for normal operation, to 60°C for abnormal operation and DBAs, and to 80°C for specific DBAs and rare events. Dry SF storage is addressed by the RSK safety guidelines on dry storage of irradiated fuel elements in containers (Nat. Report, [4-2]). Regarding criticality safety, the RSK safety guidelines require the above mentioned limit of k-eff for normal operation, and subcriticality for inci-

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				dents. Cask temperatures, which endanger shielding of gamma- and neutron-radiation and leak-tightness, may not occur.
5	4 (ii)	G/ Art.4 (ii), Page 94	In relation to the minimization of radioactive waste associated to spent fuel management, it would be convenient to inform: Which are the measures to reduce the volume of radioactive waste considered by the spent fuel generators? If any modifications on design or procedures are under consideration to reduce the volume of waste to be managed.	Measures to reduce the volume of radioactive waste are: • Increased burn-up of fuel discharged from NPPs by increased enrichment and by optimized in-core fuel management (operation period, loading patterns) • Minimization of waste volume by combustion, high pressure compaction, drying • Reduction of waste by decay storage
6	4 (iii)	G, p.94	What is the status of the plan that considers the interdependencies among the different steps in spent fuel management? Will it lead to centralized facilities?	A project group, headed by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), is drafting a "national waste management plan". The draft currently in process does not lead to centralized storage facilities for spent fuel and HLW in general. Though, with respect to a repository, a single-repository-concept is favoured by the BMU.
7	4 (iii)	Section G, page 93	What is the "disposal plan" (mentioned in this article), what is its subject matter, what is its status?	According to the political party's coalition agreement of 1998, the Federal Government will develop a "national waste management plan". The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) therefore has established a project group. The plan will contain the three main aspects • a long-term waste management concept, • stock taking of radioactive wastes and waste management facilities as well as the prognosis of future development of waste amounts, • specific plans to manage the radioactive wastes. The plan is currently in the process of drafting.
8	4 (vi)	G/ Art. 4 (vi), Page 95	The Report states that the "casks" as components of the storage system called "interim storage" ensure leak-proof confinement. More detailed information about this point, is considered convenient regarding: ▪ the estimated failure rate of this component (casks), and ▪ the methods used to ensure that this failure rate would be maintained through 40 years of useful life foreseen for these containers.	There is no failure rate for the cask. The casks are sealed leak-tight with a lid system that takes the form of a double barrier and is made up of a primary and a secondary lid. The leaks are sealed individually and bolted on, with the sealing being effected either by metal or elastomer seals. The metal or elastomer seals will have an effective period of 40 years from the moment of loading the cask. In the interim storage facility itself, the secondary lid including the seals and the pressure switch are additionally protected from environmental influences by a further protective steel plate that is bolted onto the cask. Between primary and secondary lid, helium is filled with a pressure of 0.6 MPa. The leak tightness is permanently watched and has to meet the rate of 10^{-8} Pa m^3/s. Every ten years the pressure switch will be changed.
9	4 (vi)	Section	Page 95 states that interim storage is limited	The time frame of 40 years begins with storing the first cask into an interim storage. Not later

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
		G p. 95	to a maximum of 40 years. What happens if disposal is not available and storage needs to go beyond 40 years? Also, when does the 40 year time frame begin – when the facility is commissioned or when each item is placed into interim storage?	than eight years before the end of the 40 years, the licensee has to submit a plan on the future storage of the fuel assemblies, including those assemblies, which are expected further.
10	4 (vi)	G; p. 95	Has already been licensed any disposal cask for SF and/or HLW in FRG? If yes, what is the requirement for the lifetime of this cask?	At time, no disposal cask for SF and/or HLW is licensed.
11	6.1	Section G p. 98	On page 98 it is indicated that a foreign state is consulted and afforded the opportunity to be involved in the process. To what extent can a foreign authority impact on the process? How would disagreements between states be resolved?	A foreign state may be involved in the EIA procedure if a project in Germany may have substantial impacts on that state. The authorities of that state have the same rights and position as the corresponding German authorities.
12	8 (i)	G; p. 102	Provide a list of normal operational events and extraordinary events for existing and/or planned dry interim storage facilities.	In dry interim storage facilities the safe confinement of radioactive substances has to be ensured by the fuel element casks. According to the "Sicherheitstechnische Leitlinie für die trockene Zwischenlagerung bestrahlter Brennelemente in Behältern, Empfehlung der Reaktor-Sicherheitskommmission" (Safety-Related Guidelines for the Dry Interim Storage of Spent Fuel Elements in Storage Casks, Recommendations of the Reactor Safety Commission (RSK)), April 2001 the following plant-internal events are usually considered as design-determining incidents: • mechanical impacts, such as – crash of a cask from maximum possible height in the least favourable impact position an with consideration of the highest an lowest temperatures, – toppling of a cask during handling, – crash of maximum possible load onto the cask. • fire (the maximum of stationary and temporary fire loads that my be present in the store have to be considered Failures of the following important systems have to be considered as abnormal operations states: • failure of the electricity supply, • failure of instrumentation and control systems, • failure of hoist, cranes and transport vehicles • failure of ventilation systems or active components that are relevant for heat removal.

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				Furthermore the following external impacts usually have to be considered: • external impacts caused by nature, such as storms, rainfall, snowfall, frost, lightning, flooding, landslides and earthquakes. • external impacts caused by civilisation, such as impacts of harmful substances (e.g. toxic or explosive gases), pressure blast waves from chemical explosions, fires spreading from outside the facility (forest fires), mines caving in and aircraft crashes. For onsite facilities also interactions with the existing power plant installations are considered, e.g. collapse of vent stack or other structure, turbine failure or collapse of vessels with high energy content.
13	9 (i)	Section G, Art. 9 i), page 105	What are time and facility frames of the decommissioning program, from what is it started and by what is it finished? What are preconditions for the beginning of the program? Is cold testing without spent fuel included in the program?	It is supposed that the question deals with commissioning! The commissioning tests are performed after completion of construction and installation in the frame of the operation licence. All handling, controlling and monitoring systems have to be checked as well as the reliability of maintenance and inspection devices. Cold testing for the entire handling procedure for each cask type is performed before the first storage with spent fuel.
14	9 (iii)	Section G, Art. 9 iii), page 106	How (besides regulatory oversight mentioned in the report) is compliance ensured with established procedures for operation, maintenance, monitoring, inspection, and testing of spent fuel management facilities?	The operational manual and the testing manual describe all actions of the operators to comply with the requirements. Besides that independent experts are in charge of surveillance acting for the regulatory bodies.
15	9 (iv)	Section G Page 108	Could Germany provide information on applicable regulations concerning licensee internal organization regarding safety? (Independence of the staff in charge of safety, working procedures, etc.)	The independence of the persons who are in charge of radiation protection, physical protection and operational safety is a postulated condition of the licence.
16	9 (iv)	Section G, Art. 9 iv), page 108	This article of the report, as regards engineering support over the facility life cycle, makes a reference to comments on Joint Convention Article 22 i). However, there is information on qualified staff, that is different from engineering support. Additional explanation should be provided for this issue.	Engineering support is maintained by the producer companies of the casks and of all handling and control devices, by the federal institutions of material and radiological sciences and by the technical surveillance which is in charge of periodic testing the reliability of all equipment.
17	9 (v)	Section G Page 108	Can Germany provide precisions on the criteria for declaration of incidents? Are they those applied to nuclear reactors? Has each incident	The obligation for operators of facilities licensed according to Section 6 or Section 7 of the Atomic Energy Act (AtG) to report accidents, incidents and other events significant to safety to the supervisory authority is regulated in the Nuclear Safety Officer and Reporting Ordi-

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			a classification with reference to the INES international scale? Is there a system for the declaration of radiological incidents?	nance (AtSMV). The criteria for the classification of accidents, incidents and events are given in section 8 and Appendix 1 and 2 of the AtSMV for nuclear reactors and for fuel cycle installations during the operation and the dismantling phase. The following levels are defined (simplified): • Category S: immediate notification of the authority after the incident has been noted; • Category E: notification within 24 hours; • Category N: notification within 5 workdays; • Category V: notification within 10 workdays (this category is only relevant for nuclear reactors prior to loading of fuel elements). A substantial number of scenarios are described in Appendix 1 and 2 of the AtSMV covering the areas: radiology and radiation protection; systems, and external and internal impacts. The scenarios cannot be outlined in detail here. Independent of the reporting according to the AtSMV, each accident or incident will be reported by the operator of the nuclear facility with respect to the INES scale. There is no direct translation of the AtSMV categories outlined above to the seven INES categories because the INES categories are defined by a set of specific criteria as laid down by the IAEA in the INES manuals. However, the AtSMV categories V and N generally correspond to INES step 0.
18	9 (vi)	Section G, Art. 9 vi), 109	How and on the basis of what requirements is information on operational experience of spent fuel management facilities analysed? How results of the analysis are taken into account?	The experience of operation and events are collected and evaluated by federal institutions. All relevant events or incidents have to be treated according to the Incident Reporting Ordinance.
19	9 (vii)	Section G, Art. 9 vii), page 109	Is there a document that serves as the decommissioning plan for spent fuel management facilities? What are requirements on it?	The suitability of the facility for decommissioning is part of the Safety Requirements and therefore precondition for the licence. There is not yet a detailed plan for the decommissioning measures, but a safety guideline for decommissioning gives the frame for this document.
20	9 (iii)	G/ Art.9 (iii), Page106	Monitoring of the ageing of casks in interim storage is foreseen during operational period. Taking into account the radiation (gamma and neutrons) exposure of the casks, is it possible to inform with more details the scope of the monitoring programme of ageing?	There is no monitoring of cask ageing. The monitoring system is used for the sealing function in order to detect loss of tightness during long time operation.
21	10	Section G p. 110	Is the period of 40 years storage solely based on technical aspects of containers? (p.110)	The period of 40 years storage is not based on technical aspects of containers. The beginning of the operation of a repository for spent fuel and HLW is expected after a period of 30 to 40 years. In this time the containers with spent fuel shall be cooled to a temperature for a safe handling and disposal. For this period the interim storage of the containers has been

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				applied for and approved.
22	10	G; p. 110	How is the HLW generated as a result of the reprocessing of German SF abroad treated in the national concept of SF and HLW disposal?	The HLW canisters from reprocessing of spent fuel elements at Cogema and BNFL are planned to be disposed of in a repository in deep geological formations. The Federal Government is aiming to establish a repository for the disposal of all kinds of radioactive waste by the year 2030.
23	12	p. 115 (H)	The report states that the WISMUT site was divided into four categories to reduce the public dosage level. What are the criteria for the classification?	These categorization has taken place on the basis of dose rates. THE CRITERIA FOR THESE CATEGORIES ARE CURRENTLY BEING INVESTIGATED
24	12		Safety of Storage of HAWC Solution and the Vitrification Method. (i) What inspection and monitoring of the existing HAWC storage tanks and heat removal systems is carried out? (ii) What is the estimated life expectancy of the existing HAWC storage tanks and heat removal systems? (iii) What additional HAWC storage tank capacity is available to provide redundancy against the possible failure of a storage tank? (iv) What other hazard analyses, in addition to the referenced external impact, have been completed to justify the safety of the HAWC storage tanks? (v) It is stated that commissioning of the Karlsruhe Vitrification plant (VEK) is planned during 2003 (Table L-5) and in total, 70m3 of HAWC is to be processed. What is the programme to complete the processing of the HAWC to a safe and passive form by vitrification?	i) Investigations are done at used empty tanks to find out information on activity and composition of residues. During operation the corrosion products in the HAWC solution are analysed every 6 months. ii) With the measured results of corrosion products in the solution the amount of corrosion is evaluated and the expected reliable life time of the tank is determined. iii) In the VEK itself is installed a 100% redundancy for the HAWC storage tank. Beyond that in the WAK are additional tanks from the former use available. iv) As design basis accidents aircraft crash and earthquake are analysed. v) The present status of the scheduled vitrification campaign is from beginning of 2005 to beginning of 2006.
25	12 (ii)	Section H Page 114	Could Germany provide information on the documents presenting the planned measures aimed at upgrading the safety of existing facilities?	We assume that the term „existing facilities“ refers to buildings and installations of past practices. The German remediation programme for contaminated sites of past practices aims at removing risks. Until this goal will be achieved, these sites are kept under institutional control. It can, however, not be the aim to improve the safety of these sites in the sense of improving

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				safety of the operation of nuclear facilities.
26	12 (ii)	H/ Art.12 (ii), Page 115	Which safety and Radiation Protection criteria are taken into account to decide remedial measures? Which licensing procedures and requirements have been fulfilled for remedial activities?	For the decision on remedial measures concerning intervention for past practices / contaminated sites, regulations for contaminated sites (a law and/or an ordinance) are currently being drafted by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). The principal radiation protection criterion below which no remedial measures are to be taken is the dose level 1 mSv/a for members of the public. If that dose level is exceeded, remedial actions may be considered. It is currently being discussed how optimization will be incorporated in the procedure. The licensing procedure is carried out by the competent authorities of the Federal States (*Länder*) according to the *VOAS*, *DB VOAS* and *HaldenAO* as described on p. 38 of the German report. These parts of the regulatory framework of the former GDR are still in use for this purpose. (Remark: workers involved in the remediation process are being regulated according to the prescriptions of the Radiation Protection Ordinance of 2001 (*Strahlenschutzverordnung, StrlSchV*)). Until today, those licensing procedures have mainly been carried out for WISMUT sites and for copper mining areas.
27	13	Section H p. 117	Are social siting criteria included in the overall criteria “for the identification of sites.....accepted by the general public”? If not, why not? If so, what social criteria are used to guage the acceptability by the general public? (p.117)	The final report of the AkEnd (Committee on a Site Selection Procedure for Repository Sites) states: “The socio-economic criteria are based on the consideration that the long-term development of a site region shall not be impaired by the establishment of a repository. The individual criteria refer to the potential development of the labour market, of the regional investments and of the housing market under the assumption that a repository will be established. A potential analysis will generate the necessary general and specific local data in order to determine deviations.” [AkEnd Report, Section 4.2.3] This means that the social and economic criteria will now play an important role in the planned site selection process for a final repository in Germany. It is planned to involve the general public intensely in this process.
28	13	H; p. 117	The site selection procedure for a repository developed by AkEnd incorporates the participation of the general public. What is the role of local governments around the proposed site? Do they have a veto right or can the Government (State) overcome their objections?	According to current law, Section 9b of the Atomic Energy Act (AtG) stipulates that the licensing procedure for the construction and operation of a repository is the plan approval procedure. Thus, the nuclear licensing authority will only be involved when the implementer of the procedure files an application for a plan approval procedure for a repository at a site that has already been selected. Furthermore, this nuclear licensing authority will be an authority of the Land in which the chosen repository site is located. The “Arbeitskreis Auswahlverfahren Endlagerstandorte” (AkEnd) - the Committee on a Site Selection Procedure for Repository Sites – in the following referred to as the “Committee” has been set up by the Federal Minister for the Environment.

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				The Committee had been commissioned to develop a traceable procedure for the identification and selection of a site for the disposal of all types of radioactive waste in Germany. The procedure was to provide for public participation in an appropriate form and to include substantiated criteria. The Federal Government still has to make a decision about adopting the recommendations of the Committee. They are to serve to support the Federal Government in the performance of its task, according to para. 9 a Section 3 of the Atomic Energy Act (AtG) [1A-3]. The Committee recommends that the scientific and technical notions of the licensing authority should be integrated from the start in the site selection procedure in connection with the preparation of exploration programmes and the assessment of the results of the exploration. Also a technical dialogue between the implementer of the procedure and the licensing authority should be established. The committee points out that the willingness of the local population to participate is the condition for a site to be included in the further site selection process.. Therefore a positive vote by the population and a vote by the local council or councils is needed.
29	14	H; p. 120	What is considered as ”mobile activity” ?	Mobile activity should be considered if buildings with penetrated activity will be dismantled. The penetration of activity could be a result of contamination of the building structures (floors and walls) with solvents during the operation of the installation. The penetrated activity will be mobilised and as result aerosol activity will arise.
30	14 (iii)	H/ Art.14 (iii), Page 122	The backfilling and sealing measures associated to the new closure concept to be used in Morsleben, are based on the same criteria applied to a deep geologic repository?	Morsleben is a repository in deep geological formations. Thus the closure concept is based on the criteria to be applied for a deep geological repository.
31	15	H; p. 123	The competent authority may demand adaptations in line with the state of art during the service life of waste management facilities. What are the criteria for such an action? Could you give examples?	Adaptations in line with the state of the art in science and technology during the service life of waste management facilities can follow e.g. due to national or international findings or if defects are found during the operating time of the radioactive waste management facilities. For instance, the following improvements have been done in the past: • amendments to waste documentation as a consequence of false declarations, • modifications to waste container design (e.g. phasing in of casks with internal coating), • change in storage configuration to permit inspections, • installation of air-conditioning in storage building following detection of condensation water with resulting risk of corrosion of the containers, • adaptation of monitoring systems (e.g. due to discovering gas generation from wastes with

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				resulting pressure build-up in waste containers).
32	15	Section H, Sub-section 15.2, p. 125	Evidence of compliance with dose limits may be provided in the form of model calculations used to ascertain and quantify potential releases of radionuclides, as well as to calculate potential radiological consequences. How are these models verified? Are uncertainty and sensitivity analyses performed? Please describe.	**How are these models verified?** Strictly speaking, a verification of a model's prognostic quality would consist in a periodically repeated comparison of the predicted and observed behaviour over the operational and post-closure phases. The German concepts considered so far for radioactive waste disposal in deep geological formations do not contain any retrievability options. Some monitoring of a repository system seems possible from the surface of the Earth or from space, i.e. in the far-field. The limitations of model calculations are well known: Site- and concept-specific models are the outcome of an iterative reduction/abstraction procedure, which concerns all findings within the site-characterisation respective the safety assessment stages of the repository development. Repository performance is usually evaluated in a manner that aims at not underestimating (radiological) consequences, while avoiding too large a simplification. As model calculations for safety analyses are performed to extrapolate today's understanding of the real world into the (farther) future, it is recognised that all models will propagate unresolved issues: data uncertainties as well as parameter uncertainties, and even inadequate physical insight into some complex natural processes. Moreover, for certain classes of highly-coupled problems (3D-THCM) computational barriers still exist and have to be over-come. Due to the many likely future evolutionary paths of a repository a "verification" of numerical models, which characterise such an open physical system, is impossible. Therefore a verification should be thought of as providing a formal, explicit and traceable procedure for considering inevitable uncertain-ties. Convergence to "sufficient confidence" has to be achieved. The accepted strategy involves a variety of measures. First, numerical codes developed in Germany for specific stages of the safety assessment (e.g., EMOS, d3f) are continually reviewed, in response to the changing level of scientific understanding and numerical progress. These codes take part in international benchmarks. To constrain numerically derived results simple and conservative models of the repository system, which allow analytical solutions of upper/lower bound character, are looked for. While striving to minimise conservatism, uncertainties of model parameters may be reduced in parallel by additional in-situ-measurements, drillings and laboratory investigations. Conceptual models for transferring results obtained in laboratories to large scales are developed. Often R&D is needed to enlarge or complete insight into natural processes (e.g. nuclide transport under variable chemical conditions in the near-field for criticality assessments). Calculations are to be refined and repeated for every substantial update of the under-lying

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				model-database. It is observed that quite essential model changes may still occur in the late stages of a safety analysis (the sealing requirements for the Morsleben LLW repository serve as an example). To establish confidence in the repository's safety, any evaluation of the model quality has to draw on the results of comprehensive uncertainty and sensitivity analysis (the scatter of potential nuclide releases depends on the completeness of the scenario development). The observation of comparable natural systems, which have evolved over long time-scales, and which may serve as non-quantitative natural analogues, is even more important for enhancing confidence. Model calculations, which deal with unpredictable future environmental conditions, form a large part within the repository's performance assessment. Their results cannot be verified in a mathematical sense. They serve as one line of reasoning within the compilation of the safety case. **Are uncertainty and sensitivity analyses performed?** Uncertainty and sensitivity analyses are part of the model calculations of the safety analysis.
33	15 (ii)	Section H, page 125, paragraph 5	The report mentions the “Safety criteria for radwaste long-term storage in the vault”. Could more detailed information on the “Criteria…” be obtained?	The “Safety Criteria for the Permanent Storage of Radioactive Wastes in a Mine” are guidelines issued by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) following consultations with the Länder (Federal State) and generally by way of consensus with them. More detailed information is given on p 46 art 19.2 of the German report.
34	16	Section H	How is feedback of operating experience acted upon, and corrective measures evaluated?	Incident reports are evaluated by the Federal Office for Radiation Protection. The results are distributed to the competent operators and regulatory authorities. Beyond that information of events within Germany are also circulated following the Incident Reporting Ordinance.
35	16		Is the disposal facility designed to deal only with nuclear wastes or will it accept the wastes from medicine, industry etc. as well?	Different types of disposal facilities are designed and in operation. The Tables L-6 – L-10 give information to the purposes of the facilities, their capacities etc. according to their licences.
36	16 (i)	L13; P. 127	Could you explain the regulatory systems or procedures to assure license holder's compliance with these regulatory requirements for operating nuclear facilities?	The regulatory authority can survey the operators’ actions at any time, and can also send independent experts of surveillance.
37	16 (v)	Section H Page 130	Could Germany provide information on the applied means for packaging, characterizing and ensuring traceability of all waste and involved processes?	The rules for declaration are given in the Radiation Protection Ordinance. According to these requirements the documentation system is developed on an electronic data base.
38	17		Did you set the long term dose limit for the	In the long term safety analysis regarding the closure of the Morsleben repository a dose limit

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			members of population related to the disposal site after institutional control?	has been taken as basis for calculations. This dose limit was taken in analogy to the limits of the radiation protection ordinance, i.e. 0,3 mSv p.a. for members of the public.
39	17		How did you solved the problem with intrusion scenarios at disposal site after institutional control?	As German disposal sites are planned in deep geological formations human intrusions after closure are not very likely. To prevent generations to come from accidentally intruding the disposal site, the documentation about the disposal is kept in safe places to conserve the knowledge.
40	17		What kind of international recommendations did you took into account in order to take the decision about dose limits during and after institutional control of disposal facility?	Germany is member of the IAEA and therefore has taken IAEA Guidelines into account when deciding about dose limits.
41	17		Are there any safety requirements/considerations for the retrievability of waste and spent fuel from the disposal facility?	The existing Morsleben disposal site as well as the plan approved Konrad site are in deep geological formations and retrievability has not been planned for radioactive waste disposed there.
42	17 (iii)	Section H Page 130	Could Germany provide information on the waste clearance procedures and provide some relevant examples of implementation?	The conditions of waste clearance are given in Section 29 of the Radiation Protection Ordinance. There are limits of radioactivity for restricted and unrestricted use. The option of waste clearance after an adapted decay period is chosen mainly for medical waste and more and more also for decommissioning waste. Details on clearance are given on pp. 76-77 of the German report.
43	17 (iii)	Section H Page 134	Could Germany provide information on the anticipated measures in case of leakage detection after closure of a disposal area? Are they currently described in a document?	Germany intends to dispose of all radioactive waste / spent fuel elements in deep geological formations, isolating it from biosphere. Due to geological and technical barriers leakage is not a process which could likely influence the behaviour of the multiple barrier system. So no measures have to be anticipated.
44	17 (iii)	Section H, p. 133	The report indicates the only envisioned monitoring will be in areas surrounding the repository. How long will these routine measurements be conducted? It appears no active or passive monitoring of the condition of waste packages and waste form is planned for any period of time following closure. Is retrievability a realistic option without any performance indicator prior to contamination breakout from the repository?	There is no time limit given for control measures as they consist of regular environmental monitoring. Germany intends to dispose of all radioactive waste / spent fuel elements in deep geological formations and doing so isolating it from biosphere. So far retrievability of waste is not included in the German disposal concept. Due to natural and technical barriers leakage (contamination breakout) is not a process which could likely influence the behaviour of the multiple barrier system. So no measures have to be anticipated.
45	19	--	Please clarify the relationship between EURATOM and the EC directives and the na-	The national nuclear regulatory body is creating the proposals of nuclear legal regulations. These proposals are submitted to the Parliament which sets them into force as law or ordi-

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			tional nuclear regulatory body.	nance. In addition the nuclear regulatory body is executing the existing nuclear legislation in form of granting the license and supervising if the licensing conditions are met. The directives enacted by the EU and EURATOM have to be adopted by the Member States into their national law. The EU an EURATOM have only regulatory but no executing function.
46	19	Section E p. 55	Please elaborate on Germany's experience on the overall effectiveness of the establishment of Advisory Bodies reporting to BMU.	For advice and technical support the BMU consults the Reactor Safety Commission, the Commission on Radiological Protection, and in many cases the *Gesellschaft für Anlagen- und Reaktorsicherheit (GRS)*. The recommendations of the RSK and SSK are summarized on page 46 of the National Report. These responsibilities ensure very effective advice and support to the BMU.
47	19	§ E-19.2 (ii) Page 49	The Federal Office for Radiation Protection (BfS) is the licensing authority for the storage of spent fuel and radioactive waste with significative contents of fissile material, while it becomes an operator for disposal activities (repositories). How independence is preserved in practice, mainly concerning matters related to the acceptance requirements of the waste?	According to Article 23, para. 1, subpara. 2 of the Atomic Energy Act <AtG>, the Federal Office for Radiological Protection <BfS> is responsible for the construction and operation of facilities for the safekeeping and final disposal of radioactive wastes. According to Article 9a, para. 3 of the AtG, the BfS may employ the services of a third party to fulfil its tasks. The BfS makes use of this option by contracting the *Deutsche Gesellschaft zum Bau und Betrieb von Endlagern für Abfallstoffe (DBE)* mbH. In exercising its tasks, the BfS performs a twofold function. On the one hand, the office is the applicant in a plan approval procedure according to Article 9b of the AtG; on the other hand, it performs a self-supervisory role during the construction and operation of a radioactive waste repository. This self-surveillance is a separate organizational unit within the BfS and is subject to the direct supervision of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety <BMU>. With this construction, even the independence concerning the acceptance criteria for radioactive wastes is preserved.
48	19	Section A, page 7, paragraph 7	Licensing of the pilot enterprise for spent fuel processing before disposal was completed in December 2000 with issuance of the third partial license. How does the system for issuing partial licenses function?	For major nuclear facilities the nuclear license is normally granted in several partial steps (partial construction, partial operating licences). Because of the scope and the construction time of such projects it makes sense to examine and license the technical details step by step. The advantage of such a procedure is that the individual licensing steps can thus be based on the latest state of the art. The location, safety concept and construction of the essential buildings are licensed in a first partial construction license, for example. Further licensing steps might be: the construction of the safety related systems and components of machinery and electrical systems, and final construction, first nuclear start-up and operation of the facility.
49	19	Section E, Subsection 22.1-2, p.	Section E states "the execution of the administrative tasks under the terms of the Atomic Energy Act is performed by the Länder (Federal States)" and "the Länder are under the	Over their entire lifetime, from the start of construction to the end of decommissioning with the corresponding licenses, nuclear installations are subject to continuous regulatory supervision by the Federal Government in accordance with the Atomic Energy Act <*AtG*>. In the case of nuclear installations or the use of nuclear fuel licensed under Article 6, 7 or 9 of the AtG, the

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
		45	supervision of the Federal Government with regard to the lawfulness and expediency of their actions". It is further stated on page 50 "Licensing and supervision are the responsibility of the competent authorities of the Länder (Federal States)". As shown in Table E-1, page 50, this applies to the handling and storage of the material if it is radioactive waste, without fissile material, and includes State collecting facilities, interim storage facilities, and conditioning facilities. Because there is no oversight by the Federal Government, how is uniformity in licensing and inspection maintained among the Länder?	*Länder* in their supervisory role are acting on behalf of the Federal Government. In other words, the Federal Government has the right to issue binding directives on factual and legal issues in each individual case. (s. Article 19.2 (iv) on page 57)
50	19	Section E, Subsection 19.1, p. 51	The licensing of nuclear installations is the responsibility of the individual federal states within the Federal Republic of Germany. How are potential differences and variations in human and financial resources and standards between the individual federal states reconciled?	To discuss differences between the individual federal states in the application of standards in the licensing procedure and during the supervision phase and to harmonise the procedures, the Federal Government has established a so-called “State Committee” with participants of all states concerned and of the federal government. One subcommittee deals with issues related to the nuclear fuel cycle and waste management. Normally the subcommittee meets twice a year.
51	19.2	Section E Page 46 to 48	Are all the safety requirements applied to the spent fuel nuclear reactors storage pools systematically applied to other spent fuel management installations? For instance, · Classifications for the elements important for safety · Redundancy · Safety reviews (which periodicity) · Periodical inspections…	Special safety requirements for spent fuel management installations were developed only for the central dry spent nuclear fuel storage facilities. For all other installations the safety requirements concerned (e. g. classification of the elements important to safety, redundancy, safety reviews (which periodicity), periodical inspections) are fixed - if necessary - in the corresponding licensing procedure with respect to the legal basis.
52	19.2	E; p. 55	In the plan approval procedure of a radioactive waste disposal facility the licensing authority is the appropriate land ministry, the supervisory authority is the Federal Ministry for the Environment, Nature Conservation and	Contrary to the standard practice for nuclear installations licensed under Articles 6, 7 or 9 of the AtG, the regulations governing the supervision of radioactive waste repositories are somewhat different once a licence has been issued. In such cases, supervision is carried out by the Federal Government itself. To this end, an independent department – the so-called “Self-Surveillance” section – has been established within the Federal Office for Radiological

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			Nuclear Safety. How is the relation regulated between the licensing and the supervisory authority? In the case of an appeal against the decision of the licensing authority, is it the supervisory authority who proceeds in the matter?	Protection which performs government supervisory tasks on behalf of the Federal Government in co-operation with the Federal Ministry responsible. In this supervision function the Federal Government has the right to issue binding directives on factual and legal issues in each individual case.
53	19.2 (i)	Section E Page 47	Does RSK scope of activity include spent fuel storage, fuel cycle and waste management facilities? Is there a specific panel or sub panel of experts for the related issues?	The German Reactor Safety Commission (RSK) scope of activity includes spent fuel storage, the fuel cycle and waste management facilities. To discuss technical issues and to prepare corresponding recommendations and comments, the RSK sets up special committees in order to deal with special issues arising at short notice and to prepare the drafting of recommendations and comments. The specific committee of the RSK which gives advice related to spent fuel storage, the fuel cycle and waste management facilities is the Committee on “Supply and Waste Handling”.
54	19.2 (i)	L5; p. 48	Do you apply state-of-the-art in science and technology to the regulation of nuclear facilities licensed earlier, or do you exempt them? Do you demand/request the license holders to perform updated safety review with state-of-the-art in science and technology?	The state-of-the-art in science and technology is postulated for licensing as well as for the periodic safety assessment of licensed facilities. However, the consequences of deficiencies are evaluated in each case separately according to the practicability of the needed improvements and the possible benefits.
55	19.2 (iv)	Section E Page 57	Could Germany provide examples and statistics related to audits and inspections for concerned facilities at different stage (design, operation, D&D)?	There are no documented examples and statistics available related to audits and inspections for facilities concerned at different stages made by the supervising authorities.
56	20	Section E	From the account given in this section, it seems that the Federal Ministry issues “guidelines” for the States. Please therefore clarify how Article 20 is satisfied, which organization is Germany’s nuclear regulatory body, and how consistency among States is ensured.	• As stated in the German National Report in Article 20, Page 60, 2nd paragraph, the federal government has taken responsibility in the field of nuclear legislation and therefore is the prime regulatory body. The atomic energy act for instance is federal law. The radiation protection ordinance is issued as a federal ordinance. Where the “Länder” are acting in the field of atomic regulations they act on behalf of the federal government. As already stated in the notes to Article 20 of the JC on page 61 it is a federal obligation to supervise the acting of the Länder in the view of lawfulness and appropriateness. So the request of Article 20 of the JC to install a respective regulatory body is fulfilled. • Concerning the cited guidelines, they are worked out by advisory bodies and are made obligatory by the federal ministry via decrees. • Because the decrees are obligatory, consistency of acting or decisions by the Länder authorities is ensured.

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
57	20		Regulatory Body The planning, construction and operation of final waste repositories is stated to be a Federal Government task with organisational separation from the nuclear supervision department (regulator) to achieve the required independence. (i) Provide details of the Federal Government organisation to clarify how the department responsible for the planning and construction of repositories will be separated from the supervision (regulatory) department? (ii)State to what level of responsibility within the Federal Government separation between repository planning and construction and supervision (regulation) exists?	As stated in the German national report the federal office for radiation protection is the competent institution for the erection of the federal disposal according to the atomic energy act. A certain department in the federal office is in charge of planning, construction and operation of that federal disposal. Another department, that is completely independent from that one, is in charge of supervision. No one in the federal office for radiation protection may give orders to that supervision department, only the federal ministry of environment may do so. That means that on the level of the departments there is a complete separation, that allows independent decisions.
58	20.1	E; p. 60 - 63	Who is the competent authority for the licensing of storage casks in FRG and what is the legal background for the cask licensing procedure?	- The competent body for the licensing of storage casks for disposal is the Federal Office for Radiation Protection. - Concerning casks for interim storage or transportation containing fuel or spent fuel elements it is the business of the Federal Office for Radiation Protection as well. - Concerning other containers for transportation or interim storage it is a matter of the Federal Institute for Materials Research and Testing. - The legal background lies in the Atomic Energy Law, Radiation Protection Ordinance, and in the Ordinance on the Transportation of Dangerous Goods.
59	20.1	Section E Page 62	Could Germany provide figures related to human or budget resources of the Federal and local regulators?	Due to the federal system of Germany, human resources and budgets are kept in several different budgets that are not summed up. Considering human resources there is an estimation of the group of people working in the nuclear field as consultant or supervisor. That estimation amounts to about 1300 specialists (source: Fritz / Kuczera, Energiewirtschaftliche Tagesfragen 3, 2003, p.134 ff).
60	20.1	L36; P. 61	The report says the Federal Office for Radiation Protection (BfS) has three functions. One is the construction and operation of federal facilities for the safekeeping and disposal of radioactive waste, a promotional function, and another is the licensing of nuclear fuel storage	The asked for topics don't coincide: - The federal office for radiation protection is the institution in charge of erecting a federal disposal. In that case, the licensing procedure is that of a plan approval procedure. Competent is the respective authority of that state where the disposal site is planned to be. - In the case of interim storage the federal office itself is the licensing authority – but the site planning and erection is done by the utilities whilst the later supervision is an obligation of

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			outside of federal custody, a regulatory function. How do you ensure the effective independence?	the respective state.
61	21	Section F	How has the independence been ensured of the radiation protection commissioners and nuclear safety officers, taking into account that their positions are part of the licensee organisation structure?	The Radiological Protection Ordinance requires that the radiation protection commissioners must not be hindered in the performance of their duties or suffer any disadvantages by virtue of their activities. A similar requirement is contained in the Ordinance on the Nuclear Safety Officer and Reporting of Accidents and Other Events with regard to the nuclear safety officers. The incorporation of these requirements into legally binding ordinances assures in the best practicable way that the decisions of the radiation protection commissioners and nuclear safety officers can be made independently from the company hierarchy. Offences are liable to imprisonment or fines as described in the comments on Article 19 2. (v), page 58 of the German National Report.
62	21	Section F	Despite of the personal responsibility established for the natural persons - members of the licensee organisation management, is there any legal possibility for administrative liability of the licensee as a legal entity and under which prerequisites?	In principle a liability arises from the Paris Convention for the licensee as a legal entity. Besides that the German nuclear legislation also contains liability regulations. This national legislation regulates the liability for nuclear facilities and nuclear-powerd marine vessels as well as the liability in other cases. Furthermore the contributory negligence, the amount of damages in the case of fatalities, the kind of damages, the maximum limit of liability and the limitation are regulated (Articles 25 to 32 of the AtG). For the licensing authority a liability arises from the fundamentals of the violation of official tasks, if during the exercise of its official tasks any harm has been caused to a third person and if the authority is responsible for harm caused.
63	22	Section F p. 67	Under Article 22, page 67, a “nuclear competence pool” is mentioned. If both licensees and regulators draw from this pool, please clarify how a conflict of interest can be avoided.	The structure and the objectives of the “nuclear competence pool” don ´t give cause to worry about a conflict of interest because in this pool the existing know how of research centres and universities is compiled and made available to everyone, as well to authorities as to licensees . To maintain an adequate level of know how is a goal that is of common interest for both parties.
64	22	F; p. 68	According to the report the anticipated costs of institutional control are low, and as it is the task of the government no funds are raised in advance. What period of time and what kind of control measures are envisaged?	There is no time limit given for control measures as they consist of regular environmental monitoring.
65	22		Human and Financial Resource Given that the Federal Republic of Germany believes the risk associated with the commercial use of nuclear energy is only acceptable	i) The Nuclear competence pool has made an inquiry with the result of about 16500 expert jobs in Germany today in the nuclear field that will go down to about 13000 in the year 2010. Considering that, still 1700 Jobs will be vacant for qualified junior experts.(Source: “Energiewirtschaftliche Tagesfragen 3, 2003, p.134ff) To match these figures the competence pool

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			for a limited period, and is committed to closing down nuclear reactors, the availability of competent nuclear safety staff and the nuclear education/training infrastructure (Page 67) could be threatened. (i) What is the 'Nuclear Competence Pool' currently reporting and forecasting in respect of the availability of adequate knowledge and competent staff in the nuclear and radiation protection sector? (ii) How does the department responsible for nuclear safety supervision (regulator) interface with the 'Nuclear Competence Pool'? (iii) Who is responsible for overseeing the work of the 'Nuclear Competence Pool' and ensuring any recommendations for improvements are made in good time to maintain nuclear safety standards?	itself has proposed and already practised: The Nuclear competence pool opens the chance of close co-operation between the research centres and neighbouring universities. In that co-operation there is the possibility of combined appointment of people for professorship and direction of institutes. It allows an easier exchange of knowledge and human resources between the parties. Besides that there is done promotion to raise interest for nuclear related studies. ii) The nuclear competence pool is independent of stately organisations and therefore no institutional links are given. On the other hand people in charge of member organisations of the competence pool are appointed members oft the RSK (Reactor Safety Commission). The RSK is an advisory body for the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. So there are personal links that help to deal with the problems. Inquiries and analysis published by the pool are taken as worthy helps for decisions. iii) The nuclear competence pool is not under regulation of any ministry and thus no regulatory body is responsible for overseeing it. Co-ordination work is done by elected members of the Board.
66	22	Section F, Subsection 22.2, p. 67	What provisions exist to ensure the reserves formed by private operators for decommissioning are maintained and kept current?	Till now there has been no cause for doubt, that financial reserves for disposal and decommissioning of private operators are available when needed. The companies are regularly audited and their annual accounts are published. In the unlikely case, that a company went insolvent, disposal and decommissioning have to be looked at differently: • According to the atomic energy law the federal government is in charge of erecting a disposal. So there is no doubt, that radioactive waste or spent fuel elements can be disposed of. It is merely a question of refinancing the costs of a disposal site. • In case of decommissioning the situation is something else: If a company went insolvent, and there were no mother company that is liable, public authorities were only committed in case of emergency.
67	22 (ii)	--	To what extent are financial guarantees required for long-term storage of spent fuel and radioactive waste, and for how long are they required to cover costs such as regulatory monitoring and possible remedial actions (not necessarily accidents)?	Long-term storage in Germany is only planned as a not retrievable disposal in deep geological formations. All waste producers have to pay their respective due according to the amount of waste they will deliver für disposal. All costs for a repository are therefore met by the polluters and not via taxes by the public. As stated in Article 22 of the German National Report according to German law the companies that are operating NPP's have to form reserves for the shut down and for decommissioning and dismantling. But as well they have to build re-

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				serves for the disposal of the arising waste. Part of these reserves have to be paid, when the RAW is conditioned for disposal and the required disposal volume is Known. The financial guarantees are not supposed to cover monitoring or remedial actions after the closing of the disposal. That is due to the German concept of safe embedding in deep geological formations, where no cause for any of such actions is expected besides the usual environmental monitoring. Costs for monitoring or remedial actions until the close of the disposal are expected costs of operation and are included in the estimated costs for the disposal – which are basis for the refinancing by the polluters.
68	22 (ii)	F.22.2 p.67-68	Please explain what are the arrangements for securing the financial reserves collected by private operators of nuclear facilities for disposal and decommissioning. Are the operators required to provide securities in order to ensure the availability of assets in the event of insolvency?	Till now there has been no cause for doubt, that financial reserves for disposal and decommissioning of private operators are available when needed. The companies are regularly audited and their annual accounts are published. In the unlikely case, that a company went insolvent, disposal and decommissioning have to be looked at differently: • According to the atomic energy law the federal government is in charge of erecting a disposal. So there is no doubt, that radioactive waste or spent fuel elements can be disposed of. It is merely a question of refinancing the costs of a disposal site. • In case of decommissioning the situation is different: If a company went insolvent, and there were no mother company that is liable, public authorities were only committed in case of emergency.
69	23	p. 70 (F)	What are the quality assurance system and the standard adopted by related applicants for the production of radioactive waste containers and the conditioning, interim storage, and disposal of spent fuel or radioactive waste?	For the production of radioactive waste packages suitable for disposal, qualified procedures have to be applied (§74 (2) StrlSchV). This includes the production of containers and the treatment and packaging of radioactive waste. The qualification by BfS approves the suitability of the process to demonstrate the fulfilment of waste acceptance requirements. The BfS-regulations require a quality assurance system to be in force at the waste management site. In most cases the more general requirements on a quality assurance system are covered by an already existing certification for the facility according to ISO 900X or KTA 1401. In addition, specific requirements for the disposal of radioactive waste (e.g. independent control measures on behalf of the BfS or the competent supervisory authority) have to be met.
70	23	p. 68 (F)	What are the major quality assurance criteria for the management of spent fuel and radioactive waste established in the BNI safety standards? To what facilities are the quality assurance requirements of KTA-1401 applied?	(1) Major QA criteria for the management of SF and RadWaste are in-facility organisation, qualification of the personnel, documentation, archiving and approval of the QA-system itself. One important means of QA management is the operation-manual. (2) KTA 1401 (reaffirmed 2001) formulates general requirements regarding quality assurance of NPPs. Beyond that, the rule is applied analogously to all other nuclear fuel cycle installa-

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				tions.
71	23		Quality Assurance How does the KTA Nuclear Safety Standard 1401 compare with the requirements of IAEA-50-C/SG-Q and the International Standard ISO-9001:2000?	Compliance with the State of the Art in Science and Technology, explicitly required for nuclear facilities in eleven sections of AtG and StrlSchV, ensures safety assessments to be in line with international standards. For example, for interim storage of SF and repository, the state of the art is addressed by Section 49, StrlSchV. Some QA requirements of international standards, e.g. of DIN ISO EN 9001 and DIN EN 45004, are not addressed by KTA 1401. Though, because of the general requirement of compliance with the state of the art, safety assessments take into account international standards. A pre-clarification, how KTA 1401 compares to international QA standards as related to fuel assemblies, had been initiated by the KTA-Chair.
72	24	Section F	Could you present a brief description of the used scenarios and methodologies for defining “clearance level”? Are there considerable differences in comparison with the used by the IAEA and the EU approaches, scenarios, methodologies for calculation and rounding of the results in determination of ”clearance levels” for the relevant radionuclides? (The following documents are alluded to: “Practical use of the concepts of clearance and exemption – Part 1 and Part 2/ Radiation Protection 122” of the European Union of 2000 and “Radioactivity in Material not requiring Regulation for purposes of Radiation Protection” of the IAEA – draft of 2003).	The comprehensive scenarios and methodologies used for defining the clearance levels as set out in the German Radiation Protection Ordinance (Strahlenschutzverordnung – StrlSchV), Table 1, columns 5 to 10a, have been determined in Germany itself and are laid down in the following technical references. The recommendation of the Commission on Radiological Protection: “Freigabe von Materialien, Gebäuden und Bodenflächen mit geringfügiger Radioaktivität aus anzeige- und genehmigungspflichtigem Umgang” (Clearance of Material, Buildings and Land Plots with Insignificant Radioactivity from Handling of Radioactive Material, which is Notifiable or Requires Licensing) adopted on the 151. meeting in February 1998, contains the values for unrestricted clearance of solids, for unrestricted clearance of liquids, for clearance of solids for disposal, for clearance of liquids for disposal by incineration, and for clearance of metal scrap for recycling. For unrestricted clearance of building rubble and excavated soil, where the anticipated amount exceeds 1000 Mg/a, for unrestricted clearance of buildings for continued use or returning to use, and for clearance of buildings for demolition the clearance levels are based on European Commission: Radiation Protection 113; Recommended Radiological Protection Criteria for the Clearance of Buildings and Building Rubble Arising from the Dismantling of Nuclear Installations. - Luxembourg 2000, although in the StrlSchV a different rounding procedure has been applied. The values for unrestricted clearance of land plots were developed within the framework of a Federal Environment Ministry project “Stillegung von Kernanlagen – Freigabe von Bodenflächen kerntechnischer Standorte” (Decommissioning of Nuclear Facilities – Clearance of Land Plots at Nuclear Facilities). The reports of international relevance for deriving clearance values were evaluated and discussed. It became apparent that for restrictive paths, to which the water path belongs, with

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				some exceptions close agreement of less than one order of magnitude was attained.
73	24	Section F	Could you present a brief information for the number of the cases and the type, radiation indicators and the inventory of the materials, exempted from the regulatory control after the entry into force of your national Regulation for radiation protection applying the approved national ”clearance levels”?	Cases in which radioactive materials gain clearance are currently listed in the Federal Environment Ministry, so as to determine the cumulative dose in Germany due to materials cleared. In most cases, these concern weakly radioactive building rubble, excavated earth and operating wastes arising from dismantling or overhauls of nuclear installations. Likewise, clearance is granted for entire land parcels following dismantling of facilities.
74	24	p. 79 (F)	With regard to environmental radioactivity monitoring, what are the threshold values that the Federal Environment Ministry can issue an alarm and what is the basis of the values?	The Federal Office for Radiation Protection (BfS) and the Federal Environment Ministry (BMU) are always informed immediately if significant concentrations of activity from artificial radionuclides bound to aerosol particles are measured. A distinction is made between trace measurements and continuous nuclide-specific measurements that are significant for the IMIS (information and measurement system for monitoring environmental radioactivity) using gamma spectrometry. The latter data are downloaded routinely every day to the IT system of the IMIS. In the case of the trace measurements, on the basis of week filters, limits of detectability of some 5 µBq/m^3 are attained. The continuously measuring gamma step filter equipment shows within a measuring time of two hours artificial radionuclides above a limit of detectability of some 30 to 50 mBq/m^3. The limit of detectability for the daily value laid down for normal operation is 10 mBq/m^3. These limits of detectability are stipulated in the routine measurement program of the General Administrative Regulations on the IMIS (AVV-IMIS). These values are oriented to what is technically possible and radiologically meaningful. At the German National Meteorological Service (Deutscher Wetterdienst – DWD) for example, there is an internal regulation that an alarm will be triggered if 200 mBq/m^3 air for one radionuclide is exceeded or 100 mBq/m^3 air per radionuclide for at least two radionuclides. As laid down in an internal alarm plan with an on-call service, following a check of the values, the BfS and Federal Environment Ministry will be informed. The monitoring systems switch automatically to a greater frequency of measurements. To complement the measuring procedure as described, for comparison purposes each measurement station has available a procedure for determining artificial alpha and beta activity in the atmosphere. Their limits of detectability are likewise documented in the AVV-IMIS. Of course, the same applies for the general-area local dose rate measurement network of the BfS. Any unusual raising of the local dose rate (frequently the case during thunderstorms with heavy precipitation, or rainfall after long dry periods) results in a notification whose plausibility is checked (on-call service).
75	24	p. 75 (F)	The report states that the effective dose of 50	Worst-case accidents are so-called design accidents, for which the safety equipment of the

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			mSv due to the release of radioactive substance into the environment must not be exceeded, even in a worst-case accident. What kinds of accidents are considered as worst-case accident?	facility must be so designed that they can be kept under control. In general, the design accidents are stipulated during the planning phase depending on local and plant-specific circumstances. Examples and classification of incidents and accidents to be considered in connection with the design of interim storage facilities for spent fuel are • mechanical impacts, such as – crash of a cask from maximum possible height in the least favourable impact position an with consideration of the highest an lowest temperatures, – toppling of a cask during handling, – crash of maximum possible load onto the cask. • fire (the maximum of stationary and temporary fire loads that my be present in the store have to be considered Failures of the following important systems have to be considered as abnormal operations states: • failure of the electricity supply, • failure of instrumentation and control systems, • failure of hoist, cranes and transport vehicles • failure of ventilation systems or active components that are relevant for heat removal. Furthermore the following external impacts usually have to be considered: • external impacts caused by nature, such as storms, rainfall, snowfall, frost, lightning, flooding, landslides and earthquakes. • external impacts caused by civilisation, such as impacts of harmful substances (e.g. toxic or explosive gases), pressure blast waves from chemical explosions, fires spreading from outside the facility (forest fires), mines caving in and aircraft crashes. The precise conditions of the accident depend on the situation within and outside of the facility.
76	24.1	Section F p. 72	On page 72, why is there a dose difference for a worker above or below the age of 18? Why was the age of 18 chosen as the cut off point?	For persons under the age of 18, the permissible occupational radiation exposure is only 1 mSv/a, in contrast to persons over 18, for which it is 20 mSv/a, because persons legally come of age when they are 18. In specific cases, the regulatory authorities may permit doses of up to 6 mSv/a for persons between 16 and 18, should this be necessary for purposes of their job training.
77	24.1	Section F p. 72	It is noted on page 72 that the ALARA principle is associated with the protection of the public and the environment. Is ALARA also associated with worker dose?	The Alara principle has to be complied with for every process in which radiation protection plays a part. For each job that an employee has to do in the controlled area, radiation protection instructions are compiled during job preparation so that the time the employee spends in the controlled area is as short as possible, and radiation protection is maximized. Sections 36 to 45 of the Radiation Protection Ordinance are concerned primarily with the radiological pro-

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				tection of operating personnel.
78	24 (i)	Section F Page 72	Comment: The way ALARA is implemented and checked (by the licensee and by the safety authority) could be more detailed.	All operators of nuclear facilities are legally obliged to avoid unnecessary radiation exposure and contamination of people and the environment. Unavoidable radiation exposure and contamination, even if these are below the statutory limits, must be kept to a minimum, in line with the state of the art in science and technology. Within the facility, the radiation protection supervisor and the radiation protection commissioners, under consideration of the state of the art in science and technology, have to ensure radiation exposure is limited to protect the general public and environment as well as the facility staff. In connection with granting of licenses and their oversight duties, the authorities shall review definition of and compliance with radiation protection measures and exposure limits.
79	24 (i)	Section F Page 72	Could Germany provide information on regulations or practices related to licensees internal organizations for radioprotection: Independent staffs, working procedures, Internal audits, regulator audits, and periodic re-evaluations?	The radiation protection supervisor and the radiation protection commissioners are according to Sections 31 – 33 of the Radiation Protection Ordinance legally obliged to organize radiation protection within the nuclear facility. In this task, they shall not be hindered while fulfilling their duties, nor discriminated against for this reason. The radiation protection commissioners concerns himself with job preparation, so that as few staff members as possible will enter the controlled area for the shortest possible time. If necessary, he will directly check the measures himself. He stipulates the required radiation protection measures and check-measurements, and reviews and documents these. He ensures that all devices and equipment of relevance for radiation protection are regularly maintained and subjected to functional testing. He instructs the staff and ensures that alarm exercises are held at routine intervals, and concerns himself with accident response as necessary in the facility. To ensure that he is technically qualified for this task as set out in Section 30 of the Radiation Protection Ordinance, he must acquire the expertise relevant for his job assignment (according to reference 3-40, annex A), and must attend refresher courses at intervals not exceeding five years. In addition, numerous events on the topic of radiation protection are organized, particularly by research centres.
80	24 (ii)	Section F.4.2 Page 72	Could Germany provide information on the applied criteria and procedures for radiological incidents declaration? Is there any system of experience feedback on radiological incidents?	With the Ordinance on persons responsible for nuclear safety and on the notification of safety-related events (reference 1A-17, AtSMV), it was made binding on all operators of nuclear facilities as defined by Article 7 para.1 and in special cases by Article 6 para 1 of the German Atomic Energy Act (reference 1A-3) that all such events have to be reported to the relevant state supervisory authority. The task of the incident notification department of the Federal Office for Radiation Protection (BfS) is to record and document all incidents taking place in nuclear facilities, which have been notified to the BfS by the relevant state supervisory authorities, among others, and to evaluate these incidents for the Federal German Ministry of the Environment, Nature Conser-

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				vation and Reactor Safety (BMU). In this way, BfS supports the Federal Environment Ministry in its duty to inform the general public of such events and, by systematic evaluation, contributes to avoiding accidents during operation of nuclear facilities from the outset. Irrespective of the process for notifying authorities as set out in the AtSMV, the incidents for which reporting is compulsory are classified by the operators of nuclear facilities against the International Nuclear Event Scale (INES) of the International Atomic Energy Agency.
81	24.2	L8; P. 77	"Annual checks are to be conducted to ensure that a collective dose of 1 manSv for the population of Germany is not exceeded by the total clearance in any given year" seems to us very new idea. Does it mean 1 manSv for the whole German population of eighty million? Does the number 1 manSv depend on the size of the population? Will clearance be suspended if the collective dose of 1 manSv is exceeded?	On one hand, the collective dose by the total clearance is calculated for every year in advance (over some decades). This calculation is based on the expected shut down dates of the German NPPs and the time schedule of decommissioning according to the experience in the past. No significant changes in clearance from other sources are expected for the future. Calculations show that the collective dose is dominated by Co-60 from NPPs. On the other hand, the collective dose is calculated for given years after the real amount of material, related to the different clearance pathways, is known and can be used as input to the model. The collective dose is calculated for all the clearances in Germany and in one year. The result does not depend on the size of the German population because the mean number of exposed persons is fixed for every scenario. The results of calculations for the farther future do not show values above 1 manSv. Therefore, there is no foreseeable need to suspend clearance now or in the future.
82	24.2 (i)	Section F Page 75	Could Germany provide indications on the procedures for revision of release permits (including limitation and optimization)?	No, it is not intended to revise the release permits. These permits are laid down in the radiation Protection Ordinance which just has been revised on 20 July 2001
83	24.3	Section F page 78	Could Germany clarify the part of this chapter: “the supervisory authority responsible for the nuclear facility may…in individual cases exempt the facility from this reporting obligation, provided it can be adequately estimated that the limits could not be exceeded”	Radioactive discharges from nuclear facilities for handling wastes, e.g. conditioning plants or interim storage facilities in which no repairs are carried out, are very minor in comparison to nuclear power stations, or may be non-existent. If the operator of this facility can provide evidence that, due to secure sequestration of the radioactive inventory or the small amount of the radioactive inventory and the nature of the tasks carried out, the limits are complied with by a substantial margin, the authority can exempt the operator from his reporting obligation.
84	24.3	Section F, pages 78, 79	There is monitoring of ^{222}Rn, ^{3}H, ^{14}C, Th, U, transuranium elements, activation and fission products in storage facility Morsleben. Could one familiarize with substantiation of this list or selected methods for monitoring of releases and discharges?	According to Section 48 of the Radiation Protection Ordinance, the federal administrative authorities listed in Appendix XIV conduct comparative measurements and comparative analyses. They develop sampling, analysis and measurement procedures, and compile the data from monitoring emissions and immisssions. The German Federal Institute of Physics and Metrology (Physikalisch-Technische Bundesanstalt, PTB) makes available radioactivity standards for reference measurements. When specifying the nuclide measurements to be conducted, the authorities take as a guide the stipulations of the German guideline for monitoring

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				emissions and ambient concentrations attributable to nuclear facilities. For Morsleben, Appendix C (interim fuel element storage facilities, final repositories for radioactive wastes) of this guideline applies.
85	25	--	Are there joint emergency plans and emergency exercises with neighbouring countries, and are the permissible release limits under both normal and abnormal conditions developed jointly?	Agreements have been made with the governments of all neighbouring countries on mutual help in the event of disasters or severe accidents. Joint disaster-control exercises are usual to the extent that personnel are exchanged for exercises, although participation may be restricted in specific cases to an observer role. Permissible releases during normal operation and in the event of accidents are subject to the legislation of the respective state. In Germany, right from the stage of the initiating procedure for legislation, the limits as laid down in the Radiation Protection Ordinance take into account the international regulations.
86	25	p. 81	Is the statement that the central interim storage facilities are not subject to any nuclear emergency preparedness correct?	No it isn't correct. The central interim storage facilities in Gorleben and Ahaus are subject to nuclear emergency preparedness to the extent necessary for them. Internal emergency plans have been drawn up for all existing central interim storage facilities for spent fuel. But rigorous emergency measures are not needed for the design accidents posited for these storage facilities, nor for very rare events of radiological significance, like airplane crashes and blast waves following explosions, as investigations have shown that the accident planning limits of Article 49 StrlSchV are not attained by a wide margin. The protection function against the effects of such events is fulfilled by the transportation/storage containers. Therefore, in the opinion of the licensing authorities, the radiological effects of conceivable accidents could not give rise to any disaster that cannot be controlled by the measures of external, conventional disaster-control planning. For this reason, the central interim storage facilities for spent fuel in Ahaus and Gorleben are subject to the external emergency precautions covered by conventional disaster-control. For the Greifswald site, where the dry "Interim Storage Facility North" (ZLN) is located, there is a disaster prevention calendar, since here, in contrast to Ahaus and Gorleben, also wet storage of spent fuel is provided in the wet storage facility ZAB.
87	25	p. 81	Is the Special Disaster Prevention Calendar ("Sonderkatastrophenabwehrkalender") for Greifswald available?	For the wet storage facility ZAB in Greifswald there is a special disaster prevention calendar. Article 11 of the Disaster-Control Law of the State of Mecklenburg-Western Pomerania contains details of this. If any further specific information on this is required, the state environment ministry is responsible.
88	25	F	In the table F-2 the Article 25 is introduced, that off-site emergency plans exist for: Wet storage facility for spent fuel in Greifswald Karlsruhe Fuel reprocessing Plant.	For purposes of limiting the extent of preparatory measures, the vicinity of the plant is divided into three zones: According to the "Rahmenempfehlungen für den Katastrophenschutz in der Umgebung kerntechnischer Anlagen", GMBl. 1999, S.538-587 the central zone should not exceed a ra-

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			Questions: What is size territory in the vicinity mentioned facilities (emergency planning zone), for which are prepared off-site emergency plans? What a further criteria was used for determination the emergency planning zone except limits the activity radioactive substances introduced in “General aspects” the Article 25?	dius of 2 km around the nuclear facility, but this depends on local conditions. Bounding this is the intermediate zone with a radius of 10 km around the facility and the outside zone with a 25 km radius. In an emergency case the “area at risk” is defined taking as a starting point the findings of the evaluation of the situation, which takes into account current information and data on conditions at the facility, meteorological conditions as well as the state of emissions and immissions.
89	25	p. 80 (F)	The report states that the criteria for the nature and scope of emergency planning are determined in particular by the radioactive inventory of the nuclear facility and the likelihood of an accident or hazardous incident occurring. What are the detailed methods for determination and the criteria or requirements applied to nuclear facilities?	For design accidents, and also for incidents whose probability of occurrence is small, the radiation exposure anticipated in the vicinity of a facility must be considered. Sections 49 and 50 of the Radiation Protection Ordinance (StrlSchV) stipulate the limits of radiation exposure following accidents. If the calculated doses lie below the limits laid down in Section 49 StrlSchV, it is assumed that no significant impacts are to be expected for the population in the vicinity of the facility. Body doses resulting for example from releases of radioactive substances as a consequence of an event which leads to slightly raised leakage rates of casks or containers will be far below the accident planning values as set out in Section 49 StrlSchV. This means that no major emergency preparedness measures, for example preparation of an external emergency response plan, are necessary. This will be decided by the responsible licensing and supervisory authorities for the nuclear facility of the regional state (Land) concerned.
90	25	Section F, page 81-83	What is the periodicity for verification of emergency plans?	The facility-internal emergency plans form part of the operating manuals of nuclear facilities, and they must be kept current. At regular intervals, within the facilities, a wide variety of emergency exercises are held, with simulations being applied to an increasing extent. Depending on the nature of the exercise, representatives of the authorities will participate. At the sites of the relevant nuclear facilities, the authorities conduct major emergency exercises at intervals of several years, so as to test how the external emergency plans function and detect weak points. The operators participate in these exercises. Appendix XIII, Part B of the Radiation Protection Ordinance states that the population must be informed periodically of the emergency plans every five years.
91	25	Section F, page 84	What measures are taken to try emergency plans in practice if a radiation emergency occurs nearby the German territory?	Under bilateral agreements, the authorities of neighbouring countries are involved in exercises at facilities close to the border at least as observers, but as a rule as participants. Additionally, staff of the Federal Environment Ministry take part in the exercises of the EU and the OECD/NEA (INEX exercises), so as to gain relevant international experience for updating the emergency planning in Germany.
92	25		Emergency Preparedness - Responsibilities of	(i) The central interim storage facilities in Gorleben and Ahaus are subject to nuclear emer-

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			the governments of the Lander (Federal States) The report states on p 81 that: **'**The central interim storage facilities for spent fuel… are not subject to any special nuclear emergency preparedness planning….' (i) In addition to the external impact assessment for fuel assembly casks and given their high radioactive inventory, what other hazard assessments have been taken into account and what conclusions were drawn, to justify the relaxation of emergency planning arrangements at storage facilities? (ii) When specific off- site emergency planning arrangements are not put in place for a nuclear facility, what provisions are contained within the 'General Disaster Control Planning' to cover emergency situations at that site? (iii) Question 5 (c) – Article 25.1 requires emergency plans to be tested at an appropriate frequency. What arrangements exist for the regular testing the emergency plans at spent fuel storage and radioactive waste management facilities? Who assesses the adequacy of the tests? Note: IAEA GS-R-2 (Preparedness and response for a Nuclear or Radiological Emergency (2002) section 5.33 states ' Exercise programmes shall be conducted to ensure that all specified functions required to be performed for emergency response…….. are tested at suitable intervals.'	gency preparedness to the extent necessary for them. Internal emergency plans have been drawn up for all existing central interim storage facilities for spent fuel. But rigorous emergency measures are not needed for the design accidents posited for these storage facilities, nor for very rare events of radiological significance, like airplane crashes and blast waves following explosions, as investigations have shown that the accident planning limits of Article 49 StrlSchV are not attained by a wide margin. The protection function against the effects of such events is fulfilled by the transportation/storage containers. Therefore, in the opinion of the licensing authorities, the radiological effects of conceivable accidents could not give rise to any disaster that cannot be controlled by the measures of external, conventional disaster-control planning. For this reason, the central interim storage facilities for spent fuel in Ahaus and Gorleben are subject to the external emergency precautions covered by conventional disaster-control. For the Greifswald site, where the dry "Interim Storage Facility North" (ZLN) is located, there is a disaster prevention calendar, since here, in contrast to Ahaus and Gorleben, also wet storage of spent fuel is provided in the wet storage facility ZAB. (ii) The general disaster control plans cover the relevant events which might occur in a facility for which off-site emergency planing is not necessary. As relevant releases of radioactive substances do not have to be considered for such facilities the possible consequences of events require no special measures additional to those foreseen for other (non-nuclear) accidents. (iii) The facility-internal emergency plans form part of the operating manuals of nuclear facilities, and they must be kept current. At regular intervals, within the facilities, a wide variety of emergency exercises are held, with simulations being applied to an increasing extent. Depending on the nature of the exercise, representatives of the authorities will participate. At the sites of the relevant nuclear facilities, the authorities conduct major emergency exercises at intervals of several years, so as to test how the external emergency plans function and detect weak points. The operators participate in these exercises. Appendix XIII, Part B of the Radiation Protection Ordinance states that the population must be informed periodically of the emergency plans every five years.
93	25	Section F, Subsection	Please further clarify and describe the roles and responsibilities for preparing emergency response plans, and the scope, requirements,	Within the federal German government, the Federal Environment Ministry is responsible for working out general criteria for preparing emergency response plans in the vicinity of nuclear facilities, and these can be taken from the "Framework recommendations for disaster-control"

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
		25.1, p. 80	and standard operating procedures required to be reflected in those plans.	(Rahmenempfehlungen für den Katastrophenschutz). When drawing up the external emergency response plans, the disaster-control authorities responsible for the facilities at regional state (Land) level base these on the framework regulations, the respective Land disaster-control legislation and the duty allocation schedules that regulate the collaboration of the various Land authorities. These plans assign responsibilities and accountabilities for who takes charge on the spot, for providing guidance to the crisis team, for the criteria for issuing alarms as well as for the stipulations needed for implementing disaster-control measures, such as: staying in buildings for protection, taking iodine tablets, evacuation, and short- or long-term resettlement of the population as well as its food supply. The plant-internal emergency plan is set out by the facility operator in the operating manual. Laid down in particular in this plan are: responsibilities and accountabilities, criteria for issuing alarms for measures within the facility, information flows to the crisis team and the disaster-control authorities as well as special stipulations for the emergency response personnel within the facility.
94	26	Section F p. 68 & 87	Are “reserves” trust funds, or simply separate accounts? (p.68 and 87)	Today these reserves are separate accounts, but as the respective companies are regularly audited there has been no doubt about the existence of the stated reserves. In connection with planned EU Regulations it is discussed in Germany as well to convert these reserves into trust funds.
95	26	Section F p. 68	Are all surveillance measures (perpetual care?) financed entirely by the Government? (p.68)	Article 22 iii refers to the time after the closure of a disposal. Due to the German concept of disposal in deep geological formations with technical and geological safety barriers there is no need for special disposal surveillance after closure. The common environmental surveillance in Germany is a governmental task and therefore entirely financed by the government.
96	26	F; p. 85	Dismantling is a part of decommissioning as it also follows from the definition in the second sentence of this paragraph.	It is confirmed that dismantling is understood to be part of decommissioning (this corresponds to broad international usage of the term “decommissioning”). “All measures after final shutdown leading to the plant or the site being released from nuclear regulatory control“ includes decontamination and dismantling of the facility, whichever is appropriate for a particular site.
97	26	F; p. 85	Neither here nor elsewhere in this Article is the decommissioning plan or its actualization mentioned.	The equivalent to a “decommissioning plan” in the German regulatory framework is the so called Safety Report (*Sicherheitsbericht*) according to Section 3 of the Ordinance Relating to the Procedure for the Licensing of Facilities in Accordance with Section 7 of the Atomic Energy Act (*Atomrechtliche Verfahrensverordnung, AtVfV*). This Safety Report is referenced in Section E on pp. 51-52 of the German report. The topics that must be described in such a Safety Report are listed on p. 52, including “description and explanation of the concept“ of the decommissioning project for which a licence is applied for.
98	26	F; p. 86,	Who pays the institutional control (survey) if	Institutional control of a site which has not (yet) been cleared, i.e. unconditionally released for

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
		87	the decommissioning is not made until green-field, i.e., if the site is released conditionally?	non-nuclear use, will be paid by the owner of the site. This is quite similar to the operational or the decommissioning phase of the facility. If, however, the owner of a site does no longer exist or cannot be held liable, the control measures would be financed from public funds.
99	26	F; p. 87	How is the financial reserve made?	The financial resources for facilities belonging to the privately owned power utilities, in particular nuclear power plants, are provided in the form of reserves that were collected during the operation of the respective facility through the price of electricity. Thus, electricity customers of today are charged according to their electricity consumption, and no burdens are imposed on future generations. The funds collected by the power utilities are internal funds, i.e. they are not controlled by the German government or an external institution. However, the necessity of such funds and the amount of money collected are derived from the regulations described in the German Report on p. 87. Liabilities for decommissioning will be identified in the commercial company's balance sheet in accordance with a legal prescription to build up financial reserves. The provisions for liabilities and the charges are made on a voluntary basis.
100	26	F; p. 85-91	Nothing is written about the necessary documents in the licensing procedure and their approval.	The necessary documents in the licensing procedure and their approval are described in section E on pp. 51-52. The section entitled "The Nuclear Licensing Procedure as Illustrated by the Example of the Procedure According to Section 7 of the AtG" (pp. 51-56) provides all the details on relevant documents and on the licensing procedure. These details also apply to the decommissioning of nuclear facilities which possess an operating licence according to section 7 of the Atomic Energy Act (Atomgesetz, AtG).
101	26	§ F-26 (i) Page 86	How are decommissioning funding reserves regulated? Who has the responsibility to assess and guarantee that the reserves are sufficient for the dedicated purpose when needed?	The way in which decommissioning funds are regulated is described on pp. 86-87. Because decommissioning of publicly-owned facilities are financed from the current state budget, this question only relates to facilities belonging to the privately owned power utilities. The financial resources for facilities of the privately owned power utilities, in particular nuclear power plants, are provided in the form of reserves that were collected during the operation of the respective facility through the price of electricity. Thus, electricity customers of today are charged according to their electricity consumption, and no burdens are imposed on future generations. The funds collected by the power utilities are internal funds, i.e. they are not controlled by the German government or an external institution. However, the necessity of such funds and the amount of money collected are derived from the regulations described in the German Report on p. 87. The assessment whether the collected funds will be sufficient for the dedicated purposes (decommissioning, waste disposal etc.) is based on detailed cost estimates which are performed

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				with standard cost models that take into account all relevant work packages and any additional cost items. The cost estimates are updated on a regular basis.
102	26	p. 89 (F)	What are the examples of unplanned and/or uncontrolled release during decommissioning and the radiation protection measures for that situation?	Examples of unplanned and/or uncontrolled releases during decommissioning of a nuclear facility depend on the type and size of the facility and of the particular decommissioning work. Possible events or incidents and their potential radiological consequences are analysed in an incident and accident analysis which is part of the licensing documents. The results of such an analysis are also included in the Safety Report which forms part of the EIA documents. In general, a significant number of scenarios involving releases are evaluated in the safety analyses which cannot be outlined in any detail here. A few examples are: • Fire in the plant involving releases of radioactivity from contamination and (possibly) a small part from activation. • Fall of containers with dusty material and eventual rupture with release of part of the contents and spread of the activity in the room atmosphere from where a release occurs. • Fall of heavy loads on items from which activity is released. • Failure of residual operating systems which are required for the operation of the plant under decommissioning. The radiation protection measures for such incidents or accidents are summarized in a catalogue of measures, see p. 82 of the German report.
103	26	p. 89 (F)	What are the critical radiological accidents during decommissioning of the nuclear facilities and the emergency preparedness for those situations?	After removal of the fuel elements from a nuclear power plant and after removal of any heat-generating radioactive waste from an installation of the nuclear fuel cycle (if there was any), there is no potential for any radiological accidents any more (no criticality, no accidents involving HLW). Examples of incidents which would be possible during the decommissioning phase have been provided in conjunction with the discussion of activity releases together with question *kr-de-7* above.
104	26		How the obligation to start with decommissioning of nuclear facility is defined in your legal basis? Have you defined in your legal basis the obligation that licensee must ensure during whole decommissioning process appropriate storage capacity?	There is no legal obligation in the nuclear law to start with decommissioning after the operator has declared final shut-down of the facility. It may well be the case that the facility will be kept in a state which resembles that of the operational phase. However, there is a intense incentive to prepare decommissioning (i.a. remove and ship the fuel elements) and apply for a decommissioning licence as this will allow discontinuation of a number of (expensive) obligations which only apply to the operational phase (safeguards, security, number of shifts, reduction of inspections etc.). The management of the material resulting from decommissioning is the responsibility of the operator. As it is evident that the radwaste must be held in an interim storage facility until a repository will be available. The operator has to provide for sufficient interim storage capacity

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				during the process of dismantling.
105	26	Section F, page 85, Legal Base, paragraph 2	Section 7 of Atomic Energy Act contains regulatory requirements on decommissioning, especially, as regards involvement of third parties in this process. Could more detailed information be obtained on this issue?	The term "third party involvement" with respect to the licensing procedure mentioned here mainly refers to persons of the general public who may be affected by the activities which are applied for. This term may also refer to legal entities which may be affected. The Ordinance Relating to the Procedure for the Licensing of Facilities in Accordance with Section 7 of the Atomic Energy Act (*Atomrechtliche Verfahrensverordnung, AtVfV*) defines the rights of those persons and legal entities. Inter alia, they have to be informed about the plans, have to be given access to the information and documents prepared for the licence application and have the right to participate in the public hearing (if such a hearing is held) where they can present objections which the competent authority has to consider in the licencing procedure.
106	26	Section F, Subsection 26.1, p. 85	The Legal Basis Section for decommissioning also mentions "third party involvement" in the decommissioning process. Please expand on this topic (e.g., who is the third party typically, and what is the third party responsible for).	The term "third party involvement" with respect to the licensing procedure mentioned here mainly refers to persons of the general public who may be affected by the activities which are applied for. This term may also refer to legal entities which may be affected. The Ordinance Relating to the Procedure for the Licensing of Facilities in Accordance with Section 7 of the Atomic Energy Act (*Atomrechtliche Verfahrensverordnung, AtVfV*) defines the rights of those persons and legal entities. Inter alia, they have to be informed about the plans, have to be given access to the information and documents prepared for the licence application and have the right to participate in the public hearing (if such a hearing is held) where they can present objections which the competent authority has to consider in the licencing procedure.
107	26	Section F, Subsection 26.1, p. 85	The Legal Basis Section for decommissioning explains that decommissioning "shall require a license". How is this decommissioning license (e.g., its terms and how it is issued) different from an operating license? What is the process for issuing this license?	The licencing procedure for a decommissioning licence obeys the same principles as that for a licence for erection or operation of a nuclear installation. This licencing procedure is explained on pp. 51-56 of the German report. It shall therefore not be repeated here. Section 7 of the Atomic Energy Act (*Atomgesetz, AtG*) stipulates in para. 1: “Whoever erects, operates or otherwise holds a stationary installation for the production, treatment, processing or fission of nuclear fuel or the reprocessing of irradiated nuclear fuel or materially alters such installation or its operation, shall require a licence.”, and in para. 3: “The decommissioning of an installation as defined in para. (1), sentence 1, as well as the safe confinement of an installation, or the dismantling of an installation or of parts thereof shall require a licence.” In simple terms, each such licence replaces the previous one. That means that a decommissioning licence (or the first decommissioning licence in a sequence of several such licences) follows the operating licence. It clearly defines what the operator of the facility under decommissioning is allowed to do (details on the activities to be performed, releases of radioactive substances, material management etc.).

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
108	26	Section K, p. 146	Section K indicates the Stade nuclear power plant will leave the grid this year and undergo decommissioning. Has a decommissioning plan dealing with the decontamination of the facility and disposition of radioactive wastes been submitted, reviewed and approved? Please describe the review and approval process.	For the nuclear power plant Stade (KKS) the final shut-down is planned for November 2003. The current decommissioning strategy which has been chosen for KKS is the early dismantling, i.e. no safe enclosure is planned. Documents which describe the decommissioning process and the material management (clearance of material, management of radioactive waste) have been prepared and submitted to the authorities over the last several years. They have been reviewed by the authorities and independent experts or are in the review process. The topics which are described in those documents are enumerated on p. 52 of the German report (cf. also para. 3 of the AtVfV). Those topics will also be discussed in the public hearing which is scheduled for November 11 of this year. In general, there are a number of guidelines and regulations for preparation of those documents. The documents are assessed by the authorities and independent experts acting on behalf of those authorities. If necessary, the plans are altered according to the results of this review and the documents will be changed accordingly by the operator.
109	26.1	L12 from bottom;P. 85	Could you give us some examples of expert knowledge of the plant's operating staff, which are very valuable in decommissioning and dismantling?	Examples of such items of the operating staff's expert knowledge which is valuable for the decommissioning phase are: • information on details of the reactor water chemistry, on special or experimental operation conditions, and the like; • information on incidents or events which involved contamination of a certain area of the plant; • information on hidden contamination which had been detected but not removed during the operating phase; • other information. All listed items are to be understood as special knowledge beyond the facts which are contained in the documentation of the plant. Experience has shown that such knowledge is much more relevant for older plants or plants with specific design features.
110	27	--	What restrictions/conditions, including financial guarantees, are in place relative to the export and re-entry of sealed sources, especially to and from countries which do not have any programs in nuclear power and/or research, or to and from countries which do not have a nuclear regulatory body and/or rules and regulations governing the use and ship-	Requirements considering financial guarantees do not exist in the German regulations and are not demanded by the German licensing authority for transboundary movements (BAFA). Before giving an import or export license BAFA asks a copy of the license for handling the source from the appropriate authority of the country of origin or reception.

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			ping of radioactive material?	
111	27	Section I p. 136	In cases of shipments from Germany to a third country, have any proposals been refused because the third country did not have the “necessary equipment to handle such waste”?	Such case has not yet been occurred. In case it happens the export license will not be given.
112	27	p. 137 (I)	What are the roles and responsibilities, with regards to safety regulation, of BfS and EBA for the transit of spent fuels through Germany by rail?	Both, BfS and EBA are subordinated authorities and thus only responsible for executing regulations given by the regulatory body of the federal government. The BfS is approving the applications for licenses of transporting spent fuels by rail and the EBA is the surveillance authority for the transaction of the transport by rail.
113	27.1	Sections I and J, Subsections 27.1 and 28.1, p. 139	Section I states German legislation does not include an obligation to accept the return of waste, except as contractually agreed in export procedures. Section J states sealed sources may only be returned to Germany as "radioactive material." What conditions or restrictions does Germany place on disused sealed sources when defined by other nations as radioactive waste? What criteria does Germany apply to distinguish disused sealed sources as waste versus radioactive material? How will comprehensive accountability of sealed sources considered waste be maintained, among various facilities, pending establishment of a repository in 2030?	According to the EU-Regulation 92/3/EURATOM spent sealed sources can be imported to Germany if it is clearly demonstrated that it is waste arisen by contracted recycling of sources abroad or that it is an re-import of spent sealed sources which can not be used any more.
114	27.3	Sec. H Art. 11 Sec. I Art.27	Considering the importance of international cooperation in RAW management through bilateral and multilateral mechanisms, as stated in the Convention Preamble ix), which legislative restrictions, if any, govern the acceptance of foreign RAW for processing and/or storage ?	According to the EU-Regulation 92/3/EURATOM there are no restrictions from Community states considering the acceptance of radioactive waste for processing or storage if the receiving facility has an appropriate license which guarantees a safe processing or storage according to German safety regulations. In Germany there are no specific regulations concerning the prohibition of import of radioactive waste. According to the principle of sustainability and the polluter-pays-principle Germany prefers national solutions particularly for long term storage and disposal of radioactive waste. Waste from foreign countries is only accepted for storage when it is of German origin or for processing when the return of the resulting products of the processing to the country of origin is guaranteed.
115	27.3 (ii)	I; p. 139	Does the German legislation restrict the acceptance of conditioned RAW of German ori-	There is no specific regulations concerning the prohibition of import of RAW of German origin. Usually there has been a changing of Notes between Germany and the state of reception

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			gin from abroad, if there are no appropriate conditions included in the export contract?	before exporting nuclear material to that state, in which Germany commits to take back the material or the waste arising from processing this material abroad.
116	28	Section J p. 141	Referring to page 141, in the event that the German company that exported a sealed source is unable to accept the source back for treatment and disposal within the originating country, will Germany allow re-entry of the sealed source?	If an exporting company is not able to accept a source back Germany will still allow the re-entry of the source. If the source has to be treated someone has to be found in the country who can do the job; if the source has to be disposed it will be taken into the government custody.
117	28	Section J p. 143 & 146	If "the system of monitoring of radiation sources is in need of improvement," please explain the absence of plans for improvement in Section K. (p.143 and 146)	Germany could try to find another company which is able to accept the source back or in the worst case take it into the government custody.
118	28	J, p.148	Below the threshold of 0.1 microsievert per hour, scrap may be processed without consulting the authorities (Section J, Article 28.1, p.143). How is this dose rate defined? (e.g. is it the contact dose rate or a dose rate measured at one meter distance from the scrap?	The procedure described on p. 143 of the German report is not compulsory. It may be followed if the competent authorities and the scrap industry in their sphere of responsibility have agreed upon it. The dose rate of 0.1 µSv/h usually refers to the dose rate measured with the entrance detectors which are located at either side of the truck or the freight car with the scrap load. Therefore, the distance between the detector and the scrap
119	28		Who is responsible and how the responsibilities are divided between different authorities?	Caused by the federal status of Germany there are different responsibilities for the sources. The license of using a source in Germany is given by the authorities of the Government of the States (Länder). The license for exporting or importing the sources is given by the BAFA. The license for transporting sources is given by the BfS for sources above 10^{15} Bq and the authorities of the States for sources below 10^{15} Bq.
120	28		Who is responsible for old (historical) spent sources like radium used in hospitals (needles)?	Generally the owner is responsible for even old spent sources. He can give these sources – after having paid a fee – to the state collecting facilities which take care of its disposal. If no owner exists or if no owner can be found, the responsibility is handed over to the state.
121	28		Who is responsible for ionising sources found at the state borders or at different industrial persons like smelters?	The ad hoc responsibility is in the duty of the custom and the police. If the source remains in the country the responsibility is then transferred to the state authorities responsible for radiation protection issues.
122	28		Who is responsible for transporting of spent sources or contaminated materials to the facility dealing with them?	The owner of transport license is responsible for the transporting of spent sources. He can give the responsibility to the one he has instructed with the transaction of the transport.
123	28		What is the role of radiation protection authority in the whole process?	The term "radiation protection authority" is assumed to refer to those authorities that are responsible for licencing and for supervision. A licence application (e.g. for decommissioning)

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				has to be filed to this authority. This authority will then be responsible for the licensing process as described on pp. 51-56 of the German report. Usually the same authority will also supervise the implementation of any licence which has been granted and of any measures stipulated by the Atomic Law. In summary the radiation protection authority has the task to assure that the conditions of the license are fulfilled.
124	28		Is the staff of radiation protection authority invited to provide controls at different stages like appearance of unknown source in the environment (outside controlled areas), transportation etc.?	If an orphan source is found it is the task of the radiation protection authority to assess the situation and to subsequently decide what has to be done with the source. It is not the task of the staff of the radiation protection authorities to take precautions for finding orphan sources.
125	28		What kind of obligations are set in legislation in order to send sources as soon as possible to appropriate facility dealing with this issue?	There are no obligations in the German regulatory framework to send a spent source at a certain time or within a certain period.
126	32	Section A, p. 9	On page 13, third paragraph it is stated that "The Federal Government is aiming to establish a repository in deep geological formations for the disposal of all kinds of waste by the year 2030". Please reconcile this statement with the statement on page 9 regarding disposal and the use of Nuclear Energy failing to meet the requirements of a sustainable energy supply. Will this repository include spent nuclear fuel, high-level waste, intermediate-level waste, and low-level waste? What would be the ultimate capacity, or size, of this repository?	In the Federal Republic of Germany the political intention is that all kinds of radioactive waste should be stored in one repository. At present we investigate the practicability of this concept. Not the disposal but the use of nuclear energy fails to meet the requirements of a sustainable energy supply, The capacity of this repository would be such that the total expected waste volume of some 350.000 m3 (corresponding to 300.000 to) can be safe disposed.
127	32.1	p.15-17	Is the German approach for the classification of radioactive waste based on heat generation replacing the IAEA classification standard, or does it represent an additional classification to the IAEA standard?	The German approach for the classification of radioactive waste based on heat generation is a classification standard additional to the IAEA standard. The German classification-standard was developed considering in particular the specific necessities of radioactive waste disposal in deep geological formations.
128	32.1	Section B p. 13	Does “political requirement” re. the “polluter pays” principle, mean a legal requirement? If not, why not?	The political requirement of the polluter pays principle leads to legal requirements which are laid down in the Atomic Act [1A-3] for the appropriate duties of the waste producer to establish the technical installations for the waste management and in the Ordinance on the Finan-

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				cial Security [1A-11] for the providing of the financial resources for this purpose including the costs of the disposal.
129	32.1	Section B p. 13	Page 13 also states that spent fuel elements are to be stored intermediately at the site where they were created until such time as the repository is commissioned; please clarify the time schedule for this.	In the middle of 2005 there will be no further transports of spent fuel to the reprocessing abroad. Thus the interim storages for the spent fuel at the sites where they are created will be in operation on schedule. The licenses of all 12 planned interim storages are applied, 4 of them already have got the license the rest will get it until the end of 2003 or the beginning of 2004. The license of the interim storing will be given for 40 years.
130	32.1	§ B-32.1 (i) & (iii) Pages 13&14	It is stated that the Federal Government is aiming to establish a repository in deep geological formations for the disposal of all kinds of waste by the year 2030. In Section A (page 10) is also stated that the plan approval procedure for the Konrad repository will be completed. Does that mean that two repositories will enter operation? Are there provisions to assess the suitability of Konrad repository for all kind of wastes?	In the Federal Republic of Germany the political intention is that all kinds of radioactive waste should be stored in one repository. At present we investigate the technical-boundary conditions that must be fulfilled to realize this concept. There is no plan to investigate the suitability of the Konrad repository for all kinds of radioactive waste.
131	32.1	§ A Page 7	Currently, there are 17 nuclear power plants in Germany, some in their decommissioning process, some already decommissioned and other for which decommissioning has been requested. Concerning the remaining 19 nuclear power plants currently in operation, Germany has established that they will remain in operation until they are thirty-two years old, closing them progressively between 2002 and 2021. Considering the proximity of the closing dates: What actions have been foreseen for the storage of spent fuel, the final disposal of the low- and medium-level radioactive wastes, and the final storage of very low-level radioactive (declassified) wastes? What type of facilities would be used, in which locations and what would be the cost?	The spent fuel shall be stored in facilities which are at the site of the NPP´s. The storing will be done in casks in a dry way which are placed in concrete halls. The cooling of the casks will be by natural convection. The low and medium level waste will be stored at site of its origin as well and in some cases can be stored in central storages as described in the report. Very low level radioactive waste does not exist in the German classification; it is either low level waste which has to be disposed or it is material which can be released out of regulatory control. The costs of the interim storages are depending of the storage capacity and amounting to 18 respectively 25 Mio €, The different NPP's have applied capacities taken into consideration the arising of spent fuel for the rest of their operation period.
132	32.1	B	Re. section B (Article 32). Please explain the	In Germany radioactive waste is subjected to a basic subdivision into

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			general waste categorization scheme ?	• heat-generating radioactive waste and • radioactive waste with negligible heat generation A detailed description of the general radioactive waste classification scheme can be found on p15-17 of the German report.
133	32.1	B, p. 17	Re. page 17 (Article 32, section B). Please explain (or provide some examples) of the statement that repository-specific descriptions or categorizations of waste exist.	The description or classification or radioactive waste (heat generating radioactive waste as well as radioactive waste with negligible heat generation) is prepared without reference to a repository. The data are envisaged to be used as input for a site-specific safety-assessment of a specific repository. Thus, it must be distinguished between the disposal of all types of radioactive waste or the disposal of as radioactive waste with negligible heat generation. According to that , the respective data must be selected and introduced into the safety-assessment. As a result, repository-specific waste acceptance requirements are prepared. In Germany the Konrad and Morsleben waste acceptance requirements are available.
134	32.1 (iii)	L10 from bottom; P.13	The report says all kinds of radioactive waste will be deposited in deep geological formations. Do you think it is cost effective to deposit large components such as pressure vessel or reactor internals in deep repository after treatment, conditioning and transportation?	The referred material has to be disposed of if a release after clearance is excluded. The size of these materials will be determined by the acceptance criteria of the repository. If required these materials have to be transformed into suitable packages. In Germany, following the polluter pays principle, the cost effectiveness of disposing waste has to be considered by the waste producer before starting his activities of which the waste results. In general the safety of waste disposal is prior to costs.
135	32.1 (iiI)	L9 from bottom; P13	The report says that the federal government is required to provide the resources for disposal. Are such financial resource for disposal covered by tax, or any special funds deposited by waste generators? If so, what is the legal basis and its outlines?	According to the polluter-pays-principle the costs for the planning, construction and operation of a final repository have to be paid by the producers of radioactive waste particularly owners of nuclear power plants. The costs are covered by dues and advance payments on dues. The legal basis for the payments and for advance payments is section 21b of the AtG (Atomic Energy Act) and the EndlagerVIV (Waste Disposal Advance Payment Ordinance).
136	32.1 (iv)	Section B, page 14, paragraph 9	Construction of a geological repository is planned in 2030. Is there an outline plan (schedule) for its construction?	Up to the present there is no agreement on an outline plan for the construction of a geological repository in 2030. But the project group “national disposal plan” is currently discussing a draft of a road map for realising a repository for all kinds of radioactive waste by the year 2030.
137	32.1 (iv)	Section B, page 15, paragraph 1	What criteria for exemption from regulatory control are established by German regulations?	We assume that term „exemption“ refers to the release of radioactive material from regulatory control after the material had been under such control. This concept is generally termed „clearance“ as defined by the IAEA. In Germany, the provisions for clearance are laid down in Sect. 29 of the Radiation Protection Ordinance (Strahlenschutzverordnung, StrlSchV) and clearance levels are given in Annex III Table 1 of the Radiation Protection Ordinance. Details on clearance can be found on pp. 76-77 of the German report. – If the term „exemption“ was meant to refer to the exemption principle as defined by IAEA, there is no direct link between

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				radioactive waste which is to be reported about under Article 32.1. Exemption criteria are laid down in Annex III Table 1 Col. 2 and 3 of the Radiation Protection Ordinance. Those criteria are used to determine whether practices dealing with (radioactive) materials which are not yet under radiological control need to be licensed. The exemption criteria are numerically identical to those of the Basic Safety Standards of the European Union and the IAEA.
138	32.1 (iv)	Section B, page 15, paragraph 6	Storage facility Morsleben terminated radwaste acceptance in 1998. Could we get familiar with the storage facility closure concept?	As the release of radionuclides from the repository into the biosphere could not be excluded totally, it is limited according to German radiation protection regulations. The safety objective is that the radiological impact on future generations should not exceed an annual effective dose of 0.3 mSv/yr per individual. In the German regulations the adherence to this safety objective is not limited to a certain time frame. Supplementary to this radiological safety objective conventional safety objectives such as limitation of subsidence of the ground surface and protection of groundwater have to be taken into account. To achieve these safety objectives several closure concepts were considered. The closure concept which has finally evolved is based on a comprehensive backfilling of all mine drifts, galleries and shafts and aims at the isolation and retention of the radionuclides in the disposal areas. The purpose of backfilling is • to preserve the integrity of the salt barrier by keeping the remaining openings mechanically stable and reducing the convergence of the salt, • to minimise the voids and to reduce the possibility of developing new cavities by solution of salt and/or potash in case of brine/water inflow and • to ensure a hydraulic resistance and to hamper the inflow of solution into the disposal areas and the outflow of contaminated solution from the disposal areas to the biosphere. The quality of the backfilling has to meet different specifications depending on its function. The highest quality backfilling is required in the access drifts to the disposal areas where it should act as a hydraulic barrier to prevent solution inflow into the disposal areas. This engineered barrier is designed to have an initial permeability of 10^{-18} m^2.
139	32.2	D; p. 35	What is the total capacity of the interim storage facility of Mitterteich utility ? What are activities of the Mitterteich utility ?	The interim storage facility in Mitterteich is an utility for the storage of conditioned radioactive waste with negligible heat generation from Bavarian nuclear power plants. This interim storage has a total capacity of nearly 29,000 m3. According to the license 40,000 waste packages in form of 200- and 400-litre-drums, cylindrical concrete and cast-iron containers may be stored. The total activity of radioactive waste stored in the interim storage in Mitterteich amounts less than 1016 Bq.
140	32.2	p. 41 (D)	What criteria are applied for the clearance of radioactive waste? And what is the manage-	The clearance criteria (clearance levels) are defined in section 29 and Annexes III and IV of the German Radiation Protection Ordinance (*Strahlenschutzverordnung, StrlSchV*). There are

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			ment method after clearance?	several clearance options for • unconditional clearance of any solid or liquid material, for buildings and building rubble of more than 1000 tons per year, and of sites; • clearance for a specific purpose, i.e. solid and liquid material for disposal (landfill, incineration), of buildings for dismantling only, and of metal scrap for smelting. For each of the above clearance options, a complete set of nuclide specific clearance level values (~ 300 per option) exists. E.g. the clearance level for the unconditional clearance of Co 60 is 0.1 Bq/g. After clearance, any material is subjected to the (conventional) waste law just as any other material. That means that a specific regulatory framework applies covering all aspects of recycling, disposal or incineration.
141	32.2	D	After reprocessing in France, vitrified waste is sent to Germany. Is there a dedicated facility available to store this type of waste and if so, where is it located?	The Gorleben facility in Lower Saxony is licensed as a storage facility where HLW canisters with vitrified waste are stored. They should remain there until disposed of in a repository.
142	32.2	Section D	Question: Do the present quantities (for the year 2003) differ significantly from those shown in the Tables D-2 and D-3 ?	Depending on the size of the reactor between 10 and 30 tHM are unloaded annually from each reactor core. This leads to a total arising of about 400 tHM per year which raise the figures in Table D-2 by about 4% with regard to the end of 2003. Changes in the same order of magnitude appear in Table D-3 if the year 2003 is to be regarded. However, some of the figures in Table D-3 will not change anymore because there are no more shipments of spent fuel e.g. to WAK, Mol or Russia.
143	32.2	Section D, Subsection 32.2, p. 34	What treatment/conditioning requirements does Germany believe are needed to make spent fuel suitable for geologic repository disposal?	Under the direct disposal concept, spent fuel elements will be undissected packed in containers of the type POLLUX or in rod canisters of the type BSK 3. This packages are suitable for disposal after having been held the spent fuel elements in storage for several decades (a period of 40 years has been applied for and approved). These containers are then to be sealed and emplaced in galleries or bore holes in deep geological formations.
144	32.2	Section D, Subsection 32.2, p. 38	Discussion on page 38 suggests a diminimis radioactivity level, below which there is no regulatory concern. Please clarify what these values are, if they exist. How were they developed?	This question relates to material originating from past practices that is to be released. For the purposes of the German report, past practices are understood as those relating to the company Wismut AG for uranium ore mining and refinement. As described, such material is not regarded as radioactive waste for the purposes of the Convention. Radioactivity levels for the release of such materials arising from these work activities are mentioned on p. 39 of the German report. These levels are not *de minimis* levels (i.e. they have not been derived on the basis of trivial doses on the order of 10 µSv/a). There are, however, radioactivity levels of the same order for NORM (naturally occurring radioactive material) as laid down in Annex XII of the German Radiation Protection Ordinance

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				(Strahlenschutzverordnung, StrlSchV). Those levels have been derived on the basis of radiological assessments based on a dose constraint of 1 manSv/a (i.e. also not on *de minimis* considerations). It should, however, be noted that these levels are outside the scope of this Convention.
145	32.2 (i)	Section D p. 21	According to page 21, spent fuel assemblies are loaded into transportation/storage containers. What is the design life of these containers? What are the provisions in the event that storage is extended beyond the design life of these containers?	In the licensing procedure for spent fuel dry storage facilities the applicant has provided evidence for a design life of 40 years for the containers. This value has also been underlain the experts opinions within the licensing procedure. As the German waste management strategy plans the construction and commissioning of a repository by 2030, an extended storage beyond the design life of the containers and corresponding provisions are not considered at present.
146	32.2 (i)	A; p. 7, 10	What does it mean “restricted use of facility to repair of defective casks”? Will be repairing of casks prohibited there? If yes how it comes together with idea of maximal reduction of cask transports? If it means that facility will be dedicated to reparation of casks only how will be solved the case of fuel element leakage discovered during the defective cask reparation?	As long as the spent fuel are stored in interim storages which will be at least until 2030, the deadline when the repository is intended to be in operation, there is no need of conditioning the SF. However during the storage time there might be the need to repair a cask which consequently leads to the necessary option to have the possibility of repairing casks. This option is realised by the license for the facility PKA which allows such a repairing. If fuel leakage is discovered during the reparation of the cask these fuels have to be packed in a cask which guarantees tightness.
147	32.2 (i)	D; p. 20	Why are the reactor pools (ponds) for storage of SF just after the unloading from reactor core not classified as SF management facilities (see Article 2 (o), (p) of JC)?	The storage ponds within the reactor building are considered as inherent parts of the nuclear power reactors. Therefore, safety aspects and inventories of these installations have been described within the review process of the Convention on Nuclear Safety. Nevertheless the German report contains a list of all storage ponds with their respective inventories (Table L-1, page 148).
148	32.2 (i)	D; p. 21	Where will be stored the SF from NPP Stade and Obrigheim after removal from reactor pools?	The Stade power plant is due to be shut down in 2003. The capacity of the reactor pool is sufficient to take all SF arising in the plant by that date. SF removed from the reactor pool can be shipped to Cogema for reprocessing. In the Obrigheim plant, the recently licensed new wet storage capacity should be sufficient until the end of the reactor’s operational life. SF removed from the reactor pool will be stored in this new installation.
149	32.2 (iv)	Section D p. 35	On page 35 it is indicated that sealed sources are not subject to further treatment nor are they packaged. Is there a requirement for periodic leak testing to ensure the continued integrity of the sealed source?	The requirements for sealed sources with respect to tightness and periodic leak testing are regulated in Sect. 66 of the Radiation Protection Ordinance (*StrlSchV, Strahlenschutzverordnung*). There it is stated that the competent authority may rule that the tightness of the casing of sealed sources with an activity higher than the exemption levels of Appendix III Table 1 Col. 2 RPO shall be tested and that the test shall be repeated at certain intervals. The test

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				results shall be submitted to the competent authority upon request, and any leaks detected shall be reported to it forthwith. In addition, in cases where the casing of such sealed radioactive substances has corroded or has been damaged, the sources have to be tested prior to any further use to see whether their casings are tight.
150	32 (iv)	Section D p. 38	Please clarify the reasons for excluding information on the Wismut sites.	The reasons for the fact that WISMUT sites are not subject to this Convention have been described on page 38 of the German report. Some key aspects are repeated here: The legal situation in the new Federal States of Germany after the re-unification is regulated by the German Reunification Act to which the Radiation Protection Ordinance makes reference. There it is stated that the relevant parts of the regulatory framework of the former GDR (German Democratic Republic) which are listed on page 38 of the German report shall remain in force. Because tailings and other residues of the WISMUT operations are below the German waste criteria they are classified as “radioactive releases” and thus not regarded as radioactive waste for the purposes of the Convention.
151	32.2 (iv)	Section B, page 30, paragraph 3	HLW processed at BNFL has not been received yet. At the same time, HLW processed at Cogema has been regulatory received since 1996. What are technical conditions for spent fuel acceptance (cooling time after vitrification, specific energy release, remaining content of U, Pu and transuranium elements, requirements on packages or packages that are used, transport shielded containers)?	The technical conditions for the HLW processed at BNFL and Cogema like specific heat release, uranium, plutonium or curium content are defined in "Technical specifications". The cooling time after vitrification depends on the heat generation of the glass canisters. Glass canisters have to cool up to a definite thermal release at transportation time. At present the cooling time after vitrification until to the return to Germany is 5 up to 10 years. The guaranteed thermal release prescribed in "Technical specifications" is < 2 kW for Cogema glass canisters and < 2.5 kW for BNFL glass canisters. The specific heat release in turn depends on the number of glass canisters per flask. At present there are 28 canisters in a flask. Therefore the heat generation will be 1.6 kW in maximum per canister. The following actinide content per glass canister from Cogema and BNFL shall be guaranteed: Cogema: U: ≤ 4,500 g Pu: ≤ 110 g Cm: ≤ 90 g BNFL: U: ≤ 2,000 g Pu: ≤ 200 g Cm: ≤ 100 g In accordance with the "Technical Specifications" the following characteristics of the glass canister are guaranteed: - non-fixed surface contamination prior to the intermediate storage - geometrical and weight parameters of the empty container (canister) and the material

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				analysis. The container (canister) shall be fabricated in 309 stainless steel or equivalent material in accordance with prescribed dimensions. The overall weight of a residue package shall not exceed 550 kg (BNFL). Non-fixed surface contamination over the surface of the container (canister) at transportation time shall not exceed BNFL: beta-gamma 4.0 Bq/cm^2 alpha 0.4 Bq/cm^2 Cogema: alpha-beta 3.7 Bq/cm^2
152	32.2 (v)	Section D p. 40	Referring to page 40, for decommissioned reactor sites, where are the spent fuel assemblies stored? If the spent fuel assemblies are stored at site, does this delay the final decommissioning phase (release) of the site to unrestricted use, in other words is disposal a precondition for site release?	The spent fuel elements are either stored in the centralized storage facilities at Gorleben and Ahaus or in the interim storage facilities on the site as described on p. 13 of the German report. If there is an interim storage facility on the site, the clearance procedure of the site will be affected. The dismantling of the nuclear facility may proceed until green field conditions are reached with the exception of the interim storage facility. The supervised area may be reduced appropriately to the interim storage facility, while the rest of the site may be cleared and used for other (conventional) purposes.
153	32.2 (v)	Section D, page 41, paragraph 2	BWR reactors are decommissioned by direct dismantling divided into 6 phases. Phase 4 (September 2002) included dismantling of the reactor pressure vessel. Could more detailed information be obtained on the reactor pressure vessel dismantling technology? The reactor building was modified into a radwaste interim storage facility. Is it prohibited for the radwaste producer to deal with waste disposal in Germany?	It should be noted that the division into 6 phases is particular to the decommissioning of KWW plant. Furthermore, it would still be possible for the operator (the licence applicant) to alter this schedule and make a further division of the remaining licencing steps or combine some steps. So this division is not representative for all BWRs. It is planned to dismantle the reactor pressure vessel of the KWW plant with a thermal cutting technique. Currently, the use of oxygen acetylene flame cutting is considered. Not the reactor building but the UNS building (the building for the independent heat removal system) has been converted into an interim radwaste storage facility. This building can be detached from the reactor building which is to be dismantled. The radwaste producer is not responsible for the ultimate disposal of the waste which is the responsibility of the Federal Government as stipulated in section 9a of the Atomic Energy Act (*Atomgesetz, AtG*) and section 76 of the Radiation Protection Ordinance (*Strahlenschutzverordnung, StrlSchV*). That means that the radwaste producer has to take care of interim storage but not of (final) disposal.
154	32.2 (v)	Section D, page 42, paragraph 3	The interim storage facility Nord stores both spent fuel and high-level waste. What is the technology for HLW collection?	The interim storage facility Nord at Greifswald/Lubmin stores spent fuel elements in containers (dry storage) and waste with negligible heat generation from the dismantling of the Greifswald and Rheinsberg nuclear power plants (KGR and KKR). There is no definition of HLW in Germany, only heat generating waste and waste with negligible heat generation as outlined on pp. 15-16 of the German report. Usually, HLW refers to

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				waste e.g. from reprocessing of spent fuel elements which is not stored at the interim storage facility Nord. However, some parts of the decommissioning waste have high specific activities. Such material is stored in specific vaults of the interim storage facility Nord which provide adequate shielding until they will be further dismantled, segmented and conditioned as radwaste.
155	39.2		Comment: No statement when the Joint Convention was ratified, accepted or approved by Germany	The joint convention has been set into force in German law on 13 August 1998 and has been ratified on 13 October 1998.
156	--	A/ Page 7	It is possible to explain the reasons why the license of PKA Conditioning Plant, was restricted just for repairing defective casks?	As long as the repository is not decided there is no need for the conditioning of spent fuel for disposal. Therefore the license is restricted to that what might be needed if required. With the given license there exists the possibility of repairing a defective cask from the interim storages of spent fuel.
157	--	A/ Page 8, Item (3), Para 3 to 7	Political reasons for phasing out nuclear energy production are presented in this section considering the risks of final disposal and reprocessing of fuel elements. Which risk value was taken into account to phase out nuclear energy production? Which criteria were used to derive the risk value to make the decision? Which comparisons to other sources of energy production were made?	Political decisions mostly are not based on quantitative values. In this case the risk of radioactive waste being a long time in the biosphere without inspection and the risk connected with plutonium which is separated in the reprocessing have been the reason of this decision.
158	--	Section K	When is the described in this section national plan for radioactive waste management expected to be ready?	The drafting process of the mentioned national waste disposal plan is still going on. The Federal Minister for the Environment is ordered by decision of the German Parliament to present the national waste disposal plan in this legislature period which ends in 2006.
159	--	--	How is it determined that the requirements and regulations currently in place are effective in maintaining doses as low as reasonably achievable, social and economic factors taken into consideration, that the burden on future generations is minimized and that releases to the environment have no adverse short- or long-term effects?	If all statutory regulations and the recommendations of the Commission on Radiological Protection (Strahlenschutzkommission – SSK) are complied with, it may be presumed that the dose to which individuals from the general public are exposed will not exceed the limit of 10 µSv/a. At the present state of the art in science and technology, a maximum possible radiation exposure of 10 µSv/a will not have any adverse impact on human health.
160	--	--	How do the results achieved, as a consequence of applying Germany's requirements and regulations, compare with international	The international standards are considered when a new national nuclear framework will be created or an existing one will be amended. In case of Directives of the EU they have to be adopted into the German national framework and thus become national German law.

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
			standards or recommendations, and with neighbouring countries' requirements, particularly when a natural resource such as water is shared?	To avoid undue burdens to the neighbouring countries there are existing permanent working groups in which the German regulatory body and the regulatory body of the neighbour state lay down what kind of burden for the public, the environment and the biosphere can be regarded as acceptable along the common border.
161	--	--	Please explain the public consultation process prior to making decisions related to waste disposal sites, and how the results of this process are factored into those decisions.	According to Article 9b of the AtG, the construction and operation of radioactive waste repositories requires a special licence. This licensing procedure is known as the plan approval (*Planfeststellung*) procedure. The requirements for this licence are very similar to those for a procedure under Article 7 of the AtG. This means that even the public participation in the licensing procedure is the same. The licensing authority involves the general public in the licensing procedures, including in particular those citizens who might be affected by the planned facility. Details are regulated in the Nuclear Licensing Procedures Ordinance <*AtVfV*> (National Report Art 19 2. (ii), Page 53). In the future, the recommendations of the"Arbeitskreis Auswahlverfahren Endlagerstandorte" (AkEnd) – the Committee on a Site Selection Procedure for Repository Sites (in the following referred to as the "Committee") will also be taken into account. This Committee has been set up by the Federal Minister for the Environment. The Committee had been commissioned to develop a traceable procedure for the identification and selection of a site for the disposal of all types of radioactive waste in Germany. The procedure was to provide for public participation in an appropriate form and to include substantiated criteria. The Federal Government still has to make a decision about adopting the recommendations of the Committee. They are to serve to support the Federal Government in the performance of its task, according to Para. 9 a Section 3 of the Atomic Energy Act (AtG) [ATG 2002]. The Committee distinguishes between various different forms of participation that are to be applied in the corresponding procedure steps and which supplement each other. They are: • participation through comprehensive information, • participation in the supervision of the procedure, • participation in the representation of regional interests, and • participation in the decision-making process. Participation through comprehensive information of the public is to explaining all procedure steps from the beginning to the population that is interested. Misunderstandings are to be avoided and rumours to be prevented. For this purpose, an independent information platform shall be set up which independently informs about the relevant topics, takes up queries and theses put forward by members of the public via different media; it also presents interesting national and international topics independently at public events.

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				For the public supervision of the procedure, a group of independent experts and personalities of public life is to be set up – the control committee. It shall monitor each step of the selection procedure and check that the specifications are duly kept. The control committee shall serve the public, issue on its own authority regular information about the progress of the procedure, and assess critical questions posed by the general public. For the participation in the representation of regional interests and in the decision-making process a citizens' forum should be set up at each site which is supported by a centre of competent experts composed of experts of its own choice. At the citizens' forum, the citizens of a site region should be able to take an active part in the discussion of issues related to disposal in general and the regional interests regarding the willingness to participate in particular, and to make suggestions or voice demands to the local council or councils involved. In addition, the chances ensuing for a region from the identification of a repository are to be discussed at a round table on regional development at which representatives from regional stakeholders, political parties, the local industry, trade unions, farming, environmental protection associations as well as other relevant societies and associations can take part. The selection procedure stipulates the enquiry about the willingness to participate in the exploration from the surface and about the willingness to participate in the underground exploration. These enquiries will have a guiding effect on the further implementation of the procedure, i. e. site regions where there is no majority in favour of a participation are put back in the selection procedure.
162	--	Introduction p. 9	Germany reports the use of BAT as required under the *Atomic Energy Act.* Does this mean that licensees will need to review the use of equipment as new ones are developed?	The use of BAT (put in words in Germany by "state of the art in science and technology") is postulated for licensing as well as for the periodic safety assessment of licensed facilities. However, the consequences of deficiencies are evaluated in each case separately according to the practicability of the needed improvements and the possible benefits.
163	--	Introduction p. 9	Germany reports that it assures "a high level of protection compared to other countries." Please provide specific examples.	Beneath the above mentioned requirement the German Atomic Act demands that external impacts have to be considered in a conservative way when designing a facility. These impacts include beneath natural ones like earthquake also such caused by humans like air craft crash, explosions and sabotage (in the letter even 9/11 has to be considered recently).
164	--	Introduction p. 9	Besides the change in ICRP recommendations, please explain the "new, unexpected risks" that Germany has encountered? (p.9)	The new, unexpected risks are those of Chernobyl and 9/11.
165	--	--	Please explain the reason(s) for not addressing non-radioactive hazards (e.g. chemical).	The nuclear regulatory framework does not explicitly address to consider non radiological hazards but there is a link in the Nuclear Licensing Procedure Ordinance [1A-10] to incorporate other authorities which are responsible for other non nuclear legislation in the nuclear licensing process. These authorities have to approve if requirements of their legislation have

Q/C No.	JC Article No.	National Report Citation	Question/Comment	Answer
				been considered if appropriate. Independent of this the impact of non radiological hazards to the environment have to be examined in the Environmental Impact Assessment [1B-14].
166	--	-	The National Report of Germany contains only very limited information related to SF and RAW installations demonstrating how the compliance with the obligations of the JC is achieved for these concrete facilities.	Germany has given detailed information how the requirements of every Article of the JC are accomplished. Therefore concrete questions would be preferred.
167	--	L13; P. 8	This section describes a series of policy changes on spent fuel management and radioactive waste management. How did the nuclear fadeout policy affect research and development projects on these areas and the institution for research and development?	The fading out policy does not affect research and development projects as far as they are connected with issues of safety and with the operational and safety issues of waste management as far as it falls into the responsibility of the state. These responsibilities are reduced to the provision and operation of a repository (Federal Government) and the acceptance and interim storage of waste from medicine, research and industry until it can be given to the repository.

Remarks:
1. Some of the questions had to be transformed into the present format for the purpose of uniformity.
2. The contents of the questions have not been changed. Merely some line feeds had to be deleted.
3. In some cases bullets used in listings have been replaced by letters (a), (b), … or (i), (ii), … in order to avoid line feeds in the Excel sheets..
4. When an explicite reference to the concerning JC Article was missing it has been added if the reference was clear and mentioned in the question otherwise not.
5. If a question referred to more than one JC Article, it was assigned to the first of the Articles mentioned.

Abbreviations:
Q/C No. = Question/Comment Number
JC Art. = Joint Convention Article