

Note:

This is a translation of the statement entitled “Schachtanlage Asse II - Genehmigung des Umgangs mit radioaktiven Stoffen gemäß § 7 StrlSchV - Stellungnahme der Strahlenschutzkommission und der Entsorgungskommission”.

In case of discrepancies between the English translation and the German original, the original shall prevail.

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Asse II Mine

**Licence to handle radioactive substances
according to § 7 of the Radiation Protection Ordinance
(StrlSchV)**

Statement by the Commission on Radiological Protection
and the Nuclear Waste Management Commission

Adopted at the 242nd meeting of the Commission on Radiological Protection on 1/2 July 2010 and by way of circulation by the Nuclear Waste Management Commission on 2 July 2010

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1 Advisory request

With its application of 21 April 2009, the revision of the application of 09 December 2009 and the extension of the application of 26 March 2010 submitted to the Lower Saxony Ministry for the Environment and Climate Protection (Niedersächsisches Ministerium für Umwelt und Klimaschutz - NMU), the Federal Office for Radiation Protection (Bundesamt für Strahlenschutz - BfS) applied for a licence to handle radioactive substances according to § 7 of the Radiation Protection Ordinance (Strahlenschutzverordnung – StrlSchV) for the Asse II mine.

To prepare a federal regulatory statement on the draft licence by the NMU, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit - BMU) requested the Nuclear Waste Management Commission (Entsorgungskommission - ESK) and the Commission on Radiological Protection (Strahlenschutzkommission - SSK) by letter of 31 July 2009 (A7-52/U2) to discuss and render an expert opinion on the draft of the licence according to § 7 StrlSchV to handle radioactive substances in the Asse II mine.

In particular, issues of

- health physics,
- emission and immission monitoring, and
- the protection of the population and the environment during normal operation and under accident conditions

were to be included in the considerations, with special relevance given to the following questions:

1. Is the list of accidents considered complete?
2. Is the derivation of emergency and precautionary measures comprehensible?
3. Are the calculated consequences for the beyond-design-basis event of an uncontrolled brine intrusion comprehensible?

The BMU's advisory request was originally made for a licensing procedure of different contents, in which the radioactive inventories to be considered in the licence were not to be restricted. The scope of the licence applied for at the time was based on the application by the BfS of 21 April 2009.

In the meantime, the licensing procedure has been considerably restricted as regards content as a result of a revised application by the BfS of 09 December 2009 and an extension of the application of 26 March 2010 as well as due to the directive issued by the BMU, setting the boundaries for any further proceedings, of 01 March 2010. The revision of the licence application by the BfS includes the handling of contaminated brine volumes in the mine, but outside the emplacement chambers, with a specific activity below the 100-fold value of the exemption limits of Annex III Table 1 column 3 StrlSchV including the handling of sample materials, the treatment and storage of other operational radioactive waste, the procedural provisions for clearance, and - in a second part of the application - all measures of operational radiation protection including radiation protection monitoring as well as the emissions. The reasons for the amendment of the procedure are comprehensible from the point of view of the ESK/SSK; they ensue from the general aim to put the activities carried out so far as part of the operation to keep the Asse II mine open on a safe licensing basis as quickly as possible.

Hence there is a changed basis to start from with regard to answering questions 1 and 2 of the BMU's advisory request. This is due to the fact that any handling of open radioactive substances with a specific activity above the 100-fold value of the exemption values of Annex III Table 1 column 3 StrlSchV is no longer covered by the applied-for licence.

2 Meetings held

The SSK discussed the application documents of the BfS and the draft licence of the NMU to handle radioactive substances according to § 7 StrlSchV in the Asse II mine in its "Radiological Protection in Nuclear Installations" Committee“ (A7) at the following meetings:

52nd meeting in Jülich on 26 November 2009,

53rd meeting in Bonn on 25 February 2010,

54th meeting in Bonn on 29 April 2012, and

55th meeting in Bonn on 10 June 2010.

The "Committee on Final Disposal" of the ESK discussed the accidents and the emergency and precautionary measures to be considered at its 11th meeting on 02 June 2010.

During the course of their deliberations, the ESK and the SSK as well as the committees concerned were informed by the nuclear licensing authority (Lower Saxony Ministry for the Environment and Climate Protection - NMU) on 29 April 2010 about the state of the licensing procedure.

The SSK discussed and adopted the statement at its 242nd meeting on 01/02 July 2010. The ESK adopted the statement by way of circulation on 2 July 2010.

3 Procedure and topics dealt with by the SSK

As assessment criteria for the assessment of the documents submitted, the SSK applied in particular

- the Ordinance on the Protection against Damage and Injuries Caused by Ionizing Radiation (Radiation Protection Ordinance - StrlSchV) in the version of 20 July 2001 (Federal Gazette I p. 1714), last Amendment by Article 2 of the Act of 29 August 2008 (Federal Gazette I p. 1793),
- the Guideline concerning Emission and Immission Monitoring of Nuclear Installations (REI) by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of 7 December 2005 (Joint Ministerial Gazette 2006 p. 254), Part C.2: Repositories for radioactive waste,
- the Guideline concerning Individual Radiation Monitoring for Determining Body Doses, Part 1: Determination of the Body Dose from External Radiation Exposure (§§ 40,41, 42 StrlSchV; § 35 RöV) by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of 8 December 2003 (Joint Ministerial Gazette 2004 p. 410),
- the Guideline concerning Individual Radiation Monitoring for Determining Body Doses, Part 2: Determination of the Body Dose from Internal Radiation Exposure (Incorporation Monitoring) (§§ 40, 41 and 42 StrlSchV) by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of 12 January 2007 (Joint Ministerial Gazette 2007 p. 623)

and by analogy

- the Guideline concerning the Radiation Protection of the Personnel during Maintenance, Modification, Waste Management and Dismantling Work in Nuclear Facilities and Installations, Part 2: The Radiation Protection Measures during the Operation and the Decommissioning of a Facility or Installation (IWRS II) by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of 10 December 2004 (Joint Ministerial Gazette 2005 p. 258),
- the Guideline concerning the Verification of the Licensee's Monitoring of Radioactive Emissions from Nuclear Power Plants by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of 5 February 1996 (Joint Ministerial Gazette 1996, No. 9/10, p. 247),
- the KTA Safety Standard 1201 Requirements for the Operating Manual, Version 2009-11,
- the KTA Safety Standard 1301.2 Radiation Protection Considerations for Plant Personnel in the Design and Operation of Nuclear Power Plants; Part 2: Operation, Version 2008-11, and
- the KTA Safety Standard 1508 Instrumentation for Determining the Dispersion of Radioactive Substances in the Atmosphere, Version 2006-11.

It was reviewed in particular

- whether the requirements of § 6 StrlSchV have been fulfilled,
- whether the state of the art in science and technology has been taken into account in the design and the measures taken, and
- whether operational radiation protection and the organisational measures fulfil the requirements of § 34 StrlSchV.

The assessment is based on the draft licence of NMU (A7-55/U2) as well as the documents cited in the following.

As the expert opinion of the authorised expert consulted by the nuclear licensing authority was not available to the SSK, that latter was not able to comprehend in detail the assertions made by the nuclear licensing authority in the description of the background with regard to the results of the review by the authorised expert.

4 State of affairs and assessment by the SSK

4.1 Applied-for project

By letter of 06 May 2010, the Lower Saxony Ministry for the Environment and Climate Protection (NMU) submitted a draft licensing notice for the Asse II mine to handle radioactive substances according to § 7 StrlSchV to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

As can be discerned from the presented draft licence and the documents attached, the NMU intends to permit the following activities and measures:

1. According to § 7 para. 1 StrlSchV, the handling of contaminated brine, solid matter and gases in the Asse II mine underground outside the emplacement chambers and hence the handling of open radioactive substances with a specific activity below the 100-fold value of the exemption values of Annex III Table 1 column 3 StrlSchV is approved, in particular
 - all measures that are necessary for keeping the mine open, including measures for stabilisation and backfilling if and when it has to be expected that during their execution contaminated liquids and solid matter, mainly brine and salt breeze, as well as gases will be encountered,
 - all measures for the impoundment, collection and interim storage of potentially contaminated and contaminated brine as well as intruding brine and measures for its use or removal,
 - the handling of the sample material from the radiation protection zones, and
 - the treatment and storage of other operational radioactive waste.

For radionuclide mixtures, the summation criterion according to Annex III StrlSchV is applied.

2. According to § 29 para. 4 StrlSchV, the procedure to verify fulfilment of the requirements according to § 29 para. 2 clause 2 no. 1 letters a and b, no. 2 letters a, b and d and clause 3 StrlSchV is defined as follows:
 - Any clearance campaigns are to be steered and carried out by means of specific clearance plans that contain all necessary requirements of the Radiation Protection Ordinance and the licence notification, including the radiation protection regime, the radiation protection instructions and operational regulations for the materials to be disposed of and all pertaining waste management targets.
 - The specific clearance plans
 - have to be submitted to the competent supervisory authority after first drafting with consideration of the clearance levels of the Radiation Protection Ordinance as amended from time to time,
 - are valid after their examination for the substance- and waste-management-specific clearances for all relevant campaigns,
 - have to be updated or modified if relevant new findings come to light making this necessary, and have to be submitted to the competent supervisory authority again for renewed approval.
 - Compliance with the requirements and procedures stipulated for the clearance of a campaign has to be demonstrated to the competent supervisory authority within the framework of the approval according to § 29 para. 3 StrlSchV and the corresponding notification with clearance documentation.
 - In connection with the clearance, proof has to be furnished according to § 29 para. 2 StrlSchV that the 10- μ Sv concept is observed.
 - The clearance documentation has to be kept for 30 years.

Waste- and mining-law-related provisions remain unaffected.

3. The procedure for the removal of solid and liquid substances that do not stem from controlled areas and for which contamination can be excluded due to their operating history and use is approved.
4. The operational regulations to ensure safe continued operation with regard to the storage of all radioactive waste in the Asse II mine with an overall activity of 1.8×10^{14} Bq alpha emitters and 2.8×10^{15} Bq beta/gamma emitters B at the reference date of 01/01/2003 that have already been approved by the competent Land authority or by the German national metrology institute (Physikalisch-Technische Bundesanstalt - PTB) are approved.

The operational regulations comprise measures of operational radiation protection including radiation protection monitoring. The measures of operational radiation protection also extend to the emplacement chambers that are currently still open.

5. For the discharge of radioactive substances with exhaust air, the following activity limits are specified:

H-3	1.0×10^{12} Bq/a
C-14	1.0×10^{10} Bq/a
Rn-222	1.0×10^{12} Bq/a
Aerosols (Pb-210)	1.0×10^7 Bq/a

6. The licence also comprises the handling of nuclear fuels according to § 2 para. 3 of the Act on the Peaceful Utilisation of Atomic Energy and the Protection against its Hazards (Atomic Energy Act - AtG) as amended and promulgated on 15 July 1985 (Federal Gazette I p. 1565), last amended by Article 1 of the Act of 17 March 2009 (Federal Gazette I p. 556).
7. The licence to handle contaminated solutions and solid matter and gases outside the emplacement chambers extends exclusively to the implementation of measures to ensure radiation protection, but not to the opening of emplacement chambers and handling with the purpose of retrieving or relocating radioactive waste. Also excluded are measures that are an obstacle to long-term safe decommissioning.

The application for handling sample material from the radiation protection areas in the surface radiation protection laboratory is rejected by the NMU.

4.2 Health physics of the applied-for projects

4.2.1 Protection against external exposure, radiation protection areas

State of affairs and assessment by the nuclear supervisory authority

In the justified part of its draft licence, the nuclear licensing authority assesses under III.2.3 the equipment for monitoring the local dose and the local dose rate (p. 43) as well as for personal dosimetry (p. 44) as being suitable. Personnel monitoring (p. 48) and the installations of the radiation protection areas (p. 49) fulfil the relevant requirements of the StrlSchV and the Guideline concerning Individual Radiation Monitoring for Determining Body Doses - Part 1 and Part 2. The routine measuring programme for monitoring the local dose rate (p. 52) fulfils the requirements of § 39 StrlSchV.

Assessment by the SSK

The SSK finds that the development of the dose rate in the radiation protection areas and the suspected areas^{*)} is recorded with the routine programs provided for dose rate measurement. This allows effective planning with regard to the possibly necessary definition of dose-reducing measures. The provided monitoring of the personnel by means of official and operational dosimeters is suitable for verifying compliance with the limits of the StrlSchV and fulfils the requirements of §§ 40 and 41 StrlSchV as well as of the Guideline concerning Individual Radiation Monitoring for Determining Body Doses - Part 1. The regulations laid down for job clearance in the maintenance regime (A7-53/U13 No.9) and in the radiation protection engineering procedure on job clearance (A7-53/U13 No. 57) are suitable for taking into account the requirements of the StrlSchV to avoid unnecessary radiation exposure and for dose reduction as well as protective provisions (§§ 6 and 43 StrlSchV). Furthermore, the requirements of KTA Safety Standard 1301.2 are fulfilled where applicable.

The current establishment of the radiation protection areas and the suspected areas in accordance with the radiation protection regime (A7-53/U13 No. 1) and the radiation protection instructions for the organisation of radiation protection monitoring (A7-53/U13 No. 4) allow an unambiguous definition of the situation at any point in time during operation. Moreover, according to the SSK, suitable regulations are provided in the radiation protection regime on how to act in the case of a change of the radiation protection areas. With these definitions and with the supervision of the access conditions of the personnel for the radiation protection areas by the dosimetry system, the requirements of §§ 36 and 37 StrlSchV are fulfilled.

4.2.2 Protection against exposure through incorporation and contamination, avoidance of contamination being carried off

State of affairs and assessment by the nuclear supervisory authority

In the justified part of its draft licence, the nuclear licensing authority assesses under III.2.3 the installations for incorporation monitoring (p. 44) as well as the monitoring of individuals for possible exposure through incorporation as being suitable and in line with the requirements.

*) Suspected areas are areas in which open radioactive substances were handled in the past and/or where the presence of any covered residual contamination is not excluded, but where the conditions for the establishment of a radiation protection area are not given. (A7-53/U13 No. 1, p. 8)

Requirement 8 specifies the regular checking of the incorporation monitoring by a measuring agency appointed by the Lower Saxony Ministry for the Environment and Climate protection if it has not been verified by measurement yet that an effective dose of 0.5 mSv/a through incorporation is not exceeded by personnel in the supervised area.

In the justified part of its draft licence, the nuclear licensing authority assesses under III.2.3 the installations for surface contamination measurement (p. 43) and sample analysis (p. 43) as being suitable. In order to keep the alarm threshold of the contamination monitors used as low as possible even below the permissible surface contamination values mentioned in Appendix III table 1 column 4 StrlSchV, the authority deems a parameterisation of these monitors necessary in Requirement 9.

The radiation protection measures at the workplace are considered by the nuclear licensing authority as being suitable for carrying out the different jobs, such as maintenance work, the handling of samples, the handling of inflowing brine, the handling of inflowing brine for the production of salt, the handling of brine that cannot be cleared, the handling of filters and ventilation pipes as well as the backfilling of emplacement chambers. The regulations in this context are deemed to be sufficient if Requirements 20 and 21 are considered (p. 49/50).

The nuclear licensing authority finds that the routine measuring programme for room air and contamination monitoring fulfil the requirements of § 39 StrlSchV (p. 52).

Generally, the nuclear licensing authority considers the work clearance procedure to be suitable. Apart from the room air monitoring on the basis of the tracer nuclides Cs-137 and H-3, it deems the consideration of long-lived decay products of Rn-222 in the nuclides to be monitored as necessary, especially if there is reason to suspect increased airborne contamination (p. 51). This is regulated in Requirement 10 (p. 17).

Requirement 11 regulates that if work has to be performed on suspected areas with respect to covered contamination and where there is reason to suspect that the cover will be damaged, the work clearance procedure for radiation protection areas has to be applied.

Assessment by the SSK

The SSK finds that the division of the facility into supervised areas, controlled areas and suspected areas and the checks carried out in these areas are suitable for ensuring the protection of the workforce.

From the point of view of the SSK, the procedures described for surface contamination monitoring, such as

- the routine surface contamination measuring programme (A7-53/U13 No. 56),
- the routine contamination monitoring upon leaving the radiation protection areas (A7-53/U13 No. 54),
- accompanying contamination monitoring when carrying out measures (A7-53/U13 No. 57),
- instructions for the sampling of brine (A7-53/U13 No. 55) and
- measuring instruments used (A7-53/U13 No. 31),

represent effective measures for preventing that contamination is carried off. These measures and the other measures to prevent that contamination is carried off are suitable to fulfil the requirements of §

44 StrlSchV.

The measuring programmes for room air and surface contamination monitoring fulfil the requirements of § 39 StrlSchV.

With the room air monitoring provided, especially of H-3 and Rn-222, as well as with the incorporation monitoring for the purpose of furnishing proof as well as for special reasons, the requirements of §§ 40 and 41 StrlSchV as well as of the Guideline concerning Individual Radiation Monitoring for Determining Body Doses, Part 2, are fulfilled.

An expedient remark is made in Requirement 8 which says that regular incorporation monitoring may be dispensed with if it can be shown that an effective dose of 0.5 mSv/a through incorporation is not exceeded for personnel working in the supervised area.

The SSK welcomes the fact that, as demanded in Requirement 9, the alarm thresholds of the contamination monitors are to be kept as low as possible. It recommends, however, that the term "parameterisation" should be specified.

The consideration of long-lived decay products of Rn-222 in the radionuclides to be monitored as demanded in Requirement 10 for the work clearance procedure is considered by the SSK to be in compliance with the requirements. However, the SSK points out that term "increased airborne contamination" has to be defined clearly.

The application of the work clearance procedure for radiation protection areas in cases where there is reason to suspect that the cover of suspected areas will be damaged – as regulated in Requirement 11 – is deemed by the SSK to be expedient and appropriate regarding the health physics requirements.

4.2.3 Organisational measures

State of affairs and assessment by the nuclear supervisory authority

In the enacting part of the draft licence, the nuclear licensing authority names the responsible personnel. In the substantiating part III of the draft licence, the nuclear licensing authority assesses the specifications regarding the organisation of radiation protection as positives and considers the requirements of § 34 StrlSchV and KTA Safety Standard 1201 as being fulfilled.

Assessment by the SSK

The SSK finds that the specifications regarding the radiation protection organisation (incl. the scopes of decision of the radiation protection officers), the number of radiation protection officers and the specifications regarding technical qualification (A7-53/U13 No.1, No. 3 und No. 4) fulfil the requirements of §§ 30, 31 and 33 StrlSchV.

The specification of the radiation protection regime and the radiation protection instructions fulfil the requirements of § 34 StrlSchV and – where applicable – of KTA Safety Standard 1201.

However, the SSK finds that in the instructions of the operating manual that has been presented and in the radiation protection instructions, there are often overlapping topics to be found. This can lead to problem in the execution and in the revision of the regimes and instructions. The SSK therefore recommends that all fundamental matters to fulfil the requirements of the StrlSchV should be specified in the regimes in the operating manual and only specific details should be regulated in separate instructions. The instructions should be cited in the respective regimes of the operating manual and contained in a list of instructions in the operating manual, with an indication of the respective status of validity.

4.3 Emission and immission monitoring

4.3.1 Release with exhaust air

State of affairs and assessment by the nuclear supervisory authority

The monitoring of the release of radioactive substances with exhaust air takes place continuously for Rn-222, aerosols, H-3 and C-14 (A7-53/U13 No. 4). Monitoring of I-129 is dispensed with as in all samples taken so far, no I-129 could be detected. For the determination of the Sr-90 concentration in the exhaust air, samples are taken and evaluated every 5 years; as regards the plutonium concentration, sampling is carried out every six months.

The balancing of the activity releases is only done for Shaft 2 as the air from Shaft 4 does not move out permanently and only contributes to the total exhaust air by a fraction of approx. 1 % - 6 %. The releases from Shaft 4 are monitored by means of a continuously operating aerosol monitor.

Additional measures for the sampling system for Shaft 2 that have to be taken by 31 March 2009 are required in (A7-53/U13 No. 82) under item 8.2:

- Modification measures have to be specified for the sampling system and the diffusor by which the separation of water on the inner surfaces of the sampling system and on the measuring filter belonging to the aerosol monitor is prevented in future.
- The size distribution of the aerosol particles in the exhaust air of Shaft 2 has to be re-determined with a suitable measuring method.
- The sampling system for aerosol particles in the exhaust air has in future to be cleaned at least every two weeks. This measure has to be established in the form of an internal instruction.
- The pipe factor on the existing sampling system for aerosols in the exhaust air has to be determined by measurements using a suitable method.
- It has to be determined whether the distribution of activity to aerosol particle diameters in the exhaust air applied as a basis so far is still also valid for abnormal cases of operation and for accidents (e.g. fire events). If this is not the case, measures have to be provided that ensure balancing of the aerosol activity released with the exhaust air.

Assessment by the SSK

The monitoring of the emissions with the exhaust air does not fulfil the requirements of the Guideline concerning Emission and Immission Monitoring of Nuclear Installations (REI) and the Guideline concerning the Verification of the Licensee's Monitoring of Radioactive Emissions from Nuclear Power Plants in the following points:

- The measuring range of aerosol monitoring deviates downwards from the requirements by a factor of 100 each.

The SSK considers this to be appropriate for the applied-for release values and the licensing scope.

- The evaluation of the molecular sieve for H-3 and C-14 is carried out exclusively by the BfS. Hence there is no verification of the licensee's monitoring according to the Guideline concerning the Verification of the Licensee's Monitoring of Radioactive Emissions from Nuclear Power Plants.

The SSK proposes for the verification of the licensee's monitoring to have the molecular sieve additionally evaluated by an independent measuring agency.

The fact that Shaft 4 is not monitored in line with the regulations for any emissions is considered by the SSK as appropriate, assuming that the radionuclide-specific activity concentrations in Shaft 4 are comparable to those in Shaft 2. This assumption, however, has to be verified. If this verification is successful, the SSK nevertheless considers it necessary to balance the emissions across Shaft 2 with a suitable correction factor that corresponds to the ratio of the volume flows from Shaft 4 to Shaft 2. Otherwise, an emission monitoring system that is in line with the regulations will also have to be installed in Shaft 4.

The immediate implementation of the measures demanded in (A7-53/U13 No. 82) for removing the deficiencies in the sampling system for Shaft 2 are considered by the SSK to be necessary.

4.3.2 Release with waste water

State of affairs and assessment by the nuclear supervisory authority

No operational liquids are released from the Asse II mine. Hence no monitoring is provided.

Assessment by the SSK

The SSK considers this approach to be in accordance with the requirements.

4.3.3 Immission monitoring

State of affairs and assessment by the nuclear supervisory authority

The immission monitoring programme is described in (A7-53/U13 No. 4) and (A7-53/U13 No. 30a) and according to the nuclear licensing authority fulfils the requirements of the Guideline concerning Emission and Immission Monitoring of Nuclear Installations (REI) if Requirement 5, which demands the upgrading of the recording systems of meteorological data in line with the requirements of KTA 1508, is considered.

Assessment by the SSK

The licensee's programme for the monitoring of the environment of the Asse II mine in normal specified operation does not fulfil the requirements of the Guideline concerning Emission and Immission Monitoring of Nuclear Installations (REI) in the following points:

- There is no continuous monitoring of precipitation. Due to the current low activity concentrations measured in the exhaust air, the SSK considers this to be in conformity with the requirements.
- According to (A7-53/U13 No. 30a), continuous monitoring of the aerosols does not take place at the most unfavourable impact location but in accordance with the draft licence in the most frequent direction of dispersion.

The SSK considers a review of the sampling location necessary.

- There is no continuous collecting of aerosols in the second most frequent direction of dispersion.

According to the Guideline concerning Emission and Immission Monitoring of Nuclear Installations (REI) this is not necessary if the independent measuring agency operates its own

sampling device. Since, however, the programme of the independent measuring agency does not contain any such measures, the SSK considers a review with regard to the need for a further sampling location to be necessary.

The programme of the independent measuring agencies for monitoring the environment of the Asse II mine prior to commissioning and during normal specified operation of the repository is not in line with the requirements of the Guideline concerning Emission and Immission Monitoring of Nuclear Installations (REI) in the following points, which at present are not comprehensible to the SSK on the basis of the documents available:

- There is no monitoring of the air in accordance with REI, Table C.2.2 item 1.3.
- Monitoring of feedstuffs for H-3 and C-14 is not included (Table C.2.2 item 3).
- The required demonstration limit in the monitoring of foodstuffs of vegetable origin lies above the requirements of REI by a factor of 2.5. Here, too, there is no monitoring for Sr-90 (Table C.2.2 item 4).
- There is no monitoring of milk and dairy products (Table C.2.2 item 5).

The SSK considers a revision of the measuring programme of the independent measuring agencies necessary.

In (A7-53/U13 No. 4) and (A7-53/U13 No. 30a), no information is given on the measures taken by the licensee and the independent measuring agency with respect to the monitoring of the environment in the case of an incident/accident.

Taking the potential maximum accidental dose of 5.5 mSv for the effective dose into account, the SSK recommends to check whether, similar to the nuclear power plants and interim storage facilities for spent fuel elements, a monitoring programme for incident/accident situations is necessary.

4.4 Radiation exposure in the environment during normal specified operation and under accident conditions

4.4.1 Radiation exposure of the population during normal specified operation

State of affairs and assessment by the nuclear supervisory authority

Radiation exposure due to the applied-for releases with the exhaust air

As part of the application according to § 7 StrlSchV to handle radioactive substances in the Asse II mine, permissible annual releases of radioactive substances with the exhaust air are applied for. The releases of radioactive substances are essentially via a diffusor. The height of emission in this case is 11 metres above ground. In (A7-53/U13 No.77), the application values are compared with the mean and maximum annual releases from the preceding years of operation. This comparison is summarised in Table 1.

Tab. 1: Applied-for releases of radioactive substances with exhaust air from the Asse II mine compared with the mean and maximum annual releases from the years of operation 2001 - 2008

Radionuclide	Application value [Bq/Calendar year]	Mean annual release from the years 2001-2008 [Bq/Calendar year]	Maximum annual release from the years 2001-2008 [Bq/Calendar year]
Tritium	$1.0 \cdot 10^{12}$	$4.3 \cdot 10^{10}$	$5.5 \cdot 10^{10}$
Carbon 14	$1.0 \cdot 10^{10}$	$1.0 \cdot 10^9$	$1.3 \cdot 10^9$
Aerosols	$1.0 \cdot 10^7$	$1.1 \cdot 10^6$	$1.6 \cdot 10^6$
Rn-22 without daughters	$1.0 \cdot 10^{12}$	$9.0 \cdot 10^{10}$	$9.4 \cdot 10^{10}$

It can be seen from Table 1 that the applied-for values were only exhausted by fractions during operation in the years 2001-2008. In (A7-53/U13 No. 13) it is analysed to what extent any changes in the annually released amounts can be expected within the framework of the applied-for handling of radioactive substances up to the maximum of a hundredfold of the exemption limit for normal specified operation. According to the results shown in (A7-53/U13 No. 13), no essential changes need be assumed for the amounts annually released.

The potential radiation exposure for the applied-for maximum release values in a calendar year is indicated in (A7-53/U13 No. 77). The radiation exposure was determined according to the General Administrative Procedure (AVV) relating to § 47 StrlSchV (draft by BfS to amend the AVV relating to § 47 StrlSchV, as at 10/01/2001) for the actual releases in 2001 and translated to the application values. The results are shown in Table 2.

Tab. 2: Maximum annual radiation exposure at full exhaustion of the application values according to Table 1

Radionuclide	Critical age group	Critical organ	Dose [μSv per year]	Limit value [μSv per year]	Fraction of limit value
Tritium	< 1 a	effective	7	300	2.3 %
Carbon-14	1 – 2 a	effective	19	300	6.3 %
Pb-201 (dominates aerosol contribution)	12 – 17 a	bone surface	1,106	1,800	61 %
Rn-222 without daughters	all	effective	39	300	13 %

Radiation exposure is dominated by Pb-210. The applied-for value exhausts the limit value according to § 47 StrlSchV for the organ dose (bone surface) by 61 %. In all, the conclusion is drawn in (A7-53/U13 No. 77) that the limit values according to § 47 StrlSchV are safely adhered to. This is also the result of (A7-53/U13 No. 13); however, it is pointed out in (A7-53/U13 No. 13) that there are uncertainties attached to the calculation method according to the AVV relating to § 47 StrlSchV for near-surface releases. Nevertheless, (A7-53/U13 No. 13) also concludes that owing to the considerably lower actually expected releases, compliance with the limit values according to § 47 StrlSchV is guaranteed.

Radiation exposure from direct radiation and from releases with waste water

According to (A7-53/U13 No. 13), no increased radiation exposure from direct radiation is expected in the vicinity of the storage facility within the framework of the applied-for scope. Also, no releases of radioactive substances with waste water are intended within the framework of normal specified operation.

Assessment by the SSK

During normal specified operation, the applied-for releases with the exhaust air make up the only contribution to the total radiation exposure in the environment. The radiation exposure levels due to the releases with air were determined in line with the state of the art in science and technology on the basis of the draft of the AVV relating to § 47 StrlSchV of 10/01/2001.

The maximum organ dose from the licensed releases of radioactive substances with air partly exhausts the limit values according to § 47 StrlSchV to a considerable extent. The argument that the actual releases lead to far lesser exposure levels is comprehensible.

However, in this context the SSK points out that it was assumed in the calculation of the radiation exposure that the applied-for releases take place exclusively via the 11-m high diffusor. The surface-near releases from Shaft 4 were not considered here. The SSK recommends to check to what extent these surface-near releases make any relevant contribution to the radiation exposure. An assessment of whether the potential radiation exposures of the reference persons from the applied-for releases with the exhaust air lie below the limit values of § 47 StrlSchV can only be made after this examination.

4.4.2 Radiation exposure in the environment under accident conditions**State of affairs and assessment by the nuclear supervisory authority**

According to § 50 StrlSchV, structural and technical measures have to be taken with consideration of the potential extent of any damage in order to limit radiation exposure caused by the release of radioactive substances under accident conditions. The conservative accident scenario applied in (A7-53/U13 No. 14) is the thermal loading of a transport cask with contaminated brine. For this case, the conservative assumption is that the entire activity content is released to the environment via the diffusor. The radiological consequences are determined in (A7-53/U13 No. 18) for the currently known highest activity concentration in contaminated brine. The determination of the potential radiation exposure in (A7-53/U13 No. 18) is based on the requirements of the incident calculation bases relating to § 49 StrlSchV and takes supplementary SSK requirements for the calculation of exposure by larger particles, H-3 and C-14, into account.

The determined potential radiation exposure of the conservative accident is extrapolated in (A7-53/U13 No. 14) to the applied-for maximum activity concentration. According to this study, the value of 50 mSv applied for the effective dose according to the requirement of § 50 StrlSchV in connection with § 117 para. 18 StrlSchV is only exhausted by 11 % at the most.

Assessment by the SSK

The SSK is of the opinion that the calculations of radiation exposure performed for the radiologically representative accidents correspond to the state of the art in science and technology. The results of these calculation show that the maximum permissible value for the effective dose according to the requirement of § 50 StrlSchV in connection with § 117 para. 18 StrlSchV is never reached by far in all the events considered. The conservative assumptions in the accident analyses furthermore ensure that the radiological consequences that have been determined cannot be reached in reality, not even for the conservative accident scenario.

However, the SSK points out that regarding the effective dose of 0.23 mSv mentioned in the draft licence (A7-55/U2) for the radiologically conservative accident scenario, an activity concentration in the brine (LAW emplacement chamber 12/750) was assumed that was the 4.15-fold value of the exemption limit according to Appendix III, column 3 StrlSchV (A7- 53/U13 No. 14). If one assumes a fire involving the 100-fold value of the exemption limit (Appendix III, column 3 StrlSchV), the maximum effective dose is increased by a factor of 24 (A7- 53/U13 No. 14).

4.5 Notes by the SSK

As clearance was not the subject of the advisory request, it was not included in the assessment.

The SSK points out notwithstanding some contradictions within the draft licence:

1. For the surrender of solid and liquid materials that arise outside controlled areas and for which a contamination can be excluded due to their operating history and use, it is to be demonstrated by suitable measurements that they are free from contamination. To show that the materials are free from contamination, the measuring method employed is to be capable of demonstrating safely a specific activity of 10 % of the respective clearance value and a surface contamination of 1 Bq/cm². The surrender of a material is to be possible if a specific activity shown by measurements lies below 1 % of the respective clearance value. However, if the detection limit of the measuring method employed is to be 10 % of the respective clearance value, surrender will not be possible if the required measured values of < 1 % of the clearance limit cannot be detected by the measuring method used.
2. As regards surface contamination, a detection limit of 1 Bq/cm² is required for surrender. This detection limit presupposes that there are no alpha emitters around since for some alpha emitters the admissible surface contaminations according to Appendix III, column IV StrlSchV lie clearly below 1 Bq/cm².
3. It is furthermore not clear whether the surface contamination of 1 Bq/cm² refers to all radionuclides (e.g. H-3).

Moreover, the SSK points out the following contradiction: In licensing document no. 32, the waste has to be conditioned in compliance with the requirements for the Asse, with subsequent storage in the Asse II mine; Requirements 16 and 17 in the draft licence, however, demand conditioning in compliance with the requirements for the Konrad mine and surrender to a state collecting facility. These contradictions have to be eliminated.

The question of the advisory request

3. Are the calculated consequences for the beyond-design-basis event of an uncontrolled brine influx comprehensible?

referred to the assessment of potential radiation exposure levels in the vicinity of the Asse II mine as a result of the beyond-design-basis brine intrusion from the overburden during the operational phase (A7-53/U13 No. 16). This question is only relevant when looking at the entire activity inventory of the Asse II mine. As this is not the subject of the current licence application, no detailed answer is provided here.

According to assessments by both the SSK and the ESK, the estimates made in the document (A7-53/U13 No. 16) are coarsely simplifying, over-conservative and in part not justifiably from a scientific point of view. They do not represent a comprehensible basis for assessing the potential consequences of an uncontrolled brine intrusion. In the meantime, the BMU has therefore commissioned a research project that is to provide realistic and reliable statements on the potential consequences of an uncontrolled brine intrusion. The final report of this project is not yet available to the SSK and the ESK.

5 Notes by the ESK

Based on the current licence application, it follows that:

- Not all technically possible accidents have to be considered anymore but only those that result from the concrete applied-for ways of handling radioactive substances up to the 100-fold value of the exemption limit according to Appendix III Table 1 column 3 StrlSchV.
- No emergency measures have to be reviewed as due to the restriction of the scope of the application to specific activities up to the 100-fold value of the exemption limits an emergency can only arise if the specific activity in the brine from a larger amount of drums or containers is released to the waste air as a result of the impact of a fire (radiologically conservative accident considered: fire impact upon the transport of drums or containers). Given the possible fire impacts originating from a vehicle, this is so unlikely that as a result the review of the precautionary measures against emergencies and of the emergency measures in case of an emergency is no longer required.
- It cannot generally be excluded that in connection with the applied-for handling, disturbances may occur as a result of indirect effects of operation that at a later stage may lead to releases of inventories that are present in various locations of the Asse II mine. Nevertheless, even those cases do not have to be considered. This applies to the effects of such cases as well as to any precautionary measures that might have to be taken to prevent such cases.

Under the conditions described above, the first question of the advisory request "Is the list of accidents considered complete?" can be answered with a "yes" as the question here is about accidents that are relevant from a nuclear regulatory point of view (with potential of a release of radioactive substances).

Under the same conditions, the second question "Is the derivation of emergency and precautionary measures comprehensible?" can be answered by stating that apparently no emergency and precautionary measures are necessary for the cases considered within the framework of the applied-for licence as the applied-for scope comprises neither any accidents with a potential for larger releases nor any emergencies.

From the point of view of the ESK as well as the SSK, if one analyses the real situation of the Asse II mine it becomes evident that there is a large variety of possibilities for situations, accidents and emergencies in which larger amounts of activity from open radioactive substances may be released.

Both the ESK and the SSK therefore consider it urgently necessary that precautionary, protection and counter-measures be examined for these cases, irrespective of the legal limitations given by the current licensing procedure. From a technical-scientific point of view, precautionary measures, measures for accident control and measures for emergency limitation would also have to be provided for these cases.

The ESK as well as the SSK point out that the emergency plans recently prepared and published by the BfS (A7-54/ U14 und U15) only refer to one special event, namely uncontrolled brine intrusion, and can therefore not be considered as plans for the entirety of the cases for which there is reason to suspect their occurrence.

Annex: List of documents

- (A7-52/U2) Beratungsauftrag des BMU,
Beratung und Begutachtung des Entwurfs der Genehmigung nach
§ 7 StrlSchV zum Umgang mit radioaktiven Stoffen in der
Schachanlage Asse
31.07.2009, Az: RS II 3 - 14841/1
- (A7-53/U13 No. 1) BfS
Strahlenschutzordnung der Schachanlage Asse II
Stand: 12.11.2009
- (A7-53/U13 No. 3) Asse GmbH
Personelle Betriebsorganisation der Asse GmbH
Stand: 06.11.2009
- (A7-53/U13 No. 4) Brenk Systemplanung, Asse GmbH
Strahlenschutzanweisung Organisation der Strahlenschutzüberwachung
Stand: 12.11.2009
- (A7-53/U13 No. 9) Asse GmbH
Instandhaltungsordnung
Stand: 30.10.2009
- (A7-53/U13 No. 13) ISTec GmbH
Sicherheitsüberprüfung des bestimmungsgemäßen Betriebes der
Schachanlage Asse II
Stand: 30.10.2009
- (A7-53/U13 No. 14) ISTec GmbH
Sicherheitsüberprüfung der Störfallvorsorge der Schachanlage Asse II
Stand: 30.10.2009
- (A7-53/U13 No. 16) GRS Braunschweig
Abschätzung potenzieller Strahlenexpositionen in der Umgebung der
Schachanlage Asse II infolge auslegungsüberschreitender Zutrittsraten
der Deckgebirgslösung während der Betriebsphase
Stand: 21.04.2009
- (A7-53/U13 No. 18) ISTec GmbH
Ermittlung potenzieller Strahlenexpositionen in der Umgebung der
Schachanlage Asse II bei Störfällen
Stand: 30.10.2009
- (A7-53/U13 No. 30a) Brenk SP, Asse GmbH
Technische Beschreibung zur Emissions- und Immissionsüberwachung
der Schachanlage Asse II
Stand: 13.11.2009
- (A7-53/U13 No. 31) Asse GmbH, ISTec GmbH
Systembeschreibung: Messlabor und untertägige Funktionsräume
des Strahlenschutzes der Schachanlage Asse II
Stand: 21.04.2009
- (A7-53/U13 No. 54) Asse GmbH
STS-FAW 007 Rev. 00: Eigenkontrolle, Vorgehensweise, Verhalten und
Maßnahmen bei möglichen Kontaminationen in Strahlenschutzbereichen

- der Schachtanlage Asse II
Stand: 17.07.2009
- (A7-53/U13 No. 55) Asse GmbH
Anweisung über Art, Umfang und Häufigkeit der
Kontaminationskontrolle
von Salzlösungen in Probeentnahmestellen
Stand: 11.05.2009
- (A7-53/U13 No. 56) Asse GmbH
STS-FAW-012 Rev. 00 Routinemessprogramm
Oberflächenkontamination
Stand: 10.11.2009
- (A7-53/U13 No. 57) Asse GmbH
Strahlenschutzfachanweisung Arbeitsfreigabe
Stand: 30.09.2009
- (A7-53/U13 No. 77) BfS
Erläuterungen zu den vom BfS beantragten Werten für die Ableitung
radioaktiver Stoffe mit der Fortluft im bestimmungsgemäßen Betrieb
der Schachtanlage Asse II
Stand: 10.11.2009
- (A7-53/U13 No. 82) BfS
Auflistung aller Anforderungen und Nebenbestimmungen aus anderen
strahlenschutzrelevanten Verfahren für die Schachtanlage Asse II
Stand: 18.11.2009
- (A7-54/U14) BfS
Notfallplanung für das Endlager Asse
Stand: 28.02.2010
- (A7-54/U15) Asse GmbH:
Notfallplanung zur Konsequenzenminimierung
Stand: 23.02.2010
- (A7-55/U2) Niedersächsisches Ministeriums für Umwelt und Klimaschutz (NMU):
Entwurf des Genehmigungsbescheides für die Schachtanlage Asse II
- Bescheid 1/2010 -
Umgang mit radioaktiven Stoffen gemäß § 7 Strahlenschutzverordnung
(StrlSchV), Akten-Zeichen: 43-40326/8/4