

Note:

This is a translation of the letter entitled “Optionen zur Stilllegung der Schachanlage Asse II Beratungsergebnisse der ESK/SSK-Ad-hoc-Arbeitsgruppe ASSE”.

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

Options for the decommissioning of the Asse II mine

Consultation results of the ASSE ad hoc working group of the Nuclear Waste Management Commission (Entsorgungskommission, ESK) and the Commission on Radiological Protection (Strahlenschutzkommission, SSK)

At its 6th meeting on 21.09.2009, its 7th meeting on 26.10.2009 and its 8th meeting on 09.12.2009, the ESK/SSK ad hoc working group ASSE dealt with the options for the decommissioning of the Asse II mine. Furthermore, these issues were also discussed at the meeting on 25.11.2009 convened by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) with the participation of the ESK/SSK ad hoc working group ASSE. The consultations were based, among others, on the feasibility studies for the decommissioning options of retrieval, relocation and complete backfilling and the comparison of options of the Federal Office for Radiation Protection (BfS) (intermediate results: Step 1).

In three letters submitted to the BMU on 02.11.2009, the ESK/SSK ad hoc working group presented the need to update the inventory information for the Asse II mine and to determine the potential radiation exposure of the population after a beyond-design solution inflow in a comprehensible manner as well as the urgency to develop an emergency concept for the Asse II mine. At this point, reference is made again to these letters.

In the following, a short overview of the main results of the consultation of the ESK/SSK ad hoc working group ASSE is given in a first part. In a second part, some key aspects will be explained more detailed.

I. Central results of the ESK/SSK ad hoc working group ASSE

1) The detailed examination of the so-called feasibility studies for the decommissioning options of retrieval, relocation and complete backfilling and the comparison of options of the BfS (intermediate results: Step 1) has shown that these only deal with parts of the questions to be considered. The various partial aspects of the feasibility studies clearly differ regarding the depth of the analyses. A number of key issues relevant for a decision have not been treated or not sufficiently (see Part II of this letter). These issues result, on the one hand, from the catalogue of criteria that originally should be the basis of the decision and, on the other hand, from the evaluation of practical experience in dealing with radioactive waste. Furthermore, none of the options considered the consequences of a "discontinuation" of the activities due to an unexpected event.

2) On the basis of the available documents and information, a detailed comparison of the decommissioning options is currently not possible. The performance of further studies that correct the deficiencies of the previous ones would require many months, if not even years. In addition, the knowledge about the overburden, about the stability of the Asse, about the nature and manner of future solution inflow will not be sufficient for years to allow for a reliable prediction of the development in the Asse.

3) Nevertheless, the ESK/SSK ad hoc working group ASSE considers it imperative that concrete steps are implemented as soon as possible and the decommissioning of the Asse mine is addressed without any delay since time is pressing and there is the danger of further deterioration of the situation in the Asse. Therefore, it has to be decided on the basis of available and quickly obtainable information, even if not being sufficient in the scientific sense. The existing uncertainties are to be considered in weighing up.

4) In the given situation, the ESK/SSK ad hoc working group is of the opinion that a meaningful discussion of the decommissioning options will only be possible after the submission and consideration of an integrated emergency plan for the Asse mine. According to the BfS, this emergency plan will be available by the end of February 2010. With the availability of the integrated emergency plan, the possible short-term responses to deterioration of the situation are known; this allows better assessment of the impacts of uncertainties. *In this regard, the ESK/SSK ad hoc working group again explicitly refers to the central importance of a transparent calculation of the potential exposure of the population after a beyond-design solution inflow.*

5) Regarding the inventory of the Asse, current knowledge on distribution and the known uncertainties show that partial retrieval or partial relocation does not improve the situation with respect to long-term safety considerations. This is, in particular, due to the distribution of the plutonium inventory throughout the entire emplacement area, to the uncertainties resulting from wrong declarations and the geochemical behaviour of the radioisotopes. The conclusion is, from the point of view of the ESK/SSK ad hoc working group ASSE, that it would be appropriate to only consider the options “complete retrieval”, “complete internal relocation” and “complete backfilling”.

6) For the option “complete internal relocation”, the ESK/SSK ad hoc working group ASSE regards it to be a considerable uncertainty that today it is not clear whether an area in the Asse formation can be found at all that may be used for relocation and, at the same time, offers a significantly higher level of safety than the current emplacement areas. The clarification of this question would take several years of exploration in the Asse. In case of a negative result, these would be lost years. From the point of view of the ESK/SSK ad hoc working group ASSE, this is a good argument for not further pursuing the option “complete internal relocation” in the given situation.

7) For the option “complete retrieval” (and also for the “complete internal relocation”), the condition of the emplaced packages and of the chambers is of central importance. This applies, in particular, to the mechanical condition of the packages (how costly and time-consuming will picking-up and recovery be?) and the condition of the content (is a specification according to the emplacement conditions in another repository possible?) but also to the issue of brine solution inflow into the chambers. The ESK/SSK ad hoc working group ASSE recommends carrying out practical investigations in the Asse II mine within the next months. Only in this way, the necessary information can be obtained for a decision on the validity of the option “complete retrieval”, especially for a realistic assessment of the actually required technical efforts and time involved.

8) As a concrete measure, the ESK/SSK ad hoc working group ASSE proposes to open some emplacement chambers, to take out selected waste packages and to check their quality and content. Type, number and emplacement area of these waste packages should be chosen such that the investigations of

possibilities lead to a cross-section of the emplaced packages, as far as possible. This way, the ad hoc working group hopes to obtain information about the accessibility and the condition of the packages, about the measures to be taken for a safe transportation of the waste within the mine and to the surface, a partial verification and partial up-date of the inventory as well as information about the condition of the backfill material and, as far as applicable, about distribution and paths of the brine solution inflow. Regarding the question which chambers are affected by brine solution inflow to which degree and what overall conclusions are to be drawn both for opening of chambers proposed here but also for the comparison of options, the currently available information - e.g. results of the working group TU Clausthal (Prof. Mengel) / FZ Jülich (Dr. Lennartz) and the relevant assessments of Mr. Saas - should be evaluated in advance. Only in this way, the necessary information can be obtained for a decision on the validity of the option "complete retrieval", especially for a realistic assessment of the actually required technical efforts and time involved.

9) Since without such an investigation, the validity of the option "complete retrieval" remains unclear, the ESK/SSK ad hoc working group ASSE considers it necessary to also work on the concretisation of the concept for the option "complete backfilling". This is justified by the fact that there is a considerable probability that, as a result of the practical investigation, only the option "complete backfilling" turns out to be feasible in practice. In addition, it should be noted that essential parts of the option "complete backfilling" also constitute integral parts of the emergency concept so that, in this regard, concretisation of planning and provision of the measures as soon as possible are required anyway.

II. Further results of the discussion of the ESK/SSK ad hoc working group ASSE

From the point of view of the ad hoc working group, the following aspects have not been considered in the decommissioning options or not considered sufficiently:

- A part of the waste packages in the Asse was emplaced in stacked form but part of it was also dumped; they are covered with crushed salt and the emplacement chambers are sealed. It is known that some chambers are penetrated by moisture due to solution inflow from the overburden. Under these conditions it is to be expected that the handling of the emplaced drums will be difficult. The ad hoc working group assumes that the coverage with crushed salt has meanwhile compacted to a considerable extent and that the drums are no longer intact. For the decommissioning options of retrieval and relocation it is to be expected that handling of open radioactive substances cannot be avoided. Thus, from the point of view of the ESK/SSK ad hoc working group, a substantiated assessment of the personal dose for the operating personnel cannot be made at present.

This assessment is based, among others, on analyses of the occurring brine solution; the radionuclides contained originate from the emplaced inventory and can only be explained by defective drums. However, these analyses also show that the adjoining salt (backfill material crushed salt) is contaminated and thus, e.g. in the case of retrieval or relocation of the waste, also has to be treated as radioactive waste.

- This approach, in turn, involves difficulties. The ad hoc working group doubts that proven techniques for large-scale handling of these packages underground, in a corrosive environment (salt and saline atmosphere), can be made available. Further, it assumes that the conditioning of this waste would have to be performed in three different conditioning facilities, since old waste, salt and liquids (brine) require different types of conditioning. These three facilities still have to be designed, licensed, constructed and commissioned.
- Under the above conditions (defective waste packages, contaminated salt, and solution inflow) it is to be assumed that the waste volume to be disposed of will considerably exceed the inventory originally emplaced in the Asse. Consequently, not only the question arises of how but also where such an amount of waste could be disposed of. First estimates of the ad hoc working group lead to the conclusion that the waste package volume licensed for the Konrad repository of a maximum of 303,000 m³ will not be sufficient to additionally accommodate waste from the Asse mine. To allow emplacement of the waste from the Asse II mine in the Konrad repository, the plan approval procedure would have to be repeated and the plan approval decision to be amended.
- As the plan approval decision for the Konrad repository also specified, besides the volume limit, upper limits of activity for the safety-significant individual radionuclides and the total activity, it can be foreseen that, under current conditions, the Asse waste cannot be emplaced in the Konrad repository due to the Pu inventory and inventory of other actinides either. All in all, the question arises of how the declaration requirements of the waste acceptance criteria for the Konrad mine can be fulfilled, including the determination of the data required for it. Note: With letter of 25.11.2009, the BMU submitted a request for advice to the ESK on the underground and above ground treatment of the waste potentially to be retrieved.
- The handling of the packages, the waste volume, the conditioning and, as far as applicable, the later final disposal of the Asse waste raise serious questions. Against this background, the ESK/SSK ad hoc working group ASSE considers the time frames given in the feasibility studies for retrieval and relocation not to be plausible since they are based on optimal conditions for the technical implementation (loose crushed salt, intact drums, smooth implementation) and for the licensing procedure. An additional factor of 1.25 chosen for these time estimates – as in the comparison of options (Step 1) of the BfS – is not comprehensible, not appropriate, and not sufficient for a realistic scheduling.

- The ad hoc working group is of the opinion that the remaining time for further actions is an uncertainty concerning all decommissioning options. It is mainly determined by the solution inflow and the stability of the overburden. In this context, the ad hoc working group points out that emptying of the emplacement chambers (creation of further cavities, possibly with stopes of small thickness) may lead to further destabilisation of the rock.
- Another important criterion for the selection of a decommissioning option is the radiation protection of the personnel. The ad hoc working assumes that it will not be possible to perform all necessary measures by remote handling. For handling of open radioactive substances, it is foreseeable that the personnel will be exposed to a substantial radiation dose not being insignificant. In this regard, sufficient and reliable aeration/ventilation of the facility is of importance for safety. However, the ad hoc working group doubts that this can be ensured in a one-shaft facility like the Asse II mine, but sinking of an additional shaft is not provided for any of the decommissioning options and would also involve considerably more time and further severe uncertainties regarding the system behaviour.
- Further, the question arises whether the issue of radiation protection of the population during decommissioning, in the foreseeable future after decommissioning and under long-term safety aspects (particularly with regard to the model assumptions and parameters used, as e.g. the dose conversion factors) as well as an assessment of the hazard potential involved in the decommissioning options of retrieval, relocation and complete backfilling has been considered in the presentation of the options and in the comparison in an appropriate, plausible and comprehensible and for all options comparable manner. The SSK will deal with these issues. In any case, the ad hoc working group is of the opinion that a foreseeable and actual exposure of persons affected has to be weighed up against a hypothetical radiation exposure in the distant future estimated under conservative boundary conditions.