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NEW NPP LITHUANIA

Bilateral Consultation
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CONTENT

1 INTRODUCTION

The company Lietuvos Energija AB is planning the construction of a new nuclear power plant (NPP) in Lithuania. It will be built next to the operating NPP Ignalina, located in the north-east of Lithuania on the south bank of Drukšiai Lake, six kilometres from the town of Visaginas and close to the border with Latvia and Belarus.

The Ignalina NPP consists of two RBMK reactor units. Each reactor unit has a net electrical capacity of 1,300 MWe. Operation of these reactors started in 1977 and 1978, respectively. Unit 1 was shut down at the end of 2004, unit 2 is scheduled for shutdown at the end of 2009.

The new NPP is to generate 3,400 MWe and serve as the replacement of Ignalina NPP unit 1 and 2. The Environmental Impact Assessment (EIA) Report presents several reactor options and states that 2 to 5 reactor units will be built – depending on the selected option.

With reference to the Espoo Convention, the Austrian Federal Ministry of Agriculture and Forestry, Environment and Water Management has expressed its interest to take part in the transboundary EIA. In the second stage of the EIA process the Austrian Federal Environment Agency commissioned the Austrian Institute of Ecology to assess the EIA Report in cooperation with Helmut Hirsch, BOKU-Met and E7 Energie Markt Analyse GmbH.

The findings of this assessment are presented in the Expert Statement (UMWELTBUNDESAMT 2008), which is published on the website of the Austrian Environment Agency[1]. As a preparation of the Bilateral Consultation meeting, the authors of the Expert Statement compiled a list of questions resulting from the evaluation of the EIA Report. The consultation was held in Vilnius on November 19th, 2008.

The Austrian party was represented by the Federal Ministry of Agriculture, Forestry, Environment and Water Management, the Austrian Environment Agency, one representative of the federal provinces and three consultants at this Bilateral Consultation.

For the Lithuanian party, representatives of the Ministry of Environment, the Ministry of Economy, the Nuclear Regulatory Authority VATESI, Environment Protection Agency, Radiation Protection Centre, the Radioactive Waste Management Agency (RATA), the developer Visagino AE UAB and the consultant team in charge of the EIA Report (Poyry Energy Oy and the Lithuanian Energy Institute) attended the meeting. The consultation consisted of a general presentation on the subject by Poyry Consultancy and a presentation of short answers to the questions handed over by Austria before the meeting.

Chapter 2 of this Report summarizes the information and positions, presented at the Bilateral Consultation and serves as an evaluation of the meeting by the Austrian expert team.

[1] http://www.umweltbundesamt.at

The schedule of the licensing procedure was an important issue in the discussion at the Bilateral Consultation. Therefore, Chapter 3 of this Report gives an overview over the positions and information concerning the procedure.

The discussion at the consultation meeting was based on the list of questions handed over by the Austrian experts, covering the following issues: reactor types (chapter 5), safety standards (chapter 6), accident analysis (chapter 7), spent fuel management (chapter 8), and need for the new power production capacity (chapter 9).

Each of these chapters has the following structure:

1. Treatment of the issue in the EIA Report
2. Comments on the issue in the Austrian Expert Statement
3. Questions
4. Answers and results of the discussion
5. Evaluation

The Austrian questions focused on issues of high relevance for the assessment of potential transboundary emissions.

2 CONCLUSIONS AND RECOMMENDATION

2.1 Licensing procedure for the new NPP in Lithuania

In the first step the Ministry of Environment publishes the EIA Report, which defines some site limitations. This is followed by the presentation of the technical specifications, issued by the safety regulator VATESI. Only after this the tendering process can start, which is foreseen for the end of 2009. This is a strict top-down approach, with the Ministry of Environment being the competent authority to issue the siting license. Beside the Ministry of Environment, VATESI is involved in consultations, as well as the radiation protection institutions, municipalities, authorities in charge of fire protection and public health. However, it is up to the Ministry of Environment to take the final decision. The final standpoint on the EIA will be provided (in English) according to the Espoo Convention. Furthermore, information will be provided to the European Commission under EURATOM (EURATOM Treaty Art. 41).

Due to the fact, that nuclear licensing procedures vary from country to country it would be very helpful if the Lithuanian side would provide a scheme explaining the further steps in the decision process. This information would enable a better understanding of the status of the EIA in the licensing process.

The EIA Report presents only very general information on the planned new NPP. Therefore, the Austrian experts hold the opinion, that it is not possible to assess the potential transboundary impact of an accident. VATESI emphasized that there is no obligation to provide other countries with more safety relevant information (e.g. results from PSA's). Moreover, there are no safety requirements for new NPPs explained in the EIA report, only general safety principles.

The main difference between the Austrian and the Lithuanian position lies in the significance of the assessment of severe accidents in the EIA Report.

Concerning this debate we would like to refer to the position of the United Nations Economic Commission for Europe (UNECE) on the Espoo Convention, which recommends a systematic evaluation of potential impacts of low probability. In particular, this concerns nuclear facilities where accidents might affect human health and safety.

Therefore, it is strongly recommended to include the information relevant for the systematic evaluation of the accident risk (accident scenarios, probability of occurrence, release rates) in the final issue of the EIA report or in a supplement.

Furthermore more safety relevant information should be provided 1. on the new reactor type and 2. on the safety standards applied for the selection of the reactor (Chapter 2.3). Other countries currently conducting EIA processes have published considerably more information on the reactor types under consideration for planned NPP already during the EIA procedure. Detailed information has been published e.g. in the UK.

Moreover, we would like to point out, that the European Commission's statement on a notified NPP project does not have to be treated confidentially and can be made available not only to governments but also to the public with the consent of the concerned country.

2.2 Reactor types

At the moment, no tendering processes are being conducted and no reactor type is excluded from the considerations. Concerning selection and safety criteria for new reactors, the developer explained, that only Generation III and III+ reactors will be built in Lithuania.

VATESI favours proven technology on the one hand, passive safety systems on the other; however, these goals might be conflicting goals and it remains to be seen how they will be assessed in the further course of the procedure.

According to the Lithuanian regulation, there is no obligation to involve VATESI in the process of tender selection. Only after the selection, VATESI is responsible for the issue of the construction license. The developer is responsible for safety and therefore, has to take its decision concerning the vendor and the reactor type. But VATESI is allowed to give advice in this decision-making process. The representative of Visaginas NPP stated, that it was in the applicant‘s interest to be in constant contact with VATESI, even if it is not a formal requirement.

A systematic and continuous involvement of VATESI in the tender process is recommended.

The criteria for selecting the reactor type will be needed as a basis for the assessment of the tendering document (technical specifications, requirements for submission). Therefore, the tendering process can start only after VATESI completed its review of the safety standards.

2.3 Safety standards

Concerning the development of safety standards for new NPPs, the Lithuanian side explained, that currently all regulations and requirements are being reviewed by VATESI. This review will be finished in 2011 and also concerns waste and decommissioning requirements. The drafts are currently on the level of internal discussion at VATESI. The new emergency procedures, for example, were already published in October 2008.

During 2009, the main regulations for nuclear safety are to be released. The reactor type for the new NPP will be chosen considerably later.

Austria should follow the review of the existing and the development of the new safety regulations for NPPs in Lithuania.

2.4 Accident analysis

Concerning severe accidents, the Austrian expert team stated that a probabilistic release limit is not a representative severe accident source term.

PSA results published for Generation III reactors indicate that 9% of all core damage scenarios lead to late containment failure and 6% to early containment failure. These accidents are relevant for the assessment of transboundary impacts, because their release rates range between 2% to 20% for iodine and caesium. The small likelihood of such events and the release assessment are both beset with

large uncertainties. However, accidents with a large release can not be excluded. If a severe accident occurs, it can cause serious impacts in large parts of Europe. Therefore, it is strongly recommended using a more realistic severe accident source term for the assessment of the possible impacts of transboundary emissions in the final EIA report or in a supplement to the report.

Furthermore, the source term which is based on 100 TBq Cs-137 should be revised. In particular, the ratio of the I-131 to Cs-137 release should be determined according to the present state of knowledge (instead of a factor 10, it could amount to a factor 55–1400).

The EIA Report presents the results for long-range transport and dispersion of radionuclides, but information on the 2% of the investigated cases which show the highest contamination values are not taken into account. The Austrian side requested this information; according to the representative of Visaginas NPP, the authors of the dispersion calculation will be asked to submit this information to the Austrian Ministry of Environment.

We recommend to include the complete data and all results from the dispersion calculation in the final issue of the EIA report or in a supplement to the EIA report.

2.5 Spent fuel management

The short overview on the new waste management strategy presented at the consultation is sufficient. Nevertheless, it is recommended to summarize the main points of the new strategy in the final version of the EIA report.

2.6 Need for the new power production capacity

Concerning the problems of economic efficiency and energy demand, it was explained that the construction of a new NPP is considered necessary in the light of the general goal stated in the National Energy Strategy from 2008 to increase the independency of the energy economy from Russia. A Least Cost Analysis and a Feasibility Study for the construction of a NPP have been carried out, which also included economic aspects.

It is recommended to include the main assumptions and results of the mentioned Least Cost Study and Feasibility Analysis into the final version of the EIA Report, including other options to decrease the dependency of the energy sector from Russia in a comparable way than the construction of the proposed new NPP, in particular:

- impact of the planned construction of transmission lines to Poland and Scandinavia in terms of independency from the Russian energy sector;
- DSM activities in the electricity sector as well as in the heating sector in connection with newly developed CHP plants in the district heating sector;
- development of electricity production form renewable energy sources, in particular from wind and biomass or biogas sources;
- newly constructed coal power plant with access to the coast.

3 LICENSING PROCEDURE FOR THE NEW NPP

In this chapter we will summarize all information about the licensing procedure. For better understanding some of this information will be explained again in other chapters.

In the first step the Ministry of Environment publishes the EIA Report, which defines some site limitations. This is followed by the presentation of the technical specifications, issued by the safety regulator VATESI. Only after this the tendering process can start, which is foreseen for the end of 2009. This is a strict top-down approach, with the Ministry of Environment being the competent authority to issue the siting license. Beside the Ministry of Environment, VATESI is involved in consultations, as well as the radiation protection institutions, municipalities, authorities in charge of fire protection and public health. However, it is up to the Ministry of Environment to take the final decision. The final standpoint on the EIA will be provided (in English) according to the Espoo Convention. Furthermore, information will be provided to the European Commission under EURATOM (EURATOM Treaty Art. 41).

Due to the fact, that nuclear licensing procedures vary from country to country it would be very helpful if the Lithuanian side would provide a scheme explaining the further steps in the decision process. This information would enable a better understanding of the status of the EIA in the licensing process.

The EIA Report presents only very general information on the planned new NPP. Therefore, the Austrian experts hold the opinion, that it is not possible to assess the potential transboundary impact of an accident. VATESI emphasized that there is no obligation to provide other countries with more safety relevant information (e.g. results from PSA's). Moreover, there are no safety requirements for new NPPs explained in the EIA report, only general safety principles.

The main difference between the Austrian and the Lithuanian position lies in the significance of the assessment of severe accidents in the EIA Report.

Concerning this debate we would like to refer to the position of the United Nations Economic Commission for Europe (UNECE) on the Espoo Convention, which recommends a systematic evaluation of potential impacts of low probability.

“The risk of an impact could be defined as the consequences of the impact multiplied by the probability of occurrence. If environmental risks in a relation to a proposed activity are relevant, the transboundary EIA would have to involve discussions on acceptable levels of risk. In some cases, the probability of impacts could be assessed in terms of the frequency of occurrence. For most environmental risk related to the activities listed in Appendix I to the Convention, a frequency approach would however not be sufficient in analysis of risk as part of a transboundary EIA. Many risks related to transboundary impacts are characterised by low probability. Thus, there would be no or very weak empirical justification for an analysis based on frequencies. For example, estimates of risks of nuclear accidents, explosions at integrated chemical installations or the breaking of dams could only to a limited extent be based on empirical data for frequency of occurrence. A systematic evaluation of potential impacts of low probability and of factors influencing the probability is likely to be important.” (ECE/CEP/9, 1996) Annex III of this publication highlights that nuclear facilities are having an “increased risk of accidents” in the context of “human health and safety”.

Therefore, it is strongly recommended to include the information relevant for the systematic evaluation of the accident risk (accident scenarios, probability of occurrence, release rates) in the final issue of the final EIA report or in a supplement.

However, more safety relevant information should be provided 1. on the new reactor type and 2. on the safety standards applied for the selection of the reactor. Other countries currently conducting EIA processes have published considerably more information on the reactor types under consideration for planned NPP already during the EIA procedure. Detailed information has been published e.g. in the UK.

Moreover, we would like to point out, that the European Commission's statement on a notified NPP project does not have to be treated confidentially and can be made available not only to governments but also to the public with the consent of the concerned country.

4 REACTOR TYPES

4.1 Treatment of issue in the EIA Report

The EIA Report presents eleven different reactors currently on offer by Areva, General Electric-Hitachi, Westinghouse-Toshiba, Atomic Energy of Canada Ltd., Mitsubishi Heavy Industries and Atomstroyexport.

A brief description for each reactor type, development history and basic design features is made available. Core damage frequency (CDF) and large release frequency (LRF) are provided in most cases, as well as information on certification, efficiency, enrichment, burn-up, MOX capability and spent fuel arising. The description of the various reactor types in the EIA Report is fairly uniform; however, in some cases data are missing.

The EIA Report provides a description of the basic principles of a nuclear power plant in general, and of three basic design types. A detailed specification of technical requirements is not presented in the EIA Report, since such specifications will be developed separately as the project proceeds. But the European Utility Requirements (EUR) are described as a principal source of technical requirements for the new NPP project. It is made clear that, in any case, the new NPP will have to meet the following requirements regarding core damage frequency (CDF) and large release frequency (LRF) by a significant margin: CDF <1E-5/a, LRF <1E-6/a. These probabilistic safety targets roughly correspond to those recommended by the IAEA (INSAG 1999). It is stated that new plants have to meet those requirements “by a significant” margin; however, it is not specified what would constitute such a margin. The plants must be designed to withstand external threats and terrorism, including the collision with a large passenger aircraft.

4.2 Comments on the issue in the Austrian Expert Statement

The candidate reactor types span a broad spectrum ranging from reactors with a basically tested design and only a few new features, to new, largely untried designs with many new features. However, there is no or very little practical experience for most reactor types.

An evaluation and comparison of the numbers as provided in the EIA Report leads to the observations that CDF varies widely among reactor types – by a factor of almost 200. However, the relevance of the different CDF values for the assessment of different reactor types is not discussed in the EIA Report.

No numbers are provided regarding the expected availabilities and costs of the various candidate reactor types. Cost overruns must be expected when NPPs of new reactor types, for which there is little or no experience, are built.

Some reactor types rely mostly on active safety systems, some on passive systems; some on a combination of both. It would be of interest to have a more detailed description of all candidate reactor types, focusing on the safety systems, as well as an assessment according to their place in the scale “predominantly active” to “predominantly passive”.

4.3 Questions

Is it correct that only four Western reactor vendors are under consideration to supply the new NPP in Lithuania and what is the reasoning behind this decision?

What are the further steps in the selection of the reactor type and the development of the plant?

Which documents will be available for foreign states participating in the cross border EIA during the selection procedure of the reactor type and how will they be informed about decisions?

Which requirements are of priority for the selection of the reactor type?

Which safety features and safety criteria will be of relevance for the selection of the reactor type?

In particular the following issues should be clarified:

- the relevance of PSA results compared to deterministic safety assessment
- CDF/LRF relation
- the relevance of mostly active to mostly passive safety systems
- the assessment of in-vessel vs. ex-vessel cooling as severe accident management measure
- a more detailed description of the requirements concerning the vulnerability of the plant to external hazards.

4.4 Answers and results of the discussion

The EIA is not a preliminary safety assessment and it has not the purpose to choose the reactor type. The purpose of the EIA is to define limitations on the site. The idea behind the EIA is to identify significant environmental impacts as first step, before money has been invested. Therefore, technical details are not available, as of yet.

Two site alternatives were assessed at Ignalina. Alternative 1 is preferred because of geological, hydrological and cooling considerations.

Despite different reactor capacities (600–1,700 MWe) are in discussion, the overall maximum capacity was determined with 3,400 MWe by the organizer of the project.

The total radiation exposure from normal operation of both, the new NPP and INPP, will be about 0.05 mSv/a (critical group), which is well below the target value of 0.2 mSv/a (the limit is 1 mSv/a).

As technological alternatives all eleven different reactor designs are assessed in the EIA (PWR, BWR, HWR). But impacts do not significantly differ from each other, according to the Finnish EIA consultant.

The detailed technical discussion will take place at a later stage of the licensing procedure.

The EIA sets limits for the protection of the environment. New nuclear regulations are not finished yet. The technology selection process has not begun yet and will not start before the limitations from other processes are known (siting, EIA). At the

moment, no tendering processes are being conducted and no reactor type is excluded from the considerations. The decision will be taken only after the EIA is finalized.

According to the Lithuanian Ministry of Environment the final standpoint on the EIA will be provided (in English) according to the Espoo Convention. Furthermore, information will be provided to the European Commission under EURATOM (EURATOM Treaty Art. 41). VATESI emphasized that there is no obligation to provide other countries with the Safety Assessment Report.

Concerning selection and safety criteria for new reactors, the developer explained, that only Generation III and III+ reactors will be built in Lithuania. The EIA states clearly that all proven and safe technologies come into question. Full compliance with standards valid and updated will be required.

VATESI favours proven technology on the one hand, passive safety systems on the other. The design must include management of severe accidents and minimization of radioactive waste. “Maximum of safety and minimum of waste” seems to be a good description of its guideline for the reactor selection.

Furthermore, VATESI explains that technical specifications will be important for reviewing PSAR etc. In the selection of the reactor, if the CDF is too high it will be weeded out by technical specifications. The EIA Report is the main document from the Ministry of Environment.

Other criteria which have to be considered are radiation protection, e.g. occupational dose, and dose from accidents. Also, other facilities on the site have to be taken into account. In principle, it would be possible to lower the emission limits for other plants on site in order to have more room for limits for the new NPP. According to VATESI, this seems not necessary yet, but indeed, limits for current facilities can be reviewed. At the moment, only about 5% of limits are being used. There is room for division of dose limits between facilities (no one is living in 3 km zone actually).

The criteria for selecting the reactor type will be needed as a basis for the assessment of the tendering document (technical specifications, requirements for submission). Therefore, the tendering process can start only VATESI completed its review of the safety standards.

According to the Lithuanian regulation, VATESI must not be involved in the process of tender selection – after the selection, VATESI is responsible for the issue of the construction license. The developer is responsible for safety and therefore, has to take its decision concerning the vendor and the reactor type. But VATESI is allowed to give advice in this decision-making process. The representative of Visaginas NPP stated, that it was in the applicant‘s interest to be in constant contact with VATESI, even if it is not a formal requirement.

4.5 Evaluation

In the first step the Ministry of Environment publishes the EIA Report, which defines some site limitations. This is followed by the presentation of the technical specifications, issued by the safety regulator VATESI. Only after this the tendering process can start, which is foreseen for the end of 2009. This is a strict top-down

approach, with the Ministry of Environment being the competent authority to issue the siting license. Beside the Ministry of Environment, VATESI is involved in consultations, as well as the radiation protection institutions, municipalities, authorities in charge of fire protection and public health. However, it is up to the Ministry of Environment to take the final decision.

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According to the Lithuanian regulation, there is no obligation to involve VATESI in the process of tender selection. Only after the selection, VATESI is responsible for the issue of the construction license. The developer is responsible for safety and therefore, has to take its decision concerning the vendor and the reactor type. But VATESI is allowed to give advice in this decision-making process. The representative of Visaginas NPP stated, that it was in the applicant‘s interest to be in constant contact with VATESI, even if it is not a formal requirement.

A systematic and continuous involvement of VATESI in the tender process is recommended.

The criteria for selecting the reactor type will be needed as a basis for the assessment of the tendering document (technical specifications, requirements for submission). Therefore, the tendering process can start only after VATESI completed its review of the safety standards.

5 SAFETY STANDARDS

5.1 Treatment of issue in the EIA Report

The general statements regarding the functioning of NPPs and principles of nuclear safety in the EIA Report are of very basic character and do not require further comments. Regarding safety standards, it is obvious that standards for new plants have not been stipulated yet, in detail, in Lithuania.

5.2 Comments on the issue in the Austrian Expert Statement

Safety standards for new NPPs appear to be in a very early stage of development in Lithuania. The development of standards for new plants in parallel with the development of the project itself could potentially lead to problems due to time pressure on the compilation of new standards. There is a risk that standards will be tailored to suit the project.

A more detailed description of the procedure on the development of safety standards for new reactors-including an explanation of how this procedure will be timed in relation to the new NPP project and how it will interact with the development of the project) – would be of interest.

5.3 Questions

As there are no details of safety standards for new NPPs mentioned in the EIA Report, and there is no reference to documents containing further information concerning standards for new plants, it appears that the development of safety standards is in a very early stage.

Therefore, we request a more detailed description of the procedure to develop those standards, including an explanation of how this procedure will be timed in relation to the new NPP project, and how it will interact with the development of the project.

5.4 Answers and results of the discussion

The development of standards was explained in the context of answering a concrete question, concerning load assumptions for aircraft crash, during the discussion of severe accidents:

It was explained by VATESI that according to the Lithuanian regulations the crash of a large passenger airplane has to be considered in design and that special rules exist which are valid also for the new NPP; but it might be necessary to make this rule state-of-the-art.

Concerning the development of safety standards for new NPPs, the Lithuanian side explained, that currently all regulations and requirements are being reviewed by VATESI. This review will be finished in 2011 and also concerns waste and decommissioning requirements. The drafts are currently on the level of internal discussion draft at VATESI. Before finalizing, they will be sent to the operators (Ignalina). The new emergency procedures, for example, were already published in October 2008.

During 2009, the main regulations for nuclear safety, are to be released. The reactor type for the new NPP will be chosen considerably later.

5.5 Evaluation

Concerning the development of safety standards for new NPPs, the Lithuanian side explained, that currently all regulations and requirements are being reviewed by VATESI. This review will be finished in 2011 and also concerns waste and decommissioning requirements. The drafts are currently on the level of internal discussion at VATESI. Before finalizing, they will be sent to the operators (Ignalina). The new emergency procedures, for example, were already published in October 2008.

During 2009, the main regulations for nuclear safety, are to be released. The reactor type for the new NPP will be chosen considerably later.

Austria should follow the review of the existing and the development of the new safety regulations for NPPs in Lithuania.

6 ACCIDENT ANALYSIS

6.1 Treatment of issue in the EIA Report

In the chapter "Risk Analysis and Assessment" the EIA Report presents a classification of events according to their probability of occurrence and their potential consequences. In section 10, Risk Analysis and Assessment, the hazards of DBA and BDBA sequences are discussed. The classification does not distinguish between low frequencies of occurrence: all incidents with a frequency of occurrence below 1E-3/a are rated as „improbable“. This is in contrast to the IAEA targets, the EUR and also to the Finnish regulation.

The classification of nuclear accidents in the industrial risk assessment is not consistent with other information in chapter 10 of the EIA Report; in chapter 5 of the EIA Report, the following probabilistic limits are given: 1E-5/a for CDF, and 1E-6/a for LRF (in accordance with IAEA safety targets).[2]

The "**representative**" source term for a severe accident chosen for the EIA Report (100 TBq Cs-137 and 1,000 TBq I-131 in a “Generation III” reactor) is not justified by any arguments. The used 100 TBq Cs-137 release is the limit of radiation protection given by the Finnish regulations. An event with a release exceeding this limits is – according to the EIA Report – very unlikely (probability of occurrence below 5.0 E-7/a) and therefore, doesn't have to be assessed.

6.2 Comments on the issue in the Austrian Expert Statement

It would be more instructive to present more detailed information from PSA or safety Reports which give an adequate illustration of the radiation hazard instead of a ranking for activities which may only be adequate for less hazardous industrial activities. Industrial methodology also is not appropriate: For example: the probabilistic category of 1E-3/a is fulfilled by all reactors today. For Generation III reactors, 1E-6/a to 1E-7/a would be more appropriate.

For the assessment of transboundary impacts low probability accidents with large releases are of foremost importance (only those accidents can affect Austrian territory.)

PSA results for the EPR indicate that 9% of all core damage scenarios lead to late containment failure and 6% to early containment failure. These are the accidents relevant for the assessment of transboundary impacts. The release rates of such accidents are in the range of 2% to 20% for iodine and caesium. Even a release rate of about 1% would result in more than 1,000 TBq Cs-137 and 10,000 TBq I-131, respectively, if the source term is based on the core inventory of the APWR presented in the EIA Report. This shows that the assumed source term for the investigation of severe accident consequences is rather low.

[2] However, the inconsistency with a figure in table 10.2.3 (last page), where in contrast to the figure given in chapter 5 or the EIA Report a CDF target value of 1E-4/a is given, could be clarified to be a typing error.

6.3 Questions

Dispersion calculation:

In the EIA Report results of long-range transport and dispersion of radionuclides are presented, but information on the upper 2% of the investigated cases is left out. The 98th percentile does not indicate the worst case. As shown in the statement, there are 1460 cases of different atmospheric conditions (summing up night time and daytime releases) which where computed. Even if these cases are too episodic to assign a reliable statistical probability to them, the calculations still show that they would be principally possible, and it would be relevant for Austria and its inhabitants to know these cases, or at least the ones which were found to result in the worst effects on Austrian territory.

In order to enable such inferences, we request more information on these upper 2% of the cases. This could be accomplished by giving us either

- maps, or
- gridded values of the deposition and the total committed external doses, for either
  all the 1,460 cases or
  for the upper 2% of the data

Severe accident source term:

Is it possible to present more information from PSAs which give an adequate illustration of the radiation hazard in case of severe accidents instead of an arbitrary chosen source term (including the contributions of different initiating events and plant states, as well as a discussion of limitations and uncertainties)?

Independent of the probability of occurrence it would be important to discuss early and large releases due to severe accidents in order to find out the relevant emissions for transboundary impact assessment. In published design control documents some data on release rates of BDBA in Generation III reactors can be found, can you provide such information for the reactors under consideration?

6.4 Answers and results of the discussion

Risk analysis

Concerning the risk classification at the consultation it was explained that the Lithuanian EIA law requires the inclusion of risk analysis and assessment in the EIA, but it refers to an industrial framework in general, not to nuclear-specific regulations. The EIA has to comply with the Lithuanian regulations, what is ensured by the contents of chapter 10: The wording takes the Lithuanian legislation into account (1E-3/a.).

Regarding details in the section on risk analysis another question was posed by the Austrian side during the discussion: It is not clear how seriousness and risk levels for the hazards listed have been derived (e.g., regarding aircraft crash etc. on p. 486; an attack with destruction of the containment will clearly have higher seriousness than given here; see also serious accidents, p. 489: an accident with containment bypass will lead to release in less than 24 hours). This issue was not answered, because safety assessment is not included in the EIA process.

In addition to the risk assessment, consequence analysis for severe accidents have been performed for the EIA (like in the Finnish EIA).

During normal operation, transboundary impacts will not cause radiological impacts. Transboundary impacts in case of severe accident are described as part of risk analysis results. DBA and severe accidents are considered in the EIA Report. For dispersion calculation the SILAM model (based on real meteorological data) was employed.

A further question by the Austrian expert concerned the source term in the EIA Report which is chosen from the US Report NUREG-1465 from 1995: This Report appears to be outdated, because it is based on a fuel burn-up of up to 40 GWd/t, whereas many of the new reactor types reach about 60 GWd/t. Also, the ratio of I-131 to Cs-137 appears to be too low compared to a recent study for a German KONVOI PWR (EIA Report: factor 10; study for GKN-2 factor 55–1,400).[3]

Concerning the discussion about the source term of a severe accident, it was explained by the EIA consultant of Pöyry that the EIA is talking about likelihoods. The source term of 100 TBq Cs-137 plus accompanying nuclides is based on its acceptance in Finnish legislation. Larger emissions have to be so unlikely they can be neglected (less than 1E-6/a). From the Austrian point of view one should not rely on probabilistic studies too much. PSA are very useful for comparisons, but they are beset with high bandwidths of uncertainty. Furthermore, deliberate terror attacks cannot be covered by PSA. The probabilistic accident emission limit is legally binding only in Finland, and maybe socially accepted in Lithuania, but this is not the case in Austria. A VATESI speaker answered that they choose the Finnish approach. Thus, this 100 TBq value could appear in technical specifications. Current acceptance criterion is 10 mSv for DBA 1E-4/a. For severe accidents, the acceptance criterion is that no long-term measures like resettlement have to be taken. Regarding limitations of PSA the standpoint of VATESI is: Safety analysis requires a deterministic approach and is rather conservative in Lithuania. VATESI relies primarily on deterministic methods.

Regarding the Austrian request for information on the upper 2% of the investigated cases, which are not presented in the EIA Report, the representative of Visaginas NPP promised to ask the authors of the dispersion calculation to submit this information to the Austrian Ministry of Environment.

6.5 Evaluation

Concerning severe accidents, the Austrian expert team stated that a probabilistic release limit is not a representative severe accident source term. The small likelihood of such events and the release assessment are both beset with large uncertainties. However, accidents with a large release can not be excluded. If a severe accident occurs, it can cause serious impacts in large parts of Europe.

PSA results published for Generation III reactors indicate that 9% of all core damage scenarios lead to late containment failure and 6% to early containment failure.

[3] Discussion with experts from Lithuanian Energy Institute continued during the break. Reference for the German study was submitted by Helmut Hirsch to the Lithuanian experts.

These accidents are relevant for the assessment of transboundary impacts, because their release rates range between 2% to 20% for iodine and caesium. The small likelihood of such events and the release assessment are both beset with large uncertainties. However, accidents with a large release can not be excluded. If a severe accident occurs, it can cause serious impacts in large parts of Europe.

Therefore, it is strongly recommended using a more realistic severe accident source term for the assessment of the possible impacts of transboundary emissions in the final EIA report or in a supplement to the report.

Furthermore, the source term which is based on 100 TBq Cs-137 should be revised. In particular, the ratio of the I-131 to Cs-137 release should be determined according to the present state of knowledge (instead of a factor 10, it could amount to a factor 55–1400).

The EIA Report presents the results for long-range transport and dispersion of radionuclides, but information on the 2% of the investigated cases which show the highest contamination values are not taken into account. The Austrian side requested this information; according to the representative of Visaginas NPP, the authors of the dispersion calculation will be asked to submit this information to the Austrian Ministry of Environment.

We recommend to include the complete data and all results from the dispersion calculation in the final issue of the EIA report or in a supplement to the EIA report.

7 SPENT FUEL MANAGEMENT

7.1 Treatment of issue in the EIA Report

The EIA Report gives the following information concerning the different kinds of radioactive waste.

The construction of a new solid waste management facility will be commissioned in 2010. Additionally to the solid radioactive waste from Ignalina NPP operational waste from the new NPP shall be stored in that location. The site for this near-surface repository for LILW has already been chosen. For liquid radioactive waste a new treatment facility will be built.

Today there are no interim storage capacities available for future spent fuel, and no plans for the construction of new interim storage facilities are discussed in the EIA Report. Further more, a concept for long-term storage of spent fuel is missing in the EIA Report.

Long-term storage and disposal of spent fuel will be subject of a separate EIA procedure and are therefore not discussed in the EIA Report.

Concerning the decommissioning of the NPP, the strategies proposed by IAEA (immediate dismantling, deferred dismantling and entombment) are presented in general: Preferences for an option are not indicated.

Cost estimations of radioactive waste management are only stated for decommissioning: The necessary financing for this process will be accumulated in a decommissioning fund. It is not clear, however, if this fund already exists.

7.2 Comments on the issue in the Austrian Expert Statement

Management of spent fuel and HLW is not described adequately. Options for interim storage of spent fuel and for long-term storage are only discussed in general, but there is no management concept presented. It is only referred to a special EIA procedure, but there is no timetable given.

The National Strategy on Radioactive Waste Management from 2002 is mentioned once in the EIA Report.

Information can only be derived from another EIA Report (GNS-RWE & LEI 2006). In this paper it is stated that “a deep geological repository is not available in Lithuania and likely will not be available at least until the middle of this century.“

7.3 Questions

Management of spent fuel and HLW is not described adequately in the EIA Report. Options for interim storage of spent fuel and for long-term storage are only discussed in general, but there is no management concept presented.

Is it possible to provide a short overview of the nuclear waste management concept with the focus on HLW and spent fuel, because the National Strategy on Radioactive Waste Management from 2002 was not available in English from the homepage of RATA?

7.4 Answers and results of the discussion

By the representative of RATA (Lithuanian radioactive waste management agency) the following information was given:

Five days after the issue of the EIA Report in August 2008, the government published the new waste management strategy (September 3rd). The EIA Report has to be updated in this regard . No authorized English translation of the national strategy on radioactive waste management existed at the time of the consultation, thus the broken link is explained.

The basic idea of the new waste management strategy is to get prepared for the dismantling of the existing NPP Ignalina and for the treatment of waste from the new NPP.

Objectives of the national waste management strategy

1. Rise safety level in spent fuel and radwaste management
2. Development of waste management infrastructure in the country, based on model technologies; minimize the amount and activity of waste
3. Confidence building, public information
4. Minimization of waste

For waste from decommissioning of the NPP Ignalina, the construction of two repositories for short-lived waste is planned: one for very low level waste (VLLW) and one for low and intermediate level waste (LILW).

Currently spent fuel is mostly still stored in the pools which are located in the reactor hall – but soon it will be moved into the dry storage facilities. One dry storage facility is located on site (capacity: 120 containers), a second, larger one with a capacity of more than 200 big containers and 50 years of safe storage time is under construction by now,. For the time after the 50 years of storage period, a new decision is required. These options for further treatment of spent fuel are still open: the construction of a repository in Lithuania or the using of a shared international repository or reprocessing. Anyway, the selection process for the site of a geological repository must be started no later than 2030, as the geological repository will be needed anyway.

7.5 Evaluation

Five days after the issue of the EIA Report in August 2008, the government published the new waste management strategy (September 3rd). The responsible agency for waste management announced that the EIA Report has to be updated in this regard. **The short overview on the new waste management strategy presented at the consultation is sufficient. But it is recommended to describe the main points in the final EIA report.**

8 NEED FOR THE NEW POWER PRODUCTION CAPACITY

8.1 Treatment of issue in the EIA Report

The EIA Report justifies the need for new capacities in consequence of closing down Ignalina NPP by the lapidary statement that otherwise – i.e. in the case of the so-called zero option – the country's energy security would not be ensured. A simplistic top-down forecast of the electricity demand by 2025 is presented to illustrate this statement. In addition, the EIA Report declines any consideration about the economic viability and cost effectiveness of the proposed NPP project by arguing that the NPP project company has been established exclusively for constructing and operating a new NPP in Lithuania and it has therefore no mandate to occupy itself with any other kind of power plants.

8.2 Comments on the issue in the Austrian Expert Statement

The EIA Report demonstrates the need for the proposed NPP project only in a superficial way. A more comprehensive analysis, however, shows that the need for an additional base load capacity of at least 1,600 MW is questionable up to the year 2025 because of the following reasons:

- The yearly final energy consumption has been fluctuating considerably between 1996 and 2006.
- Due to the adoption of the EU Directive on Energy End-use Efficiency and Energy Services (2006/32/EC) Lithuania is obliged to increase its efforts in improving the energy efficiency of its economy. Therefore we have to expect a number of measures facilitating power savings leading to a limitation of the increasing trends in demand.
- Since the proposed NPP project for economic reasons has to deliver base load electricity it is important to differentiate between base load, medium load and peak load demand. Due to the structural changes in the Lithuanian economy we may expect a more dynamic development of the medium and peak load demand as compared to the base load demand. It is therefore questionable if the proposed NPP will be able to operate at full capacity if the base load demand lags behind a potential overall increase of electricity demand.
- The Baltic power system was designed as an integral part of the wider Soviet system, a fact that has caused overdeveloped infrastructure from the perspective of the single markets. Even after the closure of Ignalina NPP there actually remains a comfortable surplus in the system on the capacity level (MW) as well as on the level of potential production (GWh). With very intensively increasing demand patterns we could expect a small capacity gap in 2015 at the earliest; assuming a less dynamic demand development the installed capacity will be sufficient until 2025. In any case the planned construction of transmission lines to Poland and Scandinavia will reduce the risk of capacity shortcomings considerably.
- The EIA has to address also the issue of economic meaningfulness and cost effectiveness of the proposed NPP project. Otherwise ecological damage would be hazarded even in case of a misinvestment. There exist considerable cost risks inherent to generation III reactors, which have not been taken into account.

8.3 Questions

How will structural changes, energy efficiency policy and economic development impact the development of the yearly electricity consumption in the different demand sectors and sub-segments by 2025? Which comprehensive demand forecast model (and the respective parameters) was used to simulate these effects?

What are the main influence factors on base load demand and how are they assumed to develop by 2025? Are historic data available on the development of the base load demand during the last five years?

What have been the input parameters for NPP cost, mainly related to: over-night construction costs, construction time, reliability of operation, O&M costs, back fitting costs, back-end costs (decommissioning and nuclear waste management) and the respective interest rates, period of assessment?

In which way has the considerable potential of CHP in the district heating sector resp. in the industrial sector been taken into consideration?

In which way has RES electricity production, which is assumed to increase steadily due to the EU policy framework, been taken into account?

In which way has the increasing integration of the Baltic electricity system to the Nordic and the UCTE systems been taken into account (relevant for an analysis on the system level)?

Is there an evaluation of cost effectiveness of the proposed NPP plant available?

8.4 Answers and results of the discussion

Concerning the problems of economic efficiency and energy demand, it was explained that the construction of a new NPP was necessary in the light of the general goal stated in the national energy strategy from 2008 to increase the independency of the energy economy from Russia. A Least Cost Analysis and a Feasibility Study for the construction of a NPP have been carried out, which also included economic aspects.

8.5 Evaluation

It is recommended to include the main assumptions and results of the mentioned Least Cost Study and Feasibility Analysis into the EIA Report, including other options to decrease the dependency of the energy sector from Russia in a comparable way than the construction of the proposed new NPP, in particular:

- impact of the planned construction of transmission lines to Poland and Scandinavia in terms of independency from the Russian energy sector;
- DSM activities in the electricity sector as well as in the heating sector in connection with newly developed CHP plants in the district heating sector;

- development of electricity production form renewable energy sources, in particular from wind and biomass or biogas sources;
- newly constructed coal power plant with access to the coast.

9 REFERENCES

ECE/CEP/9, (1996): ECE's environmental Series No. 6 "Current Policies, Strategies and Aspects of Environmental Impact Assessment in a Transboundary Context"

GNS-RWE & LEI (2006): GNS-RWE NUKEM & subcontractor Lithuanian Energy Institute, Environmental Impact Assessment Report. Interim Storage of RBMK Spent Nuclear Fuel from Ignalina NPP Units 1 and 2.

INSAG (1999): International Nuclear Safety Advisory Group: Basic Safety Principles for Nuclear Power Plants. 75-INSAG-3 Rev. 1, INSAG-12, IAEA, Vienna.

UMWELTBUNDESAMT (2008): Wenisch, A.; Hirsch, H.; Mraz, G.; Seibert, P. & Leutgöb, K.: NPP Lithuania, Expert Statement to the EIA Report. Ordered by the Federal Ministry for Agriculture, Forestry, Environment and Water Management. Umweltbundesamt, Report, Bd. REP-0186, Vienna.

10 GLOSSARY

APWR ..... Advanced Pressurized Water Reactor

BDBA ..... Beyond Design Base Accident

BWR..... Boiling Water Reactor

CDF..... Core Damage Frequency

CHP ..... Combined Heat and Power

Cs..... Caesium

DBA..... Design Base Accident

DSM ..... Demand Side Management

EC ..... European Commission

EIA ..... Environmental Impact Assessment

EPR..... European Power Reactor

EU ..... European Union

EUR ..... European Utilities Requirements

I ..... Iodine

IAEA..... International Atomic Energy Agency

LILW..... Low and Intermediate Level Waste

LRF ..... Large Release Frequency

LWR ..... Light Water Reactor

MOX..... Mixed Oxide Fuel

mSv..... Milli-Sievert

MW..... Megawatt

MWe..... Megawatt electric

NGO..... Non Governmental Organisation

NPP..... Nuclear Power Plant

PSA..... Probabilistic Safety Assessment

PWR..... Pressurized Water Reactor

SA ..... Severe Accident

TBq ..... Tera Becquerel

VATESI ..... State Nuclear Power Safety Inspectorate