ÖSTERREICHISCHES
ÖKOLOGIE INSTITUT

Scoping Phase of the EIA Program for NPP Loviisa 3

Expert Statement

Antonia Wenisch, Richard Kromp

Vienna, 2008

Erstellt im Auftrag des
Bundesministeriums für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft,
Projektleitung Abteilung V/6 „Nuklearkoordination“
GZ BMLFUW-UW.1.1.4/0006V/6/2008

lebensministerium.at

Table of Contents

Authors:
Austrian Institute of Ecology
Vienna,7. Seidengasse 13
www.ecology.at

Introduction

The company Fortum Power and Heat Oy (hereinafter 'Fortum') plans to construct a new Nuclear Power Plant (NPP) on the island of Hästholmen in Loviisa. Electric capacity of the new NPP shall be 1,000 to 1,800 MW.

According to the Finnish law the construction of a new nuclear power plant is subject to a decision-in-principle issued by the Government and ratified by the Parliament. The EIA process must be completed before submitting any application for a decision-in-principle concerning a new power plant. The last comprehensive environmental impact assessment of the Loviisa nuclear power plant took place in connection with the EIA procedure for the Loviisa 3 nuclear power plant project in 1999.

Fortum emphasizes that no decisions on construction have been made, nor has the actual design process been started. If the decision-in-principle is ratified and, in addition to environmental issues, the technical and economic prerequisites for construction are fulfilled, the decision on the construction of the plant can be taken in the early 2010s.

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. The Austrian Institute of Ecology was assigned by the Austrian Ministry of Agriculture and Forestry, Environment and Water Management to elaborate an Expert's Statement on the EIA Program for Loviisa 3 NPP.

The Experts Statement analyses the comprehensiveness of the proposed content of the EIA compared to the European Commission's EIA directive and the Espoo convention, respectively.

The task is to evaluate whether the information proposed to be provided by the EIA will allow to assess the safety of the new NPP concerning emissions into the environment in a transboundary context, both during normal operation and accidents (design base and beyond design base accidents). For Austria mainly airborne emissions could be relevant, in particular emissions due to severe accidents could contaminate not only the vicinity of the plant but depending on the climatological conditions at the time of a large accidental release also regions far from the NPP could be affected. The Experts Statement formulates information requirements wich will allow the assessment of the significance of accidents with a large release of radioactive substances.

A team from the Institute of Meteorology of the University of Natural Resources and Applied Life Sciences, Vienna and the Austrian Institute of Ecology analysed the climatological risk that emissions due to severe accidents at NPPs in Europe could affect Austrian territory to an extent that would require radiation protection measures for risk groups (children and young people, expecting and nursing mothers) and normal population, respectively. „Climatological risk for the NPPs in Finland“ means the probability of weather conditions in Europe which lead to transport and deposition of emissions released from Finland to Austrian territory, expressed as percentage under consideration of all weather situations. As a result of this study carried out on behalf of the Austrian Federal Ministry of Agriculture and Forestry, Environment and Water Management, the climatological risk that an accidental release from a NPP in Finland causes a significant impact to Austria is in the range of 1- 5%.In particular the climatological risk for the site of Loviisa was assessed to be 2,25 % for the risk group and for general population, as well. [SEIBERT et al. 2004]

Even if the probability of such weather situations is small, an impact to Austria of a severe accident at Loviisa cannot be excluded. Depending on the amount of radioactive substances released due to an accident, the impact could be significant, i.e. protection measures could be required for people living in Austria. Therefore, Austria has an interest in the planning of this large new NPP in Finland.

This Experts Statement refers to the following documents:

> **Fortum Power and Heat Oy Environmental Impact Assessment Programme Loviisa 3 - Supplementing the Loviisa Nuclear Power Plant with a Third Plant Unit ,** by Pöyry Energy Oy, Consulting 2007 hereinafter referred to as [EIA, page]
>
> **ENVIRONMENTAL IMPACT ASSESSMENT PROGRAMME FOR THE LOVIISA 3 NUCLEAR POWER PLANT UNIT; STATEMENT BY THE CONTACT AUTHORITY**
> Ministry of Trade and Industry, Statement Translation, 2007.
> hereinafter referred to as [MTI, page]

This Experts Statement concerns the scoping phase of the EIA procedure, therefore this Experts statement will formulate requests for information. The statement consists of two parts:

The first part “Summary and Conclusions” presents the most important findings and recommendations for the content of the EIA Report. The following chapters deal with the issues, presented in the EIA Program and relevant from the Austrian point of view, in more detail.

Preparation of the EIA report has begun in autumn 2007 and shall be finished in June 2008. Display for public inspection is intended for July and August 2008.' *The EIA procedure is completed when the Ministry of Trade and Industry* (MTI*) provides Fortum with its statement on the EIA report. The licensing authorities and Fortum will use the assessment report and the Ministry's statement as base material for their decision-making. In its permit decision the environmental permit authority will present how the assessment report and the associated statement have been taken into account*.' [EIA, 18]

The Finnish Ministry of Trade and Industry is responsible for the EIA process. For the International participation the responsible authority is the Finnish Ministry of Environment.

Summary and Conclusions

The EIA program presents the content of the EIA report in a comprehensive manner. Aspects of particular interest from an Austrian point of view, are stressed in this statement. Our assessment of the EIA program deals with issues of general interest as the discussion of the options for electricity production or the management of nuclear fuel. On the other hand all issues relevant for the assessment of environmental impact caused by airborne emissions of radioactive substances are treated and in particular the question of accidents and transboundary emissions is discussed.

Options under assessment

We recommend to include a comprehensive justification of the need to construct a new NPP in the EIA report. We support the Ministry of Trade and Industry's (MTI) suggestion to include information on the cost structure of the project and its alternatives in the EIA report, provided that all options will be considered equally: not only generation technologies including renewable energy, but also options for demand side management and efficiency enhancement.

Nuclear Fuel

The information presented in the EIA report should contain an assessment of all environmental burdens and hazards connected with the total nuclear fuel chain. The EIA report should provide this data for comparison with the environmental and health impacts to other power generation technologies.

Environmental and health impacts

In the assessment of health impacts due to radioactive emissions, not only new ICRP guide lines should be considered but also the results of studies in Germany which show that children living near to NPPs, compared to others have a higher risk to develop leukemia.

An important impact to the environment is the release of a large amount of heat from new large NPP into the Sea which must be considered in the EIA in connection with the existing environmental burden from NPPs and other pollutants around the Baltic Sea.

Safety and Risk Analysis

Since a detailed safety review can only be conducted in the construction licensing phase a serious debate of the impacts of accidents to the environment seems hardly possible in the EIA process.

Therefore as a minimum more detailed information on safety and design requirements for LWRs must be provided by the EIA report. Otherwise it is impossible to evaluate the potential impact of severe accidents in Loviisa 3 on Austrian territory.

Influences of the different facilities to each other at the site (LILW storage, interim fuel storage, the two existing units and unit 3) as well as common cause failures (e.g. due to external events) should be discussed in the EIA report as well as the potential challenge on the NPP's safety due to global change.

We expect that the EIA report contains detailed information about the postulated initiating events (internal and external) for the design basis, as well as on targets for DBA and BDBA frequencies and related source terms to be met by the new reactor. Also parameters which are relevant for the assessment of potential source terms should be given in the EIA report e.g. the radioactive core inventory.

According to chapter 7 of the EIA Programme the EIA report should cover all the issues necessary for an assessment of accident impacts on a transboundary level. In this context severe accidents are of particular interest. Therefore we recommend that a worst case scenario concerning the amount of radioactive release is analysed, even if the applicant thinks that this scenario will have a very low probability of occurrence.

Moreover we demand that the EIA report includes a description of the function of the emergency information system in case of an accident with a potential transboundary impact.

The proposed project

Fortum Power and Heat Oy (hereinafter “Fortum”) is examining the construction of a nuclear power plant unit with approximate electric power of 1,000 to 1,800 MW and thermal power of 2,800 to 4,600 MW on the island of Hästholmen in Loviisa, which is the location of two existing nuclear power plant units: Loviisa 1 and 2. In order to improve its facilities for constructing additional production capacity, the company has initiated the Environmental Impact Assessment (EIA) procedure. [EIA, 11]

Fortum emphasizes that no decisions for construction and design of the new NPP have been made, yet. However, the completion of an EIA is a prerequisite for the application of a decision in principle to construct a new NPP in Finland. According to the EIA the aim is to start the construction of the new NPP in 2012 and to commission it in 2018. [EIA, 14]

According to the stage of the project information on the plant itself is scarce, but it is said that it will be a Light Water Reactor (LWR). Therefore the plant will be either a Pressurized Water Reactor (PWR) or a Boiling Water Reactor (BWR)

Preliminary technical information is given in Table 5.1 [EIA, 29] :

Description	**Value and unit**
Electrical power	Approx. 1,000–1,800 MW
Thermal power	Approx. 2,800–4,600 MW
Overall efficiency	Approx. 35-40%
Fuel	Uranium dioxide UO_2
Consumption of uranium fuel	Approx. 20–40 tonnes/year
Average degree of fuel enrichment	Approx. 3–5% U-235
Amount of uranium in the reactor	Approx. 100-150 t
Annual electricity production	Approx. 8–14 TWh_e
Need for cooling water	Approx. 40–60 m^3/s

Technical Lifetime of the plant is about 60 years.

The ultimate heat sink is seawater (cooling the steam in the turbine condenser). It is an optimistic assessment that *'Radioactive water from the reactor will not mix with the cooling water at any stage'.* [EIA, 25] . Even if this assessment is valid for the cooling water from the turbine, leakages of the NPP and the auxiliary facilities cannot be excluded at all.

'In addition to the power plant itself, the project also includes the interim storage of the spent nuclear fuel produced by the new power plant, the treatment, storage and final disposal of low and intermediate-level operating waste, and the decommissioning of the power plant followed by the treatment and final disposal of the decommissioning waste, all occurring at the plant site. ' [EIA, 25]

Options under assessment

The zero option

As zero option the EIA Programm defines that the Loviisa 3 NPP Project will not be implemented. In this case Fortum will not construct another type of plant at the Loviisa site. Fortum wants to keep the site next to the existing NPP as a potential construction site for a NPP. In the zero option 8-14 TWh of electrical energy will be removed from Fortum's annual production. *'The environmental impacts of the zero-option are assessed by taking a brief look at whether the option that the development of Loviisa continues as before has any impacts, and by presenting a summary of public estimates of the environmental impact of different methods of electricity production. "* [EIA, 25] The assessment will deal only with a limited period of time, namely the time the two existing NPP units will be operating.

Option excluded from the investigation

' Fortum's climate strategy .. includes energy conservation, more efficient utilisation of renewable energy sources and the construction of new, environmentally sound production capacity. The total demand for electricity depends on the overall economic and social development, which are beyond Fortum's sphere of influence ... Fortum does not have access to any energy conservation means that would allow replacement of the quantity of electricity produced by the Loviisa 3 plant unit to satisfactorily meet the needs of its customers. For this reason, energy conservation will not be examined as an alternative to the Loviisa 3 project. ' In a similar argumentation Fortum excludes the analysis of other options of power production as an alternative to the Loviisa 3 project. [EIA, 25ff]

From the standpoint of an utility this may be a logical argumentation. But energy saving, demand side management and alternative power production, including renewable energy forms, should be considered in the decision-making process of the government and parliament concerning the decision in principle for the new NPP. Environmental NGOs emphasize in their comments that the need for the project should be justified sufficiently and demand that the EIA programme should give equal weight to different options. [MTI, 12ff]

The Ministry of Trade and Industry itself explains that the applicant for the NPP as an energy selling company has only limited influence on the electricity use of its costumers. The Ministry recommends that the EIA report includes the energy efficiency and conservation efforts of the responsible organisation Fortum. [MTI, 17]

'The Ministry also notes that the report on the importance of a new nuclear power plant or power plants to the national energy supply, supporting the Government's decision-making with regard to reaching the decision-in-principle, will include information on energy conservation and efficiency. However, this perspective will cover the Finnish energy supply as a whole and thus could not be applied to the issue of replacing the power plant under review. Drawing up nationwide reviews of energy supply falls within the remit of the central government. The Ministry points out that the Government is currently preparing a long-term climate and energy strategy.' [MTI, 17]

We recommend to include a comprehensive justification of the need to construct a new NPP in the EIA report. We support the MTI's suggestion to include information on the cost structure of the project and its alternatives in the EIA report, provided that all options mentioned above will be considered.

Nuclear Fuel

Approximately 20 to 40 tonnes of fuel will be consumed by the new NPP. Uranium mining, processing of the ore, enrichment and fuel fabrication have a significant impact on the environment.

'The most important potential procurement sources of uranium and its enrichment and fuel manufacture will be examined and the environmental impacts of nuclear fuel production and transportation will be described according to the existing clarifications. ' [EIA, 55] Since the Ministry of Trade and Industry *'finds it reasonable that the organisation responsible for the project should examine the environmental impacts of the entire fuel supply chain in general and, additionally, the company's opportunities to influence this chain.' W*e expect that this will be considered in the EIA report.

At the back end spent fuel has to be stored at first at the plant in the storage pool. *'From the plant, the spent fuel will be transferred for a few decades to the spent fuel storage pool located in connection with the Loviisa power plant, or a separate interim storage will be built for the fuel. ... After the storage period in Loviisa, the spent fuel of the Loviisa 3 power plant is planned to be permanently disposed of in the bedrock of Olkiluoto, Eurajoki, in the final repository to be built approximately 400–500 metres below ground level. Posiva Oy, jointly owned by Fortum and TVO, carried out the EIA procedure in 1997–1999 for the final disposal of the spent fuel from six nuclear reactors (the running reactors at Loviisa 1 and 2 and Olkiluoto 1 and 2, the Olkiluoto 3 reactor under construction plus the new reactor) at Olkiluoto .'* [EIA, 32]

The information presented in the EIA report should contain an assessment of all environmental burdens and hazards connected with the total nuclear fuel chain. The EIA report should provide this data for comparison with the environmental and health impacts to other power generation technologies.

Environmental and health impacts

'Annual radiation doses to the people living in the vicinity of the power plant are calculated based on radioactive releases from the power plant. The maximum allowable radiation dose is 100 microsievert (µSv) per year. The radiation dose of the nearby residents with the most exposure to emissions into the air and the sea in 2006 was approximately 0.1 microsievert (µSv). The radioactivity of the people living in the vicinity of the power plant is regularly measured. ' [EIA, 49] *Radiation monitoring covers the vicinity of the power plant, to a range of approximately 10 kilometres from the power plant.'* [EIA, 54]

According to chapter 7 the assessment of radiation impact and health effects of radiation will be given as part of the Assessment of impacts on people and society in the EIA report:

'*The radioactive and other airborne releases arising from the operation of the planned power plant will be presented. Their impact on the environment and people will be assessed based on the existing research findings. ' [EIA, 52] 'The increase in radiation dosages for residents in the surrounding area caused by radioactive releases from the new power plant will be assessed. Health impacts and risks will be assessed using calculations based on radiation exposure.* [EIA, 54]

In the assessment of health impacts due to radioactive emissions, not only new ICRP guide lines should be considered but also the results of studies in Germany which show that children living near to NPPs, compared to others, have a higher risk to develop leukemia. [KIKK STUDIE 2007]

An important impact to the environment is the release of large amounts of heat from the new large NPP into the Sea which must be considered in the EIA in the context of the existing environmental burden from NPPs and other pollutants around the Baltic Sea. The situation of the environment in this region affects not only the marine ecosystem but also coastal regions and should be evaluated from a holistic point of view.

Safety and Risk Analysis

For Austria the safety and risk analysis of the new NPP is the most important issue of the transboundary EIA process. Accidents with a large release of radioactive substances into the atmosphere could also affect Austria. Whether Austria could be significantly affected by an accident in Loviisa 3 depends on a) the climatological conditions at the time of the accident and b) on the amount of radioactive substances released. The maximal source term is plant specific, therefore the EIA report should present either the maximal release in case of a severe accident or more detailed information on the design and safety features of the NPP.

A team from the Institute of Meteorology of the University of Natural Resources and Applied Life Sciences, Vienna and the Austrian Institute of Ecology analysed the climatological risk that emissions due to severe accidents at NPPs in Europe could affect Austrian territory to an extent that would require radiation protection measures for risk groups (children and young people, expecting and nursing mothers) and normal population, respectively. „Climatological risk for Loviisa site“ means the probability of weather conditions in Europe which lead to transport and deposition of emissions released from the Loviisa site to Austrian territory, expressed as percentage under consideration of all assessed weather situations. As a result of this study the climatological risk for the site of Loviisa was assessed to be 2,25 % (risk group) and 2,25% (for general population), respectively. [SEIBERT et al. 2004]

The source term assumed for this analysis is a worst-case scenario for the release due to a severe accident at a PWR 1000 MW reactor. Only the source term for Cs-137 of 6.75 E16 Bq, as a characteristic nuclide, was considered in the dispersion model. A simple conversion factor to derive dose estimates from the total Cs-137 depositions was applied, which is based on results of previous calculations carried out with mainframe COSYMA.

Transport, diffusion and deposition of the released substances were calculated with the Lagrangian particle dispersion model FLEXPART. FLEXPART is a model suitable for the meso-scale to global-scale calculations, which is freely available and used by many groups all over the world. The calculations were made for 88 different dates in the year 1995 as a part of the RISKMAP study. This year has been shown to be climatologically representative at least for the Alpine region. [SEIBERT et al. 2004]

Chapter 5.2. of the EIA program deals with nuclear safety. “*A nuclear power plant must be designed in accordance with nuclear energy legislation and YVL Guides (NPP guides) published by the Radiation and Nuclear Safety Authority in order to ensure the safety of plant operation. The safety of nuclear power plants and the requirements set for the safety have been and will be continuously developed based on experience and the results of safety surveys. The nuclear power plant currently under the preparation process represents advanced technology and fulfils the Finnish safety requirements.' ... 'In the nuclear industry, systematic safety*

principles have evolved to limit the risks. These principles focus on preventing accidents and limiting the consequences. The design of a nuclear power plant has its foundation in ensuring safety by structures and arrangements that prevent radioactive substances from entering the environment, even in the most unlikely accident situations." [EIA, 30]

Unfortunately safety requirements are not described in detail. However, the list of safety provisions is impressive: '*the multiple isolation principle is applied to the design,.. leak-proof reactor cooling circuit,... gas-tight containment, consisting of various steel and concrete structures, ... the containment is covered by the thick concrete outer wall of the reactor building, protecting the plant against possible external impacts, several redundant emergency cooling systems ..and backup power generators .."* [EIA, 30]

The statement that the core melt frequency must be less than once in 100,000 (1 E-5) [EIA, 30] confirms only with the IAEA safety targets for existing NPPs. Severe accident management systems that prevent significant radioactive emissions in case of an accident are also mentioned in chapter 5.2. Furthermore there is declared: '*Although a severe accident must be very unlikely and a significant release caused by it even more unlikely, extensive preparations must be made to protect the population of the area, too '* [EIA, 30ff]

Since '*detailed safety reviews can only be conducted in the construction licensing phase' [EIA, 31]* a serious debate of the impacts of accidents to the environment seems hardly possible in the EIA process.

Therefore as a minimum more detailed information on safety and design requirements for LWRs must be provided by the EIA report. Otherwise it is impossible to evaluate the potential impact of severe accidents in Loviisa 3 on Austrian territory.

We expect that the EIA report contains detailed information about the postulated initiating events (internal and external) for the design basis, as well as on targets for DBA and BDBA frequencies and related source terms to be met by the new reactor. Also parameters which are relevant for the assessment of potential source terms should be given in the EIA report: the radioactive core inventory, the average and maximum burn-up of the fuel.

Influences of the different facilities to each other at the site (LILW storage, interim fuel storage, the two existing units and unit 3) as well as common cause failures (e.g. due to external events) should be discussed in the EIA report as well as the potential challenge on the NPP's safety due to global change.

The Ministry of Trade and Industry comments that the *'EIA report should include a review of current nuclear power plant types on the market which are suitable for the project under review*'.[MTI, 17] Therefore we expect that the EIA report will provide detailed information on the type of plants under consideration for Loviisa 3.

Influences of the different facilities to each other at the site (LILW storage, interim fuel storage, the two existing units and unit 3) as well as common cause failures (e.g. due to external events) should be discussed in the EIA report as well as the potential challenge on the NPP's safety due to global change.

According to both documents the EIA program and the Statement of Ministry of Trade and Industry, safety issues and discussion of accidents are seen as part of the EIA report. But it is still unclear how a serious assessment can be carried out, without a clear decision on the plant. The description of the how the safety assessment will be carried out for the construction and operating license, is no substitution of the safety assessment itself.

The Ministry of Trade and Industry comments states that '*the safety planning criteria for the prospective plant must be presented with respect to the limitation of emissions of radioactive substances and environmental impacts, as well as an assessment of the possibilities of meeting the safety requirements in force'*. [MTI, 17]

'The EIA report will discuss the environmental impacts of exceptional situations based on the safety analyses and accident modelling assessments prepared for the current power plant units, as well as on the requirements imposed on the new power plant. Other contemporary threats, such as the effect of climate change, will also be considered in the assessment. The consequences of exceptional situations will be assessed based on the extensive research data on the health and environmental impacts of radiation. The safety assessments to be carried out for the purpose of applying for a construction and operating license pursuant to the Nuclear Energy Act, as well as other types of surveillance, will also be described. The assessment report will also include the current emergency arrangements for a nuclear accident. The impacts of spreading accident release are observed to the area of neighbouring countries up to 1,000 kilometres from the power plant.' [EIA, 54]

In its comment the radiation and nuclear safety authority STUK says *' that the EIA report should describe the key grounds and objectives for planning the limitation of emissions of radioactive substances and environmental impacts, alongside an assessment of the feasibility of meeting the safety requirements in force.'* and the safety technology authority proposes that the EIA report includes a review of risks of plant operation including probability and consequences of emergencies at the plant. [MTI, 21]

In Finland radiation exposure of the general public is limited by the the general regulations of the government [STATE (395/91)] for the safety of NPPs, which are as follows:

The limit for the dose commitment of the individual of the population according to [STATE (395/91)]**:**

- arising from **normal operation** of a nuclear power plant in any period of one year, is 0.1 mSv.
- arising from an **anticipated operational transient** in the period of one year is 0.1 mSv.
- the limit for a **postulated accident** in the period of one year is 5 mSv.
- and for **a severe acciden**t an atmospheric release of cesium-137 should not exceed 100 TBq. (The combined fall-out consisting of nuclides other than cesium-isotopes shall not cause, in the long term, starting three months from the accident, a hazard greater than would arise from a cesium release corresponding to the above-mentioned limit.) The possibility that, as the result of a severe accident, the above mentioned requirement is not met, shall be 'extremely small', which is < 5E-7 according to [STUK YVL2.8]

This probabilistic objective for the limited release due to a severe accident set by Finland's nuclear regulatory authority STUK is more ambitious than the limited release target defined by the European Utilities [EUR 2001].

We expect that the EIA report describes the design objectives and the provisions for limitation of emissions due to accidents with sufficient details to make it plausible that the limits will not be exceeded.

The comment of the Ministry of Trade and Industry states that *'the EIA report must present various emergency scenarios involving radioactive emissions and, with the help of illustrative examples, should describe the extent of the affected zones and the impacts of emissions on people and the environment. ..... the EIA report must present a clear summary of the basis used in the review. Assessing the impacts must not be limited to the exclusion area or the emergency planning zone for rescue operations. The assessment must also include a review of the possible environmental impact of radioactive substances on the states around the Baltic Sea and on Norway. '* [MTI, 19 ff]

In a transboundary context severe accidents are of particular interest. Therefore we recommend that a worst case scenario concerning the amount of radioactive release will be analysed among the '*illustrative examples'*, even if the applicant thinks that this scenario will have a very low probability of occurrence.

Moreover we demand that the EIA report includes a description of the information system in case of an accident with a potential transboundary impact.

REFERENCES

[97/11/EC] Council Directive on the assessment of the effects of certain public and private projects on the environment, as amended

[ESPOO 1997]: Convention on environmental impact assessment in a transboundary context, Bundesgesetzblatt für die Republik Österreich, Jahrgang 1997, Teil III, 201, published 28. November 1997

[EUR 2001]: „European Utility Requirements for LWR Nuclear Power Plants" (Generic Nuclear Island Requirements)

[KIKK STUDIE,2007] Epidemiologische Studie zu Kinderkrebs in der Umgebung von Kernkraftwerken (KiKK- Studie), Im Auftrag des Bundesministeriums für Umwelt, Naturschutz und Reaktorsicherheit und des Bundesamtes für Strahlenschutz, Deutschland, 2007

[SEIBERT et al. 2004]: Entwicklung von Entscheidungskriterien betreffend die Beteiligung an UVP Verfahren entsprechend der Espoo-Konvention, Seibert P., Frank A., Formayer H., (Universität für Bodenkultur, Institut für Meteorologie), Wenisch A., Mraz G. (Österreichisches Ökologie-Institut), Wien 2004, im Auftrag des BMLFUW.

[STATE (395/91)] Decision of the Council of State on the general regulations for the safety of nuclear power plants

[STUK YVL2.8] PROBABILISTIC SAFETY ANALYSIS IN SAFETY MANAGEMENT OF NUCLEAR POWER PLANTS, 2003

GLOSSARY

BDBA	Beyond Design Basis Accident
BWR	Boiling Water Reactor
DBA	Design Basis Accident
EIA	Environmental Impact Assessment
EPR	European Power Reactor
EU	European Union
GHG	Greenhouse Gas
LILW	Low and Intermediate Level (radioactive) Waste
HLW	High Level (radioactive) Waste
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiation Protection
LILW	Low and Intermediate Level (radioactive)Waste
LWR	Light Water Reactor
MTI	Ministry of Trade and Industry
MW	Megawatt
MWe	Megawatt electric
NGO	Non Governmental Organisation
NPP	Nuclear Power Plant
PWR	Pressurized Water Reactor
SNF	Spent Nuclear Fuel