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Panel discussion on nuclear energy-related projects

Background note on the application of the Convention to nuclear energy-related activities

Note by the secretariat

Summary

This note was prepared at the request of the Working Group on Environmental Impact Assessment at its thirteenth meeting (ECE/MP.EIA/WG.1/2010/2, para. 44). It was circulated for comments for a period of two months, August-September 2010, and then amended. Following review of the note by the Working Group at its fourteenth meeting (ECE/MP.EIA/WG.1/2010/5, paras. 22–24), further periods for comments were provided, from December 2010 to mid-March 2011.

This note attempts to reflect the diverse and sometimes conflicting views expressed on the application of the Convention to nuclear energy-related activities, particularly nuclear power plants. It is not a guidance note, but rather is intended to encourage debate on key issues during the panel discussion on nuclear energy-related projects to be held during the fifth session of the Meeting of the Parties to the Convention.

The note does not necessarily reflect the views of the United Nations Economic Commission for Europe or of the secretariat.

Contents

I. Introduction

1. Over the coming years, member States of the United Nations Economic Commission for Europe (UNECE) plan the construction of a large number of nuclear power plants (NPPs), while older existing plants are being decommissioned as they reach the end of their operational life or investments are being made and their operational life extended. Several countries plan the construction of interim and long-term repositories for spent nuclear fuel and radioactive waste.

2. Most of the NPPs now operating in UNECE member States were built before the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) entered into force in 1997; their construction was rarely subject to environmental impact assessment (EIA) in a transboundary context, and not always to domestic EIA. However, the decommissioning of some of these NPPs has been authorized after an EIA in accordance with the Convention.

3. Many examples of the application of the Espoo Convention to more recent nuclear energy-related activities were reported in completed questionnaires on the implementation of the Convention in recent years, including:

(a) Bulgaria (Belene NPP);

(b) Czech Republic (Temelin interim storage facility for spent nuclear fuel);

(c) Finland (Olkiluoto-4, Loviisa-3 and Fennovoima NPPs, and a final repository for spent nuclear fuel);

(d) Germany (interim storage facilities for spent nuclear fuel);

(e) Hungary (Paks NPP lifetime extension);

(f) Lithuania (Ignalina NPP decommissioning projects (near-surface repository for low- and intermediate-level short-lived radioactive waste; land-fill facility for short-lived very-low-level waste; new solid radioactive waste management and storage facilities) and Visaginas NPP);

(g) Romania (Chernavoda NPP, units 3 and 4);

(h) Slovakia (Jaslovske Bohunice NPP V-1 decommissioning);

(i) Sweden (Barseback, Forsmark and Ringhals NPPs, and encapsulation plant and the final repository for spent nuclear fuel).

4. Current examples include plans for activities in: Belarus (Astravets NPP); France (decommissioning of Chooz A NPP); the Netherlands (Borssele NPP); and Slovakia (Mochovce NPP, units 3 and 4). A list of operating nuclear plants and plants under construction in the UNECE member States was presented to the Working Group on EIA at its thirteenth meeting in May 2010 and subsequently revised by Parties.[1]

5. This paper presents information on how the Convention has been and is applied to such activities, and suggests good practice, primarily with respect to NPPs. The information is based in part on interventions made by delegates at the thirteenth meeting of the Working Group, and in part on comments on a draft of this paper. Examples of other international

[1] The list is available on the website at http://www.unece.org/env/eia/meetings/wg_eia_13.htm (unofficial documents, item 5 (f)).

agreements to consider when assessing the environmental impact of an NPP are cited in annex to this paper.

II. Screening

General issues

6. NPPs and nuclear waste storage facilities are listed in appendix I to the Convention:

- Item 2 includes “nuclear power stations and other nuclear reactors (except research installations for the production and conversion of fissionable and fertile materials, whose maximum power does not exceed 1 kilowatt continuous thermal load)”;
- Item 3 specifies “Installations ... solely designed for the production or enrichment of nuclear fuels, for the reprocessing of irradiated nuclear fuels or for the storage, disposal and processing of radioactive waste”.

7. These items have been revised in the second amendment of the Convention, adopted in decision III/7 (ECE/MP.EIA/6, annex VII):

- Item 2 (b) identifies “Nuclear power stations and other nuclear reactors, including the dismantling or decommissioning of such power stations or reactors (except research installations for the production and conversion of fissionable and fertile materials, whose maximum power does not exceed 1 kilowatt continuous thermal load)”;
- Item 3 identifies:

“(a) Installations for the reprocessing of irradiated nuclear fuel;

(b) Installations designed:

- For the production or enrichment of nuclear fuel;
- For the processing of irradiated nuclear fuel or high-level radioactive waste;
- For the final disposal of irradiated nuclear fuel;
- Solely for the final disposal of radioactive waste; or
- Solely for the storage (planned for more than 10 years) of irradiated nuclear fuels or radioactive waste in a different site than the production site.”

8. The second amendment explains that “for the purposes of this Convention, nuclear power stations and other nuclear reactors cease to be such an installation when all nuclear fuel and other radioactively contaminated elements have been removed permanently from the installation site” (footnote 1 to para. 2 (b)).

9. The renewal of an NPP licence is generally subject to EIA, though the location, technology and operating procedures may remain unchanged (see appendix III to the Convention). However, in many UNECE countries, NPPs are licensed without any lifetime limitation. Questions remain as to whether an extension of the designed operation period of an NPP is subject to the Convention if no licence renewal process is needed. The unlimited licence is normally coupled with the obligation to perform periodic safety reviews, usually every 10 years. Such a review could lead to a modification of the NPP and its operating licence; national legislation does not always require EIA in such cases.

10. Major changes to nuclear energy-related activities, subject to the provisions of the Convention, might include:

(a) A substantial increase in production levels at an NPP, for example, by 25 per cent;

(b) A substantial increase in the production or storage of radioactive waste from a facility (not only NPP), for example, by 25 per cent;

(c) An extension of the lifetime of a facility;

(d) Decommissioning of the facility;

(e) Closure of a long- or medium-term repository for radioactive waste.

11. However, unlike for many other items in appendix I to the Convention, the nuclear energy-related items lack thresholds, whether qualitative (such as "major" or "large") or quantitative. This gives a different legal basis for the interpretation of the term "major change" when applied to such activities compared with activities listed with thresholds.

12. Opinions differ as to whether screening should be based upon an assessment of transboundary radiological impact arising from normal operation, incidents and design-base accidents,[2] but not less probable events, or whether it should include severe accidents beyond the design base. The frequency of the initiating event for a severe accident may be below one millionth per year, but the risk of a very low probability but particularly severe accident may raise concerns. The box below presents a possible argumentation for the Convention to cover severe accidents beyond the design base. However, some countries would argue that a lower boundary on the accident frequency range has to be specified and that the limit of one millionth per year is reasonable.

13. The Convention does not identify the risk of accidents as a screening criterion (see appendix III), whereas the corresponding European Union (EU) directive[3] does (annex III, para. 1).

14. In addition, a distinction might be made between the different types of nuclear energy-related activity to ensure the appropriate application of the Convention with regard to different kinds of nuclear activities. For example, an NPP is more likely to have acute significant transboundary impact than a final storage.

Good practice

15. The consideration of severe accidents beyond the design base, and related mitigation and monitoring programmes, should inform the permitting procedure and perhaps the screening and the subsequent EIA.

[2] Design-base (or basis) accidents are postulated accidents that a nuclear facility must be designed and built to withstand. Accidents beyond the design base are thus accident sequences that are possible but were not fully considered in the design process because they were judged to be too unlikely (after United States Nuclear Regulatory Commission online glossary, http://www.nrc.gov/reading-rm/basic-ref/glossary.html).

[3] Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment, as amended by Directives 97/11/EC of 3 March 1997 and 2003/35/EC of 26 May 2003.

III. Notification

General issues

16. The Party of origin needs to determine which Parties (and perhaps other countries) should be notified and what is the territory or area potentially affected and therefore considered for notification purposes. Past practice has often been to notify neighbouring States; but, if an accidental release of radionuclides were to occur the extent of the resulting damage would depend on, among other factors, meteorological conditions, and could be widespread. As with screening, opinions differ as to whether Parties should be notified if an accident beyond the design base at a planned installation would impact on them (see box below), or only if they would likely be affected during normal operation, incidents and design-base accidents. The number of affected Parties could be large, so complicating the procedure under the Convention.

Possible argumentation for the Convention covering severe accidents beyond the design base

Article 1, item (vii), defines impact as "any effect caused by a proposed activity on the environment", and article 1, item (viii), defines transboundary impact as "any impact not exclusively of global nature".

The UNECE publication *Current Policies, Strategies and Aspects of Environmental Impact Assessment in a Transboundary Context* (ECE/CEP/9) provides an important resource for the determination the significance of a transboundary impact. Part three, chapter II, on "Significance" of adverse transboundary impact, states: "Many risks related to transboundary impacts are characterized by low probability. Thus, there would be no or very weak empirical justification for analysis based on frequencies. For example, estimates of risks of nuclear accidents ... 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" (pp. 49–50).

Furthermore, annex II of the report by the secretariat, "Specific Methodologies and Criteria to Determine the Significance of Adverse Transboundary Impact" (CEP/WG.3/R.6), which provides a tool for determining the significance of impacts, recommends in supra note h that "if significant impacts are expected only in the event of an accident, the full table can be filled in to illustrate the worst case scenario."

In addition, the EIA checklist regarding NPPs, presented on the UNECE website, suggests that radioactive emissions and their impact on human health and safety should be assessed on the basis of listed factors like risk of nuclear accident, risk of explosion, etc.

The inclusion of severe accidents is of importance since it has effects on the scope of the EIA, but, more importantly, it directly relates to the scope of the application of the Convention. Not covering severe accidents means weakening the Convention and its goals, especially in the context of NPPs.

17. The Party of origin should expect that many countries may wish to be notified and to participate in the transboundary EIA procedure under the Convention, in part as the Convention may provide the only legal procedure for potentially affected countries to discuss the planned activity.

18. The right of the potentially affected Party to be notified upon request is not provided under the Convention, whereas it is under the corresponding EU directive. However, this does not lead to a clear distinction between legal frameworks in EU and non-EU States as many non-EU States have taken, or are taking, steps to transpose the EU legislation.

19. Nonetheless, the Convention, in article 3, paragraph 7, provides mechanisms by which a Party, which considers that it would be affected by a significant adverse transboundary impact, may discuss with the Party of origin, or refer to an inquiry commission (appendix IV), the question of whether there is likely to be such an impact.

20. Many countries are now developing mini-reactors (based on military and ice-breaker designs), with power output being a fraction of that of the current power plants. These mini-reactors can be used as modules and a power plant gradually built up by adding modules. They can also be moveable, for example, by being constructed on a floating platform and then towed. Mini-reactors complicate further the identification of affected Parties.

Good practice

21. Wide notification, and responding positively to a request for notification, may avoid later delays in the approval procedure that would occur if the Convention's provisions in article 3, paragraph 7, were applied. At least all neighbouring Parties should be notified.

22. Other potentially affected Parties, and affected areas within those countries, could be identified using dispersion calculation models and subsequent radiation exposure calculation, based as appropriate on severe accident scenarios; certain models might be selected for the calculation of transboundary radiological impact, with several proven models available. If the calculation shows a significant adverse transboundary radiological impact, the affected Party should be notified. Consideration of shared natural bodies such as rivers, lakes and seas could also help identify potentially affected Parties.

IV. Environmental impact assessment procedure

General issues

23. The Convention requires that information on the EIA procedure be provided to the affected Party. Nonetheless, there may be a lack of information on and understanding of the EIA procedure in the Parties concerned, which may result in difficulties for the Parties involved in fulfilling their obligations, for example, in giving equivalent opportunities to the public of the affected Party.

24. The construction of an NPP is normally part of a more general governmental policy, such as an electricity supply programme, which in some jurisdictions should already have been assessed earlier by the means of a strategic environmental assessment (SEA) at a time when the locations of the planned NPP may not be known. On occasion, EIA has instead been initiated at this stage before a decision has been taken on the location, but this is problematic as EIA is site-dependent.

25. In some EIA systems, the EIA procedure is carried out quite early, with no detailed information on technical specifications. Nonetheless, the requirements of the Convention must be satisfied in full.

Good practice

26. Because of the complexity of decision-making processes for nuclear activities and the diversity of national procedures, it may be important to provide information on the EIA system, licensing system, their inter-linkages and their links with the final decision.

27. To ensure that the opportunities provided to the public of the affected Party will be equivalent to those of the Party of origin, the EIA procedure of the Party of origin could be applied for the public of the affected Party.

28. It may be appropriate to provide opportunities for the authorities and public of the affected Party to participate repeatedly throughout the authorization procedure, and more frequently than required by the Convention. However, this may also be incompatible with existing national legislation.

29. Alternative locations or technologies for a planned NPP need to be simultaneously examined during the EIA procedure or, preferably, during a preceding SEA of a more strategic decision. The no-action alternative must be addressed with regard to the significance of any likely environmental impact.

30. In cases where the construction of an NPP is within the framework of a more strategic decision already subject to SEA, the EIA procedure for the construction of the NPP can partially be based on the documentation and the outcome of the SEA.[4] It might be argued that, in countries where no SEA system is in place or no SEA has been carried out at a more strategic level, construction of a first NPP might bear both policy- and project-level implications.

V. Environmental impact assessment documentation

General issues

31. The likelihood of radionuclide releases may be low, but possible damage in case of severe accidents may be very high. Neither the Convention nor the corresponding EU directive explicitly mentions risk assessment. However, both the Convention (appendix II, items (d) and (e)) and the EU directive (annex IV, paras. 4 and 5) require that the EIA documentation describe the potential environmental impact and mitigation measures to minimize the impact; these provisions might be interpreted broadly as requiring some risk assessment measures. However, opinions differ as to whether EIA should address severe accidents (see again the box above).

32. Given that design-base accidents are meant to be contained by the NPP design and operating procedures, it is unclear whether accidents beyond the design base are best addressed through EIA. On the one hand, it could be argued that they should only be assessed from the nuclear safety perspective, given that the aim is to reduce the probability of beyond-design-base accidents (and severe accidents) below nuclear safety targets, rather than to minimize environmental impact. This would imply that the overall deterministic or

[4] A practice sometimes referred to as “tiering”.

probabilistic safety analyses of initial events, and the subsequent sequences and consequences, should be in the frame of nuclear safety licensing procedures rather than in EIA. On the other hand, it could be argued that severe accidents causing large radioactive releases, as long as they cannot be excluded completely, should be addressed by the EIA documentation.

33. EIA is carried out at a stage when detailed information may not be available to enable overall deterministic or probabilistic safety analyses of initial events, and the subsequent sequences and consequences. Further, ionizing radiation is not always addressed in EIA legislation, making it perhaps difficult to provide comprehensive and consistent documentation.

34. Potential transboundary impact, other than that caused by radionuclides, must not be neglected. For example, nuclear energy-related installations may also use hazardous chemicals that are likely to have a significant adverse transboundary impact.

35. The EIA and other documentation for nuclear energy-related activities is normally extensive and highly technical. This raises questions about both the communication of large volumes of information, and its translation. The Internet and other electronic means (e.g., compact disc) may facilitate dissemination of such information, but in some countries Internet access is limited, so the method of dissemination needs to take into account those resources available to the relevant population. In situations where the volume of EIA documentation is particularly large, it may not be reasonable to expect full translation, but translation of only the non-technical summary in many cases will not be sufficient.

36. Translation is not addressed in the Convention. Sometimes there is no translation of the documentation into the official language of the affected Party or the translation is poor or incomplete. English is widely used in international affairs and English terminology regarding environmental protection, radiological impacts, etc., is well known, so its use might result in better quality documentation. However, key information needs to be available in languages understood by the population of areas likely affected in the Parties concerned.

Good practice

37. When severe accidents are to be the subject of EIA (recalling that opinions differ on this question), there is a need for information about possible severe accident sequences, and other possibilities for the release of radionuclides, and of their probability.

38. Again when severe accidents are to be the subject of EIA, documentation should include information on measures to reduce the size and probability of radionuclide releases, as well as reports on probabilistic safety analyses, a description of emergency preparedness arrangements (though these may not be available at this stage), an environmental radiation monitoring programme and other risk assessment requirements.

39. Documentation should cover those external events that could pose a threat to safety at the site in question and assess the risks arising from such events. Effects on the supply of cooling water and on electric power grid connections should be considered, as well as effects from terrorist attacks. Hazardous industry, traffic and exceptional natural phenomena should be considered. Examples of exceptional natural phenomena include: freezing or other clogging of the cooling water intake, storms, snow loads, flood, low sea level and seismic events. Further, consideration should be given to the potential for climate change to alter the operating environment of a nuclear facility, including changes in river

flows or sea level.[5] The cumulative effect of multiple installations should be assessed, as might also be their associated cumulative risk.

40. The taking into consideration of the recommendations of the International Commission on Radiological Protection on standards for environmental control needed to protect the general public might ensure that other species would also not be put at risk.

41. Good practice would require translation of at relevant least parts of the EIA documentation, including the non-technical summary and a specific chapter addressing the transboundary issues, into the language of the affected Party by the Party of origin,[6] which might in turn impose this obligation upon the project proponent. This would be in line with the polluter pays principle and may simplify the procedure and reduce delays. The translated materials should be sufficient for the affected Party to make informed comments on the activity and the EIA documentation.

VI. Public participation

General issues

42. Under the Convention, the public of the affected Party has the right to make comments on and to express objections to proposed activities (art. 3, para. 8 and art. 4, para. 2). The Parties concerned need to ensure that opportunities provided to the public of the affected Party are equivalent to those of the Party of origin (art. 2, para. 6). Nuclear activities often attract a high level of public interest and could result in significant numbers of written objections and comments.

Good practice

43. Information should be shared on how the public participation is being arranged in both the Party of origin and the affected Party. If a public hearing is held in an affected Party, the project proponent, together with the relevant authorities (e.g., environmental, licensing, and health and safety) from the Party of origin, should be invited to attend and provide the public with the necessary information. If, on the other hand, a public hearing is only held in the Party of origin, the affected Party should be informed sufficiently early so that it can in turn notify its public and enable their participation. In either case, interpretation should be provided as necessary.

44. It may be important to inform the public on the possibility of severe accidents and their impacts on the environment and health. Besides informing the public, this may enable the authorities of the concerned Parties to develop anticipatory safety measures.

[5] One commenter suggested that, where the original permitting process did not take into account the potential impact of climate change on operations, a special analysis of this issue should be carried out.

[6] See also the Implementation Committee's opinion (ECE/MP.EIA/2011/6, para. 52).

VII. Consultations

General issues

45. Detailed information regarding security is often confidential because of the physical protection measures planned. Therefore, information regarding security cannot be exchanged in the framework of EIA, which is a transparent and public procedure. However, the confidentiality of security issues has to be determined with care, weighing considerations of national security and the principle of transparency. A certain degree of transparency is necessary to assess if the security measures are sufficient to protect the public in the Parties affected, and to reassure the public that the project has been designed and will be constructed and operated to the appropriate standard. However, some would consider sufficient a statement that the nuclear installation would comply with international law and safety standards, given the sensitivity of more detailed information.

Good practice

46. Security information on physical protection measures planned, falling within article 2, paragraph 8, of the Convention, should only be communicated if necessary, during bilateral consultations (art. 5) and subject to the relevant rules of confidentiality.

47. Affected Parties might request maximum information regarding safety and security measures (not falling within art. 2, para. 8) and their efficiency, and might expect state-of-art levels of safety and security. Affected Parties might also request reasonable modification of the project, effective monitoring systems and further exchange of information.

48. All relevant authorities might take part in consultations, including those with nuclear, security and environmental responsibilities. The representation of the developer will enable questions to be answered in depth. It is helpful if the questions are submitted in advance.

VIII. Final decision

General issues

49. In practice, it is often difficult to get sufficient information on the final decision, or even to determine which decision is the final one. Normally, the final decision would allow the project proponent to proceed with the project.

Good practice

50. Given the high level of public interest, and the strong interest often shown by the authorities in affected Parties, it is important to demonstrate that, in the final decision on the proposed activity, due account is taken of the outcome of the EIA, including the EIA documentation, as well as the comments received from the public and authorities of affected Parties and the outcome of the consultations. This information needs to be shared with the public and authorities of affected Parties.

IX. Post-project analysis

General issues

51. There appears to be little experience of post-project analysis, particularly for nuclear energy-related activities.

Good practice

52. Given the long time lag that often arises between a final decision and project commissioning, post-project analysis may play an important role in ensuring that conditions imposed on the construction, commissioning and operation phases are fulfilled.

Annex

Examples of other international agreements to consider when assessing the environmental impact of a nuclear power plant

All UNECE member States with one or more NPPs on their territory have joined the Convention on Nuclear Safety and some other international agreements relating to the operation of nuclear facilities. As Parties to the Convention on Nuclear Safety they participate in a process of review of their national nuclear safety policy that is organized every three years.

All EU member States are also part of the European Atomic Energy Community (Euratom) and subject to the Euratom Treaty.

The following list is incomplete, but provides examples of relevant international agreements:

- Convention on Civil Liability for Nuclear Damage (Vienna, 1963, amended 1997) and Convention on Supplementary Compensation for Nuclear Damage (Vienna, 1997);
- Convention on Third Party Liability in the Field of Nuclear Energy (Paris, 1960, amended 1964 and 1982);
- Convention on Nuclear Safety (Vienna, 1994);
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Vienna, 1997);
- Convention on Early Notification of a Nuclear Accident (Vienna, 1986);
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Vienna, 1986);
- EU Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community Framework for the nuclear safety of nuclear installations;
- Treaty establishing the European Atomic Energy Community (Rome, 1957).

In addition, the following publications in the Safety Standards Series of the International Atomic Energy Agency are relevant:

- No. 50-C-S (REV. 1), Code on the Safety of Nuclear Power Plants: Siting (1988);
- No. 111-G-3.1, Siting of Near Surface Disposal Facilities (1994);
- No. 111-G-4.1, Siting of Geological Disposal Facilities (1994);
- No. 115, International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, International Atomic Energy Agency, Food and Agriculture Organization of the United Nations, International Labour Organization, the Nuclear Energy Agency of the Organization for Economic Cooperation and Development and the Pan American Health Organization of the World Health Organization (1996).