

**SUBMISSION IN THE**  
**SEA PROCEDURE**  
**for the Polish Nuclear Energy Programme**

under  
**the law of 3 October 2008 for Providing Information on the Environment  
and its Protection, Public Participation in Environmental Protection and  
Environmental Impact Assessment**  
(OJ No. 199, as amended poz.1227.),

**EU Directive 2001/42/EC**  
on the Assessment of the Effects of Certain Plans and Programmes  
on the Environment  
and  
**the Aarhus Convention**  
on Access to Information, Public Participation in Decision-making  
and Access to Justice  
in Environmental matters



by  
Ir. Jan Haverkamp

**GREENPEACE**

Jan Haverkamp – EU policy campaigner dirty energy  
Greenpeace European Unit  
Rue Belliard, 1040 Brussels, Belgium  
Tel: +32 477 790 416 Fax: +32 2 2741910 E-mail: jan.haverkamp@greenpeace.org  
[www.greenpeace.eu](http://www.greenpeace.eu)

**GREENPEACE**

**International**

My name is Jan Haverkamp. I have an academic engineering degree (Ir. - equivalent with a Masters degree) in Environmental Hygiene from the Agricultural University in Wageningen as well as a candidate (equivalent with Bachelors) degree in Biochemistry from the State University in Leiden, both in the Netherlands. I have studied also nuclear physics and energy policy at the State University in Leiden.

I work as an independent expert in energy issues with specialisation in nuclear energy issues for the global environmental organisation Greenpeace and work since 1987 in Central Europe. Previously to this SEA, I have participated in the Environmental Impact Assessment processes for the first two blocks of the Temelín nuclear power plant (NPP) in the Czech Republic, the Belene NPP in Bulgaria, the Cernavoda NPP in Romania, the Visaginas NPP in Lithuania, the Mochovce 3,4 NPP in Slovakia and the blocks 3, 4 of the Temelín NPP in the Czech Republic.

I have been asked by Greenpeace in Poland to write a submission in the SEA procedure of the Polish Nuclear Energy Programme. I wrote these comments on personal title and my opinion – though based on my experience within Greenpeace and benefiting from input from other Greenpeace colleagues and experts – does not necessarily coincide with the opinion of Greenpeace as organisation.

Greenpeace as organisation does, however, endorse my recommendation **that the report should be dismissed as insufficient and inadequate and that the Ministry of Economy be required to re-do the Strategic Environmental Assessment on a sufficient level of quality.**

In the short term available for comment (only the legally minimum time for public comment of 21 days – without taking into consideration that the introduction of complex technology like nuclear power needs more time than, for instance, the construction of one small local heating installation), I have not been able to assess all materials in detail. I was furthermore hindered by the fact that the documentation was only available in Polish, which means that I had to have important parts translated – which given the extremely little time available could only be done in a very limited way. This all has had a negative influence on how systematic I have been able to assess the report and therefore on the quality of this submission. An extra handicap was that the procedure was running during the New Year's holidays – a period in which also I was partly unavailable. I have been able to make a rough assessment of the Polish Nuclear Power Programme itself and of the SEA report. I have not been able to look into the Appendix dealing with location choice.

The short time for public comment is not reasonable or appropriate as defined in the Aarhus Convention, the EU Directive on SEA and the Espoo Convention's SEA Protocol. Greenpeace has submitted a complaint about this and other breaches of these Conventions and Directive to the Minister of Economy. When a reasonable and appropriate time will be established for public input, I will try to deliver a more detailed input.

Prague / Brussels, 18 January 2010

[jan.haverkamp@greenpeace.org](mailto:jan.haverkamp@greenpeace.org) – tel.: +32 477 790 416

## COMMENTS

1. The process of a Strategic Environmental Assessment falls under article 7 of the Aarhus Convention<sup>1</sup> as a form of public participation during the preparation of plans and programmes. The Aarhus Convention recognises that public participation in decision-making enhances the quality and the implementation of decisions, and gives the public the opportunity to express its concerns and enables public authorities to take due account of such concerns. From this follows that an SEA process is not an exercise for the sake of itself, but a process in which the quality of the decisions concerning plans and projects are enhanced. This means that the SEA process is functioning as a justification procedure for the environmental impacts of these plans and programmes, and if these impacts cannot be justified, as a means for the public authority to take measures to prevent these impacts.

For that reason, a full overview of information has to be available to the public in the form of the Plan or Programme under discussion and the relevant SEA report, so that it can fulfil its function in the public participation process.

The Polish Nuclear Energy Programme and its SEA report do not give all information necessary to enable the justification of the potential environmental impacts of the development of nuclear power in Poland.

**By not providing all necessary information and coming to misleading conclusions, the Programme and SEA report are an insufficient basis for public participation as prescribed under the Aarhus Convention, the EU Directive on SEA and the SEA Protocol of the Espoo Convention.**

### Process

2. **The period of 21 days for reaction** - The Polish law on access to environmental information and environmental impact assessments prescribes a *minimum* period for public reactions of 21 days. Minimum means that this is considered the minimal reasonable time frame for procedures of minimum size.<sup>2</sup> The Aarhus Convention requires that reasonable time-frames are given for the different phases.<sup>3</sup> The EU Directive on SEA prescribes “appropriate time frames to express their opinion on the draft plan or programme and the accompanying environmental report before the adoption of the plan or programme or its submission to the legislative procedure”.<sup>4</sup>

The minimum time-frame of 21 days in Polish law is the minimum for simple cases. In the case of over 1200 pages of complex documentation<sup>5</sup> for a plan with potential influence on all of Poland and far beyond its borders, using this minimum is not reasonable as defined under the Aarhus Convention nor appropriate as formulated under the EU Directive on SEA.

The Ministry of Economy announced the public participation period for the SEA procedure on 30 December, thus including several public holidays, as well as partly choosing a time that is generally seen by the public as holiday-time. In this time it is more difficult for the public and NGOs to gather expert input

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1 Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters done at Aarhus, Denmark, on 25 June 1998; <http://www.unece.org/env/pp/documents/cep43e.pdf>

Polish version: <http://www.unece.org/env/pp/EU%20texts/conventioninpolish.pdf>

2 See footnote 1

3 Aarhus Convention, art. 6(3): “The public participation procedures shall include **reasonable time-frames** for the different phases, allowing sufficient time for informing the public in accordance with paragraph 2 above and **for the public to prepare and participate effectively during the environmental decision-making.**” [emphasis added, JH]

4 EU Directive 42 of 2001 on SEA, art. 6(2): “The authorities referred to in paragraph 3 and **the public** referred to in paragraph 4 **shall be given an early and effective opportunity within appropriate time frames to express their opinion** on the draft plan or programme and the accompanying environmental report before the adoption of the plan or programme or its submission to the legislative procedure.” [emphasis added, JH]

5 The documentation consists of the **Polish Nuclear Energy Programme** from 16 November 2010, 125 pages, the **Strategic Environmental Assessment of the Polish Nuclear Energy Program** of 785 pages and an **Appendix - Options for localization**” of 295 pages.

in order to formulate a quality opinion on the documentation. The reduction of time to prepare input resulting from the choice for such a period is neither reasonable nor appropriate and violates also the notion of “at least” as used in the Polish law.

**For these reasons, Greenpeace demands from the Ministry a prolongation of the response time to 3 months, i.e. to 31 March 2011.**

3. **Transboundary consultation** - Poland has signed the SEA Protocol under the Espoo Convention on 21 May 2003 in Kiev, but has not ratified it yet. However, the EU, which is also signatory to the Protocol, approved the protocol on 12 November 2008.

The SEA Protocol under the Espoo Convention prescribes a full transboundary SEA procedure for plans and programmes in the energy field.<sup>6</sup> The SEA Protocol under the Espoo Convention prescribes in art. 8 transboundary public participation.

The SEA Protocol under the Espoo Convention furthermore demands reasonable time-frames for public participation.<sup>7</sup>

The EU SEA Directive prescribes a transboundary SEA procedure for plans or programmes likely to have significant effects on the environment in another Member State. The adoption of the use of nuclear power in Poland will have potentially significant effects on surrounding Member States and beyond.

The EU SEA Directive prescribes in article 6 transboundary public participation.

**Greenpeace demands from the Ministry the start of a transboundary SEA procedure in which it informs all surrounding countries and the countries around the Baltic Sea of its intention to finalise a Polish Nuclear Energy Programme and offers the possibility for a transboundary consultation.**

4. **Availability of documentation only in Polish** – The documentation is only made available in the Polish language.

The public is with this programme confronted with a highly complex matter. It is therefore likely that the public, and especially non-governmental organisations, will have to gather expert opinions in order to be able to give a quality response to the plans. The amount of nuclear expertise in Poland is highly limited and Greenpeace needed to consult experts from outside the country.

The public outside of Poland and EU residents in Poland that are not fluent in the Polish language have a right on access to the public participation procedure under the same circumstances as Polish citizens (Aarhus Convention, art. 9).<sup>8</sup> Other EU Member States and signatories to the Espoo Convention and its SEA Protocol and their citizens will need access to the documentation in another language than Polish.

In the case of the transboundary Environmental Impact Assessments under the Espoo Convention of Belene (Bulgaria), Cernavoda (Romania) and Visaginas (Lithuania), a full English translation was made

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6 SEA Protocol of the Espoo Convention, art. 4(1-2): “1. Each Party shall ensure that a strategic environmental assessment is carried out for plans and programmes referred to in paragraphs 2, 3 and 4 which are likely to have significant environmental, including health, effects. 2. A strategic environmental assessment shall be carried out for plans and programmes which are prepared for [...] energy, [...] and which set the framework for future development consent for projects listed in annex I and any other project listed in annex II that requires an environmental impact assessment under national legislation.”

7 SEA Protocol of the Espoo Convention, art. 8(4): “Each Party shall ensure that the public referred to in paragraph 3 has the opportunity to express its opinion on the draft plan or programme and the environmental report **within a reasonable time frame.**”

8 “Within the scope of the relevant provisions of this Convention, the public shall have access to information, have the possibility to participate in decision-making and have access to justice in environmental matters without discrimination as to citizenship, nationality or domicile and, in the case of a legal person, without discrimination as to where it has its registered seat or an effective centre of its activities.”

available to the interested public.

Because of the obligation of international consultation under the EU SEA Directive and the Espoo Convention SEA Protocol, the availability of an English version of all materials should be taken as a standard procedure.

When the public has to produce translation itself in order to get international feedback, it will not be able to do so within the currently given time-frame of 21 days.

**Greenpeace demands that the Ministry gives access to the documentation also in the English language, which is commonly seen within the EU as *lingua franca*, or to extend the period for public consultation with an extra month – i.e. to 30 April 2011 – to enable citizens and NGOs to produce translations themselves.**

## Content

### 5. The Polish Nuclear Energy Programme

The Programme is a rough-brush plan. It misses a lot of essential information, which partly is covered by the later developed SEA report. Hereunder only a few examples of low quality information as an illustration.

Poland is said in the Programme to be a net importer of energy. That is not true for electricity. The UCTE / entso-e statistics show that in 2008, Poland **exported** net 683 GWh. In 2007, the export was even 5355 GWh. In 2006, export was 11006 GWh. In 2005, 11180 GWh. In 2004, export was 450 GWh. In 2003, 10276 GWh. In 2002, 9320 GWh. In 2001, 6729 GWh. In 2000, 6518 GWh. In 1999, 5657 GWh. It is clear that Poland has been traditionally a large exporter of electricity, although there are changes between different years, both in net amounts as well as in amounts to different countries.

From further analysis it becomes clear that the Ministry wants to develop renewables and nuclear power in order to maintain Poland's export position – whereas it continues to rely on conventional fossil sources for covering the domestic demand.

The Programme is based on the 20/20/20 climate targets of the EU and does not take into account that the EU is likely to increase its emission reduction target to 30% in 2020, as soon as an agreement is reached with other high emitters within the UNFCCC. This is important, because possible construction work for nuclear power stations before 2020 will add to the greenhouse gas emissions in Poland and therefore reduce the chance of Poland to reach its 2020 goals.

The analysis of demand and capacity seems to be based on a patchwork of different studies that do not fit together seamlessly. There is no systematic analysis of different possible policy scenarios.

Page 19 of the Programme shows completely unrealistic time-frames. A 4-year construction time for a reactor has not been achieved anywhere over the last decades, and certainly not in a newcomer country! Furthermore, public participation in the form of this SEA and the following EIA have not been included. This lack of awareness of need for environmental assessment is shocking, but also will add to the time-line.

From the list of responsibilities on page 20 and further, it becomes clear that this is a state-driven project, not at all a market driven project. This goes against the liberalisation of the electricity market and gives nuclear power a non-market-conform advantageous position – especially in comparison with potentially competing generation forms like co-generation, renewable energy sources and energy efficiency measures.

**Page 37, Table 4.1 – investment costs for nuclear.** The investment costs of 3000 EUR '05/MW installed are approaching realistic figures, but are still around 50% under current reality. It would be wise to use at least 3500 – 4500 for a real comparison.

The chapter on Environment is completely inadequate. It does not address the problems of fuel production, transportation risks, back-end, nor accidental emissions and their effects on the environment. It does not address the need for large amounts of cooling water and the effect on the local environment. This should not be out-sourced to the SEA report, but be an inherent part of the Programme. This is also true for an analysis of potential accidents and their consequences for Poland and Europe.

The Programme is not transparent in its sourcing of data and uses very little factual information. It completely lacks comparisons between different energy policy scenarios.

## The Strategic Environmental Assessment of the Polish Nuclear Energy Programme

### 6. **Alternatives** – The report is inadequate in its analysis of alternatives.

Under the Aarhus Convention, the Espoo Convention and the SEA Directive, the Programme needs to be compared with realistic alternatives. In the case of an energy programme (be it in general or the programme for one generation source of electricity), the only sensible comparison is one between different policy scenarios, delivering different energy-mixes.

The report only describes one possible mix, based on a non-comparative analysis of the development of different electricity generation sources and energy efficiency. The report suggests that within that mix, nuclear energy is inevitable. This inevitability is, however, highly speculative, because no comparable data are made available for other possible energy mixes.

There is not only one possible development path, but many. Each of these paths, based on its own mix of policy measures, delivers in the long term different energy mixes.

There are several recent studies that have shown that for the EU-level a scenario leading to 100% renewable energy sources in 2050 is feasible<sup>9</sup>, and these scenarios prove to be more beneficial on all socio-economic parameters as well as environmentally than alternative scenarios.

Therefore, among the alternative scenarios that should be developed for Poland, at least one should be based on a target of 100% renewable energy (RE) provision in 2050, based on development of energy efficiency and RE.

### 7. **Biased treatment of different energy sources in the proposed energy mix** – In the energy mix proposed in the SEA report, the demand growth numbers are unrealistically high. The energy efficiency and RE targets in the chosen mix are not brought forward as alternatives, but as insufficient means to fulfil this unrealistic demand growth (fig. 10.1.3). A 15% part of RE in 2020 is without any serious ambition – a lot lower than the ambition of the nuclear programme. With that, the authors introduced an unacceptable bias towards nuclear power.

We furthermore have to conclude that the criteria and uncertainties that are mentioned for the development of EE and RE are *not* used in the analysis for nuclear energy, which gives another bias towards nuclear energy.

### 8. **The costs of nuclear power** – Throughout the study, the authors use too low estimates for costs of new nuclear power stations. The current costs hover between 3500 € / MWe and 4500 € / MWe, with cost

9 McKinsey & Company, KEMA, The Energy Futures Lab at Imperial College London, Oxford Economics and the ECF, *Roadmap 2050 - a practical guide to a prosperous, low-carbon Europe*, Berlin (2010) European Climate Foundation; <http://www.roadmap2050.eu/downloads>

Price-Waterhouse-Coopers, PIK, IASA, ECF, *100% renewable electricity; A roadmap to 2050 for Europe and North Africa*, London (2010) Price-Waterhouse-Coopers; [http://www.pwc.co.uk/eng/publications/100\\_percent\\_renewable\\_electricity.html](http://www.pwc.co.uk/eng/publications/100_percent_renewable_electricity.html)

Sven Teske (ed.), *energy [r]evolution - towards a fully renewable energy supply in the EU 27*, Brussels (2010) Greenpeace / EREC; <http://www.greenpeace.org/eu-unit/press-centre/reports/EU-Energy-%28R%29-evolution-scenario>

estimates in Canada and the US being even higher than that. Also several studies on which this SEA report is based, e.g. the ExternE studies, use too low construction costs for nuclear power stations. This is of crucial importance, because these higher constructions costs make nuclear power uncompetitive with gas and with most RE sources as well as most of the available energy efficiency technologies. With that the entire picture of the possible role of nuclear power shifts.

9. **Nuclear power and greenhouse gas emissions** – The authors claim on page 8-595: **“Elektrownie jądrowe nie będą miały negatywnego wpływu na klimat, a wprost przeciwnie – ich wprowadzenie pozwoli ograniczyć emisje CO<sub>2</sub> przez uniknięcie emisji z elektrowni opalanych paliwami kopalnymi.**” [Nuclear power plants do not have a negative impact on the climate, on the contrary – its input will help to reduce CO<sub>2</sub> emissions by avoiding emissions from power plants burning fossil fuels.].

This is not true.

First of all, the construction of nuclear power stations in Poland would push Poland out of line with the European climate targets for 2020. For the construction of nuclear blocks, Poland will need to use an enormous amount of fossil fuels that will increase its CO<sub>2</sub> emissions.

It has to be pointed out here, that according to the International Panel on Climate Change, greenhouse gas emissions would need to peak around 2015 if we want to have a reasonable chance to maintain temperature rise this century under 2° C.

When Poland follows a similar trend as Finland, it will see because of the construction of nuclear power stations a slump in the development of energy efficiency and of renewable energy sources that would (per kWh delivered) emit less CO<sub>2</sub> than a nuclear power plant.<sup>10</sup> Out of all options, a combination of energy efficiency and renewable energy sources is the most likely to be able to deliver the greenhouse gas emission peak in 2015.

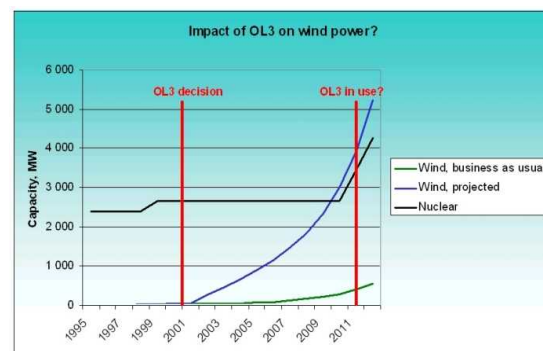
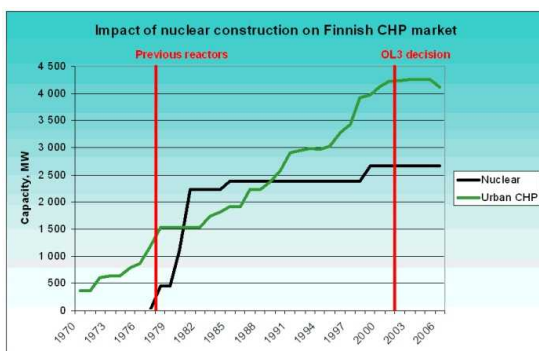
Depending on the development of the uranium market, the CO<sub>2</sub> emissions of nuclear power stations could reach after 2020 levels that could go as high as 112 gCO<sub>2</sub>/kWh, which is a factor 2 to 5 more than renewable energy sources.<sup>11</sup>

The construction of nuclear power stations therefore can in no way be seen as part of climate protection, but rather aggravates the situation. This apart from the other unsolved problems that nuclear power brings about, including nuclear waste, costs, technological and fuel dependency, ongoing radioactive emissions and rest-risk of a nuclear accident, including from terrorist threat.

The authors of the SEA report furthermore base their estimate of CO<sub>2</sub>-emissions from nuclear power on intransparent industry data. Based on a comparison 103 life-cycle studies, Sovacool<sup>12</sup> comes to a range between 1,4 gCO<sub>2</sub>eq/kWh to 288 gCO<sub>2</sub>eq/kWh with a mean value of 66 gCO<sub>2</sub>eq/kWh.

10. **The grid-conflict between centralised nuclear and decentralised RE development** – The report does not pay any attention to the conflict that will arise in grid-management between the input of variable,

10 Although Finland has a large potential for CHP and wind energy, investments in both have virtually halted because of the construction of new nuclear capacity in Finland. (Source: Greenpeace Finland)



11 Benjamin K. Sovacool, Valuing the greenhouse gas emissions from nuclear power: A critical survey, Energy Policy 36 (2008) 21940 – 2953, Elsevier

12 Ibidem

flexible and cheap decentralised RE sources and inflexible, expensive centralised sources as coal and nuclear power. This grid-conflict – especially in the time-frame of the coming 15 years – leads to large changes in the cost picture for nuclear power. Greenpeace has issued a first study on the issue in 2010<sup>13</sup> and published a more detailed study on the 18<sup>th</sup> of January 2011.<sup>14</sup>

The upcoming conflict between RE and nuclear power can already be illustrated with the proposals from the authors for new grid connections and grid improvements. This plan does not include the possibilities for connection to the German-Swedish sea-links that are currently under development for the attachment of off-shore wind in the Baltic Sea. That means that by developing the plans in this Programme, Poland is already missing the boat for one of its most important potential RE sources and optimisation of the grid for that purpose.

11. **Socio-economic impact of nuclear power** – Like all other factors, the socio-economic impact of nuclear power is not compared with possible alternative policy scenarios. Therefore the claims that nuclear power will lead to “changes in the value of land in the area, municipal revenue growth, improvement of infrastructure, a reduction of unemployment, economic recovery of the region, and improvement of the country's energy security” in chapter 9 are empty. It is unknown how the local economy would be able to benefit from the development of renewable and decentralised energy sources, it is certain that an energy efficiency and RE oriented development will create more jobs, and an energy efficiency and RE oriented policy will certainly lead to a larger energy security, as the electricity system will not be depending on imported nuclear fuel, to a lesser extent on imported technical expertise, and will be less vulnerable to the instabilities in the grid caused by unexpected shut-downs of large 1000 MW or 1658 MW units. Chapter 9 illustrates the problem of not comparing different policy scenarios. It states that jobs will be created, but does not calculate how many jobs will be lost because the energy efficiency industry and RE industry will not be developed instead.
12. **The use of external studies is one-sided** – The authors use a wide spectrum of outside studies to support their argumentation. It has to be noted, however, that they consequently leave out more critical studies and some of the studies they use are contested (e.g. the ExternE studies from the European Commission – contested on its assumption of construction costs, its methodology for comparing incidents and accidents, and others). In case there will be more time for public input, Greenpeace is willing to provide more studies on issues as cost, nuclear safety, security, nuclear waste management, alternative scenarios and others.
13. **Insufficient inclusion of full fuel chain analysis** – Although the report claims to pay attention to full fuel chain influences, among others by using the McKinsey study on greenhouse gas emissions per delivered kWh and the ExternE studies on inclusion of externalities, full fuel chain analysis is not consequently used in the report. There is insufficient description of the environmental impacts of uranium mining, fuel production, risks of transport, risks of spent nuclear fuel management, environmental impacts of reprocessing and once-through use of fuel and radioactive waste management. For a more detail analysis of what is missing, more time needs to be available.
14. **Insufficient basis for the conclusion that the Programme would reduce social costs associated with energy production** – Because there are no scenario comparisons, no total integration of full-chain analysis, an insufficient analysis of impacts of accidents, the conclusion that the Programme would reduce social costs associated with energy production is at least preliminary and unscientific if not outright misleading.

13 Ackermann, Thomas, Eckehard Tröster, Rebecca Short, Sven Teske, *[R]enewables 24/7 - Infrastructure Needed to Save the Climate*, Brussels / Amsterdam (2009) EREC, Greenpeace;  
<http://www.greenpeace.org/raw/content/international/press/reports/renewables-24-7.pdf>

14 Van De Putte, Jan, Rebecca Short, *Battle of the Grids – How Europe can go 100% renewable and phase out dirty energy*, 2011 (Brussels) Greenpeace; <http://www.greenpeace.org/eu-unit/press-centre/policy-papers-briefings/battle-of-the-grids>

Tröster, Eckehard, Rena Kuwahata, Thomas Ackermann, *European Grid Study 2030/2050*, Langen (2011) Energynautics GmbH;  
[http://www.energynautics.com/downloads/europeangridstudy2030-2050/energynautics\\_EUROPEAN-GRID-STUDY-2030-2050.pdf](http://www.energynautics.com/downloads/europeangridstudy2030-2050/energynautics_EUROPEAN-GRID-STUDY-2030-2050.pdf)



15. **Inconsequential use of basic principles** – The Programme quotes the central principles of the Treaty of the Functioning of the European Union art. 191 as basis - including the precautionary principle, the principle of prevention, the principle of repairing the damage at the source and the polluter pays principle. However, these principles seem to play no role in the assessment of risks of large accidents and their environmental impacts, the environmental impacts of fuel production and radioactive waste production and radioactive waste management.
16. **Insufficient analysis of large accidents** – The report pays insufficient attention to the possible environmental impacts of large – especially beyond design – accidents.

**Malevolent attack** – In comparison with other ways to meet the demand for energy services, especially in comparison with energy efficiency and renewable energy sources, nuclear power stations add a unique risk in the form of malevolent attacks. The possible emissions and possible enormous consequences from such an event should be taken into account in the justification process of environmental impacts of the project. If 9/11 has shown anything, it is that no effort of security services, flight security and protection of airspace can fully exclude the possibility of malevolent attack on strategic or symbolic targets. During the investigations around 9/11 it also became clear that nuclear power stations were possible targets. The risk of malevolent attack is not only confined to attacks with aircraft, but also includes internal sabotage, attacks with charged heads and others. The necessary measures by the state to completely prevent these kind of events would need to turn Poland into a police state – the so called “Atomstaat”, for which the philosopher Robert Jungk already warned in 1977.<sup>15</sup>

#### **Insufficient assessment of a serious accident**

The evaluation of a nuclear accident in the SEA report does not sufficiently assess the possible impacts of large accidents. It gets stuck in chance-calculations, but does not sufficiently acknowledge the possibility that part of the core can come into the environment under certain circumstances.

The study completely lacks an analysis of the spread of emissions in the case of a large beyond-design accident. It furthermore does not even attempt to estimate possible source terms for such accidents. This follows the trend to underestimate such events in Environmental Impact Assessments for new nuclear power stations, like for instance the EIA of the proposed Temelín blocks 3 and 4 in the Czech Republic. There calculations were based on a 0,03 PBq emission of caesium-137, a 1,0 PBq emission of iodine-131 and 770 PBq of Xe-133. Thus the total radioactivity of the evaluated emissions would amount to less than 100 PBq, which is less than 1/1000 of the radioactivity contained in a modern reactor<sup>16</sup>. This presupposes that only 0.015 percent of the caesium, for instance, and 0.03 percent of the iodine contained in a European Pressurized Reactor would be released into the environment<sup>17</sup>. This does not correspond to a serious nuclear accident. Analyses made on the international level typically suppose that between 10 and 50 percent of caesium and at least one percent of iodine is emitted in a nuclear accident<sup>18,19</sup>.

The total radioactive emission of the Chernobyl disaster was approximately 12 000 PBq, i. e. a thousand times that used in the EIA estimates<sup>20</sup>, although compared to the Chernobyl facility, the planned Temelín reactors would be larger and their fuel burn-up drastically higher. The estimates of the caesium release

15 Robert Jungk, *Der Atomstaat – Vom Fortschritt in die Unmenschlichkeit*, München (1977) Kindler, ISBN 3-463-00704-5

16 This estimate is based on the isotope distribution in a 1000 MW pressurised water reactor with a fuel burnup of 35 GWd/t. Data: Large & Associates 2007: *Assessments of the radiological consequences of releases from proposed EPR/PWR nuclear power plants in France, Annex 2*.

17 Bouteille, François & al. 2006: *The EPR overall approach for severe accident mitigation*. Nuclear Engineering and Design 236 (2006), p. 1464 – 1470.

18 Large & Associates 2007: *Assessments of the radiological consequences of releases from proposed EPR/PWR nuclear power plants in France*.

19 US Nuclear Regulatory Commission 1975: *Reactor Safety Study, an Assessment of Accident Risks in US Commercial Nuclear Power Plants, WASH-1400*.

20 Nuclear Energy Agency 1995: *Chernobyl, Ten Years On*, p. 29.

fraction, for example, in the Chernobyl accident vary from 20 to 80 percent<sup>21</sup>. The radioactivity of caesium in an EPR, for example, is approximately 700 PBq, that is 2,5 times that in the Chernobyl reactor. The high fuel burn-up and the possible use of MOX fuel further dramatically increase the potential emission of radioactive substances.

The following illustrates one example of a sequence of events that might lead to a serious nuclear accident in a modern pressurised water reactor. This scenario was conceived by John Large, a leading advisor in nuclear safety, who has worked for decades in research projects at the British Atomic Energy Authority. Among other tasks, Mr. Large was in charge of charting the state of the sunken nuclear submarine Kursk and raising it back to the surface.

*On these grounds we demand that the examination of a nuclear accident be based on the quantity of radioactive materials contained in a modern nuclear reactor with a high fuel burn-up and the supposition that a significant fraction of these materials is released into the atmosphere. The estimation of these fractions must be based on acknowledged international research and experience. All data used in evaluating these emissions must be published – currently, for example, the quantity of radioactive materials contained in a functioning EPR cannot be found in any public documents.*

TIME seconds	SEQUENCE EVENT
0	The assumption is that the reactor is operating at full power when the operators take inappropriate action following what seems to have been a straightforward reactor trip triggered by, say, the loss of steamside feedwater to the steam generators.
30	Unknowingly, the operators then follow established plant procedures to restart the reactor being unaware that the plant is in fact suffering from an unanalysed (not prescribed) event such as, say a small loss of coolant incident via the RPV circuit pressuriser system. As the incident develops with the operator intervention having no effect, at about 30 seconds into the incident, the reactor alarms transmit to the control room at a rate of over 100 per minute.
480	Too many of the alarm messages are of a diversionary nature and delay the operators present moving to a correct analysis of the situation and inability be able to isolate the fault conditions then developing apace.
555	In the highly stressed environment, the operators trigger the high pressure injection pumps not knowing that this would result in a loss of the pressuriser bubble and injection of unboranated water into the core. When, at about 75 seconds. The condenser hotwell high level alarm sounds with an impending loss of condenser vacuum, the operators become preoccupied in considering the option of initiating a steam dump to atmosphere.
2055	With the operators still believing that events are on course for the reactor restart, at about 25 minutes into the incident increased neutron flux signals, caused by steam voids now forming in the MOX fuel core, prompt concern about recriticality so much so that the operators scram the reactor, turning off the primary pumps in one of the two steam generator loops to provoke flow reversal induced by continued pumping in the other loop.
2415	However, again unbeknown to the operators, the isolated loop has boiled dry, so flow reversal and cooling is unavailable because steam has siphon blocked the 'U' section of the primary circuit to this loop. The remaining loop pumps a two-phase mixture, flow decreases due to increasing voidage causing the pumps to trip followed by boiling in the RPV after about 6 minutes with the water level lowering to uncovered the fuel core.
3315+ say 1 hour	Within 15 minutes, the dry space above the core fills with superheated steam leading a zirconium-steam reaction with, within seconds, a hydrogen explosion sufficient to rupture the RPV and eject much of the molten fuel mass, itself leading to a series of molten fuel-water explosions sufficient to breach the reactor building containment.
14,115 say 4 hours	Incident ends, radioactive release commences through damaged secondary containment, continuing steadily for about three hours as water remaining in the containment continues to boil off incurring a series of smaller hydrogen burns and explosions.

21 Sich, A. R. 1994: *The Chernobyl Accident Revisited: Source Term Analysis and Reconstruction*. MIT.

Proper source terms should be used in meteorological spreading models to estimate the impacts of such large accidents on a larger scale. It is incomprehensible that such analyses have not been taken up in Chapter 7. Given proper source-terms, such maps can illustrate better than anything else what the consequences of large accidents can be for the population.

It is in a fast analysis of Chapter 7 not clear where the data and methodology used in this chapter come from. Is this from the providers of nuclear technology (Areva, Westinghouse, GE?) or is this self-developed? The reference to a “Good Practice Guide for Atmospheric Dispersion Modelling” without any other reference of source is not really impressive. It is not clear whether the used calculation methods are a hodge-podge of different methodologies or a systematically built up own methodology.

47. **Nuclear safety** - The authors have a blue-eyes view on the reality of nuclear safety. They write on page 3-178, for instance, “*Elektrownie proponowane dla Polski będą spełniały najostrzejsze wymagania bezpieczeństwa i ochrony radiologicznej.*” [The proposed Polish power plants will meet the strictest requirements for safety and radiological protection.] What a Nuclear Energy Programme should prescribe is that these highest levels of safety and radiological protection should be met. Whether they are met is a question of design, implementation and high quality oversight – all of which still have to be established. The construction of new nuclear capacity in Finland (Olkiluoto 3), France (Flamanville 3) and Slovakia (Mochovce 3,4) shows that during the actual implementation of nuclear power projects, many problems are encountered that do not guarantee automatically the highest level of safety. Whether this is in the form of design (Mochovce 3 and 4 are not meeting BAT) or implementation (Olkiluoto 3 already has registered over 3000 safety violations during construction, Flamanville 3 is following closely). Also, the French and Finnish example illustrate the importance of a highly experienced and independent nuclear regulator – something that still needs to be developed in Poland.
- The sentence on page 3-178 illustrates that the authors only rely on positive information and are not sufficiently aware of critical information.

#### 48. **Nuclear power and health**

**Tritium** – Chapter 7 pays too little attention to the emissions of Tritium and possible consequences. These have recently been highlighted by studies of IRSN (France) as needing more attention.<sup>22</sup>

**Recent research possibly linking certain cancers to nuclear power** – In paragraph 7.7.8, the authors leave out recent large scale studies in Germany<sup>23</sup> and the USA that indicated an increase of several forms of cancers related to the distance towards nuclear power plants. Also in the overall table in 9.1.1, page 9-654, these findings have been excluded.

#### 49. **Spent nuclear fuel and nuclear waste**

**Reprocessing** - The information about reprocessing in chapter 8 has been taken from PR materials from EdF and Areva and do not give an adequate picture of the immense pollution caused by the technology nor of the fact that only a small fraction (less than 10%) of the initial material is actually re-used.

**High-level radioactive waste (HRW)** – The issue of HRW is not dealt with adequately at all. It sketches deep geological disposal as final management, without addressing any of the controversies that currently exist around this form of waste management in Finland, Sweden or France (the only countries currently investigating the option).<sup>24</sup> It does not mention alternative options. It does not come to the hard conclusion that currently there is no existing management method anywhere in the world and investigated methods are so far only speculative.

22 <http://livre-blanc-tritium.asn.fr/plus/telechargements.html>

[http://www.irsn.fr/FR/Actualites\\_presse/Actualites/Pages/20100709\\_rapports\\_IRSN\\_etat\\_connaissances\\_tritium.aspx](http://www.irsn.fr/FR/Actualites_presse/Actualites/Pages/20100709_rapports_IRSN_etat_connaissances_tritium.aspx)

23 Kaatsch P, Spix C, Schulze-Rath R, Schmiedel S, Blettner M (2008) *Leukaemia in young children living in the vicinity of German nuclear power plants*. Int J Cancer. 2008 Feb 15; 122(4) pp 721-6

24 Helen Wallace, *Rock Solid? A scientific Review of Geological Disposal of High-Level Radioactive Waste*, Buxton (2010) GeneWatch UK; <http://www.greenpeace.org/eu-unit/press-centre/reports/rock-solid-a-scientific-review>

**The report avoids difficult issues** – On page 8-546, the authors state: “*W niniejszym opracowaniu starano się nie unikać problematyki powstawania, transportu i składowania odpadów promieniotwórczych.*” [In this study, no attempt was made to avoid the problems of formation, transport and storage of radioactive waste.] This is factually not true, as the conclusion that there is no solution for radioactive waste has not been explicitly drawn.

**Salami-slicing of the Programme to avoid difficult issues** – On page 8-546 it is stated: “*Należy jednak podkreślić, że ta część cyklu paliwowego nie jest objęta przedmiotowym zakresem prognozy oddziaływania na środowisko Programu Polskiej Energetyki Jądrowej.*” [It should be noted, however, that this part of the fuel cycle does not fall within the scope of environmental impact assessment of the Polish Programme for Nuclear Energy]. If a SEA does not look to the waste products produced by the plan or programme, what is the use of a SEA? This is really incredible! The quoted reference to art. 5.2 of the SEA Directive is a *chotspe*. With a pig-stable one would not be allowed to leave out the waste produced. Let alone with a nuclear energy programme. What has to be highlighted here, is that – very controversially – the waste issue also is not addressed in recent EIAs of nuclear power stations. The production of radioactive waste is, however, a crucial and inherent element of the environmental impacts of nuclear energy and likewise is its analysis essential for any justification decision for the adoption of nuclear energy in the energy mix. Even stronger – it should be the basis for any decision procedure for new nuclear projects: if there is no solution for the waste and there are feasible alternatives for the programme, there should be no new production of nuclear waste (precautionary principle).

50. **Impact of emissions** – The description of possible influences in chapter 9 (page 9-652 and further) does not address the impacts of emissions after a heavy accident. This chapter also does not include impacts of emissions during the front-end of the fuel chain (mining, fuel production, transport) and decommissioning and the back-end of the fuel chain (spent nuclear fuel processing, radioactive waste management). As these are crucial potential emissions that need to be justified in comparison with other options to fulfil the goals of the Polish energy policy, this omission is unacceptable.

51. **Conclusions and recommendations (Chapter 11, page 11-734 and further)** – This chapter is possibly the weakest of the entire report. It is postulated that “*Programu ma wysoki potencjał obniżenia kosztów społecznych związanych z produkcją energii jak również redukcji emisji gazów cieplarnianych*” [the Programme has a high potential for reduction of social costs associated with energy production as well as reducing greenhouse gas emissions.]

Because the analysis is based on unrealistically low construction costs for new nuclear power stations, on an insufficient analysis of back-end costs (decommissioning and radioactive waste management) and an insufficient analysis of the development of the uranium market in the coming 60 years, this statement cannot be upheld.

Furthermore, the analysis completely lacks a comparison of different realistic policy scenarios, including scenarios without nuclear power development and based on further development of energy efficiency and renewable energy, as for instance carried out by McKinsey, PriceWaterhouseCoopers, Greenpeace and EREC.<sup>25</sup> Because of that, it is impossible to claim on the basis of this SEA report that the development of nuclear power in Poland will indeed reduce social costs and greenhouse gas emissions with such a level that it can justify the potential environmental impacts.

The arguments used in Chapter 11 for the urgency of implementation of this Programme are exactly the

25 McKinsey & Company, KEMA, The Energy Futures Lab at Imperial College London, Oxford Economics and the ECF, *Roadmap 2050 - a practical guide to a prosperous, low-carbon Europe*, Berlin (2010) European Climate Foundation; <http://www.roadmap2050.eu/downloads>

Price-Waterhouse-Coopers, PIK, IASA, ECF, *100% renewable electricity; A roadmap to 2050 for Europe and North Africa*, London (2010) Price-Waterhouse-Coopers; [http://www.pwc.co.uk/eng/publications/100\\_percent\\_renewable\\_electricity.html](http://www.pwc.co.uk/eng/publications/100_percent_renewable_electricity.html)

Sven Teske (ed.), *energy [r]evolution - towards a fully renewable energy supply in the EU 27*, Brussels (2010) Greenpeace / EREC; <http://www.greenpeace.org/eu-unit/press-centre/reports/EU-Energy-%28R%29-evolution-scenario>

same as for the implementation of possible alternatives. From that perspective the lack of comparison with realistic alternative policy scenarios is incomprehensible.

The conclusions fail to address the issue of management of radioactive waste as a top-priority. There is world-wide no satisfactory solution for dealing with radioactive waste, be it long-lived waste or high-level waste. On the basis of the precautionary principle, this issue should be solved before Poland would want to start the development of nuclear power.

52. **Propaganda** - The SEA report rightfully states: "*Program ten nie może mieć charakteru propagandy na rzecz energetyki jądrowej.*" [This program may not have the nature of propaganda in favour of nuclear power.]

However, the Polish Nuclear Energy Programme itself states that the goal of the educational campaign is acceptance of nuclear energy. This is a propagandist goal.

Also the public support targets mentioned in the Programme on page 18 (target 7) point to opinion massaging instead of a public debate and proper public participation. The fact that the main responsibility for obtaining a favourable public opinion is put into the hands of a ministry is shocking – instead of a public debate that could help inform the ministry about the necessity of this programme, the ministry takes, in spite of its public function, the role of propagandist.

**The statement in the SEA means, that as outcome of this SEA, the current nuclear propaganda campaign carried out by the plenipotentiary for nuclear power should be immediately stopped and be replaced by an open and widely informed public debate about nuclear power before any further steps are taken.** It is advisable to start with a debate about management of nuclear waste.

Indeed, consequently, this public participation process in the SEA procedure should fulfil itself the condition of not functioning as a tool of propaganda, i.e. the public should be given wider information (e.g., different realistic policy scenarios for the development of the energy sector, better quality information on front-end and back-end of the fuel chain, better quality information about possible accidents and nuclear security) and the public should get a reasonable possibility to react on that information. The currently used legally minimal reaction time of 21 days fundamentally contradict this.

After the conclusion that information and education should not be propaganda, the report concludes: "*Powinien natomiast dostarczać społeczeństwu rzetelnych informacji oraz wskazywać na atuty energii jądrowej i jej niezbywalne miejsce wśród innych korzystnych dla środowiska metod pozyskiwania energii.*" [Society should be provided with reliable information and indications of the advantages of nuclear energy and its inalienable place among other environmentally beneficial methods of energy generation.] It is incomprehensible to me that this sentence can follow the former one. Non-propagandist information supply and education implies that society has a right to receive reliable information on the advantages **and disadvantages** of nuclear energy, and that society then should get the chance to freely conclude whether nuclear energy deserves a place among environmental beneficial methods of energy generation, **or not**. Basically, the report demands open debate, but is in itself a blunt tool of propaganda with pre-drawn conclusions.

Also the description of opposition against nuclear power on pages 71 and further falls under the label of propaganda. Instead of a proper description of movements that oppose nuclear developments in Poland and internationally, and a fair reflection of their arguments, the authors resort to defamatory language. The authors then give extra-proportional attention to a handful of people that present themselves with green credentials and that have a more favourable opinion towards nuclear energy (though it fails to mention that not all of them have a fully favourable one). The authors do not discuss the argumentation of those people, nor put them into a wider perspective.

It should be advised that the entire text is scanned for propaganda and adapted as to deliver a more balanced basis for the Strategic Environmental Assessment.

53. **Proposals incompatible with Aarhus, Espoo and EU EIA Directives** – The criteria proposed for the Environmental Impact Assessment in paragraph 11.3 do not fulfil those set in the Aarhus Convention, the Espoo Convention and the EU EIA Directives. I suppose they also do not fulfil Polish law, but I was in the short term allowed for public input not able to verify that.