SUBMISSION ON THE

EIA REPORT
for a new nuclear source
on the locality Temelín

Environmental Impact Assessment Report, as required by Czech law 100/2001 Sb.

by
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GREENPEACE

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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.

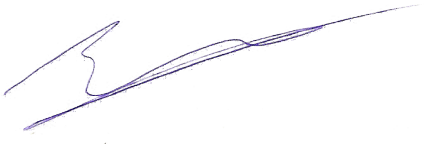
I work as an independent expert in energy issues with specialisation in nuclear energy issues for the global environmental organisation Greenpeace and work since 1987 in Central Europe. Previously to this EIA, I have participated in the Environmental Impact Assessment processes for the first two blocks 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 and the Mochovce 3,4 NPP in Slovakia.

I have been asked by Greenpeace International to write a submission on the Temelín 3,4 EIA report. I wrote these comments on personal title and my opinion – though based on my experience within Greenpeace and benefiting from input from 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 ČEZ be required to re-do the Environmental Impact Assessment on a sufficient level of quality.**

In the short term available for comment (only the legally minimum time for public comment on EIA reports of 30 days – without taking into consideration that a complex project like a nuclear power station needs more time than, for instance, a small local heating installation), I have not been able to assess all materials in complete detail. This 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 summer holidays – a period in which also I was partly unavailable.

I have been able to assess the Czech and German version of the EIA report, but have referred to the Czech version throughout this submission.



Prague, 06 August 2010 – the 65th anniversary of the Hiroshima nuclear bomb

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International

GENERAL COMMENTS

1. The process of an Environmental Impact Assessment falls under article 6 of the Aarhus Convention as a form of public participation during the preparation of a project. 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 EIA process is not an exercise for the sake of itself, but a process in which the quality of the decisions concerning projects are enhanced. This means that the EIA process is functioning as a justification procedure for the environmental impacts of the project, and if these impacts cannot be justified, as a means for the public authority to take measures to prevent these impacts.
   For the public to fulfil its function in the public participation process, therefore a full overview of information has to be available in the form of the EIA report.
   The EIA report for the Temelín 3,4 project does not give all information necessary for such a justification. As ultimate consequence, it even draws the untenable conclusion that the project will not have any influence on the environment, nor any influence outside of the borders of the Czech Republic.
   By not providing all necessary information and coming to misleading conclusions, the report proves to be an insufficient basis for public participation as prescribed under the Aarhus Convention.

Process

2. **Accessibility of the EIA documentation** – The EIA documentation was not easily available over the web-site of the Czech Ministry of Environment or of the promoter CEZ, but only over the Czech Environmental Information Agency cenia.cz. The information should be accessible in an easier way in order to reduce barriers for the public to participate in the procedure.
   The non-technical summary of the EIA documentation is a completely insufficient basis for the public to understand the project or to come to reasonable conclusions.
   Its availability at the end of a 600+ page report also does not enhance its accessibility.

3. **Language** - The EIA report was published in the Czech Republic only in the Czech language. It was furthermore translated into German for Germany and Austria, where it was published on the websites of the Environmental Ministries of Bavaria and Saxony. For a project of the magnitude of the Temelín nuclear power station with possibly considerable impacts on the environment of a large part of Europe and an obligation to submit the Environmental Impact Assessment internationally under the Espoo Convention, the availability of an English version of all materials should be taken as a standard procedure. The Espoo Convention art. 2 (6) requires a similar level of public participation and access to justice to be secured for citizens outside of the Czech Republic. Possible affected parties are not only German language countries, but also from Slovakia, Hungary, Poland and indeed countries further away. Availability of an English translation would also enable peer review by international experts on behalf of the public. In the case of Belene (Bulgaria), Cernavoda (Romania) and Visaginas (Lithuania), a full English translation was made available to the interested public.

   The documentation was only accessible over the Czech language web pages of the Czech Environmental Information Agency, and not over the English language pages.

4. **Period for comments** – The public was allowed to comment on the EIA report for the legally prescribed minimal period of 30 days. The Aarhus Convention prescribes in article 6 (3) that the public participation procedures shall include reasonable time-frames for the different phases, allowing sufficient time for the public to prepare and participate effectively during the environmental decision making. We argue that the minimal time of 30 days, which is valid as a minimum for relatively simple projects, is not a reasonable time for a complex project like a nuclear power station and 24 kilograms of documentation[1]. **We** therefore **demand a new period for public submissions of at least three months** in order to be able to analyse the documentation into more depth.

Content

5. **Sources of data** – The report is sloppy in indicating the sources of data. In most cases data are mentioned without any reference in footnotes or end-notes. This makes the report completely intransparent. Serious review by the public is hampered by this omission.

6. **Alternatives to the project** – Although the report describes alternatives to the project by referring to the Czech energy strategy and the Pačes Commission, realistic alternatives focusing on energy efficiency and renewable energy development are missing.

7. **Alternative sites** – The report excludes any alternative siting of the project. By excluding these alternatives, it becomes impossible to judge whether the Temelín site is indeed the most optimal one.

8. **Alternative designs** – The report states that four possible designs of nuclear power plants are taken into consideration. The amount of information available from these designs is to date too insufficient to enable proper comparison between them as well as with viable alternatives. None of the mentioned designs is currently in operation, and those two that are under construction and undergo regulatory scrutiny in different countries are faced with regulatory challenges. **We demand that more information on the different designs is included in the EIA report**, especially concerning the fuel characteristics, fuel use (burn-up, change of characteristics during use) use of the reactor (base-load or load-following) and safety and security measures.

9. **Lack of full chain impacts** – The report does not give a full overview of all environmental impacts that are inevitably linked to the project and that should be taken into account when comparing the project with alternative options. Especially the lack of detail information about the environmental impacts of the front-end (uranium mining, fuel production) and back-end (waste processing and decommissioning) is unacceptable. The authors argue that these steps are subject to their own procedures and legislation. This practice of compartimentalisation of the project, however, makes it impossible to come to a proper comparison with alternatives. In the case of a pig-stable, the final waste processing is supposed to be part of the EIA, and so should it be for a nuclear power station. To be able to compare the influence of the Temelín project on the general public, also the environmental impacts in the relevant uranium mining areas should be taken into account – also the inhabitants of those areas belong to the general public, and the realisation of the project inevitably will lead to demand for uranium ore and the accompanying environmental and health impacts.
The lack of inclusion of waste management is also an unacceptable form of compartimentalisation. Especially storage of nuclear waste is an issue that should have

1 http://www.cez.cz/en/investors/inside-information/1321.html - "RNDr. Jan Horák from SCES – Group, spol. s r.o., which processed the documentation, introduces preparation of the documentation of which total weight is 25 kilograms."

been included here, as operation of Temelín 3 and 4 inevitably and irreversibly leads to radioactive waste for which there is no solution with currently available technologies.

10. **Source term beyond design accident underestimated** – The report underestimates the source term for a beyond design accident and with that underestimates the possible impacts of such an accident. The experiences of Chernobyl show that these impacts are considerable and concrete.

11. **Cost and economy** – The report does not include any information on costs and economic parameters that would enable proper comparison between different alternatives. Without this basic information, claims that the project would help combating climate change become hollow, as the costs might be inhibitive in comparison with economically more viable alternatives. This is also true for the prevention of radioactive contamination anywhere along the fuel chain – if the costs are inhibitive, it is either likely that the necessary safety and security measures could be tuned down, leading to a larger risk, or that the costs are so inhibitive that the use of alternative ways to meet the energy service demands becomes more logical also from an environmental impact point of view.

12. **Realism of the project** – The report does not analyse whether the project is at all realistic. Current experiences with the construction of nuclear power stations in Europe show that these projects are widely over time and over budget, which is in line with historical experiences in the Czech Republic, where Temelín 1 and 2 came on-line after a more than double construction time and for more than three times the original budget. Increasing budgets and time over-runs can lead to cutting edges with direct effect on nuclear safety and the environmental impacts of the project, and therefore such an analysis is of high relevance for the EIA report.

13. **ALARA** – The above mentioned concern is highly relevant, because the project is concerning nuclear safety based on the principle of ALARA (risks should be As Low As Reasonably Achievable from economic and social point of view). The use of ALARA, and especially the use of the word “reasonable” is contested because it opens the door to cutting edges where nuclear safety is concerned on the basis of costs. In other fields, especially chemistry, the Precautionary Principle and the principles of Best Available Technology (BAT) and Best Regulatory Practice (BRP) are used. On the basis of these principles, the project would look completely different. Comparison with alternatives, especially the development of delivery of energy services based on energy efficiency and renewable energy sources, would also lead to a different conclusion – the conclusion that nuclear power does not provide BAT and is unacceptable under the premise of the Precautionary Principle, as it creates wastes for which there is no solution, as well as risks that are avoidable from economic, social and environmental sustainability point of view.

14. **Malevolent attack** – The authors refuse to properly address the issue of malevolent attack on the reactors as well as on high-level radioactive waste and spent nuclear fuel storage, transports and management facilities. The authors push this responsibility towards the State, but are unwilling to give the basic data necessary to compare the risks from new nuclear reactors in Temelín with other alternatives in this respect. Especially alternatives in the form of energy efficiency and renewable energy sources do not face these risks.

15. The report does not analyse the additional risks to the operation of Temelin 1 and 2 during construction of the new blocks, nor the additional risks to the operation of Temelin 3 and 4 during decommissioning of Temelin 1 and 2. The intensive work on a relatively limited geographical space could lead to an increased risk of design based or even beyond design accidents, including increased risk of malevolent attack.

16. There is no description whatsoever of the effects of a design based or beyond design accident on the personnel of the power station.

Concluding, I strongly recommend that the EIA report be dismissed by the Czech Ministry of Environment as insufficient and inadequate and that ČEZ be ordered to carry out a new EIA of sufficient quality.

In case this recommendation is not followed, it is very likely that I will recommend Greenpeace to take legal steps against a final approval of the EIA report, in which we will seek annulment of such a decision. This right that is guaranteed under the Aarhus Convention article 9.

DETAIL COMMENTS

Detail comments use the page numbering of the Czech version of the EIA report.

17. Page 80: The project is characterised as an ecologically clean form of electricity production. This is factually wrong. Nuclear power creates highly dangerous wastes that have to be kept out of the environment for periods of up to a million years and no technologies currently have been proven to be able to meet that challenge. Decommissioning of nuclear installations has to be done not by the generation benefiting from its output but by a next generation. Nuclear reactors all have a rest-risk on a large beyond design accident with ecologically catastrophic consequences. Nuclear power needs nuclear fuel derived from uranium mining – a highly polluting activity, as a recent Greenpeace study on uranium mining in Niger is amply illustrating.[2] The huge legacy passed to next generations excludes nuclear power from falling under any definition of sustainability.[3]
    The above mentioned remarks show that the authors have insufficient knowledge about potential negative effects of nuclear power generation on the environment. This fundamentally disqualifies them from carrying out an Environmental Impact Assessment.

18. The authors claim that other sources, including renewable energy sources, cannot cover the demand for electricity in the Czech Republic. They do so without any reference to proper analysis. In contrary, several recent scenario's show that it is possible to cover almost the entire energy demand in the EU, including the Czech Republic, in 2050 with renewable energy sources, and as part of that 100% of the electricity demand. One of them, with lead consultancy McKinsey[4], prepared for the European Climate Foundation (ECF), was even prepared in cooperation with the promoter of Temelín, ČEZ! Recent studies from Price-Waterhouse-Coopers[5], and

2 Andrea A. Dixon (ed.), *Left in the dust; AREVA's radioactive legacy in the desert towns of Niger,* Amsterdam (2010) Greenpeace; http://www.greenpeace.org/international/en/publications/reports/Left-in-the-dust/

3 The widest used definition of sustainability comes from the World Commission on Environment and Development in its 1987 report "Our Common Future", also knows as the Brundtland Report: *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*. It is widely accepted that the large economic and possibly environmental impact of decommissioning and radioactive waste management for future generations negatively impacts their ability to meet their own needs.

4 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

5 Price-Waterhouse-Coopers, PIK, IIASA, 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

Greenpeace and the European Renewable Energy Council (EREC)[6] illustrate that the 100% renewable pathway is indeed possible and from economic and environmental point of view the most beneficial one. Another study by the Stockholm Environment Institute[7] shows that an EU climate target of 40% emission reductions for 2020 – the year that Temelin 3,4 should deliver electricity to the grid – can be reached without new nuclear being installed. A coalition of Czech NGOs commissioned in 2009 the German Wuppertal Institute with a study that shows that the Czech Republic falls completely within this trend.[8]

19. The authors quote an electricity demand in the Czech Republic for 2009 of 69 TWh. They predict a demand of 96 TWh/yr in 2030.
The authors do not give the source of their numbers. The prediction for 2030 has to be characterised as on the very high side.
The European grid regulator entso-e gives for 2009 other numbers.[9] Consumption for the Czech Republic was in that year 61,6 TWh. But next to that, the authors fail to mention that electricity production in the Czech Republic in 2009 was according to entso-e 76 TWh. The Czech Republic exported according entso-e in 2009 a total of 13,6 TWh! This is more than the total output of the Temelín units 1 and 2 in 2009, which reached a record level of 13,3 TWh.[10] This illustrates that Temelín is not necessary to cover Czech demand, but rather to enable ČEZ to export electricity to a market that can easily do without, as already explained above.

20. The points above mean that the whole premise for justification of this ecologically dirty energy source is completely wrong. **Temelín 3 and 4 are not needed to meet future electricity demand.**

21. The authors refer to the scenarios worked out by the Pačes Commission and in their description already illustrate the largest error in the work of this Commission. The Commission excluded a scenario based on targeted energy efficiency policies and the development of renewable energy sources as described in the scenarios of Price-Waterhouse-Coopers, McKinsey, the Stockholm Environment Institute, Greenpeace / EREC and the Wuppertal Institute mentioned under point 18. This clearly demonstrated that the Pačes Commission was biased in favour of the promoter of the Temelín nuclear power station, ČEZ, and its report therefore cannot be used as sole basis for an EIA justification.

22. In its analysis on page 82 of the development of available fuels in the Czech Republic, the authors strangely enough fail to include nuclear fuel. There are widely differing estimates about the availability of uranium resources in the coming decades, but most importantly, uranium imports will make the Czech Republic depending on 1. the fuel

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6 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

7 Charles Heaps, Peter Erickson, Sivan Kartha, Eric Kemp-Benedict, *Europe's Share of the Climate Challenge - Domestic Actions and International Obligations to Protect the Planet*, Stockholm (2009) Stockholm Environment Institute; http://www.sei-international.org/publications?pid=1318

8 Stefan Lechtenböhmer, Magdolna Prantner, Sascha Samadi, *Development of Alternative Energy & Climate Scenarios for the Czech Republic*, Wuppertal (2009) Wuppertal Institute for Climate, Environment and Energy

Karel Polanecký e.a., *Chytrá energie - Konkrétní plán ekologických organizací, jak zelené inovace a nová odvětví mohou postupně proměnit energetický metabolismus české ekonomiky – a srazit znečištění, dovoz paliv i účty za energii*, Praha (2010) Hnuti Duha, Greenpeace, Veronica, Calla, CDE
http://hnutiduha.cz/uploads/media/chytra_energie.pdf

9 https://www.entsoe.eu/index.php?id=91

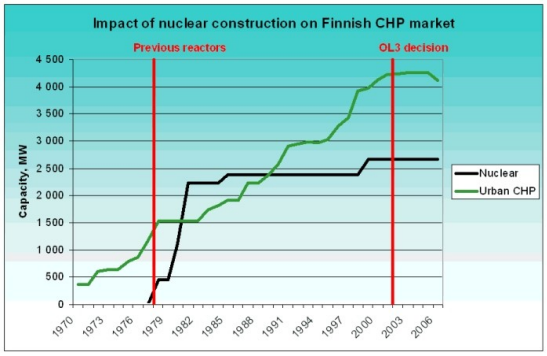
10 http://www.praguemonitor.com/2010/07/20/temel%C3%ADn-generates-100m-mwh-energy-ten-years

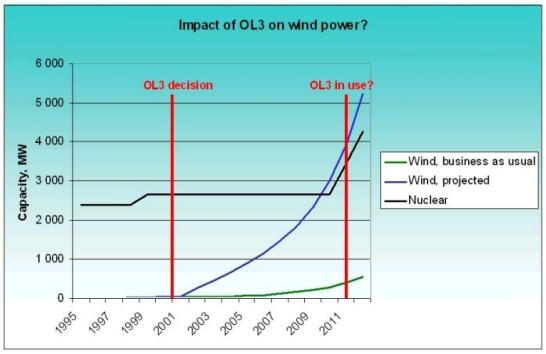
producer and 2. the country of origin of uranium. The fuel producer will likely be linked to the constructor of the reactor, which means Areva, Westinghouse, GE / Hitachi or Rosatom / TVEL. Although uranium fuel for European reactors used to come largely from relatively stable political countries like Australia, Canada and the US (though political stability is difficult to predict over the 60 year life time of new reactors), uranium now increasingly comes from politically highly unstable countries like Kazahstan, Niger and Namibia. This trend is likely to continue. With that, uranium fuel availability is at least as complex an issue as the availability of the other fuels described, with the exception of fuel for renewable energy sources outside of biomass.

23. The authors claim to give on page 83 an international comparison of nuclear energy development, but fail to come with any. Currently, only Finland, France and Slovakia are building new nuclear reactors in the EU. Finland and France are facing enormous time and budget overruns as well as a myriad of unexpected nuclear safety related issues with their EPR reactors. Slovakia faces financing problems, and builds two completely outdated VVER 440/213 reactors in Mochovce. Over the last decade, the amount of nuclear energy in the EU 27 electricity mix has slowly but steadily decreased and it is because of high construction costs and technical problems likely that that trend continues. The plans for new nuclear power stations at Temelín go against that trend.

24. The authors claim that the construction of Temelín 3 and 4 would be in line with the European climate targets for 2020. This is not true. For the construction of these blocks, the Czech Republic will need to use an enormous amount of fossil fuels that will increase its CO_2 emissions. If all will go according to planning, and that is in the nuclear sector a very big "if", Temelín 3 and 4 might deliver their first electricity in 2020. This means, however, that Temelín 3 and 4 will have added considerably to the CO_2 emissions from the Czech Republic in the term up to 2020.
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 the Czech Republic follows a similar trend as Finland, it will see because of the construction of Temelín 3 and 4 a slump in the development of energy efficiency and of renewable energy sources that would (per kWh delivered) emit less CO_2 than Temelín.[11]
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_2 emissions of Temelín 3 and 4 could reach after 2020 levels that could go as high as 112 gCO_2/kWh, which is a factor 2 to 5 more than renewable energy sources.[12]
The construction of Temelín 3 and 4 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.

11 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)





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

25. Because the authors have not included studies based on increased energy efficiency and the development of renewable energy sources in their comparison, the given analysis of electricity prices is inadequate. The scenarios mentioned under point 18 that are based on an environmentally sustainable development of the electricity sector, all come in the long term with comparable or better final costs for the delivered services than scenarios including nuclear power.

26. A similar error appears in the description of environmental impacts. Because an environmentally sustainable scenario is not included, the authors conclude with a self-fulling bias towards nuclear energy.

27. Page 87 – The qualification of the promoter. Greenpeace published in 2001 and 2002 findings from whistleblower information according to which a vital welding repair error in Temelín block 1 made in 1994 under responsibility of subcontractor Modranská potrubní and main contractor Škoda a.s. was hidden with support from SÚJB.[13] Greenpeace currently still has a case running for the Constitutional Court in Brno to gain access to SÚJB inspection report 15/2001 that contains the results of the inspectorate's investigation into the whistleblower allegations.
It is not clear to Greenpeace which role the operator ČEZ has played in wiping this issue under the carpet, but its qualification to run a nuclear power plant safely cannot be fully accepted until this issue is completely clarified.

28. Page 89 – The authors claim they have looked at the experiences with reactors of Generation III that have recently been taken into operation. This only concerns the two ABWR reactors in Kashiwazaki-Kariwa, Japan and the AES-91 nuclear power station in Tianwan in China. However, these reactor types are not under consideration for Temelín. From the designs considered for Temelín, there are only projects under construction in China, Finland, France, India and Russia. From those, only the EPRs in Finland and France have a more or less similar economical, infrastructural and regulatory environment as the Czech Republic. The tiny amount of Generation III projects on their way so far make the authors' claim statistically irrelevant. It is to be expected that the promoter will face a difficult learning curve during the implementation of a similar project in the Czech Republic, including comparable time delays and budget increases as seen in Finland and France.
It is too early to speak of construction of an AP1000 in the United States, as no final construction permit has been handed out yet.

29. The different types of reactors taken into consideration for the Temelín 3,4 project do have different characteristics that will lead in concrete cases to different influences on the environment, both in regular operation (including fuel production, operational emissions, cooling water characteristics, waste and spent nuclear fuel characteristics) as during different accident scenarios. Because none of the mentioned reactors has any operational experience, estimates of impacts on the environment are still very sketchy, as was shown during the EIA for the Visaginas NPP in Lithuania in 2008. Greenpeace stated there in its submission: *"This leads to lack of concreteness and detail throughout the report – e.g. production of high-level nuclear waste is reported as ranging from 47 to 370 tons per annum, a range of almost an order of magnitude for maybe the most serious environmental impact of the project! The same staggering lack of detail is evident in the assessment of nuclear safety. In effect, the company is asking for a* carte blanche *to build any installation they please, and in so doing devaluating the whole EIA process. There needs to be a design-by-design analysis of main*

13 Jiří Tutter, Jan Haverkamp, *Tajná oprava svaru potrubí primárního okruhu s reaktorovou nádobou na 1. bloku jaderné elektrárny Temelí*, Prague (2001) Greenpeace; http://old.greenpeace.cz/archiv/faktax.pdf

Jiří Tutter, Jan Haverkamp, *The Risks of Škoda - Unsettling facts on the Temelín Nuclear Power Plant concerning faulty welding work and documentation in Temelín block 1 - Fact sheet, version 5.02*, Prague (2006) Greenpeace; http://www.wisebrno.cz/dokument.php?id=51

environmental impacts and nuclear safety measures." The same argumentation holds for this EIA report.
It therefore must be concluded, that the law may allow for an EIA in this stage, but that the promoter is not drawing the consequence of working out a detail EIA for each of the proposed designs. **The EIA report therefore is insufficient**.

30. On page 90, the authors state that whatever design is chosen, the legal limits will need to be kept. This may be true, but the fact that there are legal limits does not automatically preclude that they could be broken once a reactor is in operation, based on the realities of the design and day. The in point 27 mentioned case of the faulty Temelín block 1 welding repair illustrates how difficult it is to stop a reactor once it is build, even if legal prescriptions were broken. Secondly, an EIA report, as argued in the general part of this submission, is a tool to justify the environmental impacts of the finally chosen option. In this situation it is not only important to know whether all options fall within the legal limits. It is even more relevant to know what the differences between the various options are in order to make a proper choice. Those options need to include different alternative ways to meet the social and economic needs, different locations as well as the different designs.

31. In its description of the availability of uranium in the Czech Republic, the author does not in any way analyse the bad experiences within the Czech Republic and neighbouring Eastern Germany uranium mining. The exercise of listing resources becomes with that a distorted picture of reality. Germany had to re-cultivate the legacy of the Wismut uranium mining with a decades long effort consuming tens of Billions of Euros. The Czech Republic has not even been able to start re-cultivation properly for its historical and current uranium mining.

32. The analysis of in-country fuel supplies is very limited. The Czech Republic is part of a global market in commodities and fuel independence is not so much dictated by possible sources in the own country, which are in most cases not economically competitive anyway, certainly not when all responsibilities concerning re-cultivation would be taken seriously. Energy dependence is determined by the degree of diversification of economically viable sources and political stability in the regions from where these resources are coming. Such a market analysis is completely lacking.
The authors' 20st century nationalist view on energy dependence is responsible for the simply ridiculous notion that coal supplies would run out earlier than uranium supplies. Only renewable energy sources and energy efficiency can deliver complete fuel independence, and scenarios that look more seriously at those options show that real fuel independence also goes hand in hand with significant savings in costs. The question re-appears: why did neither the Czech government, nor the Pačes Commission nor the promoter look into realistic scenarios based on a 100% renewable energy future? The conclusion from my analysis from the report of the Pačes Commission and this EIA report is that the development of nuclear energy is an ex-ante input – and absolutely not a conclusion from the analysis. I challenge the promoter to let go of this ideological paradigm and indeed include alternatives based on energy efficiency and renewable energy development into the comparison.

33. After page 103, the authors include information about nuclear energy that is diverting the attention from the project. There is no chance that Temelín will host a reactor that will use Thorium, nor is it likely that it will produce hydrogen. Apart from these techniques still being highly speculative and unproven in a functioning market environment, they divert the attention from the challenges that new reactors in Temelín are posing.

34. Page 108 – Comparison of CO_2 emissions. It is unclear what the sources are for these numbers. Based on a comparison 103 lifecycle studies, Sovacool[14] comes to a range

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

between 1,4 gCO_2eq/kWh to 288 gCO_2eq/kWh with a mean value of 66 gCO_2eq/kWh. Can it be, that the authors have left out higher ranges of data?

35. Zero option. The authors do not take into account that the formerly for two more blocks foreseen space in Temelín in the mean time has gotten a new function as recreational and nature area. Nor do they acknowledge that these areas had an agricultural and village function before Temelín was chosen by the former regime as location for large industrial development. In describing the zero variant, these issues should also be taken into account. Temelín has a history[15], and it has a today.

36. On page 109, the authors state: *"Vlivy dalších zdrojů, které by zajišťovaly náhradní výkon za záměr, však zachází za rámec této dokumentace a jsou diskutovány pouze obecně."* This is not sufficient. The EIA is not there to dish up 24 kilograms of description for the sake of description, but in order to give a justification for the impacts on the environment caused by the planned project. This justification can only be made when a serious comparison is made with alternative options. As we have argued above, the authors, as well as previous Czech governments and the Pačes Commission have left out important alternatives, which cause an ideologically based bias in the decision process towards nuclear energy and coal. Without an in-depth comparison between the impacts of the planned project and the potential impacts of a zero-variant with other options to meet the service demands, the EIA looses its sense. We therefore call for a more in-depth comparison of scenarios including the planned project with scenarios excluding it – including a scenario based on development of energy efficiency and renewable energy sources.

37. Page 129 – **Malevolent attack**. The authors state that: *"Primární ochrana proti úmyslným útokům (nejen za použití letadla) je v odpovědnosti státu."* (The primary protection against malevolent attack (not only by the use of an aeroplane) is in the responsibility of the state). In the framework of an Environmental Impact Assessment, this is a debatable statement. 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 in this respect a unique risk. The possible emissions from such an event should be taken into account in the justification process for the possible environmental impacts of the project. Trying to divert the responsibility for this inherent problem with nuclear power to the state is an attempt to avoid taking this problem into account from the side of the promoter. It is the promoter who decides to develop this portfolio of generation sources, it is the promoter who has also alternatives, it is therefore the promoter who in this planning stage bears the responsibility for taking this risk or not.
    Given the fact that nuclear power carries this inherent risk with possible enormous consequences, the authors take it with an almost unscrupulous lack of seriousness. 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 authors already acknowledge that risk of malevolent attack is not only confined to attacks with aircraft, but also includes internal sabotage, attacks with charged heads and others. The mentioned measures by the state could only counter all these risks, if the Czech Republic were turned into a complete police state – the so called "Atomstaat", for which the philosopher Robert Jungk already warned in 1977.[16]
    Concluding: **The risk of malevolent attack has to be taken extremely seriously and possible impacts on the environment from such an attack should be**

15 Antonín Pelíšek, *A po nás planina,* České Budejovice (2006) nakladatelství PENI; http://www.ekolist.cz/recenze.shtml?x=2054062

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

included in the Environmental Impact Assessment and compared with the possible impacts on the environment of sabotage of other alternative means to meet the demand for energy services. Without such a comparison, no proper justification can be made.

38. Page 161 – Final storage low- and middle radioactive wastes (LRW and MRW) in Dukovany. The EIA misses a description of this storage, including the need for possible expansion in case Temelín 3 and 4 are build. The general statement that this storage space is sufficient should be argued with figures: a description of existing capacity, current use, to be expected waste streams and to be expected additional waste streams from Temelín 3 and 4.
In detail, the EIA misses clarity about the technical details of the storage of LRW and MRW. It also misses details about how it is foreseen that access to these wastes is restricted and these wastes are guarded for several hundreds of years – also in case of political instability.
The description of management of LRW and MRW is therefore insufficient.

39. The EIA does not describe what will be done in the final stages with high radioactive wastes (HRW) – it merely describes interim storage in Dukovany or in Temelín. Given the large risk that this waste poses, it is of uttermost importance for any justification of the project that all data considering final processing of this waste are available.
Without a clear solution for final HRW management, the construction of the project is irresponsible.
It is indicated, though not explicitly mentioned, that spent nuclear fuel (SNF) will be treated as waste. Also here there are no details about the final processing. Reference to the *Koncepce nakládání s radioaktivními odpady a vyhořelým jaderným palivem v ČR* is insufficient because this concept proposes management processes that are still in the infancy of their development. No detail technique is known, no site for final storage or disposal is known. The ideas about techniques to be used are currently contested.[17]
The indicated way of dealing with radioactive wastes for these reasons goes against the basic principles of sustainability. This issue should weigh heavily in a comparison with other ways to meet the demand for energy services, especially with options focusing on energy efficiency and renewable energy sources.

40. Page 164 – **Decommissioning**. Decommissioning is treated as a separate activity. This is under the Aarhus Convention article 6(4) not acceptable. This article prescribes that public participation, i.e. the EIA procedure, shall take place when all options are open and effective public participation can take place. As soon as Temelín 3 and 4 are constructed, the option of decommissioning is no longer open, especially the zero option (no decommissioning) has been closed off.
Decommissioning also produces large amounts of wastes that need to be processed. These wastes need to be accounted for in the comparison with alternative options to meet the energy service demands, including options focusing on energy efficiency and renewable energy sources. This has not happened in the EIA and therefore a proper justification of the project's environmental impacts cannot be made on the basis of this report.
That decommissioning will fall under all prescriptions of the nuclear law is irrelevant. First of all, the nuclear law will probably look different in 70 years time when decommissioning comes on the horizon, but secondly, as long as the detail design of the project is unknown, it is also unknown whether it will be able to fulfil the prescriptions of the law. When the project is constructed, the process of decommissioning is in principle a *fait acomplis* and it is likely that when

17 Greenpeace, *The deadly legacy of radioactive waste – wasting our time with nuclear power*, Amsterdam (2010) Greenpeace; http://www.greenpeace.org/international/en/publications/reports/deadly-legacy/

Helen Wallace, Study commissioned by Greenpeace, *No time to waste: Scientific review of existing models for long-term storage of radioactive waste [working title]*, to be published in September 2010 – available from Greenpeace from that date.

decommissioning cannot be done according to legal prescriptions, future generations responsible for the process will find themselves forced to change the prescriptions. For that reason **it is of paramount importance that decommissioning is an integral part of the current EIA process – in full detail**.

41. Risks to the population - A few authoritative and well substantiated studies have recently found an alarming link between incidence of cancer, especially childhood leukaemia, and proximity to nuclear power plants.[18] There is no established explanation for these findings, but they are nevertheless very relevant for the EIA and should not be omitted.

42. Page 167 – Further use of the location. To postulate that the location will be used for further activities of ČEZ a.s. shows that the authors lack perception of reality. If the project goes ahead, decommissioning will not be finished earlier than in a century from now. Predicting the use of the location 100 years in advance is a *chotspe*. 100 years ago, the Czech Republic did not exist. Since then, two World Wars raged over the Czech lands, communist rule changed much of land use perceptions and so did the return to democracy. The word "*logicky*" does not deserve any place in this part of the EIA.
    On the basis of these paragraphs it has to be concluded that a detail work-out of decommissioning is extremely important, because the authors seem to want to prevent decommissioning (and waste) issues to be taken up into the justification process.

43. Page 191 and 192 – **Tritium emissions**. Tritium is one of the more problematic radioactive substances. Is there a reason to presume that the emissions of two blocks of the AES-2006 design (2 blocks of 1200 MW) will emit twice as much tritium into the air as two blocks EPR (2 blocks of 1700 MW)? And if so, what are the data for the other two designs?
    It is furthermore not really clear why tritium has not been included in the emissions of radioactive waste water. The measuring overviews later in different rivers do not really give much information. The overview of emissions from the existing blocks of Temelín on page 261 indicate that there are increasing tritium emissions into the waste water, as is to be expected over time. However, there is no information about possible increases and cumulative effects because of two more blocks.
    In the description of effects on the population on page 420 and further, the current debate about the adequateness of the dose-effect coefficient for tritium of the ICRP has not been taken into account.[19] This can mean that the effects of especially tritium emissions in the EIA have been severely underestimated.

44. Page 345 – Current influence from Temelín. It has to be remarked that the radioactive emissions in waste water are quite high and show a (to be expected) increase over the time of operation of Temelín 1 and 2. It will be important to know whether a more than doubling of capacity, as well as the use of higher burn-up of fuel and the use of MOX will not lead to values that are very close to the acceptable limits.

45. **Insufficient assessment of a serious accident**
    The evaluation of a nuclear accident in the EIA report is 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[20]. This presupposes that only 0.015 percent of the caesium, for instance, and 0.03 percent of

18 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

19 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

the iodine contained in a European Pressurized Reactor would be released into the environment[21]. 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[22,23].

The total radioactive emission of the Chernobyl disaster was approximately 12 000 PBq, i. e. a thousand times that used in the EIA estimates[24], 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 fraction, for example, in the Chernobyl accident vary from 20 to 80 percent[25]. 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

20 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*.

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

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

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

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

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

	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.

46. Page 508 concludes: **"Podklady a informace jsou dostatečné pro vyhodnocení všech relevantních vlivů."** (The documentation and information is sufficient for the evaluation of all relevant influences). This is not true.

    1. The EIA lacks information about an alternative based on a focus on energy efficiency and renewable energy sources as described above.
    2. The lack of information about the different designs leaves a large uncertainty about basic data, especially for the estimation of design based and beyond design based accidents.
    3. There is insufficient information about the increase of risks for incidents and accidents in the blocks 1 and 2 during the construction phase of blocks 3 and 4, as well as during the decommissioning of blocks 1 and 2 during operation of blocks 3 and 4.
    4. There is completely insufficient information about the environmental impacts of the to be used fuel (from mining and fuel production of fresh fuel as well as impacts from fuel from reprocessed SNF, including the effects of higher burn-up and the use of MOX).
    5. There is completely insufficient information about the back-end of the fuel chain (limited information about amounts of different categories of waste from decommissioning, no information about spent nuclear fuel composition, no information about final storage techniques planned, insufficient information about temporary storage including risks of malevolent attack, etc.)
    6. There is no information about the risks and environmental impacts of SNF and radioactive waste storage, especially for the longer term, including risks from human interference (accidental, planned or in the form of malevolent attack, including the risk of use of plutonium for nuclear weapons in the long term).
    7. There is no information about risks because of situations of political instability, including war, and insufficient information about risks because of malevolent terrorist attack.
    8. Information is partly not based on latest scientific knowledge, e.g. the impacts of tritium and the relationship between childhood leukaemia and distance to nuclear power stations.

    Greenpeace demands that this information will be worked out and included so that a final justification of the environmental impacts can be made.

48. Page 509 states that all alternatives (meant are different designs of the nuclear reactors) are identical from the position of environmental protection. The EIA report does not investigate this, but merely states this. The data provided in this EIA concerning tritium emissions already show that this is not true. But apart from that, the different providers of these designs argue during public presentations that there are

differences in safety levels and risks, which logically also translate into different impacts on the environment, especially in cases of design based and beyond design accidents. This EIA is incomplete without a proper comparison between the different designs that goes beyond mere vague descriptions. This should include detail description of the radioactive inventory of the core during operation, description of safety components, etc. Furthermore, this documentation should be submitted to public participation for a sufficient time for the public and NGOs to have it reviewed on a sufficient level of expertise. Such a period should also not be during the time of general holidays.

49. The conclusion of the EIA states: "V průběhu zpracování dokumentace nebyly zjištěny žádné skutečnosti, které by z environmentálního hlediska bránily přípravě, provádění, provozu resp. ukončení provozu posuzovaného záměru. Potenciální vlivy na veřejné zdraví a životní prostředí (ve všech jeho složkách), a to i s uvažováním spolupůsobícího účinku provozu stávající elektrárny a stávajícího pozadí, nepřekračují příslušné zákonné limity nebo (pokud nejsou limity stanoveny) akceptovatelnou míru. Vlivem záměru tedy nedojde k poškozování životního prostředí ani veřejného zdraví." (During the processing of the documentation, no information was revealed that would prevent from an environmental viewpoint the preparation, implementation, operation, respectively decommissioning of the proposed project. The potential impacts on public health and the environment (in all its components), and that while taking into consideration possible cumulative effects because of the operation of the existing power station and the existing surroundings, do not exceed the legal limits or (in case no limits are defined) acceptable levels. The effects of the project therefore will not harm the environment or public health.)
Greenpeace concludes that the authors in reaching this conclusion have structurally excluded information that would lead to more complex picture. An indication of information lacking is given in point 47.

50. The EIA concludes that: *"Vzhledem k tomu, že vlivy záměru se ani v dotčeném území neprojevují významným způsobem, jsou vyloučeny vlivy přesahující státní hranice."* (Because the influences of the project are within the analysed area without consequences, cross-border influences are excluded).
This conclusion is contradicted by the information provided in the EIA under the chapter on accidents. And this under the use of an insufficiently high source term. When a more realistic source term is used, influences comparable with those from the Chernobyl catastrophe cannot be excluded. The EIA lacks an analysis of such influences.
It is also contradicted by the fact that the project will require the use of uranium, causing environmental impacts of uranium mining outside the country, that it will need the preparation of nuclear fuel, causing the dumping of depleted uranium and other radioactive wastes in other countries as well as radioactive emissions in other countries.
Also the influences of risks from management of radioactive wastes and spent nuclear fuel can have cross-boundary effects that have not been analysed.
The only possible conclusion can be that the authors have not seriously looked into the issue but have worked towards a pre-defined outcome.

51. The non-technical summary excludes too much information and is completely insufficient.