

**ANNEX IV – First submission made by Jan Haverkamp
in commission for Greenpeace CEE and others**

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COMMENTS on the ENVIRONMENTAL IMPACT ASSESSMENT IMPLEMENTATION OF NEW NUCLEAR POWER PLANT UNITS AT THE PAKS SITE made by MVM Paks II Zrt

by

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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 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 for among others the global environmental organisation Greenpeace and work since 1987 in Central Europe. Previously to this Environmental Impact Assessment (further: EIA), I have participated in the EIA procedures for the first two blocks of the Temelín nuclear power plant (NPP) in the Czech Republic, the Belene NPP in Bulgaria, the Cernavoda 3,4 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 as well as in the Strategic Environmental Assessment of the Polish Nuclear Energy Programme. I have advised different stakeholders in the EIA procedures for Borssele 2 in the Netherlands, Hinkley Point C in the United Kingdom, Hanhikivi in Finland and EIA procedures relating to nuclear plant lifetime extension in Hungary, Ukraine, Belgium, Sweden, Spain, the Czech Republic and the Netherlands. I have participated as expert for the complainant or adviser in court procedures concerning public participation in Bulgaria, Slovakia, Lithuania and Poland and in procedures for the Aarhus Convention Compliance Committee in complaints against Slovakia, the Czech Republic, the United Kingdom, Germany and the Netherlands.

I have been asked by Greenpeace in Austria and Hungary to write a submission in the EIA procedure of the Paks II project. I wrote these comments on personal title and my opinion – though partly 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 Central and Eastern Europe as organisation does, however, endorse my recommendation that the report should be dismissed as insufficient and inadequate and that MVM Paks 2 Zrt should be required to update the Environmental Impact Assessment Study report to take the remarks made in this submission and submissions of others in the public participation procedure into due account on a sufficient level of quality, following Aarhus Convention art. 6(8).

The confusion around the available time for submissions in this EIA procedure impacted the way I could analyse the over 2000 pages of documentation. I am giving here now a first go-through, but maintain the right to come with additional submissions at a later date.

The analysis in this submission concentrates on

- procedural issues
- Volume I of the Environmental Impact Study, chapters 1 – 9 and 19 – 22
- the Simplified Public Summary
- the International Chapter

I have used the English versions, and the pages refer to the .pdf page counting of each document.



Gdansk, 11 June 2015

Introduction

1. The Environmental Impact Assessment for the Paks II nuclear project in Hungary is made under Hungarian law, implementing the Convention on Environmental Impact Assessment in a Transboundary Context, done at Espoo (Finland), on 25 February 1991 (further: **Espoo Convention**) and the Directive 2011/92/EU Of The European Parliament And Of The Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 (further: **EU EIA Directive**).
2. The procedure also has to be in line with the 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 (further: Aarhus Convention).

Remarks concerning the procedures

3. 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 add information and express its viewpoints and concerns and enables public authorities to take due account of this input. 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 is enhanced. This implies 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 Paks II project does not give all information necessary for such a justification. It explicitly excludes relevant economic information; information about viable and reasonable alternatives; information about the environmental impacts of the entire fuel chain (including uranium mining and fuel production); crucial information about nuclear risk and safety; information about the environmental impacts of a severe accident with substantial emissions of radioactive substances into the environment; and vital information about the lack of information and knowledge, lack of experience and stand of technology in radioactive waste management, especially concerning high-level wastes. As ultimate consequence, it even draws the untenable conclusion that the project will not have substantial influence on the environment, nor any influence outside of the borders of Hungary.

By not providing all necessary information and coming to misleading conclusions, the Paks II EIAS report proves to be an insufficient basis for public participation as prescribed under the Aarhus Convention, as well as an insufficient basis for the following decisions concerning the construction of the Paks II nuclear power plant.

4. From Chapter 1 of the EIAS documentation, it becomes clear that detail decisions already have been made concerning the choice of electricity generation technology. **That means that this EIA and its public participation process do not take place when all options are open. This is in breach with the Aarhus Convention art. 6(4):** *"Each Party shall provide for early public participation, when all options are open and effective public participation can take place."*

5. **Transboundary notification:** Hungary notified under the Espoo Convention and the EU EIA Directive all member states of the EU plus Ukraine and Moldavia of the upcoming EIA procedure. When Greenpeace Switzerland pointed out that Switzerland had been omitted, the Hungarian authorities rectified that omission. This wide notification policy acknowledges the potential harm that a nuclear power station may cause for a large area, learning from the experiences in Mayak, Windscale, Chernobyl and Fukushima.
This notification policy is highly commendable and should function as an international model.

6. **Accessibility of documents** was good and the **provision of a relatively high quality English translation** of most of the documentation was extremely helpful and can function as a model for others.

7. **The non-technical summary** does not deserve that name. It is a cut-and-paste of large amounts of largely technical data from the main EIAS report. The information is for that reason not in any way more accessible to a larger public. The non-technical summary should contain the main proposals for the project and a clearly formulated justification for choices made, including the use of visualisations to more clearly explain all this (Espoo Convention, Appendix II, paragraph (i)). The non-technical summary furthermore should refer for more technical detail to the main EIAS report with clear reference indications.
This chapter cannot function as non-technical summary. It should be completely rewritten and once more submitted to public participation.

8. **Participation of the public in Hungary:** According information I received, the Hungarian authorities restricted the participation in the EIA public participation procedure for citizens and non-governmental organisations (NGOs) in Hungary. This is in breach with the Aarhus Convention, the Espoo Convention as well as the EIA Directive.
According to the information received, only the public in a limited area around the foreseen Paks II nuclear power plant is considered to have an interest and has standing in the EIA public participation procedure. Art. 6(7) of the Aarhus Convention does not restrict the definition of the public that is allowed to submit comments, information, analyses or opinions that it considers relevant to the proposed activity, but entitles this right to the public in general. Where other obligations sometimes are restricted to “the public concerned”, art. 6(7) does not make this distinction. Apart from that, art. 2(5) of the Aarhus Convention and art. 1(2e) of the EIA Directive define “the public concerned” as *“the public affected or likely to be affected by, or having an interest in, the environmental decision-making.”* Because of the use of large amounts of highly radioactive material concentrated in the reactors and fuel ponds and storages, the potential of a severe accident by which substantial amounts of radioactive substances are emitted into the air cannot be excluded, the experiences with Chernobyl and Fukushima have shown that the public concerned in Hungary is far larger than – as I was informed – defined for the public participation procedure in this EIA. For that reason, the organisation of a hearing only in Paks must be considered to be insufficient, especially because a third of the population of Hungary lives in the region of Central Hungary and a quarter in the agglomeration of the capital Budapest. Next to that, citizens of potentially foreseen locations for uranium mining, for radioactive waste management, storage and disposal and along potential transport routes of radioactive substances related to the project may have a special interest in participation. For that reason also public hearings in at least Budapest, Pecs and Debrecen and maybe more locations would be logical.
We therefore demand that the Hungarian authorities open up the public participation procedure for all citizens in Hungary, notify the EIA procedure also through national media and organise a public hearing in more places, including Budapest, Pecs and Debrecen.

9. **Participation of NGOs:** According to the information received, Hungarian NGOs are only admitted to the public participation procedure after registering themselves as interested in participation in the procedure. This puts a barrier to participation of NGOs and *de-facto* excludes NGOs that decide to participate in a later stage. The registration provision is therefore in breach with the wide interpretation for access to public participation that the Aarhus Convention envisions and in a later stage may have negative consequences for access to Justice as granted under Aarhus Convention art. 9. **We therefore demand that the Hungarian authorities open the public participation procedure for all Hungarian environmental NGOs, irrespective of their registration in the procedure.**
10. Participation of the public and NGOs in countries outside of Hungary, including those countries that expressed their interest in participation in the procedure under the Espoo Convention, is not restricted. This leads to the strange situation that there is wider access to the public participation procedure outside of Hungary than in Hungary itself. Given the non-discrimination clauses in the Aarhus Convention (art. 3(9)) and the right to equivalent access to public participation of the Hungarian and non-Hungarian public as defined in art. 2(6) of the Espoo Convention, this situation is not acceptable. This supports the demands made under points 6 and 7.
11. **Public hearing:** I was able to participate in the public hearing in the town of Paks on 7 May 2015. Some considerations concerning the process:
 - 11.1. The hearing started too late in the day (17:00) and therefore ended too late in the night (23:30).
 - 11.2. The 65 minute introduction into the EIA documentation by the state envoy for the Paks II project, Mr. Attila Aszódi, was too long and took away valuable time and energy from the public. Especially because most of the presentation had no relation to the later made submissions from the public.
 - 11.3. The large screen time-indicators to remind speakers of the time they were using was useful, as was the suggestion to the project promoter to limit responses to 3 minutes per issue.
 - 11.4. The podium set-up of 10 mainly male people behind a large table and two dozens of mainly male experts behind them is intimidating to the public.
 - 11.5. The chair of the hearing, mr. Zoltán Horváth, provided by the Government office of Baranya County (and remember that Paks II is a state project, not a private one), was not always content independent and in several cases answered questions addressed to the promoter. He also was not properly informed about the rights of the public in such procedures. It is preferable to have a content-neutral facilitator of such processes.

The Aarhus Convention describes the rights of the public during such hearings in art. 6(7):

“Procedures for public participation shall allow the public to submit, in writing or, as appropriate, at a public hearing or inquiry with the applicant, any comments, information, analyses or opinions that it considers relevant to the proposed activity.” [emphasis added JH]. During this hearing, there were several issues which limited the possibility of public participation.

- 11.6. Those members of the public that wanted to submit comments, information, analyses or opinions were told by the moderator that they were only allowed to submit questions. Of course, questions for clarification can be part of a public hearing, but limiting the participation of the public to questions only is in breach with art. 6(7).
- 11.7. The representative of the project, Attila Aszódi, and the moderator repeatedly remarked that certain issues were not part of the EIA procedure. This included

economic issues, issues concerning nuclear safety, issues related to the fuel chain (mining, fuel production, radioactive waste) and others. With that they put psychological pressure on the public to exclude certain issues. This is breach with art. 6(7) as well, as art. 6(7) defines that the public may submit comments, information, etc. that **it**, the public – and not the authorities or the project promoter – considers relevant.

- 11.8. The time to submit comments, information, etc. was limited to 3 minutes per issue. This is also in breach with the right of the public as defined in art. 6(7) to define itself what it considers relevant.

The Aarhus Convention furthermore protects the public when it participates in public participation in art. 3(8): *“Each Party shall ensure that persons exercising their rights in conformity with the provisions of this Convention shall not be penalized, persecuted or harassed in any way for their involvement.”*

- 11.9. The representative of the project, the government envoy Attila Aszódi, on at least three occasions verbally attacked members of the public submitting their comments, information, etc. This is obviously in breach with art. 3(8) of the Aarhus Convention.
- 11.10. Although only around 30 members of the present public submitted comments, information etc., the hall was filled with between 300 and 400 people. Most of this crowd consisted of people working for the existing Paks nuclear power station. On several occasions, when members of the public submitting comments, information etc. made critical remarks about the procedure or the content of the project, they were jeered by the crowd, causing an intimidating atmosphere. Also this is in breach with art. 3(8) of the Aarhus Convention.

We therefore advise the for the EIA responsible authority to organise more public hearings in which the rights and protection of the Aarhus Convention are upheld in order to give the public in Hungary a chance to submit its comments, information etc. in an undisturbed way.

12. **Regulatory independence** – the project is pushed forward and represented not by MVM Paks 2 Zrt, but (at least during the EIA hearing as well as during other public presentations I have seen outside of Hungary) by the government envoy Attila Aszódi. Furthermore, the project financing is organised with a government loan agreement with Russia. With this, the interest of the government in the project to go ahead is overwhelming.
- This may have consequences for the regulatory independence of the environmental authorities responsible for the oversight of quality the EIA procedure as well as for the independence of the nuclear regulator OAH NBI. The former already appeared to suffer during the EIA hearing on 7 May 2015. The set-up, organised by the environmental authority, forced the public to write down their questions on pieces of paper with one question per paper, only allowed the public to speak 3 minutes per question, allowed the chair (delivered by the Government Office of Baranya County) to limit the possibilities for the public to submit comments, information etc. and only allowed questions, as well to try several times to change the order of questions away from the order that a member of the public had wanted to ask its questions – with that confusing the public. Nor the chair nor the environmental authority oversaw that the promoter (i.c. mr. Aszódi) actually responded to issues raised by the public, but let mr. Aszódi in many cases divert from the issue and avoid clarification. One example was a question about nuclear waste, which was clearly about high-level waste, and mr. Aszódi tried to answer that for low- and mid-level waste. When I (the questioner) clarified it was about high- level waste, mr. Aszódi refused to address that and continued to use his time to talk about low- and mid-level waste, and the chair let him.

Remarks concerning the documentation

Volume I of the Environmental Impact Study, chapters 1 – 9 and 19 – 22

General issues

13. International obligations of Hungary under the Aarhus Convention, the Espoo Convention and the EU EIA Directive

The goal of public participation procedures is to enhance the quality and the implementation of decisions, contribute to public awareness of environmental issues, give the public the opportunity to express its concerns and enable public authorities to take due account of such concerns (preamble Aarhus Convention)

The EIAS report states that its purpose is *“to identify and evaluate the environmental impacts of the planned nuclear power plant technology on the individual elements and systems of the environment depending on the condition and load capacity of the design area.”*¹ This is only the first half of the objective mentioned in the Aarhus Convention. **Important is also that this identification and evaluation is taken into due account in the decisions concerning the development consent for the project** (art. 6(8) Aarhus, art.8 of Directive 2011/92/EU).

14. The EIA documentation states in several cases that **certain information and analysis is not included in the procedure**, e.g. economic and financial information and assessments, assessment of potential impacts of beyond DBC4 incidents and accidents or incidents with an PRA (PSA)² of lower than 10⁻⁶.

This is not in line with the Aarhus Convention, which states in art. 6(6): *“Each Party shall require the competent public authorities to give the public concerned access for examination, upon request where so required under national law, free of charge and as soon as it becomes available, to all information relevant to the decision-making referred to in this article that is available at the time of the public participation procedure, without prejudice to the right of Parties to refuse to disclose certain information in accordance with article 4, paragraphs 3 and 4.”* [emphasis added JH]. Article 4 only allows for exemption of information that would adversely affect *“4(4d) The confidentiality of commercial and industrial information, where such confidentiality is protected by law in order to protect a legitimate economic interest.”* and for that *“The aforementioned grounds for refusal shall be interpreted in a restrictive way, taking into account the public interest served by disclosure and taking into account whether the information requested relates to emissions into the environment.”*

When information is relevant for an environmental decision, it has to be shared with the public and the public has the right to give its view on that information in the public participation procedure so that those insights can be used in the final decision.

The EIAS furthermore states that in case *“the impact assessment conducted in this system of conditions does not identify any inadmissible use or exposure for any environmental element or system, then no environmental consideration prevents the installation and operation of the two 1200 MW units.”*³ - Given the fact that every activity to generate electricity has some impact on the environment, and given the fact that nuclear power stations at least carry the risk of emissions of large amounts of radioactive material in the case of a severe accident, the above mentioned

1 EIA report, page 37, 1.3.2 Environmental Impact Assessment Study (EIAS) of the Paks II Nuclear Power Plant.

2 The authors of the EIAS talk about Probabilistic Safety Analysis or PSA, whereas it is more adequate to speak about a Probabilist Risk Analysis (PRA), because what is analysed is not safety, but the risk of failure. We will therefore use the more adequate term PRA.

3 EIAS report, page 37, 1.3.2 Environmental Impact Assessment Study (EIAS) of the Paks II Nuclear Power Plant.

criterion only makes sense in a comparison with reasonable alternatives, and that includes a comparison taking into account the above mentioned missing information. To clarify the quoted goal of the EIAS: **The inevitable environmental impacts of the two 1200 MW units have to be justified against reasonable alternatives.**

15. **Economy:** Economy has been excluded from this EIAS.⁴ How can one come to a justification of the rather severe impacts on the environment of this project when it is not analysed whether there are currently economically better options available?

Economic effects of accidents are also excluded – even though these have themselves environmental impacts. To give one example: after the Fukushima catastrophe, Japan was (temporarily?) forced to import and use an increased amount of fossil fuels to prevent the total collapse of its economy, which led to a sharp increase in greenhouse gas emissions.

The omission of economic information is in breach with Aarhus art. 6(6) which prescribes that all information relevant to the decision making needs to be provided.

16. **Alternatives:** The EIA Directive art 5(1(d)) prescribes for the EIAS *“a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment”*. The Espoo Convention prescribes for the EIAS in Appendix II (b): *“A description, where appropriate, of reasonable alternatives (for example, locational or technological) to the proposed activity and also the no-action alternative;”* and adds that these alternatives have to be assessed on its environmental impacts (Appendix II (c, d)). These alternatives furthermore have to be subject to the transboundary consultations (Espoo art. 5(a)). Aarhus 6(6e) requires *“An outline of the main alternatives studied by the applicant”*, whereby all information relevant for decision making needs to be included.

For the Paks II project that means that the EIAS should include at least:

- **reasonable alternative energy policies** (reasonable technological alternatives – Espoo Convention): Are there reasonable alternatives that can lead to the same goals (reduction of greenhouse gas emissions, increasing security of supply of electricity, provision of affordable electricity for economic development, provision of economic activity for job and wealth creation) without the chance on a severe accident that could release large amounts of radioactive substances? The EIAS refers to the Hungarian Energy Strategy 2030, which, however, contains outdated and in several cases objectively false economic data and does not include different energy policies that would target for a 100% renewable electricity provision in 2050, like we see currently pursued by countries like Denmark, Sweden, Germany, Switzerland, Spain and Portugal.
- **alternative nuclear reactor technologies** (reasonable technological alternatives – Espoo Convention): There is absolutely no argumentation or justification given for the choice of the Rosatom technology; including an objective comparison of the environmental impacts of each potential alternative reactor technology. Which reactor technology has the lowest risk on a severe accident? Which technology has the least impact on the Danube water temperature?
- **alternatives for the site choice** (reasonable locational alternatives – Espoo Convention): The promoter currently chooses for the option to concentrate for a certain time 6 nuclear reactors on a multi-reactor site. This brings several environmental consequences, among which the increased risk on multi-reactor accidents because of common-cause problems or because of accidents in one reactor influencing the operation of other reactors; increased influence on the cooling water; increased need for independent cooling water (independent heat sink). Which alternative location possibilities are there in Hungary? How do they compare to the current choice?

⁴ Among others: EIAS report page 42, 1.3.2.3 Environmental Impact Assessment Analysis (EIAA) – Environmental Impact Assessment Study (EIAS)

These alternatives should be compared in the EIAS on all relevant criteria: environmental, including accident risk; economic; social.

17. **Realism of the project** – The EIAS 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. This recently includes projects from the chosen provider Rosatom, which had to face cancellation of its Belene project in Bulgaria because of severe understatement of costs, corruption allegations and refusal to face important environmental challenges, including seismic risk, and its Baltic NPP project in the Kaliningrad enclave because of an overoptimistic assessment of demand. Also its projects at the Leningradskaya and Novovoronyezhskaya nuclear power plants are suffering from time over-runs and a complete ignorance about potential budget increases.⁵ 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 EIAS report.
18. **The exclusion of severe accidents:** The EIAS looks into severe accidents only to a limited degree. Nuclear risk is normally determined in probabilistic and deterministic ways. However, the EIAS limits the types of accidents it assesses only on the basis of probabilistic criteria. At least since Fukushima, it has become clear that only a focus on probabilistic risk analyses (PRA / PSA) is not sufficient, because there are pathways that have not been taken into account, especially pathways including human failure, certain extreme natural events, and malevolent human action (sabotage, terrorist attacks and acts of war). For that reason also deterministic assessments need to be made and defence in depth (including assessments of spreading of radioactive substances after a severe accident in which the first four layers of defence in depth have failed, and the necessary mitigation measures) has to be based on both probabilistic and deterministic assessments. “Think the unthinkable”. Art. 6(6) of the Aarhus Convention requires all this information, because it is relevant for the environmental decision.
The EIAS does not give any or insufficient attention to the next issues:
 - multi-unit incidents and accidents (not assessed);
 - problems caused by incidents or accidents in other units on the site (not assessed);
 - spreading of emissions from a severe accident with a substantive release of radioactive substances (insufficiently assessed);
 - security – the risk and potential impacts of sabotage, terrorist attack and acts of war (not assessed);
 - emergency preparedness and response (not assessed);
 - problems with radioactive water after a severe accident (not assessed).
19. **Fuel chain – front end:** There is no analysis of environmental impacts of fuel chain activities that are inevitably linked to the construction and operation of Paks II, and that have considerable environmental impacts. These include **uranium mining** and **ore processing, uranium enrichment, and fuel production**. It does not matter that these activities happen in- or outside Hungary. The environmental impacts are part of any sensible life-cycle analysis and will have to be justified in comparison with reasonable alternatives (see point 16 above). When no details are known about origin of the uranium or who is responsible for processing, enrichment and fuel production, still an overview of general data should be given. This information is relevant to the decision making and therefore necessary under Aarhus art. 6(6).

5 See among others: Bartuška, Václav, *Final report of the government envoy for the expansion of the Temelín nuclear power station*, Prague (2014); <http://www.greenpeace.org/international/Global/international/briefings/nuclear/2014/Report-on-Temelin-3and4-for-Czech-government.pdf>

As example: **uranium enrichment.**

The fact that under the current arrangements the first 10 years of fuel will be provided by Rosatom's daughter TVEL inevitably relies on uranium enrichment in Russia. The electricity mix driving its centrifuge programmes is more carbon intensive than, for example, in EU based enrichment facilities. The question is whether this difference has been taken into account in establishing the carbon footprint of Paks II?

20. **Fuel chain – back end; radioactive waste:** The report relies on over-optimistic assumptions concerning the possibilities for deep geological disposal and – apart from fairytale options like transmutation and Generation IV reactors – no assessment is made of alternatives like fully engineered near or on surface options or very deep bore-holes. By not giving the full picture, the quality of the final decisions around the project will most certainly be negatively influenced.
21. **Radiation protection of the population:** Emergency preparedness and response is missing completely from that assessment, although it is mentioned as vital in the defence in depth concept. This means that the EIAS does not give any idea about whether the population can be sufficiently protected in the case of a severe accident with a substantial release of radioactive substances.
- The EIAS contains several studies on the health of the population around Paks in relation to the currently existing nuclear power plant. It refers to the so-called KiKK study and follow-up studies, but it dismisses them with reference to the studies that are included in the EIAS report. However, it does not mention that there exist no studies that were carried out using the same methodology as the KiKK study. Before dismissing the findings of the KiKK study, the involved institutions should carry out an analysis of existing databases following the methodology used by the authors of the KiKK study or set up a study methodology to obtain the necessary data sets for such an analysis. The KiKK study found a significant relation between distance of living from a nuclear power station and the occurrence of childhood leukaemia within a radius of five kilometre. The studies mentioned in the EIAS look at a radius of 10 km. This is a significant methodological difference that could well lead to a false positive.
22. **Effects of climate change on nuclear risk:** Although there is a fair assessment of the micro-climate in the 30 km radius area around the project, there is no assessment of the impacts of the mentioned and non-assessed changes in the wider climate on the risks of the project. This includes issues like extreme weather occurrences (wind, precipitation, frost). There is furthermore no assessment of larger scale (longer distance) impacts of climate change on the risk of the project (protracted drought period effects on the Danube, extreme high water levels in the Danube and others).

Detail issues

DOCUMENT: Paks2_NPP_EIA_Report_1-8_EN.pdf

(These comments follow the .pdf page numbers of this document)

23. Page 27: *“The purpose of the project is to build two modern, III+ generation, pressurized water nuclear power plant units,”*.
- This statement is false, as is also clear in the Data of the Planned Activity (see page 2 of this EIAS document): **The purpose of the project is the “generation of electricity power for public purposes.”** From the project description it becomes clear that the project seeks to produce 19 TWh of electricity per year (on the basis of 2400 MWe capacity and 90% availability factor). The construction of a nuclear facility with two times 1200 MWe capacity is a means to an end.

Because the Hungarian government and MVM Paks II Zrt are formulating their goals falsely, they also are incapable of giving a justification for the choice of the tools and their impact on the environment, both in the National Energy Strategy 2030 and in this EIA.

The purpose of the project should be re-formulated as suggested here and the EIA should be adapted to serve that purpose.

24. Page 27, 1. Basic Information on the Planned Project – It has to be noticed that for the chosen elements (power plant technology, the cooling water system, connection to the Hungarian power system), only for the second viable and reasonable alternatives have been assessed, but not for the first and the last. These omissions needs to be addressed.
25. Page 29, Article 5 – Obligations of the Russian Party: *“(7) supply the main equipment required for the nuclear island and the technical, electrical, automation systems, devices, tools and materials in the amount required for the commissioning of the power plant units, according to the required time schedule and safety classification;”*
Does this mean that Rosatom may not deliver the non-nuclear part of the reactor? We have noticed interest of other suppliers for non-nuclear parts. Are the costs of those fully included in the currently mentioned price calculations? This question is relevant, because in the case of the Belene nuclear power plant in Bulgaria, Rosatom also had left out vital parts from the original price calculation, which was one of the reasons for the far higher final price estimate of the project and its resulting failure.
26. Page 35 – publicity: *“In the course of the procedure, the Energiaklub Climate Policy Institute and Applied Communications requested acknowledgement of its customer status, and on this basis it requested access to the PCD for inspection and formulating an opinion. Based on the statutes of the club, DdKTVF approved its customer status, and provided the Club with access to the electronic version of the consultation application. Up to the publication of the Opinion, Energiaklub had not expressed its opinion on the PCD.”*
This is fully incorrect. Energiaklub submitted its viewpoints. Because the scoping phase public participation was inadequately published, Energiaklub only found out relatively late and submitted its viewpoints on 22 December. These viewpoints should have been taken into account.
The description illustrates that Hungary has an insufficient notification procedure. Energiaklub is a well known energy related NGO throughout state administration and should have received the announcement of the procedure directly by mail or email. Secondly, this illustrates that too much time is lost with the procedure of registration of NGOs and giving access. Such a procedure does not exist in most EU countries, because it is fully superfluous. If we exclude the intention of intimidation, there is simply no other justification for this procedure than bureaucracy. If an NGO is known for its work in an area that is related to the environment and has submitted its statutes with registration as NGO, this should be sufficient for access to public participation procedures under Aarhus.
27. Page 46 – Electricity demand: *“Renewable energy sources and small power plants can cover only a part of the forecast capacity shortage (nearly 6500 MW in 2030), since the conditions for their installation and use have gradually worsened, and so in the future new projects can only be completed under less favourable conditions, and their competitiveness is doubtful.”* [emphasis added JH].
It has to be stated clearly that these conditions have worsened in Hungary because of political decisions, not because of market potential or technical developments. The competitiveness of most renewable energy sources (e.g. on-shore wind, solar PV, small and micro-hydro, geothermal and the sustainable and decentralised use of biomass for gasification or heat-power co-generation) is currently larger than that of nuclear and with falling prices for all renewable sources

and increasing prices for nuclear, this competitiveness is only growing. The EIAS should be updated to reflect the real situation of renewable energy sources on the market, including the current and to be expected stand of technique and costs and sensible support measures from the state. Such an update should include a more ambitious development of energy efficiency and renewable energy sources than made in the anti-nuclear – green (+) scenario of the National Energy Strategy 2030, including a set of supportive policies, be expanded to the time horizon of 2050, and include a scenario targeting at a 100% renewable electricity sector in 2050 or shortly after that.

Calculations made by Greenpeace for its advanced Energy [R]evolution Scenario⁶ shows that a 78% renewable share in the electricity sector without any nuclear capacity is feasible in 2050, both technically and economically, and with better social-economic and environmental consequences.

The quoted assessment in the EIAS needs to be removed and replaced by a new and better one.

28. Page 48: the availability of CCS should not be taken for granted and for a realistic approach be excluded. Current developments in CCS are not giving much hope that this technique can be implemented in an economic competitive way, especially if compared to the development of energy efficiency and renewable energy sources.

References to CCS in the report need to be removed in the form they have now and replaced with a more factual description.

29. Page 51: NCCS-2 - the chosen minimum GHG emission scenario (with a structural underestimation of the potential of solar, wind and other renewable energy sources – see point 26 above) and maximum GHG emission scenarios (the dash for gas) are ludicrous and therefore do not help in determining an optimal mix. The set-up of the analysis creates a false dichotomy: nuclear or gas. This is only the choice when no changes are made in policy direction; in reality the spectrum of choices is far larger.

It has to be noted here further, that UK DECC developed its carbon calculator in order to create support for its choice for nuclear power. There exists public doubt about whether the model does not contain inherent structural bias towards that policy option. I have so far not seen any independent analysis of the code of the model. For that reason, the reference to the carbon calculator is out of place.

The entire assessment of alternative policies needs to be redone on the basis of updated factual information and including reasonable scenarios based on development of energy efficiency and vastly more ambitious development of renewable energy sources, and targeting at a fully renewables based electricity system in or shortly after 2050.

30. Page 55 – the maps with nuclear power stations contain many stations that are already closed down, for example Ignalina (Lithuania) and several German NPPs.

The map needs to be updated.

31. Page 63 – One important actor is missing in this list: ENSREG, the European Nuclear Safety Regulators Group.

32. Page 66 – *“One structure used widely for handling meltdowns in the course of serious accidents is the “core catcher””*.

⁶ Teske, Sven, *The Advanced Energy [R]evolution - a sustainable energy outlook for Hungary*, Amsterdam (2011) Greenpeace International, http://www.greenpeace.org/hungary/Global/hungary/informes/up_files/1321434990.pdf

This statement is false. Currently, from the now operating 438 nuclear power reactors, only the Tianwan and Kundankulam nuclear power stations include a core catcher. The principle furthermore has been included in the French EPR design and the follow-up designs of the Russian build reactors in Tianwan and Kundankulam and is proposed for other modern reactor designs. But it is certainly not “widely used”. There is also no operational experience with core catchers.

33. Page 67 – the reference to Chernobyl is irrelevant. Relevant would have been a reference to the Fukushima nuclear power reactors, which were not PWRs but BWRs, but have a lot more in common with PWRs than the Chernobyl RBMKs. It is furthermore not right to say that Chernobyl type reactors have been shut down nearly everywhere in the world, when this is only in two countries out of three, e.g. Ukraine (Chernobyl) and Lithuania (Ignalina) and the suppliers of the reactor foreseen for Paks II, Russia and Rosatom, are still operating these dangerous RBMK reactors on 3 sites (Kursk, Leningradskaya, Smolensk).

This reference needs to be removed from the report.

34. Page 67 - *“As a result of the above, nuclear power plants can be built today with a probability of grave accidents affecting the environment being less than 10^{-6} per reactor year.”*

This statement is false. There is no comprehensive information about the statistic probability of severe reactor accidents, simply because there has not been a statistically significant amount of severe accidents. Hereby it has to be remarked that the current amount of severe accidents with a substantial release of radioactive substances into the atmosphere is with six in the last 60 years (Three Miles Island, Chernobyl 4, Fukushima 1, 2, 3) far higher than the previously set PRA limit of 10^{-5} , and the consequences have been devastating. However, this does not say anything yet about the true chance on a severe accident. The value of 10^{-6} is probably derived from the PRA (or PSA, as it is called in this documentation). The PRA calculates on the basis of known failure rates for individual parts and engineering estimates where such rates are not known, as well as on the basis of engineering judgement about failure paths, what the expected overall failure rate may be for these failure paths. They do not state the chance on an accident in general, but are a tool to discover weak areas in the design.

This sentence is fundamentally misleading because it does not reflect the actual chance on a severe accident, and has to be removed from the report as well as the the non-technical summary (page 41).

35. Page 67 – *“The probability of a potential risk must be kept at the lowest possible level in accordance with the ALARA (As Low as Reasonably Achievable) principle, to guarantee the best reasonably achievable safety.”*

This statement is false. The lowest possible risk for a nuclear reactor is development of reasonable alternative zero-options, that is, not building and operating the reactor. Then comes the use of Best Available Technology (BAT). ALARA is a step down from this, because it allows a weakening of the (in chemical installations usually used) BAT principle on the basis of “reasonable” factors from economy and engineering complexity. Therefore, neither in this project, nor in other nuclear power stations, we come anywhere near the lowest possible level of risk. **This sentence needs to be removed from this report and the non-technical summary (page 41), or rewritten in a form that gives an honest reflection of the level of risk.**

36. Page 68 – Stress tests: *“No critical or significant deficiencies were found and some of the recommendations concerned developments in progress.”* There is a way of formulation that covers up the real message. The real message is that also the existing Paks units need essential upgrades and know flaws that cannot be addressed (like the lack of secondary containment). What is hidden in the quoted sentence is that MVM is not implementing all recommendations, but only “some” - with that flouting the idea of “safety goes first”. The revised Hungarian national

action plan of December 2014 furthermore shows that implementation of recommendations is in the most cases delayed.

Furthermore, the stress tests are not relevant for Paks II, because planned NPPs were not submitted to the tests and the new design VVER1200 also was not submitted to the tests.

These references to the European post-Fukushima stress tests need to be removed from the report and the non-technical summary (page 42).

37. Page 101 – Summary of topographical features – It has to be mentioned that the access by rail is somewhat limited. The link by rail to Russia for transport of – as planned – spent nuclear fuel is either over Budapest (which is not advisable) or the Baja bridge, which implies an extra risk. Greenpeace already made in 2004 an inventory of risk points along the rail connection to Zahony, which should be at the disposal of MVM.
38. Page 105 – Regulation of the Heat Load Imposed by Nuclear Power Plants
It is completely beyond my grasp to understand why the EIAS mentions here from three examples, two countries that operate coastal nuclear power stations and not inland ones. Comparing the necessary legal criteria for cooling water temperatures with coastal nuclear power stations is similar to comparing them with necessary cooling temperatures of nuclear power stations on the Moon. That, where there are several countries in the world that do operate nuclear power stations inland using cooling water from river systems and have legal values for the temperature of emitted cooling water. These include next to mentioned Germany, countries like Slovenia, the Czech Republic, Slovakia, France, Spain, Belgium, the US and Russia. An open pick, I would say. When one would want to go for stringent norms, the US and France are obvious candidates.
39. Page 106 and further: 5.3. Cooling methods to be taken into consideration regarding the Paks site
It is not made clear whether the effects of climate change on the water temperature of the Danube as well as availability of cooling water (in times of drought) have been taken fully and realistically into account.
Using the argument that a certain system has not been built on such a scale in Hungary yet is hardly valid when we have to compare that to the construction of the VVER1200 reactor, which in this form also has not yet been built in Hungary, or indeed anywhere else yet. Or maybe we should turn it around: because Hungary has no experience with building a generation III nuclear reactor – like with these cooling techniques – it should maybe resort to cleaner and cheaper ways to generate its needed electricity that it has already some experience with, like renewable energy sources.
Additionally: during the public hearing on 7 May in Paks, it was made clear that MVM Paks II Zrt has chosen for the option to reduce capacity in times where the water temperature in the Danube threatens to go over the set limits. The initiative for this lies with the operator, which is a fully state owned corporation, with afterwards overview by the regional environmental authority, which is politically submitted to the same state. This creates a very concerning situation. The economic cost of capacity reduction is high, especially with prolonged periods of high temperature and/or drought. This means that there will be a large economic and, because of the current governmental structure, political pressure to be flexible with the temperature limits. As long as there is no independent authority deciding about whether or not capacity needs to be reduced, this option is a dangerous one. And this is especially true when prolonged periods of high temperature and/or drought can be expected in the future because of climate change.

40. Page 121: “The VVER-1200 unit is better in terms both of its economy (unit capacity, efficiency) and availability (92% utilisation factor, 60 years operating life).” This should rather be: ‘The VVER-1200 unit **is expected to be** better’, as there is no unit operational anywhere yet to confirm this.
41. Page 126 – Spent nuclear fuel – we are happy to see that Hungary comes back from the idea that spent nuclear fuel can be brought abroad for final disposal. Apart from the fact that, as described, the conditions from the Euratom Radioactive Waste Directive are not met, this also would be immoral.
However, this does put the question on the table whether Hungary can guarantee final disposal in its own territory, given the fact that nowhere in the world a final disposal for this type of waste is operational, and that includes the WIPP facility in the US, which is currently on hold after an accident.
There should be greater attention in the EIAS to the fact that there is no final disposal technology proven for spent nuclear fuel, nor for vitrified residual waste in case there will be a choice for reprocessing. The EIAS should also explore the question whether it can be morally/ethically justified to start the production of highly dangerous radioactive waste when there is no final disposal technology available yet, the prospects on functioning final disposal installations are low, like they are now, and viable alternatives for the production of electricity are available that are furthermore cheaper, deliver the objectives faster and have less impacts on the environment.
42. Page 182 – table row 3a.2.4.0600 and 3a.2.4.0800: “*except for sabotage*”. This is not an irrelevant in-between remark. There is no (sufficient) analysis of what inclusion of the issue of sabotage would mean for all the claims concerning safety in the EIAS.
The EIAS should include an analysis of severe accidents with a substantial emission of radioactive substances as a result from sabotage, terrorist attack or acts of war, as well as of potential impacts (on the environment, health and economy) and necessary emergency preparedness and response measures.
43. Page 188 – 6.16 – Decommissioning – The question how decommissioning of the existing Paks units could be impacted by a severe accident in Paks II and *mutadis mutandis*, how operation of Paks II could be impact by a severe accident during decommissioning of Paks units 1 to 4 is not addressed. This should be analysed, including the potential impacts of multi-unit and common-cause accidents.
44. Page 189 - 6.16.2 – Decommissioning of Paks II – How can the current legal regulations **guarantee** that resources needed for dismantling will be available at the end of the operating period, when they are structurally lacking everywhere in the world for reactors currently facing decommissioning, including countries like the UK, Germany, the US and Russia? What will be the options when resources will not be sufficient?
45. Page 190 - Can MVM Paks II Zrt **guarantee**, not merely “assume”, that there will be a final disposal for radioactive material resulting from the decommissioning process? If MVM Paks II Zrt cannot guarantee this, it should describe and analyse the alternatives, including those that can lead to the zero option of not developing the project.
46. How can MVM **guarantee** that decommissioning happening not later than 2180 will indeed be carried out in a way that it will **not burden future generations**? Is taking a decision now, producing decommissioning waste not later than in 2180 in itself not already a burden to future generations? This project breaks the fundamental basis of sustainable development.

47. Page 191 – 6.16.3 – The final conclusion that Rosatom expects lower costs gives a biased picture of the reality. Current experience shows that costs for decommissioning are far higher than initial estimates and there is little reason to believe that that trend will be broken. To expect that they will be lower than the decommissioning costs of existing reactors is based on the presumption that decommissioning is better engrained in the design. However, the proposed design will have a longer life-time, higher burn-up and deliver larger amounts of radioactive wastes with a more complex way of processing. That increases the chances for higher costs rather than lower. This paragraph should be rewritten in a way that reflects reality in more detail. That includes current estimates of the costs, including uncertainty levels of those estimates, especially upper levels, and a detail description of proposals how this will be financed, how funds will be accumulated, secured, how oversight will be organised to guarantee that the funds, but also technology and skills, will be available at the moment they are needed. When this cannot be foreseen in sufficient detail, alternatives will have to be analysed and described, and justified against the zero-alternatives for the project. **The current description is completely inadequate and insufficient and could cause an unbearable burden for future generations.**
48. Page 193 and further – 7. Connection to the Hungarian power grid
It is not made clear in sufficient detail what the consequence will be of a total of over 4000 MW of nuclear capacity to the Hungarian grid, especially for its flexibility and its potential to deal with the uptake of large volumes of variable renewable capacity. This should be analysed not only for the period that the current Paks units 1 to 4 have been closed, but also for the period that all reactors will operate next to one another.
These results should flow into analyses with more realistic assumptions about the development of energy efficiency and renewable electricity generation in Central Europe.
49. There is no overview of the need for spinning stand-by capacity in order to guarantee grid stability in case of a scram of one or both of the reactors (common cause shut-down). What form will this spinning stand-by have? What will be the environmental impacts of this spinning stand by, including greenhouse gas emissions? Have the latter been taken up in the analysis of the carbon footprint of the project?
50. Page 201: It is described that the 400 kV and 120 kV transmission lines are situated in one safety zone of 170 meter wide. Although using one corridor might decrease the impact on space use, having **both transmission lines in one corridor increases the chance on common cause failure, for instance due to extreme weather and sabotage or acts of war.** What alternatives are there? What are the environmental impacts of such alternatives? What would be the reduction of the risk of common-cause failure?
51. Page 205 – 8. Potential impact factors
Location: the EIAS fails to mention the location of impacts of a potential severe accident with substantial emissions of radioactive material. There is not even a reference to the separate International Chapter that claims (but fails) to deal with this.
52. Page 206 – **There is no assessment mentioned of beyond design conditions**, even though the accidents at Three Miles Island, Chernobyl, Fukushima and also a host of non-nuclear calamities (for example: Seveso, Bhopal, Banqiao Dam, Deepwater Horizon, Exxon Valdez) show that severe beyond design accidents do happen in reality and need to be taken into account in environmental impact assessments.

53. Page 208 – 8.1.1.1.4 Generation of radioactive waste.
The EIAS omits to mention that radioactive waste is created during construction with the use of measurement equipment using isotope sources (see also 8.1.1.1.3).
54. Page 208 – 8.1.1.2.1 – impact factors at times of service breakdowns and emergencies.
I do not understand why increases in emissions of radioactive pollutants is not mentioned here.
Also during the test phase of the reactors, service breakdowns and emergencies can at least lead to increases in the emission of radioactive noble gasses and tritium. There exists a hypothesis that peaks in the emission of such emissions may have an influence on the health of the surrounding population including childhood leukaemia, like for instance found in the KiKK study and follow-up studies.
The test-phase of the nuclear power plant falls under normal definitions still under the construction phase.
55. Page 209 – 8.1.2 – **the lack of mentioning and assessing beyond design accidents and severe accidents with a substantial emission of radioactive substances** caused by human failure, malevolent attack (incl. sabotage, terrorist attack and acts of war) **is not acceptable.**
Events like Three Miles Island, Windscale, Mayak, Chernobyl, Fukushima and also a host of non-nuclear calamities (for example: Seveso, Bhopal, Banqiao Dam, Deepwater Horizon, Exxon Valdez) show that severe (incl. beyond design) accidents do happen in reality and need to be taken into account.
56. Page 212 - *“Based on section 3.2.2.3300 of the Nuclear Safety Regulation (NSR) promulgated by Government Decree 118/2011. (VII.11), internal initial events resulting from malfunctions of systems or their elements, or from human errors, or both, can be removed from the list of hypothetical initial events at new nuclear units, if their incidence is lower than 10^{-6} occurrences per year.”*
This kind of ostrich-policy does not take away the fact that there is no way to assess occurrences with any acceptable degree of certainty. The PRA (Probabilistic Risk Analysis or PSA as it is called in the EIAS documentation) is not a predictive tool, but an analytic one to trace weak parts in the design. The predictive value of PRAs has never been sufficiently established, due to the large amount of uncertainty in their values and the large amount of engineers judgement in calculating them. Besides that, vital issues concerning human failure and malevolent behaviour (including sabotage, terrorist attack and acts of war) are excluded from PRAs. On that basis it is qualitatively impossible to predict which event chain PRA of lower than 10^{-6} indeed defines an occurrence lower than 10^{-6} . **Exclusion of events with a PRA lower than 10^{-6} from the assessment is a political step, not one based on safety culture and therefore not acceptable in an EIAS. Exclusion of the possibility that substantive amounts of radioactivity (up to half of the I-131 and Cs-137 and Cs-134 content) can be emitted to the atmosphere is in fundamental breach with the principles of defence in depth as defined by the IAEA.**
57. Page 213 – 8.1.2.2.3 Sources of waste generation during abnormal operation.
I would have supposed that after the INES 3 incident in Paks unit 2 in 2003, it would be clear that there can also be damaged fuel after certain abnormal operation events. Analysis of this potential in the new reactors is missing here.
58. Page 214 – 8.1.5 Impact bearers
What is missing from this table is the potential impact on economic systems. Impacted economic systems themselves impact the environment. One example: after the Fukushima catastrophe, Japan was (temporarily?) forced to import and use an increased amount of fossil fuels to prevent the total collapse of its economy, which led to a sharp increase in greenhouse gas emissions.

It is important that such economic assessments and their resulting impacts on the environment are determined to at least a certain extent in order to enable a reasonable comparison with reasonable alternatives including zero options.

59. Page 216 – legenda. R (radiological impacts) are not mentioned in the tables. It is furthermore unclear what the function is of the E (emergencies) and D (design based conditions) in the table.

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(These comments follow the .pdf page numbers of this document)

60. Page 96 – 9.7 Impacts of Paks developments

“On national level we should highlight the improving economic performance (GDP) as it will grow as a result of the project, because parallel with the preparatory works for the planned project domestic undertakings will begin preparations as they want to be involved into the project implementation, and all this have and will have effects onto education, development of the human resources and technical assets of the relevant undertakings and their innovation.”

I am sorry to say, but **this entire chapter is ideological rubbish**. It is bad economic theory. It is not backed up by proper analysis.

Apart from the question whether GDP is still an adequate measure to express economic performance, any development can improve it. The question is: improve in comparison with what. When Paks II is not built, there will be alternative development of energy infrastructure (the zero-alternatives that should have been included in the EIAs) that also will lead to an improvement of economic performance. In order to establish which improvement is larger or qualitatively preferred, it is necessary to compare the project with other reasonable alternatives. As has been argued already before, the National Energy Strategy 2030 has done a bad job on that and has left out vital alternatives, as well as introduced partly outdated and partly false data in the chosen ones (e.g. costs and cost development of nuclear energy and renewable energy sources, assessments of social costs, etc.).

Defining the “zero option” as a “no-development” scenario is an ideological propaganda tool that has no relationship with reality. The “zero option” of course means development of alternative policy scenarios. Greenpeace analysis⁷ has shown that an alternative energy system based on a more ambitious introduction of energy efficiency and renewable energy will lead to a larger improvement of economic performance, including employment and industrial opportunities, under the same assumptions of increase of GDP as business as usual (under which the implementation of the Paks II project falls).

61. The paragraph quoted from the chapter in point 51 does not analysis the complexity of balancing the electricity grid during the time that old and new Paks reactors operate together, nor in the case there will be a larger penetration of renewable energy sources than foreseen in the National Energy Strategy 2030.

62. The exclusion of competition for this project (non-tendering) and the following attempts to limit competition for the supply chain to Russian and Hungarian companies will erode the competitiveness of the supply market and with that it will erode quality. Erosion of quality in nuclear construction and operation means an increase of risk for damage to the environment and human health.

Choosing the nuclear pathway will furthermore put Hungary further backwards on the development of truly competitive, clean and sustainable energy sources and systems as well as the supporting IT sector.

63. The project will not create jobs in the sectors where there is currently the largest demand for employment: jobs that require lower and mid-level education. But also in the high-level

⁷ Teske, Sven, *The Advanced Energy [R]evolution - a sustainable energy outlook for Hungary*, Amsterdam (2011) Greenpeace International, http://www.greenpeace.org/hungary/Global/hungary/informes/up_files/1321434990.pdf

Teske, Sven, *Energy [R]evolution – a sustainable EU 27 energy outlook*, Amsterdam (2012), Greenpeace International, <http://www.greenpeace.org/eu-unit/Global/eu-unit/reports-briefings/2012%20pubs/Pubs%203%20Jul-Sep/E%5bR%5d%202012%20lr.pdf>

educational sector the amount of jobs created will be lower than in the Energy [R]evolution Scenario developed by Greenpeace.

64. We demand that this chapter be scrapped and replaced by a serious non-ideological socio-economic analysis, including comparisons with reasonable alternatives that go beyond the limited options of the National Energy Strategy 2030.

Document Paks2_NPP_EIA_Report_19_RadioWaste_EN.pdf

(These comments follow the .pdf page numbers of this document)

65. This chapter fails to address the problem of waste water after a severe accident (see experiences Fukushima).
66. The chapter talks about a “nuclear fuel cycle” and even “closing the nuclear fuel cycle” (par. 19.4.3) This is delusional NewSpeak. There is a fuel chain, with a clear beginning (uranium ore) and end (spent nuclear fuel and radioactive waste). Because Hungary currently opts for a once-through process, it is a perfect chain. Were Hungary to choose for reprocessing of SNF, there would be a tiny eddy in that chain, but the around 6% volume that is indeed returning into the chain does not warrant calling it a cycle. **We demand that the wording of the EIAS concerning the fuel chain be adapted to what it really is: a fuel chain and not a cycle.**
67. Page 49: *“The benefit of permanent isolation and storing is that no tasks and problems will arise for the next generations and there is no need for intervention in the future.”*
If the knowledge level of the authors does not go further than this, the quality of the entire chapter has to be drawn seriously into doubt. Permanent isolation of high-level radioactive waste is currently still only a principle, a technological hypothesis, but not an operational technology and the countries that – counter to Hungary – are attempting to implement a programme of permanent isolation are currently facing severe technological problems. That includes the US, Finland, Sweden, Belgium, France and Switzerland. One of the dilemma's is the question of need for intervention in the future. Recent experiences in Germany (Asse II, Morsleben) and the US (many sites, but especially WIPP) have shown that even in an early stage intervention may be necessary because used technologies were inadequate.
68. The authors also do not realise what they are writing. When it is stated that decommissioning will happen before 2180, they cannot claim that next generations will have no tasks and problems.
No matter what high-level radioactive waste management is chosen, because of the introduction of a reactor design with a technical life-time of 60 years or longer, the next generations are asked to solve the problem of decommissioning and radioactive waste management for our generation that decides to build this project.
69. *“In many countries, research is in progress on the permanent repository of the high-level waste. There is unanimous agreement: high-level waste having long half-life can only be placed safely in a stable geologic formation (i.e. in deep geological disposal facilities).”*
Repeating the mantra from the nuclear industry that there is consensus about deep geological disposal does not make it operational, nor does it create a consensus that simply does not exist. There are severe technological challenges to the programmes that currently attempt to come to a form of deep geological disposal and it is too early to judge whether they indeed can come into operation. The problems with potential geological / seismic activity (Yucca Mountain), water access (NAGRA, Onkalo, SKB), copper corrosion (Onkalo, SKB), the behaviour of clay in reaction to the heat from high-level waste and spent nuclear fuel, movements and cracking of clay over long time (Mol, Bure), chemical and bio-chemical interaction between clay and waste (Mol, Bure, Onkalo, SKB), and many more still need to be sufficiently addressed.
70. There is a large group within the academic community that pleads for keeping open alternative options, including very deep borehole disposal or fully engineered surface or near-surface options. It is simply not true that there is unanimous agreement about what should be done with high-level waste. **There is a strong argument for prevention of production of high-level waste as**

long as this technological problem is not solved. This would imply the choice for zero-option alternatives for the currently discussed project.

71. The use of generation IV reactors and P/T is so much in its infancy that it does not deserve more space than simply mentioning it. A recent study by the French nuclear technical support organisation IRSN⁸ comes to the conclusion that potentially only one of the current proposed fourth generation reactors could be developed to commercial level before 2030 and that none would be necessarily safer than the current light water reactors.
72. The chapter misses an analysis of the fact that the VVER1200 will use a longer operational cycle and higher burn-up of the fuel. This will change the characteristics for the foreseen spent nuclear fuel management as well as the conditions that temporary storage needs to meet.
73. **The chapter misses an economic analysis of the build-up of the fund for decommissioning and waste** and it is thus impossible to assess whether at the time of decommissioning sufficient funds will be available. It is also not clear how necessary funds can be garnered in case the reactors will have to close prematurely for whatever reason.
74. The most obvious conclusion from paragraph 19.4 is not drawn: **There is worldwide no solution for high-level wastes. But these wastes will form a huge challenge for future generations to deal with. For that reason the only morally defensible position is to reduce the amount of high-level waste as much as possible. Given the fact that virtually all high-level waste (volume and radiation) comes from nuclear power generation, a further stop on the construction of nuclear power stations is a moral obligation.**
75. Page 53 – 19.7.3 – the use of radioactive isotopes for measurement purposes will result in radioactive waste. Also emissions and the production of radioactive waste will occur during the testing phases of the reactor. Reactor testing is furthermore a rather risky operation, which has a relatively high risk of resulting in a severe accident with potential substantial release of radioactive substances. For that reason, transboundary impacts can not be excluded from the time of criticality of the reactor.
76. Page 53 – 19.8.1 Normal operational
That the amount of radioactive waste produced will be more or less than that of the current Paks reactors is irrelevant. Relevant is that waste is produced for which there is no final disposal solution available. Also relevant is that the waste will be more difficult to manage because of its higher burn-up.
77. That emissions remain ALARA is not sufficient. What is important is that Hungary commits to the use of **best available technologies (BAT) and best regulatory practice (BRP)** to keep it as low as reasonably achievable and that thus economic or political arguments are excluded from influencing the interpretation of the word “reasonably”. This implies regular upgrade investments and the commitment to shut down the reactors when BAT or BRP cannot be met.
78. The chapter misses an analysis of potential severe accidents in the SNF storage (temporary and final disposal) – a very important issue as the Fukushima catastrophe has aptly illustrated. There is also no assessment of potential impacts of severe accidents during transportation of SNF. The lack of such assessments is unacceptable, especially because they can lead to situations that

8 IRSN, Examen des systèmes nucléaires de 4^{ème} génération, Paris (2015);
http://www.irsn.fr/FR/expertise/rapports_expertise/surete/Pages/Rapport-Generation-IV_04-2015.aspx#.VW8II0ZG4Uo

could expose large areas to radioactive contamination. **The transport of SNF from Paks Unit 2 to Russia last year through a country in a civil war situation has proven that too little sense of responsibility exists concerning these risks within the Hungarian nuclear establishment – this includes MVM and the nuclear regulator OAH.**

79. Such analyses should include design based accidents as well as severe accidents including those that could lead to emissions of substantial amounts of radioactive substances into the environment, and those that could be caused through technological failure, extreme natural events, human error, malevolent human action (including sabotage, terrorist attack and acts of war) or combinations of those.

80. Page 66 – 19.8.2.2.2. Indirect impact area of high-level wastes

“From the data of the geophysical monitoring system installed in the repository chamber before filling up and closing, one can infer a leakage, which might occur as a direct impact related to the immediate environment of the deep geological storage area, however, the probability of this is practically negligible.” [emphasis added, JH]. Given the fact that no deep geological disposal is in operation, the last part of the sentence is nonsense. It is simply not known currently how large the probability of impact of such a storage will be. Calculations in Sweden based on new knowledge concerning copper corrosion show that earlier estimates were completely unreliable. **This sentence should therefore be removed.**

81. Page 67 – 19.8.2.3 Area of transboundary environmental impact

“In the case of compliance with the strict instructions and process descriptions (procedures) during nominal operations with respect to the management of radioactive wastes, the environmental impacts originating from the management of radioactive wastes of different levels shall not reach or go beyond national borders. The same applies to the spent fuel assemblies.”

The problem is, of course, when there is no compliance with the strict instructions and when the chosen technologies do not work as foreseen (as, for example, happened in WIPP and in Asse II, as well as the 2014 transport of spent nuclear fuel from Hungary through war-torn Ukraine to Russia). There should at least be a qualitative impact assessment of what can happen in case of failure of temporary storage or final disposal – and there is a good chance that this may involve transboundary consequences.

82. Chapter 19.8 completely lacks an assessment of severe (beyond design based) accidents involving radioactive waste and accidents caused by human failure and/or malevolent intent (sabotage, terrorist attack, acts of war).

Document Paks2_NPP_EIA_Report_20_EnviroRadio_EN.pdf

(These comments follows the .pdf page numbers of this document)

83. Page 39 - *"The main task of the study was not to measure the induced effect, but the demonstration that the health of people living near the nuclear power plant is not at risk."*
When the health study is set up with the preliminary goal not to find an effect, one will not find an effect. The basic hypothesis of such a set-up is wrong.
84. This becomes apparent in the fact that the team did not consider to follow the study methodology of the KiKK study⁹ and its follow-up studies. These studies conclude a relation between distance to the power station and the occurrence of childhood leukaemia within the area until 5 km. In the EIAS, however, an area with the radius of 10 km was chosen – a distance in which also the here cited studies did not find a relevant correlation.
By choosing for the EIAS the set-up as mentioned, the authors knew from other health studies around nuclear power stations, including the KiKK study, that they were not going to find statistically significant differences and with that automatically would have their (wrongly formulated) hypothesis confirmed. In that way, indeed **the main objective of the research carried out and analysed for this EIAS was "not to measure the induced effect"** and the inputs were chosen for that purpose. This is painfully bad science.
85. On page 84, we see again the exclusion of beyond design severe accidents with substantial emissions of radioactive substances from the core into the environment. These should be included in the analysis.
86. Page 89: *"From Table 20.6.2-4 - Table 20.6.2-8 it can be clearly seen that the calculated dose never exceeded the neutral (effective dose <90 µSv/yr) effect (highest value: 21 µSv – late dose of small children at 400 m), thus it can be concluded that beyond the safety zone (and in fact within it too) only neutral effect can be expected."* [emphasis added, JH] The authors are not careful with their formulation. Right would be "no measurable effect" is to be expected. Given the LNT

9 KiKK Study:

Spix C, Schmiedel S, Kaatsch P, Schulze-Rath R, Blettner M., *Case-control study on childhood cancer in the vicinity of nuclear power plants in Germany 1980-2003*. Eur J Cancer. 2008 Jan;44(2):275-84.
http://www.alfred-koerblein.de/cancer/downloads/Spix%20C_EJC_2008.pdf

Kaatsch P, Spix C, Schulze-Rath R, Schmiedel S, Blettner M. Leukaemia in young children living in the vicinity of German nuclear power plants. Int J Cancer. 2008 Feb 15;122(4):721-6.
http://www.alfred-koerblein.de/cancer/downloads/Kaatsch%20P_IJC_2008.pdf

More details about the statistic analysis: <http://www.alfred-koerblein.de/cancer/english/kikk.htm>

A summary from the German Federal Institute for Radiation Protection:
<http://www.bfs.de/en/bfs/forschung/ergebnisse/kikk/info/kikk.html>

Other studies finding similar results:

Committee on Medical Aspects of Radiation in the Environment (COMARE) (2011) Fourteenth report. *Further Consideration of the Incidence of Childhood Leukaemia Around Nuclear Power Plants in Great Britain*. London: Health Protection Agency. http://www.comare.org.uk/press_releases/documents/COMARE14report.pdf

Spycher BD, Feller M, Zwahlen M, Rösli M, von der Weid NX, Hengartner H, Egger M, Kuehni CE. *Childhood cancer and nuclear power plants in Switzerland: A census based cohort study*. International Journal of Epidemiology (2011) doi:10.1093/ije/DYR115. <http://ije.oxfordjournals.org/content/early/2011/07/11/ije.dyr115.full.pdf+html>

hypothesis, this can still mean that some children would develop thyroid cancer because of such emissions, but it would not show up as statistically significant.

87. Page 104 – 20.6.5.3 – Transboundary impacts

The exclusion of severe accidents with substantial emissions of radioactive substances, as can be expected, leads to not finding transboundary impacts. This is not acceptable. Missing is an analysis of an accident in which a part of the core content of I-131 and Cs-137 and Cs-134 come into the environment – comparable with emissions we have seen in Chernobyl and Fukushima. What has furthermore not been taken into account is a multi-unit accident, as we have witnessed in Fukushima. Given the concentration of six reactors on one site, common cause initiated accidents cannot be excluded, as well as cross-influence from an accident in one reactor on the performance of the other reactors. This is also true for the situation in which one or more reactors are in a state of shut-down or even under decommissioning.

88. There is no assessment of emergency preparedness and response in order to estimate what the impact of such accidents would be on the population, the environment and the economy.

Paks2_NPP_EIA_Report_Non-Technical_summary_EN.pdf

(These comments follow the .pdf page numbers of this document)

89. Given the fact that this non-technical summary consists of condensed information from the EIAS report, in order to prevent doubles, I do not repeat comments here. Most remarks made in earlier parts of this assessment also need to be taken into due account for this non-technical summary.
90. Page 17: "The purpose of the project in the process of preparation is to implement two modern, III+ generation, pressurized water nuclear power plant units,".
This statement is false, and it is extremely confusing that this purpose is again another one as formulated in the EIAS, chapter 1, Basic Information on the Planned Project (document Paks2_NPP_EIA_Report_1-8_EN.pdf, page 27). The Data of the Planned Activity (document Paks2_NPP_EIA_Report_1-8_EN.pdf, page 2) make clear what the real purpose of the project is: **The purpose of the project is the "generation of electricity power for public purposes."**
From the project description it becomes clear that the project seeks to produce 19 TWh of electricity per year (on the basis of 2400 MWe capacity and 90% availability factor). **The construction of a nuclear facility with two times 1200 MWe capacity is a means to an end.** Because the Hungarian government and MVM Paks II Zrt are formulating their goals falsely, they also are incapable of giving a justification for the choice of the tools and their impact on the environment, both in the National Energy Strategy 2030 and in this EIA.
The purpose of the project should be re-formulated as suggested here and be stated consequently throughout the project and this EIA documentation, and the EIA should be adapted to serve that purpose.
91. Page 41 - *"Figure 10: The first containment structure provides protection against external impacts"*
This statement is false. Right is: The secondary containment structure provides a degree of protection against external impacts.
92. Page 41, Inherent safety - *"Pressurized water reactors, currently the most wide-spread type in the world, fall into this category."*
This statement is false. Inherent safety is a feature of certain specific technological tools in a reactor design. It is not a reactor category. There exist no "inherently safe reactors". The VVER 1200 design used in this project contains also a large amount of active risk reduction features, that do not fall in the category of "inherent safety features".
It is furthermore false to state that the VVER440 reactors in Paks are inherently safe. They are not, but rely largely on active risk reduction techniques.
Furthermore, also the RBMK reactor includes some inherent safety features. The fact that PWR reactors have other features than RBMK reactors does in itself not make them less risky, as the catastrophe in Fukushima has clearly illustrated.
These false statements should be corrected, because they mislead the public and decision makers.
93. Page 221 mentions the necessity of moving bats, an issue that was also brought forward by mr. Aszódi during the hearing. Instead of spending so much valuable time there about this issue, this should have been explained in more detail in this EIAS report, and... why are the beautiful bat pictures he showed there not taken up? Bats are cute and cuddly – the perfect stuff for non-technical summaries!

94. Page 264 – Actions to Protect Accidents with an Environmental Impact and, upon their Occurrence, to Mitigate their Environmental Consequences
Maybe I am just not a good researcher, but I have not been able to find this issue of emergency preparedness and response (EP&R) anywhere in the technical EIAS report. I made a full search on the key-words “Comprehensive Emergency Management and Action Plan”. It is a bit astonishing to see it pop up just like that in the non-technical summary without any reference to more in-depth assessment. **There should be a more in-depth analysis of the emergency preparedness and response issue in the main report.**
95. It is too late to develop and analyse an EP&R plan after the project already has been decided. The potential of a severe accident with substantial emissions of radioactive substances into the environment is irreversibly connected to the implementation of the project. Before the final decision to carry out the project, it has to be assessed whether this fifth level of the IAEA defence in depth principle can be worked out to a sufficient level or not. This includes not only response to an accident, but also response under the circumstances that could lead to an accident – that is EP&R for single but also multi-unit accidents, under circumstances of natural disaster (as happened in Fukushima), terrorist threat, or civil or international war.
This could be partially based on a fundamental assessment of the current EP&R provisions in Hungary and the lessons learned from the Fukushima accident – an exercise that has not yet taken place in Hungary, nor in the rest of Europe.
96. Page 266 – The summary of the non-technical report is completely useless, and the final conclusion is an affront to human intelligence: *“In accordance with the detailed analyses of the environmental impact assessment study, the implementation of Paks II. affects the settlements of Dunaszentbenedek and Paks települések, while the operation of Paks II. will affect Dunaszentbenedek, Paks and Uszód settlements.”* (Yes, there are TWO spelling mistakes in the original of this sentence!). This one paragraph indeed does summarise what is wrong with this EIAS: the authors do not take the potential danger of nuclear power in any form seriously.
On the basis of this final conclusion in the non-technical summary, the entire EIAS has to be rejected as insufficient.

Paks2_NPP_EIA_Report_Transboundary_chapter_EN.pdf

(These comments follow the .pdf page numbers of this document)

97. I was wondering whether I should make a remark about the word “erection” in the title of this chapter. Although it grammatically can be used here, it is not the logical translation of “létesítése” in this setting... it does look like a very Freudian reflection of the project.
98. It is strange that the spread of emissions from a severe accident are only taken into account in a special chapter for the transboundary procedure. Also Hungarians will be affected by the spread of emissions from a severe accident with a bypass of the containment system. **The analysis of spread of radioisotopes from a severe accident with substantial emissions of radioactive substances needs to be taken up in the general documentation of the EIAS.**
99. Page 5 - *“During the period of erection, operation and decommissioning of the new unit no transboundary radiological aquatic impact on the Danube and its wildlife exists which could be deemed to be important, and correspondingly, no such impact area can be defined, either.”*
Hah – the erection again :-). Seriously, this statement is false. It has not been assessed what the consequences can be of a severe accident with substantial emissions during the testing phase of the reactor. It has not been made clear whether this phase is part of the construction of the nuclear power plant, although normally it is in literature and the operational stage only starts at the moment that the start-up operators hand over the reactor to the licensee. So the open question is, **what are the possibilities of severe accidents during the start-up and testing phase, which source term could be generated from such severe accidents and how do these spread.**
100. Page 6 - *“Estimates of the impacts upon decommissioning is very difficult to make due to the very long time horizon and the lack of information on the exact details of the decommissioning works.”*
This statement is false. On the basis of the proposed running time of 60 years, the proposed burn-up and the proposed design it should be possible to make a reasonable estimate of the amount of spent nuclear fuel produced in this time as well as its radioisotope composition. It should also be possible to make a reasonable estimate of the amount and severity of contamination of the nuclear part of the reactor and the resulting amounts of low-, mid-and high-level radioactive waste. It should furthermore be possible to give a qualitative assessment of the risks for severe accidents during decommissioning work and the amount of radioactive substances that can be emitted into the environment as a result. The only reason why they have not been made is because the project promoter obviously does not care for them. Nevertheless, they are an inevitable environmental impact of the project and need to be included in the assessment for justification of the overall environmental impacts of the project in comparison with reasonable alternatives. **We therefore demand that in the framework of this EIA, an in-depth study is added of the potential environmental impacts of decommissioning, and consequently be submitted for feedback in a public participation procedure.**
101. Page 6 - *“In general it can be stated that the loads defined for the construction period or somewhat lower than those may be taken into account.”*
It is completely incomprehensible what is meant with this sentence. My assumption is that it wants to state that there will be less exposure (including to radioactive substances) during operation than during construction. For transboundary purposes, this is nonsense, if only because the period in which a severe accident with substantial radioactive emissions can be caused is in the operational time (of 60 years or more) much longer than during the construction time (several months to a year).
As for greenhouse gas emissions, data calculating those for the construction of the power plant as

well as for uranium mining, enrichment, fuel production and normal operation of the power station completely fail in the EIAS report, so such a conclusion for those gases cannot be made either.

102. Page 6 – Impacts after a severe accident with substantial emissions of radioactive substances can lead to substantial contamination of the air, terrestrial and aquatic wildlife, as for instance the contamination of reindeer in Lapland, deer and sheep in the UK and wild boar in the Schwarzwald and Bavaria have clearly shown after the Chernobyl catastrophe. It is likely that after a severe accident in Paks, migrating fish in the Danube will be heavily contaminated with severe consequences for fishery activities downstream (Croatia, Serbia, Bulgaria, Romania). It is therefore not justified that these are not taken into account.
103. Page 6 - *“Impacts on waste management remain local in all of the cases and hence, no cross border impacts can be talked about.”*
Although there is an in principle decision for once-through use of nuclear fuel, reprocessing has not been completely excluded. Also, Hungary has over the last decades been very active in initiatives looking for regional approaches to radioactive waste management (SAPIERR, SAPIERR II, ERDO), which opens the possibility that Hungary might look for a transboundary final disposal in the future. **We demand an analysis of the possibilities that Hungary leaves open for transboundary transport of radioactive waste, including temporary movements for reprocessing or temporary storage, and the potential impacts of such operations including severe accidents with substantial emissions of radioactive substances.**
104. Page 6 - *“In Hungary the radiation exposure originating from all radiation sources is around 3 mSv”*: I take that this means 3 mSv/yr.
105. Page 7 – *“neutral”*: the linear-no-threshold model, which is currently still the consensus model on impacts of ionising radiation, stipulates that every radiation has an effect. There is therefore no “neutral” situation. Every extra exposure to radiation, also lower than 90 µSv/yr, is therefore an extra exposure that needs to be taken into account and every judgement about what is and what is not acceptable is a political one. **The term “neutral” should not be used in relation to radiation exposure, nor the term “safe”.**
106. Page 8 – Liquid radioactive discharges: The table given is only for normal operation. **What fails is an analysis of liquid radioactive discharges after a severe accident with bypass of the primary containment structure and substantial emissions of radioactive substances.** (See also point 98).
107. Page 9 – Impacts of airborne radioactive air pollutants: **The EIAS relies on the use of one computer model**, the TREX-Euler model. **It would be advisable to use other models as well** and compare the results. Early observations after the Fukushima accident showed that the predictive value of different models could lead to qualitatively different outcomes, depending not only on input data. One option would be to compare the data of the TREX-Euler model with those that could be generated for different source terms with the FlexRISK model as developed by the University of Vienna.
108. Page 12 – Temperatures from the Paks meteo tower: I am surprised to see that the temperature readings from the tower measurements were not available for input. What has happened with them? Have they not been stored? Are there other data that have not been stored from previous operation?

109. Page 14 – It has to be noticed that **the source term was chosen for technical design based incidents**, which according to the definition of design base do not include substantial emissions of radioactive substances. The outcomes therefore are not surprising. Other, not PRA (PSA) based accident sequences could well lead to bypass situations with substantial emissions of radioactive substances. The claim that these cannot happen cannot be upheld. For details see above. **The limitation of source terms by the authors of the EIAS report must therefore be characterised as an attempt to model towards pre-drawn conclusions and therefore decidedly dismissed.**
110. As mentioned earlier, also the operational emissions cannot on the basis of the Linear-no-Threshold model be characterised as leading to **“neutral impacts”**. There are no neutral impacts of radiation, and during normal operation there will be emissions of radioactive tritium and noble gasses. One of the effects may be the one as found in the above mentioned KiKK study, whose methodology unfortunately has not been used in the preparation of this EIAS report (see point 84). The maximum formulation may be that the effect is not statistically detectable. The use of the word “neutral” is dangerous and propagandistic NewSpeak.
111. The choice for design basis defined emissions also excludes **concentrated emissions for shorter as well as multi-day time periods**, as seen during the Fukushima and Chernobyl accidents.
112. **There is no analysis of multi-installation accidents** – neither design based nor severe with substantial emissions of radioactive substances. The EIAS should include at least an engineers estimate of such accidents in comparison with single unit accidents, but it would be advisable to make one or preferably several runs with multi-source emissions to see whether this would lead to qualitative different outcomes.
113. Page 18 – In the event of releases exceeding the design base: The chosen events (TAK2 (DEC2)) are still not severe accidents with a substantial emission of radioactive substances and seem to have been chosen on the basis of PRA (PSA) considerations and not along deterministic lines. **The exclusion of severe accidents with a substantial emission of radioactive substances is not justifiable.**
The final conclusion on page 23 - *“Thus it can be stated that the summarised radiological impacts across the border are kept below the dose limit constraint defined by the authority even in the case of releases beyond the design base, in other words the impact is neutral.”* - **can** for that reason **not be upheld**, because the type of beyond design base accidents was (consciously?) limited to PRA (PSA) defined incidents with low emissions of radioactive substances. Also here, the use of the word *“neutral”* is misleading.
The impacts of a severe accident with substantial emissions of radioactive substances – in the magnitude of one fifth to a half of the Iodine-131 and Caesium-134 and Caesium-137 content, depending on the chosen deterministic incident scenario – should be calculated, added to the EIAS report and submitted to a public participation process for feedback.
114. Why have different exposure periods (7 days, 10 days) been chosen for different incidents?
115. Why was no difference made between the I-131 exposure (short lived, targeted exposure of the thyroid gland, high exposure vulnerability of children, special measures needed (iodine prophylaxis and evacuation)) and Cs-137 exposure and deposition (long term, special measures needed (long term evacuation, limitation of use of agricultural and fishery produce, decontamination))?

116. The results of an analysis of a severe accident with a substantial emission of radioactive substances should not only be published in the chapter on transboundary impacts of the project, but most importantly also in the main report and be discussed with the Hungarian public, local authorities, emergency authorities and security authorities. In this discussion also the issue of emergency preparedness and response should be included.

117. Page 24 – The management of comments received in response to the Preliminary Consultation Document: **Why is no table overview given of the submitted comments?** It is OK to bundle them in the cases where they were the same (whereby it would be good to indicate how often certain comments were submitted), but the current overview does not give a clear picture of which comments had to be taken into due account. It is impossible to judge whether this has been done fairly or not.

118. Page 29 – General remarks on the investment project: The Euratom treaty is missing from the list. As you probably will be aware of, this is not part of the European Union, but a separate treaty to control the peaceful use of atomic energy in Europe.

119. Page 30 - *"It is important to note that the preliminary consultation process still concerned five potential units, but since then the selection of the approved Supplier has taken place under Act No II of 2014 on the proclamation of the convention between the Government of Hungary and the Government of the Russian Federation on the cooperation to be conducted in the field of peaceful use of nuclear energy, and accordingly, the Environmental Impact Assessment was prepared with a view to the parameters and particulars of this Russian type unit, and evaluates the potential environmental impacts of this single type of unit. Correspondingly, no tendering procedure will be conducted anymore and the comments on the selection of the type are not relevant any more in the light of Act No II of 2014."*

It is important to notice that with this selection of the approved supplier, public participation does not take place any longer "when all options are open", as stipulated in art. 6(4) of the Aarhus Convention and art. 6(4) of the EU EIA Directive.

Furthermore, **there is no-where in the entire EIAS report a solid justification for the choice of the approved supplier and the related technical design, let alone a justification for this choice in respect to a comparison of environmental impacts of the different designs as proposed in the scoping phase.**

120. Page 30 – *"It is also important to note that the discussion and answering of any kind of economic or financial issues does not constitute a subject matter or a function of the Environmental Impact Study."*

This statement is false. **Economic and financial issues are part of the relevant information under consideration when the environmental decision is taken according to the definition of environmental information in Aarhus Convention art. 2(3b) and therefore have to be taken into account during public participation:** *"Factors, such as substances, energy, noise and radiation, and activities or measures, including administrative measures, environmental agreements, policies, legislation, plans and programmes, affecting or likely to affect the elements of the environment within the scope of subparagraph (a) above, and cost-benefit and other economic analyses and assumptions used in environmental decision-making;"*.

[Emphasis added, JH]. This is confirmed by the EU EIA Directive, where it states in art. 6(3a): *"Member States shall ensure that, within reasonable time-frames, the following is made available to the public concerned: (a) any information gathered pursuant to Article 5;"*, which includes in art. 5 all relevant features of the project, and a description of relevant alternatives including the the main reasons for the option chosen. Although this does not explicitly mention relevant economic

and financial information, it is clear on the basis of the Aarhus Convention, that such information belongs to the relevant features of the project for the function of the EIA procedure, including the justification of choice in comparison with reasonable alternatives.

121. Page 30 - "and answering economic issues is not found relevant under this current procedure." This is a false assumption. Art. 6(7) of the Aarhus Convention defines that **it is the public that determines what are relevant issues for discussion and not the authority**.¹⁰

122. Page 31 - *"In the light of the aforementioned considerations the Environmental Impact Assessment must not have the goal to investigate the various aspects of nuclear safety, it only have to identify and evaluate the potential environmental impacts of the facility."*
This is false. **Nuclear safety is highly relevant for determining the possibility whether substantial amounts of radioactive substances can be released into the environment.** With that it is essential information in an EIA procedure, as defined in art. 2(3b) (*[...] activities or measures [...] affecting or likely to affect the elements of the environment*), irrespective of whether this information is dealt with in other procedures.

123. Page 31 - **Nuclear liability**: also this information falls under the necessary information for environmental decision making as defined in art. 2(3b) of the Aarhus Convention: cost-benefit and other economic analyses and assumptions. The omission of liability information and the discussion of the cost-benefit assumptions relating to environmental impacts is therefore in breach with the Aarhus Convention and the EU EIA Directive.

124. We demand that the following information and analysis thereof in respect to their influence on the impacts on the environment as well as in comparison with reasonable alternatives, including zero-options that rely on a focus on energy efficiency and the expansion of renewable energy sources, are added to the EIAS report: all relevant economic information, all relevant safety information, all relevant information concerning liability arrangements.

125. Page 31 - *"Pursuant to paragraph (4) Article 11/A of the Nuclear Energy Act during the licensing procedure the OAH will organise public hearings where the public will have the opportunity to get familiar with the procedure and may put questions to the representatives of both the authority and the project sponsor."*

This is not a reason to exclude nuclear safety from the EIA. A public hearing during which only questions can be asked to "become familiar with the procedure" is not public participation in an early stage, which is taken into due account, as defined in the Aarhus Convention, and therefore irrelevant for the current public participation procedure.
It is furthermore unlikely that the OAH will organise public participation in countries taking part in the transboundary procedures under Espoo.

126. Page 31 – Energy Strategy 2030 - *"4. Preservation of the current nuclear capacities"*
I have mentioned it before, the preservation of nuclear capacities is not a necessity for meeting the objectives set out in the Energy Strategy 2030 and to several of those objectives (like energy independence, the development of renewable energy sources, affordable energy) it is a barrier.

127. Page 31 – Energy Strategy 2030 - *"5. The environmentally friendly use of domestic coal and lignite resources in electric power generation"*

¹⁰ Aarhus Convention art. 6(7): "Procedures for public participation shall allow the public to submit, in writing or, as appropriate, at a public hearing or inquiry with the applicant, any comments, information, analyses or opinions that it considers relevant to the proposed activity." [Emphasis added, JH].

This is a *contradictio in terminis*. There is no environmentally friendly use of coal and lignite. Mining of both has significant effects on the environment; burning of both has significant effects on air quality and health; burning of both has significant effects on global warming. A strategy based on this assumption is fundamentally flawed and cannot function as a basis of implementing plans or projects.

128. Page 32 - *"The total breakdown of all the six power plant units at the same time has a very low level of probability."*

Given the fact that no analysis was made of multi-unit incidents and common-cause failures, this statement cannot be made. Next to that, assessing the stability of the grid in such an event is a task of the project promoter and not of MAVIR Zrt. MAVIR Zrt will have to take the possibility of multi-unit failure into account and this information should flow into the EIAS report.

129. Page 33 – Responding on the comment made at the end of page 32 concerning reasonable alternatives: This does not respond to the issues raised above it. Basically, the National Energy Strategy 2030 looked at a limited amount of alternatives and refused to take into account a consistent policy in support of energy efficiency and expansion of electricity generation with renewable energy sources leading to an almost or fully 100% renewable electricity provision in 2050 with consistent milestones in 2020 and 2030. This omission should be corrected in the EIAS process in order to come to a rational justification of the proposed impacts on the environment.

130. Page 33 – concerning reduction of demand: The remarks from the promoter concerning renewables *"exploitation of these potentials in the environments with favourable conditions has happened already"* is complete nonsense. There is a huge potential still all over Hungary for efficiency measures to reduce demand as well as for the installation of (most certainly in comparison with the Paks II project) competitive wind, solar (heat and PV), geothermal, biomass, biogas and small and micro-hydro capacity. The problem is that this is not assessed as an option in the Energy Strategy 2030. In that, the fourth pillar of preservation of nuclear capacity has been used as an input and not a conclusion.

131. Page 33 – I just want to flag that the authors here **confirm** that **there has been no transboundary public participation for the strategic environmental assessment of the Energy Strategy 2030**, in breach with the Espoo Convention's Kiev Protocol, Aarhus Convention art. 7 and the EU SEA Directive. This means that the consideration of reasonable alternatives (or rather the lack thereof) in the formulation of the Energy Strategy 2030 also has not been submitted to full public participation.

132. Page 33 / 34 – Emergency preparedness and response. If these plans are existing, why have they not been taken up and analysed on their potential (remaining) environmental impacts in the EIAS report? Reference to the establishment licensing procedure is irrelevant, because these take place under different rules for public participation and therefore do not give the public as defined under the Aarhus Convention, the Espoo Convention and the EU EIA Directive access to public participation concerning this vital aspect related to environmental impacts. **Emergency preparedness and response are defined under the Aarhus Convention, the Espoo Convention and the EU EIA Directive as relevant for (public participation) in the EIA procedure.**

133. Page 34 – 3.5.3 Nuclear Safety: *"Nuclear power plants are designed and the technical equipment and safety systems are set up in a way that guarantee the safety of the environment around the power plant even in the case of an accident."*

This is a false statement. Nuclear plants are designed to reduce the risk for impacts on the

environment, but they cannot, never, guarantee the safety of the environment. Such an attitude was one of the basic mistakes identified at the basis of the Fukushima catastrophe as well as that it played a fatal role during the Chernobyl catastrophe.

Similarly: *"The supervising authority allows the start-up of the reactor or the completion of the various operations to be conducted on the reactor equipment only when it was verified that safe operation of the reactors can be warranted."*

The supervising authority (*in casu* the OAH) allows start-up when the legally prescribed criteria are met, even though these cannot guarantee exclusion of severe accidents, not even severe accidents with a substantial emission of radioactive material. The use of this kind of language by the promoters is deceiving. Because it is fundamentally impossible to exclude *"any hazard to the neighbouring or any other countries from the power plant units"* (page 35), these hazards need to be taken into account in the decisions concerning the construction of these nuclear power plants, including the EIAS.

134. Page 35 – Nuclear security: Apart from the fact that too little (non-confidential) information has been given about nuclear security in this report, it completely fails to address the issue of threats due to acts of war. Given the long operation time of the proposed project (more than 60 years) and the needed cooling down period before final decommissioning, it is not possible to guarantee political stability in Hungary for this period of time – especially not when Hungary's internal and external politics are fuelling political unrest as they have done in recent years. **An analysis of potential environmental impacts after malevolent acts of war against the project is therefore a vital aspect of any EIA for a nuclear project.**
135. Page 35 – The mentioned emergency heat removal process is an emergency measure and not an operational secondary heat-sink. After the Fukushima catastrophe, it has been proposed to provide all nuclear reactors with an independent secondary heat-sink in case the primary heat-sink (in this case the Danube) becomes unavailable, before having to rely on emergency measures. The concern from the public is with that not sufficiently answered in the EIAS report.
136. Page 36 - *"However, it is a generally accepted fact that the environmental impacts of standard operational releases from the nuclear fuel cycle are negligible."*
It is these kind of uninformed and arrogant statements that shed sincere doubt on either the quality of the used authors, or their intention to deliver a quality EIAS report.
First of all, the authors will need to learn that there is no fuel cycle. There is a fuel chain. Especially in the case of Hungary, that has chosen for once-through use of fuel and not for spent nuclear fuel reprocessing. Also in the cases where reprocessing is chosen, the tiny eddy of 6% volume of only once to be re-used material from the initial fuel is too little to talk about a (closed) cycle. Apart from the fact that every reprocessing factory (Windscale / Sellafield, la Hague, Mayak, Rokkasho) is a operational and pollution nightmare.
The environmental impacts of uranium mining are horrendous in virtually every location where it takes place – this includes Canada, Kazakhstan, the United States and Australia as largest sources for uranium, but also Niger, Namibia, Russia and even the Czech Republic. All face enormous legacy pollution, all face ongoing pollution and actual lack of sincere reclamation and re-cultivation of mined areas and tailing ponds or the lack of funds to do so. Uranium enrichment produces ever increasing amounts of depleted uranium, either dumped in Russia without any programme for final disposal or stockpiling on site in France, the Netherlands, Germany and the UK.
Also the back-end of the nuclear fuel chain is an open wound of environmental impacts, as there is no technical solution available for safe final disposal of high-level waste.
Chapter 19 does not provide sufficient information about all this.

137. Page 37 – Joint impact of the two power plants

Given the fact that multi-unit incidents and common-cause incidents have not been analysed, the claim that joint impacts are described by the relevant chapters of the EIAS is at least incomplete. This is also true for the impact of severe accidents from one of the proposed reactors on the operation or following decommission work of the existing Paks units as well as *mutadis mutandis* the impacts of a severe accident in one or more of the existing units on the operation of the proposed installations.

138. Page 38 – Transport of nuclear fuel: The authors do not answer the question raised. They should have made clear that transport of fuel will happen either through air from the fuel provider, i.e. TVEL in Russia, crossing the airspace of Ukraine, or by train, also crossing the territory of Ukraine. Alternatively, fuel can be shipped from Russia to Slovenia or Croatia and transported from there by train through Slovenia and/or Croatia to Hungary. Of course, this changes in case alternative fuel providers are chosen after the initial 10 years contract with TVEL. This is all public information and there is no need to withhold this from the public.