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Your Ref: Email received 05 August 2011

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Dear Rod Gurzynski

RE: ESKOM EIA CONCERNS FOR THE PROPOSED NUCLEAR POWER STATION AND ASSOCIATED INFRASTRUCTURE (DEA Ref. No: 12/12/20/944)

SUBMISSION ON REVISED DRAFT EIAR FOR THE ESKOM NUCLEAR POWER STATION AND ASSOCIATED INFRASTRUCTURE (NUCLEAR-1) DEADP REF NO. 12/12/20/944

Comment 1:

The scope of Nuclear-1 EIA

The Revised Draft Nuclear-1 EIA recommends one site, Thyspunt, and initially one nuclear power plant of up to 4 000 MW capacity[1] with reservation for future expansion of the site up to 10 000 MW. The original EIA was for 3 alternative sites and 3 nuclear power plants with a maximum capacity of 12 000 MW. An approval of Thyspunt will lead to Eskom applying for the other two, with Eskom's stated intention being 'to pursue up to 20 000 MW of nuclear power generating capacity"[2]. This nuclear scenario hinges on Nuclear-1 EIA. The sequence of events depends on whether or not Nuclear-1 is to be part of a 'fleet strategy' as suggested in IRP2, which would include payment of 'royalties' for use of the technology. A decision based on the Nuclear-1 Revised EIA recommendation is therefore more than it purports to be: it unleashes a massive, partially costed and probably un-costable capital investment in a highly complex, inherently dangerous technology[3] with impacts on associated infrastructure and on the future development model of South Africa. The decision-maker is effectively forced make a strategic decision based on a site-specific assessment, which is illogical.

Response 1:

It is not factually correct to state that the original EIA was for three nuclear power stations on three alternative sites.

[1] Nuclear-1 Revised DEIR Executive Summary
[2] Nuclear-1 Revised DEIR Introduction pg. 1-8
[3] The phrase "inherently dangerous" refers to the fission process used to create artificial radioactive isotopes, including plutonium and transuranics, together with a large amount of heat.

As indicated in Section 1.2.1 of the Revised Draft EIR, the initial application for Nuclear-1 was for a single nuclear power station. Eskom indicated its intention in 2009 (based on expected changes in the 2010 EIA regulations) to apply for authorisation at all three alternative sites. However, this amendment of the application was never carried through and therefore the application is still for a single nuclear power station at a single site.

Since the publication of the Nuclear-1 Revised Draft EIR, the Integrated Resource Plan 2010, which is government's official strategy for ensuring security of electricity supply, 9,600 MW of nuclear generation is required, as well as 17,800 MW of renewable sources, 6,300 MW of coal and 8,900 MW from other sources. For the moment therefore, even though Eskom, indicated its intention to develop up to 20,000 MW of nuclear generation (prior to the publication of the IRP), only 9,600 MW is required by the IRP.

Your opinion of the inherent danger in nuclear technology is noted. There is indeed risk involved in electricity generation using nuclear technology. Generally all forms of technology and developments have some form of risk associated with them. Environmental Impact Assessment is a tool to ensure that environmental, including social and infrastructure development risks are evaluated and appropriate mitigation measures put in place to address risks which are not considered fatal flaws.

As indicated in the Revised Draft EIR, nuclear generation is intended specifically to contribute to base load electricity supply, which renewable technologies are not able to provide, given current technology constraints.

The EIA process, which is by its very nature a project-specific environmental management tool, does not have any mandate to revisit the strategic analysis of power generation alternatives that was completed in the IRP. The Nuclear-1 EIA process is therefore not in a position to assess the merits of different power generation alternatives e.g. nuclear power vs. other forms of renewable power generation. The environmental application for Nuclear-1 is for a nuclear power station, as has been the case with other power stations such as the gas-fired power stations that have been constructed at Mossel Bay and Atlantis and the Medupi and Kusile coal fired power stations currently under construction. In all these previous instances, the scope of the EIA was restricted to a specific power station on a specific site or sites within a defined geographical area.

The strategic decision regarding the need for nuclear generation was taken in the IRP, outside the ambit of the EIA process.

Comment 2:

An assessment of the macro-impact of a full-blown nuclear power industry cannot be made from the information contained in Nuclear-1 EIA or in the superficial Economic Impact Report. An assessment could have been made in the course of the Integrated Resource Plan for electricity IRP2010 public process, but was not. The Department of Energy has nevertheless recommended the 'Revised Balanced' scenario with 1600 MW of nuclear energy proposed for year 2023.

Response 2:

Your comment is noted. As indicated above, an EIA is a project-specific tool of environmental management and is not designed to deal with strategic information on the life-cycle impacts of a particular industry.

Comment 3:

IRP2 was not a strategic environmental assessment, and is not yet complete, as the Executive Summary recognises:

'It [the Integrated Resource Plan] is not a plan that deals with the overall energy needs of the country nor does it deal with the wider infrastructure plan for the country"[4]...An assessment of the plan's anticipated price path and investment requirements will be done. This assessment will also identify whether other policy objectives, not considered specifically in the scenarios, are met, such as competitiveness, social development issues, localisation, etc."[5]

Nuclear power requires such an assessment and Nuclear-1 EIA is premature. Since IRP2 claims

[i]The National Planning Commission (10.06.2011), also aware of the lack of a full impact assessment, states:

"Nuclear power is one of the options...yet the financial cost, environmental safety, waste disposal and decommissioning costs have to be taken into account"[6].

This statement is actually an expression of the precautionary principle. The NPC Report also defers the issue of nuclear power, correctly, to further democratic process: "South Africa needs a national debate on the future of development and use of nuclear energy"[7]. The current Nuclear-1 EIA in contrast does not adopt the precautionary principle and does not amount to a national debate. It accepts at face value Eskom's preference with regard to nuclear power and it accepts the 3 sites chosen by Eskom as a given. It does not consider the no-go option at any level and it excludes any alternative scenario, with biased evidence. Nuclear-1 EIA also fails to assess anything to do with safety, leaving that to the NNR, even though safety also has financial, social and environmental impacts. These are the main limitations and shortcomings of Nuclear-1 EIA.

Response 3:

As indicated in Responses 1 and 2, an EIA, as a project-specific tool of environmental management, does not have the capacity to lead such a national strategic debate on the principle of using or not using nuclear power. However, it has to be pointed out that the national justification for nuclear has been undertaken under the public process leading to the gazetting of the IRP2010.

This environmental impact assessment is only one of many authorisations. Issues related to a national debate on Nuclear should be raised directly with the Department of Energy.

Comment 4:

Need and desirability for the project

With regard to power generation options, Nuclear-1 EIA accepts Eskom's generation model assuming a constant minimum "base load" demand and "base-load power stations" or "plants that produce energy at a constant rate" to supply it. The EIA does not inform the decision-maker of alternative models where inflexible nuclear "base-load" power generation is actually harmful to managing a balanced energy grid incorporating renewable energy. Germany for example is aiming to do away with nuclear power and to build a "much more flexible power plant fleet"[8].

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[4] Executive Summary of the Draft Integrated Electricity Resource Plan for South Africa - 2010 - 2030. pg. 2.

[5] Executive Summary of the Draft Integrated Electricity Resource Plan for South Africa - 2010 – 2 that the assessment of investment requirements, competitiveness, social development issues, localisation etc. will be done, then it should be done. But it has not been done. Thus we still do not know the financial, environmental, social and developmental impact of this choice. Nuclear-1 EIA becomes by default the arena for this macro-assessment even though the limited terms of reference are: 'Eskom + 4 000 MW PWR nuclear power plant + 3 sites'.

[6] National Planning Commission. Dept.: The Presidency. Diagnostic: material conditions: nuclear.

[7] National Planning Commission. Dept.: The Presidency. Diagnostic: material conditions: nuclear.

[8] Federal Ministry of Economics and Technology and Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. Energy Concept for an Environmentally Sound, Reliable and Affordable Energy Supply. 28 September 2010.

Nuclear-1 EIA accepts without comment or analysis Eskom's position that:

"coal-fired and nuclear power stations are currently the only feasible options in South Africa for base-load electricity generation"[9].

The statement is inaccurate and only relevant to Eskom's current generation model. A nuclear power plant could only be operational by 2023 at the earliest. Long before this date, any number of feasible alternative generation options could be in place, amongst others: run of river hydroelectric power from Inga, Congo; solar concentrated thermal power with storage, with or without gas back-up (South Africa has much better solar resources than Germany); wind as a lowest-cost energy resource, and combined heat and power for those large industries like smelters that require constant heat (because electricity is not an economic source of heat).

Response 4:

Your comment is noted. The point is made in the Revised Draft EIR that nuclear power is not being pursued by Eskom to the detriment of other forms of power supply and that a variety of generation technologies, including renewable technologies, are required in order to meet South Africa's energy needs. Reliance on only one technology does not provide a guarantee of sufficient and reliable supply. A combination of proven base-load, peaking and other generation technologies are required.

With regard to "an inflexible system" this is given consideration in the accepted Integrated Resource Plan(IRP).. Base load power will be required to ensure quality and security of supply. However a balance between this with other technologies must be achieved. There are several coal-fired power stations, which will be decommissioned from the 2020's. These need to replaced and in terms of South Africa's climate change commitments low carbon base load options need to be pursued.

Eskom is indeed pursuing other forms of generation technology such as solar thermal and depending on the success of these pilot projects, more such projects may be implemented in future. The South African government is also pursuing projects such as the Inga hydroelectric project on the Congo River and other countries in the SADC region. However, risks including political and social aspect also create uncertainty and protracted processes and no guarantee of timelines. . The IRP relies on a balanced approach that includes a range of different supply options rather than relying on only one technology such as wind, solar, coal or nuclear.

Comment 5:

Greenhouse gas mitigation

Nuclear-1 EIA promotes nuclear power as a greenhouse gas mitigation strategy[10]. But nuclear power will not help with greenhouse gas reduction before 2023 at earliest, and not until after it has paid off its carbon debt from construction etc. The time to act to keep the global temperature from rising 2 deg C is now. There is even a 25% chance that by 2027 it will be too late to achieve this target. This means nuclear power may be too late in which case it would be detrimental in that it would tie up money that would have been better spent on alternatives and efficiency strategies. Nuclear-1 EIA does not assess these probabilities or the cost of the alternative strategy.

Response 5:

Your comment is noted. The proposal is a do nothing alternative (because as you mentioned reliance on nuclear to lower greenhouse gas emissions may be too late) or exclusive reliance on other forms of generation, which in itself is risky. It is in recognition of these risks that the Integrated Resource Plan included nuclear generation as a proven source of base-load electricity generation. The manufacture of other technologies equally includes the release of greenhouse gases in their life-cycles. As

[9] Nuclear-1 Revised DEIR Version 2/Sept 2010 pg. 4-73
[10] Nuclear-1 EIA Revised DEIR. Ch. 4. Need and Desirability for the project. pg. 4-7.

indicated by the publications referenced in Chapter 4 of the Revised Draft EIR[11], nuclear generation has a similar greenhouse gas profile over its life-cycle to some renewable technologies such as wind and solar. There would, therefore, be little effective benefit in terms of greenhouse gas emissions to using renewable technologies in favour of nuclear technology. If a nuclear power station has to "pay off its carbon debt", renewable technologies would, having similar life cycle greenhouse gas emissions, presumably also have to pay off such debts.

Comment 6:

Project Alternatives

The Executive Summary states[12]:

"The consideration of alternatives is a **key requirement** of an EIA...alternatives to be considered during the EIA include the following:

- location of the power station
- forms of power generation
- nuclear plant types... "

In the light of this it is inexplicable to find the following in the Final Peer Review:

"...many stakeholders wanted to re-open the nuclear debate, raising issues about nuclear energy compared with other forms of power generation...Gibbs has correctly not been drawn into a debate...[t]he consultants simply assert that the approved terms of reference of the EIA concerns the investigation of options for a nuclear power station."[13]

This shows, at the very least, a contradiction in the Peer Review with the stated requirement of EIA process. Nuclear-1 EIA Project Alternatives and the Economic Impact Report do however make numerous debatable assertions about alternatives while Gibbs EIA practitioner Jaana Ball has argued in favour of nuclear power in reply to my earlier comments.

Nuclear-1 Revised DEIR adds more comment on wind power, and therefore I would like to add comments to the new information. Nuclear vs wind: land area Nuclear-1 EIA Revised DEIR gives the land area required for 4,000 effective MW of wind as 2,730km2.[14] The larger area of land taken by wind farms vs. a nuclear power plant is not a fair or full comparison. In the case of wind, the remains in use and generates an income for the farmer. In the case of nuclear power, apart from the plant itself, large areas of land are used for mining, processing, fuel fabrication and for storage of waste and spent fuel. To assess the land area impact, you have to add all that up. The EIA does not do this, so let me do so: the total land area to support a 4 000 nominal MW of nuclear power plant 4,000 - 40,000 km2 (based on 1-10 km2 4 per MW installed, over the full life cycle[15]).

Response 6:

Environmental Impact Assessment is, by its very nature, a project-specific tool of environmental management and it not equipped to deal with strategic issues like the principles of using or not using nuclear power. It is recognition of this that the quoted comment by the reviewers was made.

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[11] Meinshausen et al (2009). Greenhouse-gas emissions targets for limiting global warming to 2°C. Published in 30 April 2009 issue of Nature. "We would exhaust the CO2 emission budget by 2024, 2027 or 2039 depending on the probability accepted for exceeding 2°C (respectively 20%, 25% or 50%)".

[12] Nuclear-1 EIA Executive Summary Version 1/February 2010. pg. 4

[13] Nuclear-1 Revised DEIR Final Peer Review Appendix H cl.2.2.1. pg. 8.

[14] Nuclear-1 EIA Revised DEIR. Project Alternatives. pg. 5-10: (273 000 Ha = 2 730km2)

[15] Sustainable Development Commission UK. Position Paper: the role of nuclear power in a low carbon economy. 2006.

Further, the comparable area of the wind farm required to generate 4,000 MW was provided in response to a specific request by stakeholders in the St. Francis area close to the Thyspunt site. Thus, the effective area impacted by renewable technologies be much larger than was stated in the Revised Draft EIR Version 1. Such a debate is however largely academic within an EIA since such an analysis cannot be performed within an environmental impact assessment. Only a complete life-cycle assessment for all alternatives, including renewable alternatives, would generate such information.

Comment 7:

Nuclear vs wind: water
Nuclear-1 EIA Project Alternatives does not mention water. Wind turbines do not use any water (other than for human use). On the other hand, nuclear power plants use 170m3 of water per kWh for cooling[16], not all of it is sea water. The amount of water used in mining uranium, in processing and in fuel fabrication is not known, but it will also be very high, as will the radioactivity levels in leaky detention ponds. In a water-stressed country, one would think this would be assessed.

Response 7:

As indicated above, the EIA process for Nuclear-1 does not intend to, nor is it equipped to assess the merits in principle of nuclear power generation vs. other forms of power generation.

Chapter 3 of the Revised Draft EIR and the Consistent Dataset (Appendix C of the Revised Draft EIR) clearly indicates that all water used during construction and operation of the proposed power station will be obtained from desalinated seawater. There would therefore be no impact on freshwater sources due to the power station's freshwater needs. All cooling water will be obtained from the sea and will be released back into the sea.

As indicated above, the issue of life-cycle impacts would equally need to apply to other forms of power generation. However, an analysis of life-cycle impacts cannot be dealt with in an EIA process. The outcomes of the IRP also illustrate that South Africa is not choosing between one technology or the other but rather determining which suite of technologies to employ to effectively and economically meet the current and growing demand of electricity.

Comment 8:

Nuclear vs wind: comparative cost
The value of wind power is not to provide "baseload" (although it can provide some, according to that definition) but as an energy source where the cost of fuel is nil. It is a generation resource to be used first in a hierarchy of power providers. When the wind is blowing it will be the cheapest energy source if it is not tied to a REFIT.

The cost of nuclear power assumed in the EIA, taken from sources such as the EPRI report[17] in IRP2010, excludes the following costs: "owner's costs" (this can include the sea-water intake infrastructure), royalties, cost-escalation (real cost-escalation for nuclear power plant construction), foreign exchange and interest rate movement impacts, worst-case accident insurance, maintenance costs beyond the operational life of the plant, decommissioning costs, and long-term (i.e. off-site) spent fuel management. Even if there is some provision for post operational costs, these are discounted in present value, based on accumulated value and unlikely to be adequate in future time. EPRI also makes favourable assumptions about capacity factor and extended life-time for the plant, unsupported by historical data e.g. from Koeberg NPS itself. Until these exclusions are costed and these assumptions are interrogated, the conclusions about the cost of nuclear power in Nuclear-1 EIA must to be considered unreliable.

[16] Certified Environmental Product Declaration EPD of Electricity, for Fosmark Nuclear Power Plant, Sweden. EPD 2007.11.01.
[17] Electric Power Research Institute costing report, in Integrated Resource Plan 2010

Response 8:

Please refer to Response 7 with regards to the assessment of nuclear power generation vs. other forms of power generation.

The KNPS's load factor averaged 71.5 % over the past 20 years and 76.5 % over the past 10 years (up to 2009). This is lower than the 90% capacity factor assumed by the EPRI but twice that of wind power.

Comment 9:

Impact analysis

The Impact Analysis eliminates the no-go option on the basis that:

"If [Eskom] does not...[provide additional large-scale base-load power stations, either through nuclear power or through... coal-fired power stations]...the country will grind to a halt."[18]

The statement is biased. It assumes Eskom must control the supply of power and offer only two generation alternatives, and where only Eskom can provide sufficient electrical power, which if it is not allowed to do so, the country will "grind to a halt". The no-go option means that many independent power producers will have to step in. With that would come more manufacturing, constructing and operating of smaller power generation facilities (other than nuclear) and the jobs and skills development that would follow would result in the very opposite of grinding to a halt. In particular, concentrated solar thermal would be ideally suited to our existing manufacturing technology and skills base, so it could be entirely home-grown and an export opportunity.

Response 9:

The decision as to what generation technology to construct is not Eskom's decision. Eskom is required to implement projects which are allocated by the Department of Energy and in terms of the IRP. As indicated in previous responses above, the IRP has already allocated electricity generation projects. The IRP recognizes the need for base load power supply.

Comment 10:

Seismic Risk Assessment

There is no mention of Fukushima in Nuclear-1 EIA Seismic Risk Assessment, (dated 16.03.2011 The Fukushima earthquake took place on 11.03.2011 yet the damage of the nuclear power plant is not mentioned[19]. This is inexplicable. Of particular concern would be unanticipated damage to emergency cooling power generators, breaks in cooling pipes and breaks in spent fuel pools structures.

Response 10:

The Fukushima incident will be dealt with in detail in the Nuclear-1 Draft EIR Version 2 (the next revision of the EIR).

There are a number of reasons why an incident like that at Fukushima (which was caused by failure of the cooling water system and not due to any form of structural damage to the power station) cannot occur at Koeberg or to the proposed Nuclear-1, which is designed to be constructed at a terrace height of at least 12 m above sea level:

[18] Nuclear-1 Revised DEIR Chapter 9 Impact Analysis pg. 9-216 5 in the document properties).

[19] Nuclear-1 Revised DEIR Seismic Hazard Environmental Impact Report.

- The original design of Koeberg provided protection against earthquakes and tsunamis and loss of off-site power supplies.
- The two nuclear reactors at the KNPS are constructed on an “aseismic” raft, and all the components and plant systems that are important to nuclear safety have been designed to these seismic specifications so that they will be able to perform their expected functions during and after an earthquake.
- A 4 m tsunami (as a result of an earthquake in the South Atlantic) was considered in determining the Koeberg terrace height. This was considered to coincide with a maximum spring tide and a major storm surge and maximum wave set-up and run up, leading to a water level of 7 m above mean sea level. The Koeberg terrace height is at the 8 m level above mean sea level.
- During normal operation, each unit at Koeberg is supplied from two 400 kV lines connected to the national grid. The station also has supply from a 132 kV line connected to the national grid.
- If there is a problem with the normal 400 kV and 132 kV supply, the Acacia open cycle gas turbine power station (far inland) supplies electricity to Koeberg through a dedicated 132 kV line.
- Koeberg has two emergency diesel generators of 5MW each for each unit respectively to provide backup power supply. A fifth emergency diesel generator that can be switched between either of the two units is also installed. These five diesel generators are all located on the Koeberg terrace at 8 m above mean sea level.
- Two smaller (1 MW) diesel generators are installed, one for each unit, and are independent of the emergency diesel generators and physically located in a different place (at a higher elevation [14 m] above mean sea level). They will provide power to the batteries and hence the instrumentation & control systems, and will ensure the integrity of the reactor coolant pump seals – thus enabling the fuel to be cooled through natural convection if all other systems fail.
- There are a further two portable generators on site that could also provide emergency power supplies.

None of these additional measures were available at Fukushima Daiichi to provide power to the power station’s cooling system. The emergency diesel generators at Fukushima Daiichi were based on an assumption of only a 5 m tsunami, which is inappropriate for a country characterised by frequent earthquakes.

Comment 11:

Economic Impact Assessment

I have previously commented on Nuclear-1 EIA Economic Impact Assessment. I would like to add the following, as it was not answered in any way by the EIA practitioner.

City of Cape Town

There is no analysis in the economic assessment of the impact of extending the life of the Koeberg/Duynefontein site (beyond the operational life of Koeberg) on city planning, growth and expansion of the city as a result of a new NNP at Duynefontein. Population density of a city is a necessary requirement for cost-effective infrastructure and service delivery but population density around a NPP has to be restricted for evacuation logistics reasons. The EIR does not assess the economic cost to the city as a result of spread-out, leap-frogged infrastructure or the opportunity cost of this.

There is also no assessment of the cost of insurance or the exclusion in household insurance policy for any radiation or nuclear-related damage. The lack of any such assessments is inexplicable, unless it is based on the erroneous assumption that no such event can occur? If comprehensive insurance was imposed as a condition it would render the project uneconomic. "Liability" is not the same as having the funds. Comprehensive insurance would affect Eskom's balance sheet and ability to borrow

funds whereas the maximum insurance cover required by Eskom at present is only R3bn. The EIA is the correct place to assess insurance: if you don't have the money the socio-economic impact could be huge.

Response 11:

The establishment of a new nuclear power station at Duynefontein in close proximity to the Koeberg Nuclear Power Station (KNPS) will have an impact for longer term planning but the City would have to consider it in its long term planning that Duynefontein will remain a nuclear site long into the future. The Emergency Planning Zones (EPZs) that will be applied to Nuclear-1 are significantly smaller than the zones currently applied for the Koeberg Nuclear Power Station (KNPS). Therefore, implications for spatial planning will continue to be governed by the KNPS rather than by Nuclear-1.

Comment 12:

Human health risk

Nuclear-1 Human Health Risk Impact Report only considers a 'technology envelope', not a specific design. But it claims to assess a design-basis accident (DBA). This is illogical. It also does not assess a worst-case scenario.

The assessment of protection of human health is transferred from the EIA to the NNR licencing process according to the DEADP-NNR agreement. But the NNR is only mandated to consider design-basis accidents. Therefore neither this study nor the NNR consider the impact of severe accidents (INES scale 7):

"...beyond-design-basis accidents do not form part of this assessment but are considered as part of the emergency response environmental impact assessment".[20]

By excluding beyond-design-basis accidents, the report concludes that:

"...there would be no measurable difference...[in health effects]..whether a nuclear power station is constructed or not".[21]

The logic is self-serving and faulty.

Response 12:

Your comment is noted. We need to point out that whilst some “Site Safety Reports” prepared as part of the authorisation process for nuclear licensing have been included as appendices in this draft EIA Report (Appendices E24, E26 and E27), radiological issues was not be assessed in detail in the RDEIR Version 1 since qualitative assessment of radiological safety is the mandate of the NNR. It is therefore important to note that The Emergency Response (Appendix E26) and Site Access Control Report (Appendix E27) and Human Health Risk Assessment (Appendix E24), which have been prepared on a high level,, are appended to this EIR for information only. Further details on these reports will be prepared as part of the NNR nuclear licensing process, as their findings will be evaluated by the NNR

However, in recognition of requirements in the NEMA, associated legislation such as the Promotion of Administrative Justice Act, 2000 (Act No. 3 of 2000) and other legal precedents that require the consideration of all relevant socio-economic factors in an EIA process, an assessment of radiological impacts of the proposed power station is included in the current version of the EIR. Although this approach of including an assessment of the radiological impacts of the proposed power station results in a risk of duplication between the EIA and the NNR licensing processes, the risk to the EIA in terms

[20] Nuclear-1 Revised Draft EIR. Appendix E24. Human Health Risk Assessment. pg. 11.
[21] Nuclear-1 Revised Draft EIR. Appendix E24. Human Health Risk Assessment. pg. 22: the no-go scenario. 6

of possible appeals, based on the exclusion of substantive issues such as health issues from the EIA process, is regarded as greater than the risk of duplication. The current version of the EIR therefore departs substantially from the approach in the previous versions of the EIR in terms of the consideration of radiological impacts.

In this context, it must be mentioned that the approaches of the EIA process and the NNR licensing process differ substantially. The focus of the EIA process is to assess the potential impacts of radiological releases (including normal operational releases and upset conditions). However, the focus of the NNR licensing process is to demonstrate beyond reasonable doubt that defence-in-depth measures (multiple, redundant, and independent layers of safety systems) employed in the proposed power station design and operation are sufficient to reduce the probability of a failure leading to core meltdown or a failure of reactor containment to acceptable and highly-unlikely levels. Thus, the EIA process focuses on the consequences of radioactive releases. The NNR licensing process also focuses on consequences but is also designed to reduce the probability of such releases. Please refer to Appendix E32 of the RDEIR Version 2 for the Radiological Impact Assessment report.

Lastly the safety case of the specific design will definitely address clusively beyond –design basis accidents and that of design base accidents.

Comment 13:

Emergency response

Nuclear-1 EIA Emergency Response Impact report states that, despite having no final design:

"...design features are included...to practically eliminate severe accidents"[22]..."there will be "minimal need for evacuation beyond 800 m from the reactor, and **not at all** beyond 3km."[23]

Thus the Human Health Impact report transfers the assessment of beyond-design-basis accidents to the Emergency Response Impact Report which in turn states that no such event that may require evacuation beyond 3km will occur.

Considering that the Fukushima evacuation zone is 20km with hot spots much further than that, there is no logic to the above statements, rather it is an expression of wishful thinking. Additional threats not considered are terrorist threats, cyber security threats and airplane crashes.

That is not good enough for an environmental impact assessment.

Response 13:

The evacuation zones for Fukushima (based on a Boiling Water Reactor design from the late 1960s) cannot be directly compared to either those of the KNPS (which is a Pressurised Water Reactor design from the late 1970s) or to the current Generation III Pressurized Water Reactor designs on which Nuclear-1 is proposed to be based. The design of the nuclear technology, structure and passive and active safety systems of Generation III nuclear power stations are very different to those of Fukushima Daiichi.

However, it needs to be pointed out that the basis for adopting the EUR by Eskom is that the EUR aims at ensuring that the design that is adopted has minimal impact on the man and environment. This has been developed by utilities who will, in any case, have their design studied and endorsed by the relevant regulatory body. If the final design does not conform to the assertions made, the design will not be accepted and might have to be modified accordingly until it conforms to these requirements. Thus, the key emphasis of this requirement is to minimise the impact on man and

[22] Nuclear-1 Revised Draft EIR. Appendix E26. Emergency Response Impact Report. pg. ii.

[23] Nuclear-1 Revised Draft EIR. Appendix E26. Emergency Response Impact Report. pg. 1

environment. The Emergency Plan boundary allow for minimal restrictions around the site, while also providing for safer designs

In addition, the assessment of external events (aircraft crash, Tsunamis, etc), on a particular design forms part of the safety case that will need to be presented to the NNR for evaluation

Management of Radioactive Waste

Comment 14:

Nuclear-1 EIA Management of Radioactive Waste report says this about high level waste stored on site in ponds:

"At present, South Africa does not have an authorised facility for the disposal of high level waste. Thus, the only currently feasible alternative is for Eskom to store high level waste in spent fuel pools on the Nuclear-1 nuclear island, as is the case at Koeberg'.

This statement is false in two ways. Firstly, there is a feasible alternative, which is not to have nuclear power at all and secondly, if you have it, to store fuel assemblies, after they have cooled down, in dry casks. But this would cost more. "As is the case at Koeberg" means that the fuel rods will be stacked and re-stacked in the fuel pools. We know now after Fukushima, if we did not already, that storing spent fuel in ponds on site is not safe. Even in "Generation III" reactors, fuel pools are not inside the double containment structures of the reactors.

The Management of Radioactive Waste report mentions actinides, specifically plutonium but nothing more than that. It does not mention that plutonium, is the most toxic element but also the fuel for nuclear weapons. A 4 000 MW nuclear power plant would produce 800 kg of plutonium a year (at 200kg plutonium per 1GW per year)[24]. A spent fuel pool containing a 4-year inventory of spent fuel rods would contain enough plutonium to make 400 plutonium weapons. A 4 000 MW nuclear power plant with a 40 year operational life would produce 32 tons of plutonium, enough for 4 000 plutonium weapons. It is hard to say what is more difficult: protecting the environment from this substance for hundreds of thousands of years or protecting the plutonium from a mad man intent on nuclear weapons. The EIA says nothing about this. Instead, the problem is transferred to the National Radioactive Waste Management Policy, although there is no final solution offered. The report states instead:

"...public acceptance of radioactive waste isolation projects remains one of the major challenges"[25]

Response 14:

Eskom, in line with global practise, use both wet (pool) storage and dry (cask) storage for the generated spent fuel from the reactors. Much so wet storage in which the pools are within the same concrete steel reinforced containment building as the reactors. The Dry storage casks are stored in the waste buildings. Highly sophisticated security measures are in place to control access to these buildings and each and every employer is screened and passes through devises that monitor absorbed doses received by entering from these employees to ensure no limits are exceeded from a regulatory compliance perspective. Furthermore, Eskom accounts for all nuclear fuel material on site (U-235, total uranium and total plutonium mass) through its Nuclear Fuel Accountancy System ("NFAS"). This report is scrutinised by the IAEA as part of the non-proliferation treaty agreement of which SA is a signatory.

The spent fuel pools and reactors at Fukushima are of a different design. The reactors are within the containment whereas the spent fuel pools are within a steel structure.

[24] Burton Richter. Beyond Smoke and Mirrors. Climate Change and Energy in the 21st Century. Cambridge University Press. 2010.
[25] Nuclear-1 Revised Draft EIR. Appendix E29 Waste Assessment.

The disposal of nuclear waste is the remit of the Nuclear Radioactive Waste Disposal Institute that has been established by Parliament under Act 53 of 2008. It is the policy of the DoE to establish a central interim spent fuel store (under the NRWDI) for South Africa by 2025. Therefore spent fuel would be shipped to this store from the power station on its closure.

Comment 15:

Footnote

There is a bias to be found in parts of Nuclear-1 EIA, as for example in the quotation above, that implies that the major disadvantage or challenge of nuclear power is "public perception". As a member of the public who has studied these documents and found numerous fault lines as indicated in my comments, I take exception to the implication that it is my 'perceptions' that is the greatest challenge rather than the issues and problems that I raise.

Response 15:

Your perception of bias is noted.

Whilst it is true that there are (managed and well-controlled) risks associated with nuclear power generation, there are many other common risks (that have a far greater potential to lead to fatalities or serious and debilitating injuries) that the public is happy to accept on a daily basis. A sober analysis of risks (taking into account both the consequence of the risk and the probability of its occurrence) shows that commonplace risks such as travelling in vehicles (more than 16,000 South African's killed on our roads each year)) results in a much higher probability of fatality or disabling injury than a nuclear power station. . In spite of the comparatively low risk of sickness or death from nuclear incidents (bearing in mind that there has been not a single fatality recorded from the release of radioactivity from Fukushima Daiichi but more than 20,000 combined deaths and missing persons recorded as a result of the tsunami), there remains a perception that nuclear technology holds an inherently greater risk of death or injury than other forms of commonplace risks.

Yours faithfully
for GIBB (Pty) Ltd

The Nuclear-1 EIA Team