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Ms Bongzi Shinga
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Email: "Bongzi Shinga" <bongzi.shinga@acerafrica.co.za>

Dear Ms Shinga

RE: Environmental Impact Assessment for the Proposed Nuclear Power Station
("Nuclear-1):
A comment on the Economic Impact Assessment Report.

My response is focused on the Economic Impact Assessment Report, a specialist study by Conningarth Economists, that informs the Nuclear-1 Environmental Impact Report. In the scope of study, the consultants confine the scope of the EIA to a 20km radius of the 3 sites, but in the body of the report they also take on a role of negating the viability of renewable energy, without any substantiation. They are wrong and the report is biased. By doing this they avoid having to make any comparison with viable alternatives. They also do not do a full life cycle cost analysis of the nuclear plant itself and they avoid any of the serious problems of the nuclear life cycle by confining the scope of the study to the 3 sites for 30 years. Nuclear power is not a self-contained technology that can be confined to a site or 30 year time period. The consultants ignore this but see the problem in terms of "perceptions" on the part of the public. This is biased.

My comments follow the quotations taken from the EIA report rendered in italics.

Executive summary

"Perceptions regarding a NPS are frequently based on a lack of scientific information about perceived impacts... Mitigation measures proposed relate to operation and maintenance (particularly the skills issues) as well as to public perceptions and concerns."

Perceptions regarding a NPS can also be based on scientific information. The role of the EIR consultants is to present the scientific information, not to preface their comments with their perception of public perception.

Operation, maintenance and level of skills is a precondition and not a question of "mitigation". Public perceptions and concerns are entirely valid and the use of the word "mitigated" implies the entire issue is merely a matter of "perceptions".

1.1. Project Background

"Identified renewable forms of energy, for example, solar, cannot supply base-load power stations. "

This statement is unsubstantiated and untrue. Concentrated solar thermal plants with hot salt storage (with or without natural gas back-up) can deliver base load e.g.: "Phase 1 of the CSP [Eskom's concentrated solar power plant near

Upington] ... will be a base-load plant" and wind farms can deliver base load where there are sufficiently varied sites with wind availability >30%. This can be proven or dis-proven by wind mapping.

1.3 Scope of this Study

"The primary objective of this study was to measure the nature and magnitude of the economic and socio-economic impacts of the NPS at each of the three sites. The economic impacts consists of...a construction and a production (operation) phase."

Nuclear power is a technology with impacts that go beyond construction and production at a site. The impacts should include post-operational life, security, decommissioning and also long-term spent fuel management, since unless a solution can be found, spent fuel may have to remain on site indefinitely.

2.1. Thyspunt

2.1.4 Fishing

"...the fear of negative market perceptions [relating to radioactive contamination of squid] appears to be mitigable. The production and distribution of scientific evidence should be sufficient to dispel such perceptions"

It is not that perceptions need to be dispelled, rather that evidence is required and is outstanding. Relevant studies could be made of marine life in the sea outfall of the Koeberg nuclear plant, for example.

2.3. Duynefontein

2.3.3. Industry

"The business sector is interested in securing a stable supply of power and is not concerned about a second NPS at Duynefontein provided that safety measures are in place...it believes that the technology will be more advanced than at Koeberg...and therefore the risk will be managed"

It is not mentioned who "the business sector" refers to. The opinions are hearsay. It is unscientific to state that "...[the business sector] believes that the technology will be more advanced...and therefore risk will be managed." Risk analysis should be done by risk specialists e.g. insurance companies. They should be given details of the new advanced technology (not included in this EIR) and see if they will include nuclear incidents in their insurance policies (at present not insured).

2.3.4 Tourism

"Estate agents believe that the direction of the city expansion will be to the north"

It is not mentioned who the "estate agents" are, but in any case the question should rather have been put to the Cape Town City's urban planning department, who could explain the parameters and the future growth of the city much better. It is not a matter of tourism. What is important, and what is not mentioned in the EIR, is the impact of low density restrictions imposed by the NPS emergency evacuation zone on the city's urban densification policy. It should be possible to put a financial cost to this in terms of opportunity cost and the cost of servicing the resulting "leapfrog" development that the EIR refers to. Although Koeberg is presently responsible for this, Koeberg's operational life is only another 10 or so years, after which the emergency evacuation zone would fall away. This omission must surely be a fatal flaw in the EIR.

3.2 Cost-effectiveness Comparison of the Three Sites

Future values have been discounted back to present values using a real discount rate of 8%...All costs resulting from the existence of Nuclear-1 but which are

ultimately passed on to end-users or absorbed by other users are taken into account..."

The purpose of a discount rate is to find the present value of future money to the investor/operator. It is not ethical to discount future costs that are "absorbed by other users" or in another word externalised. The discount rate can only be used where the individual or entity remains legally bound to pay for these costs he/it has incurred. Hence, "costs absorbed by other users" are not taken into account in this method. The only way to internalise the external costs is to invest a corresponding amount at a realistic safe rate of return e.g. government bond rate, and not at 8% real rate of return above inflation, which is a speculative (i.e risky) rate.

"Removal of nuclear waste" is mentioned as a cost that is discounted. So long as the operator does not have to pay for the full and final cost of waste management, i.e. externalises them, these costs should not be discounted.

3.2.1.2.2 Reactor StandardCost

...The non-variable element of the capital amount, payable to the vendor, has been brought into the study as the "Reactor Standard Cost" [R150 275m]. The co-called "Correction Value" refers to costs identified and calculated other than vendor costs [R150 275m + 19 725 m = R170 000 000 000].

It is misleading to imply there is a reactor standard cost. What reactor is being costed? From the very limited practical experience with "Generation III" there will be no fixed turnkey price to a nuclear reactor. Costs vary with the cost of capital including exchange rate movements and the time period of construction with delays. The initial cost of the still unfinished reactor at Olkiluoto has doubled and Flamanville 3 is 20% over budget. The latest estimate for a nuclear power plant is in the range of \$5000 -7000/MW (Moody's) which would place the cost of Nuclear-1 (4000MW) in the cost range R160 - 220bn. This is in today's money. Nuclear construction costs have been consistently escalating in real terms: 15% annually between 2003-2008 so the construction cost by 2020 could be substantially more.

3.2.1.2.14 Value of Unskilled Job Creation

"...it is clear that all three sites would have a very positive impact on unskilled job creation"

It is obvious that such a huge construction investment would impact on unskilled jobs creation. It would be more useful to compare job creation potential with a viable alternative. The number of jobs created, both unskilled and up-skilled, by installing say 10 000 MW of wind turbines across varying locations in the region would be more instructive.

3.2.1.3.1 Power Balancing

This section implies that only a NPS can provide power balancing. This is not true. For example, 10 000 MW of wind turbines in varying locations with high wind availability (+30%) could provide 2 000 MW of firm capacity and 1 000 MW of variable energy supply, a total of 3 000 MW. "Nuclear-1" could provide 3 000 MW if run at 75% capacity, but not all the time - there would be some down time when the plant generates much less or nil.

3.2.1.3.2 Power Supply Delays

"Site preparation and construction delays at the different sites could cause a relative delay in the commencement of electricity supply"

The maximum of 4 months delays allowed for in the study are wholly unrealistic. Delays in the latest Generation III power plants are Olkiluoto: 4 years and Flamanville: 20%? Delays of years, not months need to be considered, and costed. Since Eskom and the consultants are not familiar with the potential for wind power to provide for firm capacity, they must cost on the basis of OCGT using diesel fuel to provide the shortfall. It is also not adequate to compare merely the cost differences of the 3 sites.

3.2.1.3.5 Transport Cost- Radioactive Waste Removal

The impact assessment limits its terms of reference to what is not critical. Only the impacts of construction and operation are considered, and only with reference to the 3 sites. Hence "radioactive waste removal" cost is reduced to the transport cost of low and medium-level waste based on the comparative distance to Vaalputs. The assessment ignores the high level waste problem, the cost of on-site storage and of very long-term management and isolation for an unknown period. The cost of security on and off-site including the cost of protecting the transport of highly radioactive materials is also not considered.

3.2.1.3.8 Agriculture Impact

The impact assessment concludes that there is no impact, except at Thyspunt where there is a negative impact. The question that ought to be answered is: what is the impact on agriculture in the event of radioactive contamination of the ground a) from the normal course of operation and b) from an incident of enhanced release? Studies around Koeberg should be made of the radio-active isotopes that may or may not have made their way into the soil at various times and from there into plants and into milk. A food chain concentrates the particles so analysis of the milk from surrounding farms should be a good indicator. Unless this is done, and it is not even mentioned in the assessment, it is not possible to make conclusions about agricultural impact.

3.2.3 Sensitivity Analysis

3.2.3.1 Discount rates

"To test the confidence levels of the results, a sensitivity analysis has been performed with various real discount rates i.e. 5%, 8% and 10%. The 5% is used as it is often the accepted discount rate for projects affecting the environment..."

The use of a discount rate to derive present value is used to determine the relative profitability of an investment to the investor. The use of any discount rate for costs not obligated back to the investor/operator for example costs affecting the environment is inherently wrong. The only future cost you can discount is the cost you yourself pay. As a thought experiment, consider the cost of a serious incident 40 years after commissioning of the reactor. The original investment would have long been paid off, at whatever interest rate was chosen and the cost of the event reduced to near-zero. Whether at the high-risk rate of 10% or the low "environmental" rate of 5%, discounting would have the same effect of reducing the apparent seriousness of the incident in present value. One way to manage future environmental costs in present value terms is to set up a fund at the beginning invested in government bonds at probably not more than 1 or 2% over inflation. Over a very long period, even this strategy is inadequate. This assessment ignores this problem by avoiding considering any long-term environmental liabilities.

3.3 Macroeconomic Impact Analysis

The NPS is such a large investment that the economic..effects will go beyond its direct boundaries...The total period of 30 years was considered as any longer period becomes statistically insignificant...Thus, although a NPS will operate for 60 years, it becomes meaningless to estimate the remaining 37 years of

operation."

1. The report recognises that the effect of so large an investment "goes beyond the direct boundaries" but as a result of its own terms of reference, (a comparison of a NPS at the 3 sites), the impacts given in the report are without comparison with any viable alternative. So there is no basis to evaluate the results other than that they are what is presented.

2. There is no basis for the statement that the NPS will operate for 60 years. The vendor may offer this in the sales-talk, but there is no experience in the world of reactors operating this long, the average age being 25 years. There are very few reactors anywhere reaching 40 years. The older reactors are, the more brittle they get and so the possibility of a serious incident rises. This is statistically significant, not insignificant or meaningless.

3.3.3.4 Decommissioning

1. As the time period of the assessment is limited to 30 years in the EIA, the future costs of post-operational life, of guarding the power station and of decommissioning and of long-term spent fuel management are effectively ignored. Certainly, decommissioning is a burden on future generations since, although it appears to add to GDP figures, there is no addition to wealth, and a diversion of human resources to unproductive work.

"Further scientific development over the lifetime of the plant can also mean that the plant can be revitalised and the lifetime extended".

2. Do they mean extended life past the 60 years they have already assumed? What "scientific development" are they referring to? This is nothing but pro-nuclear propaganda.

3.5 Climate Change

The report concludes that there are financial cost implications associated with sea level rise, especially at Duynefontein, and yet these costs are not quantified as such and are not included in the reactor cost "correction value". The variable costs for the 3 sites differ, (Table 3.25) but it is not clear whether the additional cost relating to sea-level rise has been included.

4.3 Risk Assessment

4.3.1.1. The Odds of a Serious Event Occurring

"The nuclear industry throughout the world has rigid safety standards... Eskom will be obliged to prove to NNR that proposed plant can and will meet these... safety standards"

Eskom is not the manufacturer or vendor of the reactor so it can not prove anything about the plant's inherent safety standards. Eskom can and must prove to the NNR that it can safely run the reactor. But first we need to know what reactor this is and then we need to know how the NNR is going to evaluate the design. If the reactor is to be one of the Generation III type as sold by Areva, it would appear that the enhanced safety features they say are incorporated are required by the higher burn-up:

"Generation III reactor fuel is to stay in the reactor core longer where it is to be irradiated or ~~spent~~ to a much greater extent ~~ll~~ compared to the equivalent Generation II reactors, [such as the Koeberg reactor], it is significantly more radioactive, its radionuclide content is more complex, actinide laden and longer lived, it is more heat generating and will remain so for decades longer.... all of this uncertainty about the fuel abnormal event

performance places much more emphasis of the surety of the reactor island containment"

Proof of safety must include all stages: design, construction, operation, post-operation, decommissioning and long-term waste management. The burden of evaluating such information falls on the NNR and their ability to perform this task depends on the resources and expertise that they have.

"Since the NNR's regulations conform to the highest international standards, it seems justifiable to say that, under normal operating conditions, it is extremely unlikely that an incident with any significant adverse effect on the economy would occur....Nuclear-1 would use state of the art technology and maintenance as well as safety standards..."

This is an opinion and a disclaimer: "under normal operating conditions". But it is precisely when the operating conditions are not normal that a serious event may occur. Regulations by themselves are then not enough. "State of the art technology and maintenance" does not reduce the chance of a serious incident to the level "academic". The report fails to make any assessment of what the "odds" are. In the USA, the Union of Concerned Scientists has stated: "serious safety problems continue to arise at US nuclear power plants because the Nuclear Regulatory Commission is not adequately enforcing the existing standards." It is these regulators who are advise our NNR. The Nuclear-1 EIR treats this question far too dismissively.

4.3.2 Skills requirements

"The possibility of a nuclear disaster is...connected to the issues of skills...There are two serious concerns: The first relates to the ability of the South African educational system to produce the skills...Nuclear skills are a scare resource worldwide.. Eskom cannot expect to find it easy to recruit such skills outside the country. The ability to retain skills is a second concern"

The consultants have finally identified a problem. The level of skills has an impact on the likelihood of a serious event occurring.

4.3.3. Radioactive waste disposal

"...We were made aware of concerns on the part of the local communities regarding the safety factor surrounding the issue of nuclear waste disposal...a National Radioactive Waste Management Agency will be established and will exert tight control over the disposal of radioactive waste...At present South Africa does not have an authorised facility for the disposal of used fuel and high level radioactive wastes. "

The safety of nuclear waste is phrased here as if a "concern" of local communities, rather than a safety issue in its own right. This displays the bias in the report. The assessment is full of contradictions, i.e. "will exert tight control" but "does not have a facility" for spent fuel. The use of the word "disposal" is also incorrect: there can not be "disposal" of spent fuel, when it has to be protected from leaking into the environment for tens of thousands of years. On any rational basis, this would be enough to reveal a fatal flaw in the nuclear power plan, but nuclear power does not appear to operate on a rational basis. Similarly, no account or estimate of the costs of long-term spent fuel management is made in the report.

"The transportation of radioactive material around the country is highly regulated"

Regulation on its own is not adequate. It would require active policing and protection in varying situations, against the possibility of a worst-case scenario which is a terrorist attack on a spent fuel transporter. No calculation

of the chances of this possibility has been made, or the cost of protecting the transporter or the liability insurance for a serious event.

4.5 Consideration of alternatives

4.5.2 Technological Alternatives.

"Identified renewable forms of energy, for example wind and solar, have inadequately developed technology to provide large-scale power generation...that can supply a reliable base load...[wind] output will oscillate widely... "

All of these statements are opinions which display bias. Wind technology is highly developed and can indeed provide large-scale power generation if the wind conditions are suitable. This can be proven or disproven by meteorological data. Concentrated solar thermal technology is also well developed, although not yet at the scale of wind. South Africa has some of the best solar resources in the world in the northern Cape. Power generation from wave and ocean current is still experimental but promising. In the southern Cape, the best resource at present is wind. Mainstream Renewable Energy is confident of the viability of 30 000 MW of wind capacity in the W and E Cape, supplying 6 000 MW of firm or "base" load and 3 000 MW of variable energy, a total of 9 000 MW at a long-term fixed cost i.e. there is no variable fuel cost. Nuclear-1 at 75% capacity (better than Koeberg) would supply 3000 MW and to generate a similar amount of energy from wind would require 10 000 MW of wind turbines installed in various locations with a capacity of 30% - 35%. This would provide 2 000 MW of firm or base load during the day, when the load is required, and 1 000 MW of more variable energy at fixed cost. Independent power producers and investors are confident enough to commit their own money to this. Already there are at least 3 500MW of wind farms in the EIA or planning stages, especially around PE and Coega. It is not acceptable for the EIR consultants to deny the reliability of renewable energy without any scientific evidence e.g. wind maps and thereby promote nuclear power on the basis of "no alternative".

"The cost of electricity generated by wind power will be almost three times that of Eskom's current installed capacity"

The consultants have fallen into a trap which they as economists should not fall into. The cost of any new generation capacity will always be more than Eskom's current installed capacity, which is 95% from coal and where the capital costs have long been written off. The cost or price of electricity from wind is currently set by NERSA REFIT to encourage new investment where there has hardly been any investment in the past. This set price may come down in future, and should be compared to the cost of new generation capacity from any other new sources, and not to existing installed capacity.

"It is pertinent to refer to a government White Paper in the UK (2008) which stated that all evidence pointed to the costs of nuclear power being lower than that of coal and gas"

Presumably this "White Paper" refers to the UK Government White Paper on Nuclear Power, in which case it says no such thing, except where there is a high carbon tax on coal. In the White Paper on Nuclear Power (2008) the chapter on the Economics of Nuclear Power concludes : " It is for investors to determine whether the financing... of nuclear power provides sufficiently attractive returns...".

Private investors (not state-owned, like Areva) have determined that it does not. The costs of building new nuclear power plants are in reality much higher than the figures used in the UK White Paper and the risks to private investors are much higher than the government realised. A recent study by Citi Bank (2008) identifies three major risks: construction, power price and operational. It concludes: "We see little if any prospect that new nuclear stations will be

built in the UK by the private sector unless developers can lay off substantial elements of the three risks. Financing guarantees, minimum power prices and/or government backed power off-take agreements may all be needed if stations are to be built."

5. Mitigation measures

"An examination of international experience with regard to NPS's shows that, in the main, people have problems with nuclear power only where accidents are concerned"

The comment is hearsay and displays bias. People have many problems with nuclear power, obviously including accidents, not least the new real threat of terrorism but also including the daily discharges. Other problems, less noticeable on the surface, are the problems of uranium mining and the exposure of mineworkers to radiation and chemical toxicity, the problem of acid mine drainage and radioactive contamination of groundwater (as is now occurring in the Witwatersrand), and the back end problems of waste management for unthinkable amounts of time and the burden of decommissioning passed on to future generations and the threat of nuclear proliferation, which always accompanies the nuclear industry and worsens as it expands. The study only highlights the critical factor of skills and the reliance of nuclear power upon the highest level of risk-management. These are the real problems that need to be addressed, not the perceptions.

5.2. Public Perceptions and Concerns

"There is a widespread...lack of information on the part of the public regarding the impact of a NPS. Proposed mitigation measures [includes]...an aggressive public relations campaign directed at the local community."

This last statement speaks for itself. The EIR consultant/s show themselves to be far from independent, in fact they clearly promote the nuclear power industry. The main problem they see is "perceptions" on the part of an ignorant public so that an "aggressive" PR campaign needs to be directed at communities presumably in order to squash any resistance. Whereas instead, an open public debate about the entire nuclear industrial life cycle needs to be brought into the public domain.

Yours faithfully

Rod Gurzynski

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