Comment on: **REVISED PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT FOR ESKOM'S PROPOSED NUCLEAR-1 -2 AND -3 - REVISION MAY 2009**

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The plan of study for an EIA starts out from the assumption that a nuclear power station is going to be built in a pre-determined place or places and the purpose of the EIA is to identify and mitigate the negative effects. The EIA construed in this way is self-limiting and does not ask the right question. The question should be: is nuclear power the best solution for electricity generation in South Africa out of a range of viable alternatives, going into the future? It is not logical or correct to assume this question has been answered. The plan of study however explicitly precludes this question from being included in the EIA. Under 'Alternatives assessed' (5.3 page 37) the following assertion is made: *"Identified renewable forms of energy are inadequately developed to provide large scale power generation facilities that can supply a reliable base load and easily integrate into the existing power network in South Africa"*. This assertion is packed with assumptions and follows a threat that in the event that a no-go alternative is adopted "*Eskom would in all likelihood apply to develop more coal fired power stations."* Thus the EIA study takes up the Eskom proposition that the key issues are decided beyond doubt and do not need to to be assessed in the environmental impact assessment, which becomes site-specific. There is an explicit threat that if the no-go option is taken, Eskom will build new coal-fired power stations. This means that without any public debate, specialist study or peer review, South Africa's energy future is being charted along the nuclear road, with all that follows from that. It could be that an environmental impact assessment is too limited in scope to address the strategic issues involved and that the appropriate type of assessment for energy and especially for nuclear power is a strategic environmental assessment. Nevertheless, the assessment must be done.

A decision about power generation and energy use is a decision affecting the whole country, the future energy path of South Africa and the resulting shape and form of our economy. An informed debate on this topic is vital. The EIA study's assertion that "renewable forms of energy are inadequately developed" is not true except in so far as Eskom has not adequately developed them. It is not true in actuality. Worldwide renewable energy technologies are developed and viable and costs of renwables are trending downwards. UCT's Energy Research Centre's renewable electricity study (2008) [1] has found that "...there are grounds to take renewable energy seriously. The modelling indicates that by itself, such a programme would have less of an impact than this year's price increase. The alternatives to electricity supply from coal in South Africa are renewable energy and nuclear. This study suggests that the renewables option is not more expensive than nuclear." In fact, together with 'partnership programmes' of research and development, infrastructure development, industrial strategy and energy efficiency measures "...the overall cost of renewables will be lower than business-as usual." The renewable electricity generation options that were evaluated in the study are wind and solar thermal and it was found that they could provide 15% of South Africa's electricity needs by 2020. Given that in 2008 Eskom distributed 220 000 GWh of electrical power, 15% of that would imply that at least 33 000 GWh is possible in South Africa from renewables by 2020. Professor Winkler, in his authoritative book "Cleaner Energy Cooler Climate" (2009) shows that there is a technically feasible contribution to be made of 86 846 GWh from renewable energy technologies.[2] This figures includes the savings or 'negawatts' of energy efficiency measures that displace electricity use, of solar water heating. The DME proposes a possible 7 900GWh/year in residential and commercial applications [3] which is a conservative target. One residential SWH panel with 65-70% efficiency and a timer-controller will displace 3.3MWh/year (at an installation cost of about R13 million/MW electricity displaced). Much more could be done in the field of energy efficiency and electricity-use displacement.

There is also the potential of clean energy from the run-of-river Inga III hydro electric power station with its capacity of 4 500MW (at a construction cost of about R16 million per MW) for steadying of base-load by 2020. By having BHP Billiton move their aluminium smelter to Bas-Congo to take advantage of Inga III relieves Eskom of 1 500MW of capacity to feed this monster at Coega when we do not even have bauxite (the base mineral of aluminium) to mine.

Intermittence: It is not correct to say that renewable energy is intermittent and nuclear power is not. Renweable energy from wind is variable and from solar thermal with hot salt storage, reliable. South Africa has adequate wind resources for 30% average availability [4] which is spread across numerous locations and the solar capacity of the Northern Cape is the best in the world. Nuclear is intermittent because it can only function as a base-load, and is not variable due to safety considerations, and so it is either on or off. The factor of unplanned unavailability of Koeberg nuclear power station is 7.6% up to 2007 [5]. This is intermittence.

Cost of nuclear: One 4 000MW nuclear power station like 'Nuclear-1' has been estimated to have a capital cost of at least R120 billion [6] which works out at R30 million per MW. The capital cost is assumed because Eskom has not revealed the true cost, if it can be calculated at all. Latest estimates from the USA, where nuclear power is more commercially priced, shows realistic capital costs in the range of R41 - 57 million/MW [7] pricing a single 4000MW reactor at R164 - 228 billion. With an availability factor of 70% [8] it would produce 24 528GWh in one year [9] which would be available by 2018 at the earliest (nuclear plant construction times are only vague estimates). One nuclear power station alone is not reliable due to unplanned unavailability. In the event of a shut-down, all 4 000MW capacity is shut down. This means an equal amount of back-up is required, hence Nuclear -2. Eskom's plans are for 3, at a combined cost of at least R360 billion but possibly R500-680 billion (in today's nominal money terms) if Moody's Investor Service estimate is more realistic. This is massive expenditure of funds on a single technology that is not flexible and is not fail-safe. No private business would invest this type of money without government guarantees (including public liability guarantees) and we must beware of this.

Back-up: Koeberg nuclear power station with a total capacity of 1 800MW requires a dedicated 195MW back-up at Atlantis, in the event of an emergency shut-down, to operate essential and critical systems [10]. This is 10.8% of the total capacity so presumably a 4 000MW nuclear plant requires a 430MW dedicated back-up quick-start capacity that can not be used for any other purpose. This cost must be factored in too. Each nuclear power station therefore requires an equal amount of back-up from somewhere for unplanned unavailability plus a 10% dedicated back-up for emergency power: a total of 120% back-up availability in the case of 2 nuclear power stations. That is if they don't not both have to be shut down at the same time for same reasons.

Decommissioning: Decommissioning costs and impacts and the technology of long-term waste management are, according to the study, "too far into the future...and therefore cannot be assessed at present" (4.4.2. Impact identification and assessment. Page15). It is strange indeed to preclude renewable forms of energy from Eskom's planning and the EIA itself because they are assumed to be "inadequately developed" and yet absolve the EIA from assessing impacts of the decommissioning phase of nuclear power. It is to be hoped that the specialist consultants evaluate all aspects of nuclear power against the viable renewable alternatives at the outset and also do not pull a cover over future costs and impacts of decommissioning and long-term waste management. Costs in the region of R11.5million/MW have been mentioned [11].

Greenhouse gases: Nuclear power while having lower greenhouse emissions than coal is not better than renewables. Nuclear power emits in the region of 66kg CO2e/MWh in its lifecycle [12] which is below that of coal (1000kg CO2e/MWh) [13] but 5 times above that of wind (12-14kg CO2e/MWh) [14]. Nuclear power also emits radionucleides in the normal course of operation and in its lifecycle while renewable energy technologies do not.

Environment: The specialist consultants are asked to provide a description of the affected environment. From an economic perspective, the affected environment is the entire future shape of South African economy and the type of work and of industry that will prevail. To do justice to this, none of the impacts mentioned in the EIA study's terms of reference for the economic assessment (4.5.13 Economic. Pg. 25) can be assessed without an assessment of the alternatives. Eskom is not only proposing 3 x 4000 MW nuclear power plants but also any number of Pebble Bed Modular Reactors as well.

The following, not included in the EIA study, needs to be addressed:

- The make and type of nuclear plants proposed
- The cost
- Decommissioning and waste management impacts can not be excluded from assessment, as proposed in the present study, nor the costs.
- In the case of Duynefontein, the sterilisation of surrounding land for urban development and the opportunity cost of that.
- A comparative evaluation with renewable energy alternatives and alternative efficiency strategies.
- The opportunity cost of investing R320 - 680 billion into nuclear power plants and the resulting opportunity cost of associated nuclear-related industry, mining and servicing, security and public liability insurance and waivers and potential nuclear proliferation.

The specialist consultants must not be influenced by Eskom's threat to 'develop more coal-fired power stations' in the event of a no-go option. Eskom has the alternative of buying electricity from independent power producers at NERSA rates and investing their capital in maintaining and up-grading their existing distribution network and investing in smart-grid technology to balance supply and demand and energy efficiency strategies. It is intolerable that South Africa could be taken down the nuclear road without a strategic assessment of the implications for all of us.

NOTES:
All costs in this study are given in 2008 nominal Rands.

1	UCT Energy Research Centre. Costing a 2020 Target of 15% Renewable Electricity for South Africa. October 2008
2	Cleaner Energy Cooler Climate. Developing Sustainable Energy Solutions for South Africa. Harald Winkler. HSRC Press 2009. Table 5.15 pg. 135
3	Dept of Minerals and Energy 2004. Economic and financial calculations and modelling for the renewable energy strategy formulation. Prepared for DME by Conningarth Economists for CaBEERE project, Pretoria. Accessed from Renewable Energy Briefing Paper. August 2008. Holm, Banks et al.
4	UCT Energy Research Centre. Costing a 2020 Target of 15% Renewable Electricity for South Africa. October 2008
5	IAEA Power Reactor Information System. March 2009. Retrieved from www.iaea.org/programmes/a2/index.html.
6	According to Moneyweb. http://www.moneyweb.co.za/mw/view/mw/en/page55?oid=240406&sn=Detail.
7	Nuclear Engineering International. Escalating cost of new build: what does it mean? Steve Kidd, Director of Research, World Nuclear Association. Quotes Moody's Investor Service estimate of $5000 -$7000/kW as "realistic". Retrieved from: http://www.neimagazine.com/story.asp?storyCode=2050690 $5000-7000/kW (2007$) @ exchange rate $1:R7.29 = R36450 - 51030/kW x CPIX adjuster 167.7/150.3 = R40570-56800/kW or R41-57 million/MW in 2008 Rands
8	70% is the historic availability factor of Koeberg nuclear power station up to 2007. IAEA Power Reactor Information System. March 2009. Retrieved from www.iaea.org/programmes/a2/index.html
9	4 000MW x 365 days x 24 hours x 70% availability = 24 528 000 MWH or 24 528 GWh/year
10	Eskom. Proposed capacity expansion of the existing OCGT plant and associated transmission lines and substation at Atlantis. http://www.eskom.co.za/content/Chap2PrjDescri081206.pdf.
11	Parliamentary Monitoring Group. Environmental Affairs and Tourism Portfolio Committee. 19 October 2004. Nuclear Regulatory Issues. A cost of R16bn for 1800MW KNPP (2004R) translates to R11.5bn/MW in 2008R.
12	Energy Governance Program, Yew School of Public Policy National Universysity of Singapore. Energy Policy 36 (2008). Valueing the greenhouse gas emissions from nuclear power: A critical survey. Benjamin K Sovacool. Elsevier. Retrived from: www. elsevier.com./locate/enpol.
13	Cleaner Energy Cooler Climate. Developing sustainable energy solutions for South Africa. Harald Winkler. HSRC Press. 2009. Tables 3.3 and 3.6
14	Declaration EPD of Electricity from Vattenfall's Wind Power in the Nordic Countries.2007. Retrieved from: http://www.environdec.com/reg/epd115e.pdf