Our Ref: J27035

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14 July 2010

Attention: Janda McDonald

Dear Madam

ESKOM ENVIRONMENTAL IMPACT ASSESSMENT (EIA:12/12/20/944) FOR A PROPOSED NUCLEAR POWER STATION AND ASSOCIATED INFRASTRUCTURE: COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Your correspondence to Ms. Bongi Shinga of Acer (Africa) refers.

Arcus GIBB acknowledges receipt of the above-mentioned letter. We thank you for your valuable comments and your participation in the Eskom Nuclear Power Station (NPS) Environmental Impact Assessment (EIA) process to date. Your questions and comments concerning the Nuclear-1 have been noted.

Responses to your comments / questions are as follows:

ASSESSMENT OF THE POTENTIAL IMPACTS ON HUMAN HEALTH ENVIRONMENTAL IMPACT REPORT

Your comment (1)

Methodology

Firstly and most importantly it must be stated that the report is not an Assessment of the Potential Impacts on Human Health of a nuclear power station as described.
In order to assess something one requires data. By its definition an assessment is the process of judging evidence gathered. Without evidence there can be no assessment.

Without an evaluation of data any conclusions drawn are subjective and inconclusive.

The data necessary to assess potential human health impacts from a proposed nuclear power plant would include, but not be limited to, the following verifiable data:

a) Levels/ amounts of radioactive isotopes routinely emitted by a nuclear power station such as the one assessed.

b) Documented health effects on the surrounding populations as a result of prolonged exposure to radioactive isotopes as emitted.

c) Levels as deemed allowable/ acceptable to human health by global and national monitoring bodies as well as by medical authorities.

d) Levels/ amounts of radioactive isotopes routinely emitted by the existing nuclear power station at Koeberg and the cumulative impacts on health from this together with the proposed new reactor. This must include data regarding continued radioactive releases here even when decommissioned.

e) Weather data as relating to how quickly and far routine or accidental emissions spread. This data must be relevant for different seasons and possible weather patterns. It must demonstrate as accurately as possible the possible amounts of radioactivity affected populations would be exposed to, in both low and high level emission scenarios.

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f) Population statistics and regional densities together with development plans for the region to assess number of people impacted by routine or accidental emissions.

g) Population data in vicinity (including analysis pertaining to percentage with vehicles to ascertain dependency on public transport) together with data as related to roads and traffic usage to extrapolate evacuation possibilities in event of a large release of radioactive gas.

h) Data related to disaster management apparatus available :
   i) Availability of iodine pills as thyroid cancer prophylaxis to be distributed and method for doing so.
   ii) Relocation possibilities
   iii) Evacuation possibilities
   iv) Control of foodstuff and water
   v) Physical shelters: how many, where etc

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If this data is not incorporated and analysed an effective EIA cannot be performed and a project of this nature cannot be passed.

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Response (1)

The report is based on a dose assessment, with qualitative interpretation of health risk. This is in line with the regulatory requirements as set out by the National Nuclear Regulator on safety standards and regulatory practices (R388) which is based on the accepted international system of radiation protection to ensure that public and the environment are not at risk from the effects of ionising radiation. Regulatory limits set by the National Nuclear Regulator are in line with recommendations from the International Commission of Radiological Protection (ICRP). The ICRP is an advisory body that offers its recommendations to regulators and advisory agencies, mainly by providing guidance on the fundamental principles on which radiological protection can be based. Virtually, all international standards and national regulations addressing radiological protection are based on the commission's recommendations. This includes international basic safety standards (from the International Atomic Energy Agency (IAEA)) and various labour conventions. The system takes into account biological

information and trends in the setting of radiation safety standards. The recommendations made by the ICRP are based on scientific knowledge and expert judgement also balancing societal and economic aspects. The commission uses information from various sources such as epidemiological studies, experimental studies to estimate risks associated with external and internal exposure to radiation and provides risks estimates at the low dose of interest in radiological protection.

The National Nuclear Regulator will not grant a Nuclear Installation Licence (based on NNR act (act 47 of 1999) if the applicant can not demonstrate that the risk to the public remains as low as reasonably achievable. Such analysis is performed through the licensing process with the National Nuclear Regulator details of which are contained in the Site Safety Report (SSR) and Safety Analysis Report (SAR), respectively) which will form part of the NNR licensing process which includes a public participation process. The HHRA specialist report is based on these principles, that no plant will be build on the site unless it can be demonstrated that it will comply with the limits as set out by the NNR. Should the cumulative impact exceed the regulatory limit, a license shall not be granted by the regulator.

The assessment of dose to the public takes into account all possible pathways, this include through air/atmospheric emissions at different intervals (both for normal operating conditions and accidental conditions).

The information on current and projected population as well as development plans, nearby transportations, military and industrial facilities are collected during the siting phase of the nuclear installations and are contained in the Site Safety Report (SSR) for the site. This information is updated on a periodic basis to reflect the current status of the site and its surroundings and is used as inputs during the evaluation of hazards associated with the site, evaluation of dose to the public and the emergency planning.

One of the requirements during the siting of the new facilities is to identify physical characteristics that could impede the development and implementation of an emergency plan, as well as to determine the feasibility of developing and implementing the emergency plan; these include additional recommendations on infrastructural requirements, protective measures associated with the emergency (i.e. relocation, evacuations, etc). The information is reviewed, evaluated and assessed by the regulatory (NNR) before a license can be granted to locate a plant on the site.

The DEAT letter refers (Ref: DG 22912) refers: i.e. Consideration of matters pertaining to nuclear safety in Environmental Impact Assessment on Nuclear Installations. To avoid duplication of work, this kind of quantitative analysis is performed through the NNR processes.

Your comment (2)

NNR Responsibilities

It is assumed that any relevant data will be assessed by the National Nuclear Regulator and then it is assumed that this data will be acceptable. One cannot presume data to be acceptable prior to an assessment of this data.

The conclusion is drawn that the approach is “adequately protective against health effects to members of the community.”[1] Without evidence to show that the NNR can and will adequately assess this data and without evidence of the actual data this conclusion is false.

[1] Environmental Impact Assesment for a Proposed Nuclear Power Station and associated infrastructure. January 2010. Assessment of the Potential Impacts on Human Health, Environmental Impact Report. p25

The fact that "all issues relating to radiological safety must be addressed through the NNR licensing process" [2] is unacceptable. The lack of transparency of the NNRs monitoring, functioning responsibilities under the guise of 'not wanting to cause alarm' could be perceived as sinister particularly when the very close relationship the NNR has with the nuclear industry, both within and outside South Africa, is considered. It must also be noted that as the NNR receives most of its formal funding from its licensees, its neutrality is dubious.

Response (2)

The regulator will not grant a Nuclear Installation License if data presented are not acceptable and if it cannot be demonstrated that there is no risk to the public and the environment. Also refer to DEAT letter (Ref: DG 22912), the NNR is by law, a competent authority to address such matters. The NNR Act also makes provision for public participation during the licensing process to allow for transparency. It is general practice that the licensee is liable for certain fees to the regulator; this is applicable throughout the organs of state; the principle also applies in the Department of Environmental Affairs through permits, polluter pays principle, etc.

Your comment (3)

Have any monitoring studies been conducted around the existing Koeberg facility to identify whether adverse health effects noted in studies in other countries (e.g. increased incidence of birth defects, cancer) are present in relation to Koeberg?

If not then on what basis can it be assumed that compliance with NNR emission levels will be protective of the health of nearby residents? (for example, residents in Atlantis have higher rates of smoking, HIV, poor nutrition and alcohol consumption than equivalent populations in the UK or Germany, for example, so there may be addition risk factors which increase risks from environmental ionising radition emissions).

If yes then why was this not included in the EIR?

- On what basis can it be assumed that the plants WILL comply with NNR emission levels if no data is presented as to the specifics of the plant.

- If the Impacts on Human Health are to be dealt with at a later stage by the NNR, the human health impacts on human health are as yet unquantified and unassessed in terms of the potential danger. In the summary section on "Impacts on Air Quality" it is stated "Furthermore based on the predicted impacts of both non-radioactive and radionuclide emissions, the operational impacts at all the alternative sites would fall safely within legal and guideline limits.[3]".

At no point in either this 16 page Executive Summary or the 27 page Potential Impacts on Human Health Environmental Impact Report Appendix E24 of the Draft Environmental Impact Report (DEIR), is it shown that these radioactive emissions do in fact fall safely within legal and guideline limits. There is no data to this effect, which has been assessed or evaluated, anywhere in the report, so the assumption above cannot be made.

[2] Arcus Gibb ref : J27035. 14 September 2009. Response to letter from Ninette Potgieter
[3] Page 7, Nuclear-1 Draft Environmental Impact Report Version 1/ February 2010 Executive Summary

All this does is reflect a bias in the report toward a preferable outcome for the proposed project.

Response (3)

As part of the licensing conditions from the Regulator, Koeberg is expected to perform monitoring programmes in areas surrounding the facility. Data collected was used as input to evaluate the dose to the public resulting from the releases from Koeberg. This information gives a good indication on the potential health risk to the public.

Your comment (4)

DEAT requirement not fulfilled

The scoping report dated July 2008, was submitted to the department of the Environment and Tourism to comply with Environmental Impact Assessment regulations, 2006.

The scoping report was accepted subject to conditions. One of these, under Human Health Risk Assessment was that "Information from existing Koeberg NPS should be used for modeling." (2.27.2 of the letter from DEAT Approval of FSR)[4]

This has not been done.

Response (4)

Koeberg data was used in the HHRA

Your comment (5)

Literature Cited

It is revealing to look at the literature that is cited in this report.

There is NOT ONE peer-reviewed publication in the scientific literature cited. Of the 13 references, three are other EIAs for the project, and one is a conference paper presentation whose scientific validity cannot be evaluated. The rest are reports, some directly from the nuclear industry or from regulatory bodies whose independence cannot be judged.

By way of pointing out some of the contemporary issues, at the end of this submission I have copied some abstracts from CURRENT PEER REVIEWED literature to suggest that there is considerable movement and discussion in scientific circles.

An EIA cannot be accomplished in a fair and transparent manner by relying on reports emanating from the same industry who are seeking approval for a further roll out of the same technology.

Response (5)

[4] Appendix B2 of Arcus Gibb DEIR: DEAT Approval of FSR

The bodies referred to are put in place to ensure peaceful application of the nuclear technology and to ensure that the public and the environment are protected. The references are from international agencies, literature publications and reports of independent consultants, not from the industry (i.e., Eskom) seeking approval from the NNR. Information contained in such reports emanate from extensive research from different member states, scientific evidence and experiments, and working group activities from different member states.

Your comment (6)

Site Safety Report

In the opening page (p2) of the Environmental Impact Report relating to The Assessment of the Potential Impacts on Human Health, many of the critical points are mentioned as being part of the report (Site Safety Report) which will be submitted by the applicant to the NNR for approval.

Thus these fundamental questions and concerns are not analysed in the Environmental Impact Report and will be privately assessed by the NNR.

Questions regarding the funding of the NNR and its neutrality remain relevant. It is a small body, which should not be taking on the analysis and evaluation of questions such as those below in isolation. Many if not all of the points below should be in both the public and parliamentary domain for opinion and analysis. Independent medical practitioners and scientists with a knowledge of radiation and its impact on health should be used to fully analyse the data.

As per p2 of the Assessment of the Potential Impacts on Human Health:

'The applicant for a nuclear installation license must submit, in support of its application, a site safety report (SSR) to the NNR comprising the following:'

1. Motivation for the choice of site to ensure a low risk of public exposure from the operation of the nuclear installation(s).'

Human health effects should be monitored in a 100km radius of a nuclear power plant. The installation of a nuclear power plant approximately 30 kilometers from the centre of a large metropolis such as Cape Town is irresponsible. Let us not forget the cumulative impacts that must be taken into account. If the new power station will have emissions in the order of Koeberg then they will each have to halve their routine emissions in order to fall within the NNR guidelines.

Response (6)

See response 1 and 2, as well as DEAT letter ((Ref: DG 22912). In terms of the draft siting regulations published by the Department of Energy, anyone who is willing to apply for a nuclear installation license for siting of a new nuclear installation must submit the Site Safety Report satisfying the conditions as stipulated in your comment above. The NNR process make provisions for a public participation process through which such issues may be addressed. DEA will grant the environmental authorisation on the condition that the NNR conditions are met, and that the NNR is satisfied with information provided by the applicant.

Your comment (7)

2. Statement as to the proposed use of the site in terms of the scope of technologies being considered for proposed nuclear installation(s) and use on the site, including as appropriate the maximal thermal power, general design characteristics ….'

No assessment of any sort can be made about an unknown subject. Until the exact technology is available for scrutiny, any analysis is subjective, irrelevant and inconclusive.

Response (7)

Noted, hence once the technology is chosen, detailed analysis will be performed to demonstrate that it is suitable to be located on the site, through the NNR licensing processes. In the absence of plant specific technologies, a technology envelope is used to provide assurance that plants that fall within the envelope can be permitted on the site. This approach is used internationally, especially by the United State Nuclear Regulatory Commission (US NRC).

Your comment (8)

3. A probabilistic risk assessment….population demographics and regional development, based on projections to account for the design life of the nuclear installations…The cumulative impact of all nuclear installations planned or existing must be taken into account…'

This is a very difficult question as growth of Cape Town to the North is occurring very rapidly. Parklands which is the fastest growing suburb in South Africa has its northern border 14 kilometers from Koeberg Power station, which is to the North of the Duynefontein settlement.

Does Arcus Gibb feel that it is ethical and acceptable for the NNR to be solely responsible for the undertaking of this analysis?

Response (8)

The NNR by law is regarded as a competent authority when it comes to issues related to nuclear safety and will decide how they handle such issues within their mandate.

Your comment (9)

4. Analysis of impact on the public due to normal operations, anticipated operational occurrences and design-basis accidents of the nuclear installation(s) to demonstrate compliance with regulatory dose limits.'

Does Arcus Gibb feel that it is ethical and acceptable for the NNR to be solely responsible for the undertaking of this analysis, especially as the dose limits are in fact set by the NNR? Could the dose limits not be altered to fit the emissions as discharged, thus releasing the applicant from any potential claims against it?

Response (9)

The NNR by law is regarded as a competent authority when it comes to issues related to nuclear safety, they base their decisions on international standards and therefore cannot just fit the standards to meet the discharges. The work performed is independently reviewed and verified.

Your comment (10)

In this regard it is necessary to point out the discrepancy in the tabled emissions in The Air Quality report where this seems to be exactly what has happened.

In Appendix 10 Air quality Assessment I would like to draw your attention to the table on page 192 where measured emissions of radionuclides from Koeberg Nuclear Power station are shown. In the year 2001, the amount of Caesium 137 as emitted is shown as 4E+04.

		TABLE II(a): IODINE-131 IN GASEOUS EFFLUENT FROM KNPS 1984-1992								
	1984	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	
Sr-90	0	0	0	0	0	0	0	0	0	
I-131	7.39E+07	1.27E+08	3.17E+08	6.66E+08	2.62E+09	2.05E+09	6.32E+08	2.13E+09	9.17E+08	
Cs-137	0	0	0	0	0	0	0	0		
		TABLE II(b): IODINE-131 IN GASEOUS EFFLUENT FROM KNPS 1993-2002								
	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Sr-90	0	0	0	0	0	0	0	0	0	3.02E+05
I-131	5.61E+08	4.41E+08	5.29E+08	2.29E+08	2.69E+08	7.48E+07	1.91E+08	2.80E+08	1.03E+09	5.27E+08
Cs-137	1.28E+06	1.94E+07	0	0	0	1.42E+06	6.40E+05	1.40E+06	4.49E+10	3.54E+06

The original report as shown above and as signed off by the National Nuclear Regulator in 2001, shows the amount of Caesium 137 emitted to be 4.49E+10.

For those who are not familiar with this system, the +4 or +10 relates to the number of zeros after the amount ie the multiples of ten.

The amount of 4E+4 is 40 000 Bequerels.

The amount in the original table provided by Koeberg Nuclear Power Station in 2001 and signed off by the regulator was actually 44 900 000 000 Bequerels.

That is a massive discrepancy.

So I ask the question is again posed:

Could the dose limits not be altered to fit the emissions as discharged or visa versa, thus releasing the applicant from any potential claims against it?

Response (10)

The figures in the Air Quality Report correspond to the emission rates provided by Eskom. The original spreadsheet provided by Eskom agrees with all other rates. If there were to be an error, it needs to be established why there is a difference and which one is correct. If it turns out that the incorrect value was used, it won't really make a difference in the dose calculations since it was based on the maximum emission nuclide rate observed over the entire monitoring period.

Your comment (11)

5. Analysis to demonstrate the viability of an emergency plan….taking in to account disaster management infrastructure.'

This is dealt with in point 4 below. As this has been cast, as with all the difficult and unanswerable questions, into the arena of responsibility of the NNR's later assessment, I would like to include this for academic purposes and in the hope that it will be dealt with later adequately.

Response (11)

Your comment is noted. As with other responses, the applicant must demonstrate to the NNR regulator that it will be feasible to develop and implement an emergency plan, taking into account site conditions. This work is independently reviewed by the regulator before it can be accepted.

Your comment (12)

6. Radiation and its effects on human health

6.1 In Section 2.2 I quote:
"Ionising radiation has sufficient energy to change the structure of molecules, including DNA, within the cells of the human body"

"Ionisation of atoms in the human body by radiation can lead to harmful biological effects"

We know that there are routine radioactive emissions from a nuclear power station for the fact that they must comply with "regulatory dose limits" which are set by the NNR.

We know that even very low doses of ionizing radiation, as from these emissions, has deleterious effects to living organisms as quoted above.

Nuclear energy should be seen as a polluting source of energy with dangerous and harmful side effects. These side effects must not be taken lightly.

Damage to DNA is the most fundamental form of damage a living organism can endure. DNA is the blueprint for life forever after. Once it is changed it can never be changed back. To quote the document section 2.2 page 5 "the genetic code is transferred from one lineage of cells to the next with remarkable fidelity."

6.2 In section 2.2 there is much reference made to the health effects as related to the Hiroshima and Nagasaki atomic bomb incidents. This is not entirely relevant to the case of a nuclear power plants emissions where continuous exposure to low level radiation is experienced, not short term large scale radiation. The radioactivity released by a nuclear power plant is longer lived than that released by a bomb detonation, hence it is not possible to draw a simple comparison between the nuclear power plant emissions and emissions due to bomb detonations.

6.3 To quote Section 2.2 page 6: "The defect that resulted from the original mutation can thus be passed on for many generations. The mutation may manifest itself as a gross anatomical abnormality, or as a subtle physiological or biochemical abnormality, nonetheless with detrimental effects on the health of the affected individual. The risk is small.."

The fact that there is a **known risk of deleterious health effects** to the general population should reduce favour for construction of a nuclear plant.

6.4 From point 2.2 on page 5 " there is not any specific cancer which can be unequivocally attributed to ionising…"

The problem regarding epidemiological studies of exposure to ionizing radiation is well known and documented. Conclusive evidence of the exact cause of any cancer is virtually impossible to ascertain due in part to the latency periods of cancers.

This does not however mean that the damage that ionizing radiation is capable of, no longer exists, simply because we cannot be sure of the exact numbers of cancers which are unequivocally related to radiation exposure.

Even 26 years after the Chernobyl accident its effects are still becoming apparent and will continue to do so as recessive genetic mutations start to appear in later generations. There are only 47 cancer deaths which can be directly attributed to the Chernobyl accident, however according to a April 2006 report by the International Physicians for Prevention of Nuclear Warfare (IPPNW), entitled "Chernobyl's consequences on health", more than 10,000 people are today affected by thyroid cancer and 50,000 cases are expected. In Europe, the IPPNW claims that 10,000 deformities have been observed in newborns because of Chernobyl's radioactive discharge, with 5,000 deaths among newborn children. They also claim that several hundreds of thousands of the people who worked on the site after the disaster are now sick because of radiation, and tens of thousands are dead.

6.5 From point 2.2 page 6 " in addition to cancer and hereditary effects, radiation exposure has been demonstrated to increase the risk of other diseases, particularly cardiovascular disease….however there is no direct evidence of non cancer diseases at doses below about 100mSv"

The fact is that the full effects of low-level radiation on human health are not completely known yet.
How can a massive investment of taxpayers money be made without adequate knowledge of what impact they may have? How can any conclusions be drawn regarding the health risks to the general public, when the scientists who research ionizing radiation admit incomplete knowledge of the subject.

Response (12)

See also response 1, Dose limits are there to ensure protection to the members of the public. Furthermore, exposures must be as low as reasonably achievable (ALARA), as has been explained in the HHRA. The nuclear industry is well regulated to ensure that systems are in place to ensure safe operations of the facility without risk to the public and the environment taking into account lessons learned from past historic incidents and accidents (including Chernobyl and Three Mile Island). The fact that there is a known risk to deleterious effects of ionising radiation does not mean that the health outcome will in fact manifest at the exposure levels near a nuclear power plant. The risk is based on the amount of radiation dose one will receive within a certain period of time and how this risk increases with the amount of radiation dose. The risk becomes significant only at exposure above a certain level of exposure. For exposures in the *de minimus* range this risk would be trivial. Hiroshima and Nagasaki was used as an example to illustrate the risk of hereditary effects associated with ionising radiation. Regulatory dose limits are based on many studies and the dose of 100 mSv is more than 2 orders of magnitude higher than what would be the case at the nuclear power station under the requirement for ALARA.

Your comment (13)

Dosage Assessments

7.1 I fail to see the logic of the approach described in the report attributed to the ICRP that bases "dose assessments, in particular prospective dose assessments, on the characterisation of an individual rather than a group …[who] is defined as the *'representative person'* … the equivalent of the '*average member of the critical group'*, representing the more highly exposed individuals." The point is that preventive measures need to protect NOT the average or typical individual but all individuals who may have a wide range of vulnerability. In that regard, South Africa's population/s is likely to have a much WIDER range of vulnerability than the populations of developed countries, who are the main contributors to the ICRP guidelines. Nowhere in the report do the consultants recognise this omission. By way of comparison, when regulations are set regarding chemical exposures or residues in food, they are not set at levels that protect the average person but are set at levels that aim to protect the most vulnerable – children, the elderly, etc.

7.2 In the Air Specialist Study it is written:

The methodology described in IAEA Safety Report No. 19 (IAEA 2001) was adopted in the estimation of inhalation and immersion dose....**The inventory of long-lived radionuclides builds up in the environment, with the result that exposures may increase as the discharge continues**.

Do dose assessments take this into account?

Response (13)

The critical group is a hypothetical group of people that will receive the highest level of exposure within the community. The average member of the critical group simply is a reference to the highest exposed individual, not the average person in the community. The dose calculations followed in the SSR are conducted for different life stages (age groups) in the critical group. The approach is very conservative. Dose evaluation studies takes into account all possible exposure pathways, and it is depended on the source term (radionuclide inventory) released into the environment (short lived and long lived radionuclides).

Your comment (14)

Emergency Plan

Point 6 on p2 of The Assessment of the Potential Impacts on Human Health, states that the applicant must submit a Site Safety Report to the NNR comprising "analysis to demonstrate the viability of an emergency plan, including transport and disaster management infrastructure."

Under the NNR Act, a declared "Site Emergency" is limited to a nuclear site (not affecting the public). However the management of the off-site emergency (affecting the public) is the responsibility of Government authorities.[5]

In terms of the Disaster Management Act, the National Government department of Minerals and Energy (DME) is responsible for coordination and management of matters related to nuclear disaster management at national level.

[5] Department of Minerals and Energy : National Nuclear Disaster Management Plan. October 2005. p4-5

As per Section 25 of the Disaster Management Act, each national organ of state indicated in the national disaster management framework must prepare a disaster management plan setting out contingency strategies and emergency procedures in the event of a disaster, including measures to finance these strategies.

To quote the Disaster Management Plan of 2005: " It is recognized that in the case where there is a need for urgent protective actions in the public domain, and where the local authority is not yet in a position to order such protective actions, the holder of the nuclear authorization should as a priority act in the interest of the public by advising/recommending such urgent protective actions."[6]
The responsibility of the NNR, when related to large scale nuclear disasters, has thus been limited to advise and recommend action. Anything above this falls on the shoulders of the DME and national government.

One would assume that a National Nuclear Disaster Management Plan would have concrete and accessible plans in place, in the event of a disastrous large scale release of radioactivity from a nuclear power station, which, though unfortunate and rare, remains a possibility with devastating consequences.

However the National Nuclear Disaster Management Plan is nothing more than a set of recommendations regarding procedures necessary to create an emergency plan.

Real issues which *should* be addressed would include:

a) The provision, storage and accessibility to protective clothing
b) The provision and accessibility by the public to prophylactic iodine tablets
c) The availability of nuclear shelters
d) The plan for evacuation looking at transport mechanisms and routes of escape

None of these are dealt with in the National Nuclear Disaster Management Plan.

If a nuclear disaster were to occur, the following would take place if the National Nuclear Disaster Management Plan were to be followed:

a) Koeberg would alert the NNR of the accident
b) The NNR would ensure that an emergency plan on site is followed .
c) The NNR would alert the Department of Minerals and Energy
d) The DME would alert the Local Authority.
e) The Local Authority would refer back to the NNR for advice on what procedures to follow.
f) A meeting would be convened by all 3 levels of government at the relevant Coordinating Centre.

By which time it would be too late.

Response (14)

All the comments above are addressed in the Emergency Plan for the site, which is to be reviewed and accepted by the NNR. The Emergency Plan for nuclear 1 will deal with issues such as roles and responsibilities, communication, actions to be taken following the emergency, evacuatation time estimates, etc.

Your comment (15)

[6] Department of Minerals and Energy : National Nuclear Disaster Management Plan. October 2005. p5

Waste management

There is no mention of what is planned for the high-level waste or low level waste in the Human Health Impact assessment.

The disposal of waste has always been and remains the “elephant in the room” when it comes to nuclear power production.

Surely this has health implications and should be included in a health risks assessment report?
We all are aware that this waste is highly toxic.

This cannot be left out of a health assessment study of any sort.

At the present moment there is approximately 1 000 000 kilograms of high level waste in storage at Koeberg. This is not being adequately dealt with by any department or body including the NNR.

Response (15)

The spent fuel stored at Koeberg is included in the radiological monitoring referred to in the HHRA and in earlier responses in this letter. The disposal of low and intermediate level radioactive waste will be undertaken at a facility that is licensed for this purpose (Vaalputs waste disposal site) and the impacts of disposal are therefore adequately managed within legally accepted criteria. This disposal site is audited on a regular basis against legal requirements. An additional report on the risks and management of waste will be published in the Revised Draft Environmental Impact Report.

Should you have any queries with respect to the above please do not hesitate to contact Arcus GIBB.

Yours faithfully
For Arcus GIBB (Pty) Ltd

_____
Jaana-Maria Ball
Nuclear-1 EIA Manager

As referred to in Point 5:
Some abstracts of relevance pasted below:

Is cancer risk of radiation workers larger than expected?
Jacob P, Rühm W, Walsh L, Blettner M, Hammer G, Zeeb H.
Occup Environ Med. 2009 Dec;66(12):789-96. Epub 2009 Jun 30.
Hemholtz Zentrum München, Institute of Radiation Protection, D-85764 Neuherberg, Germany. Jacob@helmholtz-muenchen.de

Abstract
Occupational exposures to ionising radiation mainly occur at low-dose rates and may accumulate effective doses of up to several hundred milligray. The objective of the present study is to evaluate the evidence of cancer risks from such low-dose-rate, moderate-dose (LDRMD) exposures. Our literature search for primary epidemiological studies on cancer incidence and mortality risks from LDRMD exposures included publications from 2002 to 2007, and an update of the UK National Registry for Radiation Workers study. For each (LDRMD) study we calculated the risk for the same types of cancer among the atomic bomb survivors with the same gender proportion and matched quantities for dose, mean age attained and mean age at exposure. A combined estimator of the ratio of the excess relative risk per dose from the LDRMD study to the corresponding value for the atomic bomb survivors was 1.21 (90% CI 0.51 to 1.90). The present analysis does not confirm that the cancer risk per dose for LDRMD exposures is lower than for the atomic bomb survivors. This result challenges the cancer risk values currently assumed for occupational exposures.
***
Cancer consequences of the Chernobyl accident: 20 years on.
Cardis E, Howe G, Ron E, Bebeshko V, Bogdanova T, Bouville A, Carr Z, Chumak V, Davis S, Demidchik Y, Drozdovitch V, Gentner N, Gudzenko N, Hatch M, Ivanov V, Jacob P, Kapitonova E, Kenigsberg Y, Kesminiene A, Kopecky KJ, Kryuchkov V, Loos A, Pinchera A, Reiners C, Repacholi M, Shibata Y, Shore RE, Thomas G, Tirmarche M, Yamashita S, Zvonova I.
J Radiol Prot. 2006 Jun;26(2):127-40. Epub 2006 Apr 24.
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Abstract
26 April 2006 marks the 20th anniversary of the Chernobyl accident. On this occasion, the World Health Organization (WHO), within the UN Chernobyl Forum initiative, convened an Expert Group to evaluate the health impacts of Chernobyl. This paper summarises the findings relating to cancer. A dramatic increase in the incidence of thyroid cancer has been observed among those exposed to radioactive iodines in childhood and adolescence in the most contaminated territories. Iodine deficiency may have increased the risk of developing thyroid cancer following exposure to radioactive iodines, while prolonged stable iodine supplementation in the years after exposure may reduce this

risk. Although increases in rates of other cancers have been reported, much of these increases appear to be due to other factors, including improvements in registration, reporting and diagnosis. Studies are few, however, and have methodological limitations. Further, because most radiation-related solid cancers continue to occur decades after exposure and because only 20 years have passed since the accident, it is too early to evaluate the full radiological impact of the accident. Apart from the large increase in thyroid cancer incidence in young people, there are at present no clearly demonstrated radiation-related increases in cancer risk. This should not, however, be interpreted to mean that no increase has in fact occurred: based on the experience of other populations exposed to ionising radiation, a small increase in the relative risk of cancer is expected, even at the low to moderate doses received. Although it is expected that epidemiological studies will have difficulty identifying such a risk, it may nevertheless translate into a substantial number of radiation-related cancer cases in the future, given the very large number of individuals exposed
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Dose quantities in radiation protection and their limitations.
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Abstract
For more than 50 years the quantity absorbed dose has been the basic physical quantity in the medical applications of ionising radiation as well as radiological protection against harm from ionising radiation. In radiotherapy relatively high doses are applied (to a part of the human body) within a short period and the absorbed dose is mainly correlated with deterministic effects such as cell killing and tissue damage. In contrast, in radiological protection one is dealing with low doses and low dose rates and long-term stochastic effects in tissue such as cancer induction. The dose quantity (absorbed dose) is considered to be correlated with the probability of cancer incidence and thus risk induced by exposure. ICRP has developed specific dosimetric quantities for radiological protection that allow the extent of exposure to ionising radiation from whole and partial body external radiation as well as from intakes of radionuclides to be taken into account by one quantity. Moreover, radiological protection quantities are designed to provide a correlation with risk of radiation induced cancer. In addition, operational dose quantities have been defined for use in measurements of external radiation exposure and practical applications. The paper describes the concept and considerations underlying the actual system of dose quantities, and discusses the advantage as well as the limitations of applicability of such a system. For example, absorbed dose is a non-stochastic quantity defined at any point in matter. All dose quantities in use are based on an averaging procedure. Stochastic effects and microscopic biological and energy deposition structures are not considered in the definition. Absorbed dose is correlated to the initial very short phase of the radiation interaction with tissue while the radiation induced biological reactions of the tissue may last for minutes or hours or even longer. There are many parameters other than absorbed dose that influence the process of cancer induction, which may influence the consideration of cells and/or tissues at risk which are most important for radiological protection.
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The KiKK studies (a German acronym for Childhood Cancer in the Vicinity of Nuclear Power Plants), results were published in 2008 in the *International Journal of Cancer* (vol 122, p 721) and the *European Journal of Cancer* (vol 44, p 275).

These found higher incidences of cancers and a stronger association with nuclear installations than all previous reports. The main findings were a **60 per cent increase in solid cancers and a 117 per cent increase in leukaemia among young children living near all 16 large German nuclear facilities between 1980 and 2003**. The most striking finding was that those who developed cancer lived closer to nuclear power plants than randomly selected controls. Children living within 5 kilometres of the plants were more than twice as likely to contract cancer as those living further away, a finding that has been accepted by the German government.

1.1 Bantamsklip, Nuclear power, Atom Bombs and Apartheid.

Now, in post-apartheid South Africa, it can be revealed that nuclear power stations and the development of atom bombs went hand-in-hand. South Africa got rid of its atom bombs, but the legacy remains. The present government seems hellbent on putting nuclear power plants right here in the south western part of our country, where it is now the most inappropriate place to put it. The question is "Why?"

The answer is: Because P.W. Botha and his Apartheid security advisors decided so decades ago. The new government is just following old plans without thinking.

The development of nuclear power in South Africa can only be understood against the backdrop of the Cold War, which started almost at the end of the 2nd World War until the fall of the Soviet Union - and beyond. Moscow drove communist expansionism and the Western powers seemed unable to stop it. Korea is still in a deadlock since 1953. Eastern European countries became puppets of Moscow, Russian tanks rolled into Prague and Budapest, to brutally suppress uprisings. The USA withdrew from Vietnam in 1975 after receiving a bloody nose. That was a war that was never even formally declared. It just happened. The Russians invaded Afghanistan in 1979 and civil war, again driven by Moscow, was devastating Mozambique and Angola. As conflict spilled over our borders, the previous government realized they may at best contain the conflict, but never win it. Then came the arms embargo in 1975. South Africa stood alone. Apartheid had made South Africa a pariah state, an outcast from the international communities, both East and West. With its back against the wall, drastic action was needed.

The decision was made to manufacture atom bombs as the only effective defense or at least a deterrent. Almost from the beginning, nuclear power stations and the development of atom bombs became inextricably linked.

Whatever one's stance is now or whatever side of the political divide you were or are on, it cannot be denied that white South Africa had every reason to feel threatened. One can now reason that the bombs would have been unnecessary, had the previous government innitiated political change in the 50's and early 60's as, in British Prime Minister Harold Macmillen's words "The winds of change are blowing over Africa." And that change did not turn out well in all of post colonial Africa. Would South Africa have been any different? It seems Botswana did well, but not the rest. Nice debating point, but no one will ever know for sure. The African states had little reason to love their former colonial masters. Whatever the case, the apartheid regime chose to dig in its heels. Apartheid drove white and non-white further apart.

As is now known, there was a lot of internal disagreement in the cabinet at the time and when F.W. de Klerk became head of state, he secretly ordered the nuclear bomb manufacturing to be stopped. The fact that South Africa indeed had nuclear weapons was only acknowledged by President de Klerk March 24 1993, four years after he ordered bomb building to be stopped in 1998. .

Let us go back to the situation in the mid seventies.

From the mid to late sixties, the situation in Sub-Saharan became more unstable and even worse during the seventies. Peace and democracy seemed out of reach. Fear gripped the southernmost country of the continent as the situation to the North seemingly worsened.

There are limitations to conventional warfare. South Africa was no match for what Moscow could supply. Cubans poured into Angola. Unrest increased on our borders. The only answer was to get atomic weapons, as well as devices to deliver them to distant enemy cities. A tall order, as very few countries had that capability at the time. Certainly none in Africa

The ultimate would be to have an atom bomb that could be dropped on Moscow - where most of the trouble was hatched. South Africa could already, theoretically, drop a bomb on Nairobi, when the rocket research stopped in 1993. At least one missile, launched from the Missile Testing Range at Bredasdorp, could travel that distance. It has been estimated that, had the research continued, the South Africans would have a missile capable to drop an atom bomb on Moscow, by 1996. That would make Moscow think twice before pushing its luck. But the Berlin wall collapsed in November 1989 and politics overtook further developments.

South Africa would also later be able to later launch its own satellite into space. Sadly,, that completed satellite is now only a display item at the Air Force Museum at Swartkops. South Africa was forced by the USA in a rather unfriendly way, to demolish its entire missile program, even for peaceful purposes. A good example of how paranoid and mixed-up American foreign policy really is. The result is that most of the scientists working on that missile program, are now working for countries hostile to the USA.

Perhaps the only good that came out of all of this is that South Africa is now the world's 3rd largest exporter of nuclear isotopes for medical and industrial use, So the bombs found a peaceful use after all.

The Technical part.

Most of us know the model of an atom. It has a nucleus, consisting of protons with a positive electrical charge, neutrons with no electrical charge and a little cloud of electrons, with a negative electrical charge, orbiting around it. When we talk about ''nuclear'', it only concerns the nucleus of the atom and what happens to it. The electrons play no part in nuclear reactions at all. Elements are things like Hydrogen, Oxygen, Iron and Uranium, according to the number of protons in the nucleus. Some elements have different isotopes. That means, although they have the same number of protons, they have different numbers of neutrons in the nucleus. So, Uranium 238 has 3 more neutrons than Uranium 235. That means: U235 and U238 are the same element, with the same number of protons and electrons, but are 2 different isotopes of the very same element, Uranium. Elementary, my dear Watson.

Some isotopes are called: ''stable'', that means they stay the same over millions of years, but others are ''unstable''. Unstable isotopes tend to spontaneously break up or lose some of its neutrons, This usually happens with some sort of release of energy in the form of radiation. These isotopes are therefore called ''radio-active''. Since there are uncountable billions and billions of atoms in one gram of an unstable element, and they break up one atom at a time at random, that means at any time now or in the distant future, there is no danger of them all breaking up at once with lots of release of radiation and energy. There are just too many of them for the chances of that to happen. They decay gradually.

But the more unstable they are, the faster it takes for one gram of that element to break up, or ''decay.'' The time it takes for one half of the atoms to break up, is called the ''half - life'' of that atom. This may vary from minutes to centuries. Then it will take the same time for the other half to break up, leaving only a quarter of the original gram to further decay, every time using the same time to half its numbers. And so on.

Scientists figured out ways to hurry up the process that will cause all of the atoms of the unstable isotope of Uranium, (U235) break up in a very short time, with the release of a helluva lot of energy and radiation. That is called a nuclear explosion or atom bomb. Or simply the A-bomb. They eliminated the natural half-life. This splitting of the atom is called ''fission''. And the bombs are also called 'Fission bombs.''

Scientists have also figured out another way to hurry up the breakdown of radio-active isotopes, but in a slower controlled sort of way with a much smaller, but longer lasting release of energy. That is the basic principle of a nuclear reactor. It is almost an atom bomb slowed down millions of times. But if

that slowed down reaction is not controlled extremely well, the reactor can overheat and cause a "meltdown". This is what happened at Chernobyl. Thousands of people died because of direct radiation near the site and thousands more later, because of the radio-active particles that were released into the atmosphere and inhaled by the unlucky victims. Something similar occurred to a lesser degree at Three Mile Island in the USA. **Incidentally, the same company, Babcock, that built Three Mile Island also built Mossgas.**

The only person who kept track of the real number of fatalities of Chernobyl, "committed suicide". If that tells you something.

Proponents of nuclear energy argue that Chernobyl was started up before completion and the protective concrete and steel containment cover over the reactor was never built. Others point out that it was built as much for generating electricity as making Plutonium, another unstable element, to build atom bombs with. It was also said that Chernobyl was a bad design and it was also due to human error and badly trained staff being overly tired, did stupid things. All of which is true. Nonetheless, more than 2 dozen nuclear accidents occurred in the western world alone, so nothing is completely safe or perfect.

To build atom bombs, you need Highly Enriched Uranium. Natural Uranium ore is only slightly radio-active as it contains a mixture of two forms of Uranium, the "isotopes", U238 and U235. Most of it is the isotope, Uranium 238, which is stable and unuseable. The unstable, or radio-active isotope is Uranium235, which is only a small% in the ore and it is U235 what is needed. It needs to be separated to an extent from the rest. This process is called "enrichment". The more U235 vs. U238 in the resulting mixture, the more it is "enriched" and the more unstable it is. In other words, the more radio-active the mixture, the more useful it is. uranium enrichment is extremely difficult and expensive. South Africa did succeed to find a secret, unique process for enriching Uranium.

More history.

The best way to secretly enrich Uranium, is to have a nuclear reactor as a cover for your activities. The country only has to say it is enriching for peaceful purposes, as North Korea and Pakistan did and Iran is doing now. Both North Korea and Pakistan now have nuclear bombs, bombs that they denied they were developing. It is the lust for political power that drove most nuclear research, not electrical power.

South Africa already had a small nuclear reactor as far back as 1965, for peaceful research purposes. But there is evidence that some elements in the South African government even then had plans to join the nuclear arms race, even though the reactor was acquired from the USA under the "Atoms For Peace" program. Interestingly, this reactor ran on Highly Enriched Uranium - that usually means, "Weapons Grade Uranium" - which was supplied by the USA. Weapons need to be lightweight to be delivered by aeroplane or rocket, so the uranium needs to be highly enriched - up to 90 % for a big bang. Reactor fuel needs only to be enriched up to about 10%, because there is no real weight restriction. The more enriched the fuel, the more unstable it is, so the more radio-active it is and the more difficult and dangerous it is to handle.

At the time, as these things go, in the murky world of politics and weapon procurement, then, as now, the amount of covert actions, secrecy, espionage and counter-espionage and deception was enormous. Prime Minister John Vorster announced publicly in 1970 that South Africa had developed its own unique way of enriching uranium. The message was clear: think twice before you mess with us. But, he assured everyone, that the enriched uranium would only be used for peaceful purposes. However, the USA did not like, nor support this development and stopped supplying highly enriched Uranium to South Africa for the small reactor it already had. The USA did not really believe South Africa could achieve that capability. The USA optimistically hoped that South Africa's nuclear program would just fizzle out with an arms embargo. However, it had the opposite effect than intended. Instead of halting the nuclear research, it just spurred the South Africans on to do the

impossible: make atom bombs with only a fraction of the money and other resources of any country that had atom bombs.

South Africa never confirmed, nor denied that it had atom bombs, but kept the world guessing - and worried. Until much later.

The excuse was that nuclear research would be used for "peaceful purposes" only. In those years, "peaceful" may even have included (as unbelievable as it may sound today) using small nuclear explosions instead of dynamite in engineering projects. The Americans contemplated using it to enlarge the Panama Canal and blasting a harbour in Alaska to construct a military base close to Russia. The Americans dropped the idea, but the Russians did use nuclear explosions to make a canal or canals, but this remains shrouded in mystery. With South Africa's rich mineral deposits and raw materials, nuclear bombs for mining were a possibility, but most believed that the South Africans did not have the technical ability to construct them.

But to be sure, the arch enemies, the USA and Soviet Union, later even joined forces to spy on South Africa, exchanging satellite pictures. A potential nuclear test site being built in the Kalahari, nearly got South Africa in a big war. The site got close to being bombed, but South Africa got wind of it (perhaps tipped off by the USA) and hastely cancelled the test and demolished the site. The public of course, never even suspected anything. However, South Africa kept the Koeberg Reactor going, so nobody really knew what "we" were up to.

The process goes in full swing

In the P.W. Botha era, there was the "total onslaught" and "swart gevaar" - mostly from the North, Within our borders, it lead to the chasm between black and white growing larger,. along with animosity and fear - the scourge of apartheid - leading to extremist groups on both sides. The scaremongering may have done more harm than good, even with 50 000 Cuban troops in Angola. The plans for an invasion and a possible war had to be drawn up and implemented with ever greater haste.

Conventional wisdom dictates in such a scenario that the defensive and offensive military bases should be as far North as possible, but not so close to the border to be vulnerable to a surprise cross-border attack. These were built and "Boetie gaan border toe."

But one will keep your secret weapon manufacturing as far away from the enemy to the North as possible and hidden where nobody will suspect it. It was already known that the nuclear facilities were near Pretoria, so no use shifting that. Just let the nuclear facilities blend in with with other industrial sites, camouflaged as something else. And so the history of nuclear power and atom bombs are twisted into the very fabric of this country. Just as is happening in all other countries aspiring to be part of the nuclear bomb elite.

The furthest away from the Swart Gevaar, and "the closest to home" was right here in the Western Cape. So the new development for secret misssile technology was hidden away in a chemical factory, Somchem, in Somerset West. The missile engine factory was hidden in the mountains that is now the Kogelberg Biosphere Reserve and other technology was developed at Houw-teq close to Grabouw. Hermanus was not spared either.

The first missile testing range was built at St., Lucia, Northern Natal, right in the middle of a high priority conservation area, despite the objections of "the Greens". Because the earth rotates westwards, it is best to place missile launching sites on the East coast and as close as possible to the equator. That is why Cape Kennedy/Canaveral is on the coast of Florida in USA and the Europeans launch theirs from French Guyana in central America. But now there was a problem. Things were not going well in Mozambique and that was too close to the secret missile testing. So then in 1983 the missile launching site went as far South as possible as well. And where is better than the Agulhas plain near Bredasdorp? This missile test range is still used today.

To be economical, one must have your power plant and fuel as close as possible to the place where it is used. It was convenient to have big power stations close to the coalmines in eastern Transvaal and the high tension wires were relatively short to the mines and industries around Johannesburg. Cape Town is far south and a lot of power is lost in transmission due to resistance in the long cables. So, to build Koeberg nuclear power station near Cape Town was logical and economically justified. There is no coal in the Cape and the nuclear fuel is manufactured near Pretoria where such a manufacturing plant was well known and how would anybody know how much Uranium is actually enriched and to what degree? Security was so tight, that neither the USA nor the Soviets ever found out.

Uranium ore is plentiful in South Africa. So weapons grade enriched Uranium - a mixture of up to about 90 % U235 and 10 % U238 - was manufactured next to reactor grade Uranium at only 3.5 % to 10% enriched. Nuclear fuel is concentrated so only a truckload or two poses no transport problem. So South Africa enriched its own uranium to about 3.5 % to be used in Koeberg, and quite legally so, in the eyes of the world. What the world did not know, was that a large amount of weapons grade Uranium was manufactured as well, at the same enrichment facilities.

However, with a growing population, more power stations became necessary. The transport of coal is expensive, so the coal-fired power stations near Cape Town were eventually shut down, as being uneconomical. At least one coal-fired power station at Newcastle, Natal, right next to a coal mine, was dismantled and the essential machinery sold to Germany, at the turn of the millenium, even with power shortages looming. This gives one a clue of how ignorant the current government actually is about energy and related matters.

The Apartheid Connection.

Now it becomes interesting. Koeberg is too far from Port Elizabeth and East London, not to mention Durban and Richards Bay to be really that economical, due to electricity lost in long transmission lines. So why build one here at Bantamsklip, which is also far too far? Or even at Thyspunt, near Cape St. Francis? Or at Duynefontein, next to Koeberg, the three preferential sites?

Well, if one put it further East, it would be too close to where Nelson Mandela and other "terrorists" came from. And here the securocrats' paranoia is showing in a 1984 report: The: "nuclear investigation report western cape 011538# P1 - 48." This report states "is not advisable to route 3 lines parallel from a security point of view." The ANC or PAC "terrorists" were trying to disrupt the economy by blowing up power lines at the time, remember? To have one main power line out of action could be managed by feeding from elsewhere in the grid. With all 3 gone, it could be extremely disruptive. Not good in war-like situation.

Durban and Pietermaritzburg are rapidly growing cities. Neither have coal fired power stations and all its electricity comes the former eastern Transvaal. Richards Bay is also developing fast and huge electricity-hungry Aluminium smelters were planned there, with one already operational. So why not put a nuclear power station there? This is now anyone's guess. Could the proximity to Mozambique still be a factor? Or the surrounding "swart gevaar"? Unlikely. Very unlikely. So what is it?

Or could it be that the old plans from before 1994 are still on the drawing boards and in the back of the minds of the old planners. And so the new planners just took over the old blueprints? Being new in the game, the new role players, some too young to remember, simply went on with the old plans, drawn up in the P.W. Botha era without questioning the reasons for the plan. It could very well be. As the French say, "There is nothing as permanent as a temporary arrangement". Judging by the plans for the Aluminium smelters that were approved and then had to be cancelled again, one has reason to question the judgement of the ministry of energy affairs and the department of trade and industry.

The Thyspunt site, although also in an ecological sensitive area, is close to East London and Port Elizabeth. P.E. the bigger city, is the one furthest from the power station. This does not really make sense. The area between the two cities was surveyed and found geologically unsuitable for a huge

structure like a nuclear power station. But one would expect it to be further up the coast, closer to Durban and Richards Bay. Especially since Eskom sells Electricity to an Aluminium smelter all the way up in Mozambique. MozaI buys electricity at half of the price that it costs Eskom to produce the power, if one has to believe the latest newspaper reports.

The Paradigm

It seems very likely that Eskom got stuck in the mindset of the "old guard", most of whom have since retired. But the new ones who took over the reigns, just went on unquestiongly with that mindset - that paradigm - that nuclear power stations should be in the old Cape Province, just like old P.W. Botha and his securocrats decided. Due to this, the Western Cape and lately the western side of the Eastern Cape must carry the burden of having nuclear power-plants in our midst. With all the negative effects and no benefit.

Will the top hierarchy wizen up that they are following P.W. Botha's policy? Unlikely. They are far too busy fighting each other for positions, big salaries and retirement bonuses. The leadership at Eskom, these last few years, has been so unstable that no big plan was formalized, except to build more power plants. Realizing that going nuclear would be too costly and will take far too long to build, they decided to go the old coal route; cheaper and faster. That was until the World Bank told Eskom they will not get a cent, until Eskom includes renewable energy in its long term planning. In their haste to get going, the board members of Eskom forgot all about their promises about renewable energy until the rude - or is that "inconvenient" - awakening by the World Bank.

It is unclear exactly how the World Bank thinks about nuclear, given the costs, but greenhouse gas power stations are a no-no to the moneylenders. Their mindset is more towards renewable sources such as wind and solar generated electricity.

So, in summary, let us not call it the "Bantamsklip" or "Thyspunt" Power Stations." Just call them after the Big Boss, "Die Groot Krokodil" who wanted it that way: **The P.W. Botha Power Stations.** That is what they really are.

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