

Our Ref: J27035

20 March 2011

Attention: Ms. I. Richardson

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Dear Madam

**ESKOM ENVIRONMENTAL IMPACT ASSESSMENT (EIA:12/12/20/944) FOR A PROPOSED NUCLEAR POWER STATION AND ASSOCIATED INFRASTRUCTURE: COMMENTS ON THE REVISED PLAN OF STUDY FOR EIA**

Your correspondence to Ms. Bongzi Shinga of Acer (Africa) entitled COMMENT ON DRAFT EIA FOR NUCLEAR 1: NUCLEAR REACTOR PLANNED FOR THYSPUNT, BANTAMSKLIP OR DUYNEFONTEIN<sup>®</sup> refers.

Arcus GIBB (Pty) Ltd acknowledges receipt of the above-mentioned letter. We thank you for your valuable comments and your participation in the Eskom Nuclear Power Station (Nuclear-1) 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:

**Your Comment (1)**

South Africa is shooting itself in the foot by industrializing valuable coastal property with the planned construction of nuclear reactors at Thyspunt, Bantamsklip and Duynefontein.

This is a financial disaster, in terms of losses to the property, agricultural, fishing and tourism markets, an ecological disaster in terms of losses of wetlands, flora and fauna and marine biodiversity and public health disaster in terms of escalating health costs due to chemical and radioactive pollutants.

One of the most important health public health campaigns of the twentieth century was directed at stopping people from smoking. These campaigns ensured that large labels on cigarette packets stated that smoking caused lung cancers.

The tobacco industry fought tooth and nail to stop this truth from being publicized. But it was successfully done because people were tired of seeing their loved ones dying from preventable diseases.

Uranium mining - releasing radioactive chemicals into soil, air and water - has been described as secondary only to smoking for causing cancer of the lungs. Leading scientists have stated that there is no such thing as a safe dose of radiation to the human body. They talk instead of risks. High risk and low risks. How much soil, water and air would be contaminated and how long people expect to live.

However uranium mining and nuclear reactors do not just affect this generation alone. Radioactivity pollutes for thousands of years, destroying human DNA and affecting that very basic of human functions - reproduction. It affects the ability of men to father children, by making them sterile. It affects women's ability to have children - causing miscarriages and sterility. And worse still, it causes increases of cancers in children, due to the vulnerability of their developmental stages.

The negligence of the uranium mining and nuclear industries in allowing human suffering to escalate over past years with increases in cancers, is matched only by their sheer effrontery as they sponsor races and events to raise funds for cancer victims.

Like the cigarette-smoking era - the uranium and nuclear era is one that will take years to battle through - leaving countless victims in its wake. Wasted years for every victim who has a name, for every child who deserved a future and for every man or woman who only wanted to be a parent.

Industry and science cannot "mitigate" against this disaster that is being encouraged to spread along the shores of South Africa. They cannot assess these risk factors. It is clear throughout the world, from the Nevada desert's "yellowcake" toxic legacy to Douneray and Sellafield's radioactive beaches, that the chain of production from uranium mining to nuclear reactors brings only death to the "cancer clusters" around them.

The uranium/nuclear industry will deny this to the end - because it is worth millions to them to do so - just like the tobacco industry before them. Smoking is now banned in public places, but there is no way to stop radioactive particles from spreading to public places, through rivers and water courses, to fish and through the soil and plants to human consumption.

This is the total hypocrisy of this industry. And this is why South Africans must object to expanded uranium mining and construction of nuclear reactors in this country. The health of our water, soil and air - the future of our children - depends on it.

### **Response (1)**

Your comment is noted. The impact on the biophysical, physical and social environment as a result of the construction, operation and decommissioning of a Nuclear Power Station at the Duynefontein, Bantamsklip and Thyspunt sites have been assessed by a number of specialist studies (see Appendix E of the Draft EIR) in terms of losses to the property, agricultural, fishing and tourism markets, wetlands, flora and fauna and marine biodiversity as well as public health. The results of the specialist studies and the assessment of impacts acknowledges the impact of the proposed development on the environment but proposes a number of mitigation measures (see the Environmental Management Plan), which, when implemented, results in no fatal flaws in terms of the impact on the environment.

Further, the current application is in terms of the authorisation of the Nuclear-1 Power Station and as Environmental Impact Assessment is a project specific tool the impact of Uranium Mining on the environment does not form part of this applicant. We can therefore not comment on this matter.

### **Your Comment (2)**

#### **1. HUMAN HEALTH**

In the areas proposed for construction of nuclear reactors: Thyspunt, Bantamsklip and Duynefontein, people will be exposed to contamination by carcinogenic radionuclides of the air, soil, water, crops, animal products and seafood.

The EIA states that radioactive substances may be discharged from the nuclear reactor into the air and communities around these sites may be exposed. But the report considers risk in terms of "dose" despite the fact that most recent research has shown that there is no such thing as a "safe dose" of radiation.

A report by the International Atomic Energy Agency in Vienna this year (2010) stated that: "The limits on quantities of radionuclides discharged are usually specified at the point of discharge, such as the stack for airborne discharges, and the discharge pipe for liquid discharges," but, "The ICRP does not propose to set any form of 'dose limits' with respect to environmental protection."

This means that there is no effective regulation of radioactive contamination of the environment and people.

In a report titled "Safe Discharge Limits in the Nuclear Industry" from 1983, regarding radioactive discharges from Koeberg via pipeline to the ocean, D. van As states that: "because of the nature of the exposure routes, these doses cannot be physically measured, in practice it is necessary to assess individual and population exposures by means of mathematical models...It is consequently very difficult to predict the quantity, nature and composition of the specific radionuclides present in the effluent..."

The report states that radioactive effluent from Koeberg contains caesium, tritium, cobalt, chromium and antimony. This effluent is pumped via pipeline into the ocean in the cooling water. However the report also states that: "all radiation doses down to the lowest level are considered detrimental".

It is obviously of great concern to the communities of Thyspunt, Bantamsklip and Duynefontein that they are assigned a high risk profile to which a monetary value is assigned depending on damage caused by radioactive pollutants.

Radionuclides disperse through the atmosphere and are transferred to soil and crops, washed off by rain, adding to radioactivity in the soil. Root uptake processes also add to crop radioactivity levels in plants such as fruits, cereals or vegetables, and the biological decay of crops containing radionuclides transfers these to the soil.

Animal products such as meat, milk and eggs become contaminated as a result of animals eating or drinking contaminated soil, food and water.

Contaminated crops, soil, animal products or air results in what the EIA terms "an internal human dose". Exposure to a radionuclide cloud or deposited radionuclides on soil is an "external radiation dose". These combine to form a total radioactive dose.

The unpredictability of uranium and radioactive particles means that scientists cannot guarantee where contamination will occur, or to what degree, and attempts to "clean up" radioactive particles have resulted in multi-million pound projects in the sea and beaches around nuclear reactors at Douneray and Sellafield.

It is extremely disturbing to read an EIA where people are described as "human receptors" of radioactive pollution. But this is the reality. People are part of the "risk assessment". At Thyspunt, people's homes are described as "sensitive receptors" and the risk includes include "humans of all life stages (including prenatal)". This terminology - referring to our own species as "receptors" obviously aids science in relegating human life to numbers and percentages on paper.

The EIA report states that the close proximity of the Thyspunt site to surface water and agricultural activity in the Krom River valley is an aspect of potential concern. Subsistence fishing in the area could also contribute to human exposure through this "pathway". An activity as simple as fishing -

which provides an essential food source for some or forms a tourism leisure activity for others - would be compromised.

At Douneray, fishing has been banned in waters around the nuclear reactor for many years. Eating locally caught contaminated fish would affect human health. But if fishing is banned, locals are denied a food source and the tourism industry suffers.

Duynefontein was described as "more difficult to assess" because there was already a nuclear reactor there and they planned to build a demonstration module of the Pebble Bed Modular Reactor (PBMR) on the same site. But there are major residential areas in the 25 km radius of the study zone that would be negatively affected.

The Kleinzee/Koingnaas area has been opened to limited tourism. The Strandveld is being marketed to tourists as unspoilt and this would be jeopardized by the construction of a nuclear reactor.

According to the EIA, current or future land use that would negatively affect the health of surrounding communities would include: "industrial emissions of hazardous substances such as sulphur dioxide, ammonia, oxides of nitrogen, reduced sulphur compounds, corrosive gases and particulates...production and storage of hazardous chemicals such as chlorine...disposal of hazardous and domestic waste, and open burning of waste...agricultural activities employing large scale crop spraying".

Those most likely to be affected by inhaling contaminated air would be those spending most of their time at home, including housewives, domestic workers, retired people and the unemployed.

Radioactive pollutants of water, air and soil could also affect recreational activities like hiking, driving vehicles such as 4x4's or dirt bikes, swimming, wading and camping.

## **Response (2)**

The safety of the Nuclear Power Station is discussed in Section 3.19 of the Draft EIR. Since the commercial use of nuclear energy to generate electricity began, it has arguably proved to be one of the world's safest energy generation technologies. It is important to note that ever since the first atom bomb was detonated Strontium (Sr90) and Caesium (Cs137) have been detected on planet earth.

A person living right next door to Koeberg will receive 106 microSieverts a year from all radioactive deposits (man made as well as from Koeberg) if they do the following every day:

- Drink the milk with the highest activity for a whole year (400 liters).
- Swims in the sea, stands on contaminated soil, eats crayfish, abalone etc all with the maximum levels detected.
- Ingests effluent water from Melkbosstrand and Vissershok Sewage Works - one cup per day from each.

According to the NNR (2005 and 2006), the public exposure to radiation as a result of Koeberg's operations has been less than 20  $\mu$ Sv per annum in general and less than 6  $\mu$ Sv per annum in 2005/6, which is far below the limit set by the NNR ([www.nnr.co.za](http://www.nnr.co.za)). The public radiation predicted for the proposed Nuclear Power Station during normal operation is 0.1 mSv. In the event of an incident or accident, this increases to 10 mSv.

Radioactivity in liquid and gaseous discharges from the Koeberg power station during 2007 and 2008 contributed a projected total individual dose of 0.004 mSv to the hypothetically most exposed public group. The projected doses, as a result of gaseous and liquid discharges, were 0.00047 mSv and 0.0038 mSv respectively for 2008 (0.00094 mSv and 0.003 mSv respectively for 2007), which is well within the NNR limit of 0.250 mSv per annum (NNR 2009).

Radiological issues further fall within the ambit of the National Nuclear Regulator. The agreement between the DEA and the NNR indicates that the DEA would not "make a pronouncement on the

acceptability" of radiological safety issues, and that this issue falls firmly within the ambit on the NNR licensing process. However, at the DEA's request, information relevant to radiological safety issues has been included in the Draft EIR.

### **Your Comment (3)**

## **2. WATER SUPPLY**

In South Africa, access to clean water for all is still a major problem. Existing water sources have already been polluted by mining to such an extent that acid mine drainage has put an end to agriculture in areas bordering on mines. South Africa has to secure clean water as a primary objective for the people of this country and the construction of nuclear reactors and expanded uranium mining to feed these reactors is in direct conflict with this goal.

It seems that the National Nuclear Regulator (NNR) has given up rehabilitating the Karoo, for example, where radioactive stones have even been used in the construction of homes and a tennis court! Radioactive water sources have been used by animals. What can be done to "clean up" after a uranium mining industry? It seems that South African scientists are still scrambling to find answers to that.

According to the Draft EIA for Nuclear 1, water for any or all of the reactors will be sourced from: existing schemes, surface water or dams, groundwater, new dams, groundwater, and desalination.

The EIA assumes that adult residents consume two litres of water per day, 350 days per year, for 30 years. If the residential water supply were contaminated, risk would extend to exposure from use of household water (e.g., cooking, laundry, bathing and showering).

The EIA states that desalination is the preferred option, but it acknowledges that the Eastern Cape is a drought stricken area. The nuclear reactor would require up to 104 L/s. The specialist study states that 260L/s of seawater is required to produce 40 per cent fresh water and 156 L/s of brine would be discharged into the surf zone.

However, this highly saline brine contains chemicals from the pre-treatment process, including heavy metals from corrosion or cleaning agents. The effluent from desalination plants is a multi-component waste, with multiple effects on water, sediment and marine organisms.

For example, one of the major pollutants used in the desalination processes is chlorine, which is added to the desalination plant feed water. "Chlorine is a strong oxidant and highly effective biocide. Residual levels in the discharge may therefore be toxic to marine life in the discharge site. The use of chlorine also leads to the formation of oxidation by-products such as halogenated organics. These compounds are usually rather persistent in the marine environment and sufficient evidence exists that some of them are carcinogenic to animals".

Waste brine contains low amounts of heavy metals including: iron, nickel, chromium and molybdenum. Antiscalants are commonly added to the feedwater to prevent scale formation. These are organic, carboxylic-rich polymers such as polyacrylic acid and polymaleic acid. Coagulants like ferric- or aluminum chloride are used to improve filtration. Antifoaming agents like polyglycols are also added to the feedwater and are poorly biodegradable. Cleaning involves the use of disinfectants that are hazardous to aquatic life.

The digging of beach wells to get seawater would undermine the coast at a time when very high seas and tides have detrimentally affected human habitation along the coast.

Accessing water needed for nuclear reactors at Thyspunt, Bantamsklip and Duynefontein could dry up coastal springs, cause flooding by seawater, contaminate local water sources with radionuclides, and negatively impact the surf zone with chemicals from the desalination process.

### **Response (3)**

The assessment of the suitability of the alternative sites in terms of the availability of fresh water is contained and discussed in Appendix E8 of the Revised Draft EIR..

Water requirements for a 4 000 MW nuclear power station will be as follows:

- Normal requirement : 70 l/s
- Construction peak : 104 l/s
- Site establishment : 23 l/s

There are no rivers or perennial streams at any of the three sites and as the nuclear power station will be developed at a coastal site where groundwater is near the end of the flow path. The only existing groundwater use that could be directly affected is that from coastal springs. Any impacts on these springs, according to the Fresh Water Supply Assessment, will be of a very localised extent. In terms of safety and assurance of supply and given the periodic droughts that affect the areas, the already scarce water supply situation and global warming impacts, establishment of a desalination plant is a very favourable alternative and is in fact Eskom's preferred alternative at all three sites (see **Chapter 5** for the discussion of alternatives). The impacts of the desalination plant have been considered and appropriate mitigation measures recommended to minimise these to acceptable levels.

The potential impacts of the construction and operation of the nuclear power station is summarised in **Table 9-7** to **Table 9-9** of Chapter 9 of the Revised Draft EIR,

### **Your Comment (4)**

#### **3. DESTRUCTION OF IRREPLACABLE WETLANDS**

The EIA mentions "impacts associated with catastrophic collapse of dune areas during construction" and explains that the "sandy nature of the proposed construction site coupled with the depth to bedrock and the volume of groundwater in the dunes means that there is some risk during construction of liquefaction of sediments, and catastrophic collapse of the adjacent dunes into the NPS during excavation (Mr P. Rosewarne. SRK. pers comm. during Site Safety Report preparation)."

There would be severe impacts to the Langefonteinvlei wetlands ranging from outright drainage of the system to erosion and the longterm degradation and loss of this important wetland area.

Wetlands are nature's way of purifying water and the effects of the nuclear reactor construction would be to destroy these. The EIA states that: "loss of coastal seeps would be considered a permanent impact, of very high negative ecological significance".

Constant through flows of seawater would result in increased salinisation, leading to a drastic decline in the present ecological function of wetlands as sources of fresh water. The diversion of groundwater flows from these wetlands is also likely to decrease the ability of this ecosystem to recover from or adapt to increased salinities.

During the commissioning stage of the plant, nuclear fuel will be transferred to the site and loaded, and there is risk of contamination of groundwater and groundwater-fed wetlands.

The EIA states that all the wetland sites of the targeted areas are "of high ecological importance". They are unique systems - "unlikely to be represented in their present form, extent and complexity anywhere else in the world...Their conservation status is extremely high and any threats to their integrity have been assessed as of high negative significance".

At Thyspunt, the wetlands are "one-of-a-kind".

Aside from construction of the nuclear reactor, the project would involve construction of transmission lines and roads.

Crossing the dunes and the associated duneslack wetlands, would result in cumulative erosion of the wetland/dunefield/terrestrial mosaic, and a damaging impact on local, regional and national biodiversity.

The EIA states that "no mitigation against infilling of seepage wetlands on Thyspunt would be possible; should infilling of wetlands on any other site be required, no mitigation against this impact would be possible either".

The disturbance to wetlands could lead to: hydrological change, erosion, loss of rare species and increase in invasive alien species.

The EIA recommends that no abstraction should take place from aquifers with direct links to (surface) freshwater ecosystems.

Disposal of sewage effluent from residential areas would result in the need for much larger volumes of sewage to be treated than at present and this affects freshwater ecosystems.

Disposal of effluent by irrigation to groundwater is not an option. It is an important negative impact in its own right.

#### **Response (4)**

The wetlands report identifies a number of significant information gaps and uncertainties, particularly regarding surface / groundwater linkages, which have resulted in the recommendation that the "no development" option should be applied to the Thyspunt site.

However, the report notes that the "no development option" is also associated with a strong likelihood of impact to the wetlands on and off the site. Existing developments, including small holiday houses within the Eskom site, as well as those adjacent to the site to the east, have all resulted in some level of degradation to the wetlands in their vicinity. Activities associated with degradation include abstraction (including the creation of weirs and reservoirs in wetland areas), the spread of alien plant material into wetlands, *ad hoc* construction of roads / causeways across wetland flow pathways; the construction of fences across wetlands and dune areas; *ad hoc* passage of vehicles through dunes; uncontrolled trampling and grazing of cattle through wetlands. In the wetlands to the east of the existing site, existing (approved and partially implemented) development rights will permit further fragmentation of the so-called eastern valley bottom system. The expansion of other cluster-type development along the area to the east of the site, between the Oyster Bay dunefield and the Thysbaai dunefield is not unlikely, and would contribute to piecemeal fragmentation and degradation of the system as a whole.

Such impacts would not however be likely to threaten the large-scale function of wetlands such as the Langefonteinvelei. These wetlands would however possibly (in the opinion of the Wetland Specialist, probably) function at a lower ecological status class, as a result of encroaching development. By contrast, the present levels of uncertainty regarding the detailed interaction and direction of flow

movement between nearby wetlands and the underlying aquifers, and the feasibility of designing a system that effectively limits the radius of draw-down, suggest that there is a significant risk at present that the proposed Nuclear-1 development could result in outright loss of function of the Langefonteinvelei, as well as affect a large proportion of coastal seep wetlands on site. Given this, the wetlands report recommended the “no development option” and accorded the proposed development a high negative impact significance rating.

However, given the conservation problems inherent in the “no development” option, the report also noted that, should the uncertainty regarding wetland / geohydrological linkages be resolved, such that it can be shown **with high confidence** that neither the mobile dune wetlands, nor the Langefonteinvelei wetlands will be affected by drawdown (i.e. these important systems will **not** be jeopardised) and that impacts to the coastal seeps can be significantly reduced, then there is scope to consider the development in a more positive light.

Such an assessment assumes that the above aspects can be guaranteed, and that all of the additional setbacks and on-site mitigation measures referred to in the report are applied. In order to address the certainty of residual impacts to coastal seep wetlands, however, the report recommends offset mitigation – namely, the inclusion of a significant extent of the duneslack wetlands associated with the Oyster Bay dunefield, as well as the “eastern” valley bottom wetland system, from the site boundary to its point of passage into the Links golf course site. In order to achieve this, the wetland report specifies that the erven shown in the attached figure, east of the site, would all need to be acquired, and managed exclusively as conservation areas. The erven would need to be acquired before new developments resulted in permanent ecosystem impacts on these sites. The expanded site would include nearly all of the Oyster Bay dunefield, and its mosaic of duneslack wetlands. The dunefield would not be crossed by any new roads, and the hydrological connectivity of the dunes to its dependent wetlands would remain intact.

The Wetland Specialist considers that active conservation of a significant extent of these wetlands and their ecological support areas is adequate offset mitigation for the inevitable loss / degradation of coastal seepage wetlands that would be associated with the proposed Nuclear 1 development. Degradation of these wetlands is moreover also considered a reality in terms of the no-development option too – all of the coastal seeps in proximity of the existing houses on the site have been impacted to some or other degree by human activities.

The attached map indicates the area that would be included in the conservation area, in the event that the development was approved. However, the positive rating accorded to the development applies only in light of the current information gaps being adequately filled, and such information supporting the view that the proposed development does not pose any threat to the ongoing functioning of the Langefonteinvelei and the Oyster Bay duneslack wetlands, and that all other mitigation measures are considered feasible, and enforceable.

As stated at the recent stakeholder workshop, additional hydrogeological and wetland ecosystem data are currently being collected at the site, to inform areas of current uncertainty. The impact of the Nuclear1 development will need to be re-assessed in light of these data, which will also inform detailed mitigation design. External peer review of the assessment of the implications of the new data would be encouraged, in light of the common objective of both this specialist and the above commenting body, of finding the best mechanism to ensure the conservation of critically important wetland ecosystems.

#### **Your Comment (5)**

#### **4. EARTHQUAKES**

The EIA states that the “ground-shaking hazard” from earthquakes represents the most serious geological hazard impacting on the location and design of a new nuclear reactor. At Thyspunt seven

fault sources, some offshore, were identified as being potentially capable of generating significant seismic events.

Many faults were identified in the area around Bantamsklip and there was significant uncertainty regarding this.

A prime objective of the surveys around Duynefontein was to find evidence of a fault that could have been responsible for the 4 December 1809 Milnerton event.

#### **Response (5)**

A key consideration with respect to seismic risk is the ability of the nuclear power plant to meet a design basis seismic event. The design basis seismic event is that event which will be used in the conservative design of the important to safety and safety critical structures, systems and components of the nuclear power station. For a standard export plant it is the seismic event against which the standard design is checked to ensure that the power station can be built on the specific site under consideration. The beyond design basis seismic event is that event which is used to ensure that no 'cliff edge' effects exist in the design which could endanger the fundamental safety functions.

Based on work completed to date none of the alternative sites are considered to have any seismic disqualifiers.

Future information, which will be developed from the Senior Seismic Hazard Advisory Committee (SSHAC) process, which will only be completed within the next 2 to 3 years, could result in the seismic risk rating of the respective sites either increasing or decreasing.

The design basis for standard nuclear power stations is considered to be based on a seismic risk of 0.3 g, a rating beyond such a parameter would necessitate the re-evaluation and design of a standard plant, resulting in potentially significant financial additions to the overall construction and operational cost of the plant.

The seismic risks at the alternative sites vary considerably. Seismic studies completed to date indicate that the design basis for the respective sites are as follows:

Duynefontein - PGA (~0.3 g)  
Bantamsklip - PGA (~0.23 g)  
Thyspunt - PGA (~0.16 g)

Peak ground acceleration (PGA) values associated with the alternative sites are provided above. Thyspunt demonstrates considerably lower risk with respect to any future variations arising from the SSHAC process, which is in the process of being completed for the three alternative sites. Depending on the outcome of the process, possible subsequent deviations from a standard nuclear power station design, which is more likely to be the case for the Bantamsklip and Duynefontein sites, will result in potentially significant cost and time delays to Nuclear-1 should it be authorised.

#### **Your Comment (6)**

### **5. AGRICULTURE**

The EIA states that agricultural land values around these sites would decrease in value due to farmers' concerns regarding contamination of produce or animals.

If any farmers were producing organically certified or "organic" produce or meat, they would also have to consider customer concerns and a potential loss of buyers. Organic certification guidelines would have to be investigated as such farmers could lose their certification.

Other negative impacts include the large increase in heavy-vehicle traffic, causing undesirable dusts and contributing to the spread of diseases in plant crops.

Construction would attract migrant labour, employed for a short period of time and then unemployed and dependent on the community around them for an income.

### **Response (6)**

Your comments are noted. The Agricultural Assessment does identify dust generation as an impact in terms of agricultural production but this impact with mitigation is not considered significant.

The Social Impact Assessment (Appendix E 18 of the Draft EIR) assessed the impact of the influx of job seekers and the following mitigation measures are however proposed:

- A proactive, broad-based information campaign (including site notices) to clarify the number of job opportunities that will be available. The objective is to dispel rumours and unrealistic expectations and thereby seek to curtail the inflow/settlement of job seekers
- Proactive engagement by the appointed contractor(s) with local authorities/ SAPS/ CPFs to ensure that job seekers do not settle in the vicinity of Staff Villages or the construction site.
- Follow a transparent public participation process with role-players and interested and affected parties;
- Make use of local labour and local suppliers of material for the construction as far as possible;
- Monitor the situation after the occupation of the Construction Village, Staff Village and housing projects, and involve the relevant role-players in such process.

### **Your Comment (7)**

## **6. MARINE BIOLOGY**

Forget about global warming affecting rise in ocean temperatures - nuclear reactors heat up the ocean wherever they are sited as they expel hot water from their cooling systems via pipelines into the ocean. According to the EIA, chlorination of cooling waters is commonly used by power plants throughout the world (Huggett and Cook 1991).

In a report titled: "Environmental Ethics of Chlorine in the Marine Biome" Jayapaul Azariah, Ph.D. questions the ethics of chlorinating the oceans. At a Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAM 1984), report No. 24 "Thermal discharges in the marine environment" examined the need for power and need to protect the oceans.

At the time of this report (2000), there were 433 nuclear power plants, with 133 under construction. The 1000 MW electricity generating station with once-through cooling, discharged to the marine environment approximately 30-60 m<sup>3</sup> s<sup>-1</sup> (Whitehouse et al 1985).

Although chlorination was commonly used in cooling systems, the by-products of chlorination, dihalomethane and trihalomethane (THMs) are carcinogenic promoters (Azariah 1991b, Azariah and Nair 1995).

Environmental loading of chlorine not only causes the elimination of non-target organisms but also causes much environmental damage. This report points out that "any responsible marine scientist must stop and think whether the marine system can bear this type of lifestyle related environmental pollution load and still be healthy".

A report titled "Cooling water chlorination and productivity of entrained phytoplankton" by Carpenter Peck and Anderson (1972) concluded that chlorine could not be used effectively as a biocide for fouling organisms without having adverse effects on entrained phytoplankton.

"The fate and effects of chlorine in coastal waters: Summary and recommendations" by Block, Helz and Davis also states that "immense volumes of water that have been chlorinated" are released into marine waters from sewage plants and electrical power plants. This heating of the marine environment is damaging to marine biology.

Both desalination and overheating of the marine environment are of particular concern for abalone that would be destroyed due to physical damage and smothering. Abalone has been severely over-fished along the South African coast and the EIA report states that to protect dwindling wild stocks the fishery has been closed. Bantamsklip falls within a small area that supports the largest remaining stocks of this species.

Chlorine increases in toxicity with higher sea temperatures. Abalone is of extremely high commercial value and in great demand. A valuable food source and income for fisheries would be lost due to pollutants.

In the event of a nuclear accident affecting the marine environment, marine life near the nuclear reactor would die. Fish or sharks, exposed to low to intermediate levels of radiation may move great distances and pose a threat to public health if they were eaten.

The development of a nuclear power station at Duynefontein, Bantamsklip or Thyspunt will disrupt surrounding habitats during the construction phase, entrain organisms during the intake of cooling water, release warmed cooling water, release desalination effluent and radioactive pollutants due to seepage of polluted groundwater.

### **Response (7)**

The Marine Biology Assessment is attached as Appendix E15 to the EIR.

#### *The Disruption of Surrounding Marine Habitats*

When associated with the construction of the cooling water intake and outfall system, this effect will be focused within the construction phase and will be localised, of medium duration and high significance. When associated with the discarding of spoil, disruption to the marine environment is significant and of high consequence. When mitigated by disposing spoil offshore (and by using only a medium pumping rate at Thyspunt), the impact is reduced to one of medium consequence, although the significance remains high. The temporal and spatial limitations of the impacts associated with the disposal of spoil on chokka squid at Thyspunt will have limited impact on the overall squid stock, when taken within the context of the extensive area over which this species spawns.

#### *The Entrainment and Death of Organisms Associated with the Intake of Cooling Water.*

At Duynefontein and Thyspunt entrainment it is not anticipated to have important ecological impacts. However, at Bantamsklip larval entrainment may have significant negative effects on local stocks of the abalone *Haliotis midae*.

#### *The release of Warm Water used for Cooling Purposes*

A tunnelled design of the release system mitigates potential negative impacts, through multiple points of release to aid dissipation of excess heat, by releasing cooling water above the sea bottom to minimise effects on the benthic environment and by utilising a very high flow rate at the point of release to maximise mixing with cool surrounding water. Comprehensive oceanographic modelling has demonstrated that the effects of elevated temperature are expected to be focused on the open

water habitat. This is of particular relevance at Bantamsklip and to a lesser degree at Thyspunt, as it would help to mitigate impacts on abalone and chokka squid egg capsules respectively. While chokka squid at the Thyspunt site are expected to avoid water temperatures elevated above their thermal tolerance range, the area predicted to be affected represents less than one percent of the coastal spawning ground

The Release of Desalination Effluent.

During construction limited volumes of hypersaline effluent will be released directly into the surf zone, where high energy water movement will result in adequate mixing with surrounding seawater to ensure minimal impact on the marine environment. During the operational phase the desalination effluent will be co-released with cooling water. As brine will be diluted to undetectable levels prior to release no impact on the marine environment is predicted from this effluent during this phase of the development.

### **Your comment (8)**

#### **CONCLUSION**

The negative impacts of constructing a nuclear reactor at Thyspunt, Bantamsklip or Duynefontein are vast and entail financial implications that live far beyond the life of the reactor or the generation of people living nearby.

These include impacts on human health that cannot just be written off as risk assessments. Modern science agrees that there is no such thing as a safe dose of radiation, but at the same time, fails to protect the environment and people that depend on clean water, air and earth for survival.

The Eastern Cape is experiencing a terrible drought and all water supplies are needed for basic survival. These cannot be accessed by a nuclear reactor. To build desalination plants means to further pollute the ocean and compromise people who depend on fishing for food or as a source of income.

Wetlands are natural water purifying systems and unique wetland systems in these three regions will be destroyed by construction of a reactor and the continual contamination of natural water sources by radioactive pollutants.

Earthquakes and their effect on a coastal reactor seem to be a highly unpredictable element - even for the scientists who study them and attempt to assess their impacts on the regions.

Agriculture and marine biology are both impacted in terms of loss of income and loss of food for people at a time when the conservation and protection of food sources should be a priority.

Natural, renewable sources of energy should be the focus for South Africa where solar and wind power options have not been given sufficient attention and are still in their infancy. These are unlimited resources for this country, as opposed to nuclear reactors that require fuel from a toxic mineral and pollute for generations to come.

### **Response 8**

Your comments are noted. In terms of alternatives to meeting the present energy demand, given the state of present technology, renewable energy sources are not yet in a position to replace base-load power stations. However, nuclear power is a relatively clean source if compared to other base-load alternatives. Thus, as far as power generation technologies are concerned, nuclear generation and coal-fired power generation are the only proven base-load technologies available in South Africa. Of these two, coal-fired generation is not viable in the coastal regions of the Western Cape and Eastern Cape. Apart from these factors, South Africa must make increasing use of nuclear power generation in future to reduce its greenhouse gas emissions in order to comply with its commitments made at the Copenhagen Climate Change Summit in December 2009. The life cycle contributions of nuclear

electricity generation to greenhouse gas emissions is small compared to coal-fired electricity generation. This points to Nuclear generated electricity being a necessary part of South Africa's strategy to generate an additional 40 000 MW of electricity by 2025.

Given the urgent power demand based on economic growth in South Africa, the No-Go alternative is not considered to be a logical alternative, as Eskom's mandate is to provide power for the country. Eskom, would in all likelihood, apply to develop more coal-fired power stations if the current application is declined. The life-cycle environmental impacts of coal-fired power generation are much greater than nuclear-fuelled power generation. It would become increasingly difficult to develop more coal-fired power stations in the future, due to carbon tax that would be imposed on countries that continue to emit greenhouse gases. The No-Go alternative would imply that potential benefits that emanate from the proposed project would not be realised. In this respect, it is important to balance the interest, needs and perceptions of neighbouring communities with the national interest for a secure electricity network that facilitates long-term sustained development of South Africa's economy. Although potential negative impacts of the proposed project would be avoided with the No-Go alternative, it is imperative that South Africa develops its power generation capacity, particularly in the Western and Eastern Cape.

Further, if Eskom does not utilise the Bantamsklip and Thyspunt sites for nuclear development, it is likely to sell the properties, pending a decision by the Eskom Board. The sale of the properties will be to a willing buyer at the market-related price, which would probably result in an alternative form of land use that will in all probability be more damaging than a nuclear power station and would not involve managing the majority of the properties as nature reserves.

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



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Jaana-Maria Ball  
Nuclear-1 EIA Manager

**Map showing extent of proposed Nuclear site, including extended conservation area, to be included as offset mitigation.**

Dotted black line shows effective extended boundary of site to the east if wetland report mitigation measures included; solid black line shows extent of Nuclear1 site as assessed in EIA report. Possible western extensions not shown here.

