

COMMENT ON DRAFT EIA FOR NUCLEAR 1: NUCLEAR REACTOR PLANNED FOR THYSPUNT, BANTAMSKLIP OR DUYNEFONTEIN

By Ingela Richardson

Introduction

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.

1. HUMAN HEALTH

In the areas proposed for construction of nuclear reactors: Thyspunt, Bantamsklip and Duynfontein, 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.

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 pretreatment 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 feedwater. "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, Bantamsklif 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.

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.

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.

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.

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 m³ s⁻¹ (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.

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.

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