

For the attention of: Ms Albertina Kakaza

Mr Langa Zita
Chairperson
Portfolio Committee
Department of Environmental Affairs and Tourism
Nuclear Energy Hearings

Dear Sir

RE: NUCLEAR ENERGY IN SOUTH AFRICA

The request from Parliament for written comment by the public on nuclear energy in South Africa has queried the impacts of this development on the following:

1. socio-economic
2. waste management
3. security of supply
4. human resource development
5. science and technology

I would also like to add:

6. environmental costs
7. health

1. SOCIO ECONOMIC

Firstly the socio-economic issue is one of grave concern for all South Africans. The economist, Professor Stephen Thomas was employed by the South African government to investigate nuclear energy and its impact on the economy as part of a panel of researchers. The official reports conducted as a result of this investigation have never been made known to the South African public, although they were presented to Cabinet and research was published in nuclear trade journals with a narrow readership.

Professor Thomas made his concerns about the financial implications of embarking on a nuclear programme very clear(1). He stated that in other countries of the world where nuclear reactors had been built, the huge costs of construction had been supported by private investors. He warned that financial institutions usually did not invest in nuclear development as it was seen to be too risky a venture.

Aside from the huge construction costs, there would also be huge decommissioning or cleaning up costs - and these were apparently not factored in to the South African programme. There would also be vast liability costs in the case of accidents that could result in deaths to labourers, as well as poisoning and deaths to a wide area around the reactor (2).

It is for this reason that the Cape Town courts are currently prohibiting building in an area 5km around Koeberg. This has huge economic implications for South Africa because wherever a nuclear reactor is built, other industries will suffer:

*The tourism industry suffers, since no one wants to visit an area where radioactivity may be a concern for themselves or their children.

*Agriculture suffers, since no one wants to buy food produce from an area where radioactivity could leach into water supplies or be released into the air and

*Real Estate values plummet, so that the housing and other business development markets suffer. (3)

What this means is that the huge start up costs (currently stated to be R150 billion over five years by Eskom, although apparently rising every year) are added to decommissioning and liability costs as well as the losses to other sectors of the economy. (4)

The projected markets for nuclear energy may also not exist. (5) Most developing nations cannot afford to build nuclear reactors themselves and so would not embark on a nuclear programme. Many nations are also now concerned about global warming and the effects on the environment of destructive industries (and this includes nuclear reactors despite advertising to the contrary) and so energy that is sold or marketed as "green" has found instant buyers, whereas other "dirty" industries (including nuclear) cannot be endorsed by businesses as "green" and are not bought. This means that if South Africa embarks on a nuclear programme with the idea of exporting either reactors or energy, a market will be hard to find and this country will be left with yet another industrial "white elephant".

2. WASTE MANAGEMENT

The second issue of waste management is also a major concern for all South Africans. Currently high level radioactive nuclear waste has been produced by overseas nations that has a lifespan of thousands of years - and there is nowhere to put this waste.(6)

According to a recent report a new spent nuclear fuel facility will have to be constructed: "In other countries that make use of nuclear energy, the cost of building such a waste facility has reached around R5-billion, says Necsa nuclear liability management divisional manager Dr Piet Bredell.

"Low- and medium-level radioactive nuclear waste from Koeberg is currently transported to the Vaalputs near-surface repository, in the Northern Cape, where it is buried in seven- to eight-metre- deep trenches. Higher-level waste, such as spent nuclear fuel, is kept in storage pools on site at Koeberg. Necsa's own waste is stored on site at Pelindaba. Low-level waste typically consists of gloves, clothes, paper and cleaning material, and medium-level waste of resins, filters and smaller components.

"It is planned that high-level waste from Koeberg and Pelindaba, and possibly other nuclear plants, will go to a "future high-level waste repository site", says Bredell. Such a deep geological repository is typically 500 m to a kilometre deep, and costs around R5-billion to develop. Bredell says South Africa is in the process of preparing legislation to establish a radioactive waste-management agency, as well as a waste fund, all before 2010. It is expected that the Bill regarding the agency will be before Parliament in March next year, while that on the fund will follow later.

"It will be the task of the radioactive wastemanagement agency to initiate the project to establish a deep-level disposal site for South Africa. The establishment of such a site is normally an extremely sensitive social issue, with Bredell noting that several similar initiatives failed abroad, as they were "wrongly initiated". "It can take up to 20 years to get a

site adopted.” One example of where this happened is the proposed Yucca mountain site, in the US. “We need to ensure the timely selection of a site for Eskom’s nuclear power station needs,” emphasises Bredell. Eskom Generation nuclear fuel procurement manager Hans Lensink says the power utility has a reference plan for its spent nuclear fuel, which includes not only disposal, but also reprocessing. Reprocessing nuclear fuel reduces the volume of waste, through the removal of plutonium and uranium. However, even reprocessing nuclear fuel leaves waste products in need of disposal at the end of the cycle”. (6)

When issues have arisen regarding waste spills, the Nuclear Energy Corporation of South Africa (Necsa) has refused to make the information known to the public. This lack of accountability on the part - not only of Necsa, but also Eskom and the National Nuclear Regulator (NNR) have led the South African public to doubt whether they could ever trust in future transparent dealings with these bodies. (7)

Necsa requires environmental organizations that are operating on behalf of the public - like Earthlife Africa - to go to court in order to get information regarding public safety issues. This smacks not only of a lack of transparency, but also a deliberate attempt to hide the truth from the public.

Workers who have had complaints against Necsa regarding health compensation have also been forced to go to court and still have received no redress from the company. And yet research documents from the company and from the Department of Minerals and Energy (DME) clearly show the dangers of radiation to human beings.

This has been highly misleading for the South African public - nuclear energy has been advertised through the press in a public relations campaign as being both "green" and "safe" which it is obviously not. The waste that builds up through the uranium mining and milling process to the nuclear reactor itself and the spent fuel rods all comprises an extreme danger to the immediate community and the nation as a whole.

People have learned from the accident at Chernobyl that there are immediate deaths and a wide area of land, air and water polluted for years to come causing cancers and mutations in children and pregnant women and sterilization of men. Nuclear waste cannot just be "swept under the carpet" or buried out in the desert. It will eventually pile up and pose a disposal crisis. (8)

The United States and Europe have still not been able to find a site to locate a deep repository for high level waste since no one wants it in their backyard. They cannot store it at sea, or launch it into space. There is simply nowhere to put this waste. (9)

In this sense, nuclear energy is not sustainable since it requires 50 000 tonnes of uranium to fuel a reactor every year and the uranium supply will come to an end but the waste will not. (10) Even the waste that the reactor deems "low level" that is pumped back into the air and water systems has proven to be deadly to residents who live around the water sources.

Research has shown "cancer clusters" around dams where the community fish and swim, such as the Trawsfynydd Lake in Wales. Ex-Environment Minister Michael Meacher of the UK said these research findings were "a sensational development" and true health effects of radioactive discharges should be resolved before any commitment to new nuclear power stations was made. (11)

Unfortunately radioactivity cannot be seen or smelled, but as Chernobyl investigator Vladimir Chernousenko said: "It has a voice". This is the ticking of the geiger counter. **(8)**

The Nuclear Age Peace Foundation states: "The majority of high level radioactive waste produced comes from the fuel in the core of nuclear power reactors. Irradiated fuel is the most radioactive fuel on the planet and accounts for some 95% of radioactivity generated in the last 50 years from all sources, including nuclear weapons production. Once removed from the core, irradiated fuel is stored in cooling pools on the nuclear reactor site. Each 1000 megawatt nuclear power plant produces about 500 pounds of plutonium a year and about 30 metric tons of high-level radioactive waste". **(12)**

3. SECURITY OF SUPPLY

According to the Nuclear Age Peace Foundation: "There have been repetitive problems with security, safety and environment impact in the nuclear industry. Radioactive contamination does not discriminate between national borders and nuclear power plants threaten the health and well-being of all surrounding environments.

Nuclear power plants produce extremely toxic radioactive wastes that are long-lived and have no safe means of disposal. Disposal is neither scientifically credible nor is there any sustainable options for interim storage. Producing long-lived radioactive wastes with no solution for its disposal will leave serious and irreversible environmental damage and degradation for generations to come, which is contrary to the principles of sustainability". **(12)**

Nuclear reactors obviously comprise one of the highest risk factors to any nation in terms of terrorist attacks or sabotage. The potential for devastation to an area from either of these factors, or even the purely human factor of error, is huge. Contrary to advertising by the pro-nuclear sector, there have been many accidents and spills in nuclear reactors over the past years, causing radioactive contamination to the community and spreading as far as contaminants have been carried. It is not possible for anyone to guarantee the safety of a nuclear reactor. **(13)**

Even in Russia - one of the countries that is proposing to trade nuclear science and technology with South Africa - there have been a number of accidents and the heightened security alert required by nuclear reactors has been impossible to maintain in terms of manpower and costs. **(14)**

Aside from the dangers to reactors themselves, there have been many documented cases of transport spills and accidents involving radioactive material such as uranium hexafluoride. **(15)** Since traffic accidents, sabotage and thefts from energy facilities are common in South Africa, this becomes a high risk factor.

The court case being enacted in South Africa at the moment - that certain people have wanted totally cut off from the media - is proof of the dangers of a nuclear programme. **(16)** The smuggling of nuclear weapons or weapons' material has put South Africa in the world spotlight as a nation where companies have been able to trade covertly with other nations. **(17)** The potential danger of nuclear arms smuggling only increases with the expansion of a nuclear programme - regardless as to whether this programme is intended to be for civil or defence reasons. There are always elements of society who will attempt to bribe and corrupt

in order to get hold of nuclear materials. This makes the country extremely vulnerable unless South Africa is willing to spend even more money on high alert security systems.

The environmental group Greenpeace showed how easy it was to break into Koeberg - South Africa's one existing nuclear facility - let alone ten, twenty or more reactors around the nation. (7) South Africa already struggles to protect electrical wiring and cables from sabotage and theft. South Africa could be put in a position of extreme risk either from planned theft and sabotage from foreign or neighbouring nations, or accidental interference by local communities, as has happened in other developing nations where the people are not aware of the dangers of radioactive materials.

The Nuclear Age Peace Foundation states: "The Nuclear Non-Proliferation Treaty (NPT) was signed on July 1, 1968 and entered into force on March 5, 1970. Its initial duration was 25 years. In 1995 it was extended indefinitely, with a review conference to be held every five years. At the heart of the NPT is a central bargain in which the Non-Nuclear Weapons States (NNWS) agreed to refrain from acquiring nuclear weapons. In exchange the Nuclear Weapons States (NWS) pledged to end the nuclear arms race and to negotiate nuclear disarmament (Article VI). As an incentive, the NNWS were promised assistance with research, production and use of nuclear energy for "peaceful" purposes (Article IV). Each NNWS also agreed to accept "safeguards" under the auspices of the International Atomic Energy Agency. These safeguards do not apply to the NWS. The treaty defined a NWS as one that had manufactured and exploded a nuclear weapon or other nuclear explosive device prior to January 1, 1967. However, any country with a nuclear reactor can in theory produce a nuclear weapon.

"MOX, or mixed oxide plutonium, is an experimental fuel in which plutonium, usually from dismantled nuclear weapons, is mixed with uranium for use in commercial nuclear reactors. The MOX projects require transporting plutonium by rail, ship or truck. The use of plutonium MOX fuel creates serious security threats as the transportation of plutonium increases the possibilities for theft and/or diversion of plutonium.

"In a study conducted in 1999, the Nuclear Control Institute determined that a severe accident at a civilian reactor powered by plutonium or MOX fuel could cause twice as many fatal cancers as an identical accident at a reactor that uses uranium fuel. MOX plutonium fuel produces more radioactivity than does uranium fuel.

"The use of plutonium MOX fuel also greatly exacerbates the problem of storing and disposing high-level radioactive waste. The use of plutonium in a nuclear reactor will not get rid of plutonium, which is an impossible goal. The idea behind using MOX plutonium, rather, is to render it less approachable by terrorists or "states of concern" because it is so lethal". (12)

4. HUMAN RESOURCE DEVELOPMENT

Unfortunately any people working in a nuclear reactor, or even in the uranium mines and mills that supply a reactor, are subject to ill-health unlike most other working environments. In Canada, primary cancers are regarded as an occupational health hazard of working in uranium mines. Research that has been conducted into cancers caused by uranium mines, the "milling" process and nuclear reactors is extensive. (18)

Since there is no cure for cancer, workers should not be subjected to this kind of "occupational health hazard". Necsa still refuses to compensate workers who have been affected by this, let alone an extended nuclear programme that would affect so many millions more. Once again the government will have to pay out health compensation and medical costs for years to come. There is no electricity supply that is worth the sacrifice of so many lives.

To consider sacrificing labour in this way is a form of "environmental racism" that has been widely experienced by the Navajo people in the United States who worked in uranium mines there. **(19)** It is devaluing and "writing off" a sector of the population as worthless. The human resources or labour that South Africa has to offer would be better off in alternative energy sectors such as solar, wind or tidal energy industries that would not comprise the kind of threat to themselves or their community that is posed by nuclear energy.

It is also sad that despite the fact that Necsa, the PBMR company, the DME and Department of Public Enterprises realises that South Africa does not have the atomic scientists available for this nuclear programme or manufacturing skills - and would have to import these scientists from Russia or elsewhere - they have chosen to forge ahead with a nuclear programme and throw millions of rand at this concept, instead of focusing funds on local skills and capacity. **(14)**

Statements by Necsa regarding nuclear energy have been contradictory. On the one hand, CEO Rob Adam has been quoted as saying to the media that PhDs do not come cheap and so they require the millions that government has been allocating each year. On the other hand, they persist with advertising the concept that "nuclear energy is cheap".

Adam has also been quoted as saying on the one hand that not just anyone can do rocket science in their backyard, but on the other hand he has stated that the average person can work in a nuclear plant. Perhaps he means that the CEOs and "rocket scientists" need high pay packages but the workers at the bottom do not. This is the usual pyramid of society with company directors bringing home the bacon while the majority of labourers live on the breadline. And perhaps this is the way society functions on many levels.

But in the nuclear industry, labourers are literally putting their lives on the line every day and may not realise the true cost to their lives and futures. For example, DME documents on radiation protection state that pregnant women must make their condition known immediately since radiation would harm the foetus. **(2)**

5. SCIENCE AND TECHNOLOGY

Necsa has stated that South Africa would have to bring atomic scientists out of retirement in order to work on a nuclear programme. Alternately they would have to employ nuclear scientists from other countries, such as Russia. In either case, the outlook is not good for South Africans. In the first scenario, there is a case where nuclear reactors that are developed with elderly staff in charge would soon be left with under-qualified staff to manage and maintain them. In the second scenario, South Africa would be spending a great deal of money investing in foreign skills, instead of investing in local skills (such as the scientists who are able to develop solar energy programmes).

Eskom also wishes to build Pebble Bed Modular Reactors (PBMRs). **(20)** According to research from Earthlife Africa: "The proposal is that the fuel for these PBMRs be produced at

Pelindaba. There are fourteen thousand tons of radioactive weapons scrap metal at Pelindaba from decommissioned nuclear facilities. Necsa wants to smelt this waste and sell the metal on the open market, followed by commercialisation of the smelter process - this process is not international best practice, and could turn South Africa into the North's radioactive waste dumping ground. The proposed reactors, radioactive fuel plant, and the proposed radioactive waste smelter, will emit many kilograms of radioactive emissions into the air, water and soil every year. Pelindaba is located within two kilometres of a World Heritage Site, The Cradle of Humankind, and ten kilometres from the townships of Atteridgeville and Diepsloot.

"At full production, for all the planned reactors, there would be nine trucks carrying nuclear material, and 145 trucks carrying chemicals every day between Durban, Pelindaba and Koeberg for forty years. There is no doubt that radiation is harmful. Furthermore, the level of what is considered a "safe" dose has been lowered consistently, and now stands at a few percent of what was originally considered a "safe dose".

"One of the arguments for the PBMR is that South Africa will need massive amounts of new power. This will not be true for at least ten years. In this time, we will be able to install all of South Africa's power requirements using safe and clean Renewable Energy Technologies, which are available off the shelf, and can be installed within weeks. The planned nuclear reactors for South Africa will generate little electricity for so great an expenditure and carry with them hazardous consequences for hundreds of thousands of years".

ENVIRONMENTAL COSTS:

On its website, Eskom claims that nuclear sites will be "revegetated" and environmentally restored after nuclear reactors are decommissioned. In reality in other areas of the world, this has not proved successful.

As an example, scientists have studied the area around Chernobyl to examine the health of the environment after this nuclear disaster. Douglas Birch, wrote for Associated Press: "In the journal *Biology Letters* in March, a group led by Anders Moller, from Pierre and Marie Curie University in Paris, said that in a study of 7,700 birds examined since 1991 they found 11 rare or unknown abnormalities in a population of Chernobyl's barn swallows. Roughly one-third of 248 Chernobyl nestlings studied were found to have ill-formed beaks, albino feathers, bent tail feathers and other malformations. Mousseau was a co-author of the report. In other studies, Mousseau - whose work is funded by the National Science Foundation and National Geographic Society - and his colleagues have found increased genetic damage, reduced reproductive rates and what he calls "dramatically" higher mortality rates for birds living near Chernobyl. The work suggests, he said, that Chernobyl is a "sink" where animals migrate but rapidly die off. Mousseau suspects that relatively low-level radiation reduces the level of antioxidants in the blood, which can lead to cell damage. "From every rock we turn over, we find consequences," he told the Associated Press in a phone interview. "These reports of wildlife flourishing in the area are completely anecdotal and have no scientific basis." (8)

The Nuclear Age Peace Foundation states that: "While electricity generated from nuclear power does not directly emit carbon dioxide (CO₂), the nuclear fuel cycle does release CO₂ during mining, fuel enrichment and plant construction. Uranium mining is one of the most CO₂ intensive industrial operations and as demand for uranium grows because of new electricity generation and new plant construction, CO₂ levels will also rise. (12)

"In a case study in Germany, the Oko-Institute determined that 34 grams of CO₂ are emitted per generated kilowatt (kWh). Other international research studies show much higher figures (up to 60 grams of CO₂ per kWh). In comparison to renewable energy, energy generated from nuclear power releases 4-5 times more CO₂ per unit of energy produced, taking into account the entire nuclear fuel cycle.

"US government regulations allow radioactive water to be released into the environment at "permissible" levels. Accurate accounting of all radioactive wastes released into the air, water and soil from the nuclear fuel cycle is simply not available. The Nuclear Regulatory Commission relies on self-reporting and computer modeling from reactor operators to track radioactive releases and project dispersions".

HEALTH:

The Nuclear Age Peace Foundation states: "It has been scientifically established that low-level radiation damages tissues, cells, DNA and other vital molecules. Effects of low-level radiation doses cause cell death, genetic mutations, cancers, leukemia, birth defects, and reproductive, immune and endocrine system disorders. **(12)**

Radioactivity is measured in "curies." An average operating nuclear power reactor core has about 16 billion curies at its core, which is equivalent to the long-lived radioactivity of at least 1,000 Hiroshima bombs. In comparison, a large-sized medical center with as many as 1000 laboratories in which radioactive materials are used, has a combined inventory of about 2 curies".

Dr Helen Caldicott, Pediatrician and President of the Nuclear Policy Research Institute states: "The classic dictum in medicine states: If a disease is incurable, prevention is the only recourse. While the specter of global warming looms large with associated epidemics of arthropod-borne diseases and millions of ecological refugees escaping catastrophic meteorological conditions, nuclear power as an alternative energy has an equally dire prognosis. **(18)**

"Nuclear power is responsible for the emission of substantial quantities of global warming gases from each step of the nuclear fuel chain, and the medical consequences of nuclear power are equally catastrophic.

"Each nuclear reactor contains 1000 times more long-lived radiation than released by the Hiroshima bomb, in the form of 200 new biologically dangerous isotopes - some with minuscule half-lives and others with half-lives of 17 million years. This material - radioactive waste - must be isolated from the environment for geological time spans, a scientific and physical impossibility. Already radioactive isotopes are leaking into soil and water from nuclear waste repositories in many countries, and these isotopes bioconcentrate by orders of magnitude at each step of the food chain. Invisible and cryptogenic to the senses, these mutagenic radioactive materials will migrate to and concentrate in specific bodily organs - iodine 131 in the thyroid, cesium 137 in brain and muscle, strontium 90 in bone, and plutonium 239 (with a half-life of 24,400 years) in lung, liver, bone, fetus, and testicle. Ultimately, these radioisotopes will induce malignancy; however, because of the latent period of carcinogenesis, the cancers will not be diagnosed for many years.

"Over generations, radioisotopes in gonads will increase the incidence of genetic and chromosomal diseases. Animals and plants will be similarly affected. Nuclear power is therefore a fundamentally mutagenic industry that results in cancer with a transient byproduct - electricity generation. As such, nuclear power is medically contraindicated".

CONCLUSION

Since the proposed nuclear programme affects all South Africans, regardless of the siting of nuclear reactors, it is vital that this issue should be addressed by all stakeholders at a summit meeting where the alternative energy resources offered by renewable and sustainable projects could be given the necessary time, research and opportunities afforded to the nuclear sector by large budget allocations. Nuclear energy has been advertised as sustainable, yet uranium is a finite source. A great deal of money will be spent on reactors that need large quantities of water and will run out of fuel, unlike solar, wind and tidal energy options that are truly sustainable and renewable. South Africa cannot afford to go backwards in scientific and social development, but must progress into a new "greener" future, where the health of the people and the environment on which they rely, is made a priority.

Yours faithfully

INGELA RICHARDSON

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