



Earthlife Africa Cape Town
www.earthlife-ct.org.za

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The following submission provides ten reasons that Earthlife Africa Cape Town is opposed to Nuclear Energy. The submission provides some substantive comment on each point.

1. Nuclear Energy generation results in radiation harm to humans and the environment
2. Nuclear Energy generation carries the risk of Catastrophic Nuclear Accidents
3. Nuclear Energy is not a viable response nor a solution to climate change
4. Nuclear Energy results in highly toxic and harmful radioactive waste that cannot be safely disposed of.
5. Nuclear Energy is uneconomic
6. We are fast approaching Uranium Peak
7. Nuclear Energy does not create significant quality employment
8. Better Alternatives to Nuclear Energy are available
9. Public Input is lacking with respect to Nuclear Energy
10. Nuclear Energy in South Africa is plagued by Institutional Problems

These reasons are substantiated by a host of research documents and reports. A bibliography of these will be provided to portfolio committee members as part of the oral submission. Furthermore, Earthlife Africa Cape Town places itself at the disposal of the committee for assistance to access these documents.

NUCLEAR ENERGY IS NOT THE ANSWER

Meeting the goal of eradicating poverty will involve providing employment and access to the basic services that continue to elude a significant portion of South African citizens. Energy, as a key component of life and a driving force for growth and development will play an integral part in meeting these goals. This places South Africa at a crossroads with respect to energy choices. There are a variety of energy generation and conservation technologies at our disposal. As with all choices, each of these technologies has consequences- advantages and disadvantages. It is important that we prioritise health and safety, job creation, affordability and access when we make these choices.

These, in addition to the threat of climate change pose a serious threat to societies of today and finding cleaner energy sources is a big challenge. It is evident that South Africa needs to move away from coal-fired power, but the Government's move towards nuclear power as an alternative has sparked controversy.

Earthlife Africa - Eskom plans to build a Pebble Bed Modular Reactor (PBMR), a version of a group of reactors termed high temperature gas-cooled reactors (HTGCR). These types of reactors were never successfully commercialised and have been abandoned. The demonstration plant will be built at Koeberg, and if successful, at least another ten reactors will be built around South Africa. Eskom plans to construct, operate and sell these reactors to create a potential export business.

Furthermore, Eskom has announced intention to expand its nuclear energy programme with the addition of Pressurised Water Reactors at several potential sites around the country.

Uranium mining prospecting also appears to be on the increase.

Here are ten excellent reasons why nuclear energy is not a solution for our country.

1. Nuclear Energy results in radiation harm to humans and the environment

There is no such thing as a "safe" dose of radiation (See also *WISE/NIRS Nuclear Monitor* 632.5701 "U.S. radiation panel: no radiation dose safe"). There is a growing body of evidence suggesting that low doses may actually be more dangerous, as they may mutate cells more easily than high doses, which can kill the cells. There is no debate as to whether radiation kills, maims, causes mutations, is cumulative, causes leukaemia, cancers, respiratory illnesses and attacks the immune system (with children, pregnant women and the elderly most vulnerable) because we already know it does.¹ The only disagreement is about what is legally considered an allowable dose.

Between 1940 and 1950 scientists laid down the first 'safe' levels of radiation: 150mSv per annum. The 'safe' level of exposure has continually been adjusted downwards as more research into the dangers is carried out. By 1990, the annual acceptable level of exposure in South Africa was reduced to 20mSv for occupational exposure and 1mSv for

¹ Bertell, Rosalie. "Health and Safety Implications of Nuclear Development: The International Experience", in *The Nuclear Debate: Proceeding of the Conference on Nuclear Policy for a Democratic South Africa* (1994)

the general public. (This limit is ten times higher than the limit laid down by the European Committee on Radiation Risk).²

Furthermore, radiation doses are often assessed based on "Standard Man". The characteristics of this standard man do not take variability into account and the differing impacts on women, foetuses, infants, children and elders as well as the sick are not integrated.

Uranium mining is responsible for the greatest proportion of the health-related damages of the nuclear power industry. There seems little doubt that communities living near nuclear plants are at risk. Before South Africa begins to build new reactors, epidemiological (health) studies of communities around Koeberg, Vaalputs and Pelindaba need to be carried out.

2. Nuclear Energy carries the risk of Catastrophic Nuclear Accidents

It has been claimed with respect to the PBMR that nuclear meltdown would be impossible. However in October 2001, Mr D.A. Powers, a member of the U.S. Nuclear Regulatory Commission's (NRC) Advisory Committee on Nuclear Safeguards, stated that the PBMR was seriously flawed, since the chaotic and unpredictable movements of the fuel balls inside the reactor vessel were a prescription for core instability.³

Since the PBMR is similar to the THTR (with some minor advancements) studies can use it as a reference to foreshadow the consequences of the PBMR. Between 1985 and 1988 there were 40 reported accidents at the THTR nuclear power plant. The possible unforeseen disasters are no doubt the reasons behind the fact there is not a single insurance company that is willing to back the operations of a nuclear power plant.

Nuclear power remains particularly dangerous and difficult to control, as 1999's accident at Tokaimura, Japan, once again illustrated.¹ At least 9 million people have been affected by the Chernobyl disaster, 2.5 million in Belarus, 3 million in Russia and 3.5 million in the Ukraine [where the Minister of Health attributes 10 000 premature deaths]. In total over 160 000 km² of land is contaminated in the three republics.²

One of the problems with nuclear power plants is, as explained by Edward Teller, that nuclear energy does not exist in a vacuum. There is an interaction between humans and nuclear power, and humans make mistakes. The effects of nuclear power disasters are far-reaching and long-lasting. South African tourism and agriculture would be drastically affected by the impacts and continue to be so, for many years after a disaster.

² "The Health Effects of Ionising Radiation Exposure at Low Doses for Radiation Protection Purposes". In 2003 Recommendations of the ECRR. (2003)

³ Fig, David. Uranium Road: Questioning South Africa's Nuclear Direction. (South Africa: 2005)

¹ Special Briefing, Nuclear Power and Climate Change, Friends of the Earth International, November 2000 and Schneider, M, Climate Change and Nuclear Power Commissioned by WWF - World Wide Fund for Nature - April 2000

² Strengthening of the Coordination of humanitarian and Disaster Relief Assistance of the United Nations, Report of the Secretary General of the United Nations, November 1995

If nuclear plans in South Africa are to expand, municipalities will need to be nuclear – disaster ready. If it is even possible to prepare for such a disaster, it will cost the South African tax payer a lot more money.

There have been a few particular disasters in the past that highlight the possible horrific side effects of a nuclear energy disaster. For example the disaster at Chernobyl. In April of 1986 workers ignored the set safety rules and caused an explosion sending burning graphite, molten uranium and radioactive ash into the air. The whole northern hemisphere was affected by radioactive contamination when 7 tons of radioactive material was released into the atmosphere. A total of 47 people died and more than 230 suffered from Acute Radiation Sickness. In countries such as Germany and Italy, there are still restrictions in place on certain foods because of this disaster. Up to 2005, about 4000 cases of thyroid cancer occurred in Belarus, Ukraine and Russia, in those aged under 18 at the time of the Chernobyl disaster. Leukemia rates have more than doubled in the period 1985-1990. Solid cancer rates have increased by 40% since the accident, with the most pronounced increase in the most contaminated areas. Non-cancer effects e.g cataract induction and cardio-vascular diseases, have also been documented. IAES/WHO report calculates that 9000 excess deaths may occur as a result of radiation exposure from Chernobyl accident.

Chernobyl is not the only instance of a nuclear disaster. In March of 1979, workers at a power plant in Pennsylvania lost control of the reactor, resulting in the release of an unknown quantity of radiation into the air. In addition, radioactive water was sent surging into the Susquehanna River.

Before this disaster, in 1999, at a nuclear power plant in Tokai-Mura, Japan, more than eight times the normal amount of uranium was added. This resulted in 15 000 times the normal levels of radioactivity released into the areas surrounding the site.

Uranium mining is responsible for the greatest proportion of the health-related damages of the nuclear power industry. There seems little doubt that communities living near nuclear plants are at risk. Before South Africa begins to build new reactors, epidemiological (health) studies of communities around Koeberg, Vaalputs and Pelindaba need to be carried out.

3. Nuclear Energy is not a viable response nor solution to climate change

The global nuclear industry is exploiting concerns over global warming by misrepresenting nuclear power as a carbon-free electricity source and global climate saviour.

However, the complete nuclear fuel chain is extremely energy intensive and dirty. The nuclear fuel cycle releases CO₂ during mining, fuel production, transport, plant construction and decommissioning, as well as for waste management far into the future.³ Uranium enrichment is one of the most energy intensive industrial operations and as

³ Nuclear Power not the answer to Climate Change, John Busby

demand for uranium grows and lower grade ores are used, so CO₂ emissions are expected to rise.⁸

Furthermore, nuclear energy is not a viable solution because electricity is just one of the human activities that produce carbon emissions. Others include transport, agriculture and deforestation. The CO₂ released worldwide through electricity production accounts for just 9% of total annual human greenhouse gas emissions.

The Kyoto Protocol excludes nuclear energy; it was not recognized as a clean alternative to fossil fuels. New nuclear energy projects would not be able to provide an offset mechanism for carbon emissions. In comparison to renewable energy, nuclear power releases 3-4 times more CO₂ per unit of energy produced taking account of the whole fuel cycle.⁴

Climate change may alter the market for nuclear energy, but it will not make uneconomic technology economic. Promoting one environmental disaster to solve another catastrophe is illogical to say the least.

4. Nuclear Energy results in highly toxic and harmful radioactive waste which cannot be safely disposed of.

There is no responsible way to "dispose" of radioactive waste and it can remain dangerous for hundreds of thousands of years, equivalent to 10,000 generations. There is no plan in place for the long-term storage of, or any final disposal site for, radioactive waste anywhere in the world. How can the nuclear industry expand without having resolved this problem or even finding a 'safe' place to store its wastes? It would be like developers building a high-rise with no toilets!

Low-level nuclear waste storage sites are built in rural areas far way from densely populated areas. Is it fair to expose people to such risks simply because they live in rural areas that are generally not well represented and without political influence? Nuclear waste is a responsibility for hundreds of thousands of years and it will be future generations that will bear the much of the health, environmental and financial costs. The best solution would be not to produce any radioactive wastes in the first place; the next best is to stop producing more now.

5. Nuclear Energy is uneconomic

Nuclear power is expensive electricity. Nuclear energy is on average between 2 and 4 times more expensive than electricity from fossil fuels. All States in the USA with nuclear power charge, on average, 25% more for their electricity.⁵ The costs of nuclear power do not stop once plant construction is completed. Nuclear plants need to be decommissioned after their (approximate) 40-year life span. The radioactive spent fuel produced by nuclear reactors needs to be stored safely for thousands of years before it loses potency, which has enormous cost, health, environmental and social implications.

⁸ Sherman, R and Worthington, R. "Pretenders and Providers: Why Nuclear Power Doesn't Make Sense". (South Africa: 2001)

⁴ Special Briefing, Nuclear Power and Climate Change, Friends of the Earth International, November 2000

⁵ Lakhani, M. "Nuclear Energy: the Counter Debate". The Enviropaedia, (2004)

With respect to costs for the renewable energy technologies, nuclear energy fares differentially, being cheaper than, the same cost as or less expensive than different technologies. However, the main difference to note is that while the costs of nuclear energy are constantly rising, the market as well as the rate of technological innovation in the renewables sector are growing rapidly. It is essential to acknowledge that, with or without climate change, nuclear power is simply not economic.

In the medium term it is possible to supply all of the world's energy needs through renewable sources based on current technology (i.e. not including the further developments to be made in the future).⁶ This scenario has been depicted in three separate studies, compiled by The Union of Concerned Scientists in the USA (1978); The International Institute for Applied Systems Analysis for Europe (1981); Enquete Commission of the German Bundestag (2002). Whilst none of these studies have ever been seriously refuted, they have all been largely ignored by conventional experts (Scheer, 2004).⁷

Nuclear power subsidies takes money away from clean alternatives and consumes funding that should be used to develop proven clean, renewable sources of energy like wind, water and solar.

The proposed PBMR has already cost R2 billion (around US\$330 million) and is expected to cost another R11.3 billion (US\$1.8 billion). This could increase to as much as R25 billion (over US\$4 billion) if decommissioning costs are included.⁴ South African taxpayers and electricity consumers will bear these costs. The demonstration plant may not make a profit but a loss. The cost of electricity can only be brought down to competitive levels once 32 reactors have been built, a very unlikely scenario, given that not a single order has been placed to date.⁵

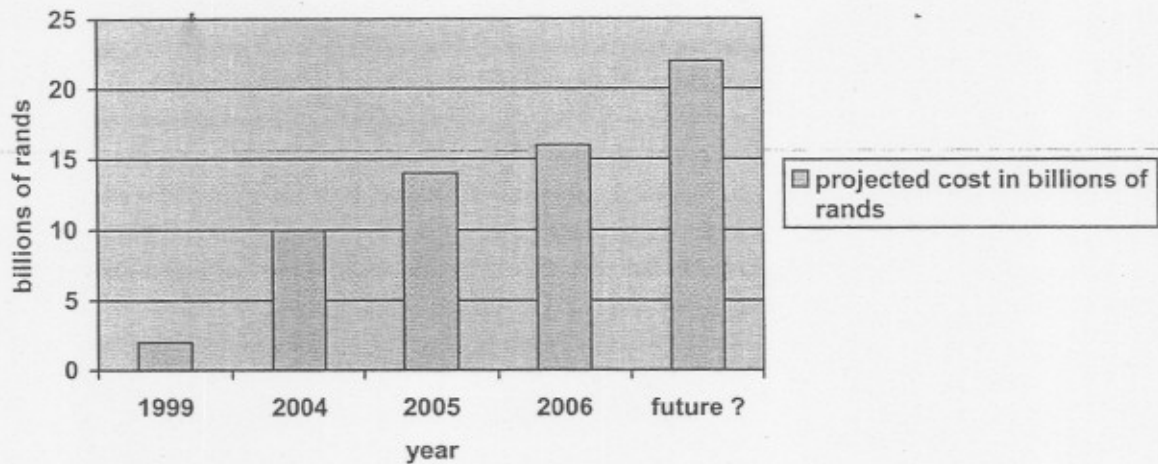
⁶ Pretenders & Providers: Why Nuclear Power doesn't make Climate Sense, R. Sherman & R. Worthington, 2001

⁷ Nuclear energy as a solution for climate change?, WISE Nuclear Monitor, February 2005

⁴ Thomas, Steve. "The Economic Impact of the Proposed Demonstration Plant for the Pebble Bed Modular Reactor Design". (University of Greenwich, UK: 2005).

⁵ Ibid

Projected Cost of the PBMR

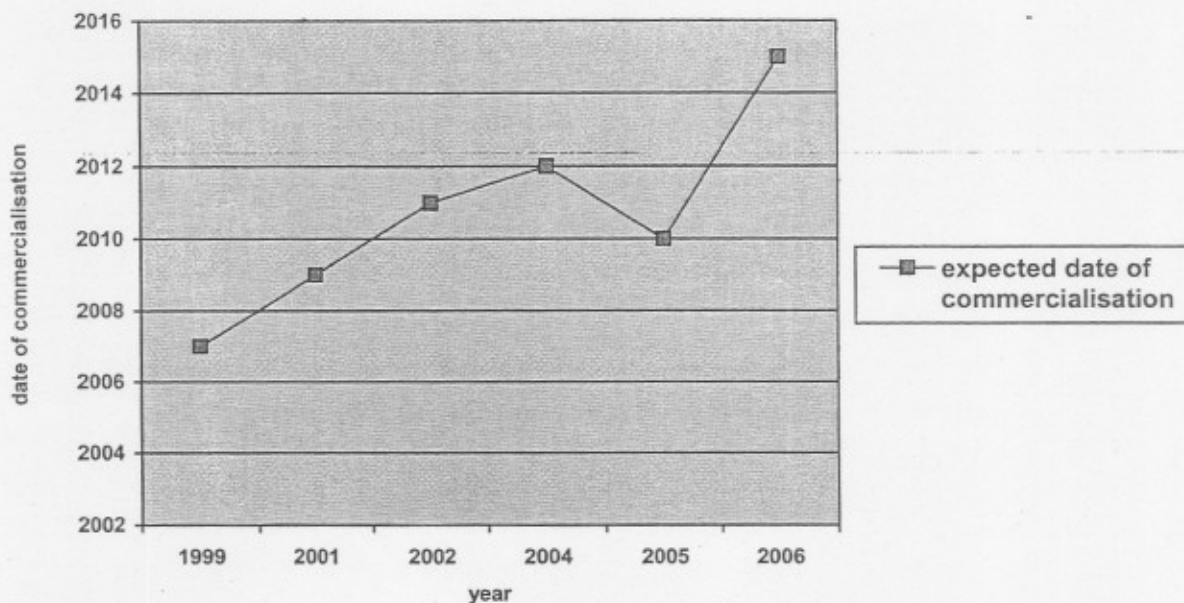


This graph shows the escalation of projected costs for the PBMR project since the announcement of the SA government involvement in the project in 1998. Despite no advancement or actual work being done on the ground, costs have escalated drastically from R2 billion in 1999 to R16 billion in 2006. It is expected that these projected costs will continue to go upwards through 2007.

The PBMR business plan is largely based around the economies of scale requiring many customers and many reactors. The estimated costs of the demonstration plant increased fivefold from R2 billion (around US\$330 million) in 1999 to R10 billion (US\$1.6 billion) in 2004. Media reports now estimate the costs to be in the region of R14 billion (around US\$2.3 billion).⁶ The costs of the project continue to escalate and the proposed delivery schedule is continually being postponed. Due to time delays, the first commercial unit will only be completed by 2014. The commercialisation phase is the last phase of the project, when it is supposed that PBMR units will be sold to power producers. The expected date of the commercialisation phase has continued to slip since inception of the project, from 2007 in 1999 to 2015 in 2006. These expected dates are optimistic and are set assuming no hiccups in the process. This technology will not be able to meet South Africa's short-term electricity needs and is not the solution to our current shortages.

⁶ Cape Times Business Report (January 12, 2006)

Expected Date of Commercialisation of PBMR project



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Nuclear power subsidies takes money away from clean alternatives and consumes funding that should be used to develop proven clean, renewable sources of energy like wind, water and solar.

6. We are fast approaching Uranium Peak

Like all fossil fuels, uranium is yet another finite resource upon which it would be short-sighted to rely. Jan Willem Storm van Leeuwen, an independent nuclear analyst writing for the Oxford Research Group, has concluded that if global nuclear energy production is maintained at 2005 levels, by 2016 the mean grade of uranium ore would have fallen significantly from today's levels and even more so after 2034. In 60 years "the world nuclear power system will fall off the 'Energy Cliff' – meaning that the nuclear system will consume as much energy as can be generated from the uranium fuel."

The remaining uranium would be very difficult and expensive to mine or unsuitable for electricity generation. Large parts of the presently quoted reserves (about half) are marginal already. This is the case in Namibia, South Africa, Kazakhstan and with the Olympic Dam mine in Australia.

⁷ Lakhani, M. "Nuclear Energy: the Counter Debate". *The Enviropaedia*, (2004)

Of course, as uranium becomes a scarcer resource and extracting it becomes more difficult and more expensive, and as lower and lower grades of ore are used, the carbon emissions associated with such a process increase as well.

7. Nuclear Energy does not create significant quality employment

Eskom's job estimates for the PBMR are based on achieving a substantial number of export sales, about 20 per year, and are highly speculative. However a detailed examination of the world market shows that few nations are likely to order new nuclear plants. Many of these jobs can be attributed to the second round effect whereby jobs already in existence, in for example the steel industry, are included in the total.¹² The amount of local people eligible for the PBMR jobs would also be quite low. South Africa has just signed a contract with Spanish manufacturer Equipos Nucleares. The group will design and manufacture the main power system pressure boundary, the steel backbone for the proposed pebble bed modular reactor's (PBMR) demonstration plant.

Renewable Energy can create about 27 times as many jobs as nuclear energy and jobs in the renewable energy generation sectors, like wind power, already have local people making up about 60% of their work force, and increasing.¹³

8. Better Alternatives to Nuclear Energy are available

South Africa is rich in wind, solar and ocean RE resources. In the USA, wind is already cheaper than coal, especially when the health impacts are taken into account. In addition to wind, there are many other RE options, including wave, photovoltaic, solar thermal, biomass, micro-hydro, etc. A mix of these technologies could easily provide all of South Africa's energy requirements. Studies have shown clear evidence that there are sufficient RE resources in South Africa to provide for 13% of the electricity demand by 2020, and easily 70% or more by 2050.¹⁴ RE is clean, sustainable, efficient and safe.

Immediate action is needed to address climate change and greenhouse gas emissions from the energy sector. Demand side management, RE and energy efficient technologies, not nuclear, are proven and viable solutions. Africa should not be a dumping site for nuclear waste or a testing ground for unsafe nuclear technology. It is unjustifiable to use public funds to sponsor nuclear plants that are a threat to the environment and to people. South Africa needs environmentally responsible development that will lead to an improvement in the quality of people's lives and will lead to truly sustainable development - economically, socially and environmentally.

9. Public Input is lacking with respect to Nuclear Energy

The SA White Paper on Energy (1998), "Government will ensure that decisions to construct new nuclear power stations are taken within the context of an integrated energy

¹² Thomas, Steve. "The Economic Impact of the Proposed Demonstration Plant for the Pebble Bed Modular Reactor Design". (University of Greenwich, UK: 2005).

¹³ Schaffler, J and Banks, D. "The Potential Contribution of Renewable Energy in South Africa". (SECCP report, 2005)

¹⁴ Ibid.

policy planning process with due consideration given to all relevant legislation, and the process subject to structured participation and consultation with all stakeholders.” Such a process has never been undertaken.

Public money is being spent without public accountability. The High Court found the Environmental Impact Assessment process to be fatally flawed when Earthlife Africa took the Department of Environmental Affairs and Tourism to court (See also *WISE/NIRS Nuclear Monitor* 623.5663 “Earthlife victory in court on PBMR EIA”). The submissions made by Earthlife Africa and other appellants were not even looked at by the decision-maker. The PBMR is being substantially funded by public money, yet a PBMR feasibility study commissioned by government and completed by a panel of international experts is not in the public domain.

The World Bank no longer funds nuclear programmes of any kind but the public purse is expected to bear this burden.

10. Nuclear Energy in South Africa is plagued by Institutional Problems

Eskom is a state-owned institution and is also responsible for almost all of electricity generation in South Africa. The South African government therefore has a vested interest in the sale of electricity. Such strong ties between these two institutions are very problematic from a transparency and accountability perspective. It is a well-accepted fact in the face of these institutions the National Energy Regulator is a weak institution. This is also highly problematic.

The National Nuclear Regulator is responsible for regulation of the nuclear industry in South Africa through the protection of humans and the environment from nuclear damage. The NNR sits within the Department of Minerals and Energy, a department which is actively promoting the expansion of nuclear energy in South Africa. The Minister of Minerals and Energy is responsible for the appointment of the board of the National Nuclear Regulator. The constitution of the board – numbers of representatives from different sectors etc – is also determined by the Minister. This is a clear conflict of interest, where the Minister and the Department of Minerals and Energy play the roles of both coach and referee. Further, there appears to be a revolving door through which personnel travel between regulator and industry. Former licensing officer of the PBMR Pty Ltd is current Chief Executive Officer of the NNR.

The NNR is also severely lacking in capacity. From an administrative point of view, it is very difficult for civil society to engage with the regulator. This is because telephone and written correspondence are not responded to; it is difficult to access documentation and to arrange meetings. Furthermore, the NNR has admitted that it lacks capacity in its regulatory role. It will need to engage foreign assistance in order to licence the PBMR. Further it has admitted to lacking capacity to independently evaluate medical reports.