



# Does South Africa's nuclear industry deserve to survive?

by David Fig

**Given the historical record of the nuclear industry, its massive subsidisation, the secrecy within which it has operated, and the commitment it made to the apartheid regime's weapons programme, does it deserve to survive into a post-apartheid era? The paper outlines various options and argues for drastic reform of the Atomic Energy Corporation (AEC) and a serious re-evaluation of Eskom's nuclear programme. It also suggests a recall conference in five years to monitor and evaluate progress in implementing some of these reforms.**

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The ANC has had a long and important history of questioning and criticising apartheid's commitment to the nuclear industry. For almost two decades the ANC has alleged that the underlying motive for this industry was the manufacture and potential deployment of nuclear weapons. The ANC distanced itself from this programme. Its troops succeeded in an attack on the Koeberg plant in 1982 when it was still under construction. The ANC published many exposes of the industry, including documents incriminating the West German nuclear industry in collaboration with its South African counterparts. The ANC lobbied at the United Nations and elsewhere against all forms of international co-operation with the South African nuclear programme. Amongst the first questions openly posed to the ANC, when it became possible to do so through the local media in the late 1980s, was a question on ANC nuclear policy. The reply, published at the time in the *Weekly Mail* underlined the ANC's commitment to a nuclear-weapons free zone in Africa.

Within weeks the ANC will be faced with a series of hard decisions about the industry. The new government will have to evaluate the claims the industry is making about its own utility to the nation and the economy. The new government will have to assess the industry's future in the light of its past record. The new government will also have to decide whether the industry can make a positive contribution to the reconstruction and development process in its current form.

This conference has the historic duty to reflect on all these issues with a view to guiding the new government's policy on the nuclear industry. During the conference you will hear contending claims made by the industry and by its critics. The debate will range around the economics of the industry, on future energy scenarios, on the military linkages, on questions of law and environmental justice, on questions of new technologies. You will be addressed by a number of experts, ranging from physicists to lawyers. But this debate is not and

should not be confined to the experts. This debate is for every South African, especially for those whose voices have been silenced in the past. I urge you to challenge and question the experts and not to assume they are sole proprietors of the discussion.

I would like to open the discussion with a short review of the industry's history.<sup>1</sup>

In 1945 the USA dropped nuclear weapons on Hiroshima and Nagasaki. This devastation put an end to World War Two. Yet instead of putting an end to the costly and environmentally damaging process of the development of nuclear weapons, reasons were found to continue the programme. These reasons included growing hostility to the USSR and its allies, a process which became known as the Cold War. The USA and Britain (which had collaborated in the making of the bomb, and was soon to develop its own weapons) desperately needed sources of uranium for their weapons programme. Research at the time revealed that the Witwatersrand gold mines were one of the world's richest sources of uranium. Secretly Britain and the US combined to procure these resources.

Prime Minister Smuts was encouraged to collaborate in this task. He set out to involve South African scientists in the uranium extraction processes. Instead of giving the responsibility for nuclear materials research and development to the CSIR, Smuts decided to follow the model of the US and Britain in separating these responsibilities under the control of an Atomic Energy Board (AEB). The AEB was to be chaired by the Minister for Mines, and combined the energies of nuclear researchers, the mining industry, the parastatals and other members of the private sector.

Smuts lost the general election of 1948 and did not survive politically to inaugurate his brainchild. The AEB was brought into being on the first day of 1949. Now the British and Americans had an institution with which to do business. After signing an agreement with the AEB, they pumped enormous amounts of capital into the gold mining industry for uranium extraction. The agreement allowed for the export of

the entire output of the new uranium plants for over a decade. All this uranium was destined for the bomb programmes in the US and Britain.

What was in this for the South African scientists? They were sent on internships to nuclear weapons and energy research laboratories in the US, Britain and Germany. They were, under the US "Atoms for Peace" project, provided with a research reactor. In short, South Africa's strength in the uranium market gave the scientific community some leverage in acquiring skills in nuclear physics, metallurgy and related fields. Over the years, they were given the political go ahead to conduct research on nuclear energy reactors, on uranium enrichment technologies, on conversion and fuel fabrication, on "hot cells" as a precursor to the development of reprocessing facilities, on nuclear waste disposal and ultimately on the design of nuclear weapons.

These research programmes and the implementation of the resulting technologies cost a disproportionately large amount of money. AEC has also admitted that there was historical "over investment" in the nuclear industry. The technologies involved in the nuclear fuel cycle have proved too expensive to be viable. The lifting of sanctions has made the technologies even more uncompetitive on world markets. Eskom, the state controlled African utility, prefers not to buy its nuclear fuel from the Atomic Energy Corporation (the AEB's successor) because it is far cheaper to obtain fuel on the global spot market.

The old enrichment technology is so expensive that even the AEC can no longer afford to keep it alive. Its plans for commercial production of enriched uranium have never succeeded; the Z-plant had to be renamed "semi commercial", a euphemism for "not economically viable". The nuclear research budget consumed most of the state's resources for energy research, with the result that it became a privileged technology. Financial resources were diverted away from the development of sustainable soft energy paths.

The research programme was given the additional protection of secrecy. In the name of security and the ideology of the total strategy, the industry maintained public silence. Consultation with the people of Cape Town on the building of Koeberg, or with the people of Namaqualand on the siting of Vaalputs, was derisory. Under current practices of Integrated Environmental Management, this highhanded approach is widely recognised as no longer being a feasible option in South Africa.

The secrecy concealed not only the costs of research and the extremely high costs of producing nuclear energy, it allowed the industry to disguise the origins of technologies like uranium enrichment. It allowed the nuclear bureaucracy to build scenarios in which thirty more nuclear power reactors would dot the coastlines of South Africa, some of them to be constructed in "six-packs".

Worst of all, it shrouded the nightmare of nuclear weapons production. The secrecy allowed ordinary scientists to collaborate with the apartheid regime to develop weapons of mass destruction unquestioningly for almost a decade. The chilling ordinariness of the bomb factory and storage vaults at Advena is something that will always live with me.

You will see for yourself that these bomb makers, scientists and nuclear bureaucrats are ordinary men.<sup>2</sup> Some of them will be speaking to us today, or mingling with us in the audience. Few will acknowledge the extent of their role, and in announcing that the weapons programme had been shelved, Mr de Klerk simultaneously announced that the records implicating a thousand scientists and technologists in the weapons programme had been destroyed. The secrecy lives on.

What this underlies is that a body of ordinary men have enjoyed extraordinary power. They have for over thirty years been given extensive resources and allowed to operate outside public scrutiny. Their attempts to establish a local fuel cycle, their building of expensive reactors, the uncertain environmental legacy of their work,

and finally their bomb programmes have all failed us economically, politically and morally.

In the light of this, does South Africa's nuclear industry deserve to survive?

We inherit a nuclear complex consisting of a number of facilities. These include:

- the conversion and enrichment facilities at Valindaba,
- the research reactor, Safari-1, at Pelindaba,
- the fuel fabrication facilities and "hot cells" at Pelindaba,
- two nuclear power reactors at Koeberg,
- the nuclear waste repository at Vaalputs.

They also include the human capital, the body of scientists and others whose skills are rare and hard to assemble. To this complex can also be added the ailing uranium mining and processing industry.

What should happen to all these facilities and human capital?

One option is to cut the losses and extinguish the industry at the stroke of a pen. It would mean closing all the facilities and decommissioning them. We would export what remains of our store of weapons-grade uranium and spent nuclear fuel. We would build a sarcophagus around the waste buried at Vaalputs. We would cease to mine uranium.

Another option is to retain the industry in its existing form, to allow it to operate with a minimum of public scrutiny and a maximum of public finance. Its plans for future development of the fuel cycle and future construction of reactors would be respected. Its bureaucratic structures would be maintained. The uranium mining industry and the nuclear division of Eskom would remain intact.

Neither of these two extremes are tenable options in the short term. The extinction of the industry would disperse human capital too rapidly for it to be utilised in other ways. The maintenance of the industry in its current form does not address the question of South Africa's social reconstruction programme.



I would argue that we need a third set of options. We need to build consensus around the fact that local involvement in the nuclear fuel cycle has been a costly mistake. It has tied up scientific, technological and financial resources badly needed in the reconstruction effort. Our involvement in the nuclear fuel cycle – in all its aspects – must be phased out.

To some extent the AEC has acknowledged that the traditional helicon enrichment process is problematic and will be phased out by the end of the decade. It is banking on making a success of MLIS – molecular laser isotope separation – a new, as yet unproven, technology for uranium enrichment. If this cannot achieve viability or external capital investment, the AEC will end the MLIS programme. The AEC needs also to take a hard look at the viability of the fuel fabrication plant, and make similar decisions if necessary.

Despite their past preoccupations, the cadre of scientists at the AEC have also recognised that they need to move towards developing new technologies that are socially useful. Such technologies aim, for example, at improving air filtration in mines and vehicles, or in removing harmful particulate emitted in domestic burning of coal. Once recognised as viable, these technologies are being hived off into commercialised divisions of the AEC and could ultimately end up in the private sector.

This direction is one worth pursuing, because it makes excellent use of the human capital, and develops socially and environmentally useful technologies from knowledge gained in solving puzzles related to the development of the fuel cycle. This trend could become the central *raison d'être* of the reconstructed industry. If it drops its obsession with the fuel cycle, the AEC could be reconstituted as a hothouse for the research and development of clean technologies (and perhaps renamed as a Clean Technology Research Corporation), giving it a socially and environmentally useful role across the spectrum of industrial applications.

The state should phase in a cap on further subsidies of the fuel cycle and transfer

these subsidies (at a much reduced level) or devote other economic instruments to the hot housing of new socially useful technologies.

In implementing its support for the creation of a nuclear weapons-free zone in the continent, the government will have a responsibility to safeguard its stockpile of weapons-grade highly enriched uranium. Currently it claims that this level of enriched uranium will be the feed stock for Safari-1. The government should explore more rigorously the option of converting Safari-1 to require a feed stock of low-enriched uranium. The implication of this is that the stockpile of HEU will need to be blended down to LEU. This strategy will be an important signal to the nations of Africa that our remaining research endeavours and limited commercial applications can never constitute a potential military threat.

The AEC's remaining regulatory functions – for example the applications of safeguards and the implementation of the Nuclear Non-Proliferation Treaty – could be hived off to the Council for Nuclear Safety, which could also develop a division to take over the long-term storage of nuclear waste from the AEC. Some of the health physicists, environmental scientists and waste management experts could be transferred to the CNS to give it extended capacity to do its job more thoroughly.

Resources invested in Koeberg need to be scrutinised, and public accounting of its economic viability needs to occur. This must happen in conjunction with an Environmental Impact Assessment – which should, according to widely accepted integrated environmental management principles – include an evaluation of waste streams.

The results of an open EIA process will determine whether or for how much longer the facility remains in operation. Meanwhile Eskom and the Department of Mineral and Energy Affairs need to reorient energy generation priorities and give due importance to the development of sustain-

able energy generation options, as well as to rapid implementation of energy conservation measures.

These suggestions are radical, but they are feasible. They are in line with conversion strategies for dirty and dangerous technologies elsewhere. They respect the store of human capital, but propose to redirect scientific endeavours into the development of more socially and environmentally useful products.

The ANC has in its election manifesto offered a vision of a more open society in which government is answerable to the people. Pursuance of the nuclear fuel cycle by its very nature diminishes the openness of the society. It is time to recognise the errors of the past, and not allow them to encumber our social, economic, and moral reconstruction efforts.

Whatever conclusions are reached at this conference, I would like to recommend that it be reconvened in five years from now, towards the end of the life of the first democratic government. We will need to take stock again, ensure that the debates remain open, that the progress or otherwise on these questions is monitored and reassessed.

## Notes

<sup>1</sup> A more comprehensive version exists in my paper entitled *The road to Koeberg: international support for the establishment of South Africa's nuclear programme*, presented to the Africa Seminar, Centre for African Studies, University of Cape Town, 15 September 1993.

<sup>2</sup> I use this term because I have yet to come across women in AEC management or in the Armscor bomb programme. ■