Essay
Why South Africa Gave Up the Bomb

J. W. de Villiers, Roger Jardine, Mitchell Reiss

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Nuclear policy : past, present and future

South Africa represents the world's first instance of nuclear rollback, a state which has unilaterally and voluntarily relinquished nuclear weapons. President F. W. de Klerk declared to a special joint session of the South African parliament on March 24, 1993, that « at one stage South Africa did develop a limited nuclear deterrent capability, » but « early in 1990 final effect was given to decisions that all the nuclear devices should be dismantled and destroyed. » De Klerk's speech was the first official confirmation of what had long been suspected : Pretoria had actually developed nuclear weapons. Yet its larger significance derives from the country's unprecedented dismantling of a fully mature nuclear arsenal.

Despite de Klerk's exhortations about opening a new chapter of « international cooperation and trust, » South Africa's nuclear past casts a long shadow. For some, de Klerk's announcement resurrected old questions about the country's nuclear behavior, reinforced current suspicions and raised fresh concerns about the country's plans for the highly enriched uranium (HEU) taken from the nuclear devices, as well as its adherence to the nuclear Nonproliferation Treaty (NPT), development of export controls, and the prospects for an African nuclear weapon-free zone. As the country moves toward its first nonracial elections in April, these issues have direct implications not only for South Africa but also for the new government's relations with its neighbors and the West. The African National Congress (ANC), the United States and other key members of the international nonproliferation community continue to look for reassurance about Pretoria's future intentions.

South Africa's nuclear journey

South Africa's nuclear program originated in its abundant uranium reserves, which were coveted by the United States and Britain for use in the Manhattan Project. During the two decades after World War II, South African uranium was sold to the Combined Development Agency, a purchasing organization set up by Washington and London to secure adequate uranium supplies for their nuclear weapons programs. But by the late 1950s, Pretoria had decided to establish an in-

digenous nuclear research and development program for peaceful purposes. And by 1969 South Africa's technological success encouraged the government to construct a pilot uranium-enrichment plant, named the Y Plant, at Valindaba, outside Pretoria. Although the plant was intended to test the technology on an industrial scale and to open new commercial opportunities, it also made possible the manufacture of material for nuclear weapons.

In 1971 Minister of Mines Carl de Wet approved preliminary nuclear explosives research. These investigations were initially limited to theoretical calculations and introductory studies of ballistics. No serious development was carried out. It was not until three years later that Prime Minister John Vorster approved development of a nuclear explosive capability-limited to peaceful applications, such as mining excavation-and authorized the funding for a testing site.

Two approximately 200-meter-deep test shafts were eventually drilled at Vastrap in the Kalahari desert. These facilities were prepared for a « cold test »-that is, one without HEU carried out in order to check the device's nonnuclear components, logistics and instrumentation. A Soviet satellite's discovery of the Kalahari site in August 1977, with later confirmation from U.S. reconnaissance, aroused vehement international protest. Pretoria realized that a nuclear test was politically impossible and abandoned the site.

The Y plant yielded its first HEU in January 1978, and the first fully assembled nuclear device was completed the following year. In July 1979 an Action Committee appointed by President P. W. Botha recommended the manufacture of six additional nuclear devices, for a total of seven, the first of which was designed for a fully instrumented underground test. It also advised that the development and manufacture of nuclear devices be transferred to Armscor, the South African arms manufacturing corporation. The atomic energy program would supply the HEU and conduct the necessary nuclear research.

It has been estimated that each nuclear device used 50 to 60 kilograms of HEU and had a yield of 10 to 18 kilotons. They were never stockpiled in assembled form ; the nuclear and nonnuclear components were stored separately in concrete and steel vaults. The assembly and testing of each device required four codes. Three senior officials each held one code, and only the head of government knew the fourth code ; consequently, no single person could activate the devices. Some sources have suggested that the explosives could have been dropped from modified Buccaneer bombers by the South African Air Force.

Toward a secret deterrent

After the discovery of the Kalahari testing site, the character of South Africa's nuclear program started to change toward acquiring a nuclear deterrent. Prime Minister Vorster convened his senior officials to consider the program's future, ordering that a document be drafted to articulate the country's nuclear strategy.

That strategy, formally approved in October 1978, consisted of three phases, which Pretoria believed, employed wisely and discreetly, would help prevent war. Phase 1 called for

strategic ambiguity : internationally, the government would neither confirm nor deny whether it possessed a nuclear weapons capability. If the country were threatened militarily, Phase 2 required South Africa covertly to reveal its nuclear capability to leading Western governments, principally the United States. Should Phase 2 fail to persuade the international community to intervene to alleviate an armed attack from outside South Africa's borders, Phase 3 required Pretoria publicly to disclose its nuclear arsenal, either by official acknowledgement or an underground nuclear test. From the outset, everyone involved in the program knew that no offensive application for the weapons was foreseen or intended. And in practice the strategy never advanced beyond Phase 1, due to the absence of any overt military threat.

South Africa's formal 1978 decision to change the focus of its nuclear program to military applications is best understood in light of its international standing at the time. As President de Klerk explained in his March 24, 1993, speech, South Africa feared « a Soviet expansionist threat to southern Africa, » which included a build-up of Cuban forces in Angola starting in 1975. The imminent independence of neighboring Zimbabwe under an actively antiapartheid regime also worried Pretoria. These events augmented the minority government's fears of encirclement.

De Klerk also noted Pretoria's « relative international isolation and the fact that it could not rely on outside assistance should it be attacked. » South Africa's relations with the rest of the world were rapidly deteriorating. By the late 1970s South Africa's participation in the U.N. General Assembly and its specialized agencies was suspended. The Security Council had imposed a mandatory weapons embargo and voluntary oil embargo on the country. Moreover, even as the most advanced nuclear energy state on the continent, South Africa for political reasons was denied its designated seat on the International Atomic Energy Agency's Board of Governors and participation in its General Conference. All these developments contributed to South Africa's sense of isolation.

The nuclear development program was classified as top secret, although its new military emphasis was announced to pertinent atomic energy personnel in November 1979. The military was not involved in the early stages of the program, but provided logistical support in selecting and developing the Kalahari testing site. For security reasons, the government decided that no cooperation from outside organizations or countries should be sought. It did not breach any international safeguard agreements that South Africa had entered. The program was at all times under the direct control of the head of government in consultation with relevant cabinet ministers, the chief of the Defense Force, the chief executive of the atomic energy program and, after 1979, the chairman of Armscor. All decisions were taken unanimously.

South Africa's Atomic Energy Corporation (AEC) has estimated the maximum cost of the nuclear deterrent as 70 million RAND a year, which includes the capital cost of the Y Plant. The total cost of South Africa's nuclear deterrent program was approximately 750 million RAND, or less than 0.5 percent of the country's defense budget at the time. About 400 people were involved in the program at any

one time, with a total of approximately 1,000 employees overall.

In the early 1980s limited theoretical work was conducted on advanced explosive designs, and in 1985 it was reported to President Botha that development of such devices was feasible. A reliable implosion device, however, would need to be tested. After a policy review, the government stuck to its original deterrent strategy, as well as its decision to build only seven devices, despite South Africa's further deteriorating international position. While the Botha regime saw no need for advanced implosion-type devices, it continued limited theoretical and experimental work in this area, on shaped explosive charges and neutron initiators.

Giving up the bomb

Toward the end of the 1980s-after the collapse of the Soviet Union, the independence of Namibia, the cessation of hostilities in Angola, and the withdrawal from that country of 50,000 Cuban troops-South Africa saw clearly that the nuclear deterrent was becoming superfluous. Furthermore, the government increasingly realized that accession to the NPT would have distinct advantages for South Africa's international relations, especially those with other African countries. Pretoria saw that the solution to South Africa's problems lay in the political rather than the military arena and that the nuclear deterrent, along with strategic ambiguity, was becoming a burden rather than a benefit.

The election of F. W. de Klerk as president in September 1989 precipitated this change in strategy. De Klerk embarked on a program of political reform to normalize South Africa's international relations. Shortly after assuming office, he appointed an Expert Committee to consider the benefits and liabilities of maintaining the nuclear deterrent and of joining the NPT. In November 1989 the committee recommended terminating and completely dismantling the nuclear weapons program. De Klerk approved. By this time only six devices had been fully assembled. In light of the profound political transition then underway in South Africa and the U.N. sanctions and rigorous inspections imposed on Iraq for its own nuclear, biological, chemical and ballistic missile programs, the committee also advised against publicizing either South Africa's nuclear capability or the arsenal's dismantlement.

That same month de Klerk appointed a working group of Armscor and AEC officials to advise him on a timetable for dismantlement and the earliest possible date when South Africa could join the NPT and conclude a safeguards agreement with the International Atomic Energy Agency (IAEA). Before a safeguards agreement could be concluded, Pretoria wanted the facilities previously used for the manufacture of the nuclear devices to be decontaminated, all nuclear material melted and stored, equipment removed, technical drawings destroyed, and the facilities mothballed or converted to commercial use.

The Y Plant was closed on February 1, 1990. The working group reported that it would need about 18 months to fully dismantle the country's nuclear deterrent capability, and Armscor and the AEC were jointly entrusted with this task. They studied the problem for five months before beginning in July 1990. An independent au-

ditor, directly responsible to de Klerk, was charged with overseeing the dismantlement of the six assembled nuclear devices and ensuring that the HEU from each, as well as from the incomplete seventh device, was removed from Armscor's custody and returned to the AEC. He was also to confirm that all technology and hardware were destroyed. The entire process was completed by early July 1991.

South Africa joined the NPT on July 10, 1991, concluded a safeguards agreement with the IAEA two months later, and presented it an inventory of nuclear materials and facilities on October 30. These actions allowed South Africa to take up its seat in the General Conference of the IAEA.

With the conclusion of the safeguards agreement, the government certified that all the nuclear explosive devices had been dismantled and all the enriched uranium stored in specially designed vaults at Pelindaba. Following President de Klerk's announcement on March 24, 1993, that South Africa had possessed and then dismantled a nuclear deterrent, the IAEA was also given access to all the facilities previously used in the nuclear program.

Lingering uncertainties

While the ANC welcomed de Klerk's March 24 speech, the tardiness and incompleteness of the government's revelations, combined with its past policy of nuclear ambiguity, left many unanswered questions. Did South Africa intend to detonate a nuclear device in August 1977 ? Was South Africa responsible for the mysterious double flash captured by a U.S. Vela satellite over the South Atlantic in September 1979 ? Did Pretoria's nuclear weapons program receive any foreign assistance ? Has the government accurately accounted for all the HEU that was produced ?

The exact source of the double flash detected by a U.S. satellite is still in dispute. Although a scientific panel convened by the Carter administration determined that the signal may have been caused by a meteor striking the satellite, many knowledgeable observers believe that it was actually a low-yield nuclear explosion.

Such incidents have fueled speculation over the extent to which South Africa's nuclear weapons program received foreign assistance. The United States, France and other countries provided South Africa with civilian nuclear technology and assistance that did not directly abet the bomb program. But this cooperation nonetheless increased the technical competence of South Africa's nuclear engineers, scientists and technicians.

More important, during the past two decades various news reports have linked South Africa and Israel as partners in military and nuclear matters, including the 1979 flash over the South Atlantic. South Africa has also allegedly received German assistance with enrichment technology. If these reports are true, this cooperation would have directly contributed to Pretoria's production of HEU and the construction of nuclear devices. When de Klerk was questioned about the government's past failure to be fully candid about the nuclear program, he characterized previous official responses as « neither lies nor the full truth. »

Given this cloudy past and the fact that all information about the nuclear program has not been disclosed, the

ANC is warranted in doubting the government's figures of spending between 700 million and 800 million RAND to produce nuclear weapons. The ANC believes that this total is at odds with the billions of RAND allocated to the AEC over the years, which reached 980 million RAND annually at the peak of the nuclear program, along with other funds hidden in various budget votes. All this funding could not have gone to the AEC's peaceful nuclear activities. How this money was used, and how much of it was channeled to the nuclear weapons program, remains uncertain.

Tug of war for leftover uranium

While the mysteries surrounding the Kalahari test site, the South Atlantic event, and even the disagreement over the nuclear program's cost figures are of interest to historians, the future of the country's HEU stockpile is the most pressing nuclear issue facing South Africa.

The debate over the future of the HEU takes place within the context of a larger dispute over Pretoria's transfer from the public to the private sector of the many governmental and quasi-governmental institutions. The ANC believes that a major objective of this unilateral restructuring is to place these institutions beyond the reach of an ANC-led government, and heading off this restructuring by the apartheid government sits high on the ANC's domestic agenda. Any decision by the current government regarding the future of the HEU would qualify as a type of unilateral restructuring and would be strongly opposed by the ANC.

There have been reports of the AEC trying to sell the HEU to foreign powers before next April's election, when an ANC-led government is expected to take office. To ensure that the HEU and other weapons-related technologies are not misused to serve any group's narrow interests, the ANC insists that a government of national unity be involved in future decision-making on matters of such strategic importance. Any foreign government that signs an agreement with Pretoria regarding the HEU stockpile without the prior knowledge and approval of the ANC will jeopardize future peaceful nuclear activities of a democratic South Africa.

Some foreign governments interpret the ANC's opposition to the present government's selling or otherwise removing the HEU stockpile from the country as an abdication of the ANC's long-standing commitment to nuclear nonproliferation. These doubts about the ANC's fitness as a nuclear custodian are not new; they most recently surfaced in December 1992. At that time, the ANC criticized the government's continued refusal to publicize its nuclear policy, a refusal that was undermining the confidence of the majority in the democratic process then underway-the negotiations of the Convention for a Democratic South Africa. At an international press conference in Johannesburg the ANC warned that continued government secrecy would amount to holding the country hostage to a nuclear threat. It was during this period of sustained ANC pressure that foreign news reports suggested that an ANC-led government would sell the HEU and nuclear technology to Cuba and the Palestine Liberation Organization to pay off old po-

litical debts.

The ANC dismissed these reports as mischief-making by Pretoria's intelligence apparatus and as an attempt to confuse the issues. The ANC said the minority government was trying to stoke fear of the ANC's stewardship in order to justify unilateral restructuring of the nuclear program. The minority government may also have sought to strengthen its bargaining position in the sale of the HEU to foreign governments afraid of proliferation.

Fortunately, the government and the ANC appear to have reached consensus on what should be done with the HEU stockpile. At a meeting of senior AEC and ANC officials at Pelindaba last July, Waldo Stumpf, chief executive of the AEC, assured the ANC that the AEC had no intention of selling the HEU during the transitional period. In addition, because the AEC intends to become a commercially viable enterprise, Stumpf argued that it will need to retain all the HEU for medical isotope production in the Safari research reactor. Stumpf claims that South Africa could be one of the world's top three producers of these isotopes, yielding much-needed foreign exchange. The AEC estimates that South Africa would receive 15 million RAND for the one-time sale of the HEU, as opposed to a revenue of 400 million to 500 million RAND over ten years if the HEU is converted to fuel for the Safari reactor.

The picture painted by Stumpf and the AEC is obviously appealing, but the commercial potential of isotope production for export cannot be determined until the results of the ANC's macrœconomic study of the AEC are in hand. The potential of the HEU for proliferation should the material fall into the wrong hands adds a special dimension to dealing with isotope production, and a purely economic decision may not be possible. For the ANC the options regarding the future of the HEU are : sell the HEU to a foreign government, blend it into low-enriched uranium for use in nuclear power reactors, use it to produce medical isotopes, or sell the HEU to a foreign government for safekeeping and repurchase it as needed for the medical isotope program. If this last option is economically viable (depending on the price the HEU will bring on the international market and the cost for Safari fuel over ten to 20 years), South Africa will be able to assuage international concerns over proliferation and still realize the economic potential of isotope production.

The ANC's nuclear agenda

South Africa will need to decide a host of other nonproliferation issues during the next few years, but it has already taken some reassuring steps. Pretoria has accepted membership in the Zangger Committee, which lists nuclear exports that require safeguards. It has already applied for membership to the Nuclear Suppliers Group and membership in the Missile Technology Control Regime is under discussion. ANC President Nelson Mandela has declared that South Africa must never again allow its resources, scientists and engineers to produce weapons of mass destruction. His words indicate that South Africa's nuclear policies will seek to make the country a responsible member of the international nonproliferation community.

In May 1993 the South African Par-

liament enacted nonproliferation legislation that prohibits South African citizens from assisting in any program related to the construction of nuclear weapons. The government has also adopted export policies commensurate with established nonproliferation guidelines, which include restrictions on dual-use technologies. Regulations and enforcement procedures to ensure compliance with these laws are currently being developed.

Following next year's elections, the ANC will seek full participation for South Africa in the IAEA. Under Article VI of the IAEA Statute, in each region the member country most advanced in atomic energy technology holds a seat on the IAEA's Board of Governors. Although South Africa has the continent's most advanced nuclear program, Egypt has held the African seat since South Africa's expulsion in 1977. The ANC is likely to consult with Egypt, other African member countries and the IAEA to find a way to resolve this issue. Possible approaches include rotating membership on the board, enlarging the African contingent or, if it is agreed that South Africa resumes membership, a sunset period after which South Africa replaces Egypt.

South Africa also intends to cooperate fully with its neighbors to establish an African nuclear weapon-free zone. An NWFZ treaty will commit African states « not to research, develop, stockpile, manufacture, or otherwise possess or have control over any nuclear explosive device. » Progress toward an African NWFZ has been slow because of the nuclear policy of the previous National Party government. However, in his March speech, President de Klerk articulated support for an African NWFZ, and the ANC also favors such a treaty. The U.N. and Organization of African Unity Group of Experts charged with drafting a NWFZ treaty is scheduled to meet for a fourth round of discussions this fall. It is hoped that a final draft will be ready for signature in time for the OAU's June 1994 summit.

As one of the world's major suppliers of uranium, South Africa would be shortsighted if it were to discontinue fuel fabrication and commercial enrichment services. Yet questions of economic viability will greatly influence the future of the country's nuclear program. The ANC is currently disinclined to support further uranium enrichment, given the massive investment of public funds this undertaking would require. The danger of proliferation also merits consideration in the decision whether to continue uranium enrichment. Regardless of how the uranium enrichment issue is decided, an ANC-led government will share the expertise of South Africa in peaceful applications of nuclear technology with other African states through applied training and scientific cooperation.

Most important, the story of South Africa's acquisition and subsequent dismantlement of its nuclear arsenal holds vital lessons. Pretoria's action establishes the precedent of nuclear rollback for other threshold nuclear states. Moreover, the careful and responsible manner in which South Africa dismantled its weapons, joined the NPT, cooperated fully with the IAEA and accepted comprehensive safeguards on its nuclear facilities may serve as a useful future model. Finally, Pretoria's gradual realization that its nuclear weapons were not only superfluous but actually counterproductive

to achieving South Africa's political, military and economic objectives may be the most important lesson of all.