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**PPNN Workshop, Zimbabwe, April 2-4, 1993: South  
Africa's Nuclear Deterrent Programme and  
Non-Proliferation Policy: Additional Information  
Presented at the Workshop**

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Summarizes PPNN Workshop, Zimbabwe and South Africa's nuclear deterrent program

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## PPNN Workshop, Zimbabwe, April 2-4 1993

South Africa's nuclear deterrent programme and non-proliferation policy: additional information presented at the workshop

Events preceding South Africa's accession to the NPT on 10 July 1991.

In 1970, South Africa took a decision to erect a pilot enrichment plant at Pelindaba. The decision was taken at this time to test a unique, indigenously-produced, enrichment technology, called the stationary walled vortex tube. It was not part of a decision to produce nuclear weapons.

By 1974, the security situation confronting South Africa to its north had changed radically. There was concern about the intention of Warsaw Pact forces towards South Africa, which was reinforced following the build up of Cuban troops in Angola from 1975. South Africa considered itself isolated and unable to count on the international community for assistance in the event of a direct threat to its territory. This deteriorating security situation led to a decision to construct a limited nuclear deterrent capability.

South Africa began construction of a nuclear test site in the Kalahari desert in 1974 in order to be able to demonstrate the capability to the world should South Africa be physically threatened. Three test shafts were drilled. One hit unfavourable geological conditions, but the other two were extended to a depth of about 180 to 200 meters and plans were implemented for test instrumentation to be put in place. Due to pressure from the United States and the former Soviet Union, the Kalahari test site was officially abandoned in 1977. The test site was never used. In 1988, a small team went back to the test site to inspect the bore holes to ascertain that they could still be used if necessary and to seal the test holes. At this time, the strategy of deterrence was still operational.

South Africa's strategy was never to use the nuclear devices in a tactical offensive way. Rather, in the event of the country being threatened by outside forces, the strategy was to conduct an underground nuclear test to convince the international community, e.g. the United States, of its nuclear capability and thereby try to persuade it to intervene. In the absence of an overt threat to South African territory, a strategy of deterrence by uncertainty was pursued, resulting in a policy of 'neither confirming nor denying' the existence of a nuclear deterrent capability.

South Africa took the enriched uranium route to acquire its nuclear deterrent. In 1978, the pilot plant was completed, with the first enrichment of uranium occurring in 1979. In 1980, South Africa produced the first of what eventually was a

limited stockpile of 6 completed nuclear fission devices. A seventh nuclear device was planned but remained incomplete by the time termination of the programme occurred in 1989. A limited capability consisting of 7 devices was considered to be necessary to ensure that a test explosion could be carried out for deterrence purposes, even if some failed to detonate.

The programme was under the direct control of the Head of State, with overall responsibility for production granted to Armscor. Only four high level government officials had access to certain parts of the nuclear codes: no single individual had access to all the codes.

The nuclear devices were of the gun-type design and never stockpiled in their assembled form. The components were stored separately in steel vaults. When assembled, the devices were about 650 millimetres in diameter by 1.8 meters in length. Because of their length and diameter, they were not suitable for use as artillery shells fired from field-guns. Neither did South Africa construct any advanced nuclear devices such as thermo-nuclear weapons.

The total cost of South Africa's deterrent programme was between 7-800 million Rand, or less than 0.5% of its defence budget at that time. About 400 people were involved on the programme at any one time, with a total of approximately 1,000 over its entire duration.

South Africa never conducted a nuclear test. The reports that it had done so in 1979, following the detection of an unusual flash, by a US vela satellite were incorrect. A panel established by President Carter concluded that the most likely possible cause of the flash was from a micro meteorite hitting the satellite. No nuclear fallout was ever measured in the area following the incident.

There was no cooperation related to the nuclear deterrent programme between South Africa and any other state during the period of its operation. South Africa neither received nor gave assistance in connection with any element of this programme. Assistance was received from France for the construction of two reactor plants for civil power production purposes, and these have always been under IAEA safeguards.

In September 1989, President de Klerk assumed office and began a re-assessment of South Africa's deterrent policy. By this time, it was clear that the security environment confronting South Africa had improved considerably, coinciding with the eventual withdrawal of Cuban troops in Angola, independence for Namibia and the ending of Cold War tensions between the United States and former USSR.

A decision was taken in November 1989 to decommission the pilot enrichment plant and to dismantle and destroy the nuclear devices, followed by the approval in February 1990 of the strategy and procedures for the dismantling program and

for the destruction of South Africa's entire nuclear deterrent capability.

Armcor and the Atomic Energy Corporation (AEC) were jointly entrusted with the dismantling and destruction of the nuclear deterrent capability. To ensure the full implementation of these decisions, an independent auditor directly responsible to the State President was appointed to supervise the dismantling process. The auditor had instruction to oversee the dismantling of the 6 assembled nuclear devices and ensure the material from these, and of the seventh incomplete device, was removed from Armcor custody to the AEC for peaceful use. The instruction also included retrieval and destruction of all hardware for the programme and the clean-up and re-designation to peaceful uses of the Armcor building used in the fabrication of the devices. However, it took much longer to ensure total retrieval of all the technical drawings from the programme. Material accounting records were retained.

Operation of the pilot plant was terminated on 18 February 1990 and decommissioning commenced. The dismantling of the nuclear devices was completed by early July 1991, prior to South Africa's accession to the NPT. Actual dismantling was preceded by the implementation of extensive control procedures to ensure full safety of personnel and security of material. The last material from the devices was returned to the AEC between 5-6 September 1991 and placed under storage, which complies fully with standards prescribed by the Convention on the Physical Protection of Nuclear Materials.

From the time of signature of the NPT, the instruction was to follow the exact letter of the Treaty. On 16 September 1991, a safeguards agreement was concluded between South Africa and the IAEA, only six weeks after signature of the NPT. This agreement entered into force on the date of the signature.

The first priority was to get all nuclear material in South Africa, including that from the dismantled devices, under safeguards. South Africa had kept a complete material accounting record for both its deterrent and civil programmes. This made it possible to compile a very comprehensive initial material inventory, which, on completion, was presented to the IAEA for verification.

The initial material inventory was not public and remains safeguards confidential in keeping with inventories drawn up by other states party to the NPT. There is no single overall figure for the material in the inventory, rather it comprises a long list of material in different chemical forms and at different enrichment levels. Each form of material is stored in specially designed vaults sealed with IAEA seals, and is inspected at least once a month by the IAEA.

The actual inventory itself was submitted to the Agency on 30 October 1991 as specified by the safeguards agreement. South Africa realized it was a special case requiring a greater

effort than usual to determine the accuracy of this inventory. It consequently made a voluntary gesture to open all production records for the 15 year period, dating back to the commissioning of the pilot plant.

Five meetings were held between South Africa and the specially assigned team from the IAEA and all facilities were opened to inspection. Because the timing of this coincided with the debate in the IAEA over special inspections, South Africa offered to allow inspectors to go anywhere, anytime. This led to inspectors, upon their request, being taken to the Kalahari test site to ensure it was no longer operational.

In addition to providing the IAEA with a complete material record, South Africa furnished documentation on all nuclear imports and exports. This, together with the other measures, will set a precedent for other threshold states if they accede to the Treaty. But because it is such a complex process, the international nuclear non-proliferation community should not expect too much from it as there are inevitable difficulties. In the case of South Africa, the establishment of a totally accurate material balance was not entirely possible due to the accumulation of small amounts of material unaccounted for (MUF) over the 15 year period. Secondly, a total in-out material balance running over 15 years operation of both enrichment plants, was influenced largely by the far greater volume of depleted material produced over this lengthy period. Due to lack of international standards on analysing enrichment levels, especially of the depleted material, and because of the very small value placed on this material, enormous difficulty exists in determining a credible quantitative mass of U-235 in this large volume of depleted material. Re-analysis of these more than 600 cylinders would require a two-week homogenisation treatment of each cylinder in turn before sampling can be undertaken. Consequently, although the IAEA figure suggest a certain material imbalance, the IAEA has determined that it has found no evidence that the material inventory is incomplete.

The process for implementing normal full scope safeguards procedures in South Africa, as required by the NPT, is almost complete. The subsidiary arrangements came into force in January 1993 and three facility attachments have so far been negotiated. Ad hoc inspections are now being conducted at a rate of one every two weeks.

South Africa is prepared to accept any special safeguards arrangement deemed necessary for ensuring that every suspicion regarding its nuclear capability is removed. This should be carried out under the auspices of the IAEA, although there are no objections in principle to other groups being attached to its inspection team.

South Africa is the first state to voluntarily dismantle its nuclear deterrent capability and announce the precise details of why the programme was initiated and then terminated. This

was done in the spirit of nuclear transparency and enunciated in the statement by President de Klerk on 25 March 1993. This policy of openness is intended to enhance the process for the establishment of a Nuclear Weapon Free Zone (NWFZ) in Africa.

The announcement of South Africa's deterrent programme was not made earlier due to the following specific circumstances:

- (1) between accession to the NPT and the timing of the statement, South Africa was in the midst of a profound political transition process;
- (2) at the time of NPT accession it was considered inappropriate to declare the former existence of the deterrent capability because the attention in the IAEA was focused on Iraq and South Africa did not want to receive possible adverse treatment as a result;
- (3) South Africa's accession to the NPT did not require it to make an announcement about its prior nuclear operations, rather the Treaty looked forward to its future behaviour as a Non-Nuclear Weapon State, which it was at the point of accession; and
- (4) it was felt that discussions on an African NWFZ could not continue while uncertainty remained about South Africa's nuclear status so it was decided to be fully transparent about its past activities.

South Africa's policy in the future will be directed towards supporting the nuclear non-proliferation regime and developing the peaceful uses of nuclear energy. Although South Africa intends to develop its nuclear capability for energy production, it will need all the high enriched uranium it has produced for use in its Safari reactor isotope production which is designed to operate with such materials. Consequently, South Africa has no plans to transfer any of this material to other countries but instead store it under safeguards until such time as it is required. Only if there is considered to be an excess, will consideration be given to possible commercial transfer. South Africa would, however, be prepared to enter into discussions on the further strengthening of safeguards over this material, if considered to be necessary.

South Africa is implementing export policies commensurate with established nuclear guidelines, which also include dual use technologies. A new Act on the Non-Proliferation of Weapons of Mass Destruction is to be presented to Parliament in 1993 making it illegal for any South African citizen to assist in any programme related to the construction of these weapons. South Africa also intends to cooperate fully with its African neighbours in creating a climate conducive to the establishment of a NWFZ for the continent.