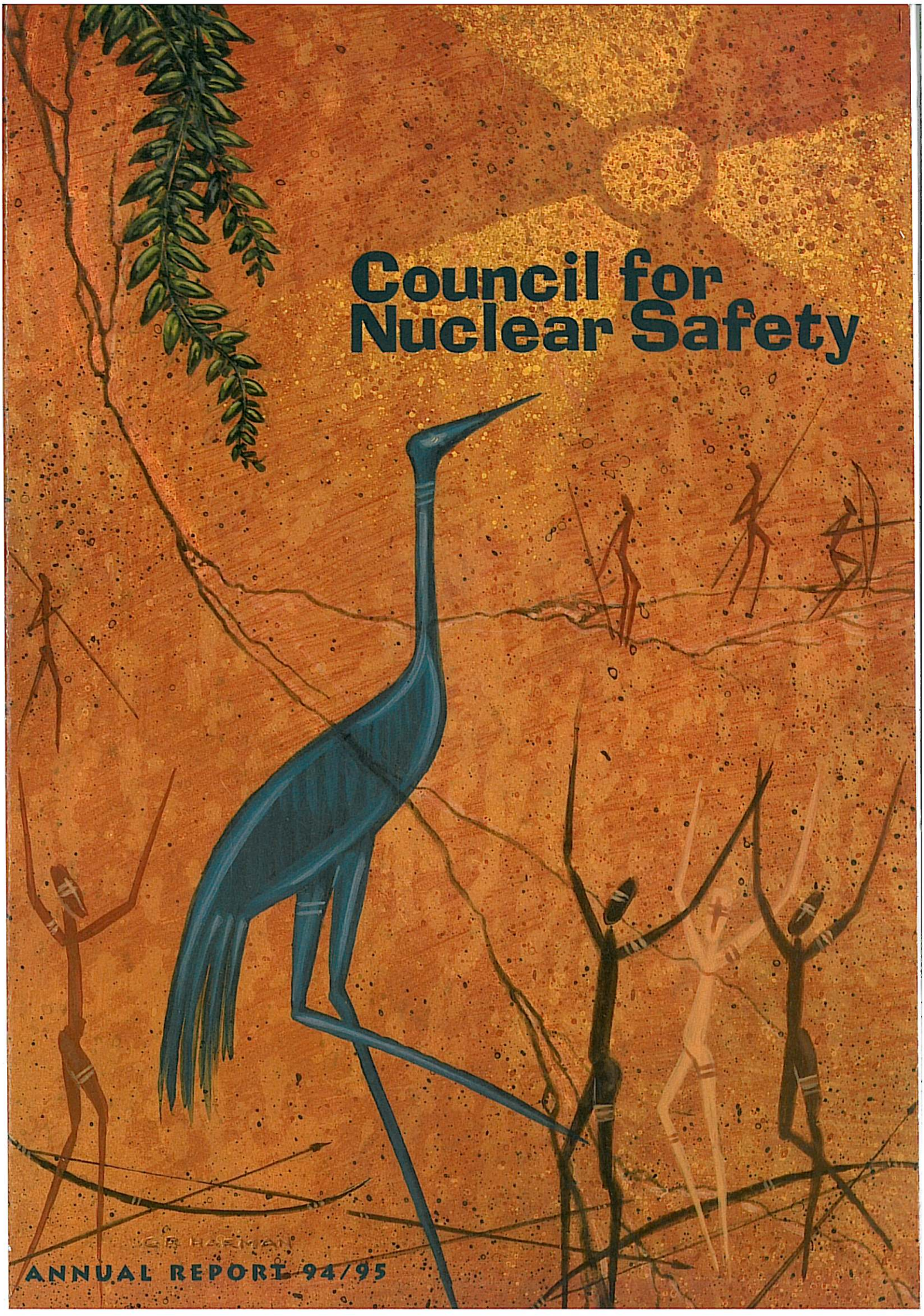
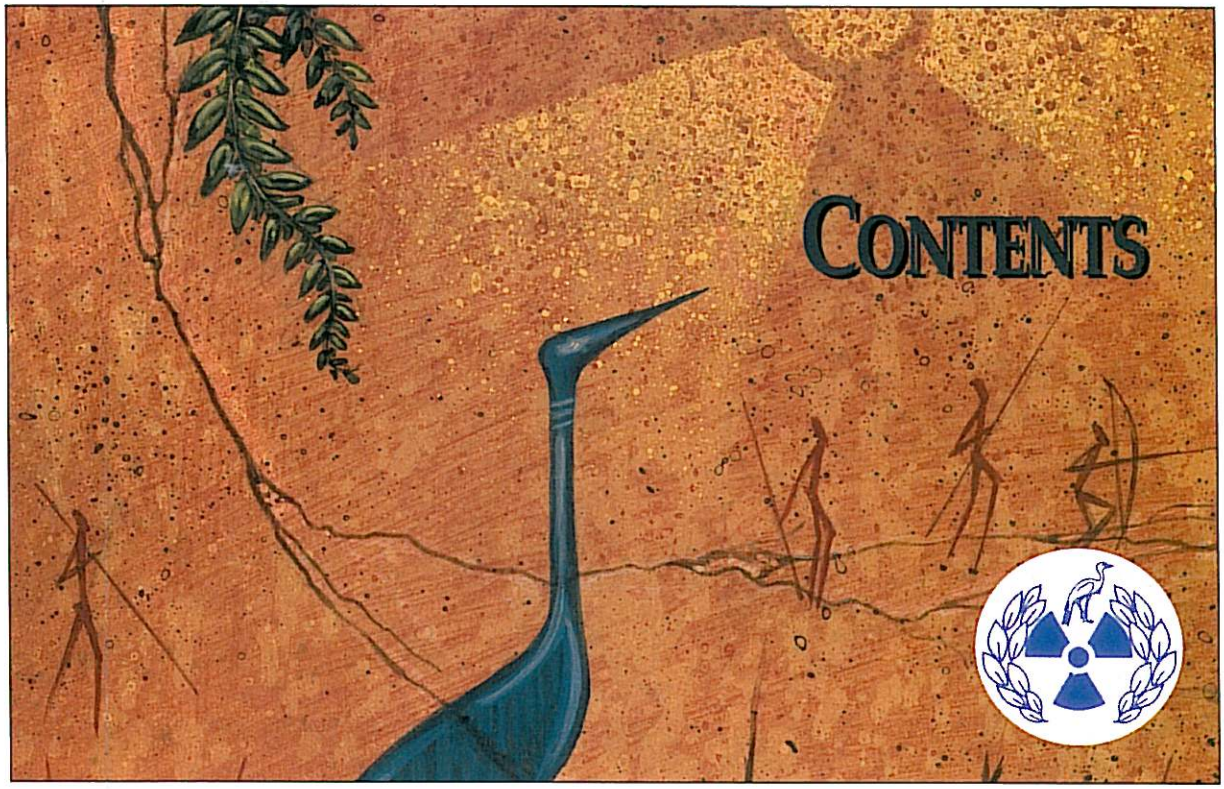
Council for Nuclear Safety



ANNUAL REPORT 94/95



Cover artwork by Graham Harman, who comments:

"Predating documented South African history, the San are the quintessential embodiment of the original ethnic Africans. I have endeavoured to include the elements of the CNS logo - the blue crane, the laurel wreath and the radiation symbol - within the milieu of endemic South African rock art. The subtly-toned human figures represent our national cultural diversity."

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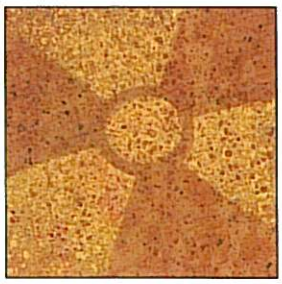


POLICY

The policy of the Council is:

- *to address the risk of nuclear damage through the application of a quantitative risk assessment approach*
- *to be cost effective in meeting its objectives and fulfilling its functions*
- *to evaluate the extent to which it meets its objectives*

STRATEGY

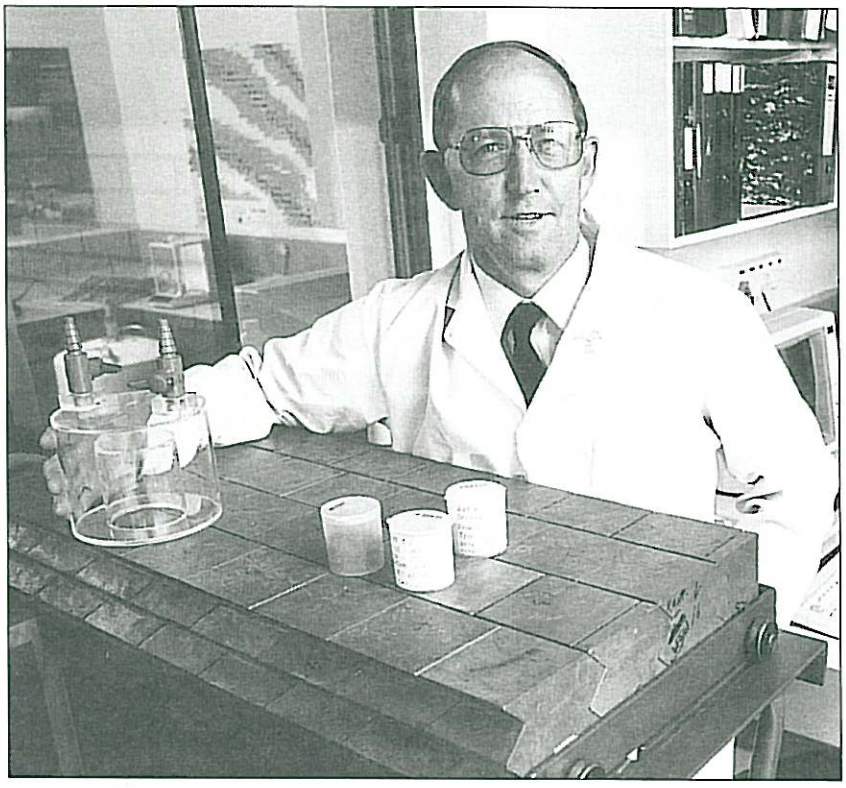
Its strategy is to accomplish this mission through:

- *the exercise of responsible and effective regulatory control,*
- *the promotion of a quality and safety culture, both within and outside its own ranks, and*
- *the consistent endeavour to maintain the highest level of integrity, professionalism and independence,*

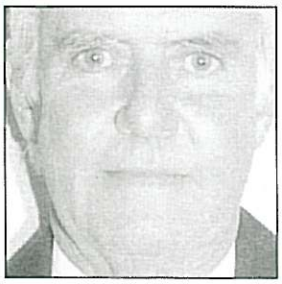
applying the skills of its staff in developing and implementing sound regulatory practices embodying innovative techniques, and maintaining a standard that is comparable internationally.

MISSION STATEMENT

It is the mission of the Council for Nuclear Safety to safeguard persons and their property against the risk of damage from the production or exploitation of nuclear energy and associated radioactive materials in the Republic of South Africa.



Dr Dolf Brits in the CNS's radio-analytical laboratory.



Prof John Martin

CHAIRMAN'S REPORT

The 1994/95 fiscal year has been one of change in the nuclear field in South Africa, and these changes have influenced the work and functions of the Council.

As a consequence of South Africa's restored status in the international community, the Council has expanded its responsibilities. Apart from one bilateral cooperation agreement that was entered into, interaction with the International Atomic Energy Agency (IAEA) has also increased, with Council for Nuclear Safety (CNS) staff becoming involved in an increasing number of the Agency's activities. These developments are welcomed, as they broaden the resource base of the CNS and ensure that its expertise is measured against international norms. Progress in this regard is expected to continue.

South Africa signed the Convention on Nuclear Safety in 1994 and, once ratified, the responsibility for assuring South Africa's adherence to the provisions of the convention will lie with the CNS. Should South Africa take its place as the designated member for Africa on the Board of Governors of the IAEA in Vienna, the CNS will become further involved in multilateral nuclear safety matters.

Consideration has been given to changes to the Nuclear Energy Act (Act No 131 of 1993), and a process of wide consultation with stakeholders and other interested bodies commenced. This process, which is being coordinated with the current fundamental review of energy policy, is ongoing, and it is intended that it should lead to a clear and widely acceptable framework for the regulation of nuclear safety.

These developments have further increased the workload of the CNS staff, who were already under considerable pressure. The vigilance of nuclear regulatory staff is imperative for

nuclear safety, which over the past year has been maintained at the required high levels consistent with international norms. On behalf of my Council, I would like to express appreciation and gratitude for the dedication and commitment of the management and staff in meeting this challenge.

Finally, I would like to thank the Minister of Mineral and Energy Affairs, the Minister of Finance, the Chair of the Portfolio Committee, the Director-General and his staff and the members of the Council for their support and cooperation during the year.

Prof John Martin

Mr Bert Winkler

Executive Officer's Review

introduction

This report covers the period from 1 April 1994 to 31 March 1995, a time of monumental change for all of South Africa's people - one that this country will probably never experience again. I am proud and thankful, as are my colleagues at the CNS, to have been a part of it all. For the CNS it has also been a year that has seen many changes and developments - some of which I mention in this introduction.

Soon after South Africa's emergence from international isolation an arrangement for the exchange of nuclear safety information was signed by the chairman of the United States Regulatory Commission, Dr Ivan Selin, and the chairman of the Council, Prof John Martin, enabling the CNS to benefit from expertise in the USA. Reflecting the empowerment initiatives within the country, a section was created within the CNS to focus on public relations and external liaison. This has, in the short time of its existence, proved to be invaluable in enhancing the profile of the CNS in the public eye.

In view of the CNS's role in the mining and minerals processing industry, a submission was made to the Leon Commission on Safety and Health in the Mining Industry and I, as the Executive Officer, appeared before the Commission to give evidence in this regard.

Throughout the year the CNS has actively participated in the process of reviewing and developing an energy policy for

Mr Jeff Leaver, General Manager of the CNS

South Africa insofar as this involved the organisation as the safety regulator within the nuclear energy component. With the CNS reporting via the Department of Mineral and Energy Affairs, more regular communication with the relevant Portfolio Committee of Parliament, and particularly with its Chairman, was promoted during the year.

In the international context there has been a very marked increase in the CNS's involvement and that of its staff. These aspects and some of the others I have mentioned are elaborated on in greater detail in the rest of this report. There is, however, one event in the international context that I wish to mention and this was the International Conference on Radiation Protection in the Mining and Minerals Processing Industries. Those concerned with its organisation, which included a major involvement of CNS staff, are to be complimented as the Conference was widely recognised as having been very successful both locally and internationally.

However, most importantly, the following report shows that the country's nuclear installations and activities involving radioactive materials within the nuclear fuel cycle have continued to remain under safe control.

Up to 31 March 1995, nuclear licences had been granted to :

- Eskom - for the operation of Koeberg Nuclear Power Station
- AEC - for the facilities at Pelindaba
  - for the Vaalputs National Radioactive Waste repository
- 35 Mines and Mineral Processors
- 6 Scrap recyclers
- 23 users of small quantities of radioactive materials

Finally, in this introduction, I wish to pay tribute to the staff of the CNS for their hard work, dedication and loyalty. To the Council, the Department and the Minister I wish to express my sincere thanks for support during the year.

B.C. Winkler

Bert Winkler

the council and its meetings

The Council's membership through the year was as follows:

Chairman: Prof John Martin
Dean, Faculty of Engineering, University of Cape Town

Vice chairman: Dr Daan Reitmann
Former Director, National Accelerator Centre,
Foundation for Research Development

Dr Louw Dreyer
Chief Director, Land Transport Management,
Department of Transport
(Resigned from Council 1 May 1994)

Mr Meyer du Toit
Deputy Director-General, Department of Land Affairs

Mr Sydney Gerber
Chief Director, Environment Conservation,
Department of Environmental Affairs and Tourism

Prof Ron Harley
Head, Department of Electrical Engineering,
University of Natal

Dr Reynecke le Roux
Director, Radiation Control, Department of Health

Prof Anna Steyn
Head, Department of Sociology,
Rand Afrikaans University

Dr Flip van Heerden
Former President, Medical Research Council

Mr Bert Winkler
Executive Officer of the CNS, ex officio member

The Nuclear Energy Act, 1993, was promulgated on 1 March 1994, and required a Council consisting of not more than eight members (including the Executive Officer as *ex officio* member). However, it was agreed with the Minister that the existing members would continue to hold office until the expiry of the period for which they were appointed (15 June 1995), or the Minister appointed a new Council, whichever occurred first.

The Council held five scheduled and one special meeting during the year. After the meeting on 22 November 1994, in Phalaborwa, Council members visited the Palabora Mining Company at the invitation of the mine management. They were given presentations by officials of the mining company on the clearance of contaminated scrap material sites, followed by a visit to some of the rehabilitated sites.

organisation of the cns

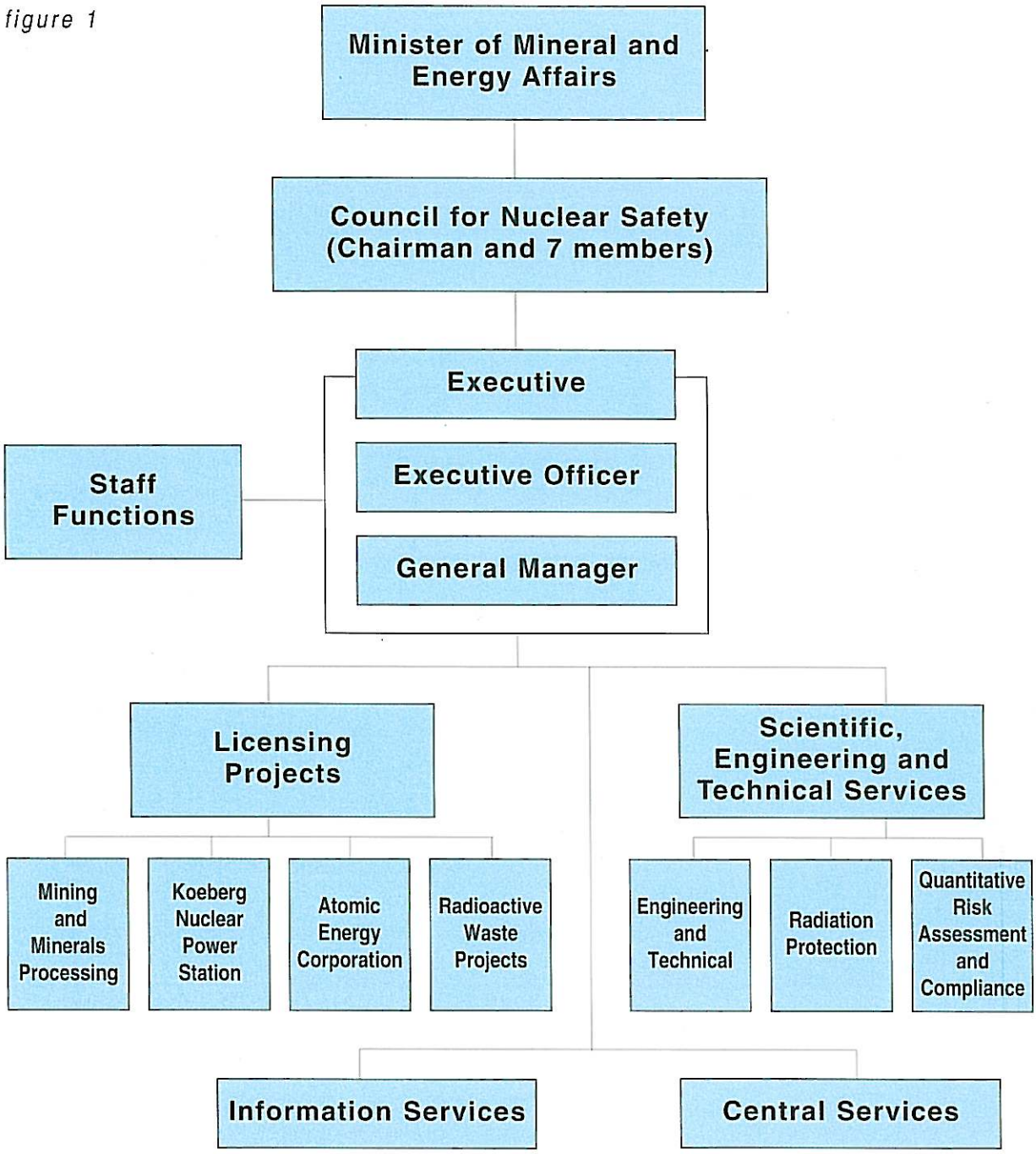
By the end of 1993, the increasing workload from the Atomic Energy Corporation (AEC) facilities and the mining activities made it clear that a change in the CNS organisational structure was required.

In particular, the need to assign responsibility for the day-to-day control of licensees' projects was identified as the highest priority, and this in turn emphasised the need to ensure that the full range of services, required to support these projects, were appropriately and efficiently provided.

The main thrust of re-organising the CNS was completed by the end of 1994 with the formation of two major groups dealing with the management of licensing projects and the provision of technical services to these projects (see Figure 1, opposite). Through this new organisation, responsibility for servicing licensees was vested in four project departments spanning the nuclear fuel cycle and involving Mining and Minerals processing activities, Eskom, the AEC and radioactive waste.

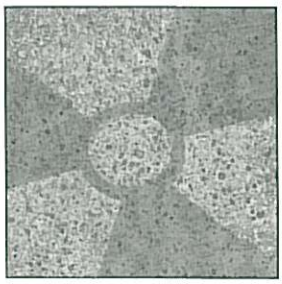
Responsibility for providing specialised scientific and technical services for these projects was assigned to three departments, each dealing with safety assessment in their respective areas of engineering, radiation protection and compliance analysis.

figure 1



The limited experience with the new structure is encouraging in that this has indicated that the objectives are being achieved although it is recognised that further refinements may be necessary.

During the year two staff members resigned, three retired and six new staff members were appointed, resulting in a staff complement of 75 on 31 March 1995.



the licensing process

The CNS is charged with the responsibility of ensuring the public and workers are safeguarded from the risk of nuclear damage by licensing nuclear installations and other activities such as the mining and processing of radioactive ores.

The licensing process necessitates that an assessment of all potential radiation hazards associated with these activities be submitted to the CNS. The assessment must cover hazards to the workforce and the public and must take into consideration both normal operations and potential accidents. From the assessment, the CNS establishes conditions of licences such that compliance with these will provide the necessary assurance that the activities are being conducted safely.

Protection of the workforce is achieved by way of plant design features and operational radiation protection programmes. Workplaces are monitored and appropriate controls placed on activities within areas where radiation hazards may exist.

Occupationally exposed workers are also subjected to individual controls which include medical surveillance, training and individual assessment and recording of radiation exposure.

Risks to the public are controlled by way of plant design features, effluent discharge controls, radioactive waste management programmes and controls on the transport of radioactive material within the public domain.

The plant design features must ensure protection during normal operation and must limit the possibility of accidents which could give rise to the release of radioactive material.

In addition and notwithstanding the requirement to demonstrate by assessment that adequate safety margins are built into plants and processes, licensees are also required to establish and maintain emergency plans to deal with any accidents that may arise, however remote the probability.

licensing projects

KOEBERG NUCLEAR POWER STATION

The Koeberg Nuclear Power Station completed its tenth year of operation during 1994.

Public Exposure

Operation of the power station routinely generates a certain amount of radioactively contaminated waste. The wastes are treated in dedicated systems which remove the majority of contaminants. The contaminants, which are concentrated by the treatment systems, are reduced in volume, immobilised and packaged for subsequent storage and disposal.

Authorised levels have been established for the discharge of treated liquid and gaseous effluent streams. This assures that any exposure to the public which may arise from these discharges is as low as reasonably achievable and that public dose limits are not exceeded.

The monitoring, analysis and control of all discharge pathways is undertaken by the licensee as a condition of the licence, and verification of analytical adequacy on selected samples is independently carried out by the CNS.

The total public dose due to radiological liquid and gaseous effluent discharges from Koeberg during 1994 was computed to be 0,5 µSv which was well within the CNS limit of 250 µSv for the highest exposed member of the public.

Dominating radionuclides, in terms of the percentage of the Annual Authorised Discharge Quantity (AADQ) discharged during 1994, in the respective transport pathways, are shown in Table 1 on page 12.

In no instance did the activity release of any radionuclide in 1994 exceed the AADQ stipulated by the CNS.

table 1

% of AADQ discharged in effluent from Koeberg during 1994			
Atmospheric Transport Pathway		Liquid Transport Pathway	
Radionuclide	% of AADQ	Radionuclide	% of AADQ
^{134}I	65	^{124}Sb	19
^{138}Xe	52	^{110m}Ag	11
^{3}H	16	^{90}Sr	9
^{132}I	12	^{3}H	9

Environmental Surveillance

To provide assurance that adequate control was maintained on effluent discharges and to confirm that no unexpected accumulation of radioactive contaminants arose in the environment, a monitoring programme was conducted. A variety of vegetation, soil, sewage and marine life surrounding Koeberg was sampled and analysed for radionuclides by Eskom.

The results from the programme, confirmed by independent CNS analysis, over this period did not indicate any untoward levels of radioactivity in the environment, confirming the adequacy of controls and the absence of accumulation.

Low levels of artificial radioactivity, below the CNS criteria, were found in sludge samples taken from Melkbosstrand Sewage Works.

The sporadic contamination of the sludge by ^{131}I was traced to patients from the area who received ^{131}I radiotherapy. Although extremely sensitive radioanalytical methods were employed, no artificial radioactivity above CNS limits was detected in any of the samples collected around Koeberg.

Waste Management

The radioactive waste management programme at Koeberg is well developed and the waste generation figures relating to 1994 are shown in Table 2 below.

Transport of Radioactive Material

In the year under review, a total of 83 loads consisting of 324 concrete containers and 816 metal drums containing radioactive waste were transported by road from Koeberg to Vaalputs. The CNS remained satisfied that the packaging and transportation was in accordance with licence conditions which required compliance with the norms of the IAEA.

Occupational Exposure

The limitation of occupational exposure is achieved through the implementation of operational radiation protection programmes designed to identify all situations which could lead to significant individual dose and to ensure that doses are kept as low as reasonably achievable (ALARA).

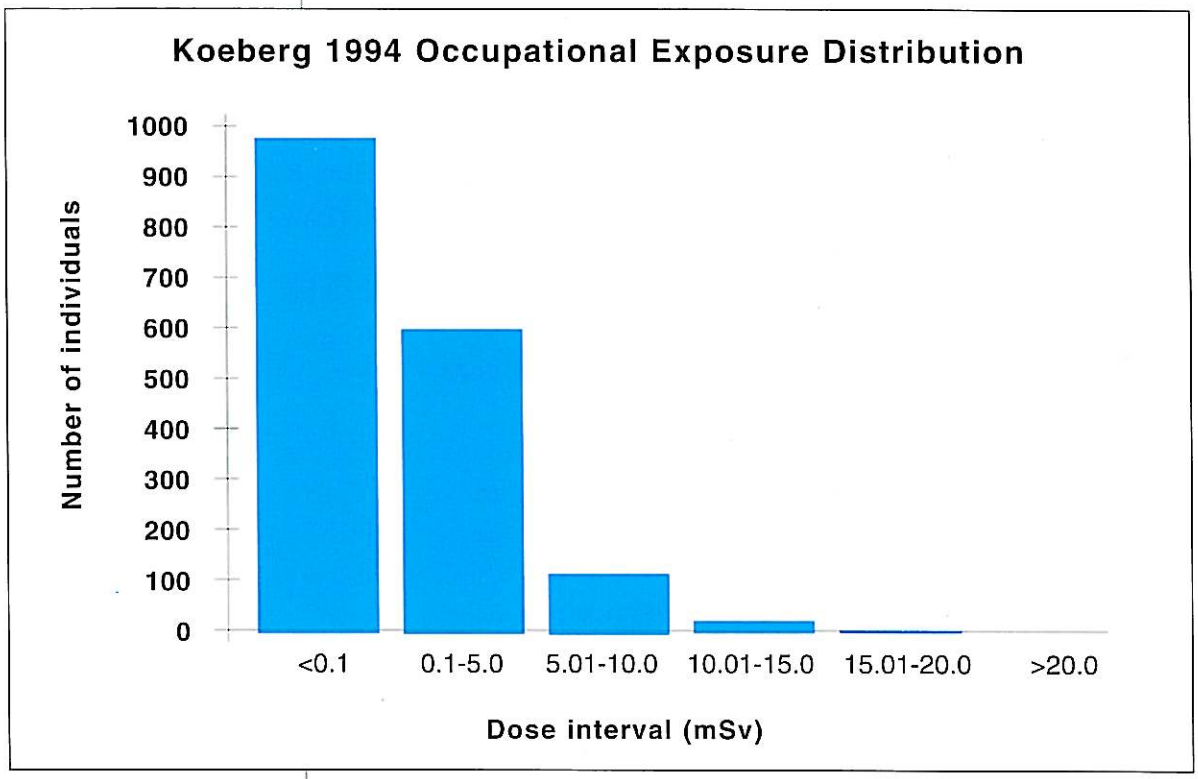
The annual collective dose among occupationally exposed workers at Koeberg during 1994 was 1,61 manSv with no individual receiving a dose in excess of the 50 mSv limit imposed by the CNS. The total occupationally exposed workforce during 1994 numbered 1 689 and resulted in the dose distribution

table 2

Waste contained in concrete drums	Volume (m^3)	Gross activity in waste (Bq)
High activity resins, spent filter cartridges and evaporator concentrates	141	1E+13

shown in Figure 2 below. This distribution conferred an average annual dose to the occupationally exposed workforce of 0,95 mSv. This was well below the CNS ALARA guideline of 10 mSv for the average annual dose to the occupationally exposed workforce.

figure 2



Safety Assessment

The safety assessment for Koeberg was started several years before operation commenced and has been maintained during the operating period. The assessment covers both normal operational aspects and accident analyses. In the case of the latter, sophisticated probabilistic risk assessment techniques have been employed.

Probabilistic risk assessment entails an identification of events which could give rise to an accidental release of radioactive material and a quantitative analysis of the probability of their occurrence.

This is combined with studies on accident propagation and quantification of the "source term" (the amount and form of radioactive material that would be released).

This information is merged with information on the environment surrounding the installation, in particular meteorological and demographic data which enables the consequences of a release to be calculated, expressed ultimately as the risk posed to the public. The results of these studies are compared with CNS safety criteria to provide assurance that the facility does not give rise to unacceptable levels of risk.

The assessed risk levels for Koeberg Nuclear Power Station demonstrated that the plant remained acceptably safe. The results were also used to identify areas for potential improvements in safety and to prioritise regulatory studies.

After monitoring international trends in safety assessment, the CNS noted an increasing move by regulatory bodies to conduct major periodic reviews of safety at operating nuclear power stations. These reviews are complementary to ongoing assessments and revisit both the design bases and the basic assumptions featured in the original safety assessments and consider, among others, developments in design codes and assessment methodology. The CNS provided Eskom with preliminary guidance for structuring such a periodic assessment for Koeberg.

Operations

Operation at Reduced Temperature

Safety studies were carried out by the CNS during the year to assess a regime of operation at lower primary circuit temperature with a view to reducing the effects of corrosion on the internal parts of the steam generators. The results of these studies enabled the CNS to approve this mode of operation, already adopted elsewhere in the world.

Advanced Design Fuel

Assessments of a proposed advanced fuel design were continued throughout the year.

The fuel is of a slightly higher enrichment (3,9 percent) which is designed to provide longer operating periods between refuelling and incorporates various enhanced safety features.

Human Factors

Reactor Operator Licences

During this period the CNS awarded new operator licences to three Senior Reactor Operators and five Reactor Operators. In addition to medical and psychological evaluations, the operators underwent stringent examinations which included written, simulator and plant walkthrough testing. The examinations were compiled and administered by the CNS.

Occurrence Monitoring

A system of occurrence identification, recording, reporting and root cause analysis is required by condition of licence.

The Koeberg occurrences were recorded in a database developed by the CNS and analysed to monitor trends for comparison with international databases.

The trends observed at Koeberg were comparable to those observed by the Nuclear Energy Agency of the OECD as indicated in Figure 3 opposite.

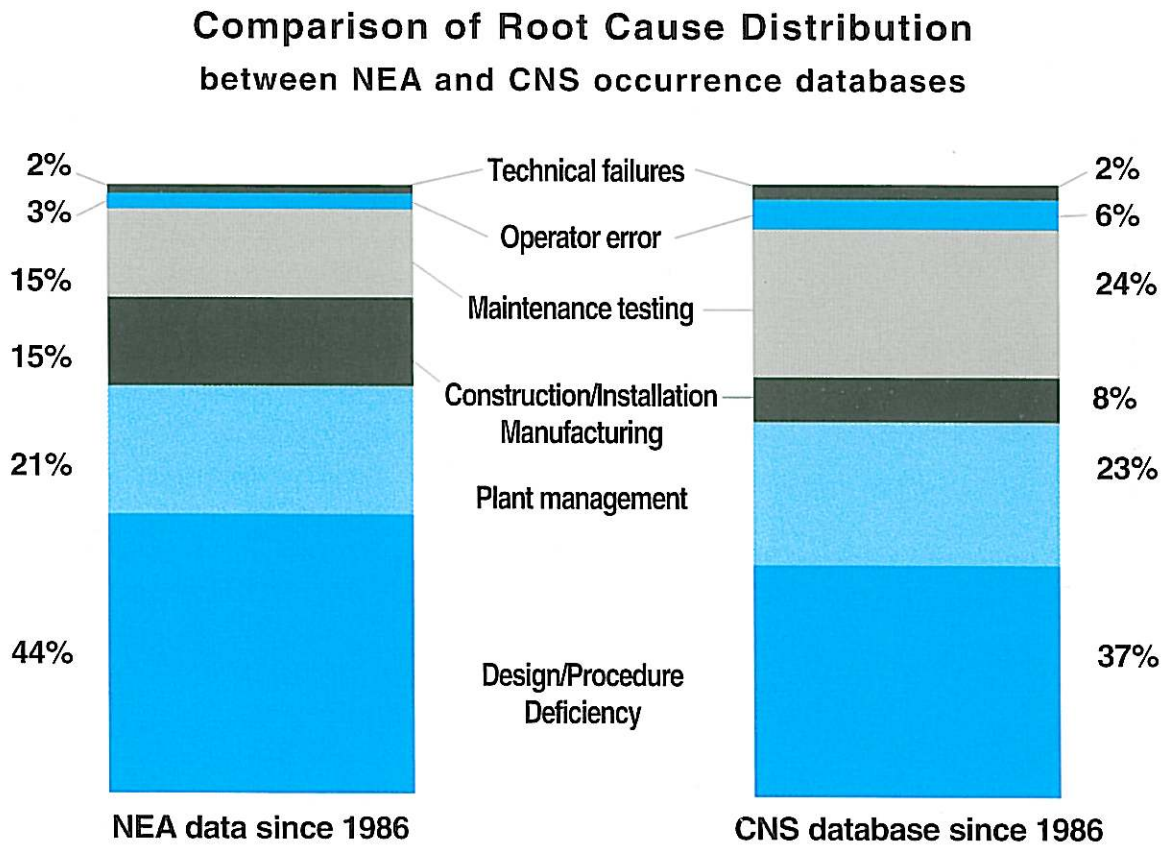
Emergency Plan Exercise

To evaluate the preparedness and effectiveness of emergency planning arrangements, the CNS conducted a full-scale emergency plan exercise at Koeberg in September 1994.

The exercise involved both the on-site and regional resources of Eskom and various local government bodies in the greater Cape Town area. The exercise was umpired by the CNS and witnessed by several local and overseas observers from Japan, the United Kingdom, Hong Kong and the IAEA.

Some areas were identified for further attention and these have been addressed by Eskom. Useful comments were received from the overseas observers, particularly in respect of controlling off-site emergency response actions.

This has also been a matter of ongoing interest to the local authorities in the region for some time, and the CNS has now



PWR reactors

figure 3

undertaken to investigate options. In view of the impending restructuring of local government, it is seen to be an appropriate time to re-visit such arrangements which will have to take into consideration whatever structures evolve.

One of the major factors influencing the viability of emergency planning is local demographics. As pressure increases to develop the West Coast, careful attention will have to be given to the continued viability of emergency planning arrangements.

The CNS has alerted the various planning authorities in the region of this factor and has continued liaison with them with a view to avoiding any compromise of emergency planning arrangements.

MINING AND MINERALS PROCESSING

Licensing

The licensing of mining and minerals processing activities involving radioactive ores commenced in 1990. At the inception of this process it was not clear to what extent radiation hazards were present within the mining industry in South Africa although it was known that conditions did exist which warranted control.

As a consequence of the limited information on such hazards and the lack of available expertise within the mining industry to quantify and control these, the licensing process was introduced in a phased manner.

The potential radiation hazards associated with mining and processing of radioactive ore are present to both the workforce and the public. They are, however, chronic in nature and do not result in acute accidental exposure.

The hazards to the workforce are generally separated into those arising underground and those associated with the operation of process plants on the surface. The former are dominated by exposure to radon daughter products, radon being an inert radioactive gas which diffuses out of uranium bearing ore bodies into the working environment and posing an inhalation hazard. (See Figure 4 opposite).

The hazards associated with surface plants generally arise through the extraction processes where the radioactive species present are selectively concentrated, giving rise to a variety of radiation hazards. Public exposure may arise from the discharge or migration of contaminated effluents into the environment, the disposal of radioactive wastes or the transport of radioactive materials, either wastes or products, within the public domain.

The licensing process commenced with 13 mines that were, or had been, producers of uranium and with operations involving monazite bearing ores, for example the mining of heavy mineral sand deposits in coastal locations. As the process developed, radiation hazards were identified at other mines and related

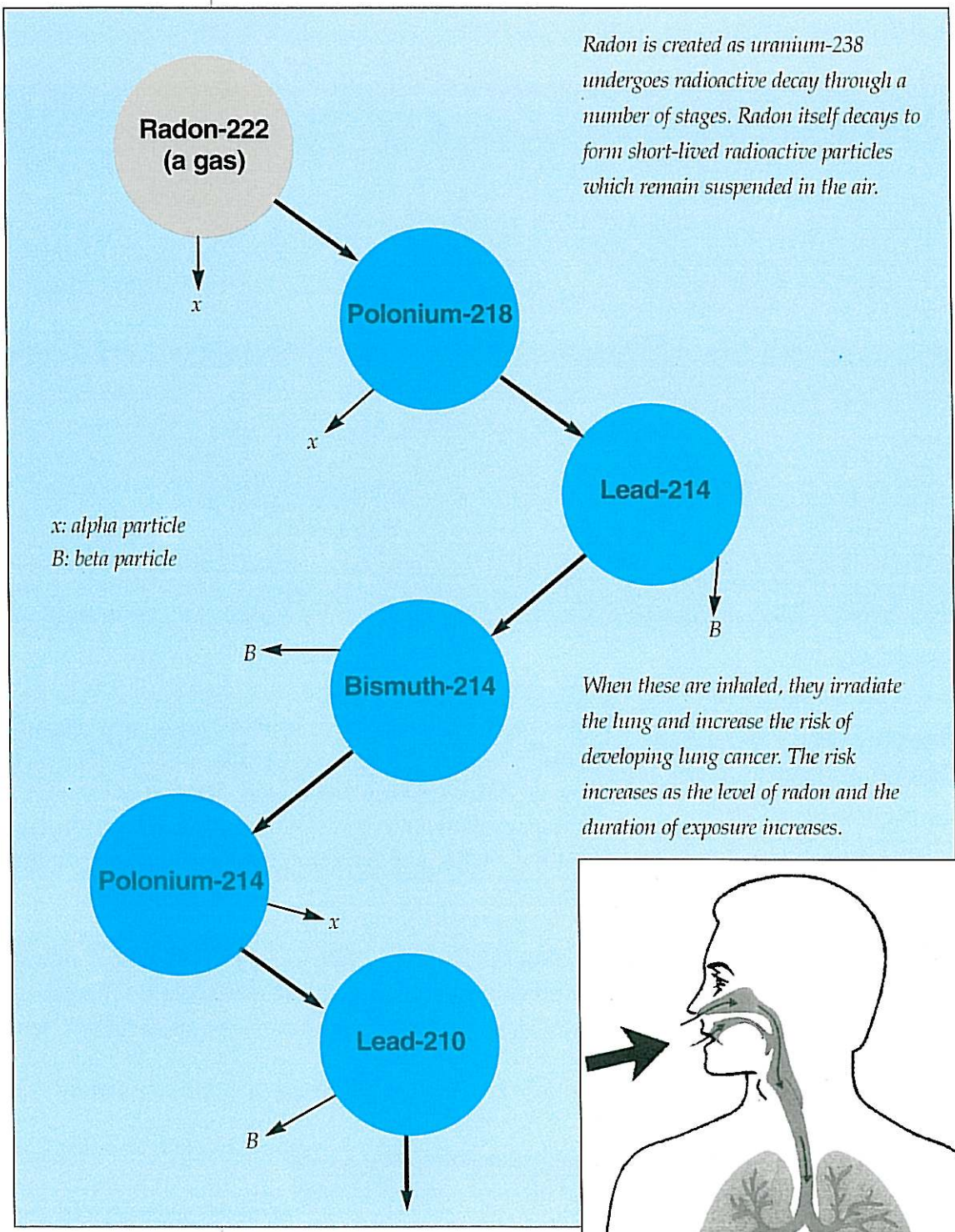

Radon-222
(a gas)
x
Polonium-218
x
Lead-214
B
B
Bismuth-214
Polonium-214
x
Lead-210
B
x: alpha particle
B: beta particle
Radon is created as uranium-238 undergoes radioactive decay through a number of stages. Radon itself decays to form short-lived radioactive particles which remain suspended in the air.
When these are inhaled, they irradiate the lung and increase the risk of developing lung cancer. The risk increases as the level of radon and the duration of exposure increases.

figure 4

activities and to date a total of 35 mining and minerals processing facilities and six scrap metal recyclers have been licensed.

Contaminated scrap material before it was removed from the Katdoringbosch Farm near Potchefstroom.

In parallel with the licensing developments, the Chamber of Mines, on behalf of its members operating licensed facilities, developed industry guidelines for control of radiation hazards. These guidelines incorporated many of the most recent recommendations of the International Commission on Radiological Protection (ICRP) and were reviewed and generally endorsed by the CNS.

The contents of the guidelines were presented for comment to the trade unions representing the workforce in the mining and minerals processing industry and the scrap metal recyclers.

Rehabilitation of contaminated off-mine sites

Investigations continued into the rehabilitation of the contaminated off-mine sites which were identified during 1993 following investigations into the recycling of contaminated scrap metals. The Executive coordinating Group (ECG), which was formed with representation from the mining industry and the CNS, initiated investigations and preliminary remedial work associated with contaminated off-mine sites.

A rehabilitation study, funded by the mining industry, was also sanctioned by the ECG to obtain estimates of the cost of rehabilitation of the 47 off-mine sites found to be contaminated. The first site to be rehabilitated and selected on a priority basis was Katdoringbosch Farm near Potchefstroom.

The AEC was contracted to perform the necessary work which commenced in January 1995.

Contaminated Scrap

To ensure that no further unauthorised releases of contaminated equipment and materials occurred from mining and minerals processing facilities, procedures were established and incorporated into the pertinent licences to control such releases. Six scrap metal recyclers were licensed to provide for the restricted release of contaminated scrap metal.

Public Exposure

Several potential pathways exist which could give rise to public exposure from mining activities both during the operational phase of mining and processing and following close-out of the facilities. In order to quantify the magnitude of such exposure

Contaminated soil being removed from the Katdoringbosch Farm.

to both present and future generations, the identification of all exposure pathways, quantification of the radioactive source terms, assessment of transport and exposure mechanisms and

calculation of subsequent radiation doses was required.

This complex process required the application of radiochemical analytical processes and computer modelling techniques.

The development of a suitable approach proceeded with investigations into practices adopted overseas, especially in Canada, being carried out to prevent any unnecessary work.

Waste Management and Mine Closure

Several waste types arise from mining and minerals processing operations and these have to be managed during the operational phase, during decommissioning and following mine closure. These may be broadly grouped into waste rock, slimes, chemical and other process residues, scrap materials and a range of consumables.

These materials may be superficially contaminated on their surfaces or the contaminant may be an integral part of the waste material matrix. Licensees are required, in terms of conditions of licence, to establish waste management programmes which identify waste arisings and characterise them with a view to subsequent treatment, packaging, storage and disposal.

A major issue that remains to be addressed is the closure of licensed mining operations.

The principles of radioactive waste management generally adopted are that contaminants should be concentrated, immobilised and then disposed of in such a way that will isolate them from the environment. In view of the bulky nature of such mining waste, the adoption of these principles gives rise to problems and the materials have to be managed in situ.

An appropriate waste management regime for bulk waste arisings has yet to be established within the context of a national policy on the management of radioactive waste.

Proposals to develop former mining land have given rise to the need to establish appropriate legal, technical and procedural mechanisms. Many sites exist on which radioactively contaminated mining residues have been placed and, in several

instances, the residues have been reprocessed and disposed of elsewhere.

The land is often located such that it is desirable for property development, however, the concern exists that there may be residual radioactive contamination on the sites.

A draft guideline was developed by the CNS on the technical aspects of assessing residual contamination and broader guidelines are under preparation for clearance of the land. These guidelines will be presented to all interested and affected parties for comment and review.

ATOMIC ENERGY CORPORATION

Licensing

The facilities operated by the AEC at the Pelindaba site were licensed in terms of the Nuclear Energy Act in 1990.

The majority of the facilities had been in operation for a number of years dating back to the 1960s. While these facilities had been subject to a process of safety review internal to the Corporation, this was not carried out with the formality and rigour of an independent regulatory process.

In most instances, the CNS identified the need for further formalised control documentation and also required formal quality management programmes to be established to provide the necessary assurance of compliance with its safety criteria. The nuclear licence granted to the AEC was regularly updated as the above safety submissions were approved by the CNS.

Public Exposure

Work proceeded on the establishment of AADQ values for the AEC facilities which were required to monitor releases to the environment and report these to the CNS.

During 1994, releases to the environment via the atmospheric transport pathway equated to the radionuclide-specific release data detailed in Table 3 on page 24.

Radionuclide-specific releases from AEC facilities during 1994	
Radionuclide	**Activity released during 1994 (Bq)**
^{238}U	5.2 E+09
^{234}Th	5.2 E+09
^{234m}Pa	5.2 E+09
^{235}U	2.4 E+08
^{231}Th	2.4 E+08
^{234}U	2.9 E+09

table 3

These releases were modelled using site-specific meteorological data and population distribution. The peak individual dose to a member of the public was computed to be 10 µSv per year, which is well below the CNS limit of 250 µSv per year for the highest exposed member of the public.

Environmental Surveillance

Environmental monitoring conducted by the AEC on and around the Pelindaba site indicated small increases in uranium concentrations in air in the immediate vicinity of the enrichment plant.

However, in all areas around Pelindaba to which the public had access, no increase in the levels of natural uranium could be detected. Similarly, no evidence of artificial radioactivity owing to operations at Pelindaba could be found in environmental samples.

Occupational Exposure

The annual collective dose among occupationally exposed workers was 0,84 manSv with no individual receiving a dose in excess of the CNS limit of 50 mSv.

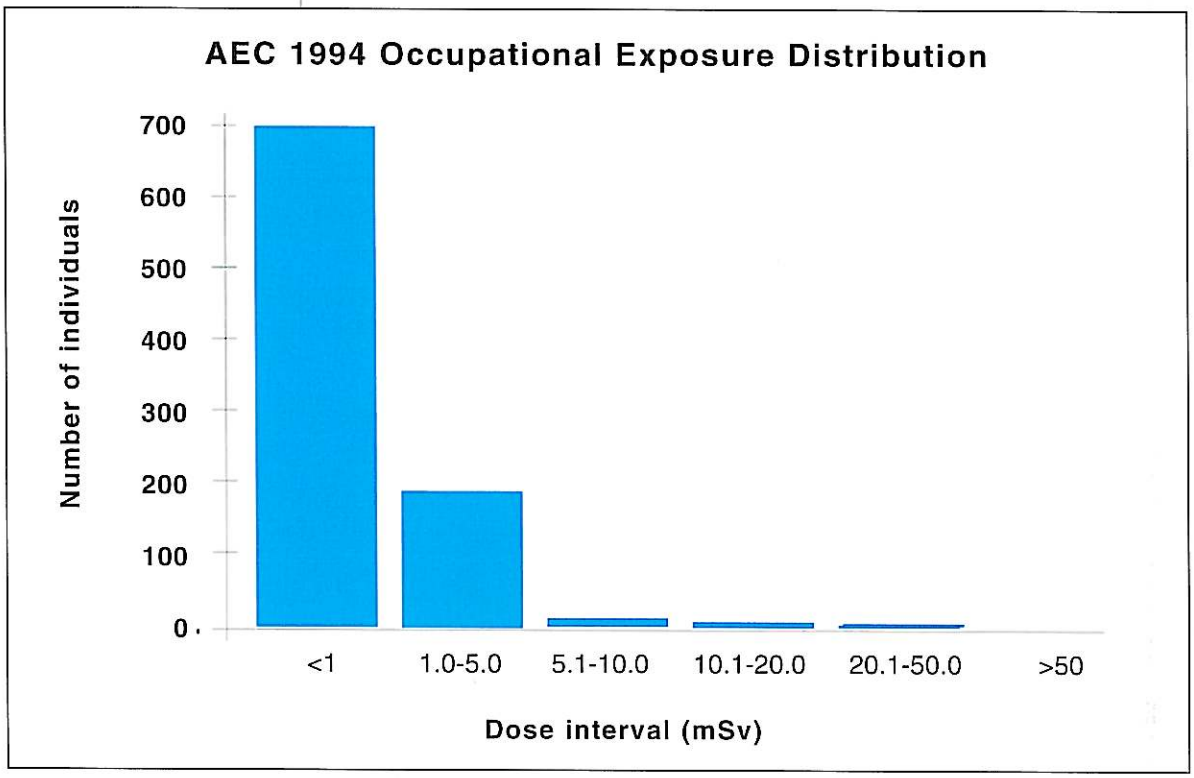
The total occupationally exposed workforce numbered 904 resulting in an average annual dose to this workforce of 0,93 mSv, which was well below the CNS ALARA guideline of 10 mSv. The dose distribution to the workforce is shown in Figure 5 below.

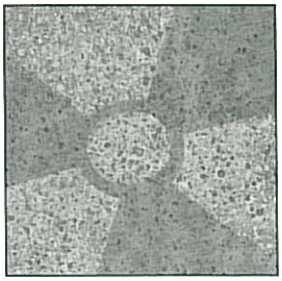
Vaalputs

In terms of the current licence, Vaalputs may only accept low and intermediate level operational waste from the Koeberg Nuclear Power Station. A licence change request was submitted by the AEC to obtain approval for the disposal of long lived radioactive waste from uranium mining processing.

This proposal was at variance with current international practice and the CNS decided it could not approve such an option in the absence of an overall national policy for radioactive waste management. The CNS, in consultation with the AEC which also has responsibilities involving radioactive waste in terms of the Act, initiated moves towards the establishment of such a policy, although, recognising the need for extensive and broad consultation in this regard, the process may take some time.

figure 5





international relations/affairs

Convention on Nuclear Safety

The Convention's objectives are applicable to civil nuclear power plants only and were formulated to achieve and maintain a high level of nuclear safety worldwide through national measures and international cooperation.

The Convention was signed, on behalf of South Africa, at the IAEA in Vienna, by Minister Alfred Nzo on 20 September 1994. The CNS proceeded to draft the necessary motivating documentation in order for South Africa to ratify the Convention.

Bilateral Agreements

An arrangement was signed on 27 September 1994 between the United States Nuclear Regulatory Commission (USNRC) and the CNS for the exchange of technical information and cooperation in nuclear safety matters.

Negotiations also took place with the French Nuclear Regulatory Authority (DSIN) with a view to concluding a similar arrangement.

International Atomic Energy Agency

The CNS has maintained an active involvement with the affairs of the IAEA and closely followed developments of interest in the nuclear safety regulatory arena.

IAEA Nuclear Information Seminar

During January 1995 the IAEA arranged a Nuclear Information Seminar in Midrand, Gauteng. The CNS played an active role in the seminar through assisting organisationally and presenting papers. Representatives from a number of African countries attended the meeting which featured both local and overseas speakers.

The purpose of the seminar was to provide public leaders and interest groups with an awareness of nuclear technology,

nuclear/radiation safety, radioactive waste management and regulatory control. The seminar provided an excellent forum for debate on aspects of the work of the CNS and made the licensing process more transparent.

Basic Safety Standards

In its role as the national competent authority in terms of the IAEA regulations for the safe transport of radioactive material, the CNS continued its involvement in the process of revising the regulations. These are undergoing a 10 year review by experts, who will take into consideration the new IAEA Basic Safety Standards.

One of the areas where there was uncertainty, and which could be of concern to the minerals industry, was the level of radioactivity where the regulations will be applicable.

The exemption levels contained in the Basic Safety Standards, if adopted in the transport regulations, could have possible adverse economic implications for local minerals exporters.

SKI - Common Cause Data Exchange - PRA

The CNS established contact with the Swedish national regulatory authority, SKI, and this has since resulted in its involvement in a data exchange programme related to the probabilistic safety assessment technique involving data on common cause failure.

CEC COSYMA

The CNS continued its work with a group from the Commission of European Community (CEC) on developing the COSYMA computer code which deals with the impact assessment of major reactor accidents.

International Conference

The CNS was prominently involved with the International Conference on Radiation Protection and Waste Management in the Mining and Minerals Processing Industries held in Johannesburg in February 1995.

This meeting was co-organised by the SA Radiation Protection Society, the S A Institute of Mining and Metallurgy and the Mine Ventilation Society of SA, and was endorsed by the International Radiation Protection Association (IRPA).

The meeting was attended by delegates from several of the major uranium producing and processing countries, the Chairman and two members of the International Commission on Radiological Protection (ICRP) and the President and Executive Officer of IRPA.

The conference provided a valuable exchange of information and was also recognised as making a significant contribution to the development of radiation protection within smaller African mining and minerals industries.

staff participation in meetings and conferences

Mr Bert Winkler attended a meeting of ICRP Committee 4 in Sweden during April 1994.

He also gave a presentation on the hazards of plutonium at a workshop held by the Royal Society of South Africa in Cape Town.

Mr Jeff Leaver attended the Diplomatic Conference organised by the IAEA on the Convention on Nuclear Safety, held in Vienna in June 1994.

Mr Leaver and **Mr Phil Metcalf,** accompanied by senior representatives of Gengold, visited the USA during September 1994 at the invitation of the Uranium Mine Tailing Remedial Action (UMTRA) project which was undertaking major rehabilitation work, utilising US Department of Energy (DOE) funding, at a number of former uranium mining activities.

Mr Metcalf attended the 10th Meeting of the IAEA Standing Advisory Group on the Safe Transport of Radioactive Materials

(SAGSTRAM) in Vienna during April 1994. He also attended the third technical committee organised by the IAEA on the impact of the 1990 Recommendations of the ICRP and the Revised Basic Safety Standards on the IAEA Regulations for the Safe Transport of Radioactive Material, during the week beginning 27 June 1994.

Mr Metcalf also provided consultancy services to the IAEA in August, reviewing a draft standard on the management of radioactive waste from the mining and milling of radioactive ores; the standard forms part of the RADWASS series of documents. In addition, he also attended the Board of Governors meeting and the General Conference of the IAEA during September 1994.

He also presented a series of lectures at an IAEA post-graduate course on radiation protection held at Argonne National Laboratories, USA, during October 1994.

In addition, Mr Metcalf undertook a two week mission on behalf of the IAEA to advise the government of Cyprus on the establishment of legislation and a regulatory infrastructure for control of radiation hazards.

Mr Alan Hall provided consultancy services to the IAEA in Vienna in March 1995 on the upgrading of the Safety Culture Services and Documentation of the Agency.

He also participated in a mission in March 1994 to the Cernavoda Nuclear Power Plant in Romania with respect to Safety Culture and Nuclear Safety Management.

Dr Danielle Schuykens attended the annual user group meeting of COSYMA (Probabilistic Accident Consequence Code Package) in Holland in April 1994.

She also attended an IAEA Technical Committee Meeting on "Peer reviews of level three probabilistic Safety Assessments" in Vienna during November 1994.

Dr Anatol Mysenkov participated in a Technical meeting on "Operation at Reduced Temperature" with Framatome in France during May 1994.

He also attended the fifth CAMP meeting on Relap-5, held in Idaho Falls, USA, where he presented work performed in South Africa by the CNS, AEC and Eskom.

Mr Slavek Rokita attended an International Conference on "Thermal Reactor Safety Assessment" in the United Kingdom during May 1994.

Dr Tim Hill attended an International Conference, held in Baltimore, USA, on the Relap-5 system transient analysis code, during August 1994. He also attended an IAEA Technical Committee Meeting on "Use of PSA in the Regulatory Process" in Vienna during December 1994.

Mr Stanley Langenhoven attended the Examiner Techniques Course at the NRC Training Centre in Chattanooga in Tennessee, USA, during August 1994.

Mr Neil Henderson attended an IAEA Technical Course on "Operational Safety Assessment Techniques" held in Madrid, Spain, during October 1994.

Mr Gert van Heerden attended the Fifth Symposium on "Current Issues related to Nuclear Power Plant Structures and Equipment" in Florida, USA, during December 1994.

Mr Nick Basson attended a training course organised by the University of Pretoria during August 1994 on "Making better decisions in Maintenance, Replacement and Reliability".

FINANCIAL STATEMENTS

report of the auditor-general

on the annual financial statements of the Council for Nuclear Safety for the financial year ended 31 March 1995

1. Audit assignment

The accounts and annual financial statements of the Council set out on pages 35 to 36, the Notes thereto and the Council's report have been audited in terms of section 193(2) of the Constitution of the Republic of South Africa, 1993 (Act No. 200 of 1993), read with section 3 of the Auditor-General Act, 1995 (Act No. 12 of 1995) and section 49(4) of the Nuclear Energy Act, 1993 (Act No. 131 of 1993). These annual financial statements and the maintenance of effective control measures are the responsibility of the Council's Executive Officer.

My responsibility is to report on these annual financial statements and the matters set out in the Auditor-General Act, 1995 (Act No. 12 of 1995).

2. Regularity audit

(1) Financial

(a) Nature and scope: The audit was carried out in accordance with generally accepted government auditing standards. These standards require the audit to be planned and performed in such a way so as to obtain reasonable assurance that, in all material respects, fair presentation is achieved in the annual financial statements. An audit includes an evaluation of the appropriateness of the accounting policies, an examination, on a test basis, of evidence supporting the amounts and disclosures included in the annual financial statements, an assessment of the reasonableness of significant provisions and a consideration of the appropriateness of the overall presentation of the annual financial statements.

I consider that the audit procedures were appropriate in the circumstances to express the opinion presented below.

(b) Audit opinion: Except for the effect of any adjustments that may have been necessary if the result of the uncertainty referred to in paragraph 3(1) had been known, in my opinion these annual financial statements fairly present the financial position of the Council at 31 March 1995 and the results of its operations and cash flow information for the year then ended in accordance with generally accepted accounting practice.

(2) Compliance: Compliance with the appropriate legislation was audited on a test basis.

3. Audit observations

(1) Depreciation charge for the year: As stated in Note 1.3 to the financial statements the expected lifespan of certain assets was changed and calculations for depreciation based on the changed lifespan of these assets were backdated to the date of purchase.

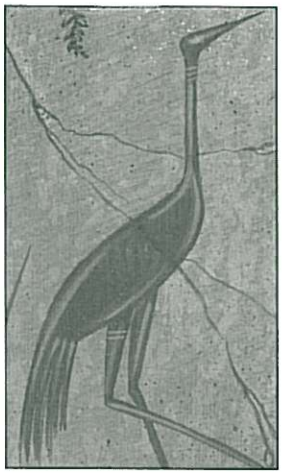
In this process the electronic data for the previous year's accumulated depreciation was overwritten, which made it impossible to verify the accuracy of the actual depreciation charge for the year. It has not been possible to quantify the extent of this error.

(2) Reporting by Public Entities Act, 1992 (Act No. 93 of 1992): Information regarding the extent to which the Council achieved its objectives for the financial year concerned, as well as appropriate performance information on the economic, efficient and effective utilisation of resources as required by sections 7(3)(b) and (c) of the Reporting by Public Entities Act, 1992 (Act No. 93 of 1992), is not included in the Council's report.

4. Appreciation

I would like to express my appreciation of the courtesy extended and assistance rendered by the staff of the Council during the audit.

H P van der Westhuizen
for Auditor-General
Pretoria 28/09/1995



council's report

for the year ended 31 March 1995

1. Nature of business

The objectives of the CNS are to safeguard persons against nuclear damage by regulating and exercising control, through the nuclear licensing process, over the construction and use of nuclear installations and the carrying out of any other activities which involve radioactive material, and which are capable of causing nuclear damage with the exception of Group IV Hazardous Substances regulated under the Hazardous Substances Act.

The functions, duties, responsibilities and objectives of the CNS are respectively carried out and achieved through the following approach and methods:

- The development of appropriate regulatory criteria in relation to its objectives.
- The prospective assessment of radiation hazards arising from activities or installations.
- The granting of nuclear licences with appropriate conditions.
- Communicating directly with licensees to assure compliance with, and understanding of, licensing requirements.
- The conducting of inspections and investigations regarding licensees' activities.
- The assessment of operating experience of licensees with a view to improving safety performance.
- Liaising with other interested parties, for example Government Departments, NGOs, Trade Unions, Media.
- Liaising internationally with other regulatory bodies and international organisations such as the International Atomic Energy Agency.
- Managing internally to achieve cost-effective performance, consistent with developing a highly competent, professional and well-motivated staff.

The operating base of the CNS is situated at its Verwoerdburg offices, from which it coordinates all of its licensing activites, including inspections. It also has a regional office near Koeberg Nuclear Power Station, from which it performs a monitoring operation on safety aspects of the power station's operation as well as the periodic examination and requalification of nuclear reactor operators.

During the year, the CNS successfully exercised its regulatory control as envisaged. Existing licensees of nuclear installations operated these in accordance with CNS requirements, and nuclear regulatory activities in the mining industry were further extended to assure the health and safety of workers and the public.

2. The state of affairs of the CNS and its operating results for the year

The financial statements set out the operating results for the CNS for the year. The approved budget for the year amounted to R19,297m of which the State's contribution was R5,480m. Operating expenditure was close to that budgeted and the year ended with an operating deficit of R98 723. The budgeted income and expenditure for the 1995/96 financial year is R23,949m and the contribution to income by the State is R5,4m.

3. Council members

The names of members holding office at the date of this report appear on page 7. Changes to the Council which have taken place since 31 March 1994 are the resignation of Dr Louw Dreyer on 1 May 1994 and Mr Bert Winkler, Executive Officer of the CNS, joining the Council as an *ex officio* member in terms of the Nuclear Energy Act, 1993 (Act No. 131 of 1993).

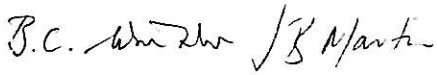
4. Audit Committee of the Council

The following members served on the Audit Committee:

- Dr D Reitmann (Chairperson): Former Director, National Accelerator Centre: Foundation for Research Development.
- Mr M du Toit: Deputy Director General, Department of Land Affairs.
- Mr O P Sadler, CA (external member): Partner, KPMG Aiken and Peat.
- Mr E L Langford (Secretary): Manager, Central Services Department, CNS.

The Committee would normally meet at least twice during a financial year, but because of the rescheduling of the external audit to later in the calendar year, only one meeting was held in the financial year. The purpose of the meeting was to review the financial statements for the 1993/94 financial year and to review the report of the external auditors for that year.

The annual financial statements, which appear on pages 35 to 40, were approved by the Council on 10 July 1995 and signed on its behalf by:



Mr Bert Winkler
Executive Officer

Prof John Martin
Chairperson

BALANCE SHEET AS AT 31 MARCH 1995

	Notes	1994/95 R	1993/94 R
Capital employed			
Income funds		**6 134 751**	10 833 474
Long-term liabilities	2	**90 209**	0
		6 224 960	10 833 474
Employment of capital			
Fixed assets	3	**1 637 789**	1 109 608
Net current assets		**4 587 171**	9 723 866
Current assets		**6 877 404**	11 261 766
Debtors	4	**2 979 362**	4 670 575
Deposits and immediately claimable amounts		**2 000**	2 000
Bank balance and cash		**3 896 042**	6 589 191
Less:			
Current liabilities		**2 290 233**	1 537 900
Creditors and provisions	5	**2 265 631**	1 537 900
Short-term loan	2	**24 602**	0
		6 224 960	10 833 474

Verwoerdburg, 10/07/95

B C Winkler
Executive Officer

J B Martin
Chairperson

INCOME STATEMENT FOR THE YEAR ENDED 31 MARCH 1995

	Notes	1994/95	1993/94
		R	R
Income funds - beginning of the year		**10 833 474**	9 879 296*
Operating surplus (deficit) before abnormal item	6	**(98 723)**	954 178
Abnormal item	6	**(4 600 000)**	0
Income funds - end of the year		**6 134 751**	10 833 474

* Reconstituted figure

CASH FLOW STATEMENT FOR THE YEAR ENDED 31 MARCH 1995

	Notes	1994/95	1993/94
		R	R
Cash (retained from) employed in operating activities		**(3 211 998)**	(803 874)
Cash (surplus)/deficit generated from operations	A	**21 616**	(1 009 422)
Income from interest		**(790 068)**	(714 323)
Employed to increase/(decrease) operating capital	B	**(2 443 546)**	919 871
Cash utilised in investment activities		**1 395 356**	278 219
Investment to maintain operations			
Additions to fixed assets	C	**1 395 356**	278 219
		(1 816 642)	(525 655)
Cash effects of financing activities			
Increase/(decrease) in cash on hand		**(2 693 149)**	525 655
Long-term liabilities		**(90 209)**	0
Payment to CNS Retirement Fund		**4 600 000**	0
Net movement of cash		**1 816 642**	525 655

NOTES TO THE CASH FLOW STATEMENT

		1994/95	1993/94
		R	R
A	**Cash surplus/(deficit) generated from operations**		
	Surplus/(deficit) for the year	**(98 723)**	954 178
	Adjustment for:		
	Depreciation	**867 175**	769 567
	Income interest	**(790 068)**	(714 323)
		(21 616)	1 009 422
B	**Employed to increase operating capital**		
	Increase/(decrease) in debtors	**(1 691 213)**	1 854 287
	(Increase)/decrease in creditors	**(727 731)**	(934 416)
	(Increase)/decrease in short-term loan	**(24 602)**	0
		(2 443 546)	919 871
C	**Additions to fixed assets**		
	Computer equipment	**1 202 648**	131 643
	Scientific and technical equipment	**(53 432)** *	71 600
	Furmiture	**23 834**	25 990
	Office equipment	**222 306**	48 986
		1 395 356	278 219

* As a result of the reclassification of assets

		1994/95	1993/94
		R	R

1 Accounting policy

The financial statements are compiled on the historical cost basis in accordance with the undermentioned policies which were applied consistently in every material respect except where otherwise stated.

1.1 Income acknowledgement in general

Income is recognised on the accrual basis.

1.2 State contributions received

State contributions are accounted for in the period with which the allocation is associated.

1.3 Fixed assets and depreciation

Fixed assets are shown at cost less accumulated depreciation and are written off over the expected useful life according to the fixed instalment method. Expected useful life of office furniture is ten years, computer and scientific and technical equipment is three years and office equipment is five years. In previous years all assets were written off over five years.

1.4 Expenditure for research and development

These expenditures are written off in the Income Statement in the year in which they were incurred.

1.5 Leased assets

Assets acquired under finance lease agreements are capitalised.

2 Long-term liability

Liability under a capitalised finance lease repayable over the period 1 December 1994 to 30 November 1999 at an effective interest rate of 18,5 % per annum and repayable in monthly instalments of R2 393 (excluding VAT).	**114 811**	0
Less: Payable in ensuing year included under current liabilities	**24 602**	0
	90 209	0

3 Fixed assets

	1994/95					1993/94
	Furniture R	Computer equipment R	Scientific & technical equipment R	Office equipment R	Total fixed assets R	Total fixed assets R
Cost	318 034	4 500 449	826 065	427 168	6 071 716	4 676 360
Accumulated depreciation	106 673	3 402 072	808 056	117 126	4 433 927	3 566 752
Book value	211 361	1 098 377	18 009	310 042	1 637 789	1 109 608

		1994/95 R	1993/94 R
4	**Debtors**		
	Trade debtors	**2 974 666**	4 317 166
	Less: Provision for bad debt	**100 000**	0
	Net trade debtors	**2 874 666**	4 317 166
	Other debtors	**104 696**	159 033
	Payments made in advance	**0**	194 376
		2 979 362	4 670 575
5	**Creditors**		
	Trade creditors	**1 034 318**	628 525
	Other creditors	**26 313**	19 375
	Provision for accumulated leave	**1 105 000**	820 000
	Provision for audit fees	**100 000**	70 000
		2 265 631	1 537 900

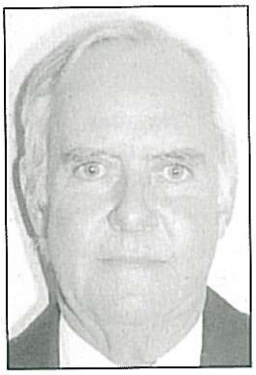
		1994/95 R	1993/94 R
6	**Operating surplus (deficit) before abnormal item**		
	Income	**19 176 599**	18 631 050
	State contribution	**5 480 000**	4 895 000
	Licensing fees	**12 528 490**	12 291 603
	Special services	**347 825 ***	681 515
	Interest	**790 068**	714 323
	Sundry	**30 216**	48 609
	Less: Expenditure	**19 275 322**	17 676 872
	Audit fees	**121 429**	88 530
	Consultancy	**73 748**	273 767
	Consumable stores	**72 001**	52 273
	Depreciation	**867 175**	769 567
	Personnel expenses	**13 971 384**	12 617 246
	Postal and telephone services	**232 808**	163 062
	Provision for accumulated leave	**285 000**	620 000
	Provision for bad debts	**100 000**	0
	Publications	**111 585**	117 238
	Rent, accommodation	**859 633**	718 161
	Research contracts	**166 988**	162 176
	Service contracts and maintenance	**501 817**	460 044
	Subsistence and transport expenses	**1 090 753**	858 663
	Sundry expenditure	**821 001**	776 145
	Operating surplus (deficit) before abnormal item	**(98 723)**	954 178
	Abnormal item: CNS Retirement Fund (note 7 refers)	**4 600 000**	0

* Radiological protection services rendered to organisations which are not licensees of the CNS

7 CNS Retirement Fund

All employees are members of the CNS Retirement Fund, a defined benefit fund which is governed by the Pensions Funds Act of 1956. The Fund was established on 1 December 1994 following withdrawal by the CNS from the Associated Institutions Pension Fund. The total actuarial shortfall of R4 600 000 as valued on 1 December 1994 was made good from surplus income funds and the fund has been certified as sound. The employer contribution rate is 20,61% of the employees' pensionable salaries, and the employees' rate has changed from 6% for female and 8% for male employees to 7,5% of pensionable salary for all employees.

CNS Council



Prof John Martin
Chairman

Mr Meyer du Toit

Mr Sydney Gerber

Prof Ron Harley

Dr Reynecke le Roux

Dr Daan Reitmann

Prof Anna Steyn

Dr Flip van Heerden

Mr Bert Winkler