

**REPUBLIC OF NAMIBIA**



Ministry of Health and Social Services

**National Radiation Protection Policy**

**NATIONAL RADIATION PROTECTION SERVICES**

**SECRETARIAT  
ATOMIC ENERGY BOARD OF NAMIBIA**

1994



REPUBLIC OF NAMIBIA

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NAMIBIA

SUBJECT: NATIONAL RADIATION PROTECTION POLICY

SPONSORING MINISTRY: Health and Social Services

DECISION NO: 29th/20.9.94/002

- BACKGROUND:
1. Cabinet at its 10th (94) meeting approved the establishment of the National Radiation Protection Policy Drafting Committee for the drafting of a national radiation protection policy for the Republic of Namibia.
  2. In pursuance of the above Cabinet decision, the Ministry of Health and Social Services, with the co-operation of the said Committee compiled a document titled: "*Draft National Radiation Protection Policy.*" The Hon. Minister of Health and Social Services now sought the approval of Cabinet for the abovementioned policy.
  3. This document provides the guidelines and strategy for establishing an Atomic Energy Board for Namibia as a national advisory board responsible for all atomic energy related activities, and for the National Radiation Protection Services, under the Ministry of Health and Social Services as the regulatory authority, compatible with the present and the future scope and extent of applications of radiation and radioisotope technologies in our country.

4. The proposal was made and there was consensus that the Ministry of Foreign Affairs should also be represented on the Atomic Energy Board.

**Resolved:**

1. That Cabinet approves the National Radiation Protection Policy.
2. That Cabinet approves the creation of two additional posts, i.e. 1 x post of Radiographer/Senior and 1 x post Technician/Senior and the adjustment of the existing post of Radiation Physicist/Radiation Protection Officer, to the level of Chief Control Radiation Protection Officer.
3. That Cabinet approves that the amount of NS 254,000.00 be allocated to the Ministry of Health and Social Services as a recurrent budget.
4. That national bodies, i.e. the Atomic Energy Board and the National Radiation Protection Services, be established to administer this policy on radiation protection and related matters and whose composition, functions, duties and responsibilities shall be specified in the legislation (or regulation).

**Further resolved:**

5. That the Ministry of Foreign Affairs also be represented on the Atomic Energy Board of Namibia.
6. That the GRN should strive to set up a competent national body with the necessary expertise in the future to deal with radiation matters in Namibia.

IMPLEMENTING MINISTRY: Health and Social Services

AFFECTED: Foreign Affairs  
Mines and Energy  
Works, Transport and Communication  
Agriculture, Water and Rural Development  
Fisheries and Marine Resources  
Attorney-General  
National Planning Commission



E.S. AMKONGO  
ACTING SECRETARY TO CABINET

secret

**NATIONAL RADIATION PROTECTION POLICY DRAFTING COMMITTEE  
(NRPPDC)**

Duly established under the Ministry of Health and Social Services in accordance with the Cabinet Decision No.10/12.04.94/006.

**DRAFT NATIONAL RADIATION PROTECTION POLICY**

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## FOREWORD

Radiation Protection is concerned with the protection of individuals, their progeny and mankind as a whole against the possibly detrimental biological effects of radiation.

Radiation doses greatly exceeding those normally received from natural background radiation are known to cause harm, and in particular, to increase the risk of cancer. It is not known, however, if harmful effects are induced at low doses and low dose rates that are comparable to, or slightly in excess of those of, background radiation. Because of this it is cautiously assumed that any exposure to radiation may entail some risk and that the risk is proportional to the dose received, down to the lowest dose.

Most decisions about human activities are based on an implicit form of balancing of costs and benefits leading to the conclusion that the conduct of a chosen practice is 'worthwhile'. Less generally, it is also recognised that the conduct of the chosen practice should be adjusted to maximise the benefit to the individual or to society.

The Ministry of Health and Social Services appreciates that, in Namibia, it is within the jurisdiction of the Government of the Republic of Namibia to implement legislation directed towards the effective control of exposure of individuals to ionising radiations arising from radiation sources. The Ministry believes that it will be of assistance to the Government if specific legislation on radiation protection and implementing bodies for the policy can be established to prescribe duties and functions of these bodies.

It is of the opinion that this policy will be of value in considering establishment of national bodies and legislation on radiation protection.

The policy set out here is based on the ICRP and IAEA standards. The policy adopted by the ICRP and IAEA in preparing recommendations is to consider the fundamental/basic principles upon which appropriate radiation protection measures can be based, while leaving to the various national protection bodies the responsibility of formulating the specific advice, codes of practice or regulations that are best suited to the needs of their individual countries.

This policy was initially prepared by the Ministry of Health and Social Services and was reviewed by the National Radiation Protection Policy Drafting Committee, NRPPDC,

established by the Cabinet. The draft policy was approved in principle by the Cabinet in September 1994; and in November 1994 it was ratified by the National Assembly.

This policy shall be applied throughout Namibia. The policy will be reviewed and revised as new information become available. This policy shall take immediate effect.

**DR N IYAMBO**  
**HONOURABLE MINISTER, MP**



## PREFACE

### National Radiation Protection Policy

This document entitled "National Radiation Protection Policy" is an enunciation of the Government's commitment to the protection of human beings and of other living species and the environment and to the safety of radiation sources. This policy takes the form of the Act that will establish the Regulatory Bodies that will ensure that exposed persons, be it workers, patients or the public, and the environment are adequately protected. This policy will further enable Namibia to take her rightful place amongst the nations of the world and to ensure the peaceful uses of radiation and nuclear technologies for the socio-economic development and prosperity.

The Ministry of Health and Social Services, with the cooperation of the National Radiation Protection Policy Drafting Committee, duly established in accordance with the Cabinet Decision No. 10/12.04.94/006, has drafted a document titled "Draft National Radiation Protection Policy". The Cabinet approved the draft policy on its September session and the National Assembly ratified it in November 1994. The Ministry of Health and Social Services is hereby issuing the formally adopted draft policy as the National Radiation Protection Policy for Namibia.

#### The aim of this policy is:

To assess, regulate and control the radiation hazards to the occupationally exposed radiation workers, the general public and the environment. To realise this aim assessment, regulation and control of the following radiation related activities will be made: production, acquisition, possession, installation, use, application, transportation, exportation, importation, and disposal of radioactive materials and radiation sources; and decommissioning of radiation facilities.

Improved public health of the nation involves protection against ionizing radiation\*. Emphasis has been placed on disease prevention and health promotion in such selected key areas, as circulatory diseases, cancers, mental illness, malaria, TB, AIDS and accidents. Radiation can be a double-edge sword, beneficial on one hand; harmful on the other; so perfect moderation rather than total abstinence is the prescription for socio-economic development of the country and the attendant improved health services. The target here, is to keep exposure to radiation to the minimum while allowing beneficiary use of radiation to continue; taking consideration of the socio-economic factor. In order to meet this target National Radiation Protection Services was set up to regulate the use of radiation and those substances that produce it.

\* Ionizing radiation hereinafter called "Radiation" is a specific form of energy in the universe. It emanates from distant stars, from the sun, from the very earth upon which human beings live. Man has learned to convert this type of energy into a diversity of versatile techniques for application in a variety of different types of tasks in the fields of agriculture, industry, science and technology and human health, including the treatment of cancerous tumors.

### **Radiation and Radioisotope Technologies**

A number of radiation sources and radioisotopes are used in Namibia at present. The most important of these include (a) Rössing Uranium Ltd., (b) fixed and portable nuclear gauges used in the mining, manufacturing and construction sectors, (c) X-Ray machines used for diagnostic radiography, veterinary medicine, baggage and mail box inspection, (d) radioisotopes used for *in vivo* and *in vitro* nuclear medicine. With the developments in the fields of agriculture, health, hydrology, and petroleum and natural gas, the applications of radiation and radioisotope technologies are expected to register a quantum jump.

### **Radiation Hazards**

High radiation doses, received in a short-period of time, can cause serious radiation injuries, including radiation-induced death. Low radiation doses, received at small dose-rates over a long time, can cause cancer such as leukemia in the exposed person and may have a detrimental hereditary effects in the progeny. Radiation doses received during pregnancy can lead to teratogenic effects in the unborn child, including severe mental retardation. The International Commission on Radiological Protection (ICRP) gives the recommendations and standards for protection of workers, patients and members of the general public against the detrimental effects of radiation.

### **Regulatory Control of Radiation Sources and Radioisotopes**

A set of Acts, Ordinances, Regulations and notifications issued by the Republic of South Africa provide the legal framework for regulatory control of radiation sources and radioisotopes in Namibia. After our country achieved independence on 21 March 1990, these Acts, Ordinances, Regulations and notifications have *not* been repealed and are in force. Until March 1990, the South African Atomic Energy Control Board administered the regulatory programmes and activities provided for in the above Acts, Ordinances, Regulations and notifications. After our independence, these programmes and activities were stopped by the Republic of South Africa and the new Government of the Republic of Namibia did not have any infrastructure to administer these programmes and activities.

### **Infrastructure for Radiation Protection**

The prime responsibility for radiation protection in a radiation practice shall be assigned to the user of the sources or installations within the radiation practice.

National bodies shall be established to administer this policy on radiation protection and related matters and whose composition, functions, duties and responsibilities shall be specified in the legislation (or regulation);

The legislation, regulations, guidelines and code of practice on national radiation protection shall be based on internationally accepted principles and standards.

### **International Relations**

In order to foster good and harmonious international relations Namibia will -

- \* Support internationally activities done on radiation protection and related matters;
- \* seek to be part of international convention on nuclear safety and radiation protection;
- \* continue the Technical Cooperation programmes with IAEA and other international organizations.

Namibia will continue strengthening and supporting the training and education programmes on radiation protection at the national level;

### **Other National Obligations for Radiation Protection**

Namibia will promote research directed at expanding the scientific knowledge and justified use of radiation sources for medical, industrial, agriculture and other peaceful uses:

Enhance and widen communications and understanding with other governments and the public on radiation awareness be it beneficial or harmful, and to restrict and or reduce the risk associated with radiation.

All the necessary funds required for the implementation of this policy shall be borne by the Ministry of Health and Social Services, Government of the Republic of Namibia. Other funds will be collected by the regulatory authority through such services as inspection and licensing as well as from dosimetry services.

### **Conclusion**

In short this document provides the policy guidelines and the strategy for establishing an Atomic Energy Board for Namibia, as a National Advisory Body for all atomic energy related activities, and for a National Competent Authority for Radiation Protection, i.e. the National Radiation Protection Services (NRPS) under the Ministry of Health and Social Services as the Regulatory Authority, compatible with the present and the future scope and extent of applications of radiation and radioisotope technologies in the country.

### **Atomic Energy Board for Namibia**

The Atomic Energy Board for Namibia (AEBN) is a national policy and decision making body which will oversee the programmes and activities of the National Radiation Protection Services (NRPS). The chairperson of the AEBN will be appointed by the Minister of Health and Social Services and will report directly to the Permanent Secretary, MOHSS on all matters concerning AEBN and NRPS. The AEBN will consist of representatives of the Ministries of Agriculture, Water and Rural Development, Education and Culture, Fisheries and Marine Resources, Labour and Human Resources Development, Mines and Energy, Trade and Industry, Environment and Tourism, Works, Transport and Communication, National Planning Commission,

and of the Office of the Attorney General. The composition of AEBN may include representatives of Medical and Dental Association, Chamber of Mines and of the National Union of Namibian Workers.

#### **National Radiation Protection Services, NRPS**

The NRPS is the unit that is responsible for the day to day activities of radiation protection in the country. It is to be based within the Ministry of Health and Social Services. It will be responsible for registration, inspection and licensing of radiation facilities, and for personnel dosimetry services and other related radiation monitoring services.

The Ministry of Health and Social Services is grateful to the following IAEA experts Mr. S. Somasundaram and Mr. E.-A. Westerlund for their technical advice and guidelines for the formulation of this policy. This policy was prepared by a Working Group of the National Radiation Protection Policy Drafting Committee (NRPPDC) established by the Cabinet. The membership of the Working Group was; Dr N. Shivute (Chairman), Miss Josephine Nathinge (Secretary), Dr. V. Shivute of the Ministry of Agriculture, Water and Rural Development, Mr R. Tiongco and Mr S. Simasiku of the Ministry of Mines and Energy, Mr G. T. Muteka of the Ministry of Labour and Human Resources Development, Mr Albrecht of the Ministry of Works, Transport and Communication, Mr G. Theron, Ministry of Foreign Affairs, Mr B. Hochobeb and Mr B. Isaaks of Chamber of Mines and Rössing Uranium Mine, and Mr Engelhardt Unaeb on National Union Of Namibian Workers and Mine Workers's Union of Namibia.

**DR S N AMADHILA**  
**PERMANENT SECRETARY**

# NATIONAL RADIATION PROTECTION POLICY

## 1. INTRODUCTION

The objective of radiation protection is to protect human beings (workers, patients, the public) and the environment from undue risks, resulting from the harmful effects of ionising radiation, while allowing for its beneficial application in medical, industrial, scientific and other purposes.

Over the last 50 years, atomic energy has grown from a laboratory concept into a multi-billion dollar industry world-wide. The uses of atomic energy are an integral part of today's world. It is important to remember, however, that this is a regulated industry, subject to stringent control, based on the fact that risks associated with atomic energy cannot be overlooked.

Through its strict licensing procedures, regulatory authorities must ensure that risks to the industry's workers and to the general public remain as low as reasonably achievable, and that all uses of atomic energy demonstrate benefits to humans.

Regulation, therefore, is an evolutionary process. As technology evolves, and knowledge about radiation and its effects grows, the regulatory process improves. This is important because the atomic energy industry is developing quickly. Therefore regulatory authorities must ensure that safety provisions keep pace with development.

But as in any human undertaking, in industries where radiation is used absolute safety cannot be guaranteed. Because this fact of life is not well understood, atomic energy is frequently the focus of controversy, as interest groups express concern about health and safety issues, about waste management and safety standards in uranium mines and other industrial and medical applications. These concerns of society are reflected and addressed in the duties performed by regulatory authorities.

The establishment of regulatory authorities in Namibia with the capability and the commitment to investigate problems and to enforce its decisions, will provide a measure of assurance to all Namibians that application of atomic energy and associated hazards are properly controlled.

## 2. RADIATION IN NAMIBIA - CURRENT STATUS

Radiation has existed in the universe since time immemorial. Light, heat, infra-red and ultra-violet rays have bombarded the earth since the planet was formed. In this century, we have learned to harness the energy of many types of radiation, such as radio waves, microwaves and the radioactivity emitted by unstable atoms of elements such as uranium, and we have added human-made sources to those that occur in nature.

Both natural and human-made radiation sources are present in Namibia.

Natural radiation sources include:

- (i) cosmic particles from outer space (sun) that continuously bombard the earth;
- (ii) radioactive materials in the soil that can pose a hazard through uptake in the body through the food chain or as an external source;
- (iii) radioactive gases such as radon emitted from radioactive substances present in building material that pose a hazard in the indoor environment.

Because it occurs naturally on earth, both people and the environment have adapted to certain levels of ionising radiation. We are exposed every day to ionising radiation from cosmic rays, building materials, food, the earth we walk on, and the air we breathe. This naturally occurring radiation is known as background radiation and it constitutes by far our largest exposure. Its effects cannot be controlled or regulated; they are always present.

The advances in science over the past decade have resulted in the invention of new technology and production of artificial or human-made radiation sources. Such sources include x-ray and radiotherapy units, gauges, radiopharmaceuticals etc.

The source inventory of radiation and radioactive sources in Namibia are summarised as follows:

## 2.1 The Mining Industry

Rössing Uranium Limited mines uranium-bearing ores by open-cast mining and processes them in a mill to recover and concentrate uranium oxide which is exported from Namibia. The mining and milling of uranium involves potential radiation hazards to the workers and members of the public viz:

- (a) inhalation of the daughter products of radon gas;
- (b) external radiation exposure; and
- (c) inhalation or ingestion of respirable dust particles containing the daughter products of uranium.

Uranium in itself is a chemically toxic element and in the absence of protection, can damage the kidneys. Radium is deposited in the skeleton and can cause bone cancer. The daughter products of radon gas can cause lung cancer. The processing of the uranium-bearing ores in the mill results in a slurry of fine particles, known as the tailings. Since the grade of uranium ore processed by Rössing Uranium Limited is very low (0.035%), practically the entire quantity mined as ore results as tailings. The tailings are disposed of in an impoundment known as the tailings impoundment. Radon gas is emitted from the tailings impoundment.

## 2.2 Industrial Applications

It is estimated that about 200 nuclear gauges are used in Namibia. A large number of fixed nuclear gauges are used in the mining sector, particularly CDM, Rössing Uranium Limited and TCL, for belt mass meters, level gauges, density gauges and calibration purposes. These nuclear gauges contain sealed sources of radioactive cesium.

Fixed nuclear gauges containing sealed radioactive americium are used for level control in bottling plants of beverage manufacturers. The nuclear gauges offer many technical and economic advantages. Being non-contact devices, they can be operated unattended in hostile environments (e.g. corrosive, high temperatures etc). They can be easily incorporated into automation systems, thereby facilitating high throughputs, consistency of product quality and reduction of wastage.

Portable nuclear gauges containing a sealed cesium source are used in the construction sector, for example, to control the thickness and density of bitumen used for surfacing roads. Portable gauges containing other sealed sources are also used in the construction sector to optimise the amount of water used for preparing cement concrete mix. The portable nuclear gauges are used by the Ministries of Agriculture, Water and Rural Development, Work, Transport and Communications, Municipalities and a few private construction companies. External exposure is the principal radiation hazard posed by sealed sources contained in the nuclear gauges. However, if the seal is damaged, as is likely during use of portable nuclear gauges in the field, radioactive contamination may arise, which can pose an inhalation/ingestion hazard thereby giving rise to an internal radiation hazard.

X-ray machines are used (a) in the veterinary field, (b) for detection of diamond thefts from CDM Pty (Ltd), (c) for inspection of luggage and parcels at airports and post offices, (d) laboratories, research and educational facilities etc.

## 2.3 Medical Applications

X-rays are widely used in medical diagnosis and in dentistry and also as an aid during surgical intervention. It is estimated that there are about 200 x-ray machines in use in Namibia. There are approximately three radiologists and 200 radiographers and assistant radiographers in Namibia to perform general and specialised radiography procedures. One Computerised Tomography (CT) scanner has been installed in a private hospital in Windhoek. Radiology plays a vital role in early diagnosis of disease and its management. The use of x-rays in medical diagnosis has increased very rapidly in the industrialised countries and has become the largest contributor to population dose amongst all human-made sources of radiation.

In the Nuclear Medicine Sub-section of Windhoek Central Hospital, a planar gamma camera and a Single Photon Emission Computerised Tomography (SPECT) gamma camera have been installed along with computers for on-line data acquisition and processing. A variety of static and dynamic studies on the functioning of different body organs are performed using ready-to-use kits of pharmaceuticals which

are labelled with radioactive technetium. Other radiopharmaceuticals which are used in Namibia include cobalt, gallium, iodine, xenon and thallium.

Radioimmunoassay (RIA) tests are performed in the Medical Laboratory of the Windhoek Central Hospital, using ready-to-use kits and radioactive iodine to determine the levels of hormones, immunoglobulins, vitamins, drugs etc in serum.

### 3. FUTURE DEVELOPMENTS

Natural gas has been discovered in Kudu area and presently efforts are on to estimate the magnitude of this reserve and to assess the feasibility of setting up a thermal power station and also a petrochemical industry utilizing this resource. The possibility of setting up an energy-intensive industries such as aluminium smelting is also under consideration. With the discovery of Kudu gas field, efforts have been intensified on exploration for petroleum and natural gas in the offshore geological formations. The Petroleum Commission has been established. The National Petroleum Corporation of Namibia (NAMCOR) conducted a regional seismic survey of the continental shelf in 1990 to ascertain the oil and natural gas potential of the offshore geological formations. Dissemination of information obtained in this survey and a series of promotional seminars organized by the Government have evoked keen interest from oil exploration companies. Concessions have been awarded to American, Canadian, Norwegian and South African consortia. The Norwegian consortium has made considerable progress and has commenced drilling operations in November 1993.

With the development of the petroleum and petrochemicals sector, one may envisage increased use of neutron gauges during the exploration and production phase of petroleum and natural gas. Industrial radiography will be applied on a large scale during the construction of refinery, and downstream petrochemical plants for the inspection of weldings on pipes, storage and process vessels. Nuclear gauges will be used in the petroleum products processing plants, petrochemical plants and liquefied petroleum gas (LPG) bottling plants. Radioactive tracer techniques may be used to locate leakages in buried pipes and installations.

During the period 1953 - 1989, forty accidents have been reported all over the world, involving industrial radiography cameras using cobalt-60 ( $^{60}\text{Co}$ ) and iridium-192 ( $^{192}\text{Ir}$ ) sealed sources. Ninety-one persons received significant doses and there were sixteen fatalities. These accidents emphasize the importance of strict regulatory control of industrial radiography sources.

At present there is no radiotherapy centre in Namibia. Cancer patients requiring radiotherapy are sent to South Africa for the treatment at a cost of US\$ 8400 per patient per month. More than 300 patients/year require this treatment. However, due to budgetary constraints only ten patients or fewer are sent for the treatment. The Ministry of Health and Social Services is making energetic efforts to set up a modern cancer care unit in the Windhoek Central Hospital, which would include a  $^{60}\text{Co}$  teletherapy machine for radiotherapy, and all associated facilities such as simulator, treatment planning system etc.



The Department of Water Affairs is seeking the assistance of the International Atomic Energy Agency to establish basic facilities for the application of radioisotope tracer techniques in hydrology. When these facilities are established, the Department of Water Affairs will be able to undertake radioisotope tracer studies to determine the flow of water in the rivers flowing along the international borders on the northeast and also to estimate the potential of underground aquifers and to obtain the parameters needed for optimum utilization and recharge of the underground water resources.

The International Atomic Energy Agency is also interested to assist the Ministry of Agriculture, Water and Rural Development in the development of application of radioisotope techniques in agriculture, such as studies of soil moisture content, soil fertility, fertilizer uptake, optimum use of fertilizers etc.

#### 4. RADIATION PROTECTION

##### 4.1 General

"Radiation protection is concerned with the protection of individuals, their progeny, and mankind as a whole, while still allowing necessary activities from which radiation exposure might result". - *International Commission on Radiological Protection*.

Humans and all living things have always been subjected to natural radiation - from the sun and outer space, from the earth itself, from the structures we inhabit, and from the food and water we consume. There are radioactive gases in the air humans breathe, and our bodies are themselves radioactive. The levels of this natural, or background radiation vary greatly from place to place.

In addition to natural radiation, man is exposed to sources of radiation we ourselves created, including x-rays and other kinds of radiation used for medical purposes, fall-out from nuclear weapons testing, and radioactive materials released in the course of nuclear power production.

Within a decade after x-rays were first introduced in the late 1890's, it was obvious that this type of radiation could be either beneficial or harmful, depending on its use and control, and that protective measures were necessary. In succeeding years, it became apparent that this also applied to other kinds of radiation.

In the extreme case, exposure of the whole body to very high levels of ionising radiation over a short period, (e.g. 3000 - 4000 times the annual background dose at once) is fatal. At lower doses, over a long time radiation exposure results in some risk of developing cancer and leukemia, the likelihood increasing in proportion to the dose.

This property of inducing cancer, called "carcinogenicity", is one that radiation shares with a large number of chemicals and other materials, both natural and human-made. Examples include asbestos, vinyl monomer, many pesticides, and some

adopt these recommendations and standards in her national Acts and Regulations and enforce them.

#### 4.3 The Namibian Constitution and Radiation Protection and Safety

The radiation hazards to the workers and to the general public, involved in the different applications of ionising radiation and radioisotopes have to be assessed and controlled properly, without diminishing the socio-economic benefits to the country.

Chapter 11, Principles of State Policy, Article 95, Promotion of Welfare of the People, Para (1) of the Namibian Constitution states: "The State shall actively promote and maintain the welfare of the people by adopting, inter alia, policies aimed at the following:

maintenance of ecosystems, essential ecological processes and biological diversity of Namibia, and utilisation of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future, in particular, the Government shall provide measures against the dumping or recycling of foreign nuclear and toxic waste on the Namibian territory".

Furthermore, Article 96, Foreign Relations, states: "The State shall endeavour to ensure that in its international relations, it ..... (b) promotes international co-operation, peace and security, (c) creates and maintains just and mutually beneficial relations among nations, (d) fosters respect for international law and treaty obligations, and (e) encourages the settlement of international disputes by peaceful means".

#### 4.4 The Legal Framework

At independence Namibia adopted all the laws promulgated by the colonial power, which was South Africa.

The legal framework for regulatory control of all activities involving radiation sources and radioactive substances in Namibia is provided by the following Acts, Ordinances, Regulations and Notifications, promulgated by the Republic of South Africa: [ Unfortunately the following first three (i - iii) acts have been repealed without substituting them with other ones].

- (i) Nuclear Installations (Licensing and Security) Act No. 43 of 1963 (as amended in 1965, 1967, 1974 and 1976).
- (ii) Atomic Energy Act No. 90 of 1967 (as amended in 1970, 1971, 1973, 1974, 1975 and 1977).
- (iii) Notice AEB 2/80 relating to Atomic Energy Act 90 of 1967; Regulation concerning the conditions for the Acquisition,

registration and licensing, for the regulatory control of practices and interventions and for enforcing the relevant regulations.

## 5. THE NATIONAL RADIATION PROTECTION POLICY

THE GOVERNMENT OF NAMIBIA DECLARES THAT THE FOLLOWING BE ITS POLICY ON RADIATION PROTECTION:

The aim of this policy is:

1) To assess, regulate and control the radiation hazards to the occupationally exposed radiation workers, the general public and the environment. To realise this aim assessment, regulation and control of the following radiation related activities will be made:

- \* production,
- \* acquisition,
- \* possession,
- \* installation,
- \* use/application,
- \* transportation,
- \* exportation,
- \* importation, and
- \* disposal of radioactive materials and radiation sources; and
- \* decommissioning of radiation facilities.

2) The prime responsibility for radiation protection in a radiation practice shall be assigned to the user of the sources or installations within the radiation practice.

3) National bodies shall be established to administer this policy on radiation protection and related matters and whose composition, functions, duties and responsibilities shall be specified in the legislation (or regulation);

4) The legislation, regulations, guidelines and code of practice on national radiation protection shall be based on internationally accepted principles and standards;

5) In order to foster good and harmonious international relation Namibia will -

- \* Support internationally activities done on radiation protection and related matters;

- \* seek to be part of international convention on nuclear safety and radiation protection;
  - \* continue the Technical Cooperation programmes with IAEA and other international organizations.
- 6) Namibia will continue strengthening and supporting the training and education programmes on radiation protection at the national level;
  - 7) Namibia will promote research directed at expanding the scientific knowledge and justified use of radiation sources for medical, industrial, agriculture and other peaceful uses:
  - 8) Enhance and widen communications and understanding with other governments and the public on radiation awareness be it beneficial or harmful, and to restrict and or reduce the risk associated with radiation.
  - 9) All the necessary funds required for the implementation of this policy shall be borne by the Ministry of Health and Social Services, Government of the Republic of Namibia. Other funds will be collected by the regulatory authority through such services as inspection and licensing as well as from dosimetry services.

#### 5.1 The Atomic Energy Act

All operations or processes where radiation is generated or present, must be subjected to the Atomic Energy Protection Act.

This Act must establish the National Competent Authority for Radiation Protection (NCARP) and the Atomic Energy Board of Namibia (AEBN) to control and supervise the development, application and use of nuclear energy as a matter of national interest.

#### 5.2 Regulatory Authorities

National authorities that are established by governments regulate the introduction and conduct of any practice involving sources of radiation. Governments need to provide these regulatory authorities with sufficient powers and resources for effective regulation.

The authorities would encourage operators to take due account of lessons learned from experience and of new developments in radiation protection and the safety of sources, in addition to applying the basic requirements of these Standards. They would also encourage the development of a safety culture in operators which includes:

- individual and collective dedication to safety, on the part of both workers and management;
- accountability of all persons for safety including those at corporate and management levels;
- encouraging a questioning attitude and discouraging complacency;
- openness and co-operation between operators and inspectors, which include facilitating the access by inspectors to premises and to relevant information.

### 5.2.1 The National Competent Authority for Radiation Protection (NCARP)

#### 5.2.1.1 Mission of the NCARP

The mission of the NCARP is to ensure that the use of atomic energy in Namibia does not pose undue risk to health, safety, security and the environment.

#### 5.2.1.2 Objectives of the NCARP

To accomplish this mission, the NCARP has set the following objectives:

- (i) It establishes the regulatory requirement for radiation facilities - including any waste management facility - and if the NCARP approves of the proposed location and the construction and operating plans, it will issue a licence first to construct the facility, then to operate it and finally (when its operational life ends) to shut it down, with all three licences made conditional on wide-ranging measures to ensure safety, security and protection of health and the environment.
- (ii) The NCARP establishes regulations and issues licences for the possession, sale and use of materials that can be used to produce atomic energy, and for radioisotopes used in medicine and industry. It also certifies that transport of hazardous radioactive substances is conducted in Namibia in terms of the transport requirements as laid down in the relevant regulations and legislation.
- (iii) To ensure compliance with its regulations and conditions of licences (including adherence to the legal limits on radiation doses to both workers and the general public), the NCARP operates a surveillance and inspection system, with the authority to withdraw licences from violators and to prosecute.

The NCARP shall be the regulatory authority on radiation protection in Namibia - which shall be referred to as National Radiation Protection Services (NRPS), Ministry of Health and Social Services, hence the NRPS will co-ordinate with institutions, government and the public sector to ensure that relevant national requirements are met.

#### 5.2.1.3 Policy of the NCARP

The policy of the NCARP therefore makes provision for:

- (i) addressing the risk to workers, public and the environment by ionising radiation through the application of a quantitative risk assessment approach;
- (ii) meeting and fulfilling set objectives in the most cost effective manner;
- (iii) evaluating the extent to which it meets these obligations on a constant basis.

#### 5.2.1.4 Responsibilities of the Regulatory Authority

The responsibility of the regulatory body should be to set radiation safety objectives and standards, and to monitor and enforce them within the established legislative and statutory framework. No other responsibility is to jeopardize or conflict with radiation protection, the prime mission of the regulatory authority.

#### 5.2.1.5 Organizational Framework

The Regulatory Authority shall fall within the structure of the Ministry of Health and Social Services, vide Annexes 2 and 3. The duties and responsibilities are given in Annex.1.

The Regulatory Authority must have the statutory authority, competence and resources:

- to set radiation protection standards;
- to register, licence and inspect radiation sources and installations;
- to set, monitor and enforce licence conditions; and
- to ensure that corrective actions are taken whenever unsafe or potentially unsafe conditions are detected.

None of these functions should be interpreted as relieving the users of any responsibility for radiation protection.

The prime responsibility for radiation safety of a source or installation rest with the user, who is responsible for specifying its radiation safety criteria and assuring itself that the design, construction and operation of the source or installation meet the relevant radiation safety standards.

Users are generally obliged not to adopt, introduce, conduct, or discontinue a practice unless complying with the applicable radiation safety requirements. This comprises carrying out related action with sources and installations with the practice; these actions include - as applicable: mining, milling, processing, designing, manufacturing, constructing, assembling, acquiring, importing, exporting, selling, loaning, hiring, receiving, siting, locating, commissioning, possessing, using, operating, maintaining, transferring, decommissioning, transporting or disposing of the source or installation.

Technical capabilities have to be established to enable provision of certain radiation monitoring services (domestic personnel dosimetry, analysis of environmental samples for radioactivity content such as water, sediments food-stuff). The need for associated calibration services should not be overlooked. A minimum emergency response system has to be set-up.

An efficient radiation protection infrastructure has to be built-up which is tailored to the size and actual needs of Namibia. This has to be done in a balanced manner in order not to draw too heavily upon the very scarce human resources of the country. The key issue to be resolved is adequate man-power resources of the country. Establishment of a core of about 6 persons to deal with radiation safety control at the national level would be appropriate.

## 5.2.2. The Atomic Energy Board of Namibia (AEBN)

### 5.2.2.1 Mission of the AEBN

The mission of the AEBN is to develop an expertise base through relevant research, development and training programmes, and to advise on and implement national and international agreements on atomic energy. The AEBN will be referred to as the National Advisory Body for Atomic Energy (NAB).

### 5.2.2.2 Objectives of the AEBN

To accomplish this mission, the AEBN has set the following objectives:

- (i) To develop and promote technology and expertise in the field of atomic energy
- (ii) Undertake and promote research in the field of nuclear technology.
- (iii) Control the disposal of radioactive waste, and operate waste disposal facilities for such purpose.
- (iv) Accredite persons or suppliers of certain services or enable licensees to comply with the regulatory requirements.

- (v) Advise and inform the Namibian Government and the National Radiation Protection Services on matters associated with any activity or condition which is capable of causing nuclear damage.
- (vi) To take command of emergency planning and execution in the event of serious accidents involving radioactive material, processes or facilities.

#### 5.2.2.3 Policy of the AEBN therefore is to:

- (i) develop and promote nuclear technology and safety in a cost effective manner such that stated objectives are met;
- (ii) develop and promote training and accreditation to establish and maintain standards of competency for practitioners in the discipline of radiation protection and safety.

#### 5.2.2.4 Composition of AEBN

The institutions to be represented in the AEBN, that is, the National Advisory Body, are listed in Annex.3, Fig.1.

## 8. CONCLUSION

A national infrastructure, including legislation and regulations, a regulatory authority, essential radiation protection laboratories, equipment and services, and an adequate number of trained people, is needed to ensure that all aspects of radiation safety are adequately dealt with.

The purpose of the national infrastructure is to provide a platform for addressing social concerns which extend beyond the legal responsibilities of the operators authorised to conduct practices with sources of radiation. For example, national authorities can ensure that appropriate arrangements are made to detect any build-up of radioactive substances in the general environment, to dispose of radioactive wastes and to be prepared for emergencies that could result in exposure of the general public.

National infrastructure can also ensure that facilities and services that are essential for proper radiation protection and safety but are beyond the required capabilities of the persons who are authorised to conduct practices are provided. Such facilities include those for personnel dosimetry and environmental monitoring, for calibration and intercomparison of radiation measuring equipment, as well as central registries of occupational doses and of information on equipment reliability.



The components of a national infrastructure are generally provided by the government, either through governmental authorities or through organisations acting on behalf of the government. The government also ensures that the provision of such services at a national level does not detract from the primary responsibility for radiation safety of the operators and workers authorised to conduct the practices and operate the sources.

**FUNCTIONS AND RESPONSIBILITIES OF NATIONAL ADVISORY BODY,  
(NAB) AND NATIONAL RADIATION PROTECTION SERVICES, (NRPS)**

**A. NATIONAL ADVISORY BODY:**

1. To review National Radiation Protection Policy for the country and to make recommendations to the Government of the Republic of Namibia.
2. To supervise the programmes and activities of NRPS.
3. To receive and consider the annual report on the programmes and activities of NRPS and make recommendations, if any, for improvements.
4. To receive, consider the proposal for annual budget (capital and recurring expenditure) and make recommendations.
5. To receive, consider and recommend applications for issue/renewal of authorizations/licences. (The proposals will be sent by NRPS through RPO and licences/authorizations will be issued by Permanent Secretary, MOHSS).
6. To receive and consider reports on inspections carried out by inspection subunit and recommend followup action, e.g. issue of warning notices, issue of notices of suspension/revocation of authorization/licence and imposition of penalties, as provided for in Radiation Protection Regulations. (The notices will be issued by Permanent Secretary, MOHSS).
7. To consider and recommend proposals for creation of additional posts.
8. To consider and recommend proposals for education and training of NRPS personnel, including training overseas.

9. To consider and recommend proposals for purchase of capital equipment, consumable stores in accordance with the guidelines of Ministry of Finance, Tender Board.
10. To coordinate all actions in conjunction with relevant authorities (Police, Fire Brigade, District/Municipal/Local authorities, medical superintendents of hospitals/clinics) for management of any radiation emergency.
11. To liaise with the International Atomic Energy Agency in case of a major nuclear or radiological emergency.
12. To approve all documents (manuals, guides, brochures, leaflets etc and draft legislation) prior to publication as NRPS reports or in the Official Gazette of the Government of the Republic of Namibia.
13. To consider any other matter which may be referred to it by the chairperson.

**B. NATIONAL RADIATION PROTECTION SERVICES**

**I. Radiation Protection Officer (RPO):**

1. To supervise the programmes and activities of NRPS on daily basis.
2. To guide and train personnel of NRPS in regard to their respective functions.
3. To prepare and submit to NAB an annual report on the programmes and activities, highlighting any deviations from approved programmes and any deficiencies.
4. To prepare and submit to NAB proposals of inspection schedules, education and training activities etc.
5. To prepare and submit to NAB proposals for purchase of capital equipment/consumable stores, servicing/repair/calibration of

equipment/instruments, reference radioactive sources, books, journals and other technical literature required for NRPS.

6. To prepare and submit to NAB proposals for annual budget (capital and recurring expenditure), consolidating all the proposals in (4 and 5).
7. To submit to NAB drafts on legislation, licensing policy manual, licensing procedures manual, inspection manual, safety manuals, guides, brochures and other documents planned to be issued as NAB reports/publications.
8. To forward to NAB reports on abnormal findings on personnel dosimeters and followup action proposed, inspection reports along with recommendations, proposals for issue of warning notices, issue of notices of suspension/revocation of licences/authorizations and imposition of penalties, reports on training courses etc.
9. To prepare a draft of Manual on Emergency Preparedness and Planning for Management of Radiation Incidents, for approval by the NAB.
10. To recommend to chairperson, NAB regarding diagnosis and treatment of radiation casualties and liaison with institutions in Southern Africa or Europe for assistance, as provided for in IAEA Convention for Mutual Emergency Assistance.
11. To submit to NAB drafts for local, plant and offsite emergency plans from Rössing Uranium Ltd and industrial radiography licensees, licensees of portable nuclear gauges etc for approval by NAB.
12. To stimulate and coordinate Research and Development programmes in Radiation Protection.
13. To foster collaboration with academic and research institutions on matters of relevance to radiation protection.
14. To perform any other official duties which may be assigned by the NAB.

## II. Inspection and Licensing Subunit:

1. To send appropriate application form(s) to radiation users for issue/renewal of licence/authorization.
2. To scrutinize the application returned by the radiation user and forward it to the RPO, with remarks.
3. To return defective or deficient applications to the radiation users with the remarks of the RPO.
4. To perform pre-licensing inspection, as recommended by the RPO.
5. To forward to the RPO the report on pre-licensing inspection results.
6. To take followup actions on the applications after review and recommendation by NAB.
7. To assist the RPO in preparing the Licensing Policy Manual and Licensing Procedures Manual for different types of radiation sources. The Licensing Procedures Manual is for internal use of NRPS.
8. To prepare drafts of advisory material for guidance of radiation users. These include safety manuals, guides, brochures, leaflets.
9. To communicate the drafts, after approval by the RPO, to NAB for publication as NAB document.
10. To participate in management of radiation emergencies, as guided by the RPO.
11. To participate as a lecturer in training courses organised by or in cooperation with NRPS.

12. To perform any other official duties, which may be assigned by the RPO.
13. To maintain in good working order all the instruments and equipment required for inspection and for management of radiation emergencies.
14. To check the performance of these instruments and equipment at periodic intervals and to report to the RPO any deficiencies in performance of these instruments and equipment and arrange for their repair.
15. To send the instruments and equipment for calibration at scheduled intervals and to receive them after recalibration.
16. To submit proposals through the RPO to NAB for any additional instruments and equipment required for inspection and for management of radiation emergencies.
17. To take followup action for purchase of the instruments and equipment, after approval by NAB.
18. To prepare an annual schedule of statutory inspections and submit it the RPO for approval.
19. To perform the statutory inspections according to the approved schedule and submit the reports to the RPO.
20. To submit proposals through the RPO to the NAB for issue of notices of warning, suspension or revocation of licence or imposition of penalties as provided in Radiation Protection Regulations, to licensees contravening or persistently contravening the provisions of Radiation Protection Regulations.
21. To take followup actions on such proposals, as recommended by the NAB.
22. To draft Inspection Manual for the different types of radiation sources, submit them to the RPO for approval and after approval to forward the drafts to NAB for publication as NAB document.

23. To assist the RPO in preparing a draft on plan of preparedness for and management of radiation emergencies and to forward the draft to NAB for approval and publication as NAB document.
24. To participate in any activity for control of a radiation emergency, as directed by the RPO, including radiation/contamination surveys and collection of samples, as appropriate and their measurement in the NRPS laboratory.
25. To participate as lecturer in training courses organized by or in cooperation with NRPS.
26. To perform any other official duties which may be assigned by the RPO.

### III. **Personnel Dosimetry Services:**

1. To operate and maintain in good working condition the TLD reader, associated personal computer and to keep adequate supply of TLD cards, card holders of different types and other supplies.
2. To prepare and issue/despatch at stipulated intervals adequate number of TLD cards in card holders to all registered radiation workers.
3. To receive all TLD cards in card holders from the registered radiation workers and measure the radiation doses with the help of the TLD reader.
4. To anneal the used/measured TLD cards and store them in a low-background enclosure, prior to re-issue/despatch to the registered radiation workers.
5. To maintain reference TLD cards for each batch and read them along with that batch, for quality control purposes.
6. To participate in inter-laboratory comparison experiments for TLD measurements, arranged by the NRPS.
7. To report any abnormal measurements to RPO.

8. To measure immediately doses of TLD cards of personnel involved in any radiation accident.
9. To participate in any special investigations or research projects involving use of TLDs, and to measure the doses.
10. To hold practical demonstrations on TLD to trainees of training courses organized by or with the cooperation of NRPS.
11. To serve as a lecturer in any training courses organized by or with the cooperation of NRPS.
12. To make suitable arrangements for measurement of external/internal contamination cases referred to NRPS.
13. To perform any other official duties which may be assigned by RPO.

### C. RECRUITMENT AND STAFFING

It is noted that the Government of the Republic of Namibia has imposed a ban on creation of new posts with a view to reduce the size, and to bring about greater rationalization, of the public service. Very strong justifications may be required for the creation of posts, selection and recruitment of persons to staff the four sub-units of the NRPS. It is essential that the Ministry of Health and Social Services obtain sanctions for creation of posts, advertisement of vacancies, selection and recruitment of persons to staff the four sub-units, according to the following order of priority (Table 1.):

**TABLE 1 STAFFING PLAN FOR NRPS**

<b>Sub-unit</b>	<b>No. of persons</b>	<b>Date by which the person should be available in NRPS</b>
1. Inspection and Licensing Sub-unit	1	Third quarter of 1994
2. Personnel dosimetry services	1	Third quarter of 1994



Until a person is recruited and posted to the NRPS, the RPO herself shall carry out the functions and responsibilities of each of the sub-units. When a person becomes available for a sub-unit, she shall train the person in the day-to-day functions of that sub-unit and then delegate the functions to that person when he/she has acquired the requisite competence to be able to perform the work independently without close supervision by the RPO.

Personnel required for NRPS should have the requisite qualifications and experience and good perception of, and attitudes to, the risks of ionizing radiation. The head of this unit needs to be a competent Radiation Protection Specialist, RPO with a wide knowledge in radiation protection and associated areas and also with good knowledge of administration. The post of the head of the unit should be adjusted to the level of Chief Control Radiation Protection Officer. The rest of the staff must be thoroughly trained and have wide experience in relevant areas.

#### **D. EDUCATION AND EXPERIENCE OF PERSONS REQUIRED FOR NRPS**

##### **1. INSPECTION AND LICENSING**

**Education:** The person should be a matriculant or equivalent. Possession of National Diploma in Radiography/Diagnostic or its equivalent is desirable but not essential. Knowledge of Basic Nuclear Physics (ionizing radiations, radioactivity and their measurement techniques) would be advantageous. Good communication (oral and writing) skill in English are required.

**Experience:** Practical experience in diagnostic radiography procedures for a period of at least three years is essential. Experience in the use of test kits to check the performance of X-ray machines and in handling of portable radiation survey instruments would be advantageous.

##### **Job Description:**

- 1.) A person required for inspection and licensing services is expected to prepare inspection and licensing manual which describes the inspection procedure for

each type of radiation source, e.g. general diagnostic radiography machine, dental radiography machine, mammography machine, mass miniature radiography machine, fixed gamma-ray nuclear gauge, neutron gauge etc. and also for inspection of an installation where radioisotopes are handled in unsealed form. The officer will also be required to prepare a checklist of all items to be covered in the inspection for each type of radiation source and a standard format of the inspection report, appropriate for each type of radiation source.

- 2.) The Sub-unit should also prepare a licensing policy manual, which defines:
  - (i) The radiation sources which are excluded from the purview of radiation protection
  - (ii) The radiation sources which are exempted from the purview of regulatory control
  - (iii) The radiation sources which require authorization and
  - (iv) The radiation sources which are subject to Licensing and Inspection.
  
- 3.) The sub-unit should also prepare a licensing procedures manual which specifies for each type of radiation source, subject to licensing and inspection, the following:
  - (a) The requirements and standards to be achieved in the different phases, starting from planning, siting, layout and design, construction, pre-commissioning and commissioning of the installation in which radiation sources or radioactive substances in sealed or unsealed form are to be used;
  - (b) The requirements and standards of safety and radiation protection features which should be provided in equipment incorporating radiation sources;
  - (c) The requirements and specifications of fixed and portable radiation monitoring equipment;
  - (d) The standards of training in safety and radiation protection, of personnel operating, servicing and repairing of radiation equipment;

- (e) The structuring of the operating organization, to provide for safety and radiation protection services, safety and radiation protection committees, including sub-committees, depending upon the complexity of the installation (e.g. a large mine and associated mill), in-service education and training of workers in safety and radiation protection, emergency preparedness, periodic reports to NAB and prompt reporting and investigation of unusual occurrence, having safety and radiation protection significance.
  - (f) In the case of portable radiation equipment (nuclear gauges, radioisotope radiography cameras), the requirements and standards of safety and radiation protection features to be provided in the design of such equipment, the standards of education and training in safety and radiation protection, of the supervisor who would be authorized to oversee the use of such equipment in public areas, the standards of education and training in safety and radiation protection, of the person(s) actually handling such equipment, the requirements and specifications of portable radiation survey instruments which should be available during field work, and the requirement for prompt reporting and immediate precautions to be taken by the supervisor in case of any mishaps or accidents leading to loss of control over the radiation source.
- 4.) The Subunit will also expected to prepare licence application forms, requiring particulars, appropriate for each type of radiation source, e.g. general X-ray machine, dental X-ray machine, gamma-ray nuclear gauges, neutron gauges, radioisotope radiography cameras etc. The subunit may also prepare leaflets, brochures or booklets to provide guidance to the applicants.

Note: The functions and responsibilities have been given in Annex.1 (B.II p.4-6)

**Other Particulars:** The job would involve extensive travelling. Motor car driving licence is required. The candidate should be willing to undertake such travel at short notice.

## E. PERSONNEL DOSIMETRY SERVICES

It is anticipated that the TLD reader, with sufficient number of TLD cards and card holders would be supplied by the IAEA towards the end of 1994 or in the first quarter of 1995. The selection and recruitment of a person for the Personnel Dosimetry Services subunit should be completed in the third quarter of 1994, so that s/he can be trained in the operation of TLD equipment for personnel dosimetry and other applications. A preliminary training on the principles and techniques of TLD, for a period up to a month, could be arranged at NRPS, MoHSS. Alternatively this training could be arranged in any other IAEA Member State in the Sub- African Region, South of the Sahara, within the framework of the IAEA-RAF Training Programmes. Specialized training on the specific TLD system supplied by the IAEA would be provided by the manufacturer during the installation of the TLD system or at the manufacturer's work, under the conditions of contract for supply of the equipment. Provision has been also made by the IAEA for an expert mission of two person-months, to train the person on TLD and to start the Personnel Dosimetry Programme.

The TLD is a versatile technique and has applications for diagnostic radiography, *in vivo* dosimetry in radiotherapy, environmental dosimetry, accident dosimetry etc. The NRPS wishes to encourage its applications on a wider scale, including a nationwide natural radiation background survey throughout Namibia.

**Education:** The person should be a matriculate and should have knowledge of electronics and familiarity with computer systems, particularly personal computers. Knowledge of Basic Nuclear Physics (ionizing radiations, radioactivity and their measurement techniques) is desirable but not essential. The person should have good communication (oral and writing) skills in English.

**Experience:** Experience in the operation of industrial or medical laboratory electronics instruments for a period of at least one year is essential. Experience in the operation of personal computer for a period of at least one year is essential.

**Job Description:** *Vide* Annex.1 (B.III p.6-7).

## F. SPACE REQUIREMENTS

An area of approximately 150 sq. metres would be needed for the NRPS, to provide an office room for the RPO and for the new recruits, the TLD personnel dosimetry services and the laboratory for nuclear counting instruments, radiation survey instruments, supplies and accessories, required for inspection and emergency services.

## G. BUDGET

NRPS is the national Regulatory Authority for the control and safe use of radiation and radioactive sources. The Regulatory Authority must have an annual budget sufficient for it to carry out all its functions and responsibilities. The Government should provide the financial resources to NRPS. The budget needs to include funds for payment of items such as:

- . salaries and wages of staff
- . modification for premises
- . purchase of consumable items such as stationery, laboratory chemicals, batteries, for instruments, cards for TLD service, components for repair of instruments etc.
- . upkeep of equipment and, vehicles.

Since the NRPS unit has just been set-up, the Government should allow a special allocation of funds that is required to purchase all major items of equipment to enable it to function. Subsequently it will be necessary to replace major items, such as instruments as they become worn out or obsolescent, or to provide additional state-of-the-art instruments as they are found to be required, and this funding must be allocated annually.

If the constitutional framework permit, NRPS may generate a small amount of income from payments made for such services it provides as, a personnel dosimetry service or inspection, emergency, registration and licencing services, calibration services for radiation and contamination monitoring instruments or radiation leakage tests for radioactive substances.