Atomic Energy Board

of Namibia

Annual Review

2013 / 2014

REPUBLIC OF NAMIBIA

ATOMIC ENERGY BOARD

ANNUAL REVIEW

2013 / 2014

This Annual Review is submitted to the Hon. Minister of Health and Social Services in accordance with the requirements stipulated in Section 15(5) of the Atomic Energy and Radiation Protection Act (Act No 5 of 2005) and covers the activities of the ***Atomic Energy Board*** and of the ***National Radiation Protection Authority***.

Objectives of the Atomic Energy and Radiation Protection Act Act No 5 of 2005

- to minimize the exposure of persons and the environment in Namibia to the effects of harmful radiation

- to ensure that adequate control is exercised over the possession, production, processing, sale, export and import of radiation sources and nuclear material

- to create the necessary mechanisms to facilitate compliance with the obligations of Namibia under international agreements relating to nuclear energy, nuclear weapons and protection against the harmful effects of radiation.

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PERSPECTIVE FROM THE BOARD'S CHAIRPERSON

The Atomic Energy Board of Namibia (AEB) recognizes nuclear energy's potential contribution to clean air and sustainable development in Namibia. More importantly, although both the AEB and the Namibian Radiation Protection Authority (NRPA) are committed to continue exploring the peaceful applications of atomic energy, its first priority remains the implementation, and continuous improvement of an internationally approved regulatory infrastructure for radiation safety to protect the Namibian population and the environment against undesirable effects of nuclear energy.

It has set about its task in a systematic manner and both the AEB and the NRPA are now well established. It played a key role in the institutional operationalization of the Atomic Energy and Radiation Protection (Act 5 of 2005). The development and expansion of nuclear technology for energy, agriculture, medicine, food preservation, hydrology, industry and ecology will support Namibia's sustainable development programmes, partnerships and capacity to achieve Vision 2030. The ability to effectively roll out the use of these technologies depends however on the country's ability to develop a critical number of skilled and competent scientists to manage these technologies safely and effectively.

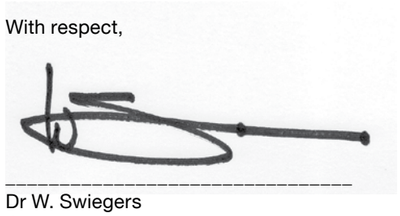
The AEB recognizes the fact that the continued provision of secure, reliable, and diverse sources of energy will play a major role in Namibia's economic growth and ability to compete internationally. Three key technologies will be required in Namibia to ensure sufficient scale of electricity generation and greenhouse gas reduction: renewables, nuclear power and clean-coal technology.

During the past year the AEB and the NRPA worked closely with colleagues from the Ministry of Mines and Energy to finalize the Nuclear Fuel Cycle Policy and the Nuclear Science and Technology Policy. The potential for training in Radiation Protection could open doors to various possible careers and it will create many new opportunities. Both the University of Namibia and the Polytechnic of Namibia are involved as strategic partners to unlock Namibia's human potential.

Internationally, Namibia promotes the enhancement of the nuclear non-proliferation regime, including obligations of parties to demonstrate their commitment towards peaceful applications of nuclear energy. The AEB is guided by the applicable International Atomic Energy Agency (IAEA) recommendations and guidance, international nuclear security instruments and associated international best practise.

It is possible that in the coming century, nuclear energy will account for an increasing share of the electricity mix in the world and possibly in Namibia. The AEB will continue to nurture innovation backed up by strong research and development, training and a strong safety culture and infrastructure.

With respect,



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Dr W. Swiegers
Chairperson: Atomic Energy Board

PERSPECTIVE FROM THE BOARD'S SECRETARY

At the end of this reporting period we marked an important milestone in the development of nuclear science and technology in Namibia – the principle approval by Cabinet of the nuclear fuel cycle policy and nuclear science and technology policy. This calls for the strengthening of interventions that will successfully translate the policy intentions into practical outcomes in line with the national priorities.

The legislative and regulatory capacity is a basic and essential pre-requisite for the introduction of nuclear-based technology, and hence this should enjoy priority as Namibia moves toward implementation of the approved polices. The foundation has been laid over the past five years, including the operationalization of the Atomic Energy and Radiation Protection Act and the institutional infrastructure that goes with it. Notable progress was also made in the implementation of the regulatory activities for the current scope of radiation sources, radioactive and nuclear material. However the same improvement is needed in terms of the staff performing regulatory work, such as to expand the depth of their skills, especially of new staff members. Therefore this current framework should be assessed against the international standards and best practices, keeping the intentions of the new polices in mind.

The success of the intentions in both the nuclear science and nuclear fuel cycle policy, depend very much on the proactive and determined interventions at all levels. For the implementation of these policies a good strategy is needed. . Key performance areas for this include forming strategic partnerships at national, regional and international level; research studies to evaluate the merits of certain nuclear technologies in the context of Namibia's development priorities; resource availability supported by clear plans of action; project management; skills development and infrastructure development.

In terms of moving forward, both the current regulatory framework and the framework to promote the applications of nuclear technology, have to be reconsidered, especially in the context of the revised policy framework. The regulatory framework should be revised to provide the space for it to evolve and to be responsive to a growing nuclear industry. Equally, we have to create a conducive environment, through which nuclear technology research and development work can be pursued actively. Therefore the political will and the correct technical advice will be instrumental to redefine the advancement of nuclear technology in Namibia.

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Axel Tibinyane
Secretary: Atomic Energy Board

INTRODUCTION

The Atomic Energy Board and National Radiation Protection Authority were primarily established for the administration of the Atomic Energy & Radiation Protection Act, Act No 5 of 2005. The purpose of the Act is to create a national framework through which nuclear technology is controlled, monitored and regulated while also ensuring that the beneficial applications thereof are realized within the context of national development priorities. In this context the technical programmes summarized in this report are centred on three points: Firstly on establishing and implementing an effective and efficient national regulatory system for nuclear and radiation safety and security to protect people and the environment against the harmful effect of radiation exposure by pursuing compliance with international standards and recommendations. Secondly they center on fostering an enabling environment, both technical capability and institutional infrastructure, for research, development and innovation in the peaceful and safe uses of nuclear technology; and thirdly on enhancing collaboration with national, regional and international bodies for peaceful, beneficial, and safe utilization of nuclear technology .

1.1 Strategic Themes

Nuclear and radiation-based technology has the potential to make meaningful contribution to development, but if not used safely and responsibly it may cause more harm than benefit. It is therefore a priority to first develop a robust regulatory framework which gives assurance that the introduction and use of nuclear based technology are controlled, monitored and regulated. This regulatory framework is divided into the following seven thematic safety areas:

(i) Legislative and Regulatory Infrastructure for the Control of Radiation Sources, radioactive and nuclear material;

(ii) Occupational Radiation Protection Programme of the Nuclear Industry and Other Applications Involving Ionizing Radiation;

(iii) Radiation Protection of Patients during Medical Exposure;

(iv) National Infrastructures for the Control of Public Exposure and Radioactive Waste Management;

(v) Compliance Assurance for the Transport of Radioactive Material ;

(vi) National Capabilities to Respond to Nuclear and Radiological Emergencies ;

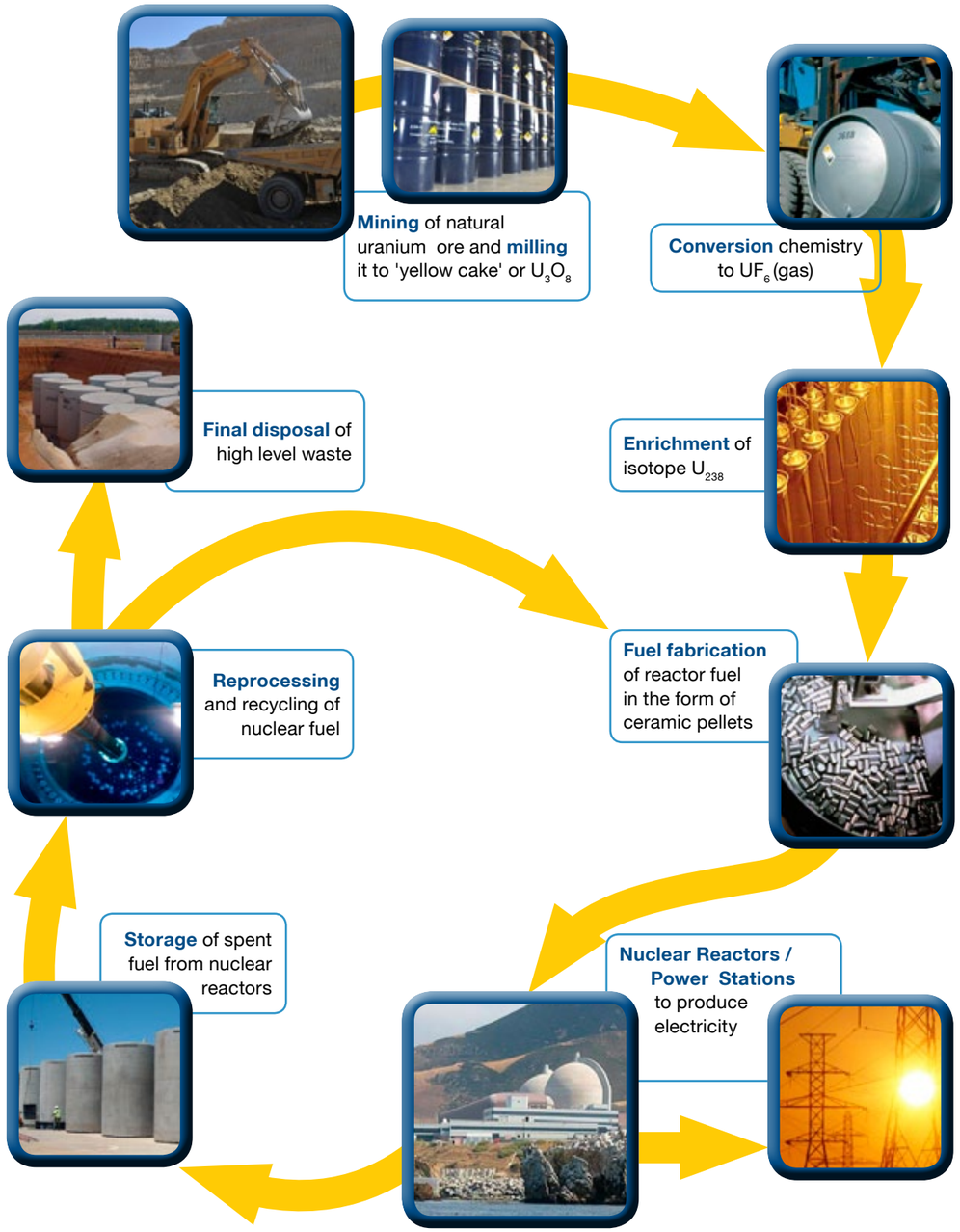
(vii) Education and Training Infrastructure, and Building Competence in Radiation Safety

The development of the regulatory framework is also coupled with the development of a framework through which national priorities may be addressed using nuclear technology. Nuclear technology could also make a meaningful contribution to key thematic areas such as energy, food safety, food security, crop production, environmental water resources management and public health. In this regard project management, strategic partnership, resource mobilisation, research and development, and feasibilities studies in the context of national priorities form a key part of the expansion and acceleration of nuclear technology based programmes.

1.2 Performance Indicators

The Board and the Authority aim for quality performance by working towards compliance with international standards and best practices in all areas of their mandate. In this context the relevant international standards have been adopted in all areas of nuclear and radiation safety and security as a guiding tool to improve performance. In this report the IAEA standards and recommendations are used to report and measure performance in relation to the international standards. [IAEA, GSR Part 1]

THE NUCLEAR FUEL CYCLE



REGULATORY INFRASTRUCTURE FOR NUCLEAR AND RADIATION SAFETY

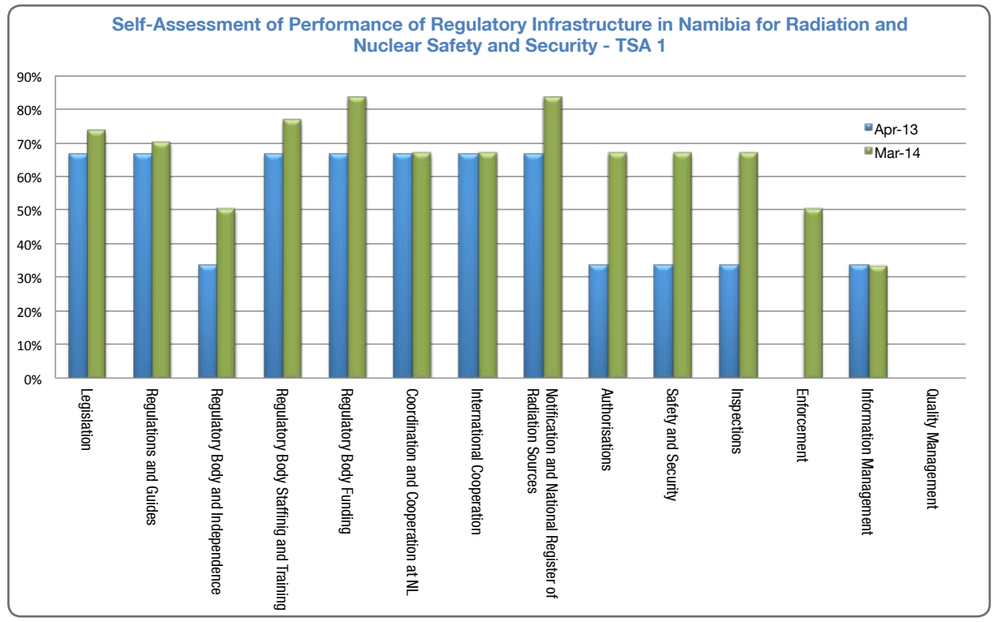
The strategic theme Regulatory *Infrastructure for Nuclear and Radiation Safety* consists of the following 14 elements:

Legislation	Notification and National Register of Radiation Sources
Regulations and Guidance	Authorisations
Regulatory Body Establishment and Independence	Safety and Security of Radioactive Sources
Regulatory Body Staffing and Training	Inspections
Regulatory Body Funding	Enforcement
Coordination and Cooperation at the National Level	Information Management
International Cooperation	Quality Management

The performance in these areas has been assessed based on the international standards applicable to each of the performance areas and the results of the self-assessment are shown in graph 1 below.

The greater part of focus of work during the reporting period was on the following elements: Notification and National Register of Radiation Sources; Authorization; Inspections, Enforcement; and Safety and Security of Radioactive Sources. This includes both the development of management tools and the operational parameters for compliance with standards. A breakdown of the inventories of the facilities, status of authorizations, inspections and enforcement is provided below.

Elements such as *legislation, regulatory body funding* and *independence* requires policy level interventions, which are currently being addressed through the policy framework, which are still being developed.



Graph 1: Self-Assessment of Performance of Regulatory Infrastructure in Namibia

Record of Facilities and Regulatory Activities

Practice	Total Active Facilities	Radiation Sources		Radiation Management Plans (RMP) Approved	Authorised Practices	Annual Reports Received	Inspections in the year	Compliance Orders	Pending Compliance Order
		Number of Radiation-Generating Devices and Sealed Sources	Quantities of Source Material and Unsealed Sources						
Fixed gauges	14	256		10	8		1	1	0
Mobile gauges	26	83		21	21		1	0	0
Dental	62	111		33	17		11	0	29
Diagnostic	79	144		72	52		9	3	0
Radiotherapy	1	4		1	1		1	0	0
Uranium Mining	5	41		5	4	3	4	0	0
Industrial radiography	5	5		4	4		0	0	0
Uranium exploration	4	4		4	4		0	0	0
Nuclear medicine	3	2		2	1	0	1	1	
Vet	8	9		2	2	1	1	1	0
Analytical services	8			5	4	1	0		
Borehole logging	1	4		1	1	1	0	0	0
Transporters	4	0		4	1	3	1	1	0
Scanners	2			1	1	0	1	0	0
Total	222	663		165	121	9	31	7	29

The challenging areas remain *quality management*, *information management*, *regulatory guides* and *safety and security*. The poor performance in these areas is mainly due to the lack of staff in the responsible division, but staff has since been recruited and work is in progress, thus improvement in these areas is expected.

In the area of *regulatory body staffing and training*, a new staff establishment has been proposed to strengthen the current capacity in terms of quality and quantity. A document has been developed which profiles the required competency levels for Radiation Protection Officers. The new staff establishment and the programme to improve the competency levels in compliance with the approved profile and Personal Development Plans will contribute to the enhancement of the performance in this area.

International Cooperation is enhanced through memorandums of understanding and committees, which both provide opportunity for streamlining the work of the Board and of the Authority. Cooperative and collaborative arrangements are in place with law enforcement agencies and other regulatory agencies of Government. There is however room for improvement especially in the area of collaboration with institutions of higher learning and other Ministries that are involved in similar regulatory work. At the *international level* there is a standing relation with the International Atomic Energy Agency, Forum of Nuclear Regulatory Bodies in Africa (FNRBA) and a Network of Nuclear Regulatory Bodies in Southern Africa. These collaborative arrangements allow for the Board and the Authority to improve on their overall performance based on the best practices and international standards in other parts of the world.

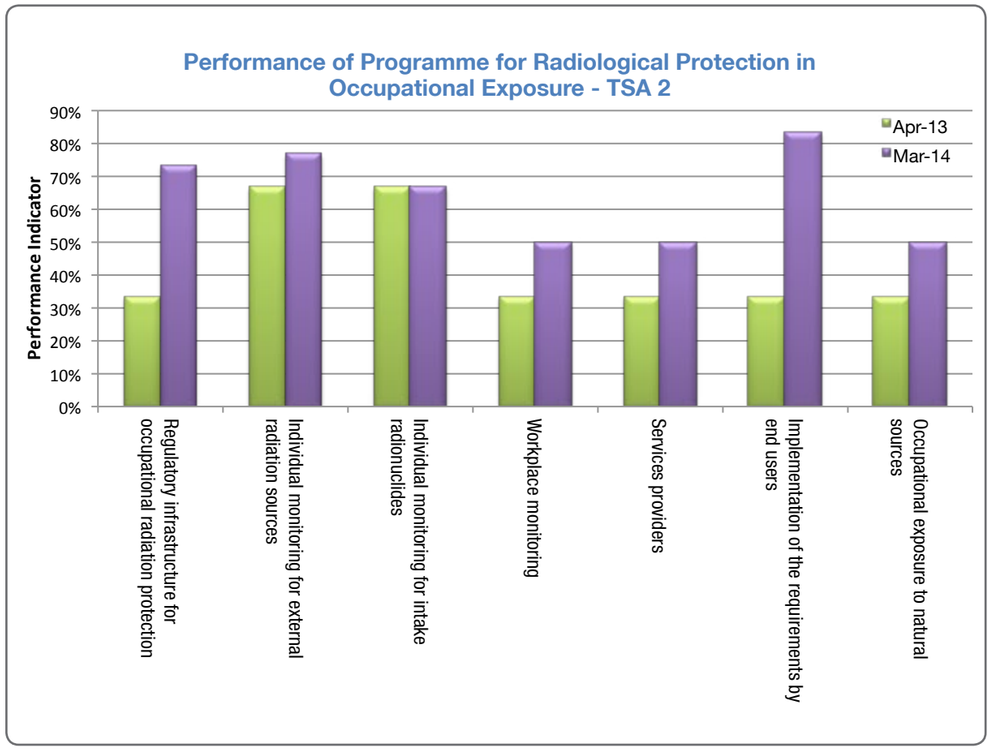
RADIOLOGICAL OCCUPATIONAL EXPOSURE CONTROL PROGRAMME

Occupational exposure includes the surveillance of all workers who are likely to incur radiation exposures in the course of their work, with the exception of exposures excluded from the regulations and exposures from practices or sources exempted by the regulations. The main objective of occupational exposure control programme is to ensure that the exposure remain within the legal limit of 20mSv/a and are also optimised to be as low as reasonably achievable. The overall occupational exposure radiation protection programme in Namibia is implemented along the seven (7) performance areas which are recommended in the IAEA international standards. The performance in these areas is assessed using the standards and the results are tabulated below.

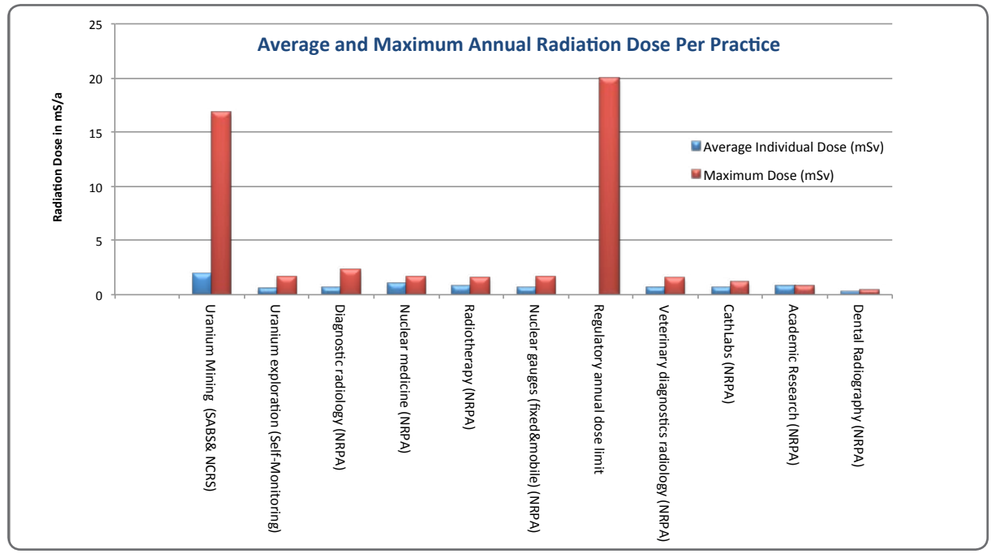
There is progress in all of the performance areas, but in most cases the performance is around 50%, with the exception of the *regulatory infrastructure, external monitoring of radiation workers and implementation of requirements by users*. The regulatory infrastructure is well developed with the current requirements being sufficient for the scope of activities. Compliance is facilitated through the regulatory activities described below.

Preparatory work has been done to improve the performance in the areas of workplace monitoring, occupational exposure to natural sources and service providers, but these all need to be strengthened by increasing the staffing levels and the competency of staff. There is particularly a need to establish a safety culture within facilities and practices through education and training as well as establishment of local rules and procedures in controlled areas.

There is a total of 3 127 workers who are designated as radiation workers and are monitored by the National Radiation Protection Authority; South African Bureau of Standards (SABS); and New Zealand National Centre for Radiation Science (NCRS). The average exposure for each of the practices is tabulated below.



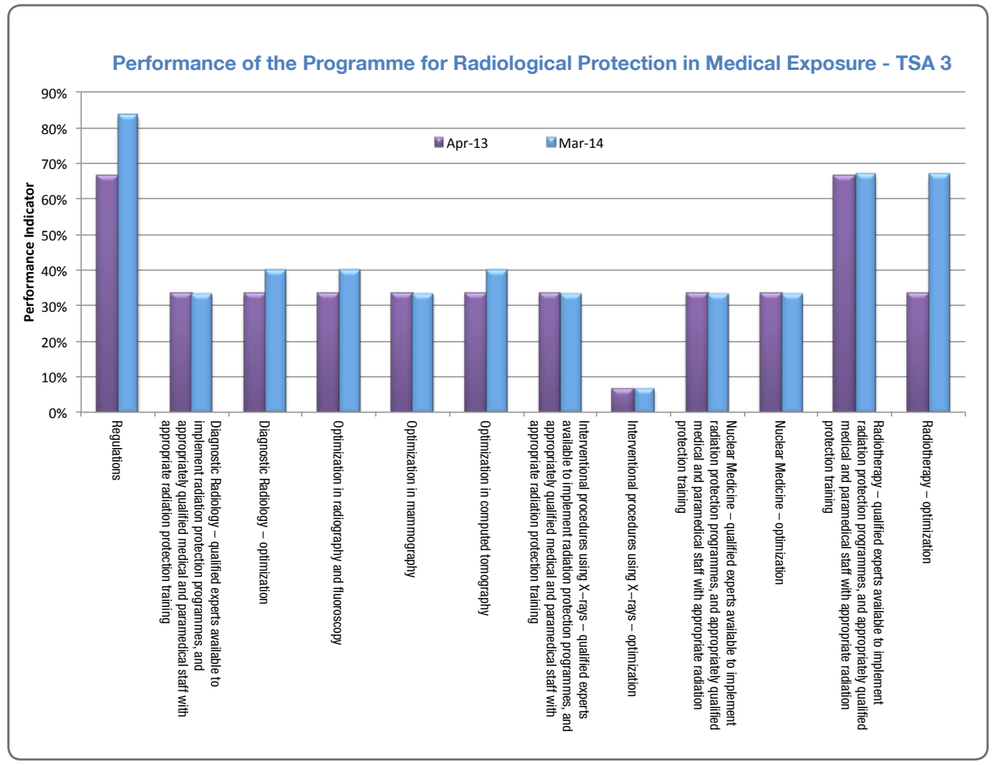
Graph 2: Performance of Programme for Radiological Protection in Occupational Exposure



Graph 3: Average and Maximum Annual Radiation Dose per Practice

RADIOLOGICAL MEDICAL EXPOSURE CONTROL PROGRAMME

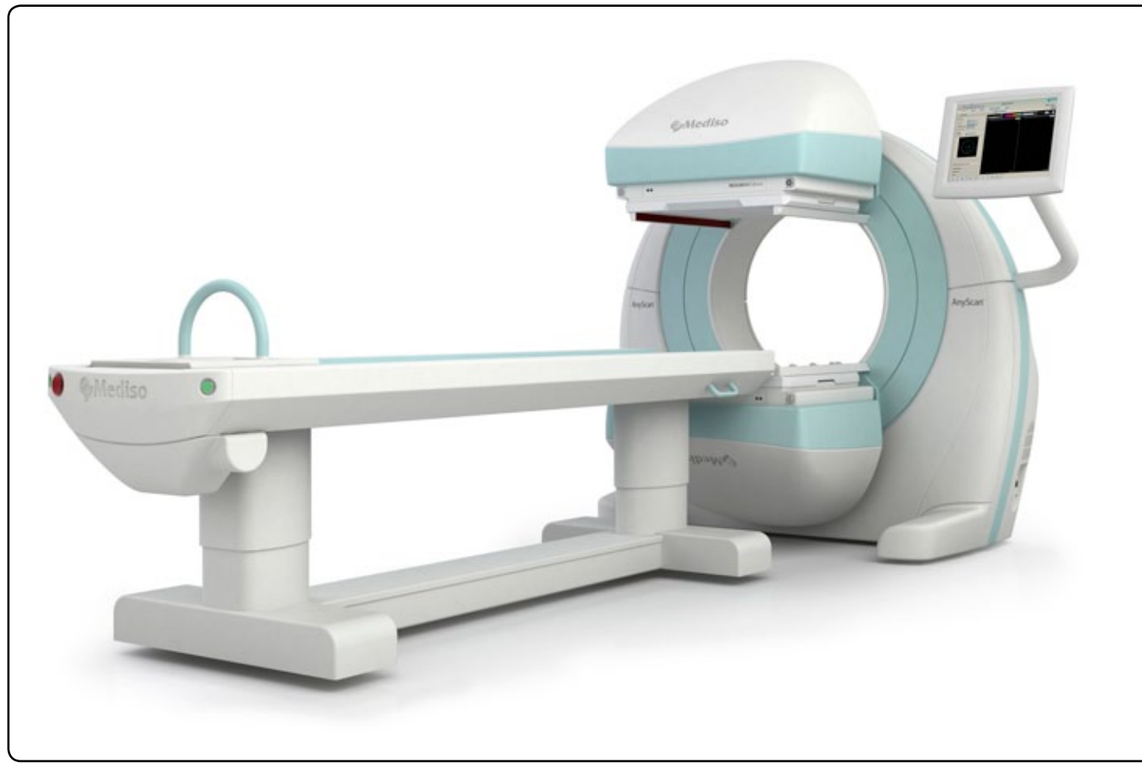
The principal focus of using radiation based technologies in the medical sector is to obtain either a quality image or to destroy harmful cells without unduly causing damage to healthy cells at the area of interest. In order to achieve this objective, it is essential that a robust regulatory framework is in place, which promotes and enhances the concept of optimisation of exposure, in order to ensure that exposures are within regulated or guidance levels and where appropriate should be minimised without compromising quality. Good outcome/results in the twelve performance areas tabulated below provide assurance that the aforesaid is achieved. These areas broadly include (i) regulations in conformity with international standards; (ii) qualified experts available to implement radiation protection programmes; (iii) appropriately qualified medical and paramedical staff with appropriate radiation protection training in Diagnostic Radiology, Interventional procedures using X-rays, Nuclear Medicine, Radiotherapy; (iv) Optimization in radiography and fluoroscopy, mammography, computed tomography, interventional procedures using X-rays, nuclear medicine, radiotherapy



Graph 4: Performance of the Programme for Radiological Protection in Medical Exposure

The *legal and regulatory framework* is satisfactory and sufficient for the scope of activities carried out in Namibia. However quality assurance programmes are lacking in most facilities and in almost all of the specialities in medical exposures. There is positive initiative in the area of *optimisation for protection in diagnostic radiology* with eight facilities now being evaluated for image quality and will be rolled out to all 66 major diagnostic radiology facilities and other x-ray imaging facilities in both the public and private health sector. Other areas of x-ray imaging and quality assurance programmes in both nuclear medicine and radiotherapy are available, but these have yet to be comprehensively evaluated by the NRPA.

The personnel working in areas of imaging and therapy using nuclear applications is well qualified and further certified by the relevant health professions council, including radiologist, nuclear medicine specialist, radiotherapists, radiographers (nuclear medicine, radiation therapy, diagnostic), dentist and medical physicist to perform work in their respective specialities. Often qualified medical and paramedical staff is also expected to perform work as experts in radiation protection, but their training in radiation protection as applied in their disciplines is limited. Hence the future outlook is to develop and roll out a training programme, aimed specifically for each of the imaging and therapy disciplines of all the workers. A document has been issued which outlines the minimum level of competencies to be certified as a radiation safety officer in a certain speciality.



RADIOLOGICAL PUBLIC EXPOSURE CONTROL PROGRAMME

The purpose of the Public Exposure Control Programme is to ensure that the public receives adequate protection against radiation exposure, including exposure from authorised practices or those that are outside the regulatory control or amenable to control.

The first objective is to ensure that the combined contribution of exposure to any member of the public does not exceed a value of 1mSv/a above background and is also optimised to be as low as reasonably achievable.

Secondly it is to ensure that the natural occurrence of radioactivity is assessed for the purpose of intervening where the radiological risks are unacceptable. Based on the above the public exposure control programme is divided into the following fifteen (15) performance areas:

Regulatory Framework for the Control of Public exposure Non-associated with Radioactive Waste Management or Decommissioning Activities;	General Safety Provisions for Radioactive Waste and Decommissioning;
Control of Discharges;	Predisposal Management of Radioactive Waste;
Environmental Monitoring;	
Control of Foodstuffs And Selected Commodities;	Clearance Regime for Radioactive Waste;
Control of Chronic Exposures (Radon, Norm And Past Practices);	Storage of Radioactive Waste;
Control of Radioactivity in Materials For Recycling;	Disposal of Radioactive Waste;
National Waste Management Policy and Strategy;	Decommissioning of Nuclear and other Facilities Containing Radioactive Materials
National Waste Management and Decommissioning Legislative and Regulatory Framework	Remediation

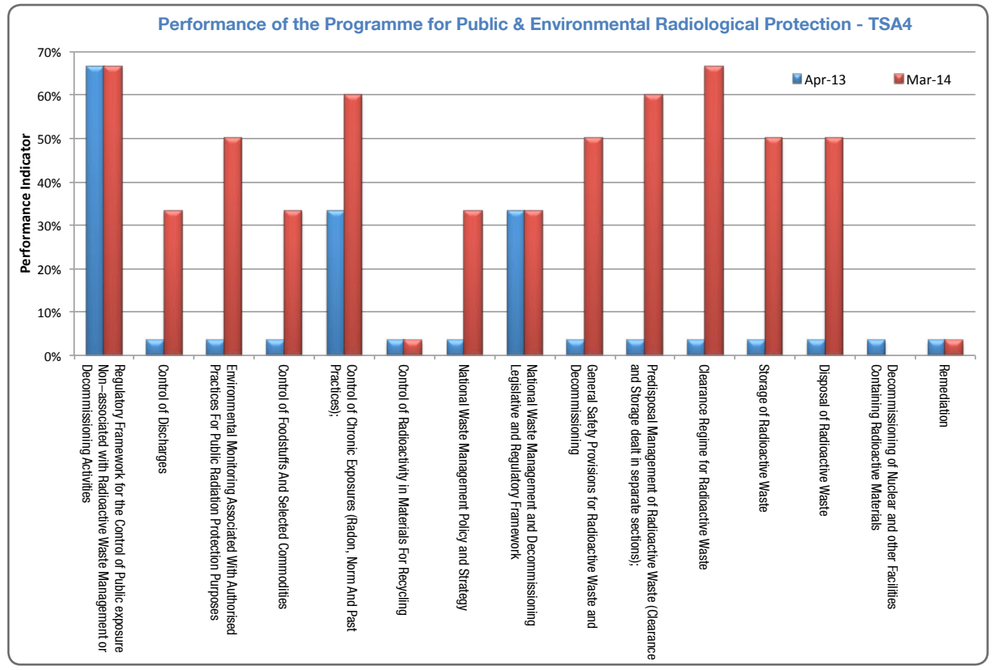
The *regulatory framework* is sufficient for the control of exposure of practices, but does not make sufficient provisions for interventions in cases of naturally occurring radioactive material. The *control of discharges* and most of the areas of *waste management* are managed within the framework of the regulatory infrastructure and hence the good progress in those areas.

Other notable areas of progress include "*Environmental monitoring*" and "*Control of chronic exposure*". Environmental monitoring associated with authorised practices is controlled and monitored through the regulatory regime through which all of the 222 active facilities are obligated to have occupational exposure control programmes in place, including environmental monitoring programmes. The assessment of radon exposure is part of the *Control of chronic exposures*, which has been conducted over a period of two years in 47% of the districts of Namibia. This includes mainly evaluation of radon gas exposure as tabulated in graph 6 on the opposite page. There is need to strengthen capacity for the assessment of ambient doserates and characterisation of NORM under this same technical area.

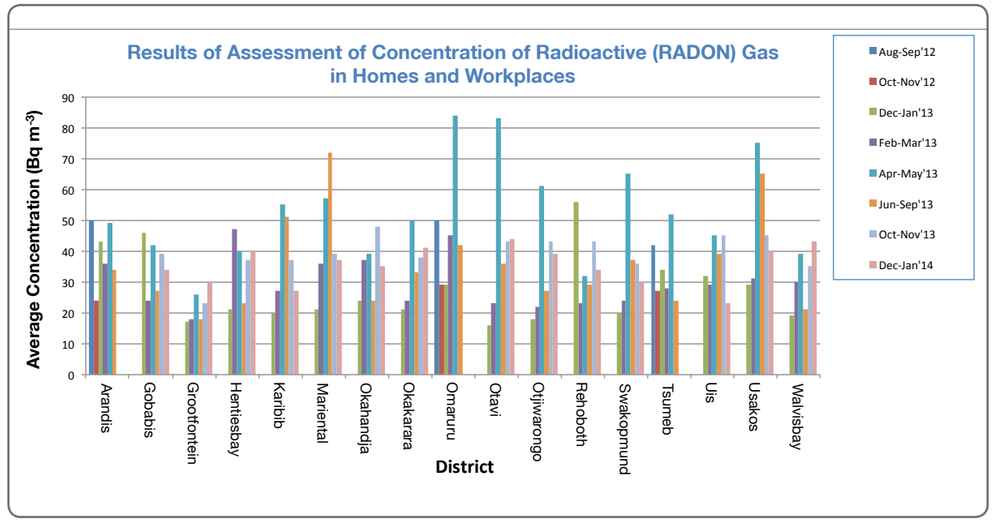
The radon gas concentrations have been found to be below the action level of 100 Bq.cm^{-3} as illustrated in graph 6, thus warranting no further action based on this assessment.

In the areas of Control of Foodstuff and Commodities and Control of Discharges capacity building has commenced through training of staff and acquisition of equipment to support sampling, sample analysis and interpretation of measurement quantities and evaluate the radiological risks to the public.

The progress or poor performance recorded in the public exposure control programme in the above areas is a reflection of the capacity both in terms of infrastructure, human resources and technical skills. In order to improve performance in the rest of the technical areas such as all areas of waste management, decommission, remediation and control of radioactivity in materials for recycling, additional staff will be required and the competency levels will equally have to be improved.



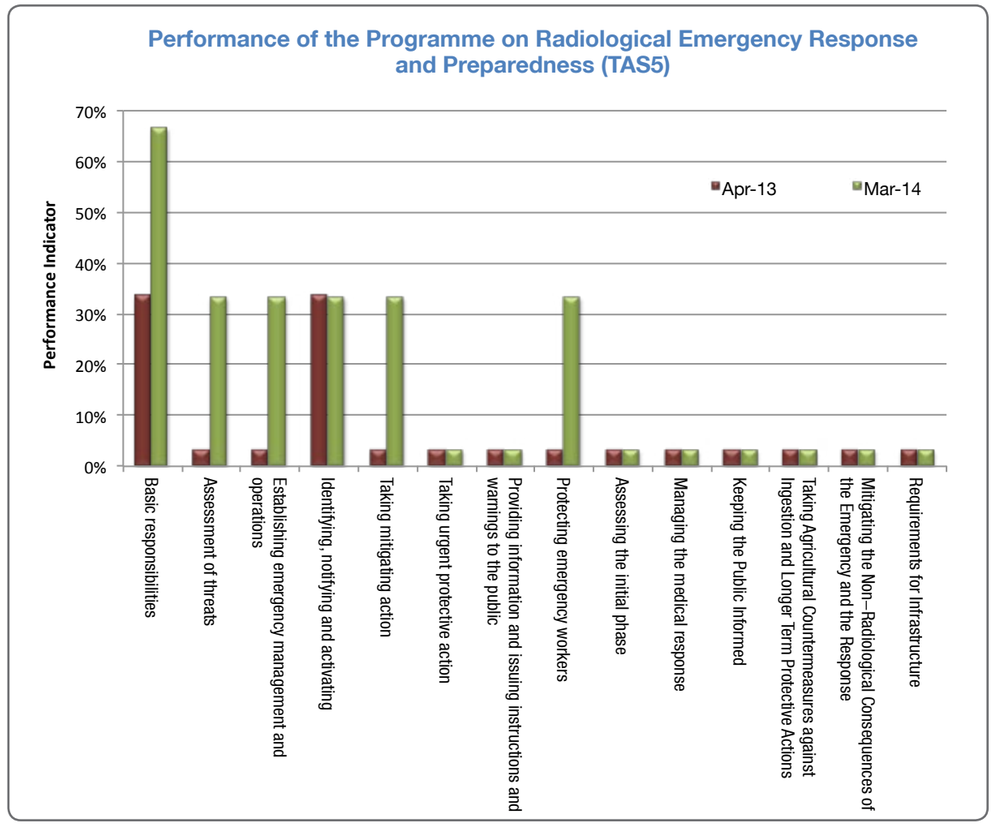
Graph 5: Performance of the Programme for Public and Environmental Radiological Protection



Graph 6: Results of Assessment of Concentration of Radioactive RADON) Gas in Homes and Workplaces

RADIOLOGICAL EMERGENCY RESPONSE AND PREPAREDNESS CAPABILITIES

Clear Designation of Basic Responsibilities	Assessment of threats
Establishing emergency management and operations	Identifying, notifying and activating
Taking mitigating action	Taking urgent protective action
Providing information and issuing instructions and warnings to the public	Protecting emergency workers
Assessing the initial phase	Managing the medical response
Keeping the Public Informed	Requirements for Infrastructure
Mitigating the Non-Radiological Consequences of the Emergency and the Response	Taking Agricultural Countermeasures against Ingestion and Longer Term Protective Actions



Graph 7: Performance of the Programme on Radiological Emergency Response and Preparedness

The *basic responsibilities* are stipulated in the legislative and regulatory framework while additional responsibilities are assigned in facility-based emergency response and preparedness plans. The responsibility for responding to any incident or accident involving radioactive material on the site of the facility rests with the facility or licensee. Therefore each facility is duty-bound to reasonably model an emergency scenario involving the radiation sources for which they are responsible and to propose responsive measures, including the status in reference to the performance parameters identified above. This requirement is enforced by the Authority when the emergency response plan is reviewed and when inspections are conducted to review the readiness of the facility to respond to emergencies. While the facilities have emergency response and preparedness plans in place, the level of readiness to implement the plans is yet to be fully evaluated by the Authority.

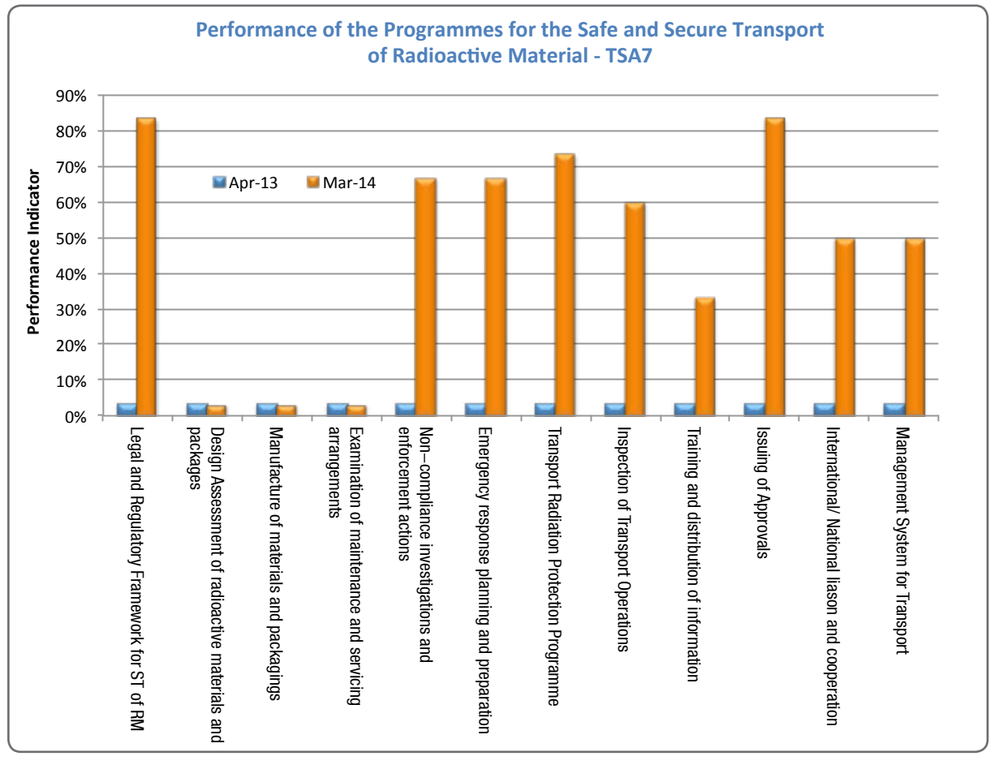
Off-site accident scenarios may require the intervention of the Board and/or Authority or other national Agencies or Office. The scenarios are identified in cooperation with facilities and practices involved in the use of radiation sources. The national emergency response plan will be developed using these scenarios and followed with capacity building among all the responders to implement these plans.

SAFE AND SECURE TRANSPORT
IMPORT AND EXPORT OF RADIOACTIVE AND NUCLEAR MATERIAL

The transport of radioactive and nuclear material is one of the activities that carry a high risk of potential exposure to persons or may cause contamination of the environment. This movement of radioactive substances heightens contact with the public, increase probabilities of accidents, theft and possible malicious acts thereby contributing to potential increased radiological risk.

In order to prevent and/or minimize the potential risks associated with transport of radioactive material, the performance of the national infrastructure is assessed and improved on the basis of the elements on the right:

Legal and Regulatory Framework	Design Assessment of radioactive materials and packages
Manufacture of materials and packagings	Examination of maintenance and servicing arrangements
Emergency response planning and preparation	International/ National liaison and cooperation
Inspection of Transport Operations	Training and distribution of information
Issuing of Approvals	Transport Radiation Protection Programme
Management System for Transport	



Graph 8: Performance of the Programmes for the Safe and Secure Transport of Radioactive Material

The IAEA Regulations for the safe transport of radioactive material has been adopted in the Radiation Protection & Waste Disposal Regulations, thus achieving a satisfactory level of compliance with the recommended standards in this area.

Containment of radioactive material plays an important role in transport safety and hence the need to ensure that the design and manufacturing of containers confirm to standards. Almost all of the containers that are used in Namibia are designed and manufactured in foreign countries. If these are in compliance with the regulatory body of the state of origin, then these are also considered satisfactory for Namibia, provided the state of origin also uses the same standards as those adopted by Namibia. Since no containers are designed or manufactured in Namibia the performance is rated low in the following areas: *Design Assessment of radioactive materials and packages; Manufacture of materials and packagings; examination of maintenance and servicing arrangements.*

There is positive progress in the following performance areas: *Emergency Response Planning and Preparation; Transport Radiation Protection Programme; Inspection of Transport Operations and Issuing of Approvals.* This progress is achieved as a result of the continuing control and monitoring under the current regulatory framework and activities. The regulatory provisions require that each applicant develops and maintains a transport plan that addresses containment, control of exposure, security, emergency response and training.

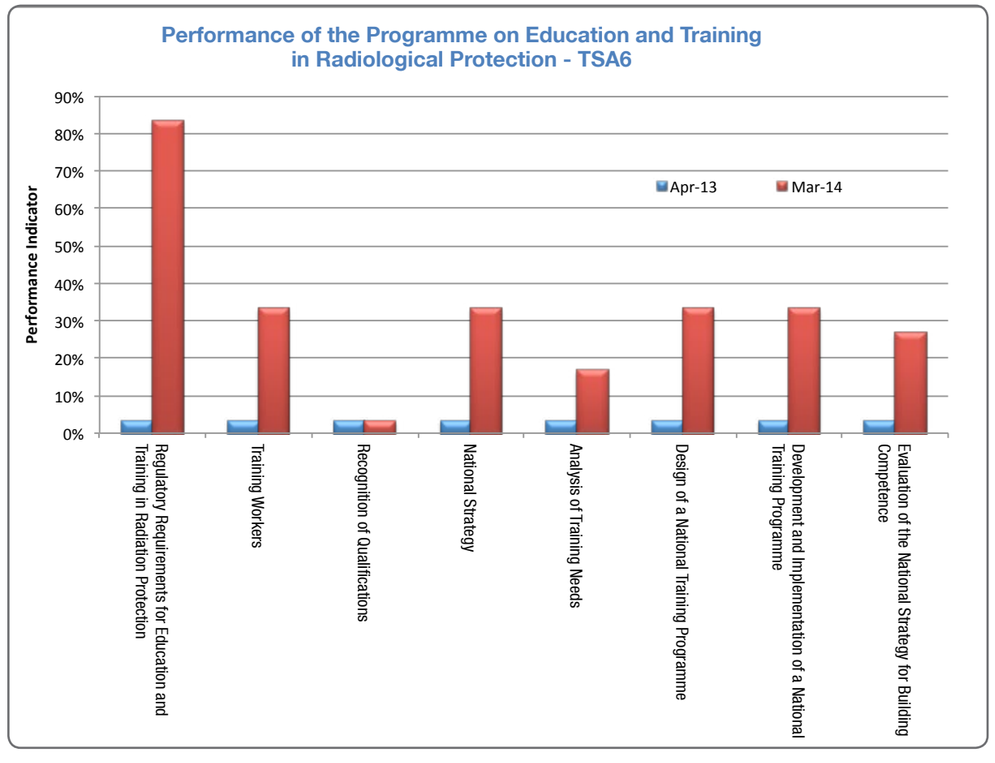
In support of the regulatory framework the following two documents have been issued to provide guidance to those involved in transport of radioactive material: Guidance on Transport Regulations and Regulatory Requirements for Authorization to Transport Radioactive Material. Performance areas that need further strengthening includes Training and Distribution of Information; International/ National Liaison and Cooperation; and Management System for Transport.

EDUCATION AND TRAINING STRATEGY
IN NUCLEAR AND RADIATION SAFETY

The following performance parameters are used to develop, measure and improve the national framework for technical competencies in radiation safety and nuclear security:

A self-assessment of the performance in these performance areas are tabulated in graph 9 below:

Regulatory Requirements for Education and Training in Radiation Protection	Training Workers
Recognition of Qualifications	National Strategy
Analysis of Training Needs	Design of a National Training Programme
Development and Implementation of a National Training Programme	Evaluation of the National Strategy for Building Competence



Graph 9: Performance of the Programme on Education and Training in Radiological Protection

The basic and minimum *legal and regulatory requirements* for education and training in radiation protection are in place. These requirements take into account specialists (*Radiation Protection Officers*) of the Authority and technical experts (*Radiation Safety Officers*) based in the facilities as well as competency building for the general radiation worker. An analysis of the training needs has been conducted and the Authority is collaborating with institutions of higher learning to design a *national training programme*.

Two documents have been issued that profile the required competencies of *Radiation Protection Officers and Radiation Safety Officers* in terms of qualifications, experience and additional training. Improvement of the competencies in radiation protection is pursued within the framework of these guidance documents.

Training of radiation workers is done by the Board and Authority and other service providers, but these training programmes have yet to be formalised and the appropriate *recognition* of qualifications should be facilitated. A draft *education and training strategy* has been developed which takes the *training need* into account and proposes the modalities of how to build the necessary competencies in all areas of specialisations.

A number of staff of the Secretariat of the Board and of the Authority also attended various meetings and workshops to deepen the understanding of the application of the international standards and recommendation, mainly in the seven thematic safety areas. The workshops and meetings also served to improve the design, planning and implementation of thematic safety areas.

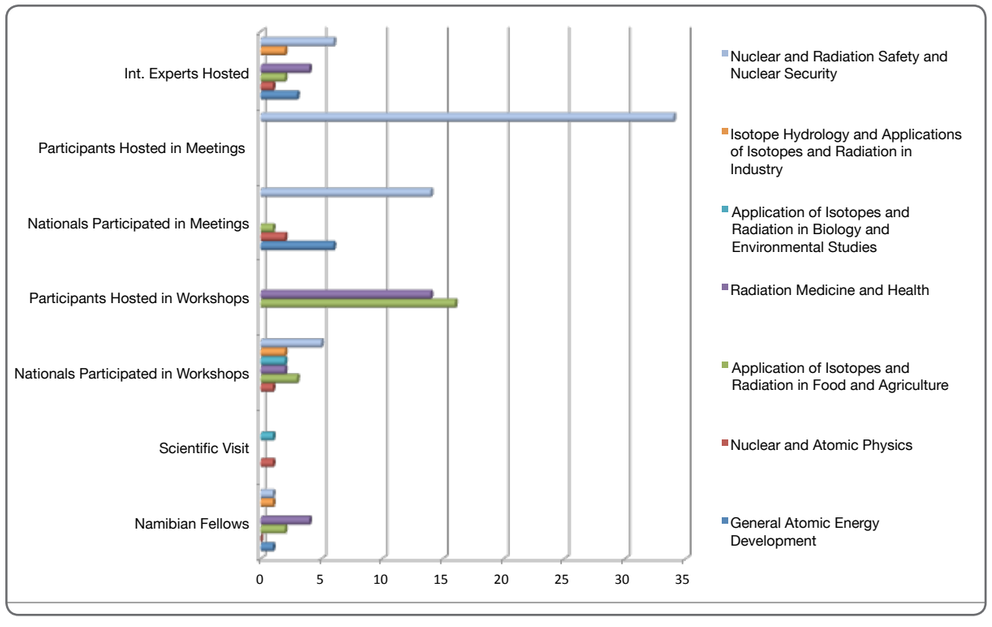
NUCLEAR TECHNOLOGY SUPPORT
FOR DEVELOPMENT

One of the functions of the Ministry of Health and Social Services is to promote the development of nuclear science and technology through accession to, participation and adherence to bilateral, regional and multi-lateral cooperation and international cooperative arrangements. In particular the Ministry's role is to advance the beneficial exploitation of nuclear-based technologies not only within the public health sector, but also in agriculture, water resource management, food safety and food security, environmental protection, energy and mining. The purpose of the programme is to engage stakeholders to ensure that nuclear technology is integrated into the national developmental agenda. The performance parameters include development assistance received; nuclear based projects negotiated and approved; technical assistance received through experts' advice, training, and equipment which all assist in technology transfer in the specific areas of interest.

9.1 Policy Framework

- **National Policy Framework**

There is currently no policy framework that enables the advancement of nuclear and science technology as a tool to address developmental challenges. Hence two policies have been drafted, which are due for final approval by policy makers. This includes the *Nuclear Fuel Cycle Policy* which is under the Ministry of Mines and Energy and will provide the framework through which nuclear fuel can be safely and beneficially exploited from raw material to other stages within the nuclear fuel cycle. The *Nuclear Science And Technology Policy* articulates Government intent and the framework of nuclear technology in the non-nuclear fuel cycle activities such as public health, productions, analytical services, agriculture, and food security.



Graph 10: Fields in which Assistance was received

- **Cooperative Arrangements**

Nuclear technology offers a complementary and unique alternative to address some of the challenges that have been identified in the National Development Plan. It is however necessary to gain a deeper understanding of the challenges and to devise plans that respond to these challenges. Therefore the Ministry has facilitated the development of a *Country Programme Framework* with the International Atomic Energy Agency, which prioritises projects that address areas that have been identified in the fourth national development plan. The Country Programme Framework is a five year planning document which defines the priority areas for cooperation between Namibia and the IAEA. It served as the basis on which projects are proposed, designed and formulated for implementation in Namibia. A summary of the progress of projects implementation is provided in graph 10 on the left.

- **Technical Assistance for Building Capacity in Support of Nuclear Technology Transfer**

As of the current financial year, Namibia had thirteen national projects at various stages of implementation. The projects include areas in crop production, nuclear medicine, radiation therapy, water resources management, food safety, education and training, animal health, nutrition and malaria, cancer control, nuclear and radiation safety. The total assistance approved for the 2013 year for national projects was €304 507, while €335 729 of assistance was provided in total. Namibia further participates in 45 regional projects supported by the IAEA and AFRA Agreements. A breakdown of the assistance received is provided in graph 10.

- **Expert Advice**

Namibia hosted 12 internal experts in the following areas of expertise: General Atomic Energy Development (3), Nuclear Chemistry and Radiochemistry (1), Fuel Cycle and Waste Management (2), Isotope Hydrology and Applications of Isotopes and Radiation in Industry (2), Nuclear and Radiation Safety and Nuclear Security (4). A meeting of 30 participants from the African regional was also held in the area of nuclear and radiation safety.

- **Planning and Review Meetings**

Nationally, Namibia also participated in various planning and review meetings on the following topics: General Atomic Energy Development (6), Nuclear Chemistry and Radiochemistry (2), Application of Isotopes and Radiation in Food and Agriculture (1), Nuclear and Radiation Safety and Nuclear Security (14).

- **Capacity Building Workshops**

Two workshops were held locally with the assistance of six (6) lecturers provided by the IAEA and also supporting 30 participants to participate in these workshops in the areas of Application of Isotopes and Radiation in Food & Agriculture and Radiation Medicine & Health. Fifteen (15) Namibian Nationals also participated in various workshops in the following areas: Nuclear Chemistry and Radiochemistry (1), Application of Isotopes and Radiation in Food and Agriculture (3), Radiation Medicine and Health (2), Application of Isotopes and Radiation in Biology and Environmental Studies (2), Isotope Hydrology and Applications of Isotopes and Radiation in Industry (2), Nuclear and Radiation Safety and Nuclear Security (5).

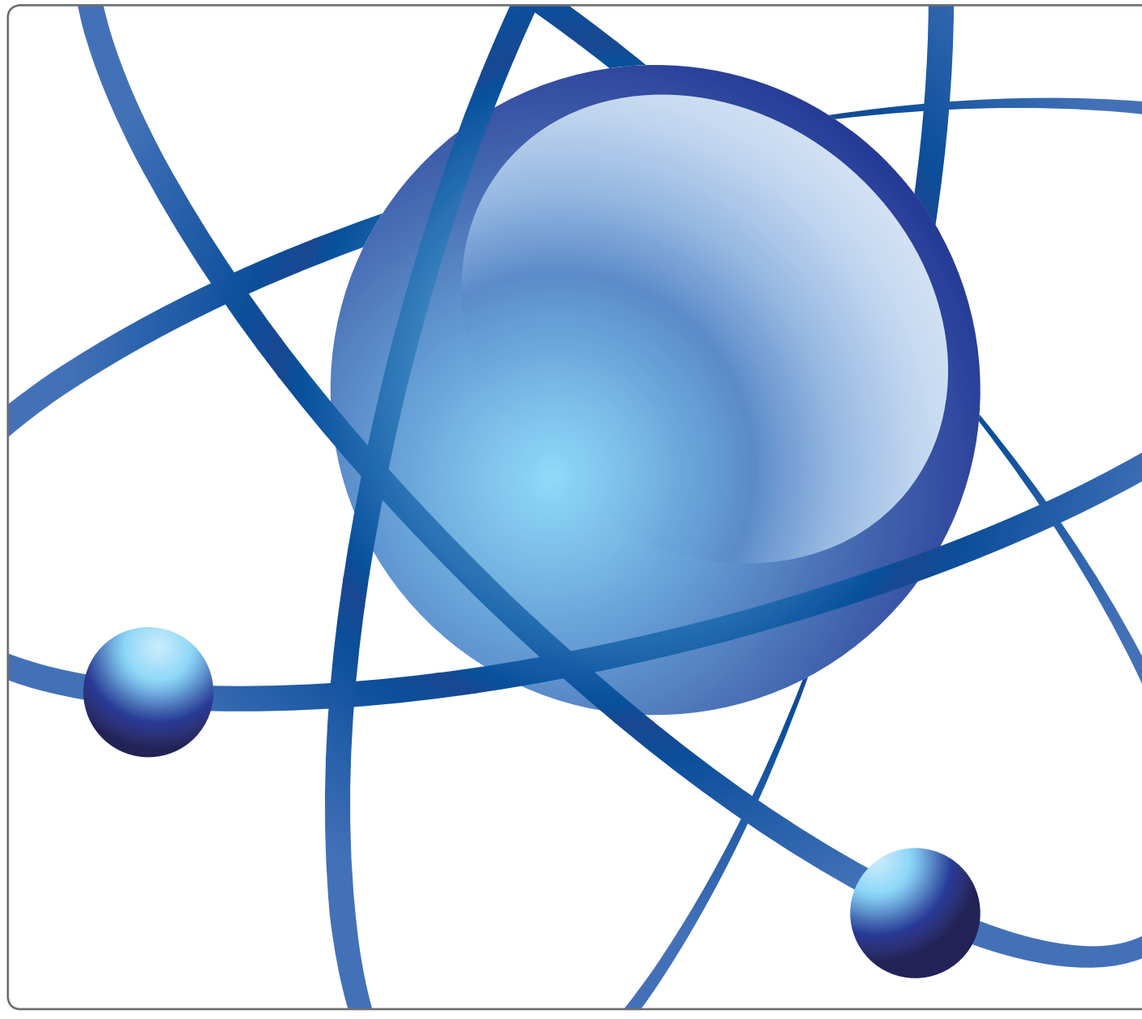
Namibia also hosted one scientific visit in the area of Application of Isotopes and Radiation in Food and Agriculture while one scientific visit was under taken in the field of Nuclear and Atomic Physics

- **Education and Training**

The availability of skills remains a challenge, which hinders progress in the advancement of the development, research and innovation in nuclear science and technology. The following skills are required to enable the full application of nuclear science technologies in Namibia: researchers in crop production; radiobiology; radiochemistry; radiation physicists, medical radiation disciplines such as radiation oncologists, medical physicists, oncology nurses, radiographers therapeutic applications, nuclear medicine technologists, radiation safety officers, and the development of skills and specialist for the application of nuclear fuel cycle activities such as nuclear engineering, nuclear physics. During the reporting period the following fellowships have been supported: one (1) PhD programme in radiochemistry; one (1) PhD programme in Radiobiology; one (1) MSc programme in the general scope of Nuclear Science and Technology; two (2) Specialisation in Nuclear Medicine; one x MSc in Medical Physics. These are some of the initiatives to develop a critical number of specialist in nuclear applications who could contribute to the development and innovation in nuclear science and technology. Consultations are underway with the *Namibia Student Assistance Fund* and the *National Research, Science & Technology Commission* to support further skills development in nuclear science and technology.

OUTLOOK FOR THE FUTURE

Approval of the policy framework is an important aspect which will enable the strengthening of the current regulatory system and promotional activities that involve nuclear technology. Improvement of the staff levels coupled with capacity development of a core number of staff in both areas of regulation and promotion of nuclear applications, should be strengthened. In particular measures should be put in place to retain the current expertise as well as to attract new skills. Infrastructure development is equally important, but must be supported through appropriate project development and project management strategies in all areas of the Board and Authority's mandate.



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Ms. Martha Hitenanye
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Mr. Axel Tibinyane
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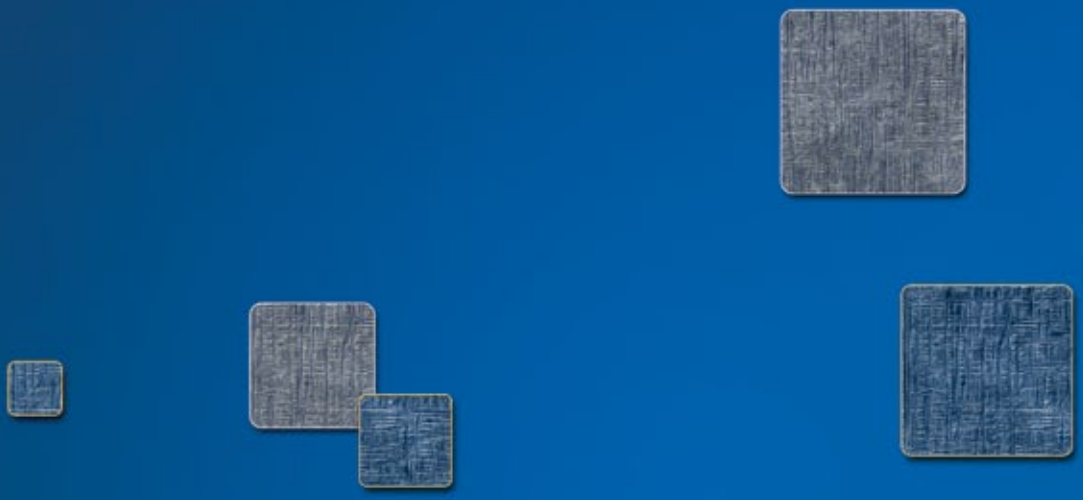

Atomic Energy Board of Namibia

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