COPING WITH NEW REGULATIONS — REPUBLIC OF NAMIBIA

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Abstract

In this paper we shall delineate the current regulatory set-up in Namibia i.e. legal framework, administrative arrangements for the management of uranium exploration, mining, milling and waste management. Uranium, mining plays a big role on the economy of Namibia. With changing policy worldwide on supply of materials and its assurance; with consequences of worldwide on supply of materials and its assurance; with consequences of the concepts of sustainable development which coupled environmental and economic consideration, industry, people, communities, and governments will realign their future perception and concepts. Environmental considerations in Namibia require that for any major development such as uranium exploration, environmental safety analysis reports are made which should incorporate community, industrial and government regulatory concerns. Namibia being a developing country, any new regulations that will consider environmental safety and regard for safe management of uranium wastes will add more pressure on present human resource needs: regulatory enhancement; and financial burden to the existing limited infrastructure. The new regulations should address the environmental effect on mill tailings which are a result of processing the uranium ore in a mill; and heap leaching residues which result from treatment of ore; tailing impoundment; tailing pile and tailing stabilization chemically or physically. From the radiation protection concepts, consideration will be made of the relationship of the new regulations and the current practice of the (ALI) recommended by the ICRP 60 of 1990 released in 1991, *vis a vis* SS-115 of IAEA for uranium intakes, considering the absence of either Nal or Germanium detector or scintillation/whole body counter in Namibia, implementation of the new regulations will require material and human resources if viable advise and training on regulatory implementation of statutory promulgation are to be enforced.

1. URANIUM EXPLORATION, MINING AND MILLING

Namibia has had several decades of uranium exploration, mining and milling. Mining is essential to the growth of our economy. The entrepreneurs are generally partners with the Government in recognizing the role of uranium mining contributes to our economic growth.

1.2. Uranium deposits

Namibia is endowed with low grade uranium resources hosted mainly in the three genetic deposit types, viz. alaskite related, surficial and sandstone type uranium deposits. The first uranium deposit, Rössing Uranium, was discovered in 1920 by a mineral prospector. Considerable number of exploration work took place from 1940 and so far 51 Uranium deposits have been found, and of these only the Rössing uranium deposit has been developed into an operational uranium mine. Others could not be developed due to low tonnage and grades found. Exploration methods include geological mapping, geochemistry of geological media, airborne radiometric surveys in many cases combined with magnetic measurements, scintillometry, percussion drilling and subsequent borehole logging. All the deposits have been compiled in a computerized database, Uranamib.

1.3. Rössing uranium mine

Rössing is a high tonnage, low grade uranium mine, located 70 km north of the coastal town of Swakomund in the Namib desert. Its host ore is alaskite. The primary mineralization (uraninite) and the majority of secondary mineralisation (beta oranophane) are economically

the most important ore minerals contributing to 55% and 40% respectively of the uranium, and the remaining 5% is betafite. There are traces of uranium in brannerite, monazite, zircon sphene, apatite and fluorite.

Mine production started in 1976. The hydrometallurgical plant was commissioned in 1976, while commercial operation started in 1978. The production capacity is 3500 t U/year, which is currently reduced due to lack of long-term sales contracts. The mine complex encompasses an area of approximately 4400 hectares. Within this area is the open pit, waste dumps, ore stockpiles, milling and acid leach recovery facility, tailings impoundment and associated support facilities. The open pit is approx. 3 km long, 0.25 km deep and 1.5 km wide. It is mined in 15m deep benches.

1.3.1. Mining and milling processes

The uranium extraction process includes drilling, blasting, loading, hauling, crushing and milling. The drilling and crushing work are carried out by wet means to suppress dust. Milling and leaching processes lead to the final stage of size reduction by rodmills operating in open circuits, in two modules with two rodmills and six leach tanks each. The resulting slurry is pumped into the leaching tanks were it is mixed with sulphuric acid, ferric sulphate and magnesium dioxide. It goes through washing and thickening process, then the slime from the thickening stage and sands from the second stage rotoscoops are re-combined into immediate tailings sump and are deposited through pipelines to tailings impoundment. Yellowcake is calcinated to uranium oxide (U_3O_8 at 98.5%U) and discharged through a hammer mill to an automatic drum filling plant where it is packed in steel drums and then dispatched to overseas customer for further processing.

2. REGULATORY INFRASTRUCTURE

Environment and radiation safety is the responsibility of the Government. The Government in meeting its obligations to the regulatory set up for safe exploration mining and milling of uranium, has required that the mining companies set up and present to the regulatory authority a code of practice for the safe operation of the mining process. This code of practice is part and parcel of our regulatory requirements until we have promulgated the Atomic Energy Act under which Uranium Mining and Milling Regulations will be issued.

General Radiation Protection Regulations for the workers have been promulgated by a Presidential Proclamation under the Labour Act and are regulated by the National Radiation Protection Services Unit of the Ministry of Health and Social Services. These regulations are based on ILO Conventions and recommendations. These regulations are complemented by the National Radiation protection policy which was ratified in November 1994. The aim of this policy is to assess, control and regulate all radiation activities in the country. The Ministry of Health and Social Services is working on a broad scope licence for uranium mining operations to be issued, in the interim, under this policy.

For now, Rössing Uranium Mine is operating under a licence issued by the Ministry of Mines and Energy, under the Minerals and Prospecting Act, which is the principal statutory instrument dealing with mining activities, in general. In this regard, The Ministry of Mines and Energy is also responsible for the control of uranium exports. Later this year the Regulatory Authority will set-up a Nuclear Material Safeguard System to implement the IAEA Safeguard Agreement which was recently entered into between Namibia and the Agency.

As you are aware, Namibia has been independent for the last eight years. There are far too many laws to be amended from the colonial and racial ordinances that were in practice prior to our independence. The labour arrangement in pre-independence Namibia were geared toward ensuring that the indigenous Namibians were available at cheap costs to the mines. Condition of work in the mines for the indigenous Namibians was very bad. We have now embarked on the policy of national reconciliation. The people, industry and the government are now united towards the building of the nation.

Our current regulatory approach in the Uranium Mining Industry is to create an understanding of the protection of the worker, the environment and the general public by setting up the code of practice based on the best available practices in the world.

Rössing Uranium Mine of Namibia has developed a detailed code of practice for the protection against ionizing radiation. The primary objective of this code is to ensure that exposures of radiation will not give rise to unacceptable levels of risk and that the sources of such exposures are identified, quantified, controlled and minimized. The regulatory authority has recognized this code for operation and practices in Namibia. This code of practice was revised after the IAEA mission recommended that the operations in our mining as applied through these codes are adequate.

3. RADIATION MONITORING PROGRAMME

Under its code of practice, the Rössing uranium mine has established an extensive monitoring programme for the protection of the workers, the general public and the environment. Area and personal monitoring is carried out across the mine in all workshops, plants, equipment and in the environment. This programme forms the basis for the assessment of occupational exposures and the effectiveness of the control programme, and quantification of the mine's environmental impact.

3.1. Background radiation

Background radiation levels are measured by exposing thermoluminescent dosimeters (TLD's) in different areas on and off the mine site.

3.2. Personnel monitoring

The personal external radiation doses of all registered radiation workers is measured with the TLD dosimeters. All designated workers are issued with such dosimeters.

3.3. Radon, thoron and progeny

Measurements of radon working levels, radon concentrations and the radon daughter equilibrium factor are used in determining the radon dosage. The thoron dosage is derived from the relative concentration of thorium in the uranium ore. Radon concentrations are measured by track etch detectors exposed over four months to obtain a time average value. In areas exhibiting high concentrations, exposure only last for two months. Grab sample measurements are also done to supplement the track etch results. The measurement of radon exhalations with the activated charcoal detectors are conducted in all areas identified as showing an enhanced exhalation of radon.

3.4. Dust monitoring

Ambient dust level monitoring comprises the determination of the respirable and the total dust concentration. The dust concentration results combined with the sizing, uranium content and

the total alpha activity are used to assess and control health and radiological hazards. Respirable dust is monitored with personal samplers in the breathing zone and in the different working areas. The high volume samplers are used to measure dust concentrations in air, and the directional samplers and fall-out plates are used to determine the dust contribution from crushers and stockpiles. Samplers of the dust collected from these monitors are sent away for radionuclide analysis which includes the determinations of gross alpha, gross beta, quantitative gamma and radium, uranium and thorium content.

Directional samplers and fall - out plates are located at the open pit, coarse ore stockpile, fine ore stockpile and the tailings dam. Samplers are placed in the four principal directions for each area. Samplers are collected monthly or when necessary and results reported annually.

4. WASTE MANAGEMENT

Radioactive wastes need to be managed both securely and safely. Security and safety entail developing and implementing relevant laws and regulations, establishing a regulatory control authority, and setting up the necessary operational capabilities. The principles of radioactive waste disposal are based on material security and maintaining their control. It is proposed that Regulatory control should include aspects that would assist customs officers, border police, other law enforcement officers, regulatory authority, and relevant bodies established in Namibia or enhance their capabilities for preventing detecting unauthorized disposal or discharge into the environment and to detect and respond to possible illicit trafficking in wastes generally.

Radioactive waste resulting from mining and milling operations, including contaminated waste materials, are disposed of and managed in accordance with approved procedures. Contaminated wastes are covered with waste rocks. Tailings from uranium extraction process is deposited through pipelines from the plant to a large valley dam impoundment. Mill tailings resulting from the leaching process of the uranium ore represent a major concern in the management of wastes from mining and milling operations. About 85% of the radioactivity originally present in the ore ends up in the tailings. In addition, the physical properties of the tailings and their chemical constituents create a potential problem of environmental contamination, which will persist for a long time after the mine has close-out. Proper tailings management, environmental monitoring and control, as well as decommissioning plans are required to preserve the current and long-term quality of the environment. Rössing uranium mine has developed a decommissioning plan which is yet to be approved by the regulatory authority.

5. PROPOSED REGULATORY INFRASTRUCTURE

The new legislation should establish a legal framework, and a regulatory authority for supporting governmental services, employers, registrants and licensees, as well as others bearing responsibility for safe mining and milling of uranium and other radioactive ores, disposal of wastes in general but paying additional attention to radioactive materials in particular.

Attention should be made of:

(a) Radioactive materials in medicine, agriculture, industry and research that are typically involved in waste generation with a view to minimization and appropriate control;
(b) The regulatory infrastructure and physical measures needed for preventing unauthorized disposal or discharges;

(c) Performance requirements, calibrations and testing of monitoring instrumentation's for the detection on compliance with disposal or discharge authorizations;
(d) Response procedure when illicit disposal or discharge is detected to remove the danger's eminence;
(e) The training requirements for persons involved in the inspection work for waste management regulatory control.

5.1. Regulatory control of discharge into environment

The regulatory Authority should be provided with sufficient powers and resources for effective regulation, and must remain independent of any government department and agencies that are responsible for the promotion, and development of the practices being regulated. It must be independent of registrant, licensees, and designers and constructors discharge practices.

For radiation protection emissions, the principles accepted for general waste safety fundamentals apply. The radiation safety fundamentals and standards in the control of discharges of radionuclides to the environment from the normal operations of practices have been recommended by IAEA Basic Safety Standards. They require that the Regulatory Authority be provided with a structured approach to limitation of risks to the members of the public and optimizing protection from such operations. This requires that guidelines be given on responsibilities of registrants and licensees in conducting discharge operations.

The scope of regulatory control of discharge into the environment should be limited to discharges into the environment of substances (including radionuclides) in the form of gases, aerosols or liquids, together with any particular materials, from the normal operations of a practice.

In addition, the law should ensure that the discharge is referred to the ongoing, or anticipated releases of harmful substances into the environment arising from normal operations of a practice or a process with a practice. Discharges of liquid substances directly to surface water bodies should be considered, but discharges of liquids substances by injection to deep underground and releases arising from accidents should be paid attention to because they pose different problems legally. They may have transboundary transportation.

5.2. Regulatory authority

The implementation of standards requires that national regulatory infrastructure be in place to enable the Government to discharge its responsibility for radiation protection and safety. An essentials part of a national infrastructure is a regulatory authority empowered to authorize and inspect regulatory activities and enforce the national legislation and regulations. The function of the authority related to discharges should include preparation of regulations, review of application to discharge materials into the environment, the approval or rejection of the applications and the granting of authorizations; the conduct of periodic inspections to verify compliance; and the enforcement against any violations of regulations, standards and license conditions. The effectiveness of safety measures for each authorized discharge together with its total potentials impact on man and the environment should be assessed.

5.3. Inspectors

The powers of the inspectors of the regulatory authority must be clearly defined and consistency of enforcement must be maintained, with provision for appeals by those

responsible for discharge Wastes. Directives to both inspectors and regulated persons must be clear. Regulated persons mean: "any organization, corporation, partnership, firm, association, trust, estate, public or private institution, group or administrative entity or other persons designated in accordance with national legislation's, who or which has responsibility and authority for any action taken under national regulatory standards".

5.4. Legal administrative requirements

(a) Practices should not be allowed or otherwise be introduced, conducted or discontinued except in accordance with the appropriate requirements of legal standards. Any legal person intending to undertake any of these actions 'shall submit a notification to the Regulatory Authority of such an intention", and shall apply for an authorization in form of a license or a registration.

(b) Exclusions from regulatory control should be clearly stated. In case of radiation discharges, it includes gaseous discharges, through building ventilation systems of radon and associated daughters arising from building materials. In general, exclusion refers to any discharge exposure whose hazards are magnitude, or likelihood is essentially unamenable to control through the legal standards.

(c) Exemptions from the requirements of regulatory control standards. The authority should be able to grant exemptions in cases where it is clear that practice is justified but regulatory provisions are unnecessary or unwarranted i.e. the risks to individuals, population and the environment caused by the exempted practices are inherently low as to be of no regulatory concern and that the exempted practice is inherently safe.

(d) Standards must prescribe limits for discharges. The exemptions are therefore below the prescribed limits.

(e) Clearance levels should be stated below which no administrative control is necessary.

6. CONCLUSION

Regulatory control is an evolutionary process which can be more effective if it is based on a process of review and correction, rather than setting precise conditions prior to allowing a process to proceed which cannot be changed to respond to the many out side impacts which can affect a process over its life cycle.

In the absence of relevant regulations, Namibia has developed a National Radiation Protection Policy, the company codes of practice is revised, regulation are being prepared to bring the future regulatory process in line with the new regulatory approach; and in addition, to enable the country to respond to new challenges and meet them, and make regulatory process commensurate with the level of risk associated with exploration, mining and milling, and associated tailing management and rehabilitation. To realize these efforts, manpower situation would need to be improved, appropriate equipment provided and inspectors empowered to assess, monitor, and regulate the uranium industry.

It is hoped that this meeting will recognize the special nature of our regulatory infrastructure and the effort that the Rössing uranium is making in protecting the workers, the environment and the public.