IMPACT OF NEW ENVIRONMENTAL AND SAFETY REGULATIONS IN ARGENTINA

E.N. ACHEN
Unidad de Proyectos Especiales de Suministros Nucleares,
Comisión Nacional de Energía Atómica,
Argentina

Abstract

Mining and processing of uranium ore has been carried out since the early fifties at several locations in Argentina. For the purpose of this presentation only the Malargüe Complex will be discussed. The second facility that will be discussed is the Cordoba Complex where uranium oxide is being produced. Since 1986, the Malargüe Complex is no longer in operation and is in the process of being decommissioned and rehabilitated. Both facilities are owned and operated by the Government's Comisión Nacional de Energia Atómica (CNEA). Two Government agencies are responsible for the implementation of the newly established Nuclear Law (Ley Nuclear), the Comisión Nacional de Energia Atómica and the Autoridad Regulatoria Nuclear (ARN). The new law follows well established international standards for radiological safety. Furthermore, any mining operation in Argentina is also governed by the country's established Mining Code. Under these regulations any new proposals will have to submit environmental impact assessments and the required public hearings before it can be approved. Thus avoiding past mistakes where practically no precautions were taken during the planning or operation stages.

1. INTRODUCTION

Uranium ore deposits have been mined in the Republic of Argentina since the early fifties, and yellow cake has been produced using different metallurgical processes in several sites.

At the end of the production stage, the facilities were decommissioned by the operator, according with the procedures approved by the Regulatory Authority and the tailings were confined and monitored to avoid their dispersion into the environment, but without final disposal.

The present regulations and standards, internationally accepted, propose a suitable management of the tailings with the objective to return the disturbed ecosystem to the community either in the same or similar conditions from the originals.

It was realized that it was necessary to adapt other experiences to our domestic scenario. Hence, it was essential to apply an interdisciplinary analysis methodology which would allow to understand the relationship between the environmental systems and the radiological and non radiological pollutants distribution.

2. PRESENT CONDITIONS IN ARGENTINA

2.1. Uranium deposits

At present, the main known deposits, with economically exploitable reserves, are:

Sierra Pintada (Mendoza Province)

It is located 1200 km to the west of the city of Buenos Aires in the foothill of the mountain chain of Los Andes. The updated uranium resources amount to a total of 5900 t U in the

category "Reasonably Assured Resources" (RAR) < $130/kg U and 2400 t U in the category RAR < $80/kg U.

In the category "Estimated Additional Resources (EAR)-I a total of 910 t < $80/kg U. This deposit, is currently in stand-by and is one that supplies our uranium production plant.

Cerro Solo (Chubut Province)

It is located 1600 km to the southwest of the city of Buenos Aires, at 630 m above the sea level and in a plateau that allows to work all year round.

This project is, at present, in the stage of advanced intensive exploration, more than 500 holes have been drilled in a 300 hectares area.

The main ore bodies are 70 to 110 m deep, 3 m of average thickness and grading between 0.3 to 0.5% of uranium. The mineralization is of tabular type and of irregular distribution with frequent high grade and thickness concentration. This project is exploring the viability of integrating a Join Venture agreement to carry out the trial feasibility study of the deposit with an option to start operation by the investor. During the period 1995 and 1996, a total of 12,000 m of evaluation drilling was carried out. This has produced a recent update of the reserves to a total of 2,330 t U under the RAR < $80/kg U category and an addition of 2,830 t U in the category EAR-1 < $130/t U.

Our country has sufficient uranium to supply our reactors. But as a consequence of the opening of our economy, the evolution in the international market and our internal costs, at present, we are buying uranium, under the form of concentrate, from the international market, and only a small amount comes from of our production plant.

2.2. Uranium mine and mill tailings

In the country there are several sites with uranium mine and mill tailings. They are still under the control of the operator waiting for the final disposal. Among these are the Malargüe and Córdoba complexes.

Malargüe Complex

The Malargüe facility of the Comisión Nacional de Energía Atómica (CNEA) is located about 500 m NE of the northern outskirts of the town of Malargüe. The town is 420 km south of the city of Mendoza, the capital of the province.

About 700,000 metric tons of uranium tailings were disposed off during 32 years of operation of the Malargüe mill. The average grade of uranium ore processed by the mill was 0.14% uranium.

The SW edge of the tailings disposal area is about 100 m from the administrative offices of the Malargüe mill. The tailings, which were deposited between 1954 and 1986 on an eight ha pile, can be classified as dry to semidry.

Since 1986 the facility is no longer in operation but its responsibility is still assumed by the operator (CNEA).

Córdoba Complex

The Córdoba Complex is situated in the city of Córdoba, the capital of the province, in the down town area. There, uranium dioxide production facility is currently in operation. At this site 18,000 metric tons of uranium mill tailings were disposed off until 1978. At that time other activities were also developed in the complex.

3. LEGISLATIVE AND REGULATORY FRAMEWORK

3.1. Ley nuclear (nuclear law)

The Nuclear Law establishes the responsibilities in the nuclear field. Two organisms are included: the "Comisión Nacional de Energía Atómica" - CNEA (National Atomic Energy Commission) and the "Autoridad Regulatoria Nuclear" - ARN (Nuclear Regulatory Authority).

The CNEA is the promoting organization of the nuclear activities and it has the responsibility of the radioactive waste management. In respect to uranium mining, it can develop all and related activities as private companies.

The ARN establishes the regulations and requirements and is the enforcement organism.

3.2. Norma Básica de Seguridad Radiológica AR 10.1.1 (Basic Standard of Radiological Safety) 1995

The purpose of this standard is to achieve an appropriate level of protection for people against the risks associated with the exposure to ionizing radiation and the radiological safety of the facilities or the practices.

The scope of the standard is limited to the protection of human beings only. It is considered that standards of protection that are adequate for this purpose will also ensure that no other species is threatened as a population, even if individuals of the species may be harmed.

The standard has requirements for practices and interventions.

The competent authority in this matter is the "Autoridad Regulatoria Nuclear" (Nuclear Regulatory Authority) ARN. It is a prescriptive regulatory authority.

3.2.1. Requirements for uranium mine and mill tailings

In the framework of the AR 10.1.1 standard are the RQ-86 and the RQ-85 requirements for the uranium tailings management of the Malargüe and Córdoba Complexes.

They establish that:

(a) the critical group should not receive a dose higher than 0.1 mSv per year, and
(b) a long term waste management should be done.

Actually the 0.1 mSv/year dose is in a revision process.

3.3. Código de Minería (mining code)

The Mining Code (MC) determinates that the mining must be done in accordance with policy, safety and preservation rules of the environment. It establishes the environmental protection legislation frame.

The environmental and mining agencies in each provinces are the enforcement authorities of the code.

The scope of this code covers:

(a) all mining activities, such as prospection, exploration, development, etc.
(b) milling activities, such as crushing, grinding, etc.,
(c) waste management

The parties (operators) in order to begin an activity they have to present an environmental impact assessment and an environmental impact statement must be obtained.

The purpose of the environmental assessment is to determine the potential impacts of a project on the physical, biological and socio-economic environment with a view towards determining mitigating measures for significant impacts and ultimately judging the acceptability of the project, balancing the potential impacts against the benefits.

4. CASE HISTORY

4.1. Malargüe Complex

In the framework of the national and provincial regulations it was necessary to develop a strategy to acquire the necessary technical knowledge in order to define the mining and milling uranium tailings management technology in the context of the whole criteria of radioactive waste management.

The final goal was to establish and implement the policies and procedures which will allow the proper management of this type of wastes within the limits imposed by the Radiological and Non Radiological Regulatory Authorities.

A general work plan resulting from the application of a block sequence technique to the basic investigations, needed to understand the problem and to determine the complementary research required, was established. It included the geological and hydrogeological characterization of the surrounding area of the facility, as well as the associated flora and fauna.

It analyzed quantitatively the radiological hazards to the members of the public and it was integrated with the safety assessment of non radiological hazards.

All relevant pathways that give rise to normal and potential exposures were identified and featured. Meteorological data as well as aquatic transport parameters were obtained and evaluated.

Once the possible dispersion extent is known, the limits of the disturbed ecosystem might be determined and compared with another undisturbed ecosystem to discriminate the potential effects produced by the tailings.

The unacceptable risks for the man and the environment were assessed and with all important variables known, the final assessment of the concurrent factors was completed.

Some potential solutions were analyzed in the framework of the following internationally accepted criteria:

(a) The dose limits specified by the Regulatory Authority should be observed.
(b) The annual releases of radioactive and non radioactive contaminants to the environment should be kept under the limits specified by the Provincial and Federal Authorities.
(c) Any exposure arising from the site must respect the ALARA principle.
(d) The options minimizing the institutional control and the maintenance should be preferred.
(e) The use of passive barriers to confine the contaminants should be maximized.

It was considered that the impoundment concept was consistent with the overall Argentine strategy for radioactive waste management, taking into account that it was the best and most widely used option to isolate the tailings from the environment.

Finally, the document "Environmental Impact Assessment and Long Term Management of the uranium tailings from the Industrial Complex Malargüe" came to the decision that the disposal of the wastes be kept in the same place with some relocations.

The basic and the detail engineering of the project have been finalized and they have been forwarded for the consideration of the provincial and federal authorities and presented in a public hearing to the population of the area. This project, which is of relevant importance, is being already executed.

4.2. Córdoba Complex

The uranium mill tailings that exist in the Córdoba Complex is an example where intervention criteria should be applied as in AR 10.1.1 standard.

⇒ Chronic exposure situation requiring remedial action to reduce or avert chronic exposure to radioactive wastes from past events.

ICRP Publication 60 in such a situation recommends the application of a protection system based on the following general principles:

(a) The proposed intervention should do more good than harm, i.e. the reduction in damage resulting from the reduction in dose should be sufficient to justify the harm and costs, including social costs, of the intervention.
(b) The form, scale, and duration of the intervention should be optimized so that the net benefit of the of the reduction of dose, i.e. the benefit of the reduction in radiation damage, less the damage associated with the intervention, should be maximized.

It is important to note that detrimental impacts due to mill tailings are not restricted to radiological hazards. Remediation activities, in general, have to address a variety of other potentially detrimental impacts. Important examples are:

(a) Physical hazards (e.g. failure of dams)
(b) Exposures to chemical substances, and
(c) Additional risks caused by the reclamation activities themselves, such as risks of traffic accidents while hauling large amount of material over public roads.

The long term uranium mill tailings management project is being currently carried out. The principals steps are:

(a) Site characterization and problem definition and, on this basis, assessment of currently prevailing and potential risks taking into account future changes;
(b) Identification of remedial and management options and evaluation of their risk reduction potential, costs and other relevant factors;
(c) Use of decision-making techniques such as cost-benefit analysis or multi-attribute analysis to decide the best waste management option in order to mitigate the impacts.

4. CONCLUSIONS

During recent years, there has been an increasing knowledge of the environmental and safety issues in mining and milling. Environmental impact assessments are now being carried out before starting up of new mines in most countries, including planning for mine and mill closure.

The new regulations in the safety field as well as the new environmental protection legislation in our country provide the frame for the technological decisions in the uranium mine and mill activities. Thus it will be possible in the future to avoid the very costly environmental restoration that is today being carried out at some sites where practically no precautions were taken during the planning or operation stages.

Nowadays, parallel with the continuing reduction of the mining of uranium ores, the remediation and decommissioning activities are becoming the main program of CNEA.

As many of these mines started before the environmental impact assessments were previously made, plans are being developed now in order to remedy these situations.