Best Practices

in the IAEA's technical cooperation programme

Technical Cooperation
KNOWLEDGE MANAGEMENT

Technological transfer on in situ leaching (ISL) mining: A more sustainable alternative for uranium production in Argentina

TC projects: ARG/3/012 and ARG/3/014

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Category:

1. Country Programme Framework/ Regional Profile Process
2. Programme Cycle Management (PCM)
3. Logical Framework Methodology
6. Partnership
7. Project Results

Best Practice Description:

Description

In situ leaching (ISL) mining is defined as the leaching of uranium from a host sandstone by chemical solutions and the recovery of the aforementioned element at the surface. ISL extraction is conducted by injecting a suitable leach solution into the ore zone below the water table; oxidizing, complexing, and mobilizing the uranium; recovering the pregnant solutions through production wells; and, finally, pumping the uranium bearing solution to the surface for further processing.

This Best Practice refers to the importance of a comprehensive perspective of the use of this mining method, which is playing an increasing role in uranium production worldwide in sedimentary basins and uranium deposits of geological types similar to those studied in Argentina.

Problem/Issue

Argentina's identified uranium resources account for more than 31 000 TU, coming mainly from the Sierra Pintada and Cerro Solo deposits located in Mendoza and Chubut provinces respectively. Both these deposits could be exploited by open pit mining, but social acceptance would be very difficult to ensure. In addition, there are specific provincial laws against this mining method.

The outcomes achieved in the framework of the technical cooperation (TC) project on ISL allowed the country to have a more sustainable alternative for the uranium production cycle in the future.

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Best Practice Description: cont'd:

How & who

The logical framework matrix for the TC project involved the following outputs: uranium favourability and exploration, production feasibility, environmental impact assessment, regulatory issues, development of human resources programmes, and the purchase and start-up of new equipment.

The project activities were carried out by the Raw Material Exploration Branch, National Atomic Energy Commission (CNEA), which has Regional Offices in the Central, Northern, Southern and Western parts of the country.

The IAEA technical cooperation programme supported interaction with specialized ISL technology organizations from Australia, Czech Republic, France, Kazakhstan and USA.

Sub Categories:

- Supporting medium term development objectives
- Meeting current and emerging country or regional needs
- Planning, concept and project design
- Evaluation
- Comprehensiveness
- Strategic
- Technical
- Sustainability of a transferred technology
- Impact on decision and policy makers

Approach

The technology transfer was carried out through two lines of action: development and strengthening of human resources in the ISL uranium mining cycle, and the acquisition of operational capabilities to support the exploration activities, emphasizing innovative geophysical technology (magneto telluric, well logging, and gamma ray spectrometry). The human resource component was fulfilled through the implementation of expert missions, scientific visits to ISL facilities, training courses both overseas and in-country, and through participation in national and international meetings. As part of the purchasing procedure for relevant equipment, on-site training courses on installation and operation were implemented by the provider, which was beneficial and expedient for the working groups.

In parallel with TC project activities, the exploration branch carried out ISL uranium projects, as follows:

Prospecting: Tertiary sandstone units of the Neuquen Basin (Rio Negro province) are under study. In this project, the compilation of information from the oil industry managed by the National Fuel Secretariat, field geological reconnaissance, petrophysical determinations and petrological studies led to the delimitation of new areas of interest.

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Best Practice Description:
cont'd:

Exploration: Advanced studies have been conducted in the Pichiñan U district (Chubut province), where in given sites several uranium mineralized levels have been determined with drilling related to geological formations placed in confined aquifers with hydrogeological conditions and water chemical composition that are very encouraging for ISL.

Research & Development/Feasibility: Preliminary studies have been addressed to determine the production feasibility of using block leaching at the Don Otto site (Salta province), pursuing the objective of having an alternative that may be applicable in the district, plus the possibility of recovering part of the remaining uranium resources of the former underground mine that operated between 1963 and 1981.

How effective

A high degree of efficiency was achieved due to a large extent to the fact that at the same time as the technology transfer, within the framework of institutional goals and public investment projects dedicated to the exploration of nuclear raw materials, the CNEA has been carrying out different projects as specified in the paragraphs above.

Lessons Learned

Knowledge of state of the art ISL constituted a baseline for building a uranium mining strategy, by gathering examples of both good and bad practices implemented in the past.

Key Success factors

A high degree of institutional commitment and support for implementing the programmed activities and smooth communication and interaction among the project team members can be mentioned among the most important factors that helped to achieve the success of the TC project. (Please also refers to 'How effective').

Beneficiaries

In addition to the direct benefits for the CNEA, the results of the TC project will help the design of future projects in the country that consider a more sustainable use of uranium resources for nuclear power generation.

Best Practice Description: cont'd:

Quality Criteria

Relevance: There were no other projects using a similar technological approach in Argentina, where open pit and underground mining had been the methods exclusively used for uranium production. Even for the Latin American region, the application of ISL would be an innovative experience.

Ownership: One of the most remarkable aspects is that the ISL uranium mining studies have been included in the CNEA Strategic Programme 2010 - 2018, designed on behalf of the Argentinean Nuclear Plan.

Sustainability: The CNEA is carrying out long term ISL uranium mining projects in different regions of the country, taking into account an adequate planning and development process for uranium resources, environmental controls, regulatory issues and stakeholders involvement.

Special conditions

On the basis of experience gained, it would be recommendable to raise awareness on technological transfer projects in countries where the geological setting is favourable for sandstone hosted uranium deposits where ISL could be used.