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Closing and opening mines: two facets of Cogema's mining strategy reflecting its commitment to sustainable development

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Abstract

All industrial corporations face the difficult challenge of adapting the number of production sites they operate to prevailing economic conditions, while pursuing a long-term strategy involving a sustained level of new investment. Achieving this delicate balance, however, often requires special technical, financial and managerial expertise, particularly in the mining industry.

Closing older mines and opening new ones are thus by no means contradictory for operators who want to stay alive: it is a fact of life and an economic necessity. But more important today is the need to make sure that such closures and openings are done properly, in accordance with the principles of sustainable development: this is of course an ethical necessity, but also a well-placed investment, necessary to ensure that future operations will be regarded positively by the people who watch us.

And, needless to say, we are indeed being watched, both as miners and as "nuclear" actors....

Cogema has substantial experience of successfully closing and opening mines, and, we believe, an excellent track record.

Persistent underlying trends in the uranium market since 1985 have maintained a downward spiral in both spot prices and prices of long-term supply contracts covering increasingly short periods. For Cogema, this situation has weakened the profitability of certain long-standing mining assets, which comprise low- and medium-grade deposits whose reserves are declining.

To remain a responsible, reliable supplier for its clients – utilities all over the world – Cogema has responded to this situation with a 15-year sequence of restructuring, closure and redevelopment operations for eight mines in France, one in Gabon and two in the United States. The company is also winding down operations for Cluff Lake, its oldest mine in Canada.

Concurrently, and while remaining present in Niger, Cogema repositioned its uranium production facilities in Canada, where it developed the McClean Lake deposit, opening the corresponding mine and constructing a brand new mill, and implemented with its partners the pilot projects of Cigar Lake and McArthur River, the two "giant" deposits discovered respectively in 1980 and 1988. For these projects, Cogema applied innovative environmental approaches fully consistent with its commitment to sustainable development.

At the same time, looking further down the road to its long-term future, Cogema also continued exploration and development efforts worldwide, for example in Kazakhstan.

1. Uranium Mine Closures

Introduction

Timetable

- Closure of the Lozère mines owned by CFM, prior to CFM's acquisition (Le Cellier in 1986, Les Pierres Plantées in 1997, Villeret in 1988 and Les Bondons in 1989).
- Closure of the Vendée Mining District in 1990.
- Closure of the La Crouzille Mining District in 1992.
- Closure of the Hérault Mining District in 1997.
- Closure of the Mounana mine (COMUF) in Gabon in 1999.
- Closure of the mines in Wyoming and Texas in 2000.
- Closure of Société des Mines de Jouac in France in 2001.
- Scheduled closure of Cluff Lake in 2002.

Commitment to Sustainable Development

The procedures and methodologies Cogema has implemented to close mines provide examples of the pioneering application of the basic principles of sustainable development. They include five main phases:

- Appropriate restructuring, optimization and planning actions, in anticipation of closure.
- Anticipating social issues in collaboration with employees.
- Securing the facilities, followed by decommissioning, dismantling and site reclamation, in accordance with good practice, adapting to the specific geographical features of the sites in France and Gabon for instance, and in continuous consultation with local residents, associations, elected officials and authorities.
- Supporting new industrial development in partnership with local, federal, national and international authorities and specialist organisations.
- Monitoring the environment after closure, with selective water treatment, in compliance with local regulations and international guidelines.

A. Restructuring and Closure

The French Mines Experience

In 1988 Cogema conducted an objective inventory of the physical, social and financial characteristics of its mines in France. An optimization and phase-out schedule was then promptly drafted to provide for:

- 1) Immediate closure of the Vendée Mining District in 1990.
- 2) Short-term restructuring of the La Crouzille Mining District in 1989 (mining of the 5000 highest-grade tonnes), followed by closure in 1992.
- 3) Restructuring of the Hérault Mining District, including introduction of an innovative underground mine radio communication system enabling staff cutbacks in 1990 and 1993, followed by closure in 1997 after unsuccessful additional exploration spendings and depletion of the deposit.

Restructuring of the Le Bernardan mine (Société des Mines de Jouac, purchased from TOTAL in 1993) followed in 1995. Closure of this mine is occurring this year, because of depletion of reserves.

B. Redundancy Plans with a "French Touch" Adaptable to Other Countries

Redundancy plans in metropolitan France are tailored to the national culture and specific features of the job market, but may serve as models for other countries. Mainly applied by medium-sized and large companies in France, they offer solutions for suitable redeployment of the employees concerned within a precisely defined framework.

Forced to implement staff cutbacks for the first time in its history, Cogema thus remained true to its worldwide tradition of social responsibility, while gradually developing its own measures and initiatives to:

- Set up employee redeployment groups and provide personalized tracking.
- Foster internal transfer procedures and promote inter-unit solidarity.
- Facilitate vocational retraining and job opportunities in other companies.
- Support business start-ups.
- Implement age-related measures (early retirement).

Spread over more than 10 years, these plans in France have affected about 2500 people, and in Gabon, more than 400.

As a measure of the effectiveness of the redundancy plans implemented, for the Hérault activities closed in 1997, only 3 individual cases remain today to be solved, for an initial workforce of more than 250. All the others have either retired or found new employment, whether inside or outside Cogema.

C. Site Reclamation (typical duration: three to five years)

Site redevelopment represents a tangible application of the Group's assertive environmental policy.

Decommissioning and reclamation of mine site facilities are just as much an integral part of industrial operations as developing new businesses and expanding production. Always anticipated and planned, these actions are designed and implemented with all the diligence and motivation required to meet Cogema's commitment to sustainable development.

Adopting an assertive approach, Cogema's Mines Business Unit therefore set ambitious objectives for site reclamation:

- Ensure long-term stability, both in terms of safety and public health.
- Reduce the residual impact of operations, to a level As Low As Reasonably Achievable (ALARA).
- Limit the areas subject to land use limitations.
- Promote site reconversion or open sites up for surface activities.
- Landscape the site successfully, in consultation with local interested parties.
- Communicate and enter into dialogue with local residents, associations and environmental organisations for each action undertaken.

In addition, basic guidelines consistent with industrial requirements were adopted such as:

- Comply strictly with applicable local regulations or anticipate regulatory changes, if foreseeable, in particular in the field of radiation protection.
- Prefer preventive to corrective measures.
- Identify solutions that offer an optimum cost/benefit ratio, the benefit being measured both quantitatively and qualitatively.

Also, for each site reclamation programme, Cogema calls on around 20 national or international scientific expert organisations (e.g., the EU SYSMIN scheme for COMUF reclamation in Gabon) to conduct feasibility studies covering a wide range of areas including biology, civil engineering, climatology, geology and radiology.

Research and development is also carried out to improve reclamation efficiency.

The results are commensurate with the investments (about EURO 300 million will have been spent over 15 years), and the reclaimed sites have often received special recognition, such as the environment prize awarded by APAVE for the Les Bondons site and a regional environmental award for the Ecarpière site in Vendée.

D. Reindustrialization (generally spans over two to seven years)

Since its inception, the Cogema Group has participated actively in the economic development of the regions in which it operates. Its support is not limited to the industrial operations period, however, but continues after closure with the introduction of local development and reindustrialization plans. These plans are either conducted independently or in partnership with public authorities, combining development incentives and prospecting for new business.

Significant results have been achieved for French mine closures. Cogema has allocated more than 1000 job creation subsidies to 150 start-ups or expanding local companies.

E. Environmental Monitoring (at least five to ten years)

Cogema's Mining Business Unit is strongly aware of its responsibility for the quality of the land restored for future generations. This responsibility involves observing, measuring and monitoring changes in the restored natural environment, after reclamation, often way beyond regulatory requirements.

Thousands of water, air, soil, sediment and plant samples are thus analyzed annually on each of the sites closed in the United States, Gabon and France. The resulting data are presented to and discussed by local committees.

2. Uranium Mine Openings

Working the "Giant" Deposits and Innovating to Anticipate Environmental Impact

Opening mines in the 21st century, in a depressed market, primarily requires mining the earth's richest deposits. Ore grades of these deposits (McClean Lake, Cigar Lake, McArthur River) are 10 to 60 times higher than those of traditional deposits, reaching several percent.

This has several environmental consequences:

- Mines are smaller and, for the same quantity of extracted uranium, the tonnage of ore to be milled and the mine tailings to be stored are decreased.
- In contrast, the radionuclide concentration of the ores and tailings, and the resulting radioactivity, are much higher than for conventional or earlier mines.

These special features require operators to devise and propose techniques never used before in metal mining to prevent human contact with the ore at all levels, and to protect and design leakproof tailings storage facilities to allow future inerting during site reclamation.

Three perfect illustrations of this are Cogema's management of the JEB mill tailings at the McClean Lake site in Canada, the mining methods employed in the jointly-owned McArthur River deposit by the operator, CAMECO, and the jet-boring method tested by Cogema for mining the Cigar Lake deposit.

The Example of the JEB Mill in Canada

The JEB uranium mill is the first to be licensed in North America in 15 years. The milling process is largely conventional, but the mill and its tailings management facility (TMF) have a number of innovative features.

- The facility is designed to process ores from 2% to 30% in grade. The mill's flexibility and safety features, therefore, are exceptional.
- The main slurry handling system, primarily leaching and storage, is confined in sealed modules that separate gamma radiation generation areas from the control and operation areas of the mill. An elevated concrete slab separates the lower floor modules from the operating switches, valves and energizing equipment as well as from the personnel operating them.
- A dual-speed, one-pass air ventilation system moves fresh air through clean areas such as control rooms through to low and then potentially higher contamination areas in the mill before being exhausted to the outside.
- The mill's radiation monitoring systems are the most extensive of any mill in the world and set a new standard for employee protection.
- The JEB TMF is based on a natural surround concept, which is a recent technical improvement of such containment systems in Canada. Depositing tailings under water protects personnel from potential radiation and airborne emissions. Features of tailings preparation, such as converting arsenic to a stable form, further increase environmental protection. The TMF is designed for the decommissioning that will eventually take place, leaving an impervious covered plug that will further protect the environment from the release of contaminants.

Developing ISL Fields in Kazakhstan and Modelling Potential Contamination

In-situ leaching (ISL) is usually applicable to roll deposits that contain low-grade ore but yield high tonnages. The geological features of these deposits, which are mainly composed of alternating sandstone-clay strata with aquifers and impervious layers, favour the injection of a uranium leaching reagent and pump-out of the resulting uranium-bearing solutions.

Recovering uranium using the ISL technology usually requires an oxidation stage. This stage is likely to mobilize additional amounts of uranium decay radionuclides which may,

if not fully controlled, contaminate other aquifers. An operating knowledge is thus necessary to properly manage solution mining operations.

Drawing on experience gained at its facilities in Wyoming and Texas, and with the help of the 15 years experience of our Kazakh partner, the Mining Business Unit is currently conducting a pilot project at Muyunkum in Kazakhstan with special emphasis on:

- Modelling the potential contamination and the chemical and spatial changes of the water tables.
- Developing chemical inerting techniques.
- Performing a comprehensive environmental analysis.

Before making a further commitment, which by the way would necessitate the prospect of a more favourable market, Cogema will wait for the results of its detailed studies designed to demonstrate beyond any doubt that such a project will not have any negative short- or long-term impact on the population and the environment.

3. Conclusions

Uranium producers now need more than just resources to ensure continued output. They must also:

- Demonstrate an industrially sound and socially responsible track record, backed by strong environmental management expertise.
- Promote a dramatic reduction of the environmental impact of new mine facilities and areas, both during and after mining operations, starting from the design phase.

Cogema has made these duties an integral part of its industrial mission to provide customers with long-term services. Its commitment to sustainable development means conforming to the exemplary standards the entire world expects from the nuclear industry.