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Economic Evaluation of Uranium Projects (Niger case study)

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I- PRESENTATION OF NIGER REPUBLIC

i- Geographical framework of Niger

Landlock country located in West Africa, the Republic of NIGER covers 1,267,000 Km2 with a population of 17.1millions. It is a democratic country with stable institutions and elected representatives at all levels. It is a decentralized country with eight (8) Regions: Agadez, Diffa, Dosso, Maradi, Niamey, Tahoua, Tillabéri and Zinder; Niamey is the capital.

ii- Geological framework of Niger

The geological framework of Niger is characterized by four (4) basements which include:
1- Liptako Gourma (North-East of west African craton): gold, lithium , phosphates, iron, copper, molybdenum, zinc, titanium, dolomite, vanadium chromites, manganese etc.;
2- Air mountains to the northern part of the country: uranium, coal, gold, molybdenum, etc;
3- Damagaram Mounio et South Maradi in central South: Gold;
4- Djado to the North-East: gold, gypsum, phosphates, uranium etc.

II- OVERVIEW OF URANIUM POTENTIALS IN NIGER

Uranium minerals have been found in the Iullemmeden basin which is a sedimentary basin. The Iullemmeden basin is composed of two sub-basins:

1- The Tim Mersoi basin which is located in the north part;
2- The Ader Doutchi located to the south west.

This basin contains the following mineralization indices: coal, phosphates, gypsum, limestone, benthonite, manganese, oil etc;

Uranium occurs mainly in the first basin. There are two types of uranium minerals characteristics:
 tretravalent uranium minerals (pechblende et coffinite) caracterized by reduced areas ;
 hexavalent uranium minerals (vanadates, phosphates, silicates, arsenites and molybdenum) which are characterized by oxided deposits area.
These two types of uranium minerals have been used to identify two types of uranium deposits which are:
 Carboniferous uranium deposits (Akouta, afasto-Ouest, Arlit, Madaouela, Tassa N'Taghalgué) ;
 Jurassic and Cretaceous uranium deposits (Imouraren, Azelik, Assaouas);

i- Uranium resources of exploration projects

Two major exploration projects have been carried out:

a- Sekiret project from 1985-1986, conducted by the association of ONAREM-PNC. The drillings have cross Tchirezrine 2 to Guezouma. All the activities have been centred on the Illummeden basin. In the Guezouman, uranium mineralization is 2.25 m thick with a grade of 0.04 % eU3O8).

b- Techili project from 1989 to 1990, the aim of this project is to evaluate uranium resources in the sectors of Madaouela and north Arlit. The thickness of the mineralization is 3,4 m with average grade of 0,2%.

ii- Uranium resources of exploitation projects

There are four companies extracting uranium in Niger. Unfortunately, due to the fall of uranium price, two companies (IMOURAREN and SOMINA) have closed. The two remaining companies (SOMAIR and COMINAK) are under a programme of social plan to reduce the number of employees.

III- ECONOMIC EVALUATION PROCESS OF URANIUM PROJECTS IN NIGER

Economic evaluations of mining projects include the examination and the assessment of technical, financial, social and political aspects of the environment in which the mineral deposit is located. These include the estimation of mineable ore deposits, the production rates, capital expenses and cost of operations. The financial assessment will be set according to the fiscal regime of the host country to generate standard project evaluation criteria such as NPV and IRR.

i- steps of uranium projects evaluation

In Niger, any mining project evaluation is based on a specific guide line called "canevas"and a working committee. The guide line is based on the following points:

a- a general presentation of the project;
b- a presentation of the investors;
c- Juridical analysis;
d- Market analysis;
e- Environmental and social impact assessment;
f- Technical analysis;
g- Financial and rentability analysis and;
h- Risks analysis.

The activities conducted by the working committee will be based on this schedule. For this, some ministries and other related structures will be identified to make up this committee.

ii- Parties involved in the evaluation process

The parties involved in the evaluation process come from the following entities:
• The General Secretary or his representative,
• The General Director of Mines;
• The Director of Mines;
• One representative of the Ministry of Finances;
• One representative of the Ministry of Environment;
• One representative of the General Direction of Customs;
• One representative of the Ministry of Water Resources;
• One representative of the Ministry of Agriculture and Wild life;
• One representative of the General Direction of Taxes;
• One representative of the Bureau of Environmental Impact Assessment;
• One representative of the Presidential Cabinet;
• One representative of the Prime Minister Cabinet;
• One representative of SOPAMIN;
• One representative of each technical Direction within the Ministry of Mines.

After the selection, the committee will be set up by decree signed by the Ministry of Mines, the General Secretary or the General Director of Mines will be the president of this committe.

The report of the feasibility study will be done through the following chapters:

 Chapter I: Introduction, Summary and Conclusions;
 Chapter II: Geology and hydrogeology;
 Chapter II: Resources;
 Chapter IV: Mine;
 Chapter V: Mineral processing;
 Chapter VI: Alternative mines and processing designs
 Chapter VII: Infrastructures;
 Chapter VIII: Transports and logistics;
 Chapter IX: Employment and training;
 Chapter X: Structure and organisation of the project;
 Chapter XI: Environment;
 Chapter Xii: Health, security and radioprotection;
 Chapter XIV: Communication;
 Chapter XV: Economic evaluations and;
 Chapter Social and impacts for the Country.

It is important to notify that the demand for exploitation licence is accompanied by the licence of Environmental Impact Assessment, and the report of environmental assessment. The report of the feasibility study will be sent to each member of the committee at least one month before the meeting of the committee. Before the convocation of this meeting, the Direction of Mines has to do a preliminary economic evaluation.

Once the committee meets, some working groups are set up according to the areas of expertise of each participant. A place and time will be allocated to each working group.

It should also be noted that representatives of the company which submit the Feasibility studies will attend to the workshop to answer to the questions of the committee and to defend their work.

Once each group has made a decision to accept or reject the part on which they have worked on, all the groups meet to take a final decision. A succinct summary deliberated from the decision may usually be:
- The feasibility study submitted by such company is accepted subject to integrate the observations made by the committee or;
- The feasibility study submitted by such company is rejected for lack of conformity, insufficiency etc.
The economic evaluation of mining project is mainly based on the Net Present Value (NPV) and the Internal Rate of Return (IRR) which are two parameters used to evaluate the degree rentability of a project through its lifespan.
To determine these two parameters, there is need to build a financial model to confirm the results of the economic evaluation presented in the feasibility study.
After building the financial model, we pass to the sensitivity analysis to know which of the technical or economic parameters which impacts more the NPV.

Sensitivity analysis
- sensitivity to the ore grade
The impact of a variation in the ore content may be small or significant in terms of cash flows, but the increase in this content may cause a decrease or increase of metal covered depending on the type of treatment applied (static or dynamic).

- Sensitivity to the type of ore processing.
  This analysis always shows that the ore processing efficiency varies with the ore grade.
- Sensitivity of technical and economic parameters
  The analysis consists in evaluating the impact of these parameters on cash flows. These parameters include: cost of mining of the ore, cost of ore processing (static or dynamic), cost of metal treatment (static or dynamic), recovery rate of the plant by the type of treatment (static or dynamic), fixed costs, sales price.

IV- The socio-economic benefits for the country:
- Job creation ;
- Capacity buildings ;
- Creation of revenues (dividends, royalties, taxes) ;
- Sustainability of mining activities;
- Building of infrastructures such as: schools, health center, roads; water infrastructures, etc.
V- Risk analysis
The risk analysis is based on the study of some parameters such as: the political context of the country, the security, the stability of the fiscal regime, the market long term price etc.

VI- CONCLUSION

Mineral project assessment requires the evaluation of technical inputs such as: the mineable reserves, the production rates, recoveries, costs and revenues. These parameters form the basis of mine project evaluation together with the tax regime of the host country.

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Country or International Organization

Niger

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