



GARA DJEBILET IRON ORE DEPOSIT

Project Presentation & Investment Opportunities



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30th October 2023 / AISU EGYPT





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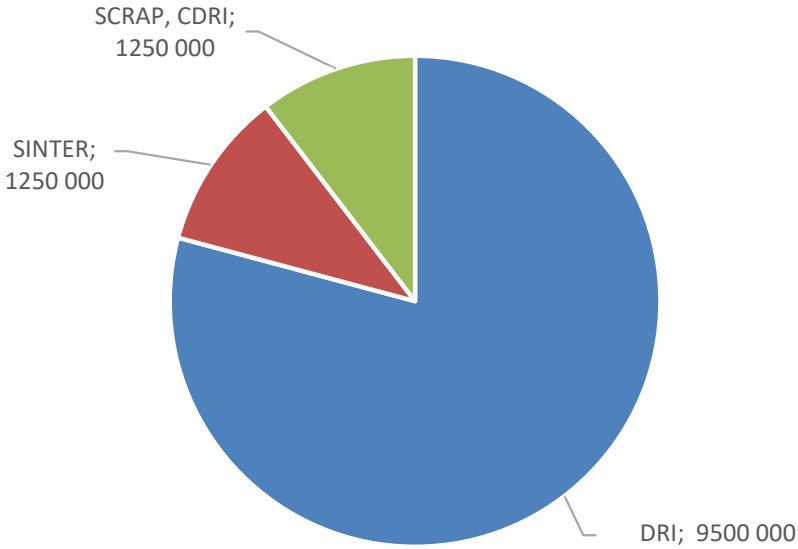
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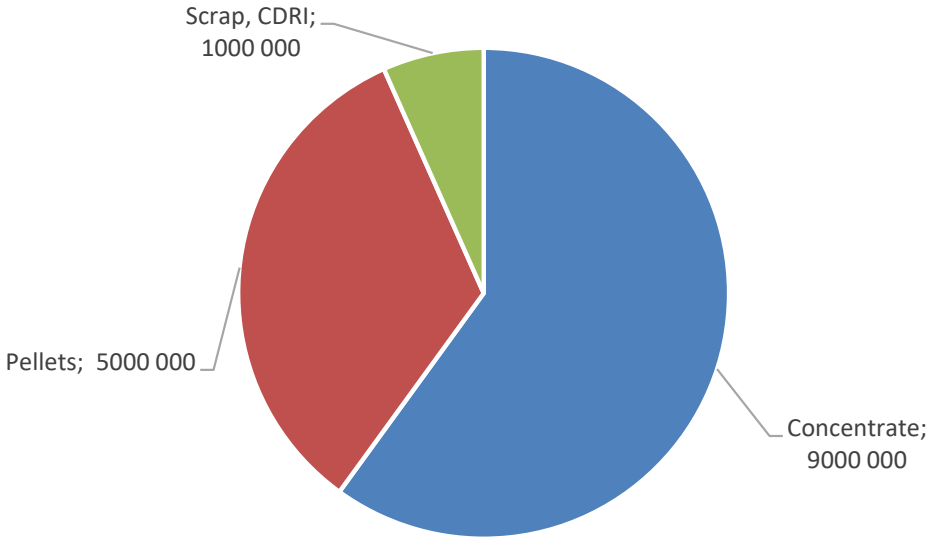
Raw material requirements up to 2025 in ALGERIA

Liquid Steel



Total = 12 MTPY

Imports (Pellet feed, Pellets, HBI)

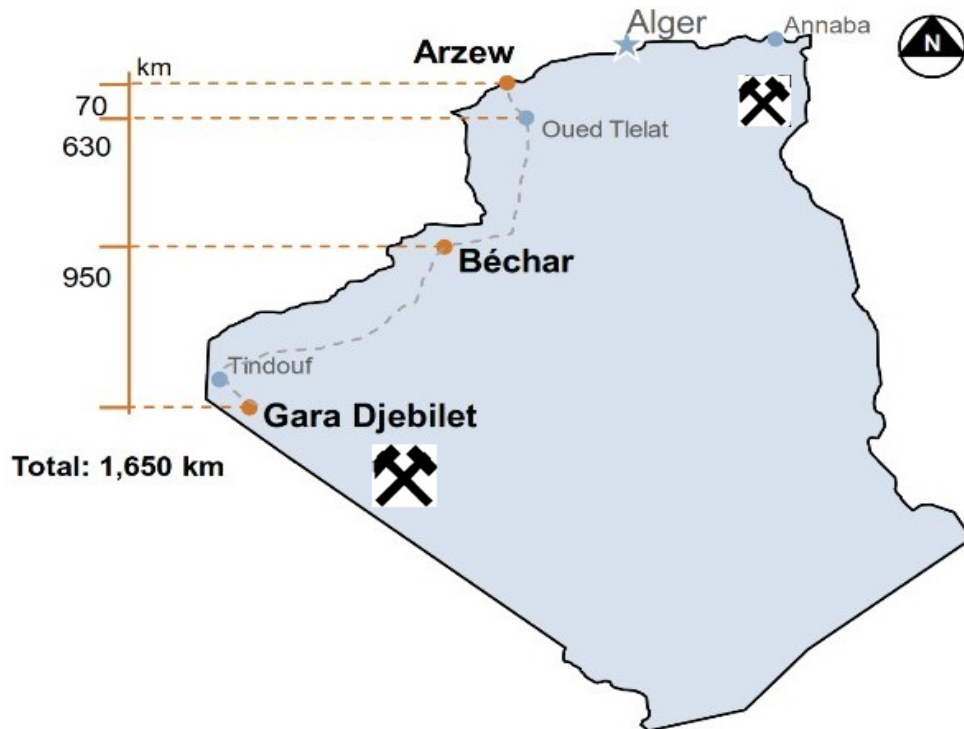


Total = 15 MTPY

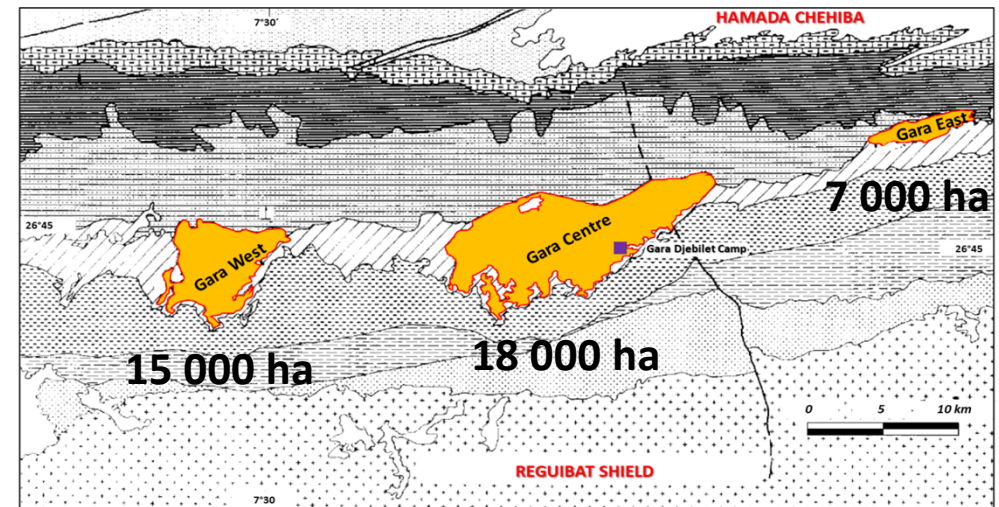
Iron Ore to import correspond to 20 MTPY equivalent to 02 billions USD/Y

2 | Gara Djebilet deposit

Gara Djebilet localization

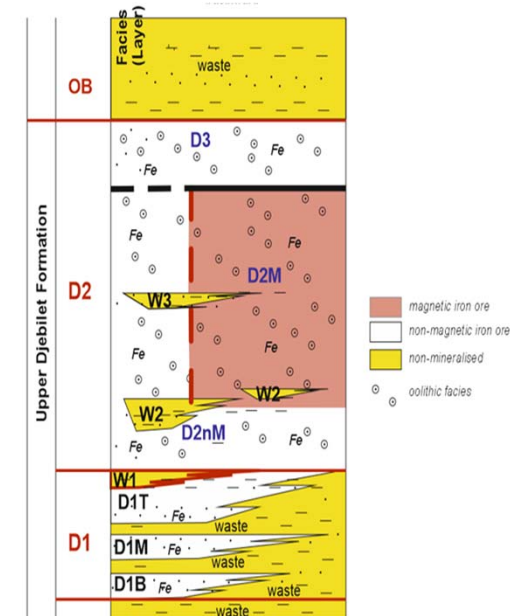
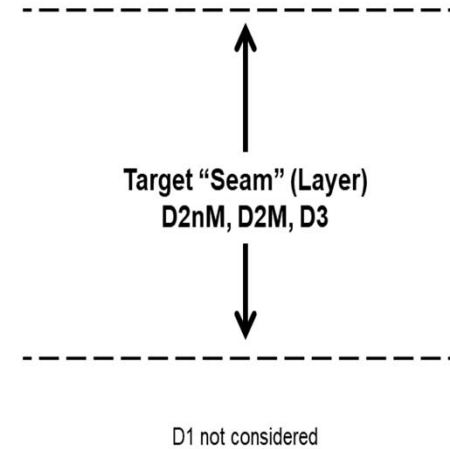
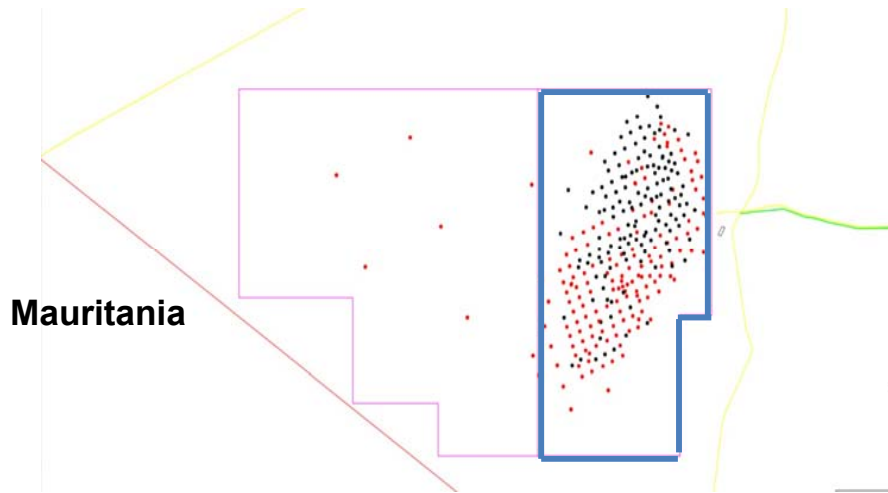


The Deposit is 40 000 hectares, constituted by 3 sites:



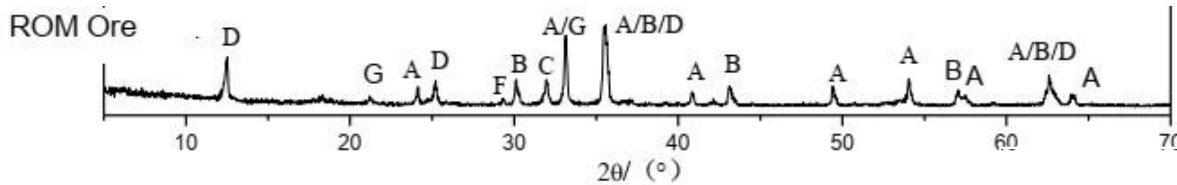
Iron Ore resources are estimated at 10 Billion tons

Gara Djebilet deposit is the unique deposit in Algeria which could satisfy the demand or decrease the import

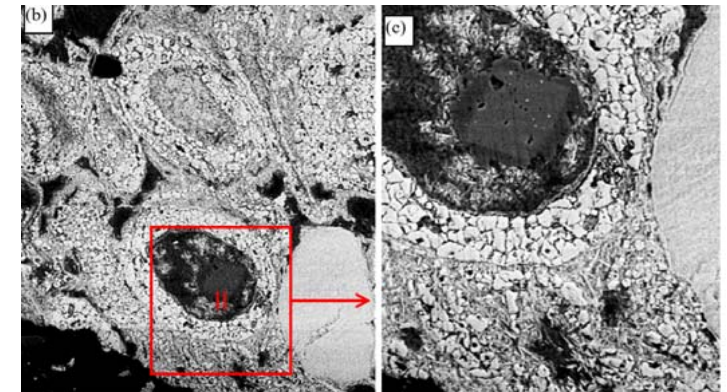


- 5 000 ha out of a total of 15 000 ha for Gara West
- 300 bore holes - 10 000 ml drilled - 4 800 samples

Composition	TFe	FeO	SiO ₂	Al ₂ O ₃	CaO	MgO	P	S	Burning Loss
Content	55.65	14.35	5.48	4.78	2.15	0.48	0.83	0.042	6.21
Composition	MnO	AS	K ₂ O	Na ₂ O	ZnO	NiO	TiO ₂	V ₂ O ₅	Cr ₂ O ₃
Content	1.03	0.018	0.070	<0.05	0.020	<0.01	0.38	0.123	<0.01



A-hematite; B-magnetite
 ; C-siderite; D-chamosite; E-quartz; F-calcite
 ; G-goethite; H-AlNaSi₂O₆



Oolitic Ore with grain size of iron oxides about 20µm

3 | Main results of geotechnical study

In the 5,000 hectares that has been studied:

- The Resource is Important : more than **1.2 Billion Tons** (JORC Code)
- The exploitation of the deposit is easy : **Open pit**
 - ❖ Mineralized body **12 m thick** (2m Hematite, 10m Magnetite)
 - ❖ **Low waste rock** cover (less than 0.5 m), except in the northern part
 - ❖ Fairly **friable ore**, crushing requires little energy

However :

- Average iron content **56%**.
- Average P content **0.8%**.

Requires treatment to be usable by the steel industry:

- ❖ Beneficiation
- ❖ Dephosphorization



- Beneficiation & dephosphorization laboratory tests have been realized between 2019-2023, in Russia (Institute for Research in Thermal Engineering metallurgy OAO VNIIMT) and in China (research center and universities through Sinosteel Equipment & Engineering Co, Ltd).
- Two solutions appeared considering the proposals made by Russian and Chinese companies having experience in the treatment of oolitic ore:
 1. Production of a concentrate ore,
 2. Production of an iron powder called PDRI.
- Recently, a Chinese Consortium leaded by MCC International proposed a specific process using 100% Gara Djebilet ore in order to produce semi-products (Billets, Slabs or Blooms). The dephosphorization will be carried out at the smelting stage.

- A "concentrate" in the form of "pellet feed", fine ore for pelletizing, obtained by roasting followed by magnetic separation and acid leaching :
 - ❖ Beneficiation of iron: **Fe = 63 – 65 %**
 - ❖ Maximum Dephosphorization : **P = 0,20 %**
 - ❖ Silica & Alumina: **SiO₂ about 4%, Al₂O₃ about 4%**
- This concentrate can be used by blending with rich imported ore
- A project in partnership with TOSYALI Algeria for the realization of a production unit of 1MT/year of concentrate in Bechar is being finalized.

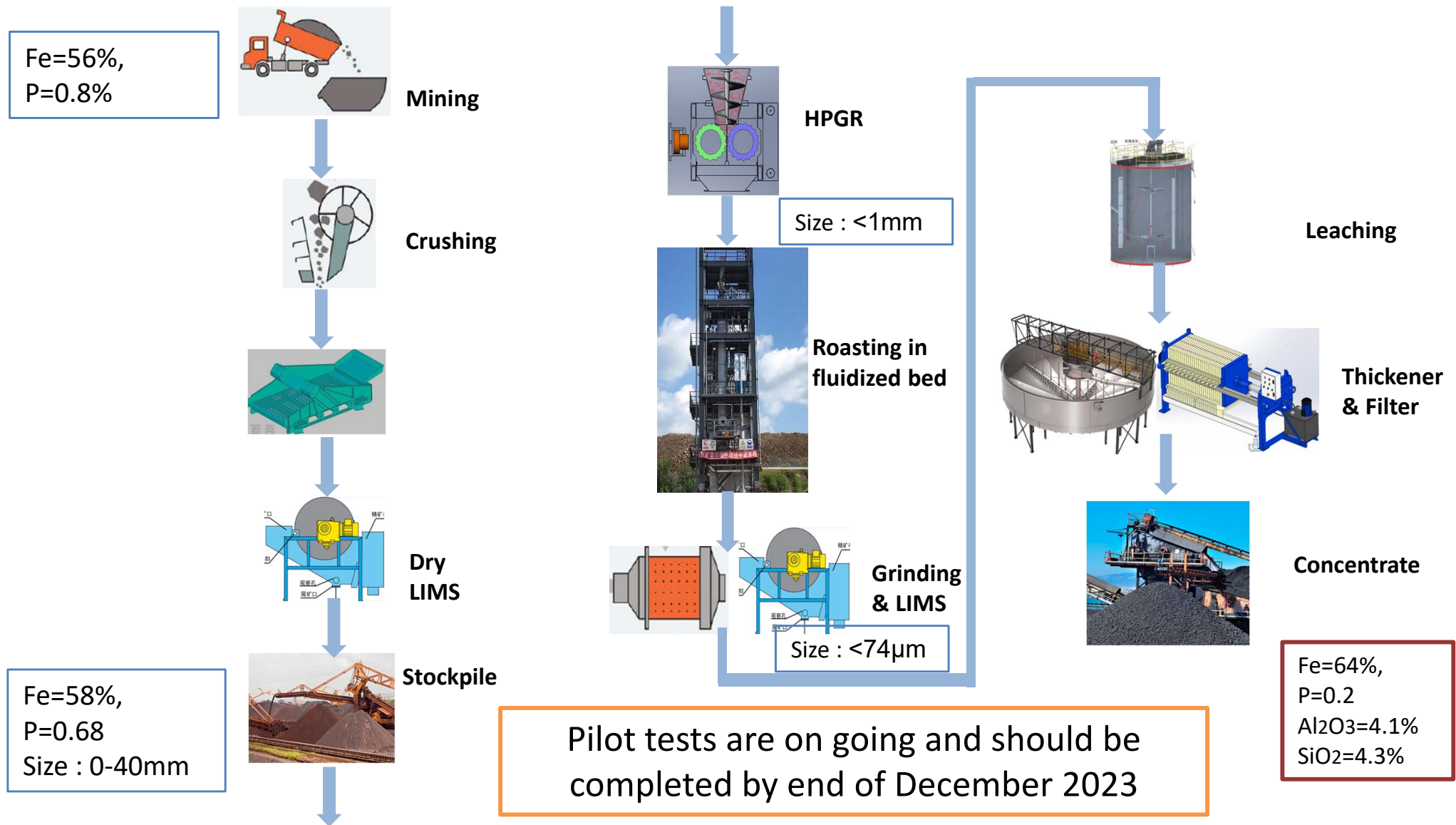


Concentrate from GD ore



Produced Pellets

Flow sheet adopted for the Iron Ore Concentrate



1. Pelletizing:

- Fe = 62%, P= 0,22% , SiO₂+Al₂O₃ = 7,6% and basicity=0,35 (need to be improved).
- compressive strength more than 3000 N/pellet.

2. Reductibility according to ISO standard:

- Reduction Index : more than 80%
- Compressive strength more than 1300 N/pellet

3. Steelmaking tests:

Laboratory tests with pre reduced pellets and melting in an induction furnace suggest a dephosphorization in two steps: fusion separation in a specific furnace followed by a dephosphorization of the metal in an electric arc furnace. More tests are going on. The report will be received in November 2023.

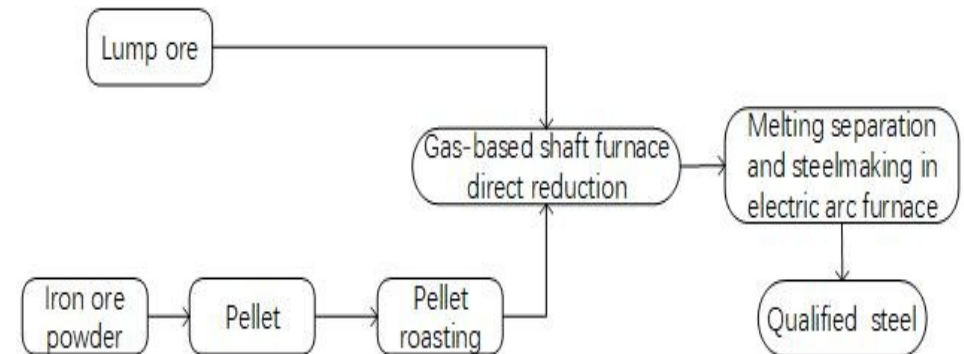
- A "Metal Powder" obtained by direct reduction of composite briquets (iron ore + coal + CaCO_3 + Binder) in a rotary furnace, followed by grinding and magnetic separation, with :
 - Iron Content Fe: $> 90\%$
 - Phosphorus Content P = or $< 0,1\%$
- The powder can be briquetted cold

(Result of KOEPPERN briquetting tests in Germany)
- It can substitute or complement to scrap and HBI, usable in steel mills
- Steelmaking tests have been done with PDRI show that with a basicity of 2,8, it is possible to reach a P content in the metal below 0,03% with addition of 20% scrap.
- A pilot demonstration plant with a capacity of about 10 000T per year should be realized in partnership in Algeria.



➤ The Chinese consortium proposed to develop and realize a first plant based on the following process:

- Direct reduction of the ore (pellets + calibrated crude ore) followed by a melting separation in a special furnace to separate slag & metal partially dephosphorized and electric arc furnace for final dephosphorization.



➤ Laboratory tests have just been completed and FERAAL is waiting for the final report.

➤ Pilot tests are scheduled to start in November 2023 and to be completed in March 2024.

- To realize the valorisation and development of Gara Djebilet Iron Ore Deposit, Algerian Government has agreed to scale up the extraction project to 50MT/year from 2040 for the production of concentrate, pellets, PDRI and semi-finished products.
- The mine has been officially opened on July 30, 2022, with an aim to learn about the technical and economic parameters of the mining, carry out laboratory and pilot tests, as well as any ore commercialization operations.
- An industrial zone of 1,000-hectare zone in Bechar has already been allocated to FERAAL to build the first processing units with TOSYALI (Concentrate plant) and Chinese consortium (Integrated steel plant) .
- The Construction of 1,000 km-long mining railroad between the mine and Bechar to transport a large volumes of ore (50MTY) has been already launched to be ready in S2-2026.
- From December 2022, The National Iron and Steel Company, FERAAL Spa, launched a Call Expression of Interest (AMI) in order to select companies willing to enter into partnership with FERAAL for the construction and operation one or more industrial iron ore processing units from the Gara Djebilet deposit (Wilaya of Tindouf). This AMI is still open.

Several opportunities are suggested

Opportunity 1:

- Pellet Feed (Concentrate)
 - Pellets
 - DRI – HBI



Opportunity 2:

- PDRI (briquettes of Powder Direct Reduced Iron)



Opportunity 3 :

- Pig iron



Opportunity 4 :

- Semi-finished steel products



Opportunity 5 :

- Iron Ore



FERAAL Spa, will continue to study all the possibilities of valorization of the ore of Gara Djebilet according to the technological evolutions and the opportunities offered by the markets.

Thank you