

NATURAL RESOURCES

Algeria has considerable and diversified natural resources, particularly hydrocarbons. It ranks 16th in oil reserves, 16th in production (2019) and 11th in exports (2019).

Algeria ranks 10th in the world regarding proven gas resources (2020), 10th in gas production (2020) and 7th in gas exports.

Algeria is the third largest supplier of natural gas to the European Union and its fourth largest energy supplier. Besides oil and gas, its underground contains large deposits of phosphate, zinc, iron, gold, uranium, tungsten... etc.

It has also renewable natural resources and is one of the best endowed countries in the world with solar resources. Integrating renewable energy into the national energy mix is a major challenge for preserving fossil resources, diversifying electricity production lines, and contributing to sustainable development and environmental protection. Through the 2011-2030 renewable energy development program mentioned above, these energies are at the heart of Algeria's energy and economic policies, including the development of large-scale photovoltaic and wind energy, the introduction of biomass (waste recovery), cogeneration and geothermal energy, and eventually the development of solar thermal energy.

RENEWABLE ENERGY:

Algeria is starting a green energy dynamic by launching an ambitious program of renewable energy development and energy efficiency. The Algerian government's strategy focuses on the development of inexhaustible resources such as solar energy and their use to diversify energy sources and prepare Algeria for the future. By combining initiatives and intelligence, Algeria is committed to a new and sustainable energy era.

According to Ministry of Energy Transition and Renewable Energy, the multi-annual program for the development of renewable energy and energy efficiency, adopted by the Government in February 2020, sets a target of 15,000 MW by 2035. This program will consider the existing potential and absorption capacity of the national electricity transmission and distribution network.

1,000MW of electricity from renewable sources is planned to be generated annually, as the first objective of the energy transition and renewable energy sector.

The updated energy efficiency program aims to achieve energy savings by 2030 for all sectors (building and public lighting, transport, industry) by introducing efficient lighting, thermal insulation and solar water heaters, clean fuels (LPG and LNG), and efficient industrial equipment.

- **Solar energy:**

Algeria is one of the world's most endowed countries with solar resources. Considering its geographical location, Algeria has one of the largest solar deposits in the world. Insolation time in the national territory exceeds 2000 hours annually and can reach 3900 hours (highland Plateaus and Sahara).

- **Wind energy:**

Wind resource in Algeria varies greatly from one place to another. This is mainly due to a very diverse topography and climate. Algeria is a vast country and is divided into two distinct geographical areas. The Mediterranean North, characterized by a coastline of 1200 km and a mountainous relief, represented by two chains of the Tellian Atlas and the Saharan Atlas.

In Africa, wind energy development remains low at 4,53GW. Algeria is currently lagging behind in the development of renewable energy, but, given the large government program in this area, this sector has real investment opportunities as well as for solar energy.

To date, a first 10MW wind farm has been installed in Kaberten region in the wilaya of Adrar.

- **Geothermal Energy:**

Geothermal energy, a renewable energy source, produces two forms of energy: electricity and heat. It can meet the concept of geothermal cogeneration (combined electricity and heat production). The use of geothermal energy is primarily local. Geothermal power plants allow geothermal energy to supply in situ and surrounding areas. This type of installation can contribute to the decentralization of energy and meet the energy needs of isolated and mountainous regions.

Geothermal energy is one of the most important sources of renewable energy in Algeria. This energy is widely used, directly in fish farming, greenhouse heating and balneotherapy and in industrial field such as electricity generation.

Study's outcomes carried out by the Renewable Energy Development Center (CDER) show that the Algerian South is characterized by an average geothermal gradient 3°C/100m. The eastern part shows a thermal anomaly that is 3 to 4°C/100m. Béchar basin is abnormally hot with a gradient exceeding 7°C/100m.

It emerges from the foregoing that the large geothermal potential in the South of Algeria constitute a set of investment opportunities.

- **Bioenergy:**

Algeria is noticeably affected by climate change. Moreover, in developing countries, demand for fossil energy, which is exhaustible, is considerably increasing. To overcome both issues, the government is planning a major renewable energy development program, which could be

the best sustainable alternative. Bioenergy, produced from biomass and waste, could be an important contribution to an alternative energy mix.

It is possible to produce bioenergy and biofuels from energy crops, waste, and other types of biomasses, producing accordingly biogas, bioethanol, biodiesel, and bio-hydrogen. Untreated waste is a significant source of pollution, in particular landfill sites, technical landfills, industrial discharges... Waste recovery for biofuel production is a safe option. However, in the case of energy crops, they must not be food crops, nor require significant amounts of water and must not occupy land intended for food crops.

For Algeria, new generations of biofuels would be a timely energy alternative for rural areas that require a decentralized energy source. Especially where the raw material is available allowing the installation of small-scale production units on the spot, likely to take part in the energy supply of the regions, to ensure local development.

- **Water:**

The water potential is estimated at 18 billion m³/year distributed as follows:

- 12.5 billion m³/year in the northern regions, including 10 billion in surface runoff and 2.5 billion in underground (renewable) resources.
- 5.5 billion m³/year in the Saharan regions, including 0.5 billion in surface runoff and 5 billion in underground (fossil)resources.

According to the Ministry of Water Resources' forecasts, Algeria's annual water needs by 2030 will have to rise to 12.9 billion m³ compared to 10.4 billion m³ today. These forecasts were mainly based on the expected increase in population growth and urban expansion, stating that "the rate of urbanization should, in 2030, be above 87% for a population of around 50 million people".

According to figures from the Ministry of Water Resources, the volume of projected annual needs by 2030 consists of 4 billion m³ for household consumption (compared to 3.3 billion m³ at present), 8.3 billion m³ for agriculture (compared to 6.8 billion m³ at present) and 0.6 billion m³ for industry (compared to 0.3 billion m³ at present).

To meet this demand, a National Water Plan has been set up by 2030. This plan is based on the continued mobilization of conventional and unconventional water resources, focusing on regions with a deficit by exploiting all available resources to intensify and expand the network of connections and transfers between major water complexes in the country.

The Minister of Water Resources explains that 45% of the projected annual needs by 2030 will be met by means of dams and 35% by mobilization and production infrastructure, by the desalination stations of seawater and groundwater of the South, while the rest, 20%, by the groundwater of the north of the country and the Highland Plateaus, whose renewal level depends on weather conditions.

FOSSIL ENERGIES:

- **Oil:**

Algeria is a member of the Organization of Petroleum Exporting Countries (OPEC). It is the 3rd largest oil producer (2019) in Africa, behind Nigeria and Angola, and the 11th largest oil exporter (2019) in the world and ranks 16th in oil reserves (2019) and 16th as world oil producer (2019). The geology of the country and its proximity to European markets are an asset for the field.

Sonatrach is the Algerian Oil Group responsible for the production, transport, processing, and marketing of hydrocarbons. Sonatrach was ranked 1st company in Africa and 12th largest oil company in the world by Petroleum Intelligence Weekly.

- **Gas:**

Algeria ranks 1st African gas producer (more than 50% of gas production in Africa) and ranks 10th largest gas producer in the world, in 2020. It is the 3rd largest supplier of natural gas to Europe.

Algeria has more than 4,500 billion m³ of proven reserves of natural gas on 1/1/2017.

Mineral Resources:

- **Iron:**

Gara Djebilet mine is an iron mine located in the South of Algeria, 170 km south-west of Tindouf, one of the largest in the world, stretches for 131 km² and offers an estimated reserve of 2 billion tons. Gara Djebilet mine was discovered in 1952.

On 12 March 2017, National Iron and Steel Company (Feraal) signed a memorandum of understanding with Chinese company Sinosteel Equipment & Engineering to carry out feasibility studies for the development of the deposit. The contract also includes the achievement, by Chinese research Centers, de-phosphorating and enrichment tests on four different processes. In 2015, Algerian laboratories were able to achieve a de-phosphorating rate of about 0.1%.

De-phosphorating process of ore had previously been a constraint that had delayed the development of the deposit. The problem had been solved technically by sending samples to specialized foreign laboratories that had carried out successful tests.

In March 2021, a memorandum of understanding (MoU) was signed between the national iron and steel company (Feraal) and a Chinese consortium of MCC, CWE and Heyday Solar for Gara Djebilet mine operation.

The numerous works carried out to date have identified and inventoried the following ores:

- **Helium:**

Reserves = 3 Gm³, 3rd in the world.

- **Lithium:**

Rechla's tin and wolfram deposit, in Hoggar, contains 0.63 to 1% of lithium. Lithium is an important component of storage in the new energies (batteries) and a fuel in the nuclear fusion that is promised to replace all other energies in the medium-term future.

- **Beryllium:**

Guérioun tin and wolfram deposit, in Hoggar, contains 2,500 tons at 2.5 ppm content. It is an important metal in electronic integrated circuits in the form of copper-beryllium alloy and in nuclear fusion as plasma cover material as well as in the aeronautics and space industries.

- **Coal:**

Bituminous coal is present at a shallow depth in the Highland Plateaus. In Bechar, the closed coal deposits still contain 1 billion tons (estimate by the Bureau of Geological Research and Mining BRGM).

- **Rock salt (NaCl):**

Salt is very present under heavy thicknesses (1000 m) in the North of Algeria. It is sometimes piled up in mountains of salt (Salt Rock of Djelfa, El Outaya of Biskra). The Saharan drilling also encountered it under 500 m average thicknesses. The Sahara reserves are estimated at 400,000 billion tons and as much in the North of Algeria. Its extraction, in depth, is easy because it is very soluble.

- **Potassium hydroxide salt (KCl):**

The perimeter formed by the wells where it was recognized covers 140,000 km² North-East Sahara, being about 2800 billion tons. It is drilled at 10 m thickness. This is the most important reserve for such a strategic product, as it would feed 9 billion human beings in the coming years. It is the basis of fertilizer as ammonia and phosphate (NKP), and is used for several purposes.

- **Barium salt (BaSO₄):**

Considerable barite reserves in the Tell. Usefulness: drilling, electronic chips.

- **Strontium salts (SrSO₄ and SrCO₃):**

Considerable reserves and various uses including magnets.

- **Manganese:**

Metal considered as strategic in the USA, because world reserves are declining dangerously, and it is essential for the manufacture of steel. Deep-sea submarine reserves in the abyssal plains are not economically viable. In the Sahara, Jebel Guettara with 3.22 Mt, at 47.2%, is not yet exploitable due to the arsenic content. In the North of Algeria (Oran), the potential is estimated at 3.3 Mt but at 30% content. Other reserves are known in the Tell lands, but at 23% content.

- **Arsenic:**

It is present in the Sahara at Jebel Guettara with 74,000 tons at 1.1% content. Worldwide production is 30,000 t/year with high-tech use through gallium or indium alloy in photovoltaic cells.

- **Coltan (niobium, tantalum):**

Tantalum is very sought after in the high technology; it is traded at 18,400 euros/kg and niobium at 472 euros/kg. In Algeria, it is present in the Hoggar, in the Rechla and El Karoussa deposits where it is combined with topazes and fluorine.

- **Gold:**

The main gold deposits of Algeria are in Hoggar with 300 indices and deposits. Major sites are in: In Ouzal (26.5 t to 25 g/t), Pharusian chain (4.1 t to 500 g/t), Central Hoggar (55 t), eastern Hoggar Tiririne (50 t to 25 g/t).

- **Wolfram-tin:**

These deposits are linked to the late granites called Taourirt du Hoggar. The reserves strengthened by the deposits of Tin Amzi, El Karoussa, Bashir, Nahda already rank Algeria 2nd in the world with 98 000 tons, notwithstanding what remains to be assessed in these granites.

- **Uranium:**

Deposits are recognized at the Hoggar (Timgaouine, etc.) where they are estimated at 26,000 t. But huge reserves exist in the Silurian in central Sahara where it is at 16,500t/km², a total of 9.5 Gt. Leaching (8% acidic water percolation through the mother rock) makes it possible to recover 100%.

- **Magnesium:**

It is obtained by Pidgeon and Magnetotherm processes from dolomite. 1.43 Mt/km² in Northern Algeria. It is widely used in light alloys of aeronautics and other purposes.

- **Chrome:**

The Hoggar is renowned for its abundant chromite resources.

- **Thorium:**

It is a metal that will replace uranium in nuclear power plants because it is less versatile and therefore safer. Its energy equation is $10 \text{ kg Th} = 278 \text{ t U natural} = 12,500 \text{ m}^3 \text{ of oil}$. In the Sahara, there is a deposit of 600,000 t of Th, which in energy terms is equivalent to 750 billion cubic meters of oil, or nearly 79 times all the hydrocarbons discovered in the Sahara.

Sources:

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Ministry of Water Resources.

Ministry of Energy.

Ministry of Energy Transition and Renewable Energy (MTEER).

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