

# CONTRIBUTION OF THE EXPLORATION ACTIVITY IN GAS RESERVES RENEWAL

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Key words: exploration activity, discoveries, gas, potential.

**Background:**

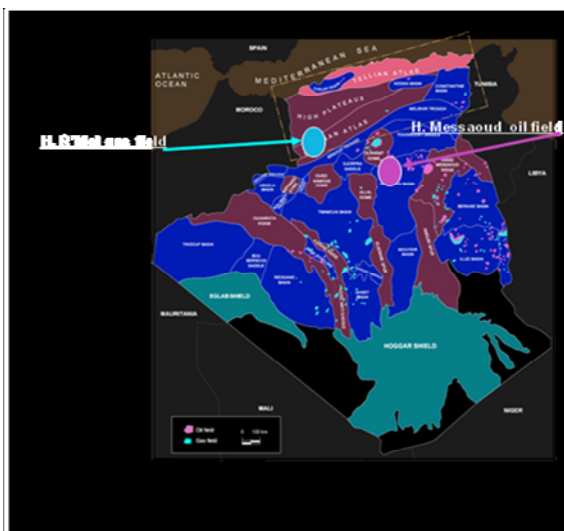
Geologist with 27 years of experience in exploration and delineation of Oil and Gas accumulations in Algeria. Since the last 3 years, in charge of Direction of Studies and Synthesis, with 85 geoscientists at The Exploration Division of SONATRACH, the Algerian NOC. Before this position, in charge of Reservoir and Reserves Dept in the same Division during 09 years.

**Aims :**

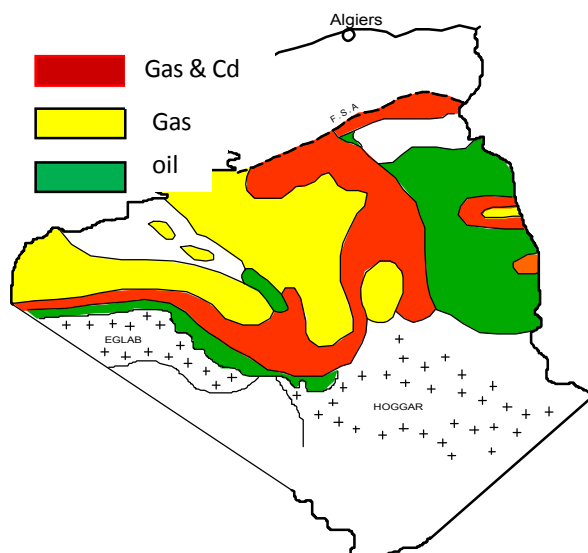
The Exploration effort activity in its internal form and in partnership highlighted in recent years many gas discoveries within different Algerian sedimentary basins. Basin modelling also highlighted significant potential of undiscovered gas. Indeed, the synthesis of these models applied on all Algerian basins called "mature", showed that of all the cumulated discoveries are less than 15 % of the trapped volume , which mean 85% have yet to be discovered.

The various works performed these recent years have indicated the existence of huge unconventional accumulations, including tight gas and shale gas. This is encouraging for more drilling in Berkine basin in order to unlock the potential of deep target .

The mining domain of Algeria covers a surface of 1.540.000 km , it has 14 different sedimentary basins mostly in the southern part of the country. Most of the basins lay south the first order flexural tectonic fault known as 'flexure Sud Atlasique' which roughly divide the country into two mega provinces: The Saharan platform with mostly intracratonic basin style and the Northern Algeria, which shows an alpine tectonic styled basins.



**Algerian mining domain**



**Frasnian & Silurian source rocks Maturity**

The known source rocks are by order of importance: the Silurian (particularly the hot shale level) and the Frasnian/Fammenian, Givetian & the Ordovician shales.

The best source rocks, considering their thickness and organic richness are localised within the basins of oued Mya, Berkine, Illizi, Ahnet & Timimoun.

The map below gives a broad picture of the level of maturity reached by the Silurian & Frasnian source rocks

The exploration activity proved important plays within the:

- Palaeozoic,
- Mesozoic,
- And Tertiary,

In general, these reservoirs are fair to excellent to the east, and globally poor to fair to the west.

The most important ones are those of the Cambro Ordovician, Devonian and Triassic.

By region, the plays are distributed as follow:

In the northern basins, the petroleum plays are Cretaceous in age (cenomanian, Turonian & Coniacian)

Objective horizons	Reservoir	Number of pools			
		Oil	Oil + Gas	Gas	Total
Eocene-Mio		1			1
Cretaceous		3			3
Jurassic					
Triassic		56	17	19	92
Carboniferous		11	2	10	23
Devonian		5	5	15	25
Silurian		22	16	52	90
Ordovician		6	1	2	9
Cambrian		15	7	39	61
Basement		9		1	10
<b>314 oil and gas fields</b>		<b>128</b>	<b>48</b>	<b>138</b>	<b>314</b>

Anhydrite	Salt	Limestone
Sandstone	Shale	Basement

In the eastern basins, the Triassic horizons constitute the most important play, however, we are now considering deeper targets as it is the case in Berkaoui field, where tests of Ordovician formations are positive.

In the western basins, proved plays are within the Cambro-Ordovician, Devonian and Carboniferous.

In the Hassi Messaoud area, oil accumulations are proved in the Cambrian with a WOC deeper than the one observed within the Ordovician formations. This is behind several discoveries made since 2000.

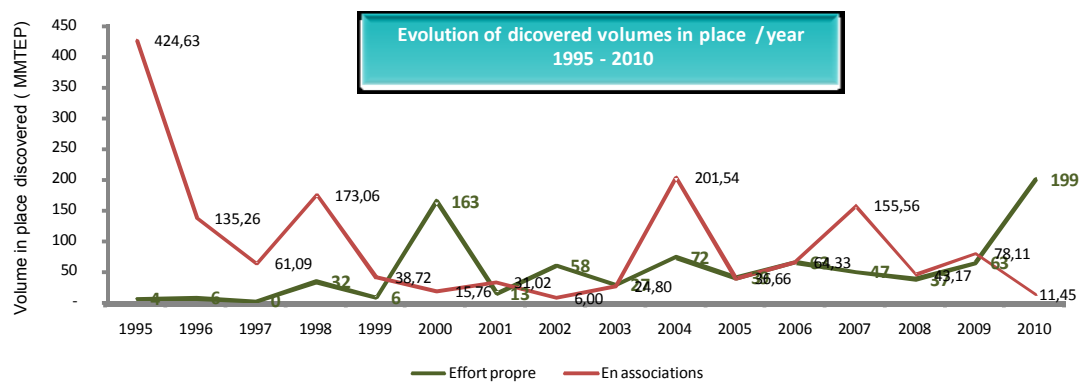
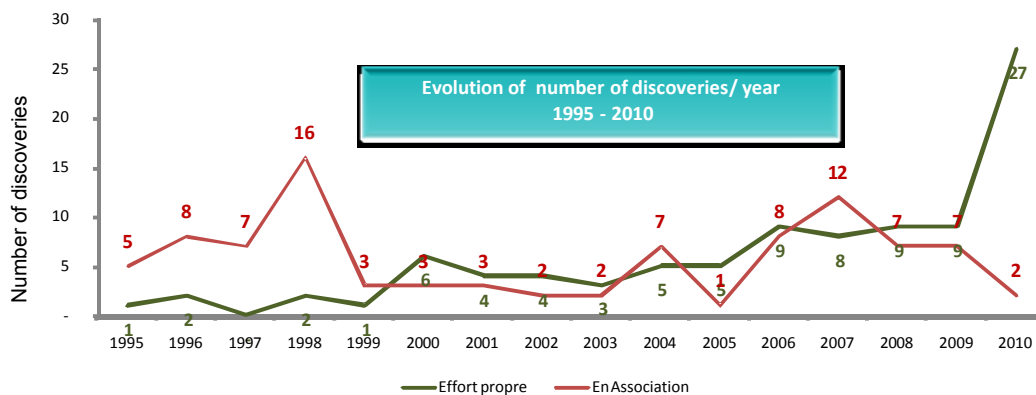
**History of exploration in Algeria:**

This started in the 1890 (heighty nineties) within the Cheliff basin. However, the first commercial discory was realised in 1948 in Oued Guetrini.

In 1950, the exploration started in the Algerian Sahara, the first well Berga 1 was drilled in 1954 in the Ahnet Basin.

In 1956, the giant fields of HMD and HRM were discovered.

During the years 1990-2000, several discoveries were made, essentially in the Berkine Basin, totalising a volume of hydrocarbons in place of 7billions barrels. These discoveries were made mainly thanks to the partnership.



These results were reached due to the increase of the exploration effort:

- Some 250 000 km of 2D seismic
- More than 50 000 km<sup>2</sup> of 3D seismic
- More than 1000 wells ( wildcats and delineation)

### **Exploration effort yield in gas:**

The increase of the tapped gas volume is mainly due to two factors: The volume of the new discoveries and also the volumes of previous discoveries which were not considered as economically viable at the time of discovery, but adding new seismic data and through new evaluation approach rendered these accumulations developable.

Exploration effort allowed to add more reserves of gas, economically sound, with more than hundred gas discoveries in recent years.

Exploration effort showed new investigation themes to be considered as new gas plays.

Discoveries in the Berkine basin and in the Illizi basin, from Hamra Quartzites formation of the Ordovician, added gas volumes for the main ongoing projects of Tinhert and Gassi Touil.

Reconsidering old wells – temporarily abandoned allowed also some additional gas which which was not correctly evaluated by conventionnal drillstem test .

Exploration activity through 2010 and 2011, showed good results. In top of investigating for gas in proved provinces such as Berkine, Illizi and Ahnet, new provinces start to emerge from frontier zones to known gas bearing provinces: North of Algeria and Bechar basin.

These results brought new hope for these provinces , thus Exploration activity is planned to be increased in these two new areas.

Exploration effort is not only dedicated to unlock the potential of classical gas , but will be certainly extended for the investigation for unconventional gas.

Some internal studies showed a high probability for Berkine, Gourara, Ahnet et Illizi basins to be also gas shale type recipient.

Drilling started to check the concept in the selected areas.

Tight sands investigation is also one the major investigation theme. Large gas volumes have been recognized in this type of reservoirs. Studies on how to best produce them are an ongoing action.

### **Conclusions :**

The Algerian mining domain has a huge gas potential

From The Exploration effort during the last 25 years, discoveries extend to almost all the basins of this first order gas potential to be tapped; the most recent (2011) discoveries recorded both in the North of Algeria and in the Bechar basins are comforting this view.

In recent year Exploration is looking intensely for conventional and unconventional gas alike.