



المكتب الوطني للهيدروكربونات و المعادن
ΕΘΣΟ. Α.Ε.Ε.Ο. | ΗΦΣΛΟ:Κ.ΟΘ:Ο. + Λ ΣΧ:Υ.Χ
OFFICE NATIONAL DES HYDROCARBURES ET DES MINES

AAPG Energy Opportunities

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Mexico City, Mexico

Promising Opportunities in the Moroccan Upstream Oil and Gas

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Department Manager

AGENDA



Country key aspects

Hydrocarbon Exploration Overview

Examples of untested Play Concepts & Analogues

Morocco Incentives

COUNTRY KEY ASPECTS

MOROCCO: A FAST GROWING ECONOMY



- **Population:** 36.45 million (very welcoming people)
- **Language:** Arabic, Amazigh, French, Spanish and English
- **Primary Energy Consumption :** 20 million TOE
- **Dependency on energy imports :** 95 %
- **Net energy bill :** 14 billion \$ (2022)
- **2030 energy consumption forecast :** 43 million TOE
- **GDP:** 330 billion \$ (2022)
- **GDP Growth:** +2.5 % (2022)
- **Inflation rate:** 6.6 %
- **Foreign Direct Investment:** 1.9 billion \$
- **Currency:** Moroccan Dirham (MAD)

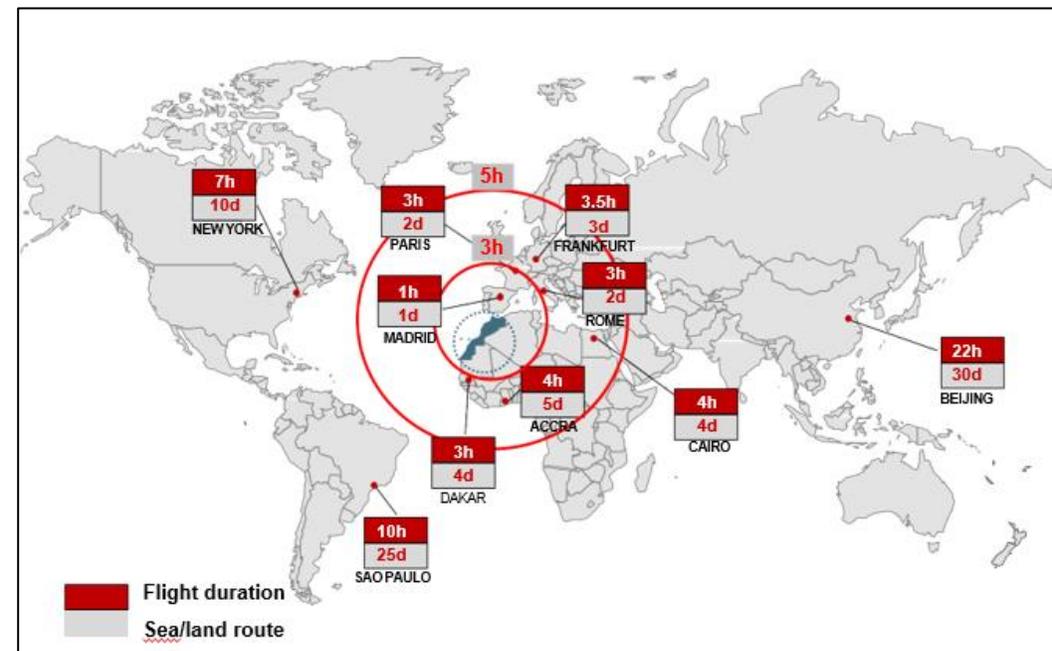
General Information

| | |
|-----------------------------|---|
| Capital | Rabat |
| Institutional System | Democratic and Social Constitutional Monarchy |
| Area | 710 850 km ² |
| Time Zone | GMT+1 |

COUNTRY KEY ASPECTS

MOROCCO: A CROSSROAD FROM AFRICA TO EUROPE

- Morocco is a **politically stable** country
- **Favorable and very attractive fiscal regime** :
- A unique **geographic location** with **3 500 Km** coastline on the **Atlantic Ocean** and the **Mediterranean sea**
- **15 Km** distance from **Europe**



- **1st in North Africa** in terms of **infrastructure quality**
- **14 foreign trade ports** and **24 airports**
- **Tangier Med Port**: A growing global connectivity with **174 ports** and **74 countries**



AGENDA



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HYDROCARBON EXPLORATION OVERVIEW

SEISMIC & WELLS DATABASE

Offshore

Atlantic

➤ 2D Seismic: 175 542 km including 13 196 km of 2D Multi-Clients

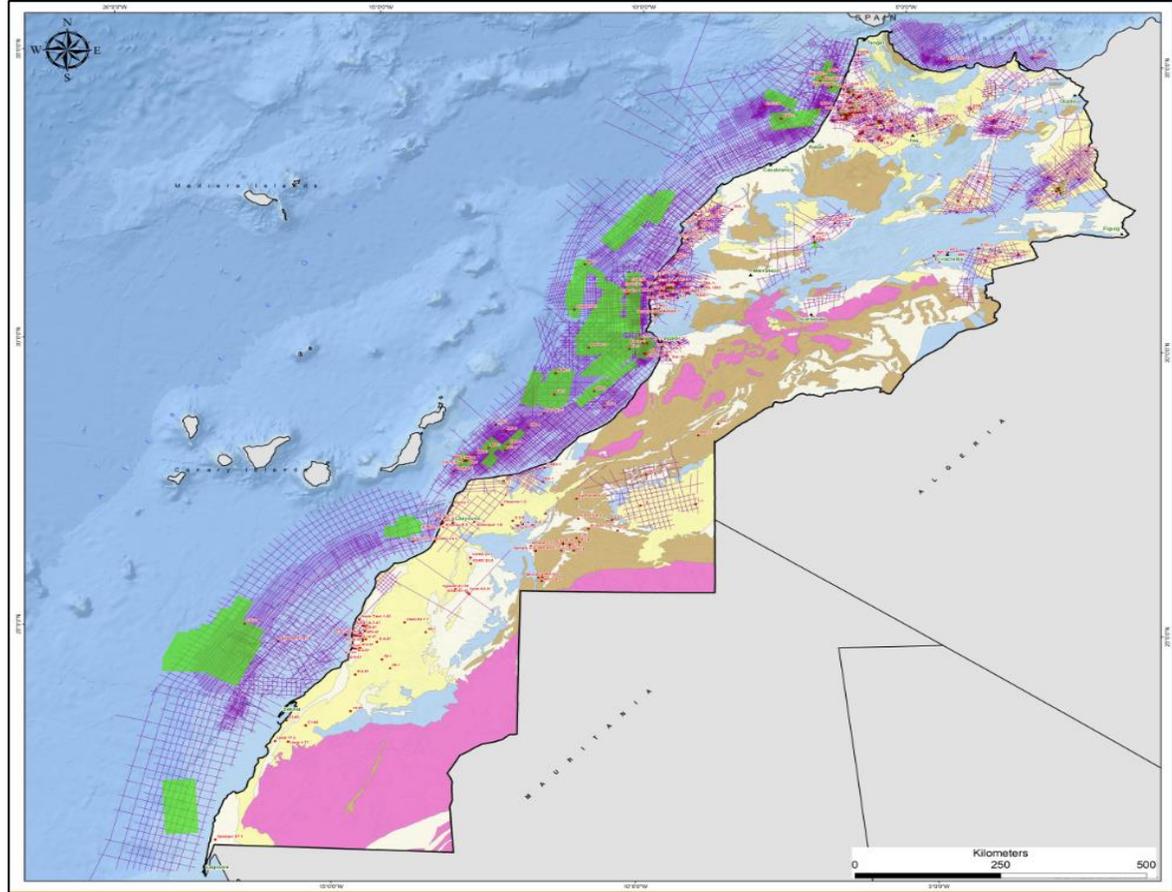
➤ 3D Seismic: 70 277 sq km

☐ 43 exploration wells

Mediterranean

➤ 2D Seismic: 10 775 Km

☐ 2 Exploration wells



Onshore

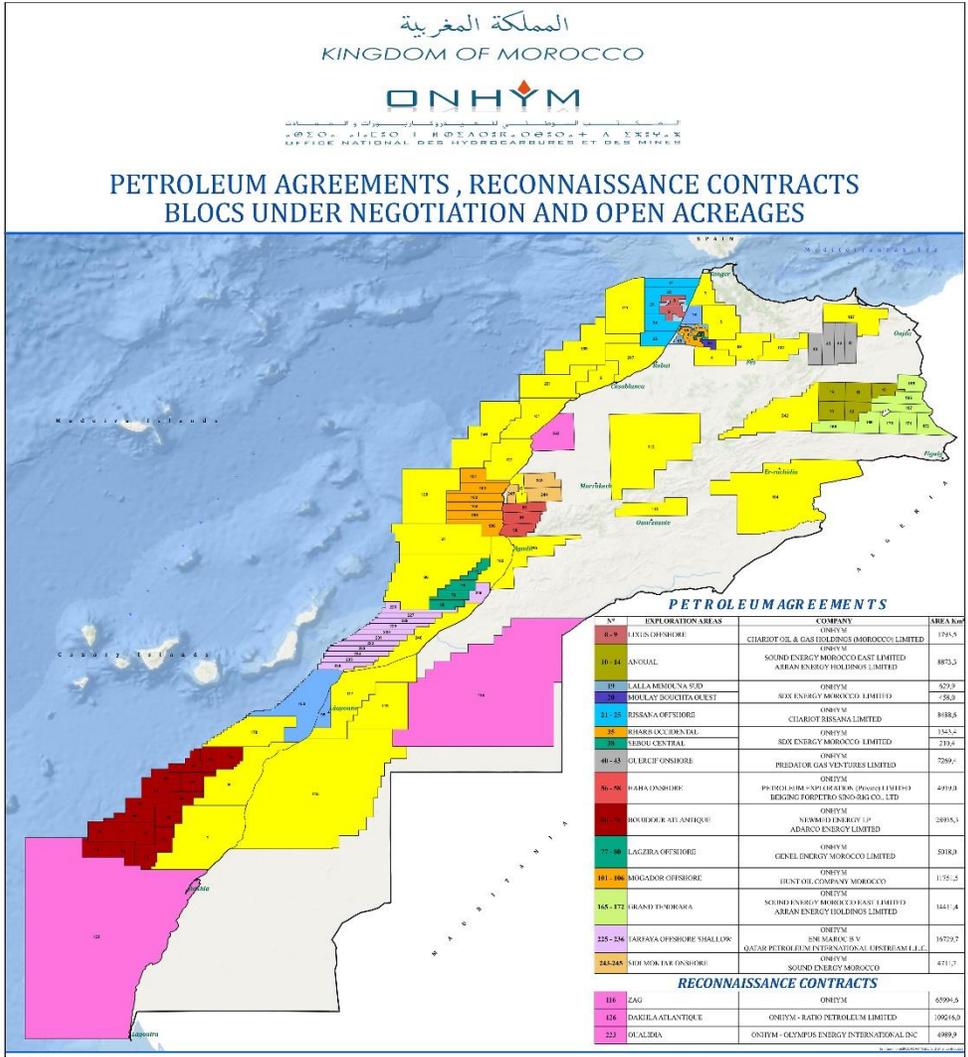
➤ 2D Seismic: 58 731 km
➤ 3D Seismic: 2 218 sq km

☐ 325 Exploration wells

More Than 95% of investments are supported by ONHYM'S Partners

HYDROCARBON EXPLORATION OVERVIEW

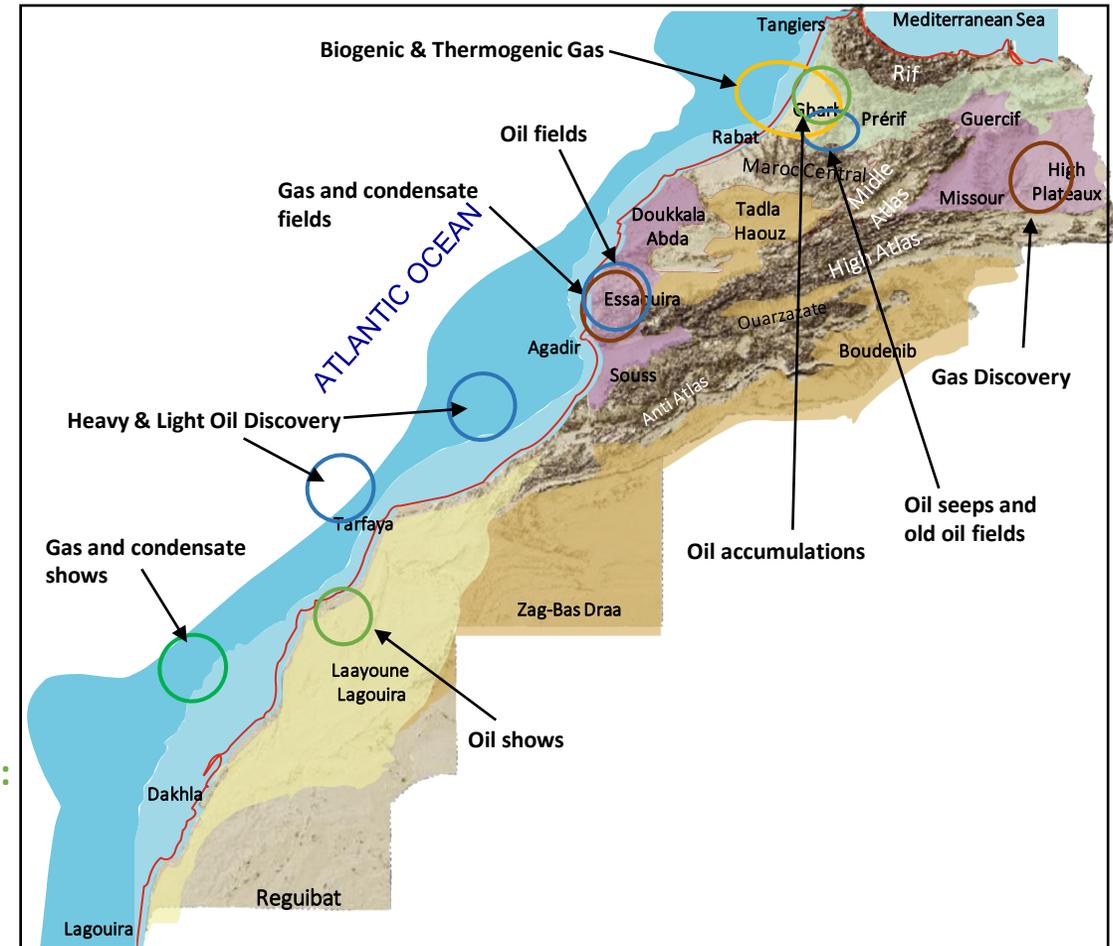
Licensing status



HYDROCARBON EXPLORATION OVERVIEW

Petroleum systems in Morocco are widely extended from Paleozoic to Tertiary. These are proven in the Onshore and Offshore Moroccan sedimentary basins through hydrocarbon occurrences (discoveries, shows, surface oil seeps,,):

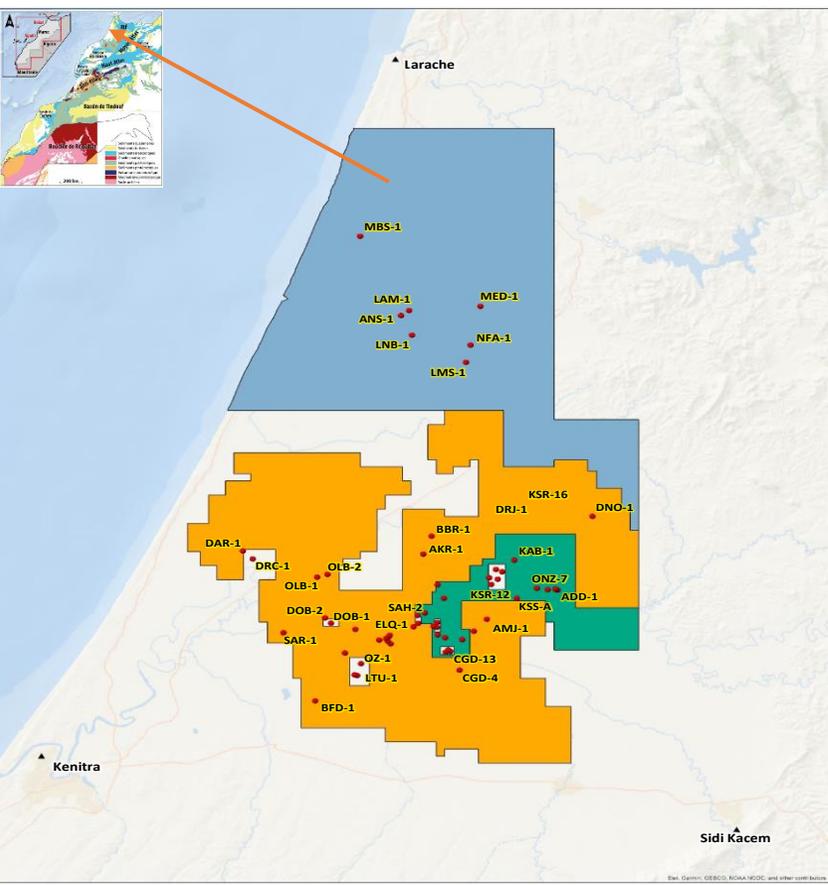
- **Palaeozoic petroleum systems (Silurian, Ordovician, Devonian):** Meskala gas & condensate field and High Plateaux gas discovery
- **Jurassic petroleum systems (Toarcian - Callovian):** oil fields in the rides prerifaines & Essaouira and oil discoveries in the Offshore
- **Lower cretaceous petroleum systems :** oil and gas shows encountered in Offshore Atlantic
- **Upper cretaceous petroleum systems (Cenomanian - Turonian):** Ain Hamra oil accumulation and oil shows in the Onshore
- **Tertiary petroleum systems :** biogenic & thermogenic gas fields in Gharb basin



HYDROCARBON EXPLORATION OVERVIEW

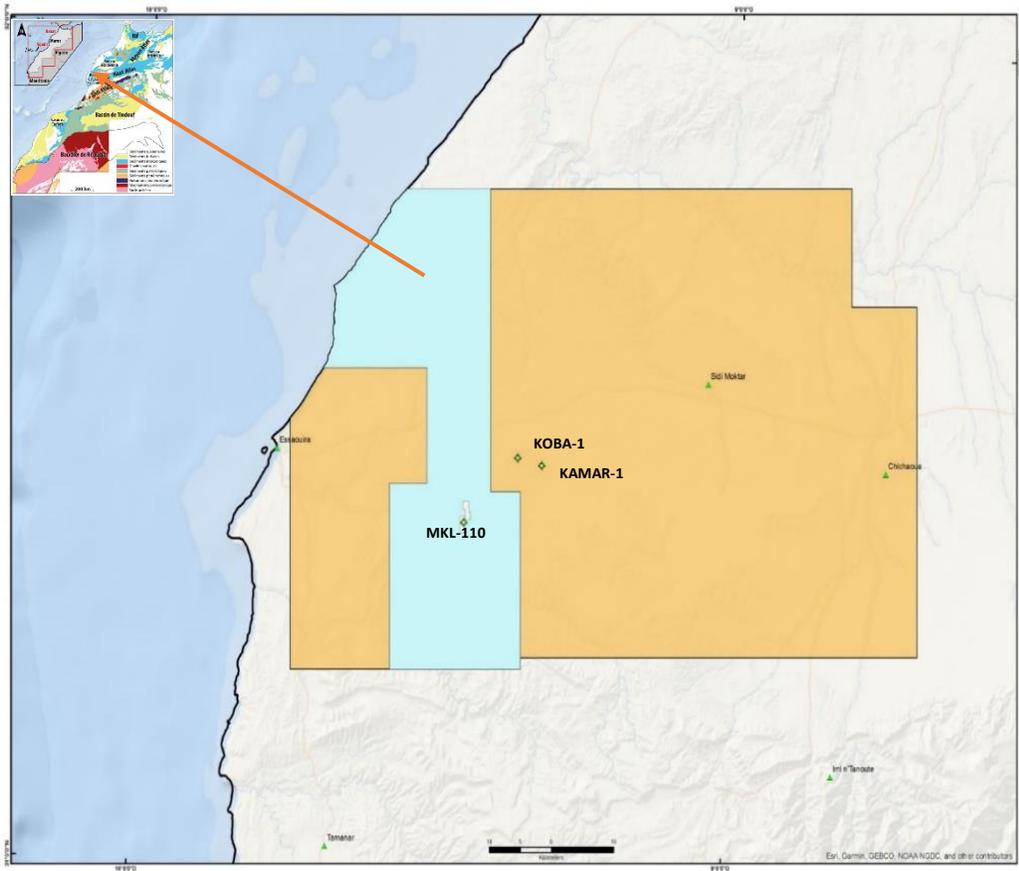
PRODUCING FIELDS AND DISCOVERIES

Gharb Onshore Basin



- ❖ 70 wells drilled including 41 gas discoveries: Gas discoveries are small but commercial due to the existing infrastructure and an important local gas market.

Essaouira Onshore Basin

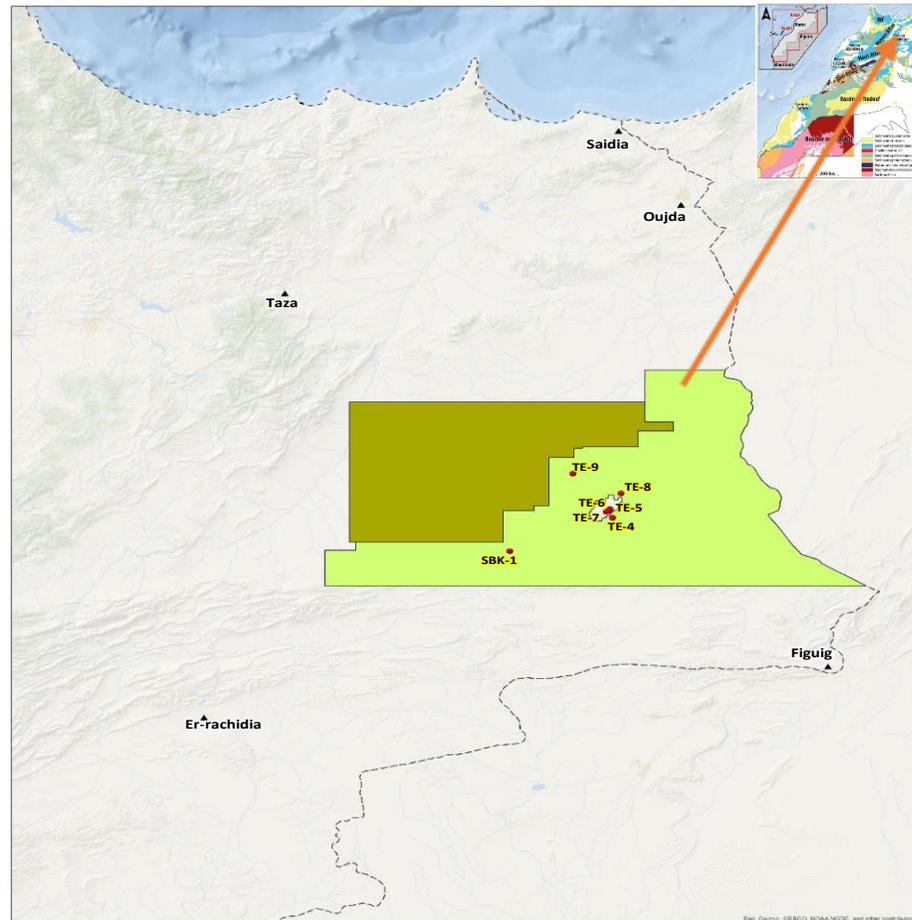


- ❖ Gas and condensate from the Triassic reservoir and oil from the Jurassic reservoir
- ❖ 3 wells drilled between 2011 and 2014

HYDROCARBON EXPLORATION OVERVIEW

PRODUCING FIELDS AND DISCOVERIES

Tendrara Basin



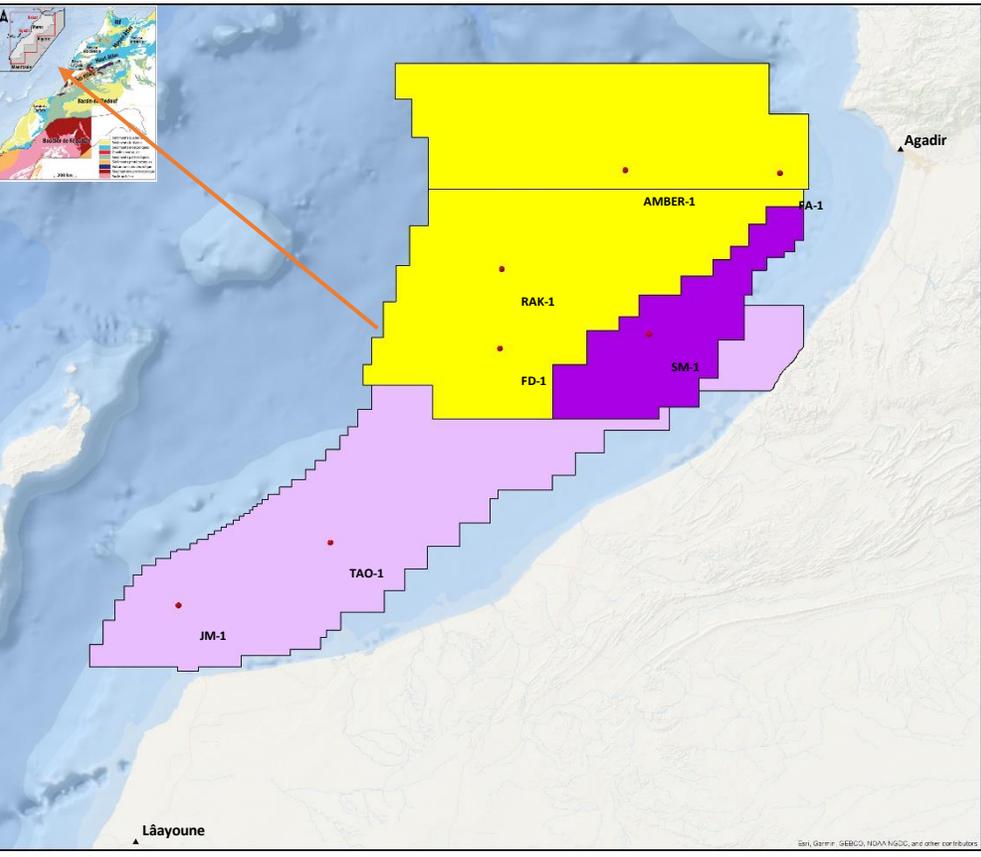
Sound Energy and ONHYM

- ❖ **5 wells** drilled between 2016 and 2019
- ❖ 2 wells found gas and condensate in the Triassic reservoir
- ❖ Award of a concession for the development and the production of gas

HYDROCARBON EXPLORATION OVERVIEW

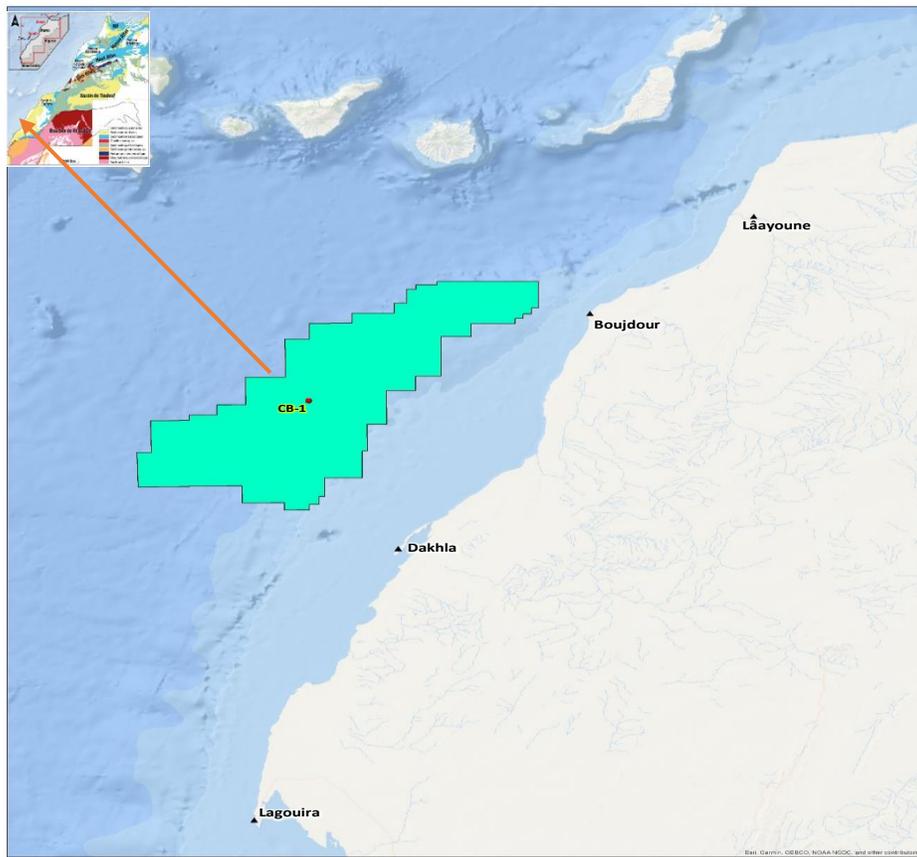
PRODUCING FIELDS AND DISCOVERIES

Tarfaya - Agadir offshore



7 wells drilled in deep water : **3 wells** targeting the Jurassic carbonates: 2 wells have found oil (JM-1 with a density of 12 API° and SM-1 with 26 API° and **4 wells** targeting the Cretaceous and Jurassic turbidites: 3 wells have encountered oil and gas shows

Boujdour Offshore

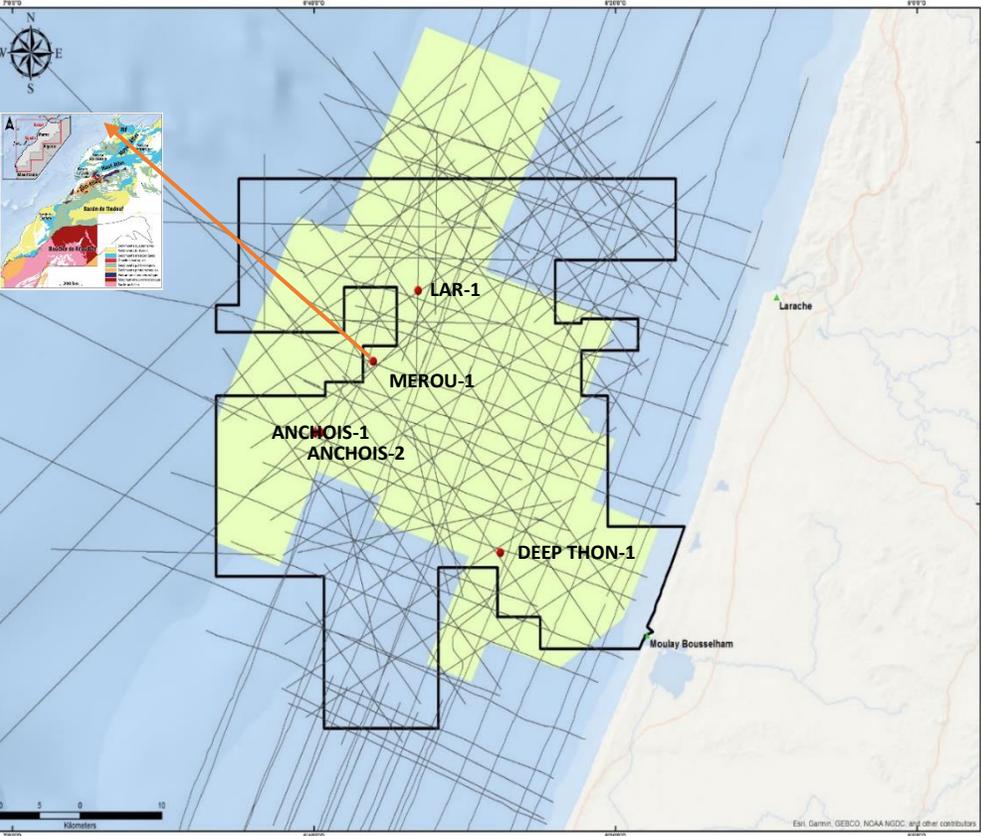


1 well drilled by Kosmos, Capricorn and ONHYM in late 2014/early 2015. The well is a non-commercial discovery of gas and condensate in the Cretaceous turbidites

HYDROCARBON EXPLORATION OVERVIEW

PRODUCING FIELDS AND DISCOVERIES

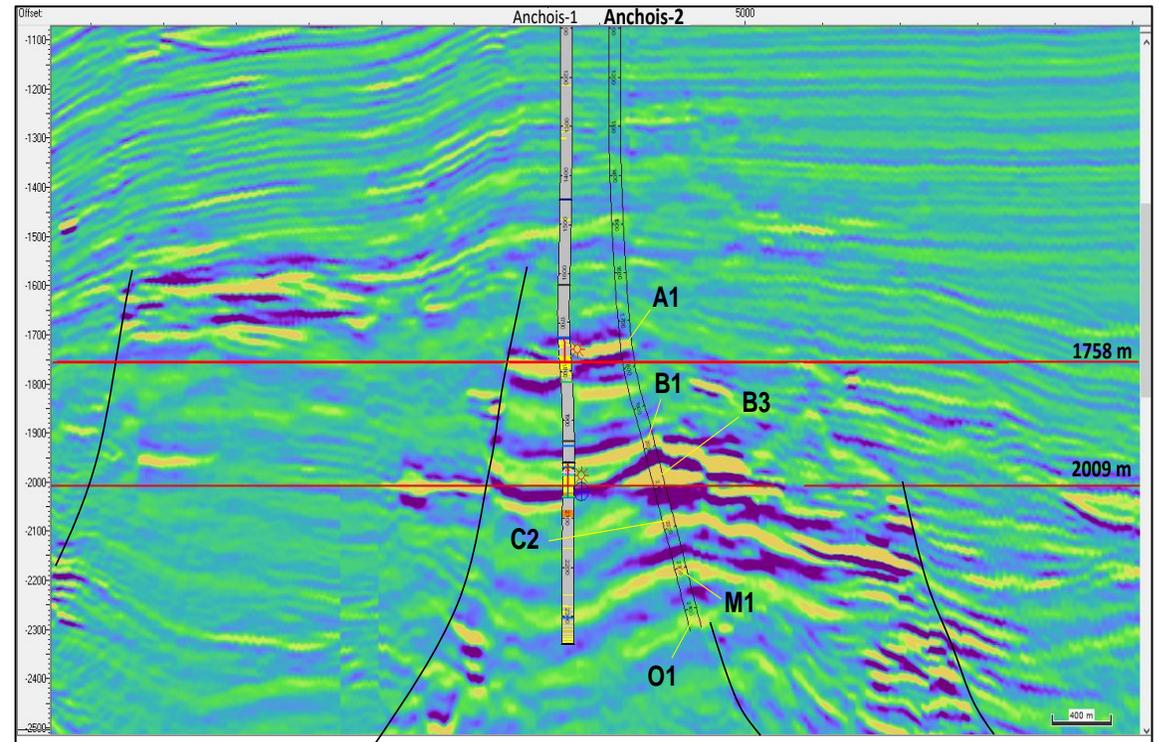
Lixus Offshore Permits



Data base

- ✓ 5 wells
- ✓ 2D: 2,657 km
- ✓ 3D: 2,000 sq km

- ❖ Anchois 2 prospect was drilled in late 2021-early 2022
- ❖ The well was drilled to test the Tertiary Turbidites
- ❖ The Anchois 2 well has found gas within several Tertiary layers





Country key aspects

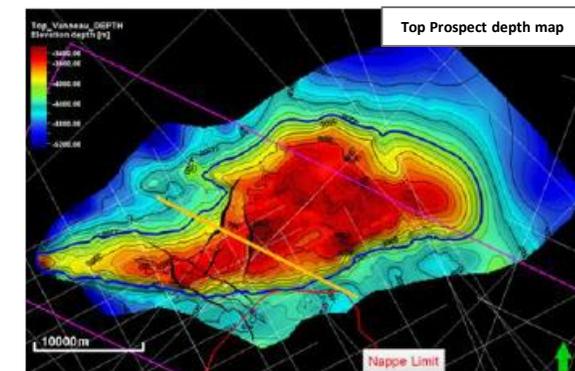
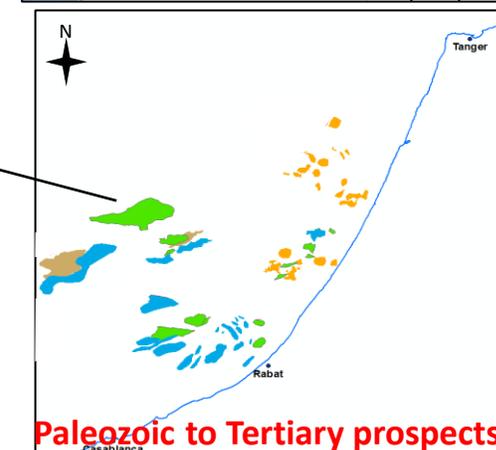
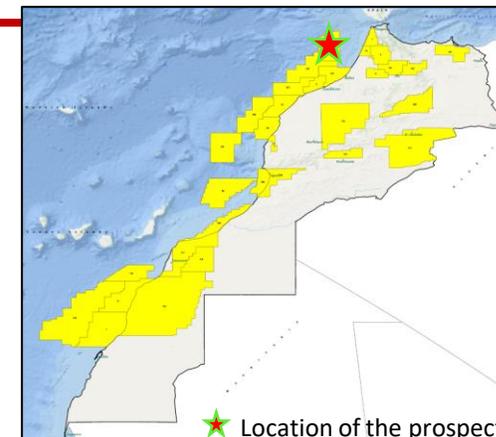
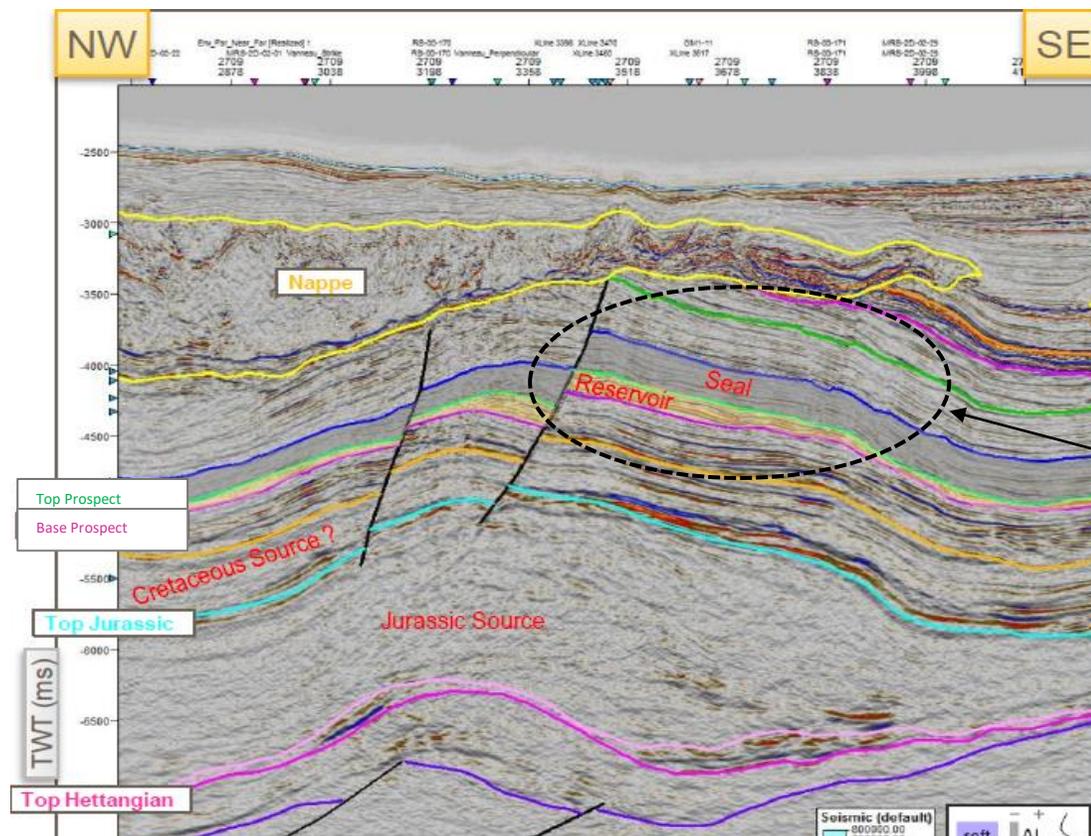
Hydrocarbon Exploration Overview

Examples of untested Play Concepts & Analogues

Morocco Incentives

EXAMPLES OF PLAY CONCEPTS & ANALOGUES

CRETACEOUS TURBIDITE SANDSTONES



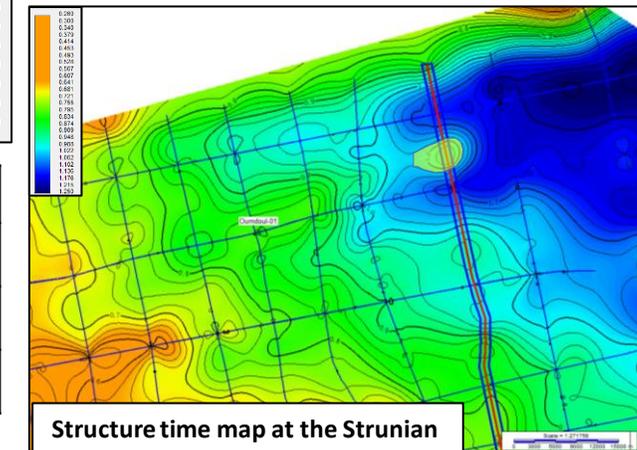
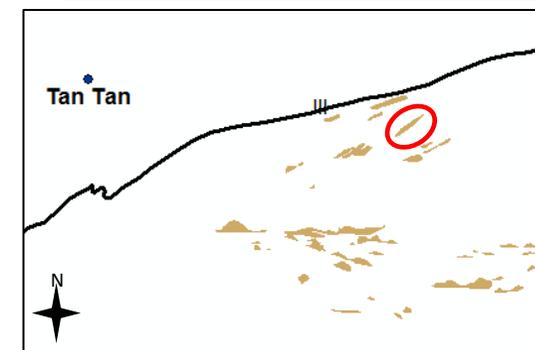
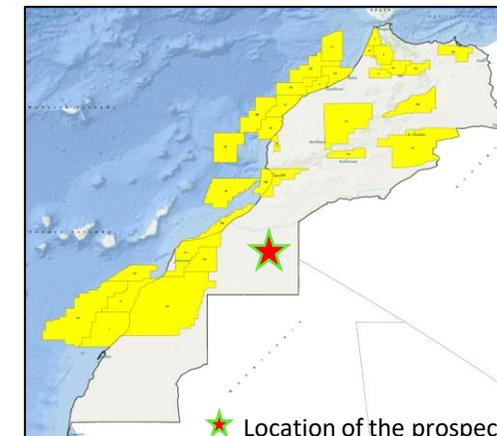
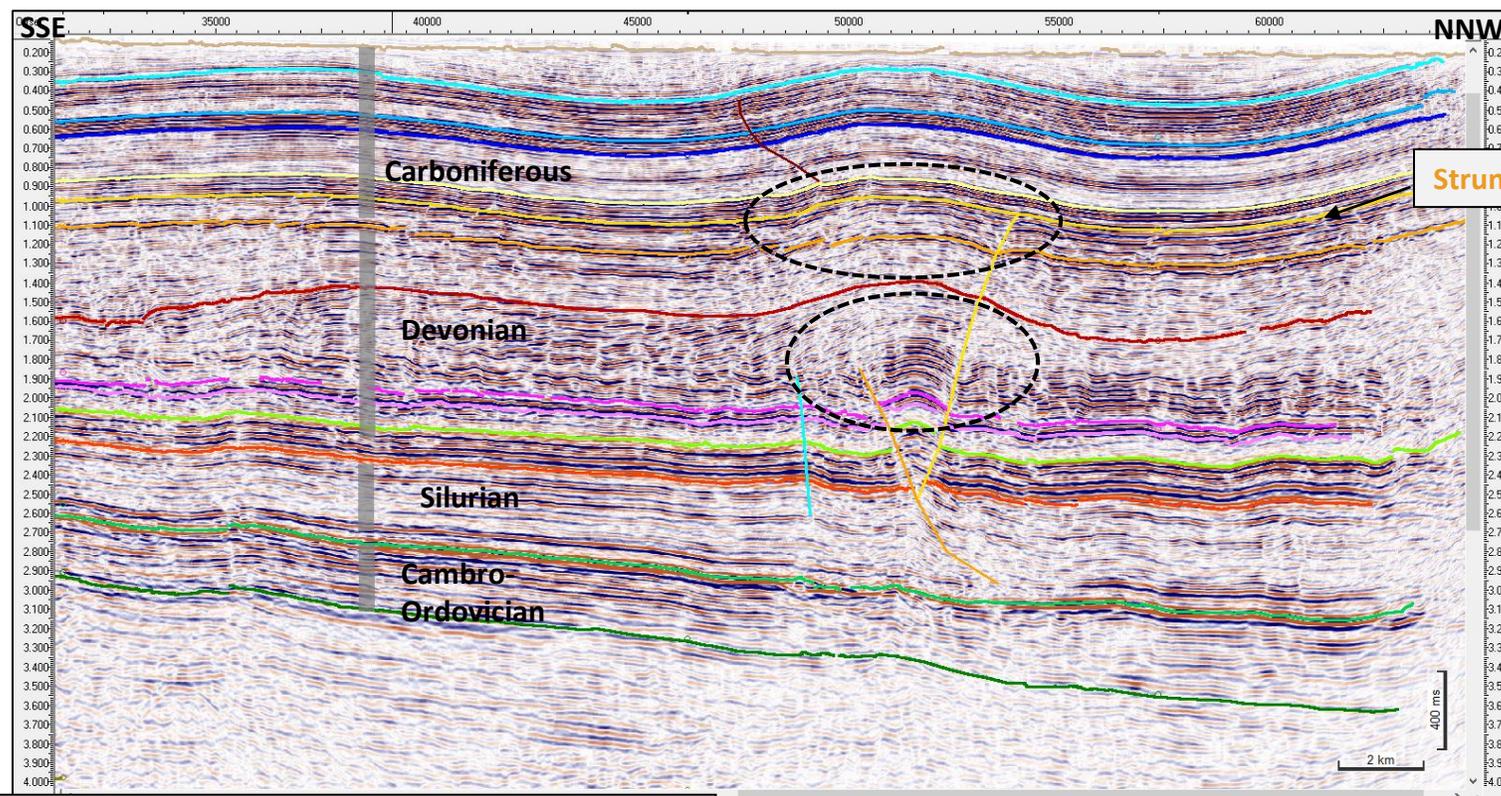
- 4 way faulted structural closure anticline prospect

1. Source Rock: Mid & Lower Cretaceous/ Toarcian.
2. Migration: Vertical
3. Reservoir: Deep marine sand-rich stacked turbidite channels of Barremian age.
4. Seal: Marls-shales deep marine Aptian-Albian
5. Trap: 4-way structural closure anticline (faulted).

| PROSPECT | |
|-----------------------------------|-----------------------------|
| Water Depth (m) | 2100 |
| Closure (Km ²) (mean) | 21.58 |
| P mean Resources (MMBO) | Oil case : 871 |
| | Gas case : 94.30 BCF |

EXAMPLES OF PLAY CONCEPTS & ANALOGUES

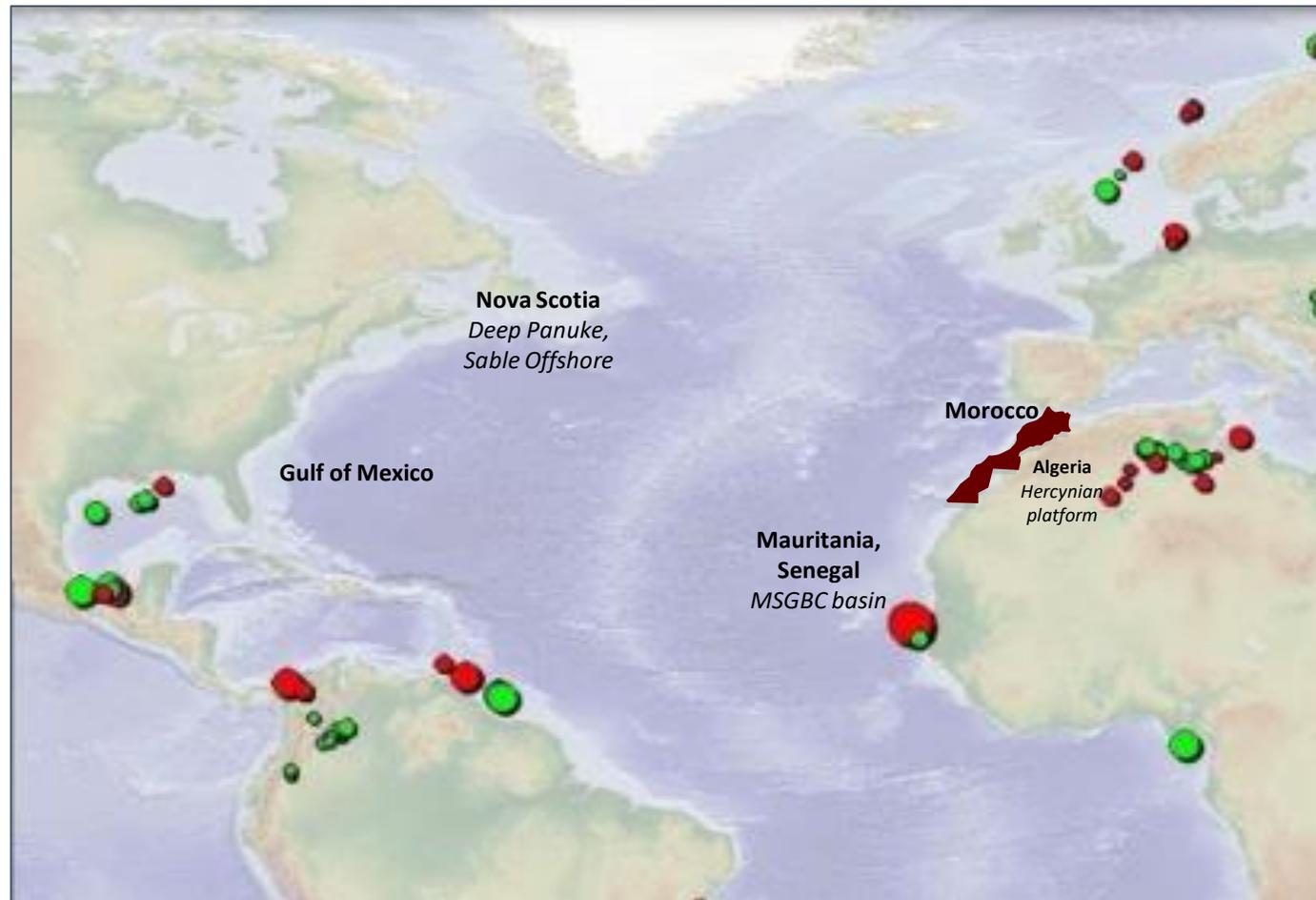
PALEOZOIC MULTI TARGET STRUCTURES



1. Source Rock: Silurian hot shales & Devonian shales
2. Migration: Vertical pathway through faults
3. Reservoir: Carboniferous & Lower Devonian sandstones
4. Seal: Palaeozoic interbedded shale & marls
5. Trap: Hercynian structures (3 to 4-way closures)

| DOUBLE TARGET PROSPECT | |
|--|----------------|
| Primary target (Devonian) gas resources | 276 Bcf |
| Secondary target (Lwr Carb.) gas resources | 294 Bcf |
| Total | 570 Bcf |

MOROCCAN BASINS ANALOGUES

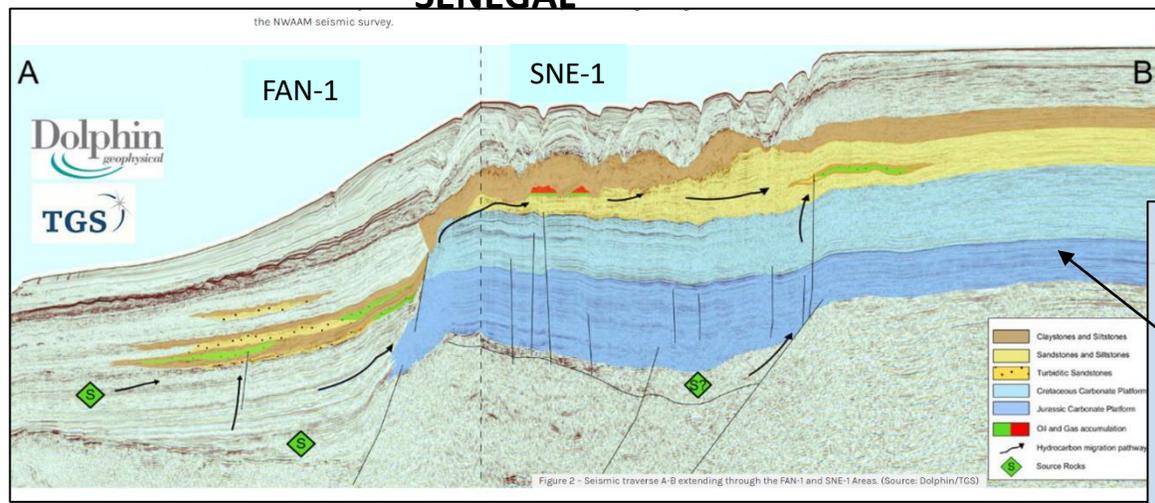


- Morocco basins have analogies with many recent discoveries and some of the biggest producing fields in the world.
- Continuity of the Algerian Triassic Province and the Saharan Hercynian platform in Eastern Morocco.
- Morocco is part of the Atlantic Mesozoic - Cenozoic Passive Margin where recent big discoveries have been made (MSGBC Basin).
- Nova Scotia analogies : Cretaceous Turbidites (Sable basin) and Jurassic carbonate (Deep Panuke field).
- Gulf of Mexico in terms of salt tectonics and related plays.

MOROCCAN BASINS ANALOGUES

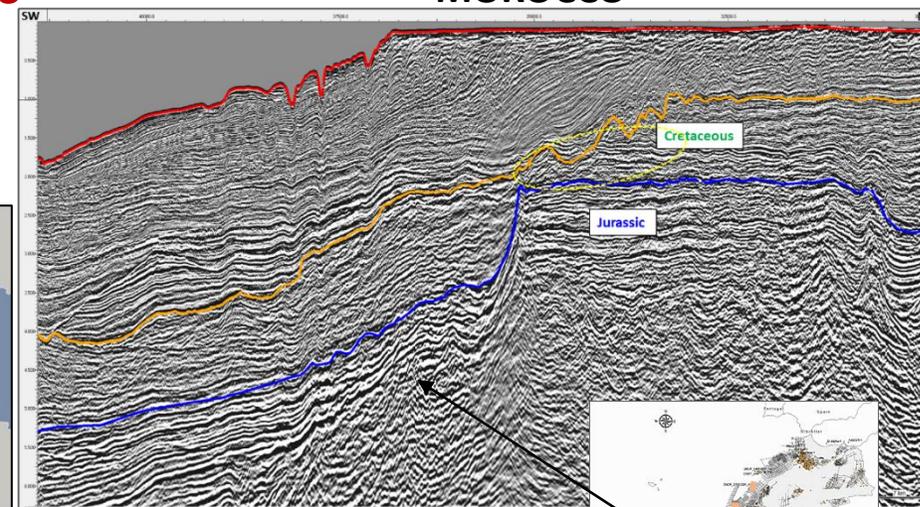
The reservoirs at SNE and FAN are represented by Lower Cretaceous and Upper Cretaceous Turbidite sandstones.

SENEGAL

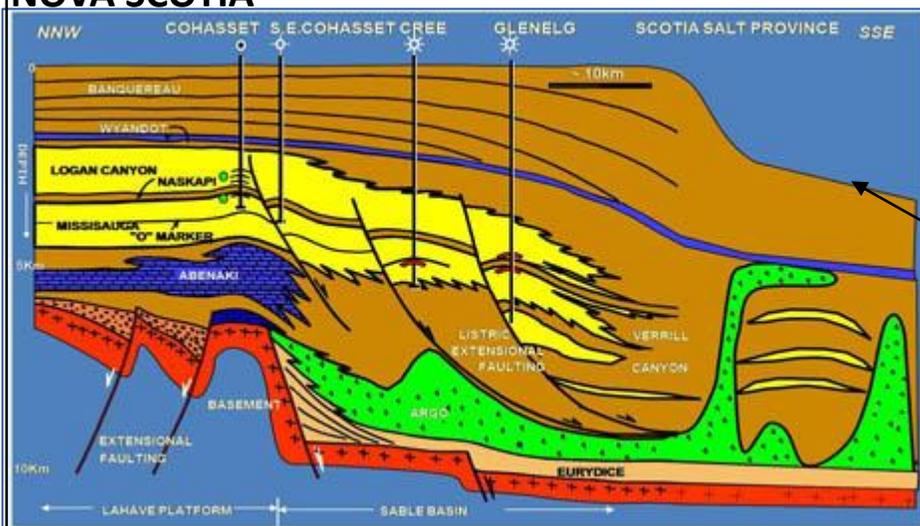


MSGBC BASINS

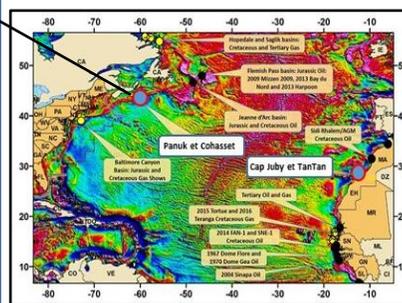
MOROCCO



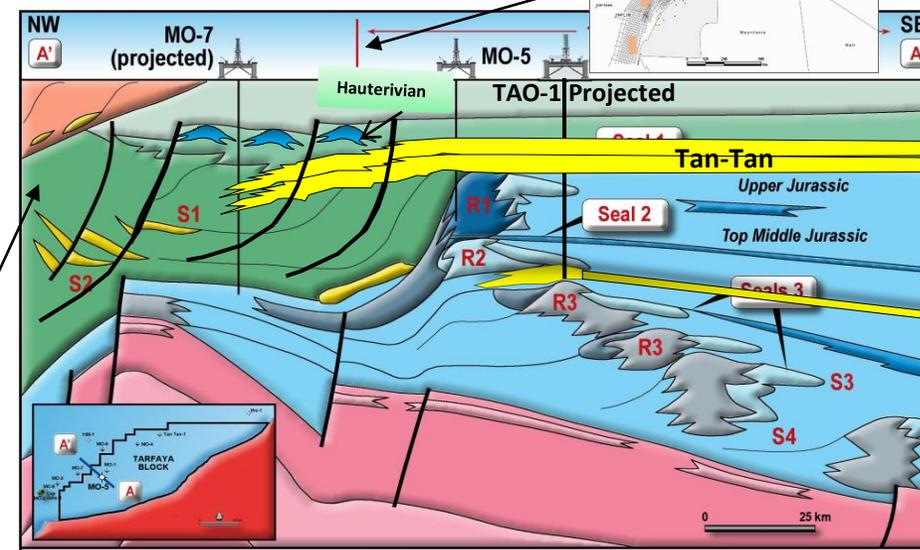
NOVA SCOTIA



ATLANTIC CONJUGATE MARGINS



MOROCCO



The main play in Panuke field is a dolomitized reefal facies, platform margin and interior oolite shoals are found.



Country key aspects

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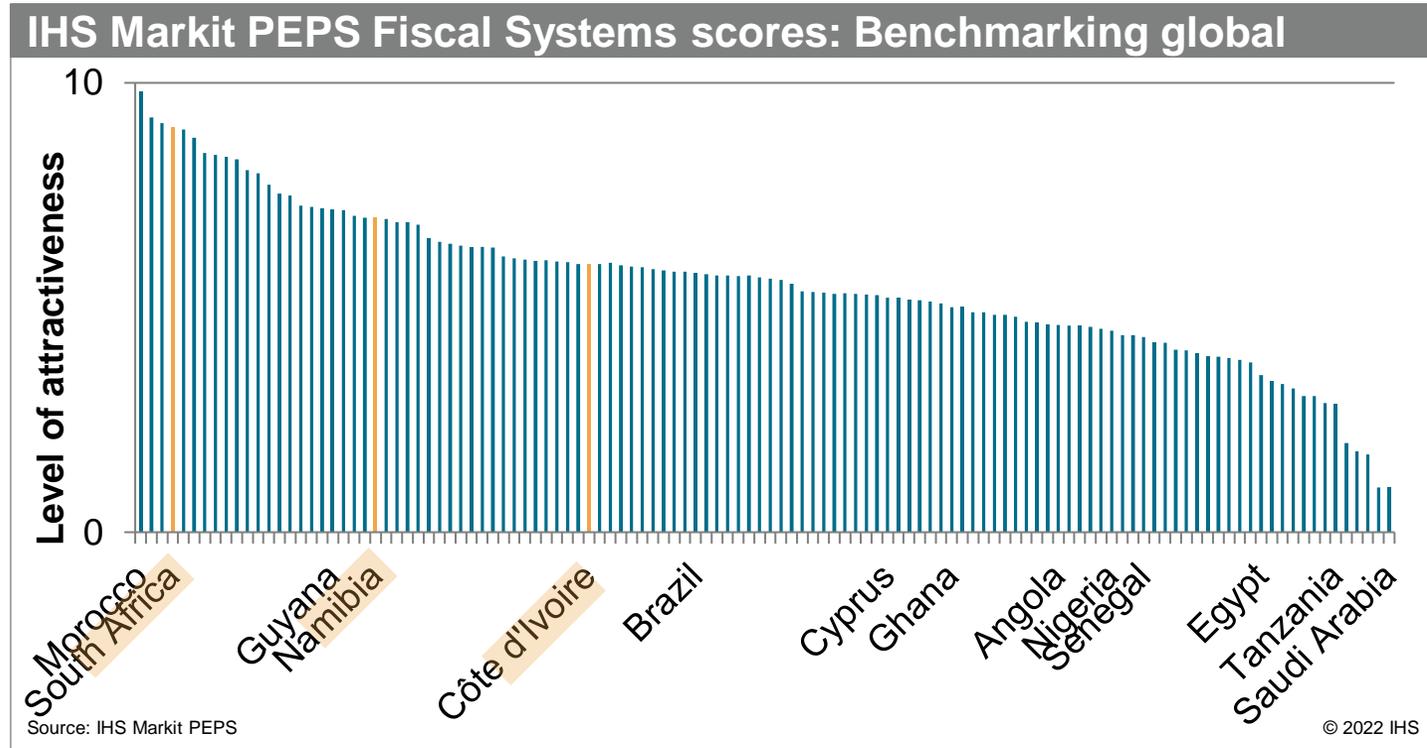
Examples of untested Play Concepts & Analogues

Morocco Incentives

MOROCCO INCENTIVES

The Moroccan Hydrocarbon Law : One of the most attractive in the world

- Government interest share : 25% maximum
- Corporate tax : Total exemption for ten-year period
- Surtax : None
- Tax exemption
 - With-holding tax on profits
 - Value added tax
 - Business activity tax
 - Urban tax
 - Tax on non-improved urban land



Easiness of doing business

No restrictions to capital for non-residents

Free repatriation of profits and capital for non-residents

More than 100 protection foreign investment agreements and double taxation

ONHYM'S ROLE IN THE DEVELOPMENT OF THE MOROCCAN GROWING GAS DOMESTIC MARKET

❖ Gas produced in Morocco basins

- ✓ Gharb basin (SDX and ONHYM): the produced gas is used by local industry (factories in Kenitra zone and AFZ)
- ✓ Essaouira basin (ONHYM): the produced gas is used by OCP

❖ Maghred-Europe Gas Pipeline (GME)

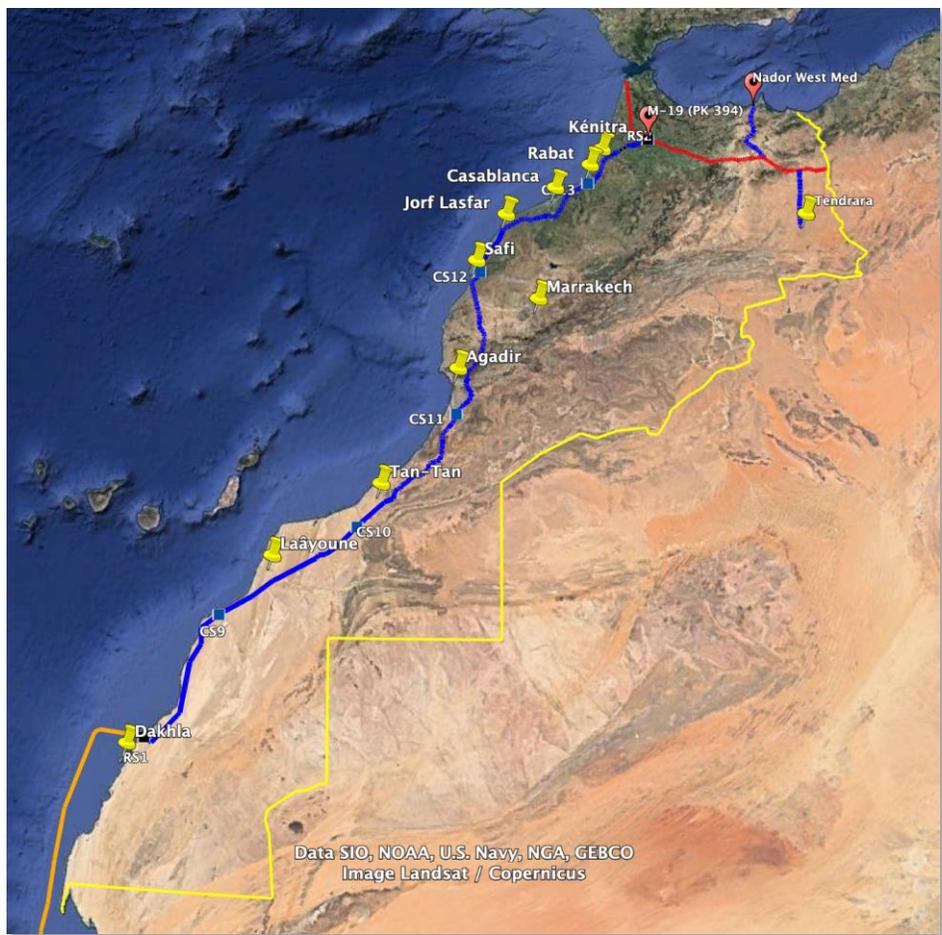
- ✓ Is used today to import gas (bought in the international market) from Spain by Reverse Flow.
- ✓ Feed the two Moroccan Gas Power Plants.

❖ Dorsale Atlantique

- ✓ The development of the Moroccan high pressure transportation network
- ✓ The Moroccan part of the Nigeria Morocco gas Pipeline.

❖ Gas to be produced in the coming years

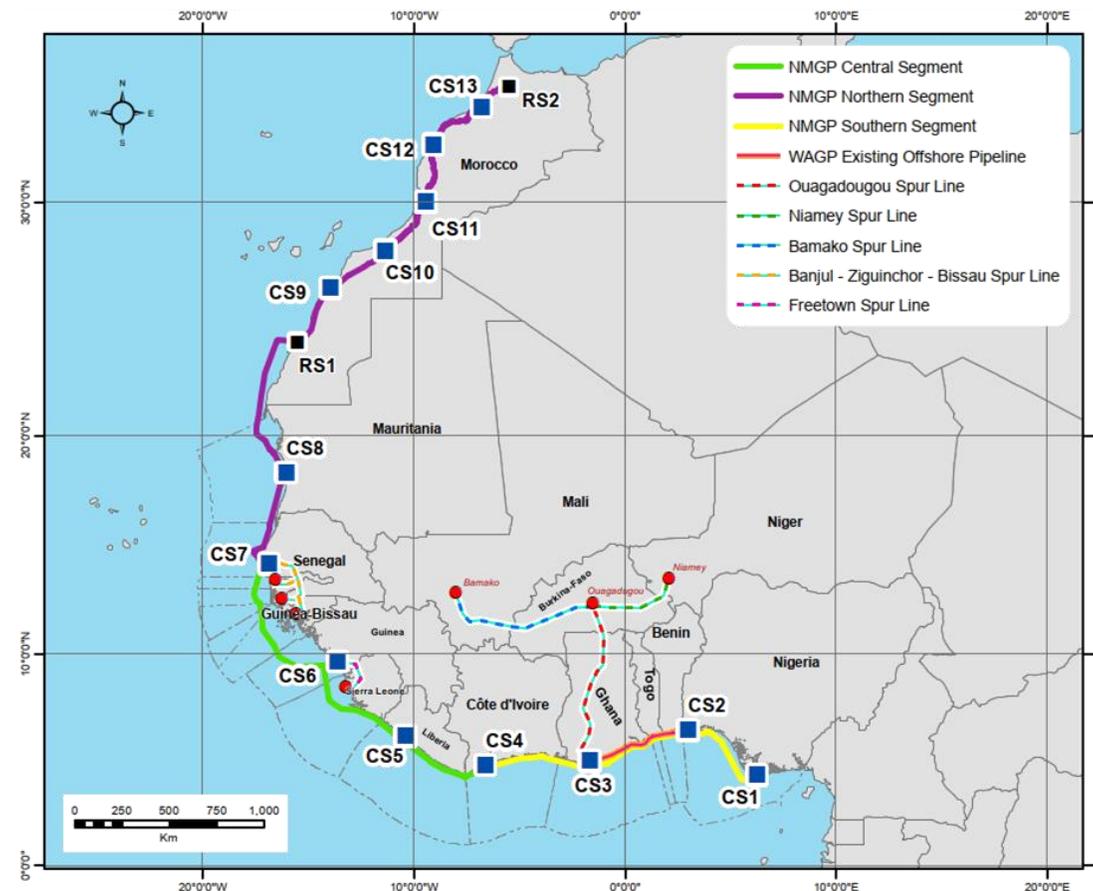
- ✓ Two gas projects to supply power plants and the booming local industry
- Tendirara project operated by Sound Energy
- **Anchois project operated by Chariot**



MOROCCO GROWING GAS DOMESTIC MARKET

Bringing gas from West Africa to Europe across 13 countries

- ❖ Design capacity: up to 30 BCM/Y
- ❖ Gas Export to Europe: 18 BCM/Y
- ❖ Overall Total Length above 6000 Km
- ❖ Memorandums of Understanding (MoUs):
 - ✓ MoU with ECOWAS signed on 15 September 2022 in Rabat
 - ✓ MoUs with Mauritania and Senegal signed on 15 October 2022 in Nouakchott



THANK YOU

For more information please
visit our **BOOTH**

