MOROCCAN ATLANTIC MARGIN: NEWLY DEVELOPED OPPORTUNITIES FOR HYDROCARBON EXPLORATION
A monarchy established in the year 788 (12 centuries ago)

The Constitutional Council reviews the constitutionality of all laws

In July 2011, a referendum established a new Constitution, guaranteeing:

- Human rights
- The legality of the State and its institutions
- Individual and collective liberty
- Improved moral standards in public life
- The plurality of the Moroccan identity

Morocco, most stable country in North Africa in 2012
According to the Association For International Affairs

Morocco, most pacifist country in North Africa in 2013
According to Global Peace Index 2013

Morocco, most democratic country in Arab region in 2013
According to the Egyptian center Ibn Khaldoun
### Investor Protection
- 51 Double Tax Avoidance Agreements
- 62 Investment Protection Agreements
- Member of OECD Investment Committee
- Member of International Centre for Settlement of Investment Disputes (ICSID)
- Member of MIGA (Multilateral Investment Guarantee Agency)

### Legal Reforms
- The creation of the Business Environment National Committee (CNEA) to facilitate procedures and access to information, and to carry out legal reforms
- The modernisation of business law
- The strengthening of intellectual property protection
- A new law on arbitration and mediation
- New banking regulations
- Administrative simplification

### An Incentive Tax System
- Reduction of tax burden
- The creation of funds specifically for investment promotion

### International Instruments
- Morocco adhered to the OECD Declaration on Propriety, Integrity and Transparency in the Conduct of International Business and Finance and to the OECD Declaration on Green Growth
Morocco's demand in:
- Primary energy: X2 BY 2020 AND X3 BY 2030
- Electricity: X2 BY 2020 AND X4 BY 2030

GDP GROWTH: 5%/YEAR

CONSUMPTION IN MILLIONS TEP

CONSUMPTION IN TWH

Investments in domestic resources are crucial
HYDROCARBON EXPLORATION OUTLOOK
Large sedimentary basins of several geological and structural types: Total surface area: 918,237 km².

A very extended offshore domain: 3,000 km coast line on the Atlantic and 500 km on the Mediterranean sea.

Total area: 300,000 km² (to 4,000 m bathymetry), consisting of Mesozoic and Cenozoic sedimentary basins.

A various onshore sedimentary basins: Objectives ranging from Precambrian to Neogene
HYDROCARBON EXPLORATION STATUS

32 ONHYM Partners on:
• 87 Exploration Permits
• 7 Reconnaissance Licenses
• 3 MOU for Oil Shale
• 10 Concessions
• Total : 336 058.75 km²

Partners Investment in 2015 : 3.18 billions dirhams (0.3 billion US$)
HYDROCARBON EXPLORATION STATUS

SEISMIC & WELLS DATABASE


Onshore
- 2D Seismic: 9 150 Km
- 3D Seismic: 1 856 Km²

Offshore
- 2D Seismic: 79 784 Km
- 3D Seismic: 47 475Km²

Exploratory Wells:
- 43 wells onshore (41 in the Atlantic & 2 in the Mediterranean)
- 293 wells Onshore
Wells drilled in Morocco Atlantic Margin

- 15 wells drilled in the period 2000-2015 in a coastline of 3000 Km: 7/15 deep waters
- 5/7 wells drilled offshore in 2013-2015 encountered either oil or gas shows or heavy oil.

Presence of working petroleum systems in the Offshore Moroccan sedimentary basins (needs to be confirmed with more discoveries).
This requires, of course, an intensive exploration drilling effort.
HYDROCARBON EXPLORATION : RECENT DISCOVERIES

**KOSMOS ENERGY**

**CAP BPOUDJOUR OFFSHORE**

- **CB-1** (drilled in 2014)
- TD 5462m TVDSS/WD 2131m
- Tithonian
- Valanginian slope fan and Berriasian channel targets
- Gas and condensate

**GENEL ENERGY**

**SIDI MOUSSA OFFSHORE**

- **SM-1** (drilled in 2014)
- TD 2762m TVDSS/WD 983m
- Middle Jurassic
- Upper and Middle Jurassic fractured carbonates
- Heavy oil (15-26° API) in the Upper Jurassic
Offshore Wells drilled in 2013/2015: Post mortem studies & learned lessons

Salt related plays:

- Thick turbidite sands would be deposited in intra growing salt diapirs minibasins, and only thin bedded sands were tested by the recent wells, on the flanks of the diapirs.
Offshore Wells drilled in 2013/2015: Post mortem studies & learned lessons

Salt related plays:

- Thick turbidite sands would be deposited in intra growing salt diapirs minibasins, and only thin bedded sands were tested by the recent wells, on the flanks of the diapirs.
- Sand bearing Inverted minibasins would be the focus in the next phase of the exploration in the salt province.
Offshore Wells drilled in 2013/2015: Post mortem studies & learned lessons

Platform related plays:

- Middle Jurassic prograding deltas, on the shelf, and their covalent silici-turbidites, in the slope and basin, would be good objectives to be targeted in addition to the upper and lower Jurassic platform carbonates in the Tarfaya area.
HYDROCARBON EXPLORATION: EXAMPLES OF NEWLY DEVELOPED PLAY CONCEPTS
Sub-salt play (Foum Draa Offshore)

1. Source Rock: Lower Jurassic marls & carbonates
2. Migration: Vertical through salt welds
3. Reservoir: Lower Cretaceous and Upper Jurassic turbidite sandstones and carbonates
4. Seal: Overlying salt
5. Trap: Combined (sub-salt)
1. Source Rock: Likely a Lower Cretaceous SR located outboard to the west
2. Migration: Vertical through faults
3. Reservoir: Lower Cretaceous deltaic sands (Tan Tan Fm)
4. Seal: Deep marine Upper Cretaceous claystones (Aguidir Fm)
5. Trap: Structural and stratigraphic (rotated listric fault blocks and truncation edge with the BTU)
Example of Upper Cretaceous Slope Fan Turbidites (Dakhla Offshore)

1. **Source Rock**: Cenomanian-Turonian marls
2. **Migration**: Vertical short pathway
3. **Reservoir**: Likely Maastrichtian turbidite sandstones
4. **Seal**: U. Cretaceous & Tertiary Marls & shale
5. **Trap**: Stratigraphic (LST)
Total unrisked generated volumes in the Moroccan Atlantic Margin about **79.7 BbblOE**. These are comprising:

- **73.1 BbblOE** from Jurassic and Lower Cretaceous source rocks;
- **1.4 BbblOE** from Mesozoic and Cenozoic source rocks in the thrust and melange zone;
- **5.2 BbblOE** from conjectural Triassic lacustrine and pre-salt sources.
CONCLUSIONS

The main strategic reasons to explore for hydrocarbons in Morocco

- **Stable and attractive country** with market place that is rapidly deregulating and opening.

- **Promising Potential**
  - Most of the nation’s territory is under explored
  - Wherever adequately explored, Moroccan sedimentary basins have produced Hydrocarbons.

- **Opportunities** that combine **low entry cost and suitable exit options**.

- **One of the most attractive fiscal regime worldwide**.

- **Fully shared vision** with partners and...

- **An exciting future** to the investors.