A Review of Prospective Deepwater Oil & Gas Developments in the Eastern Mediterranean

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Agenda
- What is Deepwater?
- Why is Deepwater important?
- The Mediterranean Sea
  - Western & Eastern Basins
  - Key Facts
  - Geological Setting
  - Bathymetry
  - The Levant Basin
  - Hydrocarbon Prospectivity

What is “Deepwater”?  
- Until fairly recently, anything beyond the edge of the continental shelf (i.e. approx. 200m) was considered as “deepwater”
- The generally accepted current definition of “deepwater” is anything beyond 500m
- “Ultra-deepwater” defined as being beyond 1500m.

Why is Deepwater important?
- Global oil output from deepwater oil and gas fields is expected to reach 13% by 2020 - up from 0% in 1990.

Conclusions

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The International Hydrographic Organization defines the limits of the Mediterranean Sea as follows stretching from the Strait of Gibraltar in the West to the entrances to the Dardanelles and the Suez Canal in the East.

The Mediterranean Sea is divided into two deep basins:

- **Western Basin:** Cape Trafalgar (Spain) and Cape Spartel (Africa) to Cape Lilibeo (Sicily), through the Adventure Bank to Cape Bon (Tunisia).
- **Eastern Basin:** Kum Kale and Cape Helles, the Western entrance to the Dardanelles to the entrance to the Suez Canal and the coasts of Syria and Palestine.

**Key Facts**

- Area of 2,512,000km²
- Coastline of 46,000km
- East to West extent of 3,860km
- Maximum width of 1,600km
- Maximum depth approx. 5,267m in the Calypso Deep in the Ionian Sea
- Average depth of around 1,600m

**The Levant Basin**

- The Levant Basin Province encompasses approximately 83,000km² of the eastern Mediterranean area.
- The area is bounded to the east by the Levant Transform Zone, to the north by the Tartus Fault, to the northwest by the Euphrates Fault, to the southwest by the Nile Delta Cone Province boundary, and to the south by the limit of compressional structures in the Sinai.

**Bathymetry**

**Western & Eastern Basins**

**Geological Setting**
Hydrocarbon Prospectivity

- According to USGS, Levant Basin alone has 1.7 billion barrels recoverable oil and 3.45 billion cubic metres recoverable gas.

- Further the combined Levant Basin, Nile Delta Cone, Eratothenes Continental Block, Herodotus Basin and the Mediterranean Ridge, may hold more than 50 trillion cubic metres of gas.

Deepwater Mediterranean Oil & Gas Production

www.atherion.co.uk Source: BG Group

WDDM Development

www.atherion.co.uk Source: IntecSea

Deepwater Prospects - Spain

- Repsol oil discoveries in the Spanish Mediterranean in 2009.
- Montanazo field (736m) and Lubina field (663m).
- 8km from existing Casablanca platform.

www.atherion.co.uk Source: Repsol

Deepwater Prospects - Libya

- 58km offshore Libya in the Sirte Basin.
- 855m water depth.

www.atherion.co.uk Source: Hess
Deepwater Prospects - Egypt

- Hodoa - Oligocene deepwater gas discovery.
- West Nile Delta area.
- 80 km northwest of Alexandria.
- 1077m water depth.

Source: BP

Deepwater Prospects - Areas of Palestinian Authority

- Gas discovery in 2000.
- 36km off coast of Gaza.
- 600m water depth.

Source: BG Group

Deepwater Prospects - Israel

- Noble Energy series of discoveries.
- Leviathan - 1,634m water depth
- Tamar - 1,676m water depth
- Dalt - 1,372m water depth
- Proximity to Cyprus 'A' (Aphrodite)

Source: Noble Energy

Deepwater Prospects - Cyprus

- Block 12 offshore Cyprus
- Noble Energy gas discovery in late 2011
- 1,689m water depth

Source: Cyprus Gas News

Deepwater Prospects – Others?

- Spectrum ASA is shooting circa 3,000 sq km of multi client 3D seismic surveys in the south western part of Lebanon’s Exclusive Economic Zone in the eastern Mediterranean.
- Shooting expected to be finished by the end of September.
- Final processed data will be available in early 2013 in advance of a license round.

Source: Spectrum ASA

Deepwater Development Concepts

Source: www.atherion.co.uk
Deepwater Challenges

- Diverless installation, operation and maintenance is required
- External pressure is a major issue
- Equipment installation without guidelines in the ultra-deep
- Flow assurance is much more difficult
- Deepwater technology is a high priority with major operators and service/equipment providers

Deepwater Challenges – BP Foinaven

- Location 190km west of Shetland Islands
- Water Depth – 520m
- Estimated recovery 380 million bbl of oil
- 230 billion cubic feet of gas
- Development FPSO with well trees
- Discovered 1992, First Oil 1997
- Plateau production 100,000 bbl/d
- Development cost £750 million

Deepwater Challenges – Lessons Learnt

- “It sounds obvious but you really must ensure that everything is 110% before putting it in the water”
- Close integration between facilities, wells and subsurface teams essential
- Involve operations team
- Design for repair and recovery
- Employ experienced engineers and managers

Conclusions

- Deepwater developments are becoming increasingly important
- The Eastern Mediterranean Basin has high prospectivity
- Deepwater projects are difficult!
- Technology is enabling economic deepwater development
- Subsea facilities will be the default option
- Assuring integrity is crucial and is the operator’s responsibility

Thank you for listening!