Future of the Ocean Economy

Exploring the prospects for emerging ocean industries to 2030
### Workshops & Expert Groups

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### OECD COUNCIL WORKING PARTY ON SHIPBUILDING (WP6)

**WORKSHOP ON SHIPBUILDING AND THE OFFSHORE INDUSTRY**

Main Outcome of the 25-26 June 2014 Trondheim Workshop

Offshore Oil and Gas: the New Frontiers

**OECD Project**

The Future of the Ocean Economy: Exploring the prospects for emerging ocean industries to 2030

**Antoine Borelli**

d2m Engineering
Offshore Oil and Gas: The New Frontiers:
25-26 June 2014 Trondheim Workshop: 4 sessions

1. “Where do we need the offshore oil and gas industry to be in 2030?”
   Antoine Borelli, Managing Partner, d2m Group

2. “Future requirements and developments in science and technology for deep-water and
   Arctic oil and gas and non-conventional hydrocarbons”
   André Cordeiro:
   Executive Manager of Petrobras Research Center CENPES, Brazil

3. “Assessing the risks - in particular environmental, operational and climate related”
   Dan McConnell, Fugro Geotechnical Division, USA
   Expert in Marine geology and geophysics

4. “The need for regulatory response, especially in terms of international institutional
   framework”.
   Olof Lindén, World Maritime University, Sweden
   Expert in Marine Environmental Management

“Offshore Oil and Gas: The New Frontiers”: Main Outcome
1 - Where do we need to be in 2030?
World Offshore crude oil production by location in the New Policies Scenario

Sources: Rystad Energy AS; IEA analysis, World Energy Outlook 2012
The offshore market is expected to double until 2030 with floaters and subsea to substantially expand its share from 40% to ca. 60%.

- Underwater facilities for oil and gas production are generally referred to as
  - subsea well
  - subsea tree
  - subsea manifold, etc.

- Together with the engineering, manufacturing and installation of umbilicals, risers, and flowlines, as well as associated services, this scope is often abbreviated as “SURF”.

- There will be a doubling of the offshore oil service market from 2010 to 2016 and offshore E&P spending will reach US$ 1 trillion in 2030.

- Today, development solutions containing floaters and SURF (subsea) covers roughly 40% of offshore field developments.

- This will increase to 60% in 2030 when tie-backs will drive growth in the subsea market by 4 times in the period 2012–2030.

1- Offshore Oil and Gas: The New Frontiers
smaller reservoirs, more difficult to produce

North Sea hydrocarbons production per type of reservoir

Sources: CGG presentation, Journées Annuelles des Hydrocarbures, Oct 2014
1- Offshore Oil and Gas: The New Frontiers: Main Findings
Investment in E&P are soaring as the production stagnates
Investments, Production, crude price and production value (base=100 in 1978)
Source: IFPEN, 2013

Figure 4: Investissements, production, prix du brut et valeur de la production (base 100 en 1978)

2 – “Offshore Oil and Gas: The New Frontiers”: Main Outcome
On future requirements and developments in science, technology and logistics

In producing offshore hydrocarbons, The Industry has permanent priority challenges which are:
(i) improve the safety of people and equipment;
(ii) minimize the impact of the industry on environment;
(iii) increase the efficiency of processes and equipment;
(iv) maintain or lower the costs of investments and operations.
But beyond these challenges, to maintain or increase its production capacity, it must explore new frontiers to find new competitive hydrocarbon reserves; the new avenues are:

- Increase the recovery rate from the reservoir, from 35/40% to an objective of 60%?
- Develop Offshore Gas production, treatment, liquefaction, transport and regaseification
- Develop unproduced geology plays in shallow, deep and ultra-deep water (beyond 2000 m);
  Develop High Pressure, High Temperature reservoirs
- Develop new areas, remote and under extreme environment conditions, such as Arctic fields
- Develop Unconventional Hydrocarbons such as Extra-heavy Oil or Shale Oil and Gas, and offshore, in the longer term, Gas (Methane) Hydrates production.
1. Industrialize and lower costs of solutions in deepwater is the priority

2. Move from present 2-3000m towards 4000m

3. Areas beyond 4000m still around 50% of oceanic basins
2 – “Offshore Oil and Gas: The New Frontiers”: Main Outcome - Arctic areas
Vast underexplored area with potentially 20% of hydrocarbons

Arctic oil and gas fields from IHS

http://www.geoexpro.com/articles/2014/01/the-arctic-the-real-final-frontier

2 – “Offshore Oil and Gas: The New Frontiers”: Main Outcome - Arctic areas

- Outstanding potential... but also Outstanding challenges,
- Arctic developments need:
  - Oil spill preparedness
  - Sufficient infrastructure (logistics, communication, including satellite)
  - Equipment that can withstand impact from ice flows
  - New drilling structures
  - And the risk assessment/site conditions that an offshore site needs
- The different basins raise different challenges.
- Industry already has experience producing in very hostile environment
- Bulk of development beyond 2030

http://www.geoexpro.com/articles/2014/01/the-arctic-the-real-final-frontier
Methane Hydrate Samples and Inferred Occurrences

• The risks associated with producing gas hydrates are not yet well assessed

• After the scientific level, an industrialization process will have to take place

• In general it seems the methane hydrates commercial exploitation will not start before 2030 in view of the challenges involved.
“Offshore Oil and Gas: The New Frontiers”: Main Outcome
3 - Assessing the risks (in particular environmental, operational and climate related)

(i) Will the risks be different than today?
- Deepwater? Probably not, except for the ones that have been miscalculated
- Arctic? Definitely
- Methane hydrate? Yes and No
  
  As a geohazard, creating soil instabilities in the foundation of facilities

(ii) Do we better need to understand the risks in the areas we are working now?

Absolutely; the industry improves as it learns from experience

What has pushed design standards and practice?

- Example: Category 4 and 5 Hurricanes Dennis, Katrina, and Rita
  - Used a 100 year return period until 2005 when Dennis, Katrina, and Rita swept through causing serious damage to many floating platforms, listed Thunder Horse and capsized the Typhoon TLP
  - Since then, significantly increased the 100 year criteria
4 - Is there a need for a regulatory response, in particular in terms of an international institutional framework

1 - It is recognized that in order for the oil and gas industry to be able to operate further offshore into deep and ultra-deep waters, as well as into the Arctic, the actors will need an incentive-oriented and stable regulatory and economic environment.

2 - The institutional regulatory framework is composed of:
- UN Convention on the Law of the Seas (UNCLOS)
- IMO conventions on maritime activities (MARPOL, SOLAS, BWMC, etc.)
- International Sea-bed Authority (ISA) for managing areas beyond national jurisdiction. IMO has clear priorities and an already very busy agenda on marine issues, without taking the mining subjects onboard...

3 - The global regulatory response to date is weak and uncoordinated. There is no effective legal regime in place for areas beyond EEZs (see e.g. fisheries).
4 - Is there a need for a regulatory response, in particular in terms of an international institutional framework

Depending upon their nature, favoured route is to negotiate issues at:
1  Multinational level
2  National level
3  Industry level

5 - Conclusion

- Offshore Oil and Gas activities require careful planning and preparation, hence good visibility to 2030... except disruptive innovations!
- The industry should be able to meet its Hydrocarbons production challenges of 48 mboe/day: but it raises huge challenges as most fields existing today will be depleted at that time: New Frontiers to be explored relentlessly....
- Complexity and costs of developments will continue growing, but many avenues are pursued and can be explored; The Support of States in helping to prompt acceptability of developments and in favor of scientific and technical Research and Development is necessary
- Progress on international multilateral negotiations necessary to: resolve jurisdiction conflicts; adopt common criteria for safety and security during life of field; set up indemnification principles, remediation in case of pollution; establish cooperation in oceanographic domain and others ; ...