The Energy Sector of the Blue Economy

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eco-union

Workshop, Marseille, 31 May 2017
Getting an idea of the importance of the sectors (today vs. 2030 globally)

Figure 1. Rough estimates of the relative sizes of maritime sectors at the global scale based on Gross Domestic Products (GDP) figures from 2005 and their expected growth to 2030 (projections made by WWF)
44% of the Med area are either contracted or designated for oil & gas exploration (Med Trends)
Med Trends forecasted high gas production increase

Figure 5. Gas production forecast in the Mediterranean Sea, based on past trends (in Million tonnes of oil equivalent). Projection of past trends[31]
Unclear development of offshore oil and gas activities (not separate from onshore); Egyptian figures are key.
Increased number of accidents is – according to REMPEC – mainly due to a better compliance to reporting procedures.
Globally about 9% of oil spills come from offshore production

- Bulk of oil spills from maritime traffic (68%) and onshore facilities (23%).
- But in regions with intensive production, related marine pollution can rise to 32%.
- Spills from offshore oil production are mostly small (<7t) or medium (<700t). They occur mainly during loading and discharging operations in ports and oil terminals.
- In May 2011, exploratory drilling in the Leviathan gas well (Israel) caused a major leak of brine (12–14 thousand barrels per day).
- Globally, the majority of well blowouts have occurred during exploratory drilling operations.
- Many new explorations in the Med Sea take place in seismic areas.
A third of known, extractable oil, half of gas and over 80% of coal reserves must not be burnt to reach 2°C target

http://newsroom.unfccc.int/unfccc-newsroom/most-fossil-fuels-must-stay-in-the-ground-new-study/

2014: UN Secretary General Ban Ki-moon called upon companies to reduce their investment in fossil fuels, or to divest completely.
Offshore wind projects can be expected in certain areas
There are no commercial offshore wind projects in the Med yet.
Gusts of change: How effective policy is catalysing a booming offshore wind sector

Kristian Petrick
IEA-RETD Operating Agent
All-Energy 2017, 10 May 2017, Glasgow
This study presents a comparative analysis of approaches to offshore wind development internationally

Policy & Regulation:
- Which policy and regulatory frameworks have been most effective in catalysing growth?
- How can policymakers effectively balance the risk profile for developers and government?

Industry Structures:
- How and why have industry structures evolved over time?
- What can policymakers do to support the development of robust industry structures?

Project Risk Management:
- How can developers manage risk throughout the project lifecycle?
- Which developer models and strategies have been most successful?
Offshore wind can achieve several government objectives

**Decarbonisation:**
- Clean, renewable source of electricity
- Highly scalable

**Energy security & system benefits:**
- High load factors (40-50%)
- Flexible generation

**Costs to consumers:**
- Considerable cost reduction achieved and further expected
- Expected to be ‘subsidy free’ in Europe within next decade

**Local economic benefits:**
- Align with industrial strategy
- Job creation & safeguarding
Offshore wind is a rapidly maturing energy technology, with deployment set to almost triple from 2015 to 2020

- Market growth historically concentrated in Europe
- Several emerging markets beginning to scale up
- Growth beyond 2020 contingent on policy support

Source: 4coffshore, WindEurope, Carbon Trust analysis
Notes: Pipeline reflects central deployment scenario
Cost reduction targets have been exceeded ahead of schedule

- Considerable cost reduction achieved since 2010
- ~60% LCOE reduction from 2010 to 2018 (FID year)
- Introduction of competitive auctions has accelerated cost reduction in Europe
- Note: Costs expected to be higher in emerging offshore wind markets

** Cost Reduction Monitoring Framework (2017)
*** Includes grid connection and site development costs for NL and DK projects (uplift of €14/MWh). It should be noted that many of the ‘actual’ projects reaching FID (financial investment decision) have not yet been built.
Six key pillars of policy to support offshore wind development

1. MARKET SCALE & VISIBILITY
   2. SITE DEVELOPMENT
   3. GRID CONNECTION
   4. INCENTIVE MECHANISMS
   5. SUPPLY CHAIN DEVELOPMENT
   6. INNOVATION SUPPORT

Two emergent policy trends:
1. Competitive auctions
2. Centralised development models
Market scale and visibility is widely considered the most important policy driver

• Lack of visibility creates uncertainty and increased risk for developers, suppliers, and investors

• Need to integrate offshore wind policy within long-term energy strategy

• Need to provide visibility over long time horizons

• Targets must be supported with appropriate policy levers

• Short to medium-term roadmaps can hedge against long-term uncertainty (e.g. NL)

Netherlands Offshore Wind Roadmap

• Roadmap with phased deployment over 5 year period
• Driven by National Energy Agreement to install 4.45 GW by 2023
• 5x 700 MW sites identified, de-risked, and tendered annually
• Call to increase targets by and beyond 2023
Centralised development models can de-risk offshore wind projects for developers

<table>
<thead>
<tr>
<th>Zone identification</th>
<th>Site selection</th>
<th>Site investigation</th>
<th>Consenting/permitting</th>
<th>Grid application</th>
<th>Grid design &amp; construction</th>
<th>Government risk/control</th>
<th>Developer risk/control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crown Estate</td>
<td>Developer</td>
<td>Developer</td>
<td>Developer via PINs</td>
<td>Developer / National Grid</td>
<td>Developer / OFTO</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>EEG 2014</td>
<td>Developer</td>
<td>Developer</td>
<td>Developer via BSH</td>
<td>TSO</td>
<td>TSO</td>
<td>Centralised</td>
<td>Decentralised</td>
</tr>
<tr>
<td>EEG 2017</td>
<td>Government</td>
<td>Government</td>
<td>Developer via BSH</td>
<td>TSO</td>
<td>TSO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>Government</td>
<td>Government</td>
<td>Government / TSO</td>
<td>TSO</td>
<td>TSO</td>
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</tr>
</tbody>
</table>

Key: Green = Government / TSO responsibility; Amber = Developer responsibility, PINs: planning inspectorates, BSH: Federal Maritime and Hydrographic Agency.

- Response to **higher allocation risk** from competitive auctions
- Centralised models require considerable **capacity building within government & TSOs**
- Some developers have a preference for greater **control of development activities**, particularly offshore transmission assets (risk of government inefficiency)
- Site-specific tendering can also introduce greater **portfolio risk**
Grid policy is heavily influenced by local context

<table>
<thead>
<tr>
<th>Grid Connection</th>
<th>Deep</th>
<th>Hybrid</th>
<th>Shallow</th>
<th>Super shallow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbine Foundations</td>
<td>Blue</td>
<td>Amber</td>
<td>Blue</td>
<td>Blue</td>
</tr>
<tr>
<td>Array Cables</td>
<td>Amber</td>
<td>Amber</td>
<td>Amber</td>
<td>Amber</td>
</tr>
<tr>
<td>Export Cables (AC)</td>
<td>Amber</td>
<td>Amber</td>
<td>Amber</td>
<td>Amber</td>
</tr>
<tr>
<td>Export Cables (DC)</td>
<td>Amber</td>
<td>Amber</td>
<td>Amber</td>
<td>Amber</td>
</tr>
</tbody>
</table>

Key: Blue = TSO responsibility; Amber = Developer responsibility

- **Decentralised developer-build (‘deep charging’) models** can result in lower cost point-to-point transmission assets.
- **Centralised TSO-build (‘shallow charging’) approaches** can help with strategic coordination of power transmission to ease onshore grid constraints. More amenable to offshore hubs and interconnection.
Incentive mechanisms evolve with technology and market maturity

<table>
<thead>
<tr>
<th>Demonstration projects</th>
<th>Early commercial projects</th>
<th>Large-scale commercial projects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capital grants</strong></td>
<td><strong>Fixed off-take contracts</strong></td>
<td><strong>Competitive auctions</strong></td>
</tr>
<tr>
<td>• Supports early projects where costs are uncertain due to lack of experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• E.g. UK Offshore Wind Capital Grants Scheme</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Market-based mechanism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Provides commercial returns for developers, based on energy generation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• E.g. Feed-in premium; UK ROCs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Increased competition encourages cost reduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Auction budgets can help to control government spend</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• E.g. UK Contracts for Difference</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Governments take on higher risk in immature stages, shifting risk to developers as the technology matures.
- Growing **technology maturity** means that emerging markets are expected to go straight to fixed off-take or competitive auctions.
- Limited **market maturity** may be a barrier to competitive auctions in more isolated markets.
European countries have benefitted from clustering around the North Sea region

- Isolated emerging markets will face greater challenges in developing robust industry structures
- Tailored policy support is required to develop necessary industry structures

Source: 4coffshore
Key Findings and recommendations

• Offshore wind is on the cusp of sharp growth and marked cost reduction
• Industry is entering a market maturation phase in Europe
• Emerging markets will face greater challenges in developing robust industry structures
• Development has been underpinned by supportive policy frameworks
• Two emergent policy trends are evident:
  1. Competitive auctions
  2. Centralised development models
• These policy trends are having a material impact on the risk profile for developers
• Capacity constrained auctions necessitate greater government de-risking

Continued policy support and industry collaboration will be critical to maintaining cost reduction and expanding offshore wind to new markets.
THANK YOU!

For additional information on RETD
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Other energy resources

Apparently no sufficient OTEC potential in the Med
### Estimation of Offshore share by country (own calculation based on IEA data and some Med Trends assumptions)

<table>
<thead>
<tr>
<th>Country</th>
<th>2015* [Mtoe]</th>
<th>Percentage offshore of total production (estimated)</th>
<th>Offshore Production [Mtoe], estimated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt gas</td>
<td>41</td>
<td>80,0%</td>
<td>33</td>
</tr>
<tr>
<td>Egypt oil</td>
<td>36</td>
<td>71,4%</td>
<td>25</td>
</tr>
<tr>
<td>Libya gas</td>
<td>11</td>
<td>66,7%</td>
<td>8</td>
</tr>
<tr>
<td>Israel gas</td>
<td>7</td>
<td>80,0%</td>
<td>5</td>
</tr>
<tr>
<td>Italy gas</td>
<td>6</td>
<td>66,0%</td>
<td>4</td>
</tr>
<tr>
<td>Tunisia oil</td>
<td>3</td>
<td>80,0%</td>
<td>2</td>
</tr>
<tr>
<td>Turkey oil</td>
<td>3</td>
<td>80,0%</td>
<td>2</td>
</tr>
<tr>
<td>Libya oil</td>
<td>20</td>
<td>6,4%</td>
<td>1</td>
</tr>
<tr>
<td>Italy oil</td>
<td>6</td>
<td>16,0%</td>
<td>1</td>
</tr>
<tr>
<td>Algeria gas</td>
<td>75</td>
<td>1,0%</td>
<td>1</td>
</tr>
<tr>
<td>Algeria oil</td>
<td>68</td>
<td>1,0%</td>
<td>1</td>
</tr>
<tr>
<td>Spain oil</td>
<td>0</td>
<td>100,0%</td>
<td>0</td>
</tr>
<tr>
<td>Greece oil</td>
<td>0</td>
<td>100,0%</td>
<td>0</td>
</tr>
<tr>
<td>Spain gas</td>
<td>0</td>
<td>100,0%</td>
<td>0</td>
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<td>Israel oil</td>
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<tr>
<td>Greece gas</td>
<td>0</td>
<td>100,0%</td>
<td>0</td>
</tr>
<tr>
<td>France oil</td>
<td>1</td>
<td>0,0%</td>
<td>0</td>
</tr>
<tr>
<td>Turkey gas</td>
<td>0</td>
<td>0,0%</td>
<td>0</td>
</tr>
<tr>
<td>France gas</td>
<td>0</td>
<td>0,0%</td>
<td>0</td>
</tr>
<tr>
<td>Slovenia gas</td>
<td>0</td>
<td>0,0%</td>
<td>0</td>
</tr>
<tr>
<td>Slovenia oil</td>
<td>0</td>
<td>0,0%</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>277</td>
<td></td>
<td><strong>84</strong></td>
</tr>
</tbody>
</table>
Also in 2016 no offshore developments in Med Sea