Overview of Global Decommissioning

Presented by

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Bangkok, 13th June 2012
Worldwide Location of Offshore Installations
Where are the Offshore Platforms

Worldwide Distribution of Offshore Structures in 2010

- Cook Inlet 17
- California 30+
- East Canada 5+
- Mediterranean 100+
- Caspian Sea 100+
- Lake Maracaibo 100+
- Mexico 120+
- Brazil 58+
- Chile 10+
- SE Asia, Australia & NZ 1733
- 630
- 750
- 500
- 350
- 3450
- 3+

Note: Figures in blue are sub totals

Estimated Total 7,668+ in 2010
Offshore Installations in USA
Location of US Offshore Facilities

- California Federal Waters (23)
- California State Waters (4 platforms & 5 Islands)
- Cook Inlet 16
- GOM 3450
Location of GOM Facilities

Gulf of Mexico OCS
Significance to the Nation

Provides about 25% of U.S. Domestically Produced Oil

70% of the oil produced in the Gulf comes from deepwater, equivalent to 19% of the total US production

Provides about 11% of U.S. Domestically Produced Natural Gas

36% of the gas produced in the Gulf comes from deepwater, equivalent to 6% of the total US production

MMS: Securing Ocean Energy & Economic Value for America

Post Maconao renamed: The Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE)

CCOP/EPPM Workshop on End of Concession & Decommissioning 12-14 June 2012
Gulf of Mexico Platforms
1942-2010
7209 Total Platforms Installed - 11% of All Platforms Decommissioned Were Reefed

Platforms Removed: 3450
Platforms Remaining: 3361
Platforms Reefed: 398
GOM Summary

GOM Shelf Activity

- Mature decommissioning business
- Over 45% of facilities removed to date
- Over 40% of wells abandoned to date
- 140 structures and 450 wells p.a
- $600m annual spend, rising
- Efficient & innovative supply chain
- Highly regulated with reefing

Data Source EFE GOM Offshore Decommissioning Report 2010
Types of Offshore Facilities In GOM

- **Fixed Platform**: (1400 ft.)
- **Compliant Tower**: (1800 ft.)
- **Moa TLP**: 3300 ft. - 4500 ft.
- **FPSO**: 4500 ft. - 6000 ft.
- **TLP**: 4500 ft. - 5000 ft.
- **Spar**: 5600 ft. - 8000 ft.
- **FPS**: 7600 ft. - 8000 ft.
Offshore Installations in SE Asia
Location of Offshore Installations in Asia (2010)

Since 2000 some 766 new offshore structures installed in the Asia Pacific Region

There are now some 1733 offshore installations in the Asia Pacific Region
Types of Offshore Installations in Asia (2010)

- Stacked Leg (<150 ft) - 9 units
- Jack-Up Production Unit (<150 ft) - 9 units
- Mobile Offshore Barge (<150 ft) - 4 units
- Fixed Platform (1400 ft) - 1645 units
- Compliant Tower (1800 ft) - 1 unit
- Mini TLP 3300 ft - 4300 ft - 50 units
- FPSO 4500 ft - 6500 ft - 2 units
- TLP 4500 ft - 5000 ft - 1 unit
- Spar 5600 ft - 8000 ft - 1 unit

- Gravity Base (<300 ft) - 7 units
- Semi Submersible (<5000 ft) - 5 units

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Asia Summary (2010)

Far East Activity

- Immature decommissioning business
- Poor data base and understanding
- Less than 10% facilities removed
- Over 100 facilities abandoned to date
- Varying conditions and complexity
- Supply chain capability immature
- Varibly regulated

Data Source: Brian Twomey, Reverse Engineering Services

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### Very Rough Estimate of Asia Pacific

Decommissioning Costs (Total Removal)

<table>
<thead>
<tr>
<th>Weight Range (mt)</th>
<th>Weight Range Average (mt)</th>
<th>No of Offshore Installations</th>
<th>Cost Per Metric Ton ($US)</th>
<th>Average Cost Per Platform ($US)</th>
<th>Subtotal Per Platform Range ($US)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 to 300</td>
<td>211</td>
<td>49</td>
<td>3600.00</td>
<td>$759,600</td>
<td>$37,220,400</td>
</tr>
<tr>
<td>&gt;300 to 1000</td>
<td>818</td>
<td>191</td>
<td>3800.00</td>
<td>$3,108,400</td>
<td>$593,704,400</td>
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<tr>
<td>&gt;1000 to 2000</td>
<td>1556</td>
<td>201</td>
<td>4000.00</td>
<td>$5,912,800</td>
<td>$1,188,472,800</td>
</tr>
<tr>
<td>&gt;2000 to 3000</td>
<td>2553</td>
<td>146</td>
<td>4100.00</td>
<td>$10,467,300</td>
<td>$1,528,225,800</td>
</tr>
<tr>
<td>&gt;3000 to 4000</td>
<td>3568</td>
<td>58</td>
<td>4200.00</td>
<td>$14,985,600</td>
<td>$869,164,800</td>
</tr>
<tr>
<td>&gt;4000 to 6000</td>
<td>4905</td>
<td>63</td>
<td>5500.00</td>
<td>$26,977,500</td>
<td>$1,699,582,500</td>
</tr>
<tr>
<td>&gt;6000 to 10000</td>
<td>7933</td>
<td>48</td>
<td>6000.00</td>
<td>$47,598,000</td>
<td>$2,284,704,000</td>
</tr>
<tr>
<td>&gt;10000 to 102,500</td>
<td>21900</td>
<td>63</td>
<td>7500.00</td>
<td>$112,500,000</td>
<td>$7,087,500,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>819</strong></td>
<td><strong>38700</strong></td>
<td></td>
<td><strong>$15,288,574,700</strong></td>
<td></td>
</tr>
</tbody>
</table>

- There 1733 offshore installations in Asia Pacific Region, data for 914 offshore installations was not available to presenter at this time – The total will be much higher in the order of $30 Billion USD
- No well P&A costs are included, costs sub installations excluded and assumes pipelines are left in place
- The above cost data is based on limited available regional cost data supplemented with worldwide decommissioning cost data
- **This is just an indication of cost so please use resultant costs with care**
Offshore Installations in Europe
Northern European Offshore Installations

Number of Platforms by Country

- UK: 362
- Norway: 107
- Holland: 84
- DK: 30
- Other: 3

Data from 2006
Offshore Installations in Denmark
(Circa 30 Installations)
Location of Danish Platforms

Oil & Gas Fields in the Danish North Sea

Maersk Oil & Gas
Amerada Hess
DONG

- Platforms
- Pipelines
Offshore Installations in Netherlands

(Circa 84 Installations in 2006)
Location of Dutch Platforms
Dutch Platform Removals??

Dutch Continental Shelf

Platform Production Decline

Platform Removals

Source: EBN

Source: Seaway Heavy Lifting Engineering B.V.
Bergen, 16 February 2010
Aart Listerink.
Offshore Installations in Norway

(Circa 93 Installations in 2010)
**From Guinness Book of Records:**

“The Troll Offshore Gas Platform, located off Norway in the North Sea, is the heaviest man made mobile object ever made, with a dry weight of the gravity base structure at 656,000 tonnes.

Standing 472m tall, it was made from 245,000m³ of concrete (the equivalent to 215,000 foundations for ordinary homes) and 100,000 tonnes of steel (approximately 15 Eiffel towers).”

<table>
<thead>
<tr>
<th>Name</th>
<th>City</th>
<th>Country</th>
<th>Use</th>
<th>Built Year</th>
<th>Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Troll A Platform</td>
<td>Troll off shore</td>
<td>Norway</td>
<td>industrial</td>
<td>1995</td>
<td>472 m</td>
</tr>
<tr>
<td>Q1 Tower</td>
<td>Gold Coast QLD</td>
<td>Australia</td>
<td>residential</td>
<td>2005</td>
<td>322.5 m</td>
</tr>
<tr>
<td>Petronas Towers</td>
<td>Kuala Lumpur KL</td>
<td>Malaysia</td>
<td>office</td>
<td>1998</td>
<td>452 m</td>
</tr>
</tbody>
</table>
ORMEN LANGE (Norway): Europe’s Deepest Subsea Development at 1,000 m (3,300 ft)
Norwegian Decommissioning Market (2010)

- Expect less schedule slippages in the future
  - 44 UK fields produce < 1,000 BOPD
  - KLIF (Norwegian Climate and Pollution Agency) proposal to initiate platform decommissioning within five years after field shutdown (NCS)
Offshore Installations in UKCS
UK OIL & GAS FACILITIES TO BE DECOMMISSIONED IN FUTURE YEARS

- 8 installations with large concrete substructures
- 31 with large steel jackets (> 10,000 tes)*
- 214 other steel jackets
- 278 subsea production systems
- 21 floating production systems
- 3,300 pipelines – around 25,000 kms
- <5,000 wells
- <200 cuttings piles

Source: DECC
Summary of UKCS (2010)

UKCS Activity

- Developing decommissioning business
- Less than 10% facilities removed
- Over 30 facilities abandoned to date
- Varying conditions and complexity
- Estimated $500m annual spend, rising
- Supply chain capability developing
- Regulated with derogation

Data Source: DECC & Oil & Gas UK

NW Hutton removed
Indefatigable being removed
Miller being prepared
UKCS Approximate Market Timing & Value
UKCS DECOMMISSIONING
Decommissioning – When – Expected Timeframes

The decommissioning challenge

- 630 installations
- 10,000 km pipeline
- 5,000 wells

£27 billion decommissioning market

- Immature Industry
- Uncertainty on timings
- Lack of investment
- Not the day job!
Jacket/ subsea structure removal

Jacket and subsea structure removal is shown by number of installations rather than fields in order to give an indication of contracts and removal events due over the next decade.

- >100,000 tonnes
- 10,000 - 100,000 tonnes
- 1,000 - 10,000 tonnes
- <1,000 tonnes
## UKCS decommissioning market: The next decade

<table>
<thead>
<tr>
<th></th>
<th>2011-2015</th>
<th>2016-2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decommissioning expenditure (£ millions 2009 money)</td>
<td>£3.8 billion</td>
<td>£5.4 billion</td>
</tr>
<tr>
<td>Wells to be P&amp;A</td>
<td>400</td>
<td>530</td>
</tr>
<tr>
<td>No. of installations/elements of infrastructure to be removed</td>
<td>114</td>
<td>170</td>
</tr>
</tbody>
</table>
Examples of Decommissioning in Southern North Sea
TYPICAL SOUTHERN NORTH SEA GAS PLATFORMS
Alternative Method of Topside Removal Piece Small
Decommissioning in Northern North Sea
Typical NNS Offshore Platform
NW Hutton Platform

Topsides 20,160 tonnes
Jacket 18,000 tonnes
Water depth 144 metres
Operational Crew: ~120
Commissioning 12-14 June 2012
Installation of A Northern North Sea Platform

22 Main Lifts
Installation of A Northern North Sea Platform
DECOMMISSIONING OF NNS PLATFORM

Giant Crane Vessel Decommissioning NW Hutton
(Only 4 in the world)
Installation of Large Jackets Using Buoyancy
NW HUTTON JACKET DECOMMISSIONING

Jacket + Piles ~18,000mt

Allowed to leave “Footings” ~ 8,500mt approximately
DECOMMISSIONING NWH JACKET

“Footings left”

Hundreds of complex subsea cuts using cranes, ROV’s and 4 types of cutting tools
DECOMMISSIONING NWH JACKET

Installed Barge Launched with Buoyancy

Decommissioned in Pieces (Major subsea cutting needed)
Subsea Jacket Cutting During Decommissioning
Subsea Cutting Methods Used To NWH Jacket

- Abrasive Water Jet (AWJ)
- Diamond Wire Cutting System (DWCS)
- Gated Hydraulic Shears
ROV Deployed Subsea Diverless Cutting Tools

ROV flyable Diamond Wire Cutting System

Subsea docking of ROV Flown (DWCT) Cutting Tool
Crane Deployed Diverless Subsea Cutting Tools

Installation on cut location

Performing cut

Source: Eamon Sheehan, BP, Aberdeen, 17th November 2010
Thank you for your attention

Any Questions?