Blowout at the Macondo Well
(or how to think about the BP Deepwater Horizon oil spill)

Offshore Magazine’s
Webcast Presentation

“Building an emergency spill response system”

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Washington, DC

January 11, 2011
Discussion

• What caused the blowout and containment failure?

• How risky is deepwater offshore drilling?

• What are the consequences to future of offshore oil and gas development?

• What regulatory regimes make the most sense going forward?

• Cost of the spill – large scale damage or environmental (and political) hysteria?
Importance of Gulf of Mexico

• The Gulf of Mexico accounts for 90% of offshore drilling in the U.S. by volume

• Accounts for approximately one third of all U.S. oil production

• Over 50,000 wells have been drilled since 1947, 4,000 of which are deeper than 1,000 ft

• Today, 80% of offshore drilling, by volume, occurs at a depth of over 1,000 feet.

• Over 400k jobs are directly and indirectly linked to gulf oil production
Active Gulf OCS Oil and Gas Platforms

Source: NOAA
U.S. (Blue) and Federal OCS (Gulf Coast in Red, California in Green) Crude Production

Source: EIA Data
U.S. Crude Oil Disposition

Source: EIA Data
Domestic Crude Oil Production by Source

Source: Commission staff, adapted from U.S. Energy Information Administration
Federal Gulf of Mexico Oil Production
Deepwater Oil and Gas Producing Countries
(thousand boe/d)

Source: Wood Mackenzie
## Offshore Production Outlooks Through 2030

<table>
<thead>
<tr>
<th>EUR, Bbo:</th>
<th>Shallow Water</th>
<th>Total Offshore</th>
<th>Deepwater</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>320</td>
<td>400</td>
<td>450</td>
</tr>
<tr>
<td>Year</td>
<td>2008</td>
<td>2010</td>
<td>2015</td>
</tr>
<tr>
<td>Production Capacity, million b/d</td>
<td>19.2</td>
<td>18.1</td>
<td>14.2</td>
</tr>
<tr>
<td></td>
<td>23.3</td>
<td>23.6</td>
<td>20.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.1</td>
<td>5.5</td>
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<td></td>
<td></td>
<td>6.3</td>
<td>10.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>27.4</td>
<td>13.2</td>
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<tr>
<td></td>
<td></td>
<td>24.4</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>15.6</td>
<td></td>
</tr>
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</table>

World Offshore Crude Oil Production (MM b/d)

Deepwater* is a Big Producer

6-6.5 mb/d worldwide from deepwater fields, should reach 8.5 mb/d by 2015.

17 countries producing from deepwater fields

28% of non-OPEC offshore crude output

U.S. has 100 deepwater fields, 1.3 mb/d in 2009

*> 400 meters

Source: Energy Intelligence Group
What Went Wrong?
National Commission Findings – Selected Technical Issues

• Cement (potentially contaminated or displaced by other materials) in shoe track and in some portion of annular space failed to isolate hydrocarbons.

• Pre-job laboratory data should have prompted redesign of cement slurry.

• Negative pressure test repeatedly showed that primary cement job had not isolated hydrocarbons.

• Despite those results, BP and TO personnel treated negative pressure test as a complete success.

• BP’s temporary abandonment procedures introduced additional risk/

• No evidence at this time to suggest that there was a conscious decision to sacrifice safety concerns to save money
National Commission Findings – Selected Managerial Issues

• Individuals should be trained to challenge data

• Greater attention to anomalies, small and major

• Individual risk factors cannot be treated individually

• Greater emphasis on procedures and training, particularly low probability high risk events

• Failure to adopt clear procedures for end of well activities

• Poor communications between operator and contractors. Muddled lines of authority between BP and its contractors, and within BP
Offshore Drilling: How Risky?
# DOI Data on OCS Production and Spills

<table>
<thead>
<tr>
<th>Time Period</th>
<th>OCS Oil Production (Thousand Barrels)</th>
<th>Number of Spills</th>
<th>Barrels Spilled (Thousand Barrels)</th>
<th>Thousand Barrels Produced per Barrel Spilled</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-1969</td>
<td>1,460,000</td>
<td>13</td>
<td>99</td>
<td>15</td>
</tr>
<tr>
<td>1970-1979</td>
<td>3,455,000</td>
<td>32</td>
<td>106</td>
<td>33</td>
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<tr>
<td>1980-1989</td>
<td>3,387,000</td>
<td>38</td>
<td>7</td>
<td>473</td>
</tr>
<tr>
<td>1990-1999</td>
<td>4,051,000</td>
<td>15</td>
<td>2</td>
<td>1,592</td>
</tr>
<tr>
<td>2000-2009</td>
<td>5,450,000</td>
<td>72</td>
<td>18</td>
<td>296</td>
</tr>
</tbody>
</table>

Source: Department of Interior Data
Largest Tanker Spills in and near U.S. Waters

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandoil II</td>
<td>Pacific Ocean, OR</td>
<td>1968</td>
</tr>
<tr>
<td>Exxon Valdez</td>
<td>Prince William Sound, AK</td>
<td>1989</td>
</tr>
<tr>
<td>Burmah Agate</td>
<td>Gulf of Mexico, TX</td>
<td>1968</td>
</tr>
<tr>
<td>Pegasus (Pegasos)</td>
<td>Northwest Atlantic Ocean, US east coast</td>
<td>1971</td>
</tr>
<tr>
<td>Texaco Oklahoma</td>
<td>Northwest Atlantic Ocean, US east coast</td>
<td>1969</td>
</tr>
<tr>
<td>Keo</td>
<td>Northwest Atlantic Ocean, MA</td>
<td>1976</td>
</tr>
<tr>
<td>Argo Merchant</td>
<td>Nantucket Shoals, MA</td>
<td>1975</td>
</tr>
<tr>
<td>Spartan Lady</td>
<td>Northwest Atlantic Ocean, US east coast</td>
<td>1975</td>
</tr>
<tr>
<td>Gulfstag</td>
<td>Gulf of Mexico</td>
<td>1966</td>
</tr>
<tr>
<td>Mega Borg</td>
<td>Gulf of Mexico, TX</td>
<td>1990</td>
</tr>
</tbody>
</table>

Source: API Data
Largest Marine Blowouts in U.S. Waters
Prior to Deepwater Horizon/BP Spill

Source: API Data
## Ten Largest Oil Spills (in modern times)

<table>
<thead>
<tr>
<th>Spill</th>
<th>Volume Range</th>
<th>Duration</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP Macondo</td>
<td>2.45-4.2 MM bbls</td>
<td>70 days</td>
<td>Offshore</td>
</tr>
<tr>
<td>Atlantic Empress</td>
<td>1,000 bbls</td>
<td></td>
<td>Trinidad and Tobego</td>
</tr>
<tr>
<td>Gulf War</td>
<td>2,000 bbls</td>
<td></td>
<td>Persian Gulf</td>
</tr>
<tr>
<td>Ixtox 1 - Bay of Campeche</td>
<td>3,000 bbls</td>
<td></td>
<td>Mexico</td>
</tr>
<tr>
<td>Fergana Valley - Uzbekistan</td>
<td>4,000 bbls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nowruz - Persian Gulf</td>
<td>5,000 bbls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABT Summer - Angolan Coast</td>
<td>6,000 bbls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Castillo de Bellver</td>
<td>7,000 bbls</td>
<td></td>
<td>Saldhana Bay, South Africa</td>
</tr>
<tr>
<td>Amoco Cadiz - French Coast</td>
<td>8,000 bbls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odyssey - Off the coast of Nova Scotia</td>
<td>9,000 bbls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M/T Haven - Genoa, Italy</td>
<td>10,000 bbls</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Popular Mechanics
World’s Largest Oil Spills

Source: National Oceanic and Atmospheric Administration, National Academy of Sciences, EPRINC Calculations, Map Data Design and Configuration

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What are the consequences to future of offshore oil and gas development?
Obama Administration Response to Blowout

• British Petroleum named as the responsible party

• USG Initially imposed a “temporary” moratorium deepwater drilling
  • Moratorium now lifted in GOM, but permits issuance is slow & limited
  • No moratorium on offshore Alaska, but no permits issued.

• Restructured Mineral Management Service (MMS) into BOEMRE

• Created the “National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling”

• BP to fund $20 billion Escrow Account for Liability Claims, Litigation from USG Underway
GoM Production Outlook: Uncertain, but Hopeful

• Exxon Mobil, Chevron, Statoil Holding Firm in Gulf

• Uncertainty remains, but 13 deepwater GoM projects remain on schedule for 2011 with strong Prospects to add 168,000 b/d of new oil production

• Petrobras’ Cascade-Chinook and Anadarko Petroleum’s Caesar-Tonga fields, which together should add 120,000 b/d of the new oil expected from the 13 projects poised to begin.

• Murphy announced deepwater rig leaving GOM; Plains E&P Planning to reduce GOM exposure; Hess to send Stena Forth to Ghana?
Moratorium Lost Production Forecasts

EIA:  26,000 bbl/d in Q4 2010
     70,000 bbl/d in 2011*

IEA:  100,000-300,000 bbl/d by 2015 should regulations tighten

IEA:  If regulations tighten worldwide, could cost 800,000-900,000 bbls/d. Would encroach on OPEC spare capacity, support prices.

Note: Some restrictions called for outside of U.S., but on balance outside of US, confidence remains in offshore regulatory regimes.

• Estimates highly uncertain, but USG pulling back on new opportunities for oil and gas development with more limited leasing program.

• Source: EPRINC calculations, Raymond James, DB, Credit Suisse.
Leasing Program on OCS Lower 48 brings Fewer Opportunities
Alaskan Depth Charge

• Shell’s exploratory drilling program in Chukchi Sea now on hold, awaiting further environmental reviews.

• Risks extend beyond lost Chuckhi Sea production because of costs challenges to Trans Alaskan Pipeline System (TAPs)

• TAPs throughput at 670,000 b/d declining at 6% per year. When throughput hits 300,000 b/d costs accelerate and producing North Slope producing fields face potential for premature abandonment.

• Moratorium places base load North Slope output at risk.
Slowdown in Alaska Leasing Places TAPS Throughput at Risk
What are the Stakes for the United States

OCS, particularly deepwater GOM, and Alaska are high valued assets with high energy security benefits

Value to Federal and state governments could easily range well in excess of $500 billion (money to U.S. Treasury)

Infra-marginal benefits also large (jobs, return on capital)

U.S. to remain large oil importer, alternate fuels are false choice.
Marine Well Containment Co.

• ExxonMobil, Chevron, ConocoPhillips, and Shell are the founding members of a new Marine Well Containment Company (MWCC). BP has subsequently joined and others likely to follow.

• ExxonMobil has been designated by the founding sponsors to lead the engineering, procurement and construction of the system components.

• Program will have surface and subsurface capability with widespread inter connectivity to address a range of blowout and spill scenarios.

• Other companies will be encouraged to joint and participate in the MWCC.

• Initial investment to construct new subsea and modular process equipment is expected to be approximately $1 billion. Engineering and procurement to be led by ExxonMobil.
Industry response: Oil Spill Containment Initiative

Capture Vessel

Shuttle Tanker

Off Loading Line

Quick Disconnect

Flexible Jumper

Umbilical

Riser

Subsea Containment Assembly

Dispersant Fluid System

Manifold

BOP

Accumulator Unit

*not to scale
Financial Costs of the Spill

At $44.11, BP's stock price has risen 63 percent from its low of $27.02 on June 25.

BP has to date paid $10.7b to plug the well, clean up, damage claims, and other costs.

A $20b BP fund known as the Gulf Coast Claims Facility, is set up for environmental damage, personal injury, cleanup and lost earnings. So far fund has paid $2.7 billion to address nearly 168,000 claims.

Federal government is suing for 21 billion in fines, but out of court settlement cannot be ruled out.

Additional lawsuits: $6 billion (Citigroup Estimate)

BP has some potential to recover funds from Transocean, Anadarko, MOEX ($4-$6 billion?)
## 2009 MMS Disbursements

<table>
<thead>
<tr>
<th>Source</th>
<th>Billion $</th>
</tr>
</thead>
<tbody>
<tr>
<td>States, Counties and Parishes</td>
<td>$1.99</td>
</tr>
<tr>
<td>U.S. Treasury</td>
<td>$5.74</td>
</tr>
<tr>
<td>34 American Indian Tribes and Mineral Owners</td>
<td>$0.45</td>
</tr>
<tr>
<td>Reclamation Fund for Water Projects</td>
<td>$1.45</td>
</tr>
<tr>
<td>Land and Water Conservation Fund</td>
<td>$0.90</td>
</tr>
<tr>
<td>Historic Preservation Fund</td>
<td>$0.15</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>$10.68</strong></td>
</tr>
</tbody>
</table>

Source: MMS Data
Federal OCS Oil, Gas and NGL Sales Volumes

Source: MMS Data
Federal OCS Revenues

Source: MMS Data
Concluding Observations

• Selecting between alternative regulatory approaches, Safety Case vs. Prescriptive Regulations important --- but competency at the well site is critical.

• Regulatory Program – Don’t Fight the Last War, i.e., safety culture yields higher returns than regulatory prescriptions

• Addressing Public Concerns: New Industry Led Containment Corporation is good start.

• Getting Liability Balance Very Important

• USG policy cannot ignore revenue consequences to the Treasury, local governments, jobs (some balance of costs and benefits).

• Effective USG management of crisis essential -- Did USG amplify the environmental damage?