The global opportunity – Gas’ role towards a more sustainable future

Elisabeth Tørstad, CEO, DNV GL - Oil & Gas

IGU Diplomatic Forum, Hovik, December 15 2015
DNV GL – Oil & Gas - Global reach – local competence

150 years of experience
3,500 technical experts
9 unique laboratories
Expertise in managing risk across the asset lifecycle
Opportunity for gas in a more sustainable future

• Ensure sustainable energy supply is available, affordable and clean
• Gas as part of a sustainable energy future
• Challenges to ensure switch from coal and oil to gas
## Just how clean is gas?

### Production of fossil fuels

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Tons of CO₂ per 1000 ton oil equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil</td>
<td>29-134</td>
</tr>
<tr>
<td>Natural gas</td>
<td>12-71</td>
</tr>
<tr>
<td>Natural gas w main power supply from renewable energy</td>
<td>0.3-30</td>
</tr>
</tbody>
</table>

### Production of energy from fossil fuels

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Pounds of CO₂ emitted per million British thermal units (Btu) of energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>214.3 - 228.6</td>
</tr>
<tr>
<td>Diesel fuel and heating oil</td>
<td>161.3</td>
</tr>
<tr>
<td>Gasoline</td>
<td>157.2</td>
</tr>
<tr>
<td>Propane</td>
<td>139.0</td>
</tr>
<tr>
<td>Natural gas</td>
<td>117.0</td>
</tr>
</tbody>
</table>

Tons of CO₂ pr 1000 ton oil equivalent produced, numbers from Norwegian Continental Shelf

Pounds of CO₂ emitted per million British thermal units (Btu) of energy for various fuels, source IEA
Carbon intensity

**Upstream**

127 t CO₂ / 1000 t.o.e.

- Energy for processing and transporting: 70%
- Flaring: 27%
- Flaring: 3%

**Midstream**

210 t CO₂ / 1000 t.o.e.

- Energy for processing and transporting: 88%
- Flaring: 2%
- Flaring: 10%

**Downstream**

154 t CO₂ / 1000 t.o.e.

- Energy for processing and transporting: 91%
- Flaring: 8%
- Flaring: 1%
How can gas displace coal for power in Asian markets?

- In 2015 Asian power companies are building more than 500 coal-fired plants
- 45% of energy demand in India is met from coal
- 40% of the 400 gigawatts in generation capacity in South East Asia by 2040 will be coal-fired
Development of LNG fuelled fleet

Additional orders beyond 2018 are confirmed

Updated 23 October 2015
Excluding LNG carriers and inland waterway vessels
Opportunity for gas in a more sustainable future

• **Gas** is a necessary part of a sustainable energy future
• Gas production can be a **low carbon** activity
• **Gas and renewable energy** are a perfect match
• **Switch from coal and oil** to gas for power and fuel
Enabling a sustainable gas future

TODAY

Collaboration

Technology

Policy & Regulations

Sustainable Future
Thank you

www.dnvgl.com

SAFER, SMARTER, GREENER