GLOBAL UNCONVENTIONAL GAS SUMMIT

BEIJING  22 October, 2013

Shale gas : a pathway for global economic growth and energy security

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President  IGU
Natural gas prices in Asia, Europe and the USA

[Graph showing natural gas prices in Asia, Europe, and the USA with different price cycles and events such as Supercycle, Supply Glut, Fukushima, etc., with various price points and trends over time.]
Planned additions of gas and coal power capacities in the USA

Source: Shale Gas Europe
The shale gas impact on employment in the US

Source: IHS Global Insight

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2015</th>
<th>2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>148,143</td>
<td>197,999</td>
<td>360,335</td>
</tr>
<tr>
<td>Indirect</td>
<td>193,710</td>
<td>283,190</td>
<td>547,107</td>
</tr>
<tr>
<td>Induced</td>
<td>259,494</td>
<td>388,495</td>
<td>752,648</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>601,348</td>
<td>869,684</td>
<td>1,660,090</td>
</tr>
</tbody>
</table>

Source: IHS Global Insight

Shale Gas Employment 2010

- Agriculture: 45%
- Mining: 12%
- Construction: 7%
- Manufacturing: 14%
- Retail and Wholesale Trade: 11%
- Transportation and Utilities: 1%
- Government: 1%

601,348 Workers
The macroeconomic and related benefits of shale gas for the US

Source: IHS Global Insight

The shale gas contribution to US GDP was 77 Billion $ in 2010, expected to increase to 118 B$ in 2015 and 230 B$ in 2035

In 2010, shale gas contributed to 19 B$ in government tax revenues. On a cumulative basis, it will generate nearly 1 Trillion $ over the next 25 years

The lower natural gas prices will result in a reduction of 10 % in electricity costs by 2015

By 2017, lower energy prices will result in 2.9 % more industrial production and nearly 5% by 2035.
Assessed shale oil and shale gas basins in the world

Source: IEA, Advanced Resources International
# Top 10 countries with shale gas reserves

*Source: EIA, ARI 2013*

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>(trillion cubic feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China</td>
<td>1,115</td>
</tr>
<tr>
<td>2</td>
<td>Argentina</td>
<td>802</td>
</tr>
<tr>
<td>3</td>
<td>Algeria</td>
<td>707</td>
</tr>
<tr>
<td>4</td>
<td>U.S.¹</td>
<td>665 (1,161)</td>
</tr>
<tr>
<td>5</td>
<td>Canada</td>
<td>573</td>
</tr>
<tr>
<td>6</td>
<td>Mexico</td>
<td>545</td>
</tr>
<tr>
<td>7</td>
<td>Australia</td>
<td>437</td>
</tr>
<tr>
<td>8</td>
<td>South Africa</td>
<td>390</td>
</tr>
<tr>
<td>9</td>
<td>Russia</td>
<td>285</td>
</tr>
<tr>
<td>10</td>
<td>Brazil</td>
<td>245</td>
</tr>
<tr>
<td></td>
<td><em>World Total</em></td>
<td><em>7,299 (7,795)</em></td>
</tr>
</tbody>
</table>

¹ EIA estimates used for ranking order. ARI estimates in parentheses.
Environmental risks of shale gas extraction

Source: UK Environment Agency
Shale Gas in the US: regulated at every stage

Source:: Accenture

Civil/site prep
Build access roads, construct and install well pads, prepare site for drilling

Drilling
Drill vertical and horizontal wells

Completion/ fracking
Complete wells with steel and cement casings
Release gas through hydro-fracking

Flowback
Capture, store and treat returned fracking fluids

Production
Capture, store and transport gas

Decommission

<table>
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<th>Civil/site prep</th>
<th>Drilling</th>
<th>Completion/ fracking</th>
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<th>Production</th>
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<td>Build access roads, construct and install well pads, prepare site for drilling</td>
<td>Drill vertical and horizontal wells</td>
<td>Complete wells with steel and cement casings</td>
<td>Capture, store and treat returned fracking fluids</td>
<td>Capture, store and transport gas</td>
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<table>
<thead>
<tr>
<th>60 days</th>
<th>15–60 days</th>
<th>15–30 days</th>
<th>20 days</th>
<th>5–40 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to water from surface, groundwater or municipal water sources</td>
<td>Volumes and quality of water required for the drilling fluid (up to 99% of the fluid depending on the operator/shale)</td>
<td>Volumes and quality of water required for the fracking fluid</td>
<td>Managing the volumes of flowback water returned to the surface in the first few days following the fracking</td>
<td>Managing the volumes of produced water returned to the surface following production</td>
</tr>
</tbody>
</table>

Global unconventional gas summit, 22nd October 2013 – Beijing, China
The specific factors driving the US shale gas success story

- An in-depth geological knowledge
- A well developed and highly competitive service industry
- A sufficient availability of water for fracking
- The property of land owners of the mineral rights attached to their land
- A comprehensive regulatory regime of the extraction process and the adherence to best practices rules by operators
The prize for a high profile development scenario of unconventional gas resources

- **Ensuring energy security through diversification of natural gas supply**

- **Delivering competitive and affordable prices of gas in Europe, Asia and South America**

- **Fostering the convergence of regional gas prices and a more liquid and effective world gas and LNG market**

- **Achieving environmental and GHG emission targets with a higher share of natural gas in the global energy mix**

- **Fostering the development of renewables coupled to natural gas power facilities as a back-up**
Global unconventional gas production
2010-2040
Source: IEA
Ten largest unconventional gas producers in 2035

Source: IEA
Impact of shale gas on international gas trade to 2035

Source: IEA
2015 World Gas Conference

26th WORLD GAS CONFERENCE
PARIS FRANCE
1 - 5 June 2015