Petroleum Industry in the 21st Century

Zagreb, 02.12.2009

András Király, Marijan Krpan
- Oil and gas will play predominant role in the world energy in the 21st century

- Renewable cannot efficiently substitute fossil fuels at economic cost

- Middle East production represent solid base for future growth

- Increasing role of BRIC countries (Brazil, Russia, India, China)

- Petroleum world must not remain unbalanced:

- Global demand grows ~2.0% p.a. (2.7%p.a. in SE-Asia)

- Oil dominance: 39% of total energy use with a 44 MMbbls/d growth (40% in SE-Asia)

- Both OPEC and non-OPEC (Africa, FSU) capacity must grow substantially

- Natural gas consumption grows 2.2% p.a.

- 6-7000 billion USD invest to meet demands without the defense costs of the extended transportation routes

Source: EIA
Oil discoveries globally are not keeping pace with production.

New discoveries are smaller and decline rates are higher than before.

Spending is focused on some open, prolific, mature areas.

Increasing weight of technically difficult projects (oil sands, unconventional, arctic, deep offshore) or politically risky areas—higher break-even oil/gas prices.

Underinvestment in closed or sub-closed areas (Venezuela, Russia, Iraq, Iran, some Arabic countries) reserve replacement by NOCs and quasi-NOCs will be a crucial issue.

The supply/demand balance is getting tight with major supply gaps developing.

Underinvestment in closed or sub-closed areas (Venezuela, Russia, Iraq, Iran, some Arabic countries) reserve replacement by NOCs and quasi-NOCs will be a crucial issue.

Who fills the gap in 8 years? Equals to current OPEC production!
### The List of Big Players

#### According to Market Capitalization

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company Name</th>
<th>Market Cap (US$ Billion)</th>
<th>% Share Price Change (%)</th>
<th>Primary Business</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ExxonMobil</td>
<td>350.8</td>
<td>-35%</td>
<td>Integrated IOC</td>
<td>US</td>
</tr>
<tr>
<td>2</td>
<td>PetroChina</td>
<td>329.7</td>
<td>-55%</td>
<td>Integrated IOC</td>
<td>China</td>
</tr>
<tr>
<td>3</td>
<td>Royal Dutch Shell</td>
<td>166.1</td>
<td>-28%</td>
<td>Integrated IOC</td>
<td>Netherlands</td>
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<tr>
<td>4</td>
<td>Chevron</td>
<td>158.9</td>
<td>-25%</td>
<td>Integrated IOC</td>
<td>US</td>
</tr>
<tr>
<td>5</td>
<td>BP</td>
<td>143.2</td>
<td>-30%</td>
<td>Integrated IOC</td>
<td>UK</td>
</tr>
<tr>
<td>6</td>
<td>Total</td>
<td>128.7</td>
<td>-34%</td>
<td>Integrated IOC</td>
<td>France</td>
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<tr>
<td>7</td>
<td>BP Billiton</td>
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<tr>
<td>9</td>
<td>Petronas</td>
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<td>-55%</td>
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<td>Malaysia</td>
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<tr>
<td>10</td>
<td>Eni</td>
<td>91.8</td>
<td>-26%</td>
<td>Integrated IOC</td>
<td>Italy</td>
</tr>
<tr>
<td>11</td>
<td>Gazprom</td>
<td>81.0</td>
<td>-74%</td>
<td>Integrated IOC</td>
<td>Russia</td>
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<tr>
<td>12</td>
<td>Sinopec</td>
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<td>-68%</td>
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<td>China</td>
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<tr>
<td>13</td>
<td>CameronPhillips</td>
<td>72.2</td>
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<td>US</td>
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<tr>
<td>14</td>
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<td>Norway</td>
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<tr>
<td>15</td>
<td>Sonangol</td>
<td>51.6</td>
<td>-57%</td>
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<td>Angola</td>
</tr>
<tr>
<td>16</td>
<td>Occidental</td>
<td>46.6</td>
<td>-22%</td>
<td>E&amp;P</td>
<td>US</td>
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<tr>
<td>17</td>
<td>BP</td>
<td>46.8</td>
<td>-31%</td>
<td>Integrated IOC</td>
<td>UK</td>
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<tr>
<td>18</td>
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<td>-45%</td>
<td>E&amp;P</td>
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<td>19</td>
<td>Reliance</td>
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<td>-98%</td>
<td>E&amp;P</td>
<td>India</td>
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<td>20</td>
<td>Rosneft</td>
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<td>-65%</td>
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<td>Russia</td>
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<td>21</td>
<td>Petrobras</td>
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<td>-91%</td>
<td>Integrated IOC</td>
<td>Brazil</td>
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<tr>
<td>22</td>
<td>Eni</td>
<td>31.7</td>
<td>-91%</td>
<td>Integrated IOC</td>
<td>Italy</td>
</tr>
<tr>
<td>23</td>
<td>CNOC</td>
<td>29.3</td>
<td>-55%</td>
<td>E&amp;P</td>
<td>Canada</td>
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<tr>
<td>24</td>
<td>EXXON MOBIL</td>
<td>27.6</td>
<td>-59%</td>
<td>E&amp;P</td>
<td>US</td>
</tr>
<tr>
<td>25</td>
<td>CNOOC</td>
<td>25.7</td>
<td>-58%</td>
<td>Integrated IOC</td>
<td>China</td>
</tr>
<tr>
<td>26</td>
<td>CNPC</td>
<td>25.7</td>
<td>-21%</td>
<td>Integrated IOC</td>
<td>Russia</td>
</tr>
<tr>
<td>27</td>
<td>Suncor Energy</td>
<td>24.9</td>
<td>-24%</td>
<td>E&amp;P</td>
<td>Canada</td>
</tr>
<tr>
<td>28</td>
<td>CNOOC</td>
<td>24.9</td>
<td>-24%</td>
<td>E&amp;P</td>
<td>Canada</td>
</tr>
<tr>
<td>29</td>
<td>Eni</td>
<td>23.7</td>
<td>-93%</td>
<td>Integrated IOC</td>
<td>Italy</td>
</tr>
<tr>
<td>30</td>
<td>Honeywell</td>
<td>21.8</td>
<td>-55%</td>
<td>E&amp;P</td>
<td>Canada</td>
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<tr>
<td>31</td>
<td>JX Nippon</td>
<td>19.3</td>
<td>-50%</td>
<td>Integrated IOC</td>
<td>Japan</td>
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<td>32</td>
<td>Chevron</td>
<td>18.3</td>
<td>-53%</td>
<td>Integrated IOC</td>
<td>UK</td>
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<tr>
<td>33</td>
<td>Sibur Holding</td>
<td>16.0</td>
<td>-13%</td>
<td>Integrated IC</td>
<td>Russia</td>
</tr>
<tr>
<td>34</td>
<td>Marathon</td>
<td>13.4</td>
<td>-53%</td>
<td>Integrated IOC</td>
<td>US</td>
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<tr>
<td>35</td>
<td>MESO Chemicals</td>
<td>13.1</td>
<td>-31%</td>
<td>E&amp;P</td>
<td>Malaysia</td>
</tr>
<tr>
<td>36</td>
<td>Sinopec</td>
<td>10.9</td>
<td>-50%</td>
<td>Integrated IOC</td>
<td>South Africa</td>
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#### According to Reserves & Production

<table>
<thead>
<tr>
<th>Beginning Year</th>
<th>Reserves, MMBbl</th>
<th>Production, MMBbl</th>
<th>Transfers, MMBbl</th>
<th>Recovery, %</th>
<th>End Year</th>
<th>Reserves, MMBbl</th>
<th>Production, MMBbl</th>
<th>Transfers, MMBbl</th>
<th>Recovery, %</th>
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<tr>
<td>2008</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td>2010</td>
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<td></td>
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</table>

Source: Bloomberg, PFC Energy estimates as of 12/31/2008

Share price growth based on exchange parity exchange rate.
# The List of Efficient Companies in Europe

## Results of Oil & Gas Operations

<table>
<thead>
<tr>
<th>Company</th>
<th>Revenues $/boe</th>
<th>Lifting Costs $/boe</th>
<th>Exploration Expense $/boe</th>
<th>DD&amp;A Expense $/boe</th>
<th>Other Expenses (Income)/boe</th>
<th>Income Taxes $/boe</th>
<th>Net Income $/boe</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIVERSE</td>
<td>$71.34</td>
<td>$11.32</td>
<td>$1.61</td>
<td>$10.59</td>
<td>$0.56</td>
<td>$29.67</td>
<td>$18.66</td>
<td>-</td>
</tr>
<tr>
<td>MOL</td>
<td>$72.93</td>
<td>$8.81</td>
<td>$1.60</td>
<td>$6.75</td>
<td>$1.99</td>
<td>$9.62</td>
<td>$42.00</td>
<td>1</td>
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<tr>
<td>Bow Valley Energy Ltd.</td>
<td>$86.79</td>
<td>$7.47</td>
<td>$0.00</td>
<td>$40.49</td>
<td>$0.41</td>
<td>$0.00</td>
<td>$38.42</td>
<td>2</td>
</tr>
<tr>
<td>Marathon Oil Corp.</td>
<td>$96.63</td>
<td>$13.10</td>
<td>$2.93</td>
<td>$17.07</td>
<td>($1.17)</td>
<td>$19.93</td>
<td>$34.77</td>
<td>3</td>
</tr>
<tr>
<td>Noble Energy, Inc.</td>
<td>$102.50</td>
<td>$16.50</td>
<td>$4.50</td>
<td>$13.75</td>
<td>$0.00</td>
<td>$33.00</td>
<td>$34.75</td>
<td>4</td>
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<tr>
<td>OMV Gruppe</td>
<td>$78.29</td>
<td>$20.79</td>
<td>$5.00</td>
<td>$6.24</td>
<td>$0.20</td>
<td>$12.72</td>
<td>$33.33</td>
<td>5</td>
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<tr>
<td>Petro-Canada</td>
<td>$93.05</td>
<td>$8.20</td>
<td>$2.59</td>
<td>$14.40</td>
<td>$0.00</td>
<td>$35.12</td>
<td>$32.94</td>
<td>6</td>
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<tr>
<td>Murphy Oil Corp.</td>
<td>$95.29</td>
<td>$16.54</td>
<td>$0.22</td>
<td>$12.75</td>
<td>$1.06</td>
<td>$32.16</td>
<td>$32.56</td>
<td>7</td>
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<tr>
<td>Nexen Inc.</td>
<td>$87.91</td>
<td>$6.21</td>
<td>$2.11</td>
<td>$24.53</td>
<td>$0.15</td>
<td>$27.65</td>
<td>$27.26</td>
<td>8</td>
</tr>
<tr>
<td>BG Group plc</td>
<td>$72.29</td>
<td>$3.10</td>
<td>$1.61</td>
<td>$8.50</td>
<td>$0.24</td>
<td>$27.77</td>
<td>$26.07</td>
<td>9</td>
</tr>
<tr>
<td>BP plc</td>
<td>$74.79</td>
<td>$15.40</td>
<td>$0.93</td>
<td>$5.56</td>
<td>($0.54)</td>
<td>$24.24</td>
<td>$25.20</td>
<td>10</td>
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<tr>
<td>BASE Aktiengesellschaft</td>
<td>$62.90</td>
<td>$10.06</td>
<td>$6.21</td>
<td>$9.56</td>
<td>$0.28</td>
<td>$30.53</td>
<td>$24.18</td>
<td>11</td>
</tr>
<tr>
<td>JX Nippon Oil &amp; Gas plc</td>
<td>$51.87</td>
<td>$7.65</td>
<td>$0.00</td>
<td>$6.62</td>
<td>$0.00</td>
<td>$14.02</td>
<td>$22.18</td>
<td>12</td>
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<tr>
<td>ConocoPhillips</td>
<td>$30.13</td>
<td>$9.98</td>
<td>$1.58</td>
<td>$13.33</td>
<td>($0.74)</td>
<td>$35.14</td>
<td>$20.85</td>
<td>14</td>
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<tr>
<td>Hess Corp.</td>
<td>$70.34</td>
<td>$18.37</td>
<td>$0.92</td>
<td>$12.10</td>
<td>$0.00</td>
<td>$16.84</td>
<td>$20.11</td>
<td>15</td>
</tr>
<tr>
<td>Royal Dutch Shell plc</td>
<td>$35.27</td>
<td>$7.98</td>
<td>$1.15</td>
<td>$6.58</td>
<td>$1.22</td>
<td>$23.21</td>
<td>$20.09</td>
<td>16</td>
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<tr>
<td>ATP Oil &amp; Gas Corp.</td>
<td>$37.84</td>
<td>$9.38</td>
<td>$0.00</td>
<td>$36.82</td>
<td>($45.42)</td>
<td>$18.53</td>
<td>$18.53</td>
<td>17</td>
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<tr>
<td>Toreador Resources Corp.</td>
<td>$31.64</td>
<td>$36.31</td>
<td>$4.87</td>
<td>$14.76</td>
<td>($5.05)</td>
<td>$14.25</td>
<td>$17.30</td>
<td>18</td>
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<tr>
<td>Exxon Mobil Corp.</td>
<td>$71.57</td>
<td>$17.93</td>
<td>$0.45</td>
<td>$6.54</td>
<td>$0.00</td>
<td>$29.42</td>
<td>$17.23</td>
<td>19</td>
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<tr>
<td>Total S.A.</td>
<td>$74.17</td>
<td>$8.77</td>
<td>$1.27</td>
<td>$8.67</td>
<td>$1.78</td>
<td>$36.81</td>
<td>$16.87</td>
<td>20</td>
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<tr>
<td>Statoil ASA</td>
<td>$72.55</td>
<td>$5.60</td>
<td>$1.65</td>
<td>$6.04</td>
<td>$0.00</td>
<td>$41.66</td>
<td>$14.41</td>
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<td>Talisman Energy Inc.</td>
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<td>$25.97</td>
<td>$5.46</td>
<td>$30.71</td>
<td>$0.00</td>
<td>$16.65</td>
<td>$11.50</td>
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<tr>
<td>Endeavour International Corp.</td>
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<td>$14.15</td>
<td>$0.00</td>
<td>$36.12</td>
<td>$0.00</td>
<td>$20.44</td>
<td>$9.82</td>
<td>23</td>
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<tr>
<td>Apache Corp.</td>
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<td>$41.70</td>
<td>$0.00</td>
<td>$37.80</td>
<td>$0.90</td>
<td>$7.89</td>
<td>$7.89</td>
<td>24</td>
</tr>
<tr>
<td>Repsol YPF</td>
<td>$96.65</td>
<td>$57.02</td>
<td>$47.30</td>
<td>$14.40</td>
<td>$12.34 ($4.11) ($10.28)</td>
<td>($12.47)</td>
<td>($12.47)</td>
<td>25</td>
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<tr>
<td>Canadian Natural Resources Ltd.</td>
<td>$91.83</td>
<td>$32.36</td>
<td>$0.00</td>
<td>$82.97</td>
<td>$1.43</td>
<td>($12.47)</td>
<td>($12.47)</td>
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</tr>
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<td>PX Energy</td>
<td>$36.70</td>
<td>$4.20</td>
<td>$70.24</td>
<td>$54.12</td>
<td>$0.13</td>
<td>$0.00</td>
<td>($91.99)</td>
<td>27</td>
</tr>
</tbody>
</table>

Sources: Bloomberg. P/E energy estimates as of 12/31/2008. Share price growth based on annual exchange rate. INAG.
### IOCs
- Access to
  - Reserves
  - Government relationships
  - Customers / Markets
  - Investment Incentives
- Economies of Scale
- Avoiding Resource Nationalism
- Sharing Risks
- Diversification of Asset Portfolio
- Competitiveness
- Maximise Shareholder Value

### NOCs
- Access to
  - Downstream Markets
  - Technology
  - Skilled Personnel
  - Trading Subsidies
  - Capital
- Improved Efficiency
- Attracting Investment
- Knowledge Transfer
- Economic Development
- Fulfill Government Priorities
- Regional Synergies
- Access to the Market

By understanding the true motivations of the NOCs, significant partnering opportunities are emerging for IOCs. Therefore a WIN-WIN situation can be created for both parties.
Today NOCs control the world reserves

Most extra profit resulting from boosting oil prices allocated to NOCs

Source: BP Statistical Review, Oil & Gas Journal, PFC Energy
IOCs ability to re-invent themselves can exploit developing certain assets where NOCs don’t have expertise yet.

**Deep offshore**

**Oil sands**

**Heavy oil**

**Arctic**

**Technically difficult or unconventional oil**
Peak oil theory says: that any finite resource, (including oil), will have a beginning, middle, and an end of production, and at some point it will reach a level of maximum output.

<table>
<thead>
<tr>
<th>Published</th>
<th>By</th>
<th>Peak YearRange</th>
<th>Published</th>
<th>By</th>
<th>Peak YearRange</th>
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</thead>
<tbody>
<tr>
<td>1972</td>
<td>ESSO</td>
<td>About 2000</td>
<td>1999</td>
<td>Parker</td>
<td>2040</td>
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<tr>
<td>1972</td>
<td>LPI</td>
<td>By 2000</td>
<td>2000</td>
<td>Bortfield</td>
<td>2004 or 2019</td>
</tr>
<tr>
<td>1976</td>
<td>UxiDOE</td>
<td>About 2000</td>
<td>2000</td>
<td>EIA</td>
<td>2021-2167; 2037 most likely</td>
</tr>
<tr>
<td>1985</td>
<td>Bookout</td>
<td>2020</td>
<td>2002</td>
<td>Campbell</td>
<td>2010</td>
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<tr>
<td>1989</td>
<td>Campbell</td>
<td>1999</td>
<td>2002</td>
<td>Cavallaro</td>
<td>2026-2028</td>
</tr>
<tr>
<td>1997</td>
<td>Ivanhoe</td>
<td>2010</td>
<td>2003</td>
<td>Lynch</td>
<td>No visible peak</td>
</tr>
<tr>
<td>1997</td>
<td>Edwards</td>
<td>2020</td>
<td>2003</td>
<td>Shell</td>
<td>After 2025</td>
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<tr>
<td>1999</td>
<td>Campbell</td>
<td>2010</td>
<td>2004</td>
<td>CERA</td>
<td>After 2020</td>
</tr>
</tbody>
</table>
Three Pre-Peak Production Growth Rates: 1, 2, and 3 percent per year
Combined with Three USGS / MMS / EIA-Sourced Technically Recoverable Resource Base Levels:
- 2.793 trillion barrels (95% chance of that much or more)
- 3.338 trillion barrels (expected value; statistical mean)
- 3.947 trillion barrels (5% chance of that much or more)

To Yield Nine Model Projections Spanning the Plausible Range of Outcomes. The central scenario combines the 2-percent growth rate and the expected value resource base estimate.
Estimated In-Place Resource: 2.372 trillion barrels
API Gravity: 7.5-9.0 degrees
Viscosity: Up to 1,000,000 centipoise
Host Formation Characteristics:
  - Porosity 31 to 35 percent
  - Permeability 2.5 to 5.0 Darcies
Resource Drawbacks: High metallic content
Extraction/Processing Drawbacks
  - High energy requirements (and associated CO2 emissions)
  - Large volumes of light hydrocarbon diluents and freshwater are required.

Estimated In-Place Resource: 1.36 trillion barrels
API Gravity: 8-10 degrees
Viscosity: 10,000+ centipoise
Host Formation Characteristics
  - Porosity 30 to 36 percent
  - Permeability 1 to 17 Darcies
Resource Drawbacks:
  - 2.0-3.5 percent sulfur content
  - High metallic content
Extraction/Processing Drawbacks
  - Requires large volumes of light hydrocarbon diluents and/or fresh water (for Orimulsion).

Canadian Bitumen (Alberta: "tar sands")
≈80 percent of the world's in-place bitumen (< 10oAPI)
- There's no finding risk (or cost).
- Commercial production is happening (and accelerating).
- The achievable recovery factors and the production costs are mostly technology-driven.

Venezuelan Extra-Heavy Oil (Orinoco Belt)
≈90 percent of the world's in-place extra-heavy oil (> 10000 cP)

---

Summary of EIA Model Results Including Canadian Bitumen and Orinoco Extra-Heavy Oil Resources

<table>
<thead>
<tr>
<th>Resource Base</th>
<th>Ultimate Recovery BBbls</th>
<th>Annual Demand Growth, %</th>
<th>Peak Year</th>
<th>Peak Rate, MMBbls/yr</th>
<th>Peak Rate, MMBbls/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean + 1.120 TBBls (30% recovery)</td>
<td>4,458</td>
<td>1.9</td>
<td>2077</td>
<td>52,985</td>
<td>145</td>
</tr>
<tr>
<td>Mean + 2.339 TBBls (60% recovery)</td>
<td>5,577</td>
<td>1.0</td>
<td>2094</td>
<td>62,750</td>
<td>172</td>
</tr>
</tbody>
</table>

---
Conclusions, Interpretations, and Implications

- A peak in world oil production is decades away … not years away.

- Geopolitical factors may cause plateaus or even declines for considerable periods of time.

- Oil production growth rates of 1 to 3 percent per year will not soon be constrained by the size of the technically recoverable resource base, particularly when extra-heavy oil and bitumen resources are included.

- Primarily its the size of the technically recoverable resource base that determines the peak year. Reasonable long term world oil supply models use the best available resource base estimates and include all economically producible petroleum resources.

- However, complacency about both supply and demand side energy research, development, and analysis is risky given the involved scientific and technical challenges and the long lead times needed for significant market penetration of new energy technologies.
Reserve Definition
Reserves are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions.

Resources
All quantities of petroleum (recoverable and unrecoverable) naturally occurring on or within the earth’s crust, discovered and undiscovered, plus those quantities already produced. It includes all types of petroleum whether currently considered “conventional” or “unconventional” (see Total Petroleum Initially-in-Place).
Reserves represent the most valuable asset of oil company and therefore their evaluation, audit and classification must be performed according to international standards.

SPE/WPC/AAPG

Resource classification system
(showing possible Project Status Categories)

<table>
<thead>
<tr>
<th>Production</th>
<th>Project Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reserves</strong></td>
<td>On production</td>
</tr>
<tr>
<td>Proved</td>
<td>Under development</td>
</tr>
<tr>
<td>Proved plus Probable</td>
<td>Planned for development</td>
</tr>
<tr>
<td>Probable plus Possible</td>
<td>Development pending</td>
</tr>
<tr>
<td>Contingent resources</td>
<td>Development on hold</td>
</tr>
<tr>
<td>Low estimate</td>
<td>Development not viable</td>
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<tr>
<td>Best estimate</td>
<td>Prospect</td>
</tr>
<tr>
<td>High estimate</td>
<td>Lead</td>
</tr>
<tr>
<td>Unrecoverable</td>
<td>Play</td>
</tr>
<tr>
<td><strong>Prospective resources</strong></td>
<td>Higher risk</td>
</tr>
<tr>
<td>Low estimate</td>
<td>Range of uncertainty</td>
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<tr>
<td>Best estimate</td>
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</tr>
<tr>
<td>High estimate</td>
<td></td>
</tr>
<tr>
<td>Unrecoverable</td>
<td></td>
</tr>
</tbody>
</table>

The comparison of SPE/WPC/AAPG vs. SEC according to classes, categories and methods.
INA Total Resources

<table>
<thead>
<tr>
<th></th>
<th>Proved</th>
<th>Proved + Probable</th>
<th>Proved + Probable + Possible</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oil Equivalent 10^6 m^3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>40495</td>
<td>60739</td>
<td>66666</td>
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<tr>
<td><strong>%</strong></td>
<td>67%</td>
<td>68%</td>
<td>69%</td>
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<tr>
<td><strong>Gas</strong></td>
<td>27192</td>
<td>41662</td>
<td>45834</td>
</tr>
<tr>
<td><strong>Condensate</strong></td>
<td>2404</td>
<td>4579</td>
<td>4579</td>
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<tr>
<td><strong>Oil</strong></td>
<td>10900</td>
<td>14498</td>
<td>16253</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>40495</td>
<td>60739</td>
<td>66666</td>
</tr>
</tbody>
</table>

**MOL GROUP**
A Comparison of Reserves Discovered Versus Reserves Produced Since 1990

Egypt – A Typical Life Cycle for an Oil Producing Country

Only West Africa region shows positive trend of discovered vs. produced reserves

Many oil producer countries shows similar development of their production curves; especially countries in MENA region which is core focused area for INA and MOL upstream activities

MOL GROUP
Where to go in future?

New Petroleum Provinces

- Central African Rift
- Republic of Niger
- Central African Rift
- Brasil Offshore
- Uruguay Offshore
- West China
- Russia East Siberia
- Artic Oil and Gas potential
New technologies and extremely high capital investments needed for Ultra Deep Offshore and Arctic

- Super Big Players only
1854 - Oil extraction from pits (Peklenica and Voloder-Mikleuška)
1855 - Granted first mining permits for oil exploration in Peklenica and Voloder- Mikleuška
1860 - Granted first concession for exploitation of the mineral field near Peklenica
1880 - Organized exploration and production of oil commences in Croatia
1883 - Rijeka refinery is established
1886 - First oil wells drilled in Međimurje (Peklenica-Selnica)
1917 - Discovery of the first Croatian Gas Field - Bujavica
1927 - Sisak refinery is established
1939 - Discovery of the first Croatian Oil Field – Gojlo
1952 - Naftaplin, Oil and Gas Production Company, Zagreb is founded
1964 - INA-Industrija naftne, Zagreb is established
1950-1970 - Majority of oil and gas fields discovered
1970 - INA - Naftaplin commences activities
1982 - Both the Ethane Recovery and Ethylene Plants commence operations
1987 - Underground Gas Storage Facility commences operations
1995 - Pilot application of EOR method on Ivanč oil field
1999 - Ivana Offshore field in the Adriatic Sea commences production.

INA Oil and Condensate Production

[Graph showing oil and condensate production with key events marked on a timeline from 1854 to 2002.]

INA Oil and Gas Production Company, Zagreb is founded
1964 - INA-Industrija naftne, Zagreb is established
1950-1970 - Majority of oil and gas fields discovered
1970 - INA - Naftaplin commences activities
Adriatic offshore
1982 - Both the Ethane Recovery and Ethylene Plants commence operations

MOL GROUP
Employees: [cca 2,250]
- Proved and probable reserves of [380]MMboe (70% gas)
- Core regions
  - Onshore Croatia
  - Offshore Croatia
  - Middle East (Syria)
  - North and West Africa
- Sale/Import of natural gas

Employees: [cca 2,850]
- Two refineries
  - Rijeka (4.5MMt)
  - Sisak (4.0MMt)
- Marketer of 4.9MMt of fuel products in Croatia and South Eastern Europe
- Maziva Zagreb lubricants business

Employees: [cca 3,250]
- Operator of [474] petrol stations in
  - Croatia ([427])
  - Bosnia-Herzegovina ([411])
  - Slovenia ([6])
- Acquisition of Energopetrol, adding [65] stations in Bosnia-Herzegovina

Source: INA annual report
Syria
- 5 Oil-gas-condensate discovery on stream
- Exploration in two blocks: Hayan and Aphamia
- Stage II completed, Stage III in 2010 production at full scale

Egypt
- Production from Ras Qattara, West Abu Gharadig, North Bahariya and East Yidma
- Exploration in East Yidma, and East Kalabsha

Middle East
- Oil & Gas (P&P)

West Africa
- Onshore fields
  - 35 Onshore oil fields
  - 18 Onshore gas fields
- Offshore fields
  - 6 Offshore fields in a JV with Agip currently on-stream, 1 under development with Edison
  - Offshore exploration in JV with Edison (Izabela, Ivona blocks)
  - 10 Exploration Licences, INA 100%
  - Gas storage Okoli
  - Remaining exploration potential and EOR potential from mature fields

Namibia
- Exploration license, Zaris Block

Africa
- Proved
  - Croatia Offshore 35%
  - Croatian Offshore 62%
  - 253.0 MMboe
- Proved & Probable
  - Croatia Offshore 25%
  - Croatian Offshore 54%
  - 380.4 MMboe

Croatia
- Onshore
  - 54%
- Offshore
  - 25%

Namibia
- Oil & Gas (P&P)
  - Condensate 7%
  - Oil 23%
  - Gas 70%

380.4 MMboe
PRODUCTION PROJECTS IN PROGRESS

- Molve - Compressor Production start-up
- Additional Workover activities
- IPO - INA PRODUCTION OPTIMIZATION of domestic onshore production activities
  - Žutica - chosen location for pilot project

EXPLORATION PROJECTS

- Dravica-1 - Well Testing in December 2009
- Zalata-Dravica East 3D survey in progress
- Potony-1 - Well Test program in 2010.
- Unconventional gas potential for Drava and Mura region

35 oil fields
18 gas condensate fields
4 geothermal fields
49 gathering & dispatching stations
19 gas & 9 compressor stations
1 ethane plant
6 water stations
3 200 km pipelines
**NORTH ADRIATIC & AIZA LAURA CA**
INA d.d. & ENI Croatia, share 50:50
- 7 fields, 17 production platforms
- New field Annamaria A - start-up in November 2009
- GOIP 4.8 BCM
- IVANA A/K upgrade (Connecting Izabela field)

**IZABELA CA**
Edison & INA d.d., share 70:30
- INA share 1501.53 MMcm
- 6 Wells Drilling & Completions
- Izabela South & North Platforms Construction & Installation
- Production Start-up in 2010

**Exploration activities**
- Well IKA SW-2Dir Post Well Evaluation
- Project IVANA C SW thin layers, Exploration Potential Evaluation
- Evaluation of Mid and South Adriatic exploration potential
Production & Development: Hayan Block

- 100% interest; Area: 4,873 km²
- Exploration activities started in 1998 and were completed in 2007
- Discovery of 6 oil, gas and condensate fields – Jihar, Al Mahr, Jazal, Palmyra, Mustadira and Mazrur
- Production started in 2005 on Jihar Field
- Jihar Field - oil and gas-condensate field
- From 2009 oil and gas production, upon finishing of Gas Treatment Plant in 2011 production of LPG will start
- Al Mahr Field – gas-condensate field production will start in 2011
- Jazal Field – oil field – production started in 2007 with one well, in 2009 started production from second well
- Palmyra Filed – gas field – in production from 2006 with two wells
- Mustadira Field – gas field – production started in 2008
- Mazrur Field – oil and gas-condensate field – production from one well started in 2009

Exploration activities: Aphants Block

- 100% interest
- Area: 4,574 km²
- Block is located between Palmyrides highs on the south, Aleppo plateau on the north and Homes depression on the west.
- Current Phase: 1st Extension (until August 2010)
  - Initial Phase – four years (2004-2008)
    - 504 km 2D seismic
    - Jaddua-1 (dry well)
    - Mudawara-2 (oil and gas shows)
  - 1st extension - two years (2008-2010)
    - 3D seismic 270 km² (acquired)
    - 2 exploration wells (will be spudded in 2010.)
- 2nd extension – two years
  - two wells
Development Concession Ras Qattara

- Operator: IEOC – 75%
- Partners: INA - 25%
- Concession consists of two oil fields: El Faras & Zarif.
- Produce and sell till the licence expiry: 1.53 MM bbls of oil

Development Concession West Abu Gharadig

- Operator: IEOC - 45%
- Partners: Devon - 30% & INA - 25%
- Concession consists of oil fields: Raml & Raml SW.
- Produce and sell till the licence expiry: 0.75 MM bbls of oil

Development Concession North Bahariya

- Operator: Sahara Oil & Gas - 50%
- Partners: IPR – 30% & INA - 20%
- Concession consists of 5 oil fields: Abrar, Ganna, Ferdaus, Rayan & Rawda
- Start of production: 2004
- Produce and sell till the licence expiry: 0.30 MM bbls of oil

Development Concession Sidi Rahman

- Operator: INA – 50%
- Partners: RWE DEA - 50%
- Sidi Rahman oil field in production
- Start of production: 2007
- License expiry: 2025.
- Produce and sell till the licence expiry: 0.52 MM bbls of oil
### East Yidma Exploration Concession
- **Operator:** INA - 50%
- **Partner:** RWE Dea - 50%
- **Effective date:** March 24th, 2004.
- **Exploration periods:** 2.5 +2+2 years
- **Current status:** Third exploration period
- **Expiry date:** September 24th, 2010.
- **Current activities:** Drilling of the exploration well Rizk East-1
- **Objectives:** Discovery of new commercial hydrocarbon reserves in Cretaceous and Jurassic reservoirs.

### East Kalabsha Exploration Concession
- **Operator:** IEOC - 50%
- **Partners:** RWE Dea - 25%, INA - 25%
- **Effective date:** May 26th, 2005.
- **Exploration periods:** 3+2 years
- **Current status:** Second exploration period
- **Expiry date:** May 26th, 2010.
- **Current activities:** Operator is preparing geological study that includes reviewing based on new well data.
- **Objectives:** Discovery of new commercial hydrocarbon reserves in Cretaceous and Jurassic reservoirs.
### Development Concession 3/05
- **Operator:** Sonangol - 25%
- **Partners:** China Sonangol - 25%, AJOCO - 20%, ENI - 12%, Somoil - 10%, NIS - 4% and INA - 4%.
- Concession consists of 6 oil fields: Palanca, Pacassa, Bufalo, Impala, Impala SE and Pambi 3/05.
- **Start of Production:** 1985.
- **License expiry:** 2025.
- **Produce and sell till the license expiry:** 3.9 MM bbls of oil

### Development Concession 3/85
- **Operator:** Total - 50%
- **Partners:** ENI - 15%, AJEX - 12.5%, SVENSKA - 6.25%, Sonangol - 6.25%, NIS - 5% and INA - 5%.
- **Start of Production:** 1990.
- **Expected the license extension till:** 2031.
- **Produce and sell till the license expiry:** 0.6 MM bbls of oil

### Exploration Concession 3/05A
- **Operator:** Sonangol - 25%
- **Partners:** China Sonangol - 25%, AJOCO - 20%, ENI - 12%, Somoil - 10%, NIS - 4% and INA - 4%.
- **Effective date:** July 13th, 2005.
- **Exploration periods:** 3 +2 years
- **Current status:** Second exploration period
- **Expiry date:** December 1st, 2010
- **Discoveries:** Punja field & Caco - Gazela field
- **Current activities:** After reprocessing of new 3D seismic (shot in 2007.) plan is to drill one exploration well in 2nd Quarter of 2010.
- **Objectives:** Discovery of new commercial hydrocarbon reserves in Miocene & Oligocene reservoirs.

### Development Concession 3/91
- **Operator:** Total - 50%
- **Partners:** ENI - 15%, AJOCO 91 - 12.5%, SVENSKA - 6.25%, Sonangol - 6.25%, NIS - 5% and INA - 5%.
- Concession consists of 1 oil field: Oombo.
- **Start of Production:** 1996.
- **License expiry:** December 2012.
- **Expected the license extension till:** 2032.
- **Produce and sell till the license expiry:** 0.9 MM bbls of oil
### Namibia, Zaris Exploration Concession

- **Operator:** INA – 100%
- **Partner:** farm – out in progress
- **Effective date:** November 23rd, 2005.
- **Exploration periods:** extension of first initial period (5 years)
- **Current status:** Initial exploration period
- **Expiry date of Initial exploration period:** November 23rd, 2010.
- **Current activities:** Continue new farm-out process and decision weather to continue or terminate the Zaris project will be highly dependent on successful farming out.
- **Objectives:** Discovery of new commercial hydrocarbon reserves in Proterozoic reservoirs.

### Iran, Block Moghan-2

- **Contract Service Agreement for Exploration and Development**
- **Contract Terms:**
  - **Effective Date:** 01.06.2008
  - **Exploration phase:** 4 years
  - **Appraisal phase:** 2 years
  - **Development phase:** according to master development plan
  - **Work Commitments for exploration phase:** acquisition of 2D and 3D seismic and drilling one well
- **Block is situated in the north-western part of Iran, in the Caspian region near the border with Azerbaijan**
- **Area:** 3,230 sqm
- **Main targets:** sandstones of Middle Oligocene and Upper Eocene formations
- **Potential Cretaceous play is under investigation**
- **Seismic Acquisition of 326 km 2D seismic should commence in July, 2010.**
Existing upstream portfolio: solid basis for further growth

Exploration activities in 16 countries, Producing assets in 7 countries*

- Balanced and focused portfolio: Hungary/Croatia, Russia, Middle East and Africa
- Strengthened Central European reserve and production base with good exploration potential
- Well-positioned in the ME/Central Asia with major development projects in Pakistan and Syria
- In-house drilling and oil service companies

MOL GROUP
Operational responsibility enables value creation

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov 2003</td>
<td>MOL acquired 25% plus one vote stake in INA (for USD 505 mn)</td>
</tr>
<tr>
<td>2003-2008</td>
<td>Restructuring with strong minority position provided by the Shareholders’ Agreement (SHA)</td>
</tr>
<tr>
<td>Oct 2008</td>
<td>MOL became the largest shareholder of INA (47.16%) via voluntary public offer for EUR 873 mn</td>
</tr>
<tr>
<td>Jan 2009</td>
<td>Amendment to the SHA provides management control for MOL and full IFRS consolidation of INA</td>
</tr>
<tr>
<td>June 2009</td>
<td>The European Commission’s unconditional approval, and the Croatian Competition Agency’s conditional approval to the Amendment of the SHA</td>
</tr>
<tr>
<td>10 June 2009</td>
<td>Closing the Amendment to the SHA via the election of the new Supervisory Board of INA at the AGM with MOL majority</td>
</tr>
<tr>
<td>30 June 2009</td>
<td>Full consolidation of INA into MCL’s financial statements</td>
</tr>
</tbody>
</table>

These steps open up the way for the improvement of efficiency and profitability as well as realization of upside potential.

MOL GROUP
Doubling proved and probable reserves, end-2008 (MMboe)

**SPE 2P reserves**

<table>
<thead>
<tr>
<th></th>
<th>MOL</th>
<th>INA</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>352</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>382</td>
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</tr>
<tr>
<td>734</td>
<td></td>
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</tbody>
</table>

**SPE 2P reserves by product**

<table>
<thead>
<tr>
<th></th>
<th>Oil</th>
<th>Gas</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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<tr>
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</tr>
<tr>
<td>734</td>
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</table>

**SPE 2P reserves by country**

<table>
<thead>
<tr>
<th></th>
<th>Hungary</th>
<th>Croatia</th>
<th>Russia</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>184</td>
<td></td>
<td></td>
<td></td>
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<td>734</td>
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</tbody>
</table>

68% increase in Hydrocarbon production, 2008 (Mboe/d)

**Production**

<table>
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<tr>
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<th>MOL</th>
<th>INA</th>
<th>Total</th>
</tr>
</thead>
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</tr>
<tr>
<td>145</td>
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</tbody>
</table>

**Production by product**

<table>
<thead>
<tr>
<th></th>
<th>Oil</th>
<th>Gas</th>
<th>Total</th>
</tr>
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<tbody>
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<tr>
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</table>

**Production by country**

<table>
<thead>
<tr>
<th></th>
<th>Hungary</th>
<th>Croatia</th>
<th>Russia</th>
<th>Other</th>
<th>Total</th>
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<td>23</td>
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<tr>
<td>145</td>
<td></td>
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</tr>
</tbody>
</table>

**MOL GROUP**
- The role of Janaf
- Druzhba pipeline
- CPOT oil line

- Soth Stream
- Nabucco
- Link with Hungary
1. Slovakia-Austria-Slovenia (existing route)
   - capacity 1,2 bcm/y
   - year 2010 (increased capacity).
2. Adriatic
   - capacity 1,5 bcm/y
   - after end of gas production from Adriatic fields, after 2020.
3. Mađarska
   - capacity 1,5 bcm/y (optional: 6.5 bcm/y) - year 2012./2013.
4. South Stream
   - capacity not defined yet (2,5 bcm/y)
   - year 2013.
5. Jonsko-Jadranski
   - capacity 2,5 bcm/y
   - year 2011./2012.?
6. LNG terminal
   - capacity
7. 
   1. phase 2,5 mld m3/g
   2. phase 4,0 mld m3/g
   - year
   1. phase 2012.
   2. phase 2015.
**Upstream production:** 2.035 bcm
- 1.128 bcm On Shore
- 0.906 bcm Off Shore

**Import (Russia):** 1.065 bcm

**Total Gas Supply = 3.1 bcm**

**Customers**
- HEP Electricity generation: 0.71 bcm
- Industrial consumers Own Use: 0.47 bcm
- Distribution companies Households & own industry: 1.30 bcm
- Petrokemija Feedstock for fertilizers: 0.62 bcm

**Total Consumption = 3.1 bcm**
Oil industry mega mergers produced new categories of players (supermajors, IOCs), which further reduced the employment pool. The consolidation wave completed, and the industry lost app. 1 million jobs from 1980s.

Source: Society of Petroleum Engineers, 2008
The number of petroleum engineering diplomas awarded in the United States in 2002 was just one-quarter the number awarded annually in the 1980s. China, India, and even Europe currently outpace the U.S. in actual numbers of engineering graduates.
Traditionally, SPE has conducted a salary survey biennially, using a random sample of SPE members. More than 10,000 SPE members participated in the 2007 survey.

<table>
<thead>
<tr>
<th>Total years of experience</th>
<th>Earth Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base Pay</td>
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<tr>
<td>0 to 10</td>
<td>$95,878</td>
</tr>
<tr>
<td>11 to 15</td>
<td>$117,154</td>
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<tr>
<td>16 to 20</td>
<td>$151,630</td>
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<tr>
<td>21 to 25</td>
<td>$129,974</td>
</tr>
<tr>
<td>26 +</td>
<td>$148,244</td>
</tr>
<tr>
<td><strong>Total (average)</strong></td>
<td><strong>$135,390</strong></td>
</tr>
</tbody>
</table>
INA, d.d. is a vertically integrated oil corporation which plays a major role in the oil, oil products and gas markets in Croatia and neighboring countries. INA, d.d. is committed to creating higher value by continuously improving its business and quality of products and services. INA is acting as IOC and NOC at the same time. INA can assure fulfilling of Croatia oil and gas demand in the future.

- Petroleum industry will close demand - supply gap
- The real technical difficulty is around the “energy” storage