Can Global Energy Resources Supply a “Business as Usual” Scenario in the Future?

Canberra, Australia, 9 June 2009

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The Ångström laboratory
One barrel oil

159 liter
1.600 kWh

Global production 2006: 85.000.000 per day, or 13.500.000 m³ per day

A typical super tanker takes 2 million barrels and Japan needs to import oil equal to one super tankers every 10th hour.

Every day is 100 tankers on way to Japan.
President Bush, Capitol Hill, 2006: “We have a serious problem. America is addicted to oil”
How much energy is bound in oil?

100 ml of oil contains 1 kWh

What can you do with 1 kWh?
You can move a small car to the top of the Eiffel Tower!

A day’s work for a man is 0.5 kWh

Filling you car with 50 liter is equal to the energy you need to move 500 cars to top of the Tower or having 1000 slaves pushing your car.
50 liter gasoline is equal to the work of 1000 persons during one day.
Statement by the Swedish Prime Minister Göran Persson, 2005

“The oil might be in decline? We have someone here in Uppsala named Aleklett that claims that.”

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The Swedish government has appointed a commission that suggested what to do to make Sweden less dependent on oil by 2020.
From 1945 to 1970, Sweden increased its use of energy by a factor of five, or nearly 7 percent per year for 25 years. This journey into the oil age transformed Sweden from a rather poor country into the third wealthiest country (per capita) in the world. Ninety percent of the energy increase came from oil. Cheap oil made Sweden rich.
Use of oil products in Sweden

Användning av oljeprodukter i Sverige, inklusive utrikes sjöfart, 1970–2006

Källa: SCB och Energimyndigheten
Energy for transportations

Slutlig energianvändning i transportsektorn 1970–2006, inklusive utrikes sjöfart

Källa: SGB och Energimyndigheten

- Gasolin
- Diesel
- Electricity
- Aviation fuel
- Bunkerolja
- Natural gas
- Etanol
- Eo 2-5
Energy for transportations

2000 - 2006
World Oil Supply

World Oil Supply according to EIA

4% fluctuation band
The commission proposes the following national objectives for more efficient use of energy and reduce dependence on oil by 2020

- Swedish society as a whole should be able to make 20 per cent more efficient use of energy by 2020 and thereby at the same time create intensified, cost-efficient prosperity that is sustainable in the long term.

- By 2020 in principle no oil should be used for heating residential and commercial buildings.

- Road transport, including transport in agricultural, forestry, fisheries, and building sectors, should reduce use of petrol and diesel by 40-50 per cent by 2020.

- Industry should reduce its use of oil by 25-40 per cent by 2020.
Web page: www.fysast.uu.se/ges
Discussion Paper No. 2007-17
December 2007

Peak Oil and the Evolving Strategies of Oil Importing and Exporting Countries
Facing the hard truth about an import decline for the OECD countries

Kjell ALEKLETT
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Discussion Paper No. 2007-18
December 2007

Reserve Driven Forecasts for Oil, Gas & Coal and Limits in Carbon Dioxide Emissions
Peak oil, peak gas, peak coal and peak CO₂

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Uppsala, Sweden
Even if oil demand was to remain flat to 2030, 45 mb/d of gross capacity – roughly four times the capacity of Saudi Arabia – would be needed just to offset decline from existing fields.
WEO 2008 was released on November 12th. On page 51 the IEA states that

“the results of these analyses [prospects for oil and gas production] are intended to provide policy makers, investors and end users with a rigorous quantitative framework for assessing likely future trends in energy markets”.
World Crude Oil Production from Fields in Production

World crude oil production outlook

- Historical production
- IEA WEO 2008 forecast
- Constant 6% decline
- Increasing average decline
- IEA FIP forecast
**Summary of future oil production**

Table 8: Summary of reported production numbers in World Energy Outlook 2000 and results from the analysis in this work. All numbers in Mb/d

<table>
<thead>
<tr>
<th>Fractions defined by IEA in World Energy Outlook 2008</th>
<th>Production in 2030 World Energy Outlook 2008</th>
<th>Production in 2030 This study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude oil – currently producing fields</td>
<td>27.1</td>
<td>27.1</td>
</tr>
<tr>
<td>Crude oil – to be developed</td>
<td>22.5</td>
<td>13.6</td>
</tr>
<tr>
<td>Crude oil – new discoveries</td>
<td>19.2</td>
<td>8.7</td>
</tr>
<tr>
<td>Crude oil – End of Oil Recovery (EOR)</td>
<td>6.4</td>
<td>6.4</td>
</tr>
<tr>
<td>Crude oil - total</td>
<td>75.2</td>
<td>55.1</td>
</tr>
<tr>
<td>Non-conventional oil</td>
<td>8.8</td>
<td>6.5</td>
</tr>
<tr>
<td>Natural Gas Liquids (NGL)</td>
<td>14.9*</td>
<td>11.5</td>
</tr>
<tr>
<td>Sum of all fractions</td>
<td>98.9</td>
<td>73.2</td>
</tr>
<tr>
<td>Processing gains</td>
<td>2.6</td>
<td>2.6</td>
</tr>
<tr>
<td>World oil supply</td>
<td>101.5</td>
<td>75.8</td>
</tr>
</tbody>
</table>

*) 19.8 Mb/d NGL has been converted to 14.9 Mb/d oil equivalents
WEO 2008 and Uppsala Oil Outlook 2008
Aviation fuel and Peak Oil

Kjell Aleklett
**Peak Oil and Transport Fuels**

**Distribution of world refinery production by product in 2006**

- **LPG, Ethane, Naphtha**
- **Motor gasoline**
- **Aviation fuel**
- **Middle distillates**
- **Heavy fuel oil**
- **Other products**

The chart shows the tonnage and percentage distribution of different transport fuels produced in 2006.
”Business as Usual” for the Aviation Industry
Energy and Economic Growth

“Business as Usual” and Oil Demand

Figure 3.1  • Change in world primary oil demand and real GDP growth

World Oil Production

World Oil Supply according to EIA

4% fluctuation band
Figure 21. Development of GDP (PPP) and oil use per capita in SSA, China and India 1980-2004.
“We must address the inevitability of peak oil by developing vehicles powered by alternatives to liquid-oil fuel”

- Irv Miller, Vice President
- Toyota Motor Sales Group
- Detroit, 2009-01-10
President Barack Obama

“No single issue is as fundamental to our future as energy”
2009 Jan 26
ASPO International
The Association for the Study of Peak Oil & Gas

www.peakoil.net
Argentina, Australia, Belgium, Canada, China, France, Germany, Great Brittan, Hong Kong, Ireland, Israel, Italy, Kuwait, Mexico, New Zealand, Portugal, South Korea, Sweden, Switzerland, South Africa, The Netherlands, USA
National ASPO groups

- ASPO Australia
- ASPO Canada
- ASPO Argentina
- ASPO New Zealand
- ASPO South Africa
- ASPO China
- ASPO France
- ASPO USA

Association for the Study of Peak Oil and Gas (ASPO)
”And therefore to the peakists I say, You can declare victory. You are no longer the beleagured small minority of voices crying in the wilderness. You are now main streams. You must learn to take yes for an answer and be gracious in victory.”

Cork, Ireland, 2007 September 17
On a time scale starting at year 0 and ending 4000 years later everyone agree that there will be a peak in the oil production between 2000 and 2100.
“The world oil depletion curve, above, is based on all available information on oil reserves and estimates of the amounts yet-to-find, and indicates that world oil production will reach a peak (87 million barrels per day) around 2010 and decline thereafter.”
Uppsala Giant Oil Fields Scenarios – Worst and Best Case Production
World Oil Production

World Oil Supply according to EIA

4% fluctuation band

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