Workshop on the economic impact of rising oil prices

28 June 2006
European Parliament Brussels
9.30h – 18.00h
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- Dietrich DOMANSKI, BIS
- Marcelo SANCHEZ, ECB
- Dr. Hans DE JONG, ABN Amro

**Part 2: Consequences of rising oil prices for financial stability**

- Jeffrey CURRIE, Goldman Sachs
- Christie SANDERS, Sanders Research
- Pekka LÖSÖNEN, EUROSTAT
- Dr. C. CAMPBELL, Association for the Study of Peak Oil (ASPO)

### Session II

**Part 1: Microeconomic consequences of rising oil prices, competitiveness and taxation**

- David BALDOCK, Institute for European Environmental Policy
- Stephan HERBST, Toyota Motors Europe
- Dr. Manfred MEIER, Volkswagen
- Olivier SCHAEFFER, EREC

**Part 2: Geopolitics and Security of Supply**

- Dr. Hasan QABAZARD, OPEC
- Pierre SIGONNEY, TOTAL
- Raphael SAUTER, SPRU Energy Group, University of Essex
- Alexandre CLAUWAERT, SUEZ
Workshop on the economic impact of rising oil prices

Draft Programme

28 June 2006
European Parliament Brussels
Room ASP 5G3
9.30h – 18.00h

9.30 - 12.30 Session 1

Macroeconomic consequences of rising oil prices

- Comparing previous oil price shocks to the current situation: Why does the economy react differently this time round (low inflation, so far no second-round effects)?
- What macroeconomic consequences can be expected from the current oil price situation?
  - inflation
  - demand
  - employment
  - growth
- Which macroeconomic policies would be appropriate?

Guest speakers:
- Dietrich Domanski, Head of Macroeconomic Monitoring Unit, BIS
- Marcelo Sanchez, Senior Economist, ECB
- Drs Han. de Jong, Chief Economist, ABN Amro

10.45 - 11.00 Coffee break
Consequences of rising oil prices for financial stability

- Is there speculation going on in the financial markets in a noticeable volume? Are new instruments being created to speculate on oil price changes? Can speculation or the use of speculative instruments seriously endanger financial stability?
- How can the lack of transparency be tackled (Joint Oil Data Initiative)?
- Recycling of petrodollars
- Peak oil discussion

Guest speakers:
- Mr. Jeffrey Currie, Goldman Sachs, Managing Director and Head of Commodities Research
- Christie Sanders, Managing Director Sanders Research
- Pekka Lösönen, Eurostat - Joint Oil Data Initiative Representative
- Dr C. Campbell, Chairman & Founder of the Association for the study of Peak Oil (ASPO)

14.30 - 18.00 Session 2

Microeconomic consequences of rising oil prices, competitiveness and taxation

- Sectoral impacts due to substitution effects based on the assumption of high standing oil prices. Who will be the winners/losers? Which are the impacts on economic sectors, notably on transport, petrochemicals, automotive, farming, tourism etc. Which types of substitution effects might occur?
- Potential impacts on trade due to rising transportation costs. Which are the impacts on division of work within firms and among firms, their current organisation being based on cheap transportation costs?
- How to take advantage of the move towards a new era of high oil prices in terms of competitiveness and new economic activities for the EU? Can public policies speed up the adaptation of the EU economy to an era of high oil/fossil energy prices? Which are the best policy tools: industrial policy, R&D policy, taxation? Is there room for economic policy to decrease the level of uncertainty about future energy situation? Which are the links with environmental considerations, notably environmental taxation?
- How to take into account all costs related with energy production, consumption and use, notably negative side effects (negative externalities) so that economic decisions are based on all parameters? How to better 'internalise' negative externalities due to oil consumption? Opportunity for an EU tax?

Guest speakers:
- David Baldock, Institute for European Environmental Policy
- Stephan Herbst, Toyota Motor Europe, Manager Environmental Analysis and Strategy
- Dr Manfred Meier, Director Technology Science, Volkswagen,
- Olivier Schaeffer, Policy Director, EREC

Panellist:
- Robert Klotz, European Commission, DG Comp, Unit Energy and Water
16.00 - 16.15 Coffee break

**Geopolitics and Security of Supply**

- Visionary and strategic assessment of the situation
- Are there competition issues on a global level? (oligopoly structure)
- Which would be the best structure of the EU energy market taking into account the need for security of supply?
- Oil versus gas – repercussion on the gas market and gas price changes
- New industrial revolution, futuristic visionary thinking, moving towards an exit from oil dependency
- To which extent can renewable energy contribute to security of supply? Which renewable energy should be preferred? Which are the drawbacks of renewable energies? Are all renewable energies neutral for the environment?

**Guest speakers:**
- Dr Hasan Qabazard, Director Research Division, OPEC
- Mr Pierre Sigonney, Strategy Department of Total
- Raphael Sauter , SPRU Energy Group University of Sussex (author of Exploiting the oil GDP effect to support renewables redeployed)
- Alexandre Clauwaert, Strategy department Suez (gas, electricity and renewables)

**Panellist:**
Session I

Part 1: Macroeconomic consequences of rising oil prices
Why is the current oil price shock different?
A macroeconomic assessment

Workshop on the economic impact of rising oil prices
European Parliament
Brussels

Dietrich Domanski
Head of Macroeconomic Monitoring
Bank for International Settlements

28 June 2006
Overview

- How large is the current oil price shock compared to those in the 1970s?
- Why have oil importing economies been much more resilient than in the past?
- Will the effects of high energy prices remain benign?
Oil prices have reached new record highs in nominal terms and have risen sharply in real terms...

Graph 1: Oil prices\(^1\)

\(^1\) Unweighted average of Dubai Fateh, UK Brent and West Texas Intermediate. The vertical references indicate the three oil shocks (1973 Q4, 1978 Q4 and 2003 Q1).  
\(^2\) In US dollars per barrel.  
\(^3\) Deflated by consumer prices in the euro area, base year 1990; in euros per barrel.

Sources: Bloomberg; national data.
...while the economic upswing has remained intact in oil importing countries

Graph 2: Growth\(^1\) during episodes of rising oil prices

OECD
- First oil shock
- Second oil shock
- Current

EU15

Quarters\(^2\)

\(^1\) Measured by real GDP. \(^2\) Zero quarters correspond to 1973 Q4 (first oil shock), 1978 Q4 (second oil shock) and 2003 Q1 (current).

Sources: OECD; Datastream; national data.
The income effect of rising oil prices has been much smaller than in the past...

Graph 3: Income transfers and EU exports

Net OECD oil imports¹

Total EU25 exports and oil imports²

¹ As a percentage of OECD GDP. ² Changes, in percentage points of GDP.

Sources: Eurostat, OECD.
...and the re-spending of petrodollars has helped European exporters

Graph 4: Indicators of oil revenue spending

1 As a percentage of GDP. 2 In billions of US dollars. 3 Market share of selected economies in OPEC imports.

Sources: ECB; IMF.
Inflation has remained subdued...

Graph 5: Inflation during episodes of rising oil prices

Euro area import prices
- First oil shock
- Second oil shock
- Current

Euro area consumer prices

1 Goods and services; prior to 1991, weighted average of France, Germany, Italy and Spain, based on 2000 GDP and PPP exchange rates.
2 Zero quarters correspond to 1973 Q4 (first oil shock), 1978 Q4 (second oil shock) and 2003 Q1 (current).

Source: National data.
...supporting domestic demand growth through easy financing conditions

Graph 6: Interest rates and domestic demand

1 In the euro area. 2 In per cent. 3 In percentage points.
Sources: OECD; national data.
Oil prices are expected to remain high...

Graph 7: Oil spot and futures prices

---

1 West Texas Intermediate, in US dollars/barrel.  
2 Date of peak in WTI spot price prior to 2006.

Source: Bloomberg.
...while inflation risks might at some point rise

Graph 8: Inflation indicators

1 Common factors among OECD countries. Normalised data, measured as the difference between the indicator and its sample average, expressed in points of standard deviation.  
2 Changes in consumer prices.  
3 Business sector.  
4 Weighted averages of the United States, the euro area and Japan, based on 2000 GDP and PPP exchange rates; changes over four quarters, in per cent.  
5 United States and Japan.

Sources: National data; BIS calculations.
Credible monetary policy has helped to avoid second round effects

Graph 9: Indicators of inflation expectations

Inflation expectations\textsuperscript{1}

\begin{itemize}
\item United States
\item Euro area
\item Japan
\end{itemize}

Break-even inflation rates\textsuperscript{2}

\begin{itemize}
\item United States
\item France
\end{itemize}

\textsuperscript{1} Expected change, in per cent, in consumer prices over the next 12 months, based on consumer surveys; for the euro area, figures are normalised by mean and variance of actual HICP inflation rate; for Japan, figures are calculated from shares of ranges in the questionnaire.

\textsuperscript{2} Difference between nominal and index-linked yields on 10-year government bonds; index-linked yields are based on TIPS for the United States and OATs for France.

Sources: Cabinet Office, Government of Japan; European Commission; University of Michigan; Bloomberg; national data; BIS calculations.
Conclusion

- Oil prices have risen primarily because of strong global demand growth and not disruptions of oil supply.
- Low and stable inflation has mitigated the impact of rising energy prices on oil importing countries.
- But concerns about oil supply have grown and inflation risks seem to have increased recently.
Oil price shocks and macroeconomic developments

Marcelo Sánchez
European Central Bank

Workshop on the economic impact of rising oil prices
Outline

• Transmission channels
• The evidence
• Additional remarks
Outline

- Transmission channels
- The evidence
- Additional remarks
Transmission channels

Oil price shocks are expected to have
• supply-side effects: higher inflation and lower real output
• terms-of-trade effects: support aggregate demand in oil exporting countries and lower it in oil importing countries
Outline

• Transmission channels
• The evidence
• Additional remarks
Empirical analysis favours non-linear models

- non-linear models predict larger macroeconomic impact than the linear one
- “scaled” model rescales oil prices taking into account their changing variability over time
The evidence: A 100% oil price shock

### A) Linear model

<table>
<thead>
<tr>
<th>Economies</th>
<th>real GDP growth after 1 year</th>
<th>real GDP growth after 2 years</th>
<th>inflation after 1 year</th>
<th>inflation after 2 years</th>
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</thead>
<tbody>
<tr>
<td>Euro area</td>
<td>-0.5</td>
<td>-1.3</td>
<td>1.7</td>
<td>1.6</td>
</tr>
<tr>
<td>France</td>
<td>-0.7</td>
<td>-2.0</td>
<td>2.5</td>
<td>3.1</td>
</tr>
<tr>
<td>Germany</td>
<td>-0.2</td>
<td>-0.5</td>
<td>1.1</td>
<td>1.2</td>
</tr>
<tr>
<td>Italy</td>
<td>-0.5</td>
<td>-1.8</td>
<td>3.9</td>
<td>4.4</td>
</tr>
<tr>
<td>US</td>
<td>-1.2</td>
<td>-2.7</td>
<td>3.2</td>
<td>4.4</td>
</tr>
</tbody>
</table>

### B) Scaled model

<table>
<thead>
<tr>
<th>Economies</th>
<th>real GDP growth after 1 year</th>
<th>real GDP growth after 2 years</th>
<th>inflation after 1 year</th>
<th>inflation after 2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euro area</td>
<td>-2.2</td>
<td>-4.3</td>
<td>3.3</td>
<td>2.2</td>
</tr>
<tr>
<td>France</td>
<td>-2.4</td>
<td>-4.7</td>
<td>5.7</td>
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<tr>
<td>Germany</td>
<td>-2.6</td>
<td>-3.7</td>
<td>1.5</td>
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<tr>
<td>Italy</td>
<td>-3.7</td>
<td>-5.4</td>
<td>9.8</td>
<td>12.7</td>
</tr>
<tr>
<td>US</td>
<td>-3.4</td>
<td>-5.0</td>
<td>5.0</td>
<td>5.9</td>
</tr>
</tbody>
</table>
The evidence: How much the shock explains

<table>
<thead>
<tr>
<th>Economies</th>
<th>real GDP growth</th>
<th>inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>after 1 year</td>
<td>after 2 years</td>
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<tr>
<td>Euro area</td>
<td>6.0</td>
<td>9.1</td>
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<tr>
<td>France</td>
<td>6.0</td>
<td>8.7</td>
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<td>Germany</td>
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<tr>
<td>Italy</td>
<td>6.2</td>
<td>7.7</td>
</tr>
<tr>
<td>US</td>
<td>3.8</td>
<td>5.0</td>
</tr>
</tbody>
</table>
The evidence: Does oil still shock?

Figure 1. *Historical decompositions of real GDP growth*

- **EA**
- **FRA**
- **GER**
- **ITA**
- **UK**
- **US**
The evidence: Does oil still shock?

Figure 4. Historical decompositions of inflation

- EA
- FRA
- GER
- ITA
- UK
- US
Outline

- Transmission channels
- The evidence
- Additional remarks
Additional remarks

• Labour market
  - oil shocks found to lower real wages and raise unemployment

• Long-run growth
  - oil shocks seen as discouraging investment, with an adverse effect on capacity expansion

• First versus second round effects
  - hard to disentangle; both likely to play a role
[The end]
Economic impact of rising oil prices

Presentation to workshop of the European Parliament

28 June 2006

Han de Jong, Chief Economist
Key areas of focus

- Differences between various oil price shocks and the implications
- Desirable policy response
Different impact 70s/80s versus now

- Smaller impact on inflation
- Smaller negative impact on economic activity
Differences with 1970s and 1980s

- Magnitude of oil price rise
- Importance of the oil price
- Cause of the oil price rise
- Economic setting
  - Transmission process
  - Policy setting
Oil price (USD/barrel)

1980: real = nominal

Source: Thomson Financial
36 months cumulative change of real oil price

Source: Thomson Financial
Oil use per unit of real GDP
US 1970=100

Source: Thomson Financial, BP
Real oil price
USD/barrel

Source: Thomson Financial, BP
Cause of oil price increase

- 70s and 80s: exogenous shocks
- Now: demand driven disturbance of supply-demand balance
Economic setting

- Transmission process globalisation has put a lid on inflation (temporary or permanent?)
- Policy setting: monetary policy
Conclusions economic impact

- Inflation remains a risk
- Modest growth impact
- Redistribution of wealth to oil exporters
Desirable policy response

- Monetary policy?
- General government
  - Lower fuel taxes?
  - Budgetary stimulus?
  - Tax oil industry’s profits?
  - Market transparency?
  - Stimulate alternatives?
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Session I

Part 2: Consequences of rising oil prices for financial stability
Reassessing long-term commodity prices

June 2006

Jeffrey Currie  Goldman Sachs International  44 (0)20 7774 6112  jeffrey.currie@gs.com

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The revenge of the old economy
Poor returns in commodity sectors led investment to flow elsewhere

Cash Return on Cash Invested

Source: Compustat and Goldman Sachs Commodity Research.
Return on capital employed in energy sectors has remained below that in the rest of the economy, leading to underinvestment in energy market infrastructure.

Source: Compustat and Goldman Sachs Commodity Research.
The transition between an exploitation phase and an investment phase: The revenge of the old economy, Part II
The industry has exhausted spare capacity, ending an exploitation phase and beginning a new investment phase.

Global oil production and capacity

Global refining capacity

Source: International Energy Agency (IEA) and Goldman Sachs Commodity Research and DOE.
The market has experienced similar investment phases in the past that lasted c. 10-15 years.

Source: BEA and Goldman Sachs Commodity Research.
Investment phases are typically characterised by rising prices, while prices decline during exploitation phases.

Source: Goldman Sachs Commodity Research.
Project complexity requires a well-trained labour force, which is currently very limited

Extraction, refining and transportation employment in oil and gas sectors in the U.S. has declined since 1980s.

Source: IPAA and Goldman Sachs Commodity Research.
As investment rises, costs rise as demand for greenfield projects increases against limited resources: reserve access, technology and labour.

Left axis: $/bbl, right axis: rig count

Source: Baker Hughes and Goldman Sachs Commodity Research
Cost structure drives long-term price while fundamentals drive curve shape
The key is to decompose the long-term oil price into (1) the long-dated oil price, and (2) the spread between the spot and long-dated oil price.

\[ P = MC + d, \text{ where } d \text{ is a delivery premium in a bull market or a discount in a bear market} \]

- In a bull market the spread is positive reflecting a premium for prompt delivery with $20/bbl being the historical high.
- In a bear market the spread is negative reflecting the cost of carrying inventory with a historical minimum of $10/bbl.

Source: Goldman Sachs Commodity Research.
The rise in marginal costs has pushed up long-dated oil prices

Marginal cost is defined as the average of the highest cost (or bottom quartile) producers

Source: Department of Energy and Goldman Sachs Commodity Research.
The fundamentals are priced into the spread between spot and long-dated prices

Spot – 5-yr forward price in $/bbl (vertical axis); US crude stocks in millions of barrels (horizontal axis)

The fundamental relationship between inventories and the spread between spot and long-dated oil prices still holds true as it did 10 years ago.

Observations are from 1991 to current

Source: Department of Energy and Goldman Sachs Commodity Research.
A cyclical bear market at $70/bbl
The rise in long-dated prices has dragged up spot prices despite weakening time spreads.

Over the last year time spreads have contracted reflecting weaker fundamentals.

The rise in the price level was driven by higher long-dated prices reflecting increased cost uncertainty.

Source: Goldman Sachs Commodity Research.
Rebalancing the oil market
Rule of thumb: Commodity returns are pro-cyclical as negative returns are mostly associated with economic downturns
Is the secular repricing of oil complete? If so, we expect a cyclically strong market for energy in 2006.

Long-dated oil prices (5-year forwards) have traded near $60/bbl since July of last year.

Source: Goldman Sachs Commodities Research.
As global oil output has not grown since November 2004, only modest demand growth will shift the balance.
Are metals going to follow energy in 2006?
Metals consumption has been driven by a massive infrastructure boom in the Non-OECD

Copper consumption in MT/US bil dollar in real global GDP

Source: WBMS and Goldman Sachs Commodity Research
This has created an acceleration in global metals demand since the mid-1990s.

Strong metals demand growth from 1994 to 2000 was mainly due to robust economic growth in the developed economies...

...but in the past five years it has been mainly emerging market demand – particularly China.

Source: CRU, WBMS, Goldman Sachs Commodities Research.
Globally, the value of copper consumption as a share of GDP is still below the levels of the 1960/70s when Japan built infrastructure.

Strong demand growth and a modest pace of investment suggest production bottlenecks will become more frequent.
Alumina capacity is now exhausted

Global alumina capacity and production

Million metric tons

Source: Brook Hunt, IAI, Goldman Sachs Commodities Research.
Production costs for metals are up sharply

Input costs for aluminum production
US$/mt

Source: Platts, Metals Bulletin and Goldman Sachs Commodity Research.
Metals producers are facing an increasingly difficult operating environment

- Producer country governments are raising taxes
  
  Examples: Chile has just adopted a new tax law which will require mining companies to pay up to 5% of operating income, while the new Peruvian tax requiring payment of up to 3% of mineral sales has just become effective.

- Labour unions are demanding higher pay
  
  Examples: Just in copper in recent months, we have the strike at Asarco, as well as labour actions at KCM and Chambishi in Zambia, and Zaldivar and Escondida Norte in Chile.

- Opposition from local communities is increasing
  
  Example: BHP pays 3% of the Tintaya mine’s profits to Peruvian community groups, but unrest continues.

- Infrastructure to support mining operations is inadequate
  
  Example: Heavy Chinese investment is needed in Brazilian rail and port infrastructure to allow the further development of the Brazilian resource extraction industry.
As a result, long-dated prices are beginning to rise in metals as well.

Five-year forward prices
Index, January 2000 = 100t

Source: Goldman Sachs Commodity Research.
Aluminum 3mo to 5yr backwardation vs. visible inventories

Backwardation reflects inventory dynamics

Vertical axis: percent backwardation; horizontal axis: weeks of consumption

Source: Goldman Sachs Commodity research
Copper 3mo to 5yr backwardation vs. visible inventories

Vertical axis: percent backwardation; horizontal axis: weeks of consumption

Source: Goldman Sachs Commodity research
Prices across most of the commodities remains well below historical real peaks with the exception of zinc

Real prices in 2006 dollars

<table>
<thead>
<tr>
<th>Monthly prices</th>
<th>Crude oil NYMEX $/bbl</th>
<th>Gold COMEX $/oz</th>
<th>Silver COMEX $/oz</th>
<th>Copper LME $/MT</th>
<th>Zinc LME $/MT</th>
<th>Nickel LME $/MT</th>
<th>Aluminum LME $/MT</th>
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</thead>
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<tr>
<td>Max</td>
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<td>1748</td>
<td>90.98</td>
<td>11930</td>
<td>3057</td>
<td>29254</td>
<td>4785</td>
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<td>Max Date</td>
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<td>Sep-80</td>
<td>Jan-80</td>
<td>Apr-74</td>
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<td>Feb-89</td>
<td>Jun-88</td>
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<td>April 2006</td>
<td>70.16</td>
<td>612</td>
<td>12.65</td>
<td>6320</td>
<td>3041</td>
<td>18047</td>
<td>2647</td>
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<td>April 2006 % Max</td>
<td>83%</td>
<td>35%</td>
<td>14%</td>
<td>53%</td>
<td>99%</td>
<td>62%</td>
<td>55%</td>
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<table>
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<tr>
<th>Daily prices</th>
<th>Crude oil NYMEX $/bbl</th>
<th>Gold COMEX $/oz</th>
<th>Silver COMEX $/oz</th>
<th>Copper LME $/MT</th>
<th>Zinc LME $/MT</th>
<th>Nickel LME $/MT</th>
<th>Aluminum LME $/MT</th>
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<td>5/9/06</td>
<td>1/3/89</td>
<td>6/1/88</td>
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<td>Recent peak</td>
<td>NA</td>
<td>702</td>
<td>14.52</td>
<td>7815</td>
<td>3470</td>
<td>20000</td>
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<td>Recent peak % Max</td>
<td>NA</td>
<td>34%</td>
<td>14%</td>
<td>60%</td>
<td>100%</td>
<td>66%</td>
<td>56%</td>
</tr>
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Source: BP, NYMES, R Shiller, Irrational exuberance, Princeton 2005 and Goldman Sachs Commodity Research
Gold has diverged from fundamentals
We believe gold is well supported over the long run

A currency basket comprised of AUD, CAD, ZAR, EUR, JPY and INR explains 80% of historical variation in gold prices. Deviations reflect a re-equilibration of the level of the relationship between the currency basket in gold in response to lower supply growth (e.g. South African production) and increased investment in jewellery demand. We believe that the relationship between changes in gold prices and the exchange rates will reassert itself in coming months, albeit at a higher equilibrium level.
ETFs have added significantly to gold demand

Source: World Gold Council and Goldman Sachs Commodity research
Global mine production has slipped in recent years

Source: GFMS and Goldman Sachs Commodity research
The relationship appears to have resumed after a period of re-equilibration.

From September 2005 through March 2006, the correlation between gold and the dollar appeared to break down. While it is still early, it appears that the relationship has returned over the past two months.

Source: Goldman Sachs Commodity research
Investment uncertainty makes finding a new equilibrium difficult and generates significant upside risk
In the current environment, long-dated prices now exceed the highest cost projects ...

Marginal cost is defined as the average of the highest cost (or bottom quartile) producers.

Long-dated oil prices have risen far above even the most costly production, as measured by the average of high-cost producers.

Source: Department of Energy and Goldman Sachs Commodity Research.
... while reinvestment rates have fallen and cash reserves have surged

Source: Goldman Sachs Commodity research.
This overshoot reflects increased uncertainty in the industry’s cost structure

Source: Goldman Sachs Commodity Research.
A simple example of investment under uncertainty

A simple example explained

Investment under uncertainty

Project has a $40/bbl breakeven cost today
  with a 50% chance of dropping to $20/bbl next year
Prices are $50/bbl and are expected to remain at these levels
If we invest today,
  Project has an NPV of $1.1 billion
However, if we delay investment, then there is a
  50% chance that costs decline and the NPV of the delayed project is $3.0 billion
  50% chance that costs are unchanged and the NPV of the delayed project is $1.0 billion
The expected NPV of the delayed project is $2.0 billion
  Expected NPV = 50% low-cost NPV + 50% high-cost NPV
  ($2,000 = 0.50*$3,000 + 0.50*$1,000)
If prices remain at $50/bbl we will delay investment until next year, as
  Expected NPV of a delayed project > NPV of investing today in the project
  (i.e., $2,000 > $1,100)
This implies that the value of the option to wait is $900 million
  The difference between the NPV of delaying investment and the NPV of investing today
  ($900 = $2,000 - $1,100)
To incentivize investment today the price would need to rise such that the
  NPV of investing today is equal to the NPV of delaying investment at a price of $50/bbl
Prices would need to rise to $58.50/bbl to increase the NPV of investing today to $2.0 billion
As a result, the uncertainty has pushed prices up nearly $9/bbl to incentivize investment today

Source: Goldman Sachs Commodity Research.
Once uncertainty is resolved, the premium will disappear as long-term oil prices find a new equilibrium.

Vertical axis: $bb/; horizontal axis time

Once the marginal project is known and the uncertainty is resolved, the long-dated price will quickly converge back down to the cost of that marginal project, which would become the new equilibrium price.

Currently, the market is unclear on which project will actually be at the margin.

Source: Goldman Sachs Commodity Research.
Agriculture prices are likely to be supported by low inventories, Chinese draught, and bio-fuel demand.
Low inventory levels suggest further upside for wheat

Source: USDA and Goldman Sachs Commodity Research.

Wheat inventories
Days of forward coverage

Source: CBOT and Goldman Sachs Commodity Research.

Wheat, actual and fair value
Cents per bushel

Source: USDA and Goldman Sachs Commodity Research.
Increasing speculative interest is also a support for wheat prices

Source: CFTC and Goldman Sachs Commodity Research.
Corn prices have converged to our fair value estimates

Corn inventories
Days of forward coverage

Source: USDA and Goldman Sachs Commodity Research.

Corn, actual and fair value
Cents per bushel

Source: CBOT and Goldman Sachs Commodity Research.
Net speculative length for corn has increased recently

Left axis: number of contracts; right axis: cents per bushel

Source: CFTC and Goldman Sachs Commodity Research.
Soybean inventories are expected to be higher next year

Soybean inventories
Days of forward coverage

Soybean, actual and fair value
Cents per bushel

Source: USDA and Goldman Sachs Commodity Research.
Source: CBOT and Goldman Sachs Commodity Research.
Speculators are short soybeans

Left axis: number of contracts; right axis: cents per bushel

Source: CFTC and Goldman Sachs Commodity Research.
China may take the opportunity to rebuild historically low grain inventories

**Chinese wheat production**
Million metric tons

**Chinese wheat inventories**
Days of forward coverage

Source: USDA and Goldman Sachs Commodity Research.
Supply constraints have resulted from lackluster acreage growth and stable yields.

Area harvested for wheat in China
Million hectares

Wheat yields in China have stabilized, further curtailing the ability of production to meet demand
Mt/hectare

Source: USDA and Goldman Sachs Commodity Research.
Agriculture demand is tied to economic expansion
Chinese demand for beef is likely to continue to grow as the country becomes wealthier

kg of beef per capita (vertical axis); Real GDP PPP per capita (horizontal axis)

Source: USDA and Goldman Sachs Commodity Research.
Disclosures

Distribution of ratings/investment banking relationships

Goldman Sachs Investment Research global coverage universe

<table>
<thead>
<tr>
<th>Rating Distribution</th>
<th>OP/Buy</th>
<th>IL/Hold</th>
<th>U/Sell</th>
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<td>59%</td>
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As of April 1, 2006, Goldman Sachs Global Investment Research had investment ratings on 2,048 equity securities. Goldman Sachs uses three ratings relative to each analyst's coverage universe - Outperform, In-Line and Underperform. See "Ratings, Coverage Views and related definitions" below. NASD/NYSE rules require a member to disclose the percentage of its rated securities to which the member would assign a buy, hold, or sell rating if such a system were used. Although relative ratings do not correlate to buy, hold, and sell ratings across all rated securities, for purposes of the NASD/NYSE rules, Goldman Sachs has determined the indicated percentages by assigning buy ratings to securities rated Outperform, hold ratings to securities rated In-Line, and sell ratings to securities rated Underperform, without regard to the coverage views of analysts.
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Regulatory disclosures

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- **Coverage views:**
  - **Attractive (A).** The investment outlook over the following 12 months is favorable relative to the coverage group's historical fundamentals and/or valuation.
  - **Neutral (N).** The investment outlook over the following 12 months is neutral relative to the coverage group's historical fundamentals and/or valuation.
  - **Cautious (C).** The investment outlook over the following 12 months is unfavorable relative to the coverage group's historical fundamentals and/or valuation.

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Losing Control

A presentation to the EC Workshop on the Economic Impact of Rising Oil Prices

June 28, 2006

Sanders Research Associates
- The world financial system can recycle petrodollars easily
- Now the destination is the United States, unlike the 70s, when it was third world borrowers
- Derivatives are a potential problem, but for the real economy, not the financial sector per se
- Peak oil changes everything
- The world financial system can recycle petrodollars easily

- **Now the destination is the United States, unlike the 70s, when it was third world borrowers**

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- **Peak oil changes everything**
- **Peak Oil is with us now**

- Production probably topped out between early November 2005 and late January 2006

- Even if it didn’t, production of light sweet crudes has peaked

- This means costs are rising

- Prices are not yet reflecting this

- For the first time in the Age of Oil, the Anglo-Saxon (UKUSA) countries do not control the world’s marginal barrels of crude and units of natural gas

Sanders Research Associates
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Sanders Research Associates
Oil and Gas Liquids
2004 Scenario

Source: Kenneth Deffeyes www.princeton.edu/hubbert

Sanders Research Associates
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- For the first time in the Age of Oil, the Anglo-Saxon (UKUSA) countries do not control the world’s marginal barrels of crude and units of natural gas
World Oil Production & Real Oil Price

Source: Sanders Research Associates & EcoWin
- Peak Oil is with us now

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- Prices are not yet reflecting this

- For the first time in the Age of Oil, the Anglo-Saxon (UKUSA) countries do not control the world’s marginal barrels of crude and units of natural gas
The Oil Clocks

North America 300bnbl

South America 120bnbl

Africa 150bnbl

Middle East 730bnbl

FSU 270bnbl

Asia Pacific 100bnbl

World

- Reserves
- Produced

1750 bnbl

Sanders Research Associates
The Gas Clocks

North America 1400tcf

Europe 600tcf

FSU 2300tcf

Middle East 1900tcf

Africa 510tcf

Asia Pacific 730tcf

World Reserves 7750tcf

South America 310tcf

Sanders Research Associates
- Oil Power is moving East
- Shanghai Cooperation Organisation is an alternative framework for Eurasia
- Iran is an observer, and wants permanent membership
- Between them, Russia and Iran control over 40% of world gas reserves
- The problem for the West is not access, but control

- The western political economy is based on a growth model dependent on debt expansion

- US political economy is organised on twin assumptions of free space and energy that validate increasing debt levels

- These can no longer be taken for granted
The problem for the West is not access, but control

The western political economy is based on a growth model dependent on debt expansion

US political economy is organised on twin assumptions of free space and energy that validate increasing debt levels

These can no longer be taken for granted
US: Total Debt as % of GDP

Source: Sanders Research Associates & EcoWin

Sanders Research Associates
The problem for the West is not access, but control.

The western political economy is based on a growth model dependent on debt expansion.

US political economy is organised on twin assumptions of free space and energy that validate increasing debt levels.

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- The western political economy is based on a growth model dependent on debt expansion
- US political economy is organised on twin assumptions of free space and energy that validate increasing debt levels
- These can no longer be taken for granted
- **Ultimately the problem is the value of the collateral underlying the debt**

- The value of the equities and the real estate at the end of the yield curve is the mathematical underpinning of the West’s debt structure

- With structurally higher energy prices, there is more of a burden on labour to absorb increased costs through lower wages and compensation
The Real Yield Curve

Now 1 2 3 4 5
30 years

Gold  Cash  Bonds  Equities & Real Property

Sanders Research Associates
- Ultimately the problem is the value of the collateral underlying the debt

- The value of the equities and the real estate at the end of the yield curve is the mathematical underpinning of the West’s debt structure

- With structurally higher energy prices, there is more of a burden on labour to absorb increased costs through lower wages and compensation
Ultimately the problem is the value of the collateral underlying the debt

The value of the equities and the real estate at the end of the yield curve is the mathematical underpinning of the West’s debt structure

With structurally higher energy prices, there is more of a burden on labour to absorb increased costs through lower wages and compensation
- US to introduce national universal conscription, i.e. corvée
- US is building labour camps
- North America is consolidating into a regional bloc with UK and Japanese wings
- Europe and US are moving to enlarge and centralise when better solutions are to get smaller and decentralise

Sanders Research Associates
The Joint Oil Data Initiative
A concrete action to improve transparency in oil markets

Workshop on the economic impact of rising oil prices
European Parliament, 28 June 2006

P. Lösönen, Eurostat
At the end of the 90’s

- there was an unusually high volatility of oil prices
- At the same time quality of global oil statistics was not satisfactory:
  - Supply did not match with demand
  - Real production, stocks and demand were not known
  - The poor quality of oil statistics was identified as an aggravating factor for the volatility

The need for reliable oil data became evident to have more transparency in the oil market
Table 1
WORLD OIL SUPPLY AND DEMAND

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**STOCK CHANGES AND MISCELLANEOUS**

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**Menu Items:**

- % of world oil production and demand
- World oil production and demand
- Net additions to world oil production and demand
- Effective consumption

Miscellaneous to balance 0.9 1.6 0.2 -0.3 0.0 0.5 0.1 0.1 1.4 0.7 1.9 1.0

Note: All figures are in millions of barrels per day, unless otherwise stated.
JODE (2001)

- 7th International Energy Forum (IEF) meeting in Riyadh, 2000

- In 2001 six international organisations (APEC, Eurostat, IEA, OLADE, OPEC and UNSD) launched the Joint Oil Data Exercise (JODE)

- A small questionnaire including main flows of crude oil and petroleum products
  - Deadline one month after the reference month (M-1 reporting)
  - Organisations collect the data from their member countries
8th IEF meeting in Osaka, 2002

- Full political support to continue the efforts to increase transparency of oil data

The six organisations made the exercise permanent and renamed it Joint Oil Data Initiative (JODI)

- Rotating coordination
- Inter-secretariat meetings
- Conferences
Milestones of JODI after the IEF meeting in OSAKA 2002

- Creation of JODI database in 2004
  - Data quality (timeliness, completeness and accuracy) had improved significantly
- IEF secretariat (IEFS) situated in Riyadh, Saudi Arabia started its work in December 2003
  - IEFS took over the coordination role of JODI in 2005 (the 7th international organisation in JODI)
- Comprehensive quality evaluation of the JODI data in 2005 (world top-30 oil producers, consumers and stock holders)
- Opening of the World Jodi Database to public, 19 November 2005
King Abdullah of Saudi Arabia launching the JODI World Database

King Abdullah launches the database of world oil producers and consumers in Riyadh on Saturday. Riyadh Governor Prince Salman and Oil Minister Ali Al-Naimi, left, are also seen. (SPA)
World JODI database

- Accessible to public
  - www.jodidata.org
  - Currently production, stocks, stock change and demand of crude oil and petroleum products are in public domain

- Data covers more than 90% of the world crude oil production and consumption

- Includes data from 92 countries

- Indication of the quality of the data by the color of the cell, a unique feature
### A View of the Live Database

#### Monthly update, M-1 data

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**Color code indicating data comparability (blue, yellow, white)**
Denmark

Timeliness

MOS

M-1

M-2

MOS Range

3.0%

Total Oil

Demand

Product Flow

Timeliness
Six Organisations plus the IEFS as Co-ordinator

World JODI Database
Creation of JODI user and methodology manual
- First edition scheduled by the end of June 2006
- Data providers and data users

Training of statisticians
- Venezuela in August 2006 for Latin American countries
- South Africa at the end of 2006 for African countries

Enlargement of public part of JODI database
- Currently crude oil production, stocks, stock change and demand of petroleum products are in public domain
- Quality evaluation of refinery input and output data in view to opening this data into public in 2006

Preparation of the 6th JODI conference at the end of November in Riyadh
Main achievements of JODI beyond data collection

1. Political awareness of the difficulties encountered in improving data quality has risen

2. Statistical systems in many countries are improving / have improved

3. Attitudes towards confidentiality and reliability are evolving

4. A world-wide network of oil statisticians have been created multiplying contacts between oil companies, countries and organisations paving the way for the global harmonisation of energy statistics

5. JODI has demonstrated that oil producer – consumer dialogue is has lead and is further leading to concrete actions
And then, what’s next?

- Expanding the JODI Questionnaire
  - Horizontally: more products (NGLs, …)
  - Vertically: more flows (stocks, trade, …)
- Duplicating the approach to gas?
- Using a similar approach to reserves?
Can transparency in oil statistics improve financial stability

- High volatility of oil prices can create instability in economy

- There are several possible reasons for fluctuating oil prices
  - Uncertainty in supply / demand
    - Natural disasters, for example hurricane Katrina in the US in 2005
    - Wars, for example Iraqi war
    - Political instability, case Venezuela
    - Unknown oil stock level, production and demand = POOR STATISTICS
Can transparency in oil statistics improve financial stability

😊 JODI has certainly improved the transparency in oil markets

😊 Policy makers and other stakeholders can be more sure about the stocks levels and have a better view the probability of real shortage in supply

😢 Natural disasters etc. cannot be predicted

😢 Speculation of oil futures cannot be stopped just by improving the statistics

- Feedback from the data users is essential
  - If the data does not fulfill expectations,
    - Proposals for improvements are welcome
    - More resources have to be engaged
Strong political support reaffirmed + launch JODI database

Decision to make the exercise a permanent reporting mechanism (JODE => JODI)

Launch of the JODE

55 countries

5th JODI Conference

Focus on Data Quality

Prepare a JODI World Database
Lessons from the Initiative

- A lot can be achieved by working together
- A close interaction between organisations, countries and the industry is key to move a process
- Improving data transparency will not happen over night
- Transparency will not happen if not all the parties do not fully participate
www.jodidata.org
Peak Oil
&
The Impact of Oil Depletion

By
C.J.Campbell

ASPO IRELAND
www.peakoil.ie
It costs money to find oil
- $10 - 20 million a *wildcat*
- But it takes **much more than money**
- It takes the right geology
  - We have new sophisticated methods to search
  - But the same rocks and essentials
The Essentials

- Oil & Gas formed in the geological past
  - A finite resources subject to depletion
  - Each gallon used means one less left
- Production mirrors discovery
- Many different categories
  - Some: easy, cheap and fast to produce
  - Others: difficult, expensive & slow
Depletion is easy to grasp

- We are born, we die and pass middle age
- The glass starts full and ends empty
The same applies to Oil

- How has such an obvious and important truth been obscured and confused?
  - Ambiguous definitions
  - Misunderstood reporting practices
  - Different mindsets
Mindsets: who to listen to?

- The **Geologist** measures Nature
  - He can’t change the Cretaceous
- The **Economist** measures Money
  - He can manipulate behaviour
- The **Engineer** does things
  - Give him a screwdriver & he goes to the Moon
- The **Manager** makes money & image
The Eternal Conflict between

Fact of Faith

People once thought the Earth was flat and greeted science with suspicion and resentment. Some still do.
The Economist’s Faith in Market Forces

What the High Priest says

Minerals are inexhaustible and will never be depleted. A stream of investment creates additions to proved reserves from a very large in-ground inventory. The reserves are constantly being renewed as they are extracted.

Professor Adelman (M.I.T)
Petroleum Geology

in

three minutes

One Viewpoint
Technology - no more advanced than the hammer, hand lens and mule - found much of the world’s oil
Andes Mountains

1. Source
2. Reservoir
3. Trap
4. Seal

Basin centre uplifted

Foothills +1+2+3+4

10 000m Cretaceous sands and clays

Interior of the Earth
Extreme Global Warming
gave excessive Algal Growths

90 & 150 million years ago

Organic debris

Rifts formed as the Continents moved apart
Migration of Oil

1. Dissipation

2. Escape

Surface of the Earth

3. Oilfield

Oil generation at 2000m depth
Geology of an Oilfield

Sandstone Reservoir

Oil

Gas

Seal

Migrating Oil

Water
What an Oil Reservoir looks like

Oil fills the pore-space between the grains of sand, which are coated in a film of water. The oil has to flow through these constrictions.
N.W Europe Oil Generating Zones

Where oil is and where it is not
Three kinds of report

- Scientific Estimates of Volume
- Financial Statements
- Political Postures

All valid within their spheres but deeply confused.
“Selling” the project to management to meet Economic Criteria

Scientific Judgement of a prospect’s size

Cautious Phased Development

Reported Reserves

Confidential

Public

Exploration

Development

Reserve growth
From denial to acceptance
- Chevron – deserves a medal
- Exxon – hidden messages
- Shell – “easy oil has peaked”
- BP – the most obtuse

New messages in different words and deeds
- Reason for mergers
  - 14 major oil companies reduced to 5.
How Lord Browne Misleads

"Reserves support current production for 41 years"

But BP now stands from *Beyond Petroleum*
### OPEC Reserve Reporting

**Kuwait 1984**
- Produced = 22 Gb
- Remaining = 64
- Found = 86 (~ 90)

- Increasing Recovery from 30% to 40%

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But Nature does not lie

- A field contains what it contains
- The term *Reserves* is confused for financial, commercial and political reasons
  - Valid in their contexts but misleading
- The discovery trend is critical
  - Need to backdate revised estimates and overcome the illusion of “Reserve Growth”
Real Discovery Trend

Past after Exxon-Mobil 3yr moving average
Production mirrors discovery

- After 20-45 years.
- Discovery peaked in most countries long ago.
- The larger fields were found first
  - Too big to miss
Peak to Peak 40 years

Peak Discovery

Discovery Gb

Production kb/d

Peak to Peak 27 years

Fall of Soviets
Peak to Peak 30 years
China

Peak to Peak 44 years
United Kingdom

Peak to Peak 25 years

Piper Accident plus a discovery lull
The End of the First Half of the Oil Age

- It lasted 150 years
- A short span of history.

It stimulated rapid expansion of:

- Industry
- Transport & trade
- Agriculture
- Population
- Financial Capital
All animals use energy from their muscles

But *Home Sapiens* was the first to use external sources
Evolution of Money

*Homo Sapiens*: the first animal to use external energy & trade

- Simple barter
- Gold and silver coins
  - Owning the mine = unearned wealth
  - Conquest for gold & silver
    - The Spanish Empire in Latin America
- Paper money
  - At first backed by gold: but later faith alone
  - **Effectively a licence to use energy**
    - Much previously minted by the Federal Reserve
    - Now, Middle East governments through petrodollars
Wall Street needs energy supply: prompting more resource wars to take what is left.
Marked by the decline of oil and all that depends on it

- Including Financial Capital

Physical decline of oil is gradual but the turning point is unprecedented.

- Debt is losing its collateral.
  - Was based on oil-driven expansion

- All quoted companies are over-valued
  - Tacitly assume business-as-usual energy supply

Does it herald - Stock Market Crash ?

The Second Great Depression ?
Price Shocks
First Signs of Crisis

Price - six times cost to produce gives false liquidity

Price Shocks as production capacity limits breached

But prices may crash if demand falls with recessions

Cost

Brent Crude US $
Plan of Action

Collect proper data.
- Use Foreign Service to secure.
- Resign from International Energy Agency.

Inform the public.

Cut waste
- Especially in transport sector.
- New building standards; town planning.
- Live differently: end consumeristic ethic.

Turn to new energy sources from
- from tide, sun, wind, bio-mass, ? nuclear.
Regionalise and Ruralise

- Rediscover the regions
  - New Community Spirit
  - Living within their resources
  - Change Mindset from “poverty” to success in sustainable living
- Urban living becomes more difficult
- Migration ceases to be viable
Depletion Protocol

Importers to cut imports to match current Depletion Rate (2.5% a year)

Consequences:

- Stops destabilising false liquidity
  - From profiteering from shortage
- Forces consumers to face reality
- Allows poor countries to afford needs
Thank You
and
Good Luck
Session II

Part 1: Microeconomic consequences of rising oil prices, competitiveness and taxation
Oil Prices and Transport Sector Responses

David Baldock
Director
The Institute for European Environmental Policy
Workshop on Economic Impacts
Of Rising Oil Prices
28 June 2006

www.ieep.org.uk
Outline

• **Context**
  • Transport and oil dependency
  • Elasticities of demand
  • Decoupling

• **Substitution**
  • Alternative fuels
  • Efficient vehicles

• **Policies and Choices**
Transport and Oil Dependency in the EU

- Transport: 55%
- Industry: 9%
- Services and Households: 16%
- Other: 20%
Easy Wins are Possible

- **In Road Transport**
  - Correct tyre pressure could save 125,000 bbl/day
  - Enforced 90kph speed limit could save over 0.5 mbbl/day

- **In Maritime Transport**
  - Slower ship speeds could save 23% of fuel used

- A wide range of technical and operational responses available
Alternative Fuels

• **Alternative Fossil Fuels**
  - A range of sources eg oil shales, tar sands
  - Likely high energy costs to extract

• **Biofuels**
  - ‘1\textsuperscript{st} generation’ offer some CO\textsubscript{2} benefits
  - ‘2\textsuperscript{nd} generation’ likely to be much better
  - A wider range of feedstocks will be usable

• High oil prices make the alternatives more attractive
• There is a choice between high and low carbon routes
Vehicle Efficiency

• A ‘win-win-win’ option
  • Reduced cost
  • Reduced fuel dependency
  • Reduced greenhouse gases

• Enormous technical potential
  • Dieselisation
  • Improved engines and drivetrains
  • Lighter and more streamlined vehicles
  • Hybrids
  • Fuel cells

• … but progress is not fast enough
Voluntary Agreements with Carmakers

[Graph showing average CO2 emissions from 1995 to 2012 for ACEA, JAMA, KAMA, ACEA target, JAMA/KAMA target, and EU target.]
Future Choices

• **Stronger policies are likely to be needed**
  • A mandatory requirement on carmakers
  • Continuing development of advanced biofuels
  • Better use of vehicle and fuel taxes

• **Significant change is possible in transport**
  • Some operational changes could be cheap and easy
  • Bigger technical changes may be cost-justified by high oil price

• **Potential benefits are large**
  • Reduced oil dependency
  • Reduced greenhouse gases
  • Reduced running costs

• **... and so are the risks of inaction!**
Impact of oil price and climate change on the car industry

Dr. Stephan Herbst
Manager Analysis & Strategy – Environmental Affairs
Toyota Motor Europe
Manufacturing Companies and Headquarters

**TOYOTA MOTOR EUROPE**

**TMUK** [United Kingdom]
- *Avensis*
- *Corolla H/B Engine*
  - 2005 production: 264 k cars, 174 k engines

**European Headquarter**

**TMIP** [Poland]
- *Diesel engine*
  - 2005 production: 50 k units

**Caetano** [Portugal]
- *Dyna*

**TMMF** [France]
- *Yaris*
  - 2005 production: 181 k cars

**TMMR** [Russia]
- *Camry*
  - Production will start in Dec 2007

**TPCA** [Czech]
- *Aygo*
  - 2005 production: 36k cars

**TMMR** [Russia]
- *Transmission Gasoline engine*
  - 2005 production: 337 k units T/M (incl. for TPCA)
  - 100 k engines (for TPCA)

**TMMP** [Poland]
- *Gasoline engine*
  - 2005 production: 337 k units T/M

**TMIP** [Poland]
- *Aygo*
  - 2005 production: 36k cars

**TMMT** [Turkey]
- *Corolla Sedan Corolla Wagon Corolla Vers*
  - 2005 production: 158 k cars
Toyota Motor Europe

Production

Sales

TOYOTA MOTOR EUROPE

Page 209 of 291
Different perspectives

I. Customer Awareness

II. Automotive Industry Technology

III. Oil Industry Energy/Fuels

IV. Government Framework
To what extend are you personally affected by various increases in the cost of driving a car?

- Fuel prices: 50.3%
- Car insurance: 33.4%
- Maintenance: 31.1%
- Parking fees: 24.7%
- Prices of spare parts: 22.6%
- New-car prices: 21.9%
- Road charges: 20.7%
- Prices of accessories: 17.9%
- Prices for optional equipment: 17.8%

Have the rising costs of driving stopped you from buying a new car?

- Yes: 30.2%
- No: 45.1%
- I hadn’t intended buying a new car: 23.9%
- Don’t know: 0.9%

Importance of Low Fuel Consumption when buying a new car

- The importance of low fuel consumption as a purchase reason decreased in all segments. However, it has started to increase slightly.

- Low fuel consumption is most important in the A segment.
• Expected annual mileage (average) decreased slightly
1. We recognize that Mobility entails negative aspects caused by environmental issues, congestion, and traffic accident.

2. Responding to issues of Energy and Climate Change is one of the biggest challenges.

3. It is essential to realize a ‘Sustainable Mobility Society’.

4. Toyota will give top priority on the development of technologies and products that contribute to tackling environmental and safety issues.
Investments in R&D (global)

II. Technology

Encouraging our Engineers to push the boundaries
Evolution of Toyota Diesel Market Share

II. Technology
Towards the Sustainable Mobility

The Ultimate ECO-Car

Hybrid Technology

“Today for Tomorrow”
40 years history of Toyota hybrid development

More than 500,000 hybrid vehicles sold worldwide

Fuel cell hybrids

Hybrids in Japanese market

Research started 1965

1977

1997

2000

2005

Toyota Highlander HV

Lexus RX400h

Premium SUV hybrid

Toyota Prius II

2005 Car of the year

Toyota Prius

1st mass production Hybrid vehicle

 Toyota Sports 800

Gas turbine hybrid prototype

50,000 hybrids sold in Europe
Toyota’s Fuel Cell Technology

Prius

FINE-X

II. Technology
Requirement for Automotive fuels

Automobile fuel should be
(1) High energy density and easy to handle
(2) Reasonable cost for society
(3) Enough and a sustainable supply capacity

Automotive fuel perspective

Gasoline and Diesel

Hydrogen/Electricity

Bio and Synthetic fuel (including blend)
Toilet's diesel fuel scenario

Short term:
- Cleaner properties (S, Aromatics, CN) for emission reduction.

Long term:
- Introduce FTD to reduce automotive fuel diversity.
- Expand usage of BTL to reduce CO2 and improve vehicle performance.
Toyota’s gasoline scenario

2010  2020

Product from non-food resources

**Ethanol** (including E85:FFV)

Biomass

Gasoline

Oil

E10 or M5 or ETBE15

Quality Target *)
Ethanol/ETBE blend

*) : Based on Automobile industries requirement
WWFC (World wide Fuels Charter)

**Short term:**
- Continue lowering sulfur to expand NOx Catalysts usage.
- Limit ethanol blend in gasoline is E5/E10.

**Long term:**
- Higher Ethanol blend (CO2 reduction & High RON)
Government

- Consistent and long-term policy approach based on sustainable mobility criteria (e.g. emissions, safety, access to mobility, affordability, competitiveness)

- Harmonised car taxation in Europe (CO₂ based) (vehicle excise duty, company car tax)
Conclusion – impact of oil price & CO₂

1. Consumer awareness & behaviour is unclear (no major changes)

2. Further Technology & fuels development is important for Toyota
   - Revamping of the entire engine and transmission line-up
   - Making hybrid vehicles more widespread and developing new technologies
     • Doubling number of hybrid models
     • Plug-in hybrid
   - Initiatives towards the diversification of energy sources
     • Bio-enthanol / Flex Fuel Vehicles (FFV)
     • Fuel cell development

3. Government support needed
Thank you for your kind attention!
Economic impact of rising oil prices

Microeconomic consequences
of rising oil prices, competitiveness and taxation

28th June 2006
## Key data January – December 2005

<table>
<thead>
<tr>
<th>Volkswagen Group</th>
<th>2005</th>
<th>Change %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deliveries to customers th. vehicles</td>
<td>5,192</td>
<td>+ 1.0</td>
</tr>
<tr>
<td>Production th. vehicles</td>
<td>5,219</td>
<td>+ 2.5</td>
</tr>
<tr>
<td>Workforce thousand</td>
<td>344.9</td>
<td>+ 0.7</td>
</tr>
<tr>
<td>Production sites</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>- thereof in Europe</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Sales revenue million €</td>
<td>95,268</td>
<td>+ 7.1</td>
</tr>
<tr>
<td>Profit after tax million €</td>
<td>1,120</td>
<td>+ 60.7</td>
</tr>
</tbody>
</table>
Development of oil prices

World oil prices in 2004 dollars per barrel as forecasted by the end of 2005*

* weighted average price of all crude oil containing less than 0.5% sulphur by weight that is imported by US oil refiners
USGS = U.S. Geological Survey

Source: Energy Information Administration – Official Energy Statistics from the U.S. government

high = world conventional crude oil resource base is 15 percent smaller than the USGS mean oil resource estimate, production more costly, OPEC contribution to total oil production = 31%

low = world conventional crude oil resource base is 15 percent larger than the USGS mean oil resource estimate, cheaper production, OPEC contribution to total oil production = 40%
Cost of automotive mobility – Germany

Cost of living and automotive mobility in Germany (2000 = 100)

Source: VDA
Operating costs of mobility within EU-25 have increased above average, by 34%, in the last decade while the costs of living have only risen by 26% in the same period.
Cost of automotive mobility

The cost of automotive mobility is influenced by several developments:

- **Fuel prices**
- **Fuel taxation system**
- **Car taxation system**
  - The taxation system should be harmonised throughout the EU.
  - At present, there are luxury tax, registration tax and additional taxes in several countries.
  - The car taxation system is currently based on different aspects within the EU (cylinder capacity, CO₂ performance, kilowatt, exhaust emissions, fuel consumption, weight).
- **Road pricing**
- **Vehicle prices** which are heavily influenced by requirements on vehicle characteristics set out by EU regulation, e.g. in the areas of CO₂, safety and recycling.
Integrated Approach

= achieving goals in the most cost-efficient way

(macroeconomic minimisation of costs impacting on the microeconomic situation, e.g. in the area of CO2 reduction)
OBJECTIVES OF THE INTEGRATED APPROACH AS A MULTI-STAKEHOLDER-APPROACH:

- Minimisation of CO₂ abatement costs
- Maximisation of CO₂ reduction
- Sustainable and affordable mobility
- Security of energy supply
- Competitiveness of the European automotive industry
- Technological leadership of the European industry

EU-wide harmonised CO₂-based vehicle taxation (ACT)

Alternative fuels
Vehicle and powertrain measures
Driver training/mobility related measures

EU-wide harmonised CO₂-based vehicle taxation (ACT)

Alternative fuels
Vehicle and powertrain measures
Driver training/mobility related measures

CO₂-based biofuel taxation

November 2003

End 2005 – CARS 21

Second Half 2006
ACEA CO₂ agreement

Structural characteristics of CO₂ abatement costs (societal costs) with increasing CO₂ reduction, as in June 2006

- abatement costs
- €/t CO₂


- vehicle technologies (Hybrid included)
- CO₂ neutral fuels/ alternative fuels
Biofuel taxation – Proposal VW

- Comprehensive and market-driven incentive system, level-playing field for 1st and 2nd generation biofuels.
- Avoidance of excessive incentives and of a long-term misallocation of economic resources.
- Long-term framework conditions, only gradual alteration through re-evaluation of sustainability in order to ensure the investments made.
- Basis for the harmonisation of fuel taxation within the EU/ at present: amendment of the directive on biofuels.

**Sustainability Rating for biofuels according to their:**
- CO2 efficiency (WtT)
- sustainability criteria (biodiversity, avoidance of rainforest deforestation, reduction of the use of fertilisers and pesticides, complexity of supply etc.)

- Classification into sustainability classes (e.g. six SI classes*) as a basis for taxation (full tax rate ↔ highest tax allowance).
- Obligation to produce certification on SI classes is with the biofuel producer.

* SI Sustainability Index
Biofuel taxation
Certification and taxation practices

Certification organisation assesses the production method of biofuels or fuel components and quantifies the sustainability performance of the whole production procedure.

Certification organisation assesses the whole production procedure as well as the conformity to existing infrastructure and fuel quality.

Tax authorities/customs set tax rate

Biomass → Biofuel producer → Fuel trading and producing companies → Market
Conclusion

If the current development continues, the economic challenge for the consumer will be to earmark an increasing part of the budget for mobility.

Against the background of a constant purchasing power, the rise of automotive mobility costs leads to an increasing risk for the competitiveness of the European automotive industry and European growth and employment.

**Request: No further increase of mobility costs.**

- Integrated approach in order to achieve objectives in the most cost-efficient way.
- EU-wide harmonisation of passenger car taxation.
- Market introduction of and level-playing field for biofuels as an accompanying measure in order to contain the crude oil market’s speculative elements.
Session II

Part 2: Geopolitics and Security of Supply
Geopolitics and security of supply

Presented by
Dr. Hasan M. Qabazard
Director, Research Division, OPEC

European Parliament, Brussels
June 28, 2006
This is so fundamental to life in the 21st century that every effort should be made to:

- Clarify its meaning
- Gain a consensus on it
- Embody its true principles in decision-making across the energy sector
This should ...

- Be reciprocal – security of demand is as important as security of supply
- Apply to all energy sources free from prejudice
- Extend across the entire supply chain
- Cover all foreseeable time-horizons
- Focus on the most modern products, with the highest environmental standards and latest technology
- Apply to rich and poor nations alike
- Be openly receptive to dialogue and cooperation
Proven oil reserves 897 billion barrels > 78% of world share
Crude oil production 30 million barrels a day about 42% of world share
Crude oil exports > 21 million barrels a day > 50% of world share
There is considerable uncertainty over how much oil OPEC will need to produce (mb/d).

- Significant uncertainties with substantial downside risks.
- Considerable implications on the scale and timing of investments!
- “Road-map” for oil demand is called for!

Page 244 of 291
Diesel prices and taxes, December 2005

US$\text{litre} 

<table>
<thead>
<tr>
<th>Country</th>
<th>Crude CIF Price</th>
<th>Industry Margin</th>
<th>Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>0.19</td>
<td>0.44</td>
<td>0.34</td>
</tr>
<tr>
<td>Canada</td>
<td>0.25</td>
<td>0.48</td>
<td>0.48</td>
</tr>
<tr>
<td>Japan</td>
<td>0.25</td>
<td>0.34</td>
<td>0.48</td>
</tr>
<tr>
<td>France</td>
<td>0.25</td>
<td>0.48</td>
<td>0.48</td>
</tr>
<tr>
<td>Germany</td>
<td>0.25</td>
<td>0.50</td>
<td>0.48</td>
</tr>
<tr>
<td>Italy</td>
<td>0.25</td>
<td>0.44</td>
<td>0.48</td>
</tr>
<tr>
<td>UK</td>
<td>0.25</td>
<td>0.48</td>
<td>0.60</td>
</tr>
</tbody>
</table>

Crude CIF Price, Industry Margin, and Tax percentages for various countries.
Supply chain tightness: downstream bottlenecks
High capacity utilization rates

*Asia = Japan, South Korea, China, India and Singapore
Crude oil prices: much affected by products markets, too!

US $/b
Dialogue and cooperation

The way forward for all players
OPEC continues to make big effort
Widened and deepened in open and constructive manner

Examples
New OPEC energy dialogues with European Union, China and Russia
International Energy Forum, with Joint Oil Data Initiative
Non-OPEC at OPEC Conferences; OPEC and non-OPEC experts’ meetings ...
Joint annual workshops organised by OPEC and International Energy Agency
Follow the path of order and stability in the international oil market.

Adhere to a broader vision, embracing such issues as sustainable development and environmental harmony.

In this way, it would be possible to imbue the industry with an enriched experience of energy security.
Thank you

www.opec.org

Stability in the oil market
Workshop on the impact of oil prices
Session on Geopolitics and Security of Supply
European Parliament
Bruxelles 28 June 2006

Pierre Sigonney
Proven oil reserves cover today more than 40 years of demand…

Proven Reserves (as of 1/1/2005)

Oil Resources: Billion barrels

- Proven Reserves: ~600
- Reserve growth: ~650
- Undiscovered Reserves: ~600

- Conventional Oil: 1,110
- Extra Heavy Oil: ~600

- North America: 52
- Latin America: 99
- Africa: 100
- Middle East: 729
- Former Soviet Union: 77
- Europe: 17
- Asia-Pacific: 36

… but are very concentrated in the Middle East

Source: O&G Journal, USGS 2000, IEA
After 2010, a growing dependence on OPEC production

Oil supply to 2020

- A significant decrease in OECD oil supply after 2010
- Global production from non OPEC should be at best stable after 2010
- OPEC decisions will define oil supply (growth in Irak, extra-heavy oil in Venezuela…)

![Oil supply chart](chart.png)
Gas supply in Europe relies on diversification and high investment.

Gas flows in 2005 and 2015

- **Production excluding Norway**: 240 -> 160 Gm3
- **Norway**: 90 -> 140 Gm3
- **Imports**: 250 -> 410 Gm3
- **Demand**: 570 -> 710 Gm3

**Sources**
- Norway
- Atlantic LNG: Nigeria, Trinidad (10 -> 30 Gm3)
- Caspian/M.E.: Pipe (0 -> 20 Gm3)
- North Afrika: Pipe (45 -> 65 Gm3), LNG (30 -> 45 Gm3)
- Middle-East: LNG (7 -> 40 Gm3)
- Russia: 160 -> 200 Gm3

**Imports**
- Norway: 90 -> 140 Gm3

**Demand**
- 570 -> 710 Gm3

**Production**
- 240 -> 160 Gm3
- Norway: 90 -> 140 Gm3
- Middle-East: 7 -> 40 Gm3

---

Source: Total
Oil & gas majors: small players in terms of production, big players in terms of investment

World oil production in 2005
(82 million barrels per day)

- National oil companies: 56%
- Other international companies and independents: 31%
- ExxonMobil: 13%
- Shell: 23%
- BP: 32%
- Chevron: 45%
- TOTAL: 32%

Global E&P capex in 2005
($225 billion)

- National oil companies: 23%
- Other international companies and independents: 45%
- ExxonMobil: 23%
- Shell: 32%
- BP: 45%
- Chevron: 32%
- TOTAL: 32%

5 Majors:
- 13% of oil production
- 23% of E&P capex

Source: Reported data, Total estimates.
International companies: increasing field complexity is driving up technical costs and project timescales

Oil & gas technical costs: $/b

Notes: Technical costs: consolidated subsidiaries (FAS 69); Wood Mackenzie data on development timescales

Angola oil projects timescales:

Kuito (CVX)
Girassol (Total)
Xikomba (XOM)
BBLT (CVX)
Dalia/Camelia (Total)
Greater Plutonio (BP)

Licence Awarded
Discovery
Onstream


Notes: Technical costs: consolidated subsidiaries (FAS 69); Wood Mackenzie data on development timescales
Slowing demand growth would help manage the tensions on oil markets

Reducing oil demand growth to less than 1% per annum would be the best solution. But is it realistic?

Source: IEA, TOTAL
Back up
Oil prices are volatile: today’s price is no guide to the future!

$2005/b (monthly average)  Mb/d

Sources: IEA, Total
To avoid a crisis, oil demand should stabilise in the OECD to allow demand to grow in the non-OECD

Oil demand growth of 1% over 2005-2020

Source: IEA; TOTAL
A lighter product mix will necessitate new refining conversion capacities

Total is developing a hydrocracker at the Normandy refinery to produce 40 000 b/d of diesel to help answer Europe demand.
The growing role of gas in power production means a global market with a key role for LNG

- Natural gas reserves are relatively abundant - proven reserves equal ~65 years of today’s production
- ‘Peak gas’ should not occur before 2040
- Gas markets are highly reliant on transport logistics - a worldwide gas market requires the development of a strong LNG network

Total is a key player in the LNG market with participations in 6 export projects (Qatar, Indonesia, Yemen, Iran, Nigeria, Norway)
Accelerating energy efficiency improvements is necessary for oil and all the other sources of energy.

We’ve been achieving 1.5/2.0% p.a. Can we get to 2.5/3.0% p.a. ?

* Energy efficiency is calculated as the ratio of world GDP, at constant prices, over world energy demand, in tonnes oil equivalent.
Improvements in renewable power generation cost are made to match conventional electricity costs, especially if distribution costs are high.

*Sources: IEA, Total*
The Oil-GDP effect and its implications for the deployment of renewable energies and security of supply

Raphael Sauter and Shimon Awerbuch

SPRU, University of Sussex

Workshop on the economic impact of rising oil prices
European Parliament, Brussels 28th June 2006
Overview

- The Oil-GDP effect
- Investment in renewable energy as a way to mitigate the fossil fuel price risk
- Avoided GDP losses
- Implications for security of supply
- Conclusions
The Oil-GDP effect

- Oil price increases and volatility dampen economic growth by raising inflation and unemployment.
- Since the mid 1980s not only oil price levels but also volatility is an important factor.
- Asymmetric relationship between oil price increases / decreases and GDP.
- Despite changes in the oil-GDP effect, there is no doubt about the negative impact of oil price fluctuation on GDP.
- Doubling in oil prices reduces GDP by around 5% - however very different for individual countries.

Sussex Energy Group
SPRU - Science and Technology Policy Research
Oil-GDP effect: % GDP change for oil price doubling

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP Elasticity</th>
<th>Country</th>
<th>GDP Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taiwan</td>
<td>-8.4%</td>
<td>Indonesia</td>
<td>-4.3%</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>-6.5%</td>
<td>Malaysia</td>
<td>-5.6%</td>
</tr>
<tr>
<td>Japan</td>
<td>-5.8%</td>
<td>Norway</td>
<td>5.1%</td>
</tr>
<tr>
<td>South Korea</td>
<td>-8.7%</td>
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<td>Philippines</td>
<td>-3.6%</td>
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<td>Singapore</td>
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</tr>
<tr>
<td>Thailand</td>
<td>-8.4%</td>
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<td>France</td>
<td>-9.8%</td>
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<tr>
<td>Germany</td>
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<td>Greece</td>
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<tr>
<td>U.K.</td>
<td>-3.8%</td>
<td></td>
<td></td>
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<tr>
<td><strong>Average</strong></td>
<td><strong>-6.3%</strong></td>
<td><strong>Average</strong></td>
<td><strong>-1.6%</strong></td>
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Source: Paul Leiby, IEA ASEAN Workshop, April 2004
Investments in renewable energy sources create benefits in terms of avoided GDP loses:

- A higher share of renewables in the electricity supply reduces demand for natural gas which reduces natural gas prices
- Through the gas-oil substitution effect oil prices will come under pressure
- Avoided oil price increases and volatility produce avoided GDP losses
A 10% RES-E increase reduces natural gas prices on average by 8.2%
Avoided GDP losses for 10% RES-E addition

Avoided GDP losses would offset 32 - 38% of investment in renewable energy in the EU

Implications for security of supply

Investments in renewable energy sources enhance energy security:

• by helping reduce exposure to oil-GDP losses

• by contributing to an optimized generation portfolio and therefore mitigating risk due to minimised exposure to fossil fuel price volatility

• by providing a form of ‘national insurance’ (Lind/Arrow) in that prices move against the value of other financial assets
Conclusions

• Investment costs in renewables can partially be offset by avoided GDP losses

• Currently fuel price risks in the electricity supply system are passed through to consumers and reduce their disposable income

• European oil and gas market structures will have to change to fully allow for the potential of avoided GDP losses

• An increased share of renewable energy sources in the supply portfolio constitutes a no regrets policy

• Similar conclusions apply to investments in energy efficiency measures
Thank you for your attention!

Raphael Sauter
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Geopolitics and supply security

Alexandre Clauwaert
June 2006
## Current situation: Growth of the Electric and Energy Needs

### Electricity Production – UE 25

<table>
<thead>
<tr>
<th></th>
<th>2005 capacities</th>
<th>2030 capacities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>710</td>
<td>1060</td>
</tr>
<tr>
<td>New Capacities</td>
<td>770</td>
<td></td>
</tr>
<tr>
<td>Replacement</td>
<td>290</td>
<td></td>
</tr>
</tbody>
</table>

**Net increase**

**Sources:** Estimations AIE

---

### Electricity Transport

**The European sub-markets in 2003**

*Image of a map showing electricity transport.*

**Sources:** UCTE

---

**Investments needs for electricity infrastructures are estimated at **750 billion €** by AIE for the period 2005-2030 for EU-25**
Increased pressure on energetic independance

Growth of direct and indirect demand of natural gas, coal and oil products (transport)

- An energetic dependance that has increased since 10 years....
- ...and that may reach 70% in 2030...

Sources: European Commission estimations
Preserving an energetic independance
Natural gas

Main gas reserves available for Europe (in Tm³)

Main risks :
- Geopolitics risk
- Technical risk
- Arbitration risk unfavourable to Europe

Tension on gas supplies?

Source: BP Statistical Review
Sources of natural gas

Europe (15)

<table>
<thead>
<tr>
<th></th>
<th>2002 (Bm3)</th>
<th>2010 (Bm3)</th>
<th>2020 (Bm3)</th>
<th>CAGR 02-20</th>
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<tbody>
<tr>
<td>EU 15 Natural Gas Supply</td>
<td>421 100</td>
<td>523 100</td>
<td>612 100</td>
<td>2.1</td>
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<tr>
<td>Indigenous Production EU-15</td>
<td>232 55</td>
<td>188 36</td>
<td>105 17</td>
<td>(4.3)</td>
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<tr>
<td>Non-Europ. Countries</td>
<td>58 14</td>
<td>105 20</td>
<td>145 24</td>
<td>5.2</td>
</tr>
<tr>
<td>Norway</td>
<td>34 8</td>
<td>23 6</td>
<td>24 6</td>
<td>n.s.</td>
</tr>
<tr>
<td>USA</td>
<td>2* 2*</td>
<td>19 2*</td>
<td>20 2*</td>
<td>7.5</td>
</tr>
<tr>
<td>Pipeline Imports</td>
<td>189 45</td>
<td>336 64</td>
<td>507 83</td>
<td>5.1</td>
</tr>
<tr>
<td>LNG Imports</td>
<td>97 19</td>
<td>131 25</td>
<td>236 39</td>
<td>2.1</td>
</tr>
</tbody>
</table>

* Imports from Norway

Sources: AIE, Brokers' reports

A key-role to play for the LNG in the diversification of the gas supply sources which explains the expected growth in this sector.
Economical competitiveness

Long-lasting high oil price prospects

Source: CERA
Economical competitiveness of electrical production costs

LRMC Comparison 2007 Baseload

Source: Suez Electrabel June 2006 forwards
Economical competitiveness of renewable production costs

- Hydroelectricity low (High fall 800kW, 6000 hours)
- PAC SOFC-biogaz 8760 hours *
- CCGT 8760 hours
- Ground wind-energy 2500 hours
- Geothermy DOM *
- Methanisation
- Biogas de CSD
- Enr marines *
- Geothermy HDR *
- Hydroelectricity high (Low fall 500kW, 3624 hours)

- Photovoltaic / commercial
- Photovoltaic / residential

€/MWh

2015 2007
The environmental stakes

- **Kyoto Protocol**
  - 5% reduction of GES emissions in 2012 in regard to 1990…
  - …until now the electrical sector is responsible for 39% of the emissions
  - European system EU-ETS

- **Combustion directive (SO₂, NOₓ) ‘Large combustion plants’**
A strain on the reserve margins on the scale of the continental block (NWE)...
...until now the prices have not yet reached the long-term marginal cost (LRMC)
The energy mix problem

The renewable energies stakes

- Part of the answer to the environmental stakes…
- … but a potential partially limited by:
  - Potential largely exploited in hydraulic
  - A photovoltaic solar development not very credible in the short-term
- Developing prospects are thus centered on wind energy and biomass (co)firing
The energy mix problem

The historical nuclear development depends on local European countries policy.

- Strongly divided positions in relation to nuclear relaunch
- An element of answer to the Kyoto constraints, but environmental elements still to be clarified (spent fuel)
The energy mix problem

The fossil energy stakes

- A contribution that remains important for the countries who choose to abandon the nuclear...

- Major stakes in terms of R&D needed to assure the competitiveness of this technology → Zero Emission Technology problem
  
  - Integration of the technologies in the working of the existing power plants (i.e Tests-projects)

  - Increase of the efficiency of the coal power plants

  - Reduction of the costs of the captation/sequestration technologies
The community directives describe a general framework.

But:

- A very uneven implementation
  - Eligibility rhythm
  - Unbundling of activities
  - Access to the networks

- A very incomplete taking into account of the long-term stakes of the sector
  - A primat to the development of the short-term competition
A market structured around large actors and undergoing consolidation movements …
- Strategic vision

- What we need:
  - Certainty on governments’ behaviour in uncertain matters, like CO2, market design, acceptable energy mix, external relations with major supplying countries...
  - European market design and structure, investor friendly environment
  - Demand reduction methods
  - Diversification, role of LNG, rebirth of nuclear generation
  - Renewable energies