Shell energy scenarios to 2050
An era of revolutionary change

IAEE, Houston Chapter
Houston, TX, September 2009

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Scenarios explore alternative futures

<table>
<thead>
<tr>
<th>The present</th>
<th>The path</th>
<th>The future</th>
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<tbody>
<tr>
<td>Current realities (mental maps)</td>
<td>Multiple paths</td>
<td>Alternative futures</td>
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Forecast

Scenarios
Discontinuities are not that obvious

“Well informed people know it is impossible to transmit voice over waves and that were it possible to do so, the thing would be of no practical value.”

*Editorial in The Boston Post* c.1865

“I think there is a market for about 5 computers.”

*Thomas J. Watson, Chairman of IBM, 1943*

“There is no reason for any individual to have a computer in their home.”

*Ken Olsen, President of DEC, 1977*

“$10 per barrel [oil] might actually be too optimistic. We may be heading for $5.”

*Economist magazine, 1999*
Time of unprecedented change

- Demand growing and moving East
- Record crude prices
- Increased volatility
- Higher project costs
- Focus on energy security
- New competitors
- Environmental stresses
- Emerging technologies
- The “Credit Crunch”

1999
10 $/bbl

2003
30 $/bbl

2005
60 $/bbl

2008
100 -140 - 100 $/bbl
The energy system today sets the context for the future

- World population: 6.6 bln; 50% in urban environment

Source: Shell International BV; UN Population Division
World population is to rise 40% over the next 50 years

A People-Centred Map of the World

Year 2000; Source Mark Newman, University of Michigan
Energy demand driven by the population & prosperity of rapidly growing economies

Population

<table>
<thead>
<tr>
<th>Year</th>
<th>North America &amp; Europe</th>
<th>Latin America</th>
<th>China &amp; India</th>
<th>Asia &amp; Oceania</th>
<th>Middle East &amp; Africa</th>
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<tbody>
<tr>
<td>1975</td>
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<td></td>
<td></td>
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<tr>
<td>2000</td>
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<td>2025</td>
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<td>2050</td>
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Energy demand per person -Historical

<table>
<thead>
<tr>
<th>Region</th>
<th>1971-2005</th>
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</thead>
<tbody>
<tr>
<td>USA</td>
<td></td>
</tr>
<tr>
<td>Europe (EU15)</td>
<td></td>
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<tr>
<td>South Korea</td>
<td></td>
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<tr>
<td>Japan</td>
<td></td>
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<td>China</td>
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<td>Brazil</td>
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<tr>
<td>Mexico</td>
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<td>India</td>
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</table>

World energy demand is on track to double by 2050.

“Business as usual” energy consumption by sector

- **Heavy industry**
- **Agriculture & other industry**
- **Services**
- **Transport**
- **Residential**
- **Non energy use** (e.g. petrochemicals)

Source: Shell International BV and Energy Balances of OECD and Non-OECD Countries©OECD/IEA 2006
With particular regions and countries such as Asia and China playing key roles

“Business as usual” energy consumption by region

Source: Shell International BV and Energy Balances of OECD and Non-OECD Countries©OECD/IEA 2006
Supply will struggle to keep pace
And environmental stresses will increasingly be at the forefront.

In “Business as usual” world, direct CO₂ from energy could rise dramatically.

- **2007**: 28 Gt/yr
- **2025**: 48 Gt/yr
- **2050**: 65 Gt/yr

**Source**: Shell International BV
Three hard truths will shape the future of the energy system

- Surge in energy demand
- Supply will struggle to keep pace
- Environmental stresses are increasing
Shell energy scenarios

National supply focus and reactive change

Emerging coalitions and accelerated change

Demography  Demand  Environment

Choices  Resources  Technology
Scramble - People at the heart of the storylines … individually and collectively

- People choose the easiest option for them
- Fear is not enough to change behaviours
- Climate change is too difficult
- Delegating action to the state
- Adapt rather than change
Scramble - Security of supply and fear of losing economic growth
Scramble – supply focus and late responses

Total primary energy demand

Direct CO₂ emissions from energy

Sources: Shell International BV and Energy Balances of OECD and Non-OECD Countries©OECD/IEA 2006
Scramble – Biomass plays a key role in liquid fuel mix

Final energy consumption of biomass

Source: Shell International BV and Energy Balances of OECD and Non-OECD Countries©OECD/IEA 2006
Blueprints - People at the heart of the storylines … individually and collectively

- Shared interest not altruism
- Adoption through “mainstreaming”
- Trial, error, collaboration and copying success
- Success is emergent, not centrally driven initially
Blueprints – Energy security and sustainability
Blueprints – multi-focus and early actions

Total primary energy demand

- Oil
- Coal
- Biomass
- Gas
- Nuclear
- Solar
- Wind
- Other Renewables

Direct CO₂ emissions from energy

- Middle East & Africa
- Latin America
- Asia & Oceania - Developing
- Asia & Oceania - Developed
- North America
- Europe

Sources: Shell International BV and Energy Balances of OECD and Non-OECD Countries©OECD/IEA 2006
Blueprints - Efficiency and innovation in transport

Passenger distance travelled (world)

Source: Shell International BV and Energy Balances of OECD and Non-OECD Countries © OECD/IEA 2006
Comparing the scenarios: energy mix

**Scramble**

**Blueprints**

Source: Shell International BV and Energy Balances of OECD and Non-OECD Countries©OECD/IEA 2006
In summary – what we have learned

- The three hard truths are *very* hard
- Transition is both inevitable and necessary
- Technology plays a major role, but no silver bullets
- Political and regulatory choices are pivotal
- The next 5 years are critical

Tackling all three hard truths TOGETHER is essential for a sustainable future
Scramble or Blueprints?