Shell Global Scenarios

Energy Implications for the US

Presentation to the USAEE Annual Conference
Denver, September 19th 2005

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Shell – Global Business Environment
The US – on an LTG path?

- Efficiency
- Russia
- Middle East
- India
- US
- aspirational EU
- China
- Open Doors
- Security
- Low Trust
- Globalisation
- Social cohesion
- Flags
Low Trust Globalisation
The scenario in a nutshell: “Carrots and Sticks”

- A legalistic “prove it to me” world of courts, lawyers, auditors, and Chinese walls
- Security through intrusive checks & controls
- High degree of both government and market-based regulation (e.g. ISO)
- Strong states seek further globalisation on their terms
- Governments drive energy diversity
- NGOs seek to overcome a more limited clout through alliances with investors and/or states

Manage regulatory change and compliance risk
Energy challenges in LTG – what will be the impact on North America?

- Energy intensive growth
- Security of supply
- Carbon

**How will NA compete globally for energy resources versus growing energy-hungry economies?**

**What is the right mix of incentives for domestic energy versus international cooperation?**

**Will the US join growing international actions to limit carbon emissions?**
Which way for US Energy Policy in LTG?

<table>
<thead>
<tr>
<th>Security of supply</th>
<th>Supply</th>
<th>Demand</th>
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<tbody>
<tr>
<td>Diversity of Supply</td>
<td>- Geographical</td>
<td>Efficiency standards</td>
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<td>- Fuel mix (inc unconventionals and renewables)</td>
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<td>Taxation</td>
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<td>Critical infrastructure (but tempered by safety and environmental concerns)</td>
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<td>Federal and local rules</td>
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<tr>
<th>Energy Intensive Growth</th>
<th>Supply</th>
<th>Demand</th>
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<td>Selective trade and investment protocols</td>
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<td>Favourable fiscal and access regimes for domestic energy sources</td>
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<tr>
<th>Carbon</th>
<th>Supply</th>
<th>Demand</th>
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<tr>
<td>Renewables, accelerated research into hydrogen and carbon sequestration</td>
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<td>Growing patchwork of state and local targets</td>
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<td>No national consensus</td>
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North American energy outlook in LTG

NA Primary Energy Demand

Historical and future growth rates fluctuate around 1% per year

- **1995**
  - Oil
  - Natural Gas
  - Coal
  - Hydro
  - Nuclear
  - Other Renewables

- **2005**
  - Oil
  - Natural Gas
  - Coal
  - Hydro
  - Nuclear
  - Other Renewables

- **2015**
  - Oil
  - Natural Gas
  - Coal
  - Hydro
  - Nuclear
  - Other Renewables

- **2025**
  - Oil
  - Natural Gas
  - Coal
  - Hydro
  - Nuclear
  - Other Renewables
North American energy outlook in LTG

2005 % Shares

2025 % Shares

In a mature energy market, the structure of demand takes a long time to shift
Could North America move to an Open Doors world…?

• Trade
  • success of CAFTA, reinforcement of NAFTA
  • Boeing/Airbus dispute amicably settled
  • China revaluations continue, improving terms of trade

• Global Security
  • continuous improvement in anti-terrorism measures reduces threat to more manageable levels, effective international cooperation is achieved
  • stabilisation of Iraq

➢ Energy Impacts
  ➢ strongest overall energy demand growth
  ➢ open market for LNG infrastructure development and imports, unfettered by restrictive energy security concerns
  ➢ renewables and unconventional fuels driven by improving technology and economics, and pulled by growing consumer acceptability – policy takes a back seat
  ➢ CO2 emissions addressed by market-based allowance trading
Or Flags?

• Trade
  • continuing trade tensions US/Europe, US/China, US/Canada etc….
  • competitive protectionist escalation

• Global Security
  • no relief from outbreaks of terrorist activity, in North America and internationally
  • increased focus on security requires step-up in funding and government attention, but inhibits economic activity

➢ Energy Impacts
  ➢ weakest overall energy demand growth
  ➢ domestic energy supply source favoured with strong legislative and regulatory support: access to hydrocarbons; renewables credits and targets; unconventional fuels programmes
  ➢ international energy supply refocussed on hemispheric (“friendly”) supply sources
  ➢ potential for regulated demand side management if energy balances are tight
Market trust & regulation: different worlds develop different tools...

Efficiency
- Market incentives
  - Free market
  - Stringent framework
    - Competition
    - Security of Supply
    - Protection of end consumer
  - Heavy handed
  - Bolt-on, ex-post

Security
- Coercion
  - National regulators
  - Self regulation
  - State

Security
- Coercion
  - NGOs
  - Media
  - Public Opinion

Social cohesion
- Aspirations to equity
  - Liberalisation questioned
  - Patchwork of national and local regulations
  - Social obligations
  - Redundancies in infrastructure

Pragmatic, ex-ante
- Harmonisation as competitive advantage
- Precautionary principle
- Pricing of externalities
… and patterns of influence could shift

**Low Trust Globalisation**
- Prove it to me
  - Regulators are law enforcers
  - Bureaucrats & lawyers
- Pro-business NGOs are more prominent
  - Media are businesses

**Open Doors**
- Know me
  - Regulators are facilitators
    - "rating value-chains"
- NGOs are voices of endorsement
  - Media are iconoclasts

Flags
- Follow me
  - Populist political leaders
  - Trade unions & dominant constituencies
  - NGOs are voices of public discontent
  - Media are part of establishment
Hydrocarbon resources are shifting towards the unconventional

Estimated Global Fossil Fuel Resources

- Unconventional hydrocarbon plays have great potential relative to conventional plays
  - and the North American unconventional endowment could be huge

- Growing development of these plays is an important contribution to North American energy security

- Economics should continue to improve with technology and scale
Long Term Oil Price Drivers

- **Moderate economic and oil demand growth**
- **OPEC cohesive and coercive**
- **Oil price target high: Test what the market can bear**

Efficiency

**Market incentives**

- **Demand growth >> supply**

- **Strong Economic and oil demand growth**
- **Core Middle-East OPEC**
- **Oil price target moderate: Not to destroy oil demand**

- **Terrorism**

Low economic and oil demand growth

- **Security Coercion Regulation**

- **Social cohesion Aspirations to equity**

- **Moderate economic and oil demand growth**
- **OPEC cohesion put to test**
- **Oil price target high, but unachievable**

- **Higher oil prices**
- **Moderate oil prices**
- **Lower oil prices**
Turning to natural gas...

North America will remain the major gas market globally

### 2000

- N. America: 30%
- FSU: 25%
- OECD Europe: 17%
- Other: 17%

### 2025

- N. America: 42%
- FSU: 23%
- OECD Europe: 15%
- Other: 20%
Long Term Gas Market Drivers

- Moderate economic but strong gas demand growth
- Regional markets for pipeline gas and LNG
- ‘Lock-in’ of supply
- Vertical linked value chain
- Gas prices linked to competing fuels.
- Heavy regulated.

- Strong Economic and gas demand growth
- De-linking of value chain and pricing
- Global market
- Regulatory convergence
- Horizontal integration

Efficiency
Market incentives

Lower
gas prices

High
gas prices

Volatile
gas prices

Demand growth >> supply

Security
Coercion
Regulation

Aspirations to equity

Social cohesion

- Low economic and steady gas demand growth
- Bilateral agreements
- Local markets
Low Trust Globalisation
Gas Markets in North America

- Rising gap between demand and indigenous supply.
- Strong opposition remains to opening up federal lands and offshore moratoria areas for drilling. Alaska gas pipeline developed post 2015
- Competition from ‘clean’ coal and renewables erodes the gas share of new power generation capacity in some regional markets.
- LNG imports rise, market share grows steadily, from 2% in 2004 to 15% by 2025.
- Prices are pulled up by rising indigenous cost of supply and lack of demand flexibility (in all scenarios).
- LNG is a price taker relative to the overall market, but may cause local price depression if takeaway infrastructure is bottlenecked.
Open Doors
Gas Market North America

- Wider gap between demand and indigenous supply driving imports and prices.

- More favourable political climate for the development of LNG import facilities, as companies earn their license to operate by demonstrating safe operations and access to a diversity of supply sources – but market mechanisms determine the location, timing and scale of import terminals.

- The Alaska natural gas pipeline receives no government support and does not compete for capital with LNG.

- Off-limits areas for domestic drilling are not opened up as confidence in open international trading grows.

- The US market share of LNG grows rapidly, reaching 30% by 2025.
Opening to new drilling of off-limits areas on federal lands and offshore, despite only lukewarm public acceptance

Indigenous supply responds, reducing need for imports.

Federal and state guarantees enable development of Alaska natural gas pipeline by 2015, also unlocking further Arctic gas development potential

Prices are pulled up by rising indigenous cost of supply and lack of demand flexibility (in all scenarios).

US market share of LNG grows slowly to around 12.5% by 2025.
NA Natural Gas Prices have been on a clear rising trend since 1990

NA Gas Prices 1990-2005
12 Month moving average

Each price trough is higher than the previous one
Each price peak is higher than the previous one
Gas intensity is declining

Natural Gas Demand Trends

![Graph showing gas intensity is declining over time. The graph indicates a decline in both bcf/000 Real GDP and bcf/000 population trends from 1949 to 2003. The intensity trend peaks around 1977 and then declines significantly. The per capita consumption trend also shows a peak around 1977 and a decline.]
Despite higher prices, US demand has been close to flat this decade...
Improved load factors in electric power embed steady, moderate demand growth
Mature producing areas still dominate gas supply to the U.S.

**2004**

- Mature: ~ 80% (hatched areas)
- Growth/Frontier: ~ 20% (clear areas)

**Legend:**
- GOM Shelf
- Gulf Coast
- Permian/MidCont
- San Juan
- Appalachia
- MidWest/Pacific
- Rockies
- GOM DW
- Canada imports (mature)
- LNG imports
US Domestic Production Will Increasingly Fall Short of Demand

Sources: EIA, NPC 2003 Study
Where strategy ends...

"Knowing is not enough: we must apply. Willing is not enough: we must do"  
(Goethe)

In the end, we must act