APEC Energy Outlook until 2030

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Rising Energy Prices: Oil, Natural Gas and Coal

- Cold Weather and Infrastructure Constraint
- Commencement of Iraq War
- Oil Demand Surge in Asia and USA

- $/1000 kcal

- Source: Asia Pacific Energy Research Centre (2005)
Yearly Volatility of Crude Oil Price (1973-2005)

(Source) Asia Pacific Energy Research Centre (2005)
(Note) Yearly volatility represents standard deviation of one year mean value of US FOB crude oil price (2000 real value).
Drivers for the APEC Energy Demand

Growth of Oil Demand (2000-2004)

- **Income Growth**
  - GDP per capita will grow at an annual rate of 3.5 percent.

- **Urbanisation**
  - By 2030, share of urban population will reach 68 percent of the total from 52 percent in 2003.
  - 26 million people per year will move from rural to urban cities.

- **Industrialisation**
  - Industry value added will grow by 4.8 percent per year, while GDP will grow by 4.1 percent per year.

(Source) Blackwell (2005)
Income Growth and Fast Pace of Motorisation (1980-2030)

(Source) Asia Pacific Energy Research Centre (2005)
Urbanisation and Residential Energy Demand in the Selected APEC Economies

### Urbanisation

<table>
<thead>
<tr>
<th>Region</th>
<th>Urban Population (Millions)</th>
<th>Share of Urban Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2003</td>
<td>2030</td>
</tr>
<tr>
<td>N. America</td>
<td>261</td>
<td>354</td>
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<tr>
<td>L. America</td>
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<td>878</td>
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<tr>
<td>Russia</td>
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<td>94</td>
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<td>APEC</td>
<td>1,360</td>
<td>2,063</td>
</tr>
</tbody>
</table>

### Residential Electricity Demand Per Person


(Source) APERC Internal Database
Total Primary Energy Demand in APEC (2002-2030)

- Oil: 1.9% p.a.
- Coal: 2.1% p.a.
- Natural Gas: 2.5% p.a.
- Hydro: 2.1% p.a.
- Nuclear: 1.8% p.a.
- Biomass and New Energy: 0.7% p.a.

(Source) Asia Pacific Energy Research Centre (2005)
Rising Oil Import Dependency

(Source) Asia Pacific Energy Research Centre (2005)
Natural Gas Trade: LNG and PNG

The Pacific Rim Natural Gas Trade (2003)

PNG

LNG

10 billion cubic meters of pipeline natural gas (PNG)

10 billion cubic meters (gaseous equivalent) of liquefied natural gas (LNG)

Percentage of Exports
- Oman: 26%
- Qatar: 53%
- UAE: 20%

Percentage of Exports
- Australia: 13%
- Brunei: 12%
- Indonesia: 18%
- Malaysia: 30%

(C) 2005 Circumpacifc Council
Sources: BP Statistical Review of World Energy 2004
United States Energy Information Administration

(Source) Circumpacifc Council (2005)
Required Capacity for Electricity Generation (2002-2030)

APEC electricity generation would require large scale capacity additions.

(Source) Asia Pacific Energy Research Centre (2005)
Energy Investment Requirements in APEC: Between US$5.3 Trillion to $6.7 Trillion (2002-2030)

(Source) Asia Pacific Energy Research Centre (2005)
Challenges for the Energy Sector of APEC

• **Energy Security**
  – Increasing Import Dependency
    • Oil and Natural Gas
  – Growing Need for Energy Infrastructure
    • Tankers, Pipeline, Refineries, Power Plants, and etc.
  – Looming Shortage of Human Resources for Energy Sector
    • Engineers, Operators and Scientists
  – Increasing Flow of Energy Transportation
    • Maritime Congestion, Sea-lane Security, Long Distance Pipeline Security

• **Investment**
  – Substantial Investment Requirements
    • Upstream, Midstream and Downstream

• **Environment**
  – Damaging Impact from Expansive Energy Use on Environment
    • Local and Global
Options for the Future

• Enhancing Energy Efficiency Improvement
  – Supply Side
    • CCGT, Clean Coal Technology, Fuel Cells
  – Demand Side
    • Electricity Appliances: Air Conditioner, Refrigerator, Washing Machine
    • Automobile: Fuel Efficient Automobile, Hybrid Vehicle

• Developing Alternative Energy Sources
  – New and Renewable Sources, Bio Fuels, Non-conventional Oil, LNG, and Advanced Nuclear

• Promoting Cross-border Resource Allocation
  – Power Interconnection
  – Oil Pipeline
  – Natural Gas Pipeline
  – Joint Stockpiling: Oil and Natural Gas