Asia’s Energy Future
Regional Dynamics and Global Implications

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An Outline

- The Big Picture for Oil
- Energy Challenges in Asia
- Focus on China and India
- Global Impact
- Future Energy Options
- Enhance Energy Security: Policy Priorities
- Concluding Remarks
The Picture of Oil

Platt's Dubai Monthly Price (Jan 2002 to Jan 2008) for Selected Asian Countries vs US and Europe (Jan 2002 = 100)

US dollar weakness reinforcing supply/demand pressures

Japanese Yen
Korean Won
Indonesian Rupiah
Thai Baht
Indian Rupee
Malaysian Ringgit
Chinese Renminbi
Euro
U.S. Dollar
World Annual GDP Growth—Weakening But Still Strong

*Does GDP growth really matter?*
Structural shifts in emerging economies driving oil demand
It is well-established that developing economies reach a ‘sweet spot’ where a manufacturing sector emerges, auto sales increase—and oil demand takes off.

Consumption base of countries in the take-off stage has increased.

Larger absolute size of the ‘take-off’ group set the stage for the 2004 demand spike.

Oil Demand of Countries in the $3,000-9,000/capita GDP (PPP) Range*

*excludes FSU
• Global vehicle ownership could more than double by 2030.
• China vehicle ownership could grow by some 20X by 2030.
• Vehicle ownership grows twice as fast as per capita income at $3,000-9,000/capita.
• Is this growth sustainable?
  • No, but the demand-side pressure is enormous.

**VEHICLE OWNERSHIP & PER CAPITA INCOME**

1971-2002

Source: IMF

Turning point
The movement of labor-intensive production overseas accelerated with the emergence of China as a low-cost manufacturing base.

**Trade-off:** increased energy use vs. reduced labor cost.
Middle East: booming economy + young population robust growth

Iran 2005 Population Distribution by Age (thousand people)

Japan 2005 Population Distribution by Age (thousand people)
Structural demand shift

Reasonably strong demand growth...even with high prices

<table>
<thead>
<tr>
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<th>Annual Growth 2007-15 (kb/d)</th>
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<tr>
<td>China</td>
<td>440</td>
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<td>India</td>
<td>130</td>
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<td>Other Asia</td>
<td>190</td>
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<td>Middle East</td>
<td>380</td>
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<td>Total</td>
<td>1.0-1.2 mmb/d</td>
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The East of Suez Demand Story


Asia Demand Highlights, ’07-15:
- China: 5.1%/year (+420-440 kb/d per year)
- India: 4.3%/year (+120-130 kb/d per year)
- Japan: 720 kb/d demand decline in ’07-15
- Total Asia: 2.9%/year

Middle East Demand Highlights, ’07-15:
- Saudi Arabia: 7.0%/year
- UAE: 5%/year
- Total Middle East: 5.4%/year (350-400 kb/d per year)
Changes in Non-OPEC Output, 2000-2025

- Additional Reserves/Discoveries
- New/Young Fields
- Existing Old Fields
Non-OPEC Production: Diminishing Growth Prospects

million b/d change vs year earlier

-0.8 -0.6 -0.4 -0.2 0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4

2006 2007 2008 2009 2010 2015 2020 2025

N America Europe L America Africa M East Asia/Pacific FSU Total
OPEC Coming to Fill the Supply/Demand “Gap”? 

- After a short-term spike, non-OPEC supply growth will slow and most likely reach a plateau sometime between 2012-2015.

- OPEC faces a natural decline of some 1.5 million b/d. *Adding capacity is very difficult as much new capacity is needed just to stay in the same place.*

- OPEC may have trouble adding up to 1 million b/d of additional capacity annually, which may be required once non-OPEC plateaus.
  
  ✓ Political, legal, and management problems are unlikely to allow for new capacity additions large enough to respond to the demand growth.

  ✓ *Is the oil there?* No one really knows for sure—reserves simply guesstimates driven by politics.

  ✓ *At the very least,* OPEC will have a comparatively easy time sustaining price levels.
Longer-Term Prospects: Incremental Oil Supply Pressures

Wishful thinking???
Can OPEC do this???
Does it want to???
Access to World Proved Oil Reserves

Note: NOC = National Oil Companies
Source: US Department of Energy

Geopolitical “peak” supply
- Full IOC access to less than 10% of reserves
- Supply economics have changed—potential producers not interested in maximizing short-term production.
Future is Clear…

Unstoppable Force: *Demand Growth*  
vs  
Immovable Object: *Supply Limitations*

Outcome: *Price Pressure/Increase*
High, Base, and Low Price Forecasts for Dubai, US$/bbl

Prices to Rise Higher?

* Actual up to 2007 and forecasts in 2008$ thereafter.

* What will choke off demand?

30%
60%
10%
Energy Challenges in Asia
Primary Commercial Energy Consumption by Source: World and Asia, 2006

World

- Gas: 24%
- Coal: 28%
- Nuclear: 6%
- Hydro: 6%
- Oil: 36%

Total consumption: 218 mmboe/d.

Asia-Pacific

- Coal: 49%
- Gas: 11%
- Nuclear: 3%
- Hydro: 5%
- Oil: 32%

Total consumption: 73 mmboe/d.
Structure of Oil Imports: the Asia-Pacific Region, 2006

Middle East: 79.0%
Africa: 12.3%
FSU: 3.7%
Latin America: 2.2%
Europe: 0.8%
U.S.: 0.9%
Canada: 0.0%
Others: 1.0%

Total imports (crude and products): 17.2 million b/d.
Asia Pacific Petroleum Product Demand, 1970-2020

Total Oil Product Consumption
Average Annual Growth Rate (AAGR)
1985 - 1995 5.5%
1995 - 2000 3.0%
2000 - 2005 2.8%
2005 - 2010 2.9%
2010 - 2015 2.6%
2015 - 2020 2.5%

*Includes Bunkering. **Includes Bunkering and Direct Use of Crude.
Historical Data and Projections for Crude Output in the Asia-Pacific Region
Asia-Pacific Crude Production and Export Availability*
1999-2015

*Note: Export availability refers to gross crude exports from all countries in the region.
Asia-Pacific Oil Production and Net Import Requirements, 1999-2015

Note: Oil production = crude output plus nonrefinery LPG.
Notes: AP inter-country trade is about 1,800 kb/d. Atlantic Basin crude supply increases from 2.3 to 3.5 mmb/d between 2005 and 2015. ME crude supply increases from 11.5 to 16.0 mmb/d over the same time period. AP is critically dependent on outside sources for its crude supply.
Energy Insecurity Index for the Asia-Pacific Region, The United States, and Europe

Energy Insecurity Index

Energy Insecurity Index for China, India, and Indonesia

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<td>Indonesia</td>
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Share of the Global LNG Market

**LNG Demand 2000**
- Total Asia Pacific: 72%
- Total Europe: 23%
- Total America (excl W. Coast): 5%

**LNG Demand 2007**
- Total Asia Pacific: 65%
- Total Europe: 24%
- Total America (excl W. Coast): 11%

**LNG Demand 2015**
- Total Asia Pacific: 54%
- Total Europe: 24%
- Total America (excl W. Coast): 16%

**LNG Demand 2000**
- Total Asia Pacific: 72%
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**LNG Demand 2007**
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Established LNG Markets
New LNG Markets
Potential LNG Markets
Producing Countries with Long-Term Contracts to Asia
New Producing Countries with Long-Term Contracts to Asia
Radical Change in LNG Equation

Gas/LNG prices have risen for five distinct reasons:

1. **Higher oil prices** mean higher natural gas prices, though gas prices are capped by interfuel competition.

2. **Construction costs** have risen significantly!

3. **The United States** has entered the LNG market from virtually zero…likely to become the second largest LNG importer behind Japan after 2010.

4. **Indonesia**, once the world’s largest LNG exporter is heading for a substantial decline of exports (except for Tangguh) due to resources problems and political pressure to divert to the domestic market.

5. **Qatar** holds most of the cards in the near term…and they know it!
Outlook for Asia-Pacific LNG Demand

(mtpa)

- Japan
- Korea
- India
- China
- Taiwan
- Other Asia
- US West Coast

Interactions Between East and West:
Important Implications for Trade, Prices, Contracts, etc.
Focus on China and India
Primary Commercial Energy Consumption in China, 1980-2008

Note: 2007 data are preliminary and 2008 data are projections.
Profits of Chinese State Oil Companies, 1997-2007

*2007 data are estimates.
Note: 1970-2006 data are actual; 2007 is preliminary; 2008-2020 data are projections.
China's Oil Exports & Imports, 1980-2008

Note: Data for 2008 are projections.
China Crude Production and Net Oil Import Requirements, 1990-2020

Note: 1990-2006 data are actual; 2007 data are preliminary; 2008-2020 data are projections.
Actual and Derived Domestic Daqing Crude Prices
June 1998 - March 2008
China's LNG Demand at Different Prices

- LNG Contracted (mtpa)
- Total LNG Demand @ $6/MMBtu DES
- Total LNG Demand @ $10/MMBtu DES
- Total LNG Demand @ $12/MMBtu DES
- Total LNG Demand @ $15/MMBtu DES

MTPA:
- Total LNG Demand @ $6/MMBtu DES
- Total LNG Demand @ $10/MMBtu DES
- Total LNG Demand @ $12/MMBtu DES
- Total LNG Demand @ $15/MMBtu DES
China’s Strategic Petroleum Reserves (SPRs)

- Plan for Phase I (by 2008): 103 million bbl (approximately 31 days of net imports or 15 days of total consumption)
  - The four selected sites for Phase I, totaling some 100 million bbl:
    - Zhenhai (Zhejiang) by Sinopec: 33 million bbl
    - Zhoushan (Zhejiang) by Sinochem: 31 million bbl
    - Huangdao (Shandong) by Sinopec: 20 million bbl
    - Dalian (Liaoning) by PetroChina: 19 million bbl

- Target for Phase II (2010): Another 204 million bbl, totaling 305 million bbl (approximately 60 days of net imports or 35 days of total consumption)
China’s Energy Security Strategies:

- Rely on domestic energy sources (i.e., coal) in general and enhance domestic oil/gas exploration activities in particular to maximize production
- Diversify the sources of oil and gas imports
- Strengthen and deepen overseas upstream energy investments
- Increase investments in oil and gas infrastructure and expand channels to energy imports
- Establish and expand the SPRs, and
- Pursue integrated strategies for enhancing energy, economic, and national security
India's Oil Consumption Outlook

Total Oil Products Consumption average annual growth rate

- 1986 - 1996 7.2%
- 1996 - 2006 3.4%
- 2006 - 2010 4.7%
- 2010 - 2015 4.1%

*includes bunkering, **includes bunkering & direct burning of crude

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<tr>
<th>Year</th>
<th>Fuel Oil*</th>
<th>Gasoil*</th>
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India’s crude oil dependency will grow with strong growth in refining capacity. We project that India’s crude imports will reach over **4.0 million b/d by 2015**. Currently, more than 70% of crude imports come from the Middle East and some 17-18% from the Atlantic Basin.
Future Energy Options

- Nuclear fuel: Is it coming back? Yes, it has to and there is no option—particularly for China and India
- Diversification of oil supplies for energy security: Little impact, the oil market is a swimming pool, it is all connected
- Cooperation among Asian countries in many areas such as strategic and common oil storage, pipelines, investments: Possible and needed but difficult. Competition will continue
Future Energy Options (cont’d)

- **GTL/CTL/CTG:** Limited. GTL, beyond the project in Qatar, is highly unlikely with high gas prices. Rising coal prices, much higher construction costs, and environmental concerns mean limited coal conversion to oil or gas.

- **Canadian tar sands or Venezuelan heavy oil:** Good potential overall but may have limits and huge investment is needed.

- **What about biofuels?**
Biofuels to the Rescue?

NYMEX Oil vs Biofuel Feedstock Price Indices

Jan 2006 Base = 100

US Corn (CBOT)  Malaysia CPO  NYMEX Oil (WTI)

Biofuels will certainly have a real impact at margin...but questions about environmental friendliness and economics are emerging.
Global Impacts
The World's Ten Largest Primary Commercial Energy Consuming Countries, 2006

- U.S.
- China
- Russia
- Japan
- India
- Germany
- Canada
- France
- U.K.
- South Korea

(mboe/d)
The World's Ten Largest Oil Consuming Countries, 2006

- U.S.
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- Japan
- Russia
- Germany
- India
- South Korea
- Canada
- France
- U.K.
Asia-Pacific Region's Oil Consumption in the Global Context

(mmb/d)

Share

Asia Consumption
Asia's Share in World

85 87 89 91 93 95 97 99 01 03 05 07

15% 17% 19% 21% 23% 25% 27% 29%

15% 21% 23% 25% 27% 29%
China's Oil Consumption in the Global and Asia-Pacific Regional Contexts

- **China Consumption**
- **Share of China in the World**
- **Share of China in Asia**

(mmb/d)
Outlook for China and Asia Oil Consumption in the Global Context

Note: 2008-2020 are projections.
Enhancing Energy Security: Policy Options

- Build up strategic oil stocks
- Establish a regional futures market for oil and natural gas
- Strengthen regional cooperation
- Mitigate the domestic impacts of short-term market instability
Enhancing Energy Security: Policy Options (cont’d)

- Initiate joint ventures with energy producers
- Reduce transportation bottlenecks
- Limit energy consumption through conservation measures
- Improve the efficiency of energy markets
- Increase domestic energy supplies
Enhancing Energy Security: Policy Options (cont’d)

- Expand the use of natural gas for power generation
- Accelerate the development and expansion of clean coal technologies
- Expand the use of nuclear power
- Support the development of alternative fuels
- However, market is the ultimate determining factor for all sustainable and effective policies!
Concluding Remarks

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- Asia has a higher share of coal use than the world average and natural gas is underutilized.
- Oil insecurity is one of the most vulnerable spots in Asia.
- Asia-Pacific region is the largest oil consuming region with a super high reliance on Middle Eastern oil.
- Asia is also the fastest growing region in terms of oil demand, leading to only higher dependence on imported oil.
Concluding Remarks (cont’d)

- China and India are important players not only in Asia but also for the world at large. China in particular will have a major impact on future oil demand in Asia and the world.
- Non-fossil and non-conventional energy will play a bigger role in the global energy scene but in the foreseeable future, the dominance of fossil energy will not go away.
- There are ways to enhance energy security in Asia. Policy priorities need to be set. However, for any sustainable solution, market has to play a central role of make it effective and workable.
Thank You