Changing Landscape of LNG Business in the APEC Region

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  – Economic, Financial and Regulatory Barriers
Total Primary Energy Supply in APEC (1980-2020)

TPES growing at an annual rate of 2.1 percent (1999-2020)

Source: APERC (2002), “APEC Energy Demand and Supply Outlook 2002”
Outlook for Natural Gas by Region (1980-2020)

Source: APERC (2002), “APEC Energy Demand and Supply Outlook 2002”

Note: IEA data for Viet Nam is available from 1986 onwards and Russian data is available from 1992 onwards, hence these are respectively included from 1990 and 1999 onwards.
Natural Gas: Incremental Growth by Sector and Region (1999-2020)

Power sector will drive natural gas demand growth

North America, Russia and China absorb two-thirds

Source: APERC (2002), “APEC Energy Demand and Supply Outlook 2002″
Why Natural Gas?

- Easy to use
- Clean
  - Neither SOx, nor NOx
  - Urbanization
- Mature market
  - Competitive price
  - Many sellers and many buyers
Two Modes of Transportation

• **LNG** (Liquefied Natural Gas) and **PNG** (Pipeline Natural Gas)

• **Determining Factors**
  – Distance, Volume and Destination (Blue Stream Project)

• **LNG**: Popular and preferred choice
  – Strong gas demand in ever growing power sector
  – LNG is growing more rapidly due to the relative cost reduction, abundant supply, mature technology, and increasingly flexible contract terms and conditions
Transportation Costs by Types of Natural Gas Trade

US Net Imports of Natural Gas, 1970-2025 (trillion cubic feet)

Outlook of LNG for APEC

Expansion of LNG use in new locations (China, the Philippines, USA) is in sight.

<table>
<thead>
<tr>
<th>Year</th>
<th>USA (EIA 04)</th>
<th>Japan (APERC)</th>
<th>Korea (APERC)</th>
<th>China (APERC)</th>
<th>Chinese Taipei (APERC)</th>
<th>Phillipines (APERC)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>4.2 million ton</td>
<td>54.5%</td>
<td>17%</td>
<td>17</td>
<td>5.6</td>
<td>94%</td>
<td>81</td>
</tr>
<tr>
<td>2010</td>
<td>46.2 million ton</td>
<td>62%</td>
<td>26%</td>
<td>16</td>
<td>9.5</td>
<td>91%</td>
<td>160</td>
</tr>
<tr>
<td>2020</td>
<td>86.94 million ton</td>
<td>69%</td>
<td>37%</td>
<td>56</td>
<td>16.7</td>
<td>95%</td>
<td>268</td>
</tr>
</tbody>
</table>

LNG Developments

• Supply
  – Abundant supply
    • Lots of green projects, significant debottlenecking potential, and new suppliers in the horizon
  – Significant cost reduction
    • In all stages of fuel chain including liquefaction, transportation, and re-gasification

• Demand
  – Robust growth
    • Power sector in China
LNG Supply Cost Reduction

Technology development and improvement in operation helped reduce the total supply cost.

Source: CEDIGAZ

Source: Recreated from the data available at Poten & Partners website

Existing and Proposed LNG Receiving Terminals in China and India

LNG Supply from Australia

Flexibility in LNG Contracts

• Shorter duration
• Price flexibility
  – Evolution of pricing
    • Cost Plus ? Crude Oil Parity, Petroleum Product Price Indexation ? Electricity Price Parity ?
  – Stable price regime
    • Price floor/ceiling
    • Decoupling with crude oil price
• Volume flexibility
  – DQT/UQT ? 10%~ 20%
• Periodical price review

Source: APERC Analysis (2005)

Decoupling with crude oil price?

Other Notable Developments

- Equity participation of buyers in upstream
  - CNOOC in Tangguh Project
  - KOGAS in Oman Project
  - TEPCO and Tokyo Gas in Darwin Project
- Emergence and increase of short-term and spot deals
- Technology seems as though entering the mature stage
- Recently passed US energy bill to give the federal government authority to construct LNG terminals
Nevertheless …

- **Economic barriers**
  - Demand security? affordability in many developing economies – per capita income
    - Gas has to compete against coal
      - China’s plan for reform for electricity price – indexation to coal price
    - High distribution cost – China’s city gas demand

- **Financial barriers**
  - High, initial capital cost? take-or-pay

- **Regulatory/Institutional barriers**
  - Siting, zoning regulations
    - BANANA (Build Absolutely Nothing Anywhere, Anytime, Near Anybody) in US
  - Environmental regulations
Final LPG demand in China for 1990-2002 represented an annual growth rate of 22%.

List of APERC’s Publications on Natural Gas

- Natural Gas Infrastructure Development in Northeast Asia (2000)
- Natural Gas Infrastructure Development in Northeast Asia (2000)
- Natural Gas Infrastructure Development in Southeast Asia (2000)
- APEC Energy Pricing Practices Natural Gas End-use Prices (2001)
- Gas Storage in the APEC Region (2002)
- Natural Gas Market Reform in the APEC Region (2003)