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## **RIS** Discussion Papers

### **Regional Cooperation for Asian Energy Security**

**Vipul Tuli**

**RIS-DP # 112**



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## Regional Cooperation for Asian Energy Security

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Vipul Tuli\*

*Abstract:* This paper attempts to convey three key messages: First, we believe interdependence in energy among Asian countries is vital for the economic development of key Asian countries. Second, there are several key impediments to increasing Asian interdependence; we believe addressing these impediments is critical. Finally, we suggest some ideas on opportunities for Asian nations to find a common ground on energy security, stability and sustainability.

### Introduction

The global energy industry is on the threshold of some very exciting changes and Asia is at the centre of these changes. Energy decision makers in Asia have the power to shape the future of the world's energy landscape. This paper attempts to convey three key messages: First, we believe interdependence in energy among Asian countries is vital for the economic development of key Asian countries. Second, there are several key impediments to increasing Asian interdependence; we believe addressing these impediments is critical. Finally, we suggest some ideas on opportunities for Asian nations to find common ground on energy security, stability and sustainability. The ideas described are not exhaustive, and there are several other areas of cooperation that Asian economies can pursue. We believe Asia is well-positioned to shape the future of the world's energy landscape.

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\* Principal, McKinsey & Co., New Delhi. An earlier version of this paper was presented at the Fourth High-Level Conference on "Building a New Asia: Towards an Asian Economic Community" on November 18-19, 2005, New Delhi, organized by RIS and ISEAS with the support of Sasakawa Peace Foundation, Japan, and UNDP Regional Centre, Colombo.

### Why regional cooperation within Asia is vital

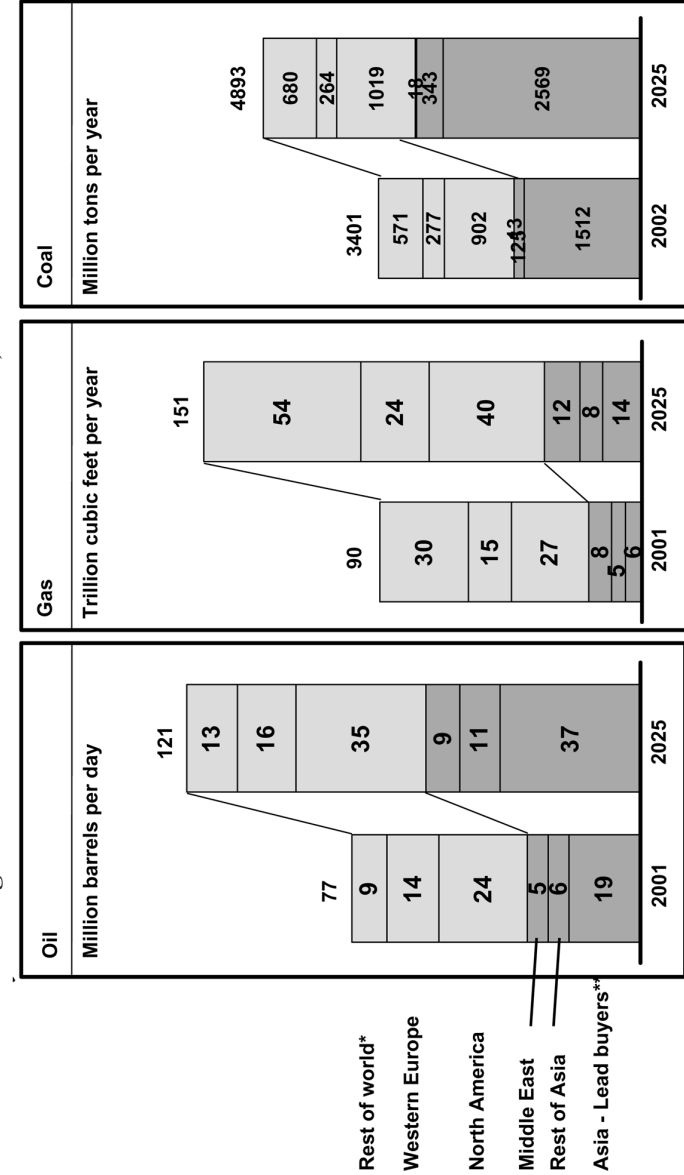
Let us start by reiterating why Asian cooperation is vital for both consuming and supplying nations. In general, we use the term Asia in its widest sense, including the Middle East, South and South East Asia and the Far East. When it comes to specific issues, though, we will refer to the relevant sub-region like the Middle East, or to individual countries. There are four main reasons why Asian cooperation is vital:

First, Asia is likely to become a dominant consumer in both the global and regional energy industry. Major Asian buyers already account for about 50% of global coal demand, 20% of global oil demand and 6% of global gas demand (IEA, 2001). As can be seen from figure 1 below, over the next 20 years, Asian demand is likely to be the primary growth engine accounting for 38% of global oil demand, 14% of global gas demand and 60% of global coal demand in 2025. Asian demand for oil, gas and coal is expected to increase to 57 million barrels per day (mb/d), 34 trillion cubic feet per year (tcf/y) and to 2930 million tons per year by 2025 respectively.

The implications of this are dramatic – by 2010, Asian oil demand will be higher than that of North America. By 2025, it will be 2½ times the size of Western European demand, with China, India, South Korea and Japan being the primary consumers. India alone will become the 4<sup>th</sup> largest oil consumer and the third largest coal consumer in the world.

Second, much of Asia’s oil and gas production is already consumed within the region, driven by economic logic. As can be seen from figure 2 below, in the year 2003, 55% of crude oil is consumed within the region. The major consumers are Japan, South Korea, India, and China and the major regional suppliers are the GCC countries like Saudi Arabia, Kuwait, UAE, Oman, Qatar and others like, Yemen, Iran, Iraq and some South East Asian countries like Indonesia, Malaysia, and Brunei. This interdependence between consumers and producers in Asia is driven by the geographical setting and economic fundamentals of demand and supply factored by the favourable transportation costs.

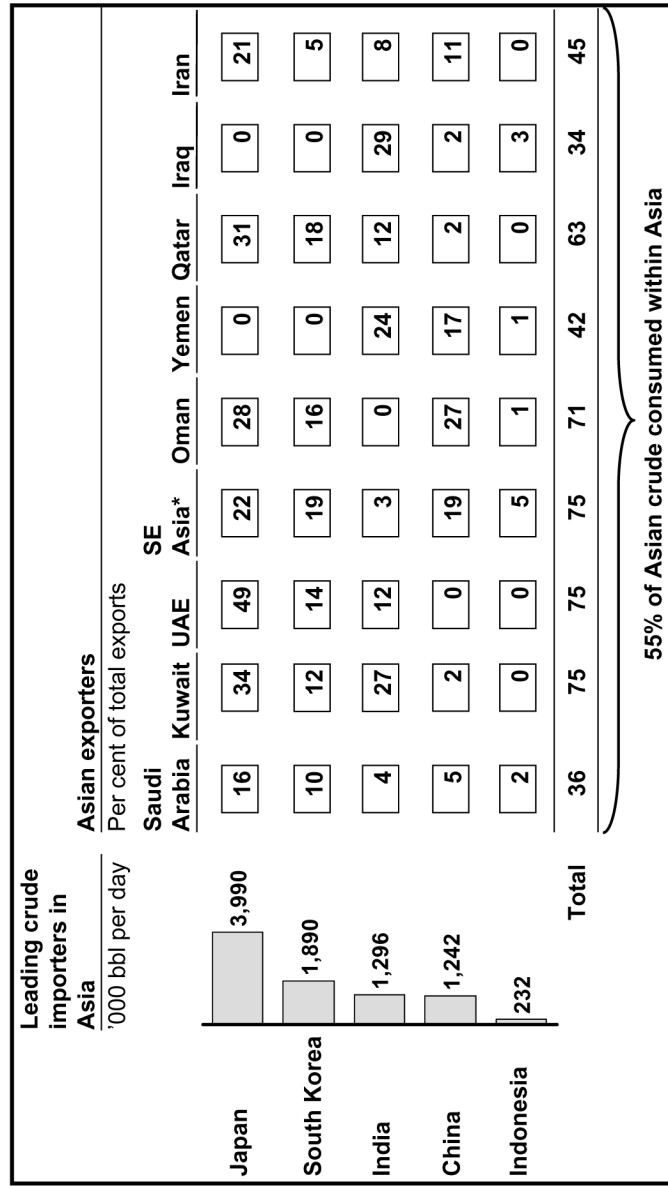
Figure 1: Asia: Dominant Consumer of Oil, Gas and Coal



\* Includes Africa, Eastern Europe, New Zealand, Australia and former Soviet Union countries.  
 \*\* India, China, South Korea, Japan.

Source: International Energy Outlook (IEA).

Figure 2: 55% of Asian Crude Currently Consumed within Asia, 2003.



\* Indonesia, Malaysia, Brunei.

Source: BP Statistical Review of World Energy 2004; World Oil Trading 2003.

Moreover, for gas, as can be seen in the figure 3, this picture is even more extreme: 95% of Asian gas is currently consumed within Asia. Maintaining and even increasing the inter-Asia supply interdependence makes economic sense.

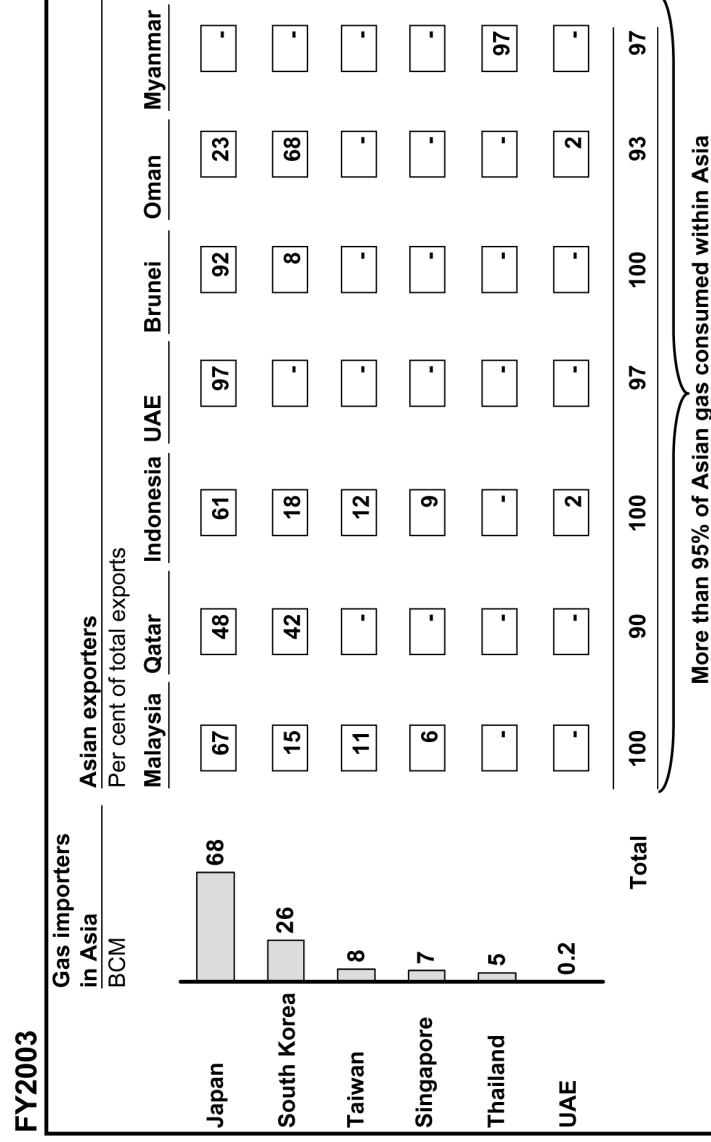
The conventional economic principle underlying supply of gas suggest that supplying gas from the Middle East to China (or India) could result in higher netbacks for producers relative to the US due to lower transport costs, assuming that longer term market prices for gas tend to be similar across regions. This also applies to crude oil.

Figure 4 depicts one such illustration. As evident, disaggregation of the components of gas supplying costs gives a differential of US\$ 0.90 per one million metric btu of gas supplied from Qatar to US and that quantity supplied to China in Asia. However, other concerns such as diversity in supply and terrorism are increasingly influencing the choice of supply source. For example, a terrorist attack in the straits of Malacca could disrupt supplies to the Far East.

Third, improved Asian linkages are critical for Middle East and South East Asian suppliers to grow their share in global energy revenues. We are at a critical juncture in the development of world energy markets. To illustrate this, we would like to share two key scenarios distilled from McKinsey's extensive research on the future of energy markets. These scenarios are developed on the basis of the transformation of the global oil and gas market as a result of world economic reorganization where Asian emerging markets have become the main consumers of oil and gas exported from the major suppliers in the region, as their previous world market share has decreases and being reorganized.

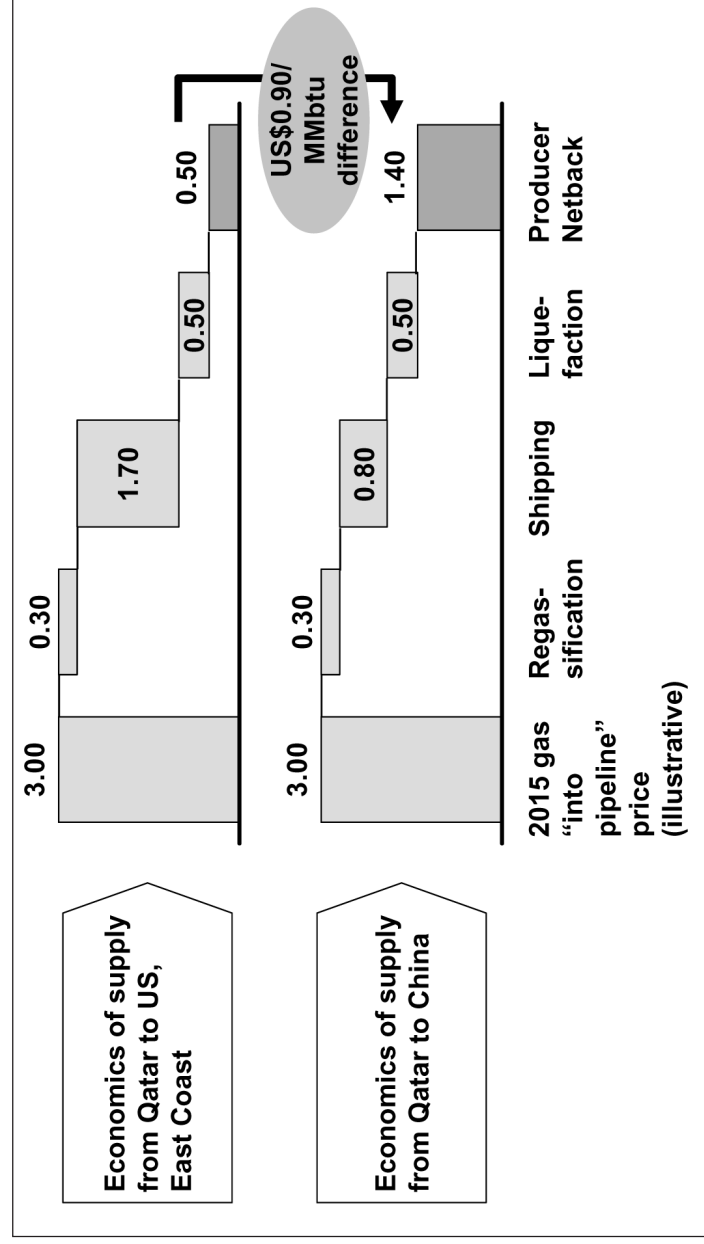
McKinsey's extensive research on the 'Future of Energy Markets' envisages two broad scenarios. In the first scenario, OPEC and non-OPEC nations follow a **balanced approach**, keeping capacity addition in line with demand growth, and maintaining current market shares. The second scenario is a **boom-bust scenario**, where supply tightness drives prices up, triggering significant non-OPEC supply and market share growth for non-OPEC

**Figure 3: More than 95% Asian Gas Production is consumed within Asia**



Source: BP Statistical Review of World Energy 2004; World Oil Trade 2003.

**Figure 4: Supplying Within Asia is more Profitable: Natural Gas Illustration**



Source: McKinsey Global Gas Model.

countries. This market dynamic in turn, could induce aggressive capacity building by OPEC, a pattern that we saw in the eighties; this would help OPEC regain share, but at the cost of lower oil prices and significant revenue loss.

As can be seen from figure 5, the balanced world approach will lead to higher economic growth, higher demand for oil and a larger share and size of OPEC production. The size of the prize is large.

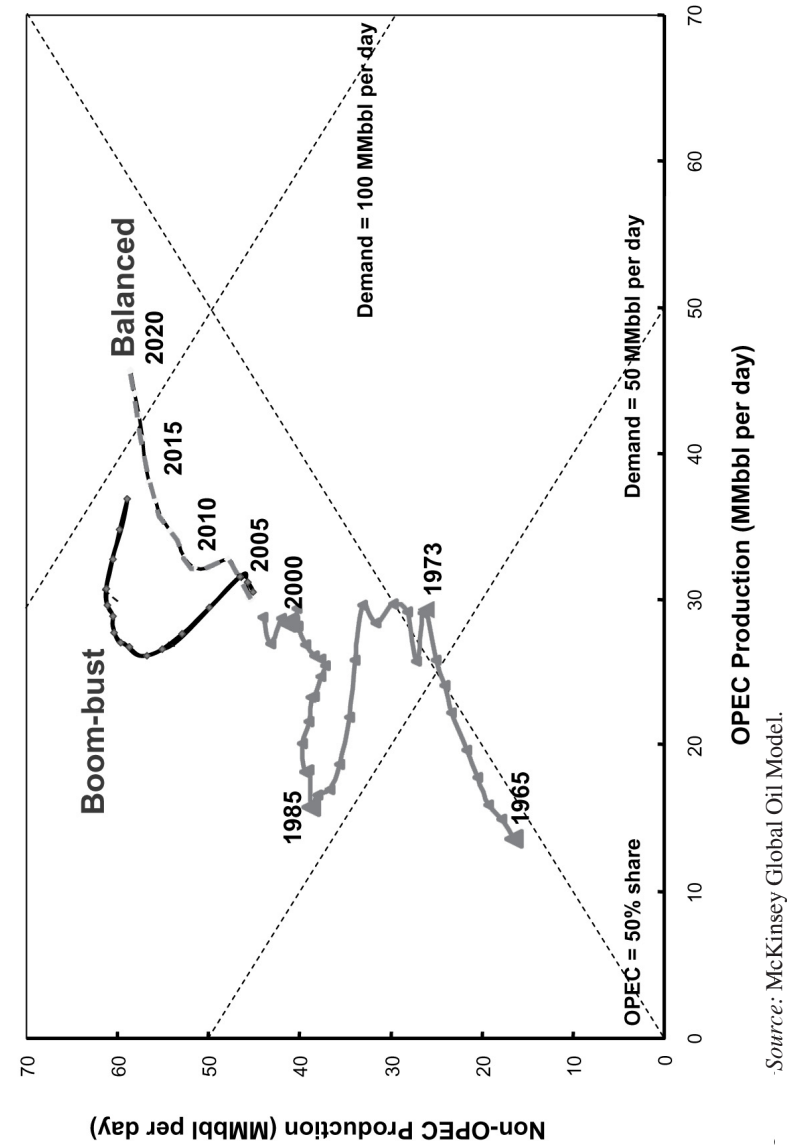
We argue that a boom-bust scenario can cause substantial damage to supplier nations by slowing down investments targeted at improving social infrastructure like education and healthcare. As per our estimates, the annual oil revenue for OPEC is expected to be US \$295 billion in the balanced scenario and only US \$ 166 billion in Boom-bust scenario. This implies that there is huge gap in the form of revenue needed for social sector investment in the OPEC supplying countries, thereby signifying the importance of market stability for the producers.

Moreover, there is an additional reason why Asian linkages are critical for major producers. As you can see from figure 6, the crude slate from the Middle East is getting heavier and sourer and Asia has low availability of complex refining capacity to process such crudes. Therefore, additional investments will be needed in consuming nations to realize the full economic value of the Middle Eastern crudes.

Fourth, greater interdependence is also critical for Asian consuming nations to reduce energy market volatility and ensure greater stability. Continued economic development of consuming countries hinges on stable energy prices. For example, as you can see from table below, domestic and international experts believe that volatility in energy prices can easily shave off 5-10% of China’s potential GDP growth, and is the second largest potential shock to growth.

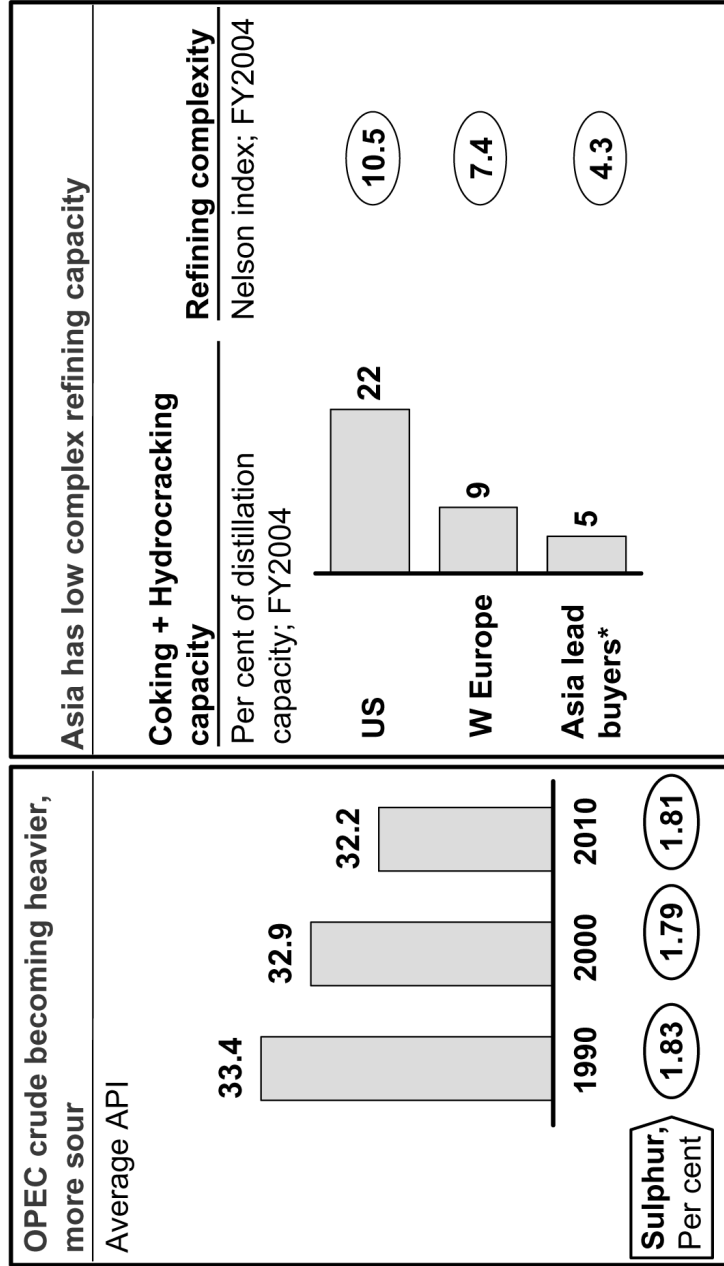
Thus, clearly, the potential for both upside and the downside cooperation for all Asian countries is very high.

Figure 5: Balanced Approach Increases Share and Volumes



Source: McKinsey Global Oil Model.

Figure 6: Huge Investment Requirement for Complex Refining



\* China, Japan, India and South Korea.  
Source: FACTS.

Table 1: Importance of Market Stability for Consumers: China Example

Type of shock	Lost GDP growth
<b>Financial</b>	
• Local Liquidity Crisis	
• Local non-performing loan Implosion	10-20%
<b>Energy</b>	
• Input price shock	
• Distribution Shock	5-10%
<b>Natural Disaster</b>	
• Grains Shortage (Floods)	
• Destruction of Major Cities or transportation Hub	2%
<b>Public Health</b>	
• Infectious Disease	NA

**Impediments to greater Asian Cooperation do exist today**

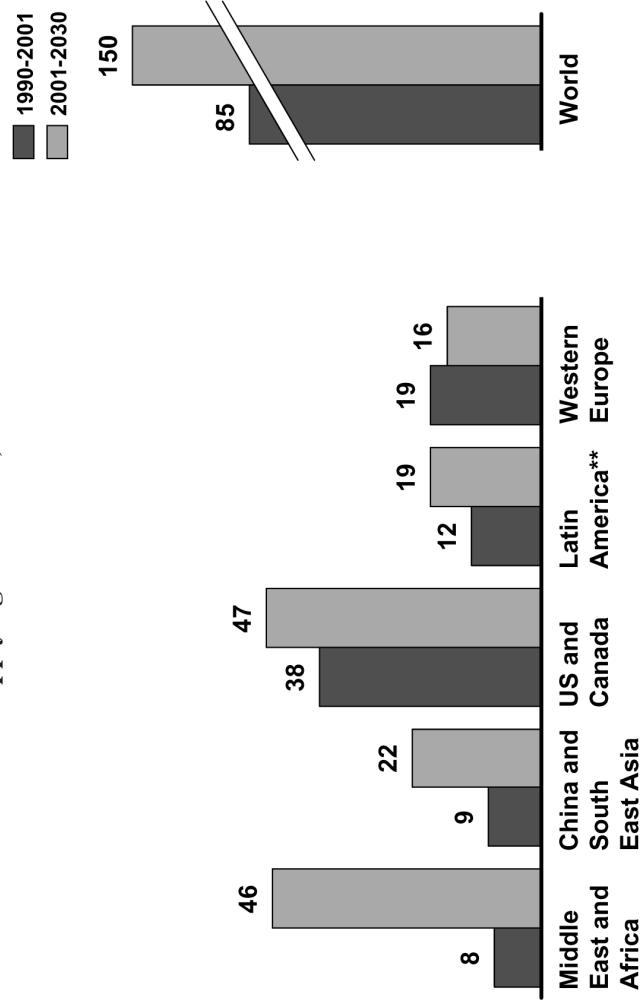
There are the key issues that will need to be addressed to clear the way for true Asian cooperation. The first set of issues pertains to Asian interdependence in oil. We believe that three issues currently hinder oil interdependence in Asia:

**The first issue is that oil supply is projected to remain tight and large, risky investments are needed to increase supply.** While supply is expected to remain tight, we believe significant options still exist to increase future production. Longer term, most supply growth will need to come from OPEC, Russia and unconventional sources. However, realizing these production increases will entail significantly higher investments. As shown in figure 8, investments to increase supply will be larger and more risky. For the Middle East and Africa alone, capital investment will need to increase from \$8bn p.a. in the last decade to \$45bn p.a. for the next three decades.

Moreover, despite their strong financial position due to the higher oil prices in recent years, supplier countries are likely to require external funding to sustain such large capital investments, if they are to ensure adequate focus on social investments and nation building, assuming an oil price of \$30/bbl. Figure 9 shows the external funding requirement of OPEC member countries



**Figure 8: Annual Upstream Capital Investment Requirements in Supplying Countries, US \$ Billion.**



Both oil and gas – Oil includes investment for E&P, non conventional oil, and refining; Natural gas includes E&P, transmission storage, LNG and distribution.

\*\* Includes Mexico.

Source: IEA World Energy Investment Outlook 2003; *Worldwide Petroleum Industry Outlook*.

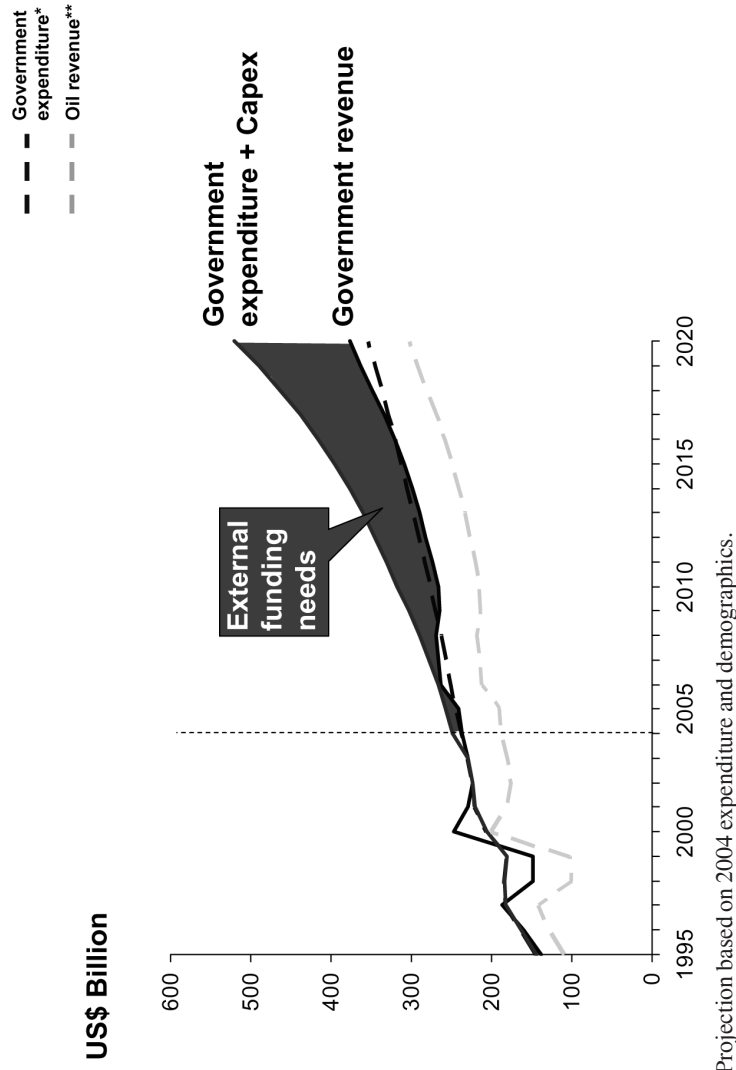
reflected through the widening gap between government revenue and government expenditure plus Capex requirements for the period 2005-2020, assuming an oil price of \$30/bbl. Thus, a subject for consideration, therefore, is whether collaboration within Asia could help bridge this investment gap.

**The second issue is that significant downstream investments are needed in consuming nations to meet Kyoto commitments.** To meet the environmental standards specified in the Kyoto protocol, substantial desulphurisation and coking investments are needed. Therefore, another area for discussion is the relative economics for consuming nations between desulphurization investments in refining vs. upstream investments in securing sweeter crudes from regions other than the Middle East.

**Third, Asian energy markets are currently neither deep nor transparent, relative to the developed markets in North America and Europe.** To start with, Asia as a whole has lower levels of crude storage compared to North America and Western Europe. Except Japan and Korea, who are IEA members and have 161 and 100 days of crud storage capacity measured in days of consumption, other big countries such as China and India have only 13 and 6 days of reserves in storage respectively.

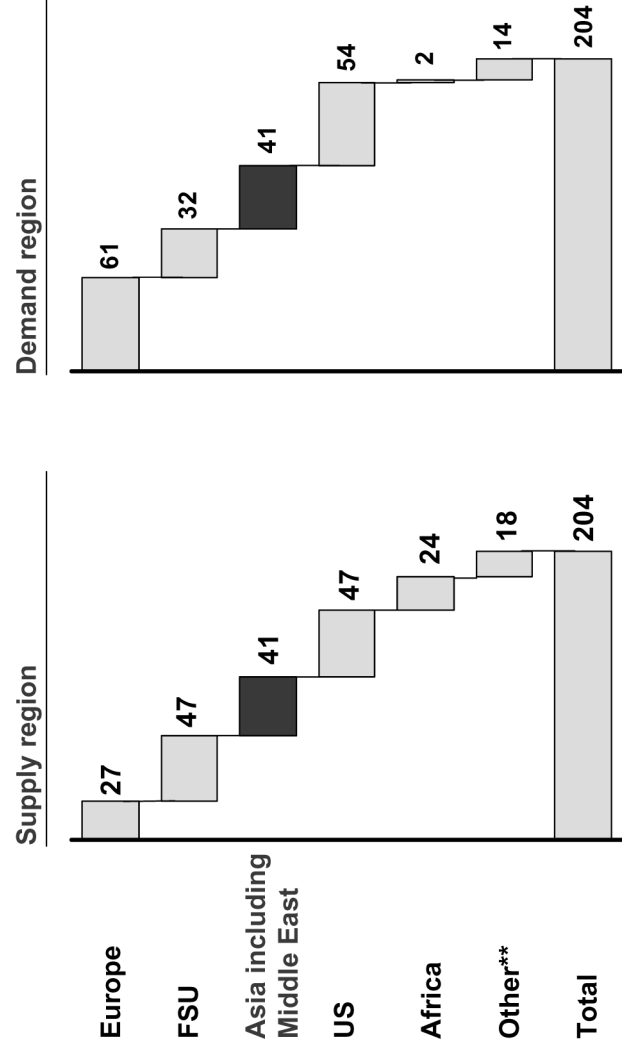
Moreover, the oil market in Asia falls short on all the key elements that characterize an efficient market. First, there is no Asian market with the active backing of key demand and supply centers and sophisticated financial markets. Second, the markets are not backed by adequate storage and delivery facilities that can control excessive speculation. Third, appropriate regulatory mechanisms need to be put in place, for example, clear settlement, clearance and arbitration processes. Finally, the market doesn't have adequate scale to offer participants liquidity. Such an under-developed market results in buyers not being able to hedge risks and heightens supply security concerns. Sellers also lose out as they leave significant money on the table because of the 'noise' caused by volatility in marker crudes that do not reflect physical trades in Asian markets. Putting in place the building blocks for creating a vibrant Asian market would be another topic to consider.

**Figure 9: External Funding requirements in Supplying Countries: OPEC Example**



Notes: \* Projection based on 2004 expenditure and demographics.  
 \*\* Assumes oil price of US\$30/bbl.  
 Source: BP Statistical Review; Goldman Sachs; McKinsey Global Oil Model; McKinsey analysis.

**Figure 10: Asian Gas market: Third largest Margin Pool in the World**



Notes: \* Margin defined as total net-back in chain, i.e., gas price in demand region minus regas, shipping, liquefaction and production cost  
 \*\* Latin America (including Mexico), Canada, Australia, New Zealand.  
 Source: McKinsey Global Gas Model.

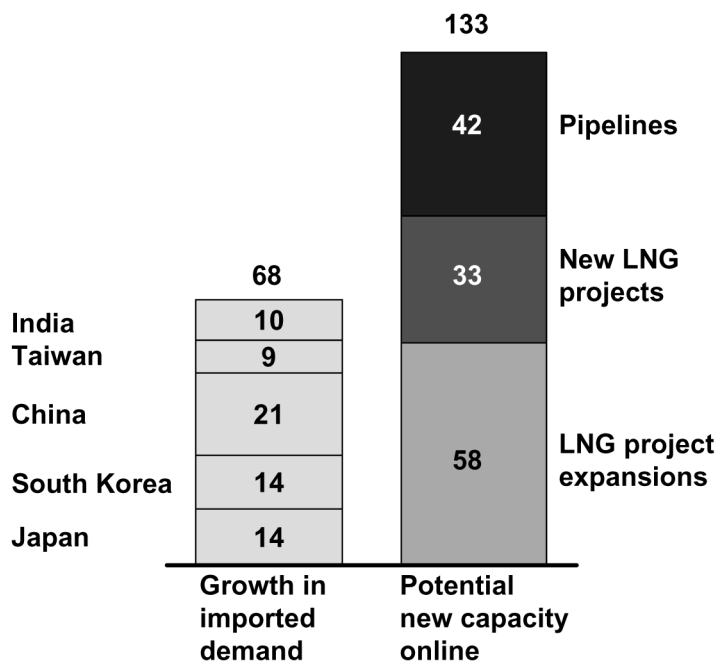
**The second set of issues pertains to Asian interdependence in gas.**

Asia offers a large margin pool for investors in gas over the next 10 years. In fact as shown in figure 10, the Asian margin pool is expected to be the third largest in the world. As a result, several large LNG and pipeline investments have been planned to meet growing demand (see Figure 11).

McKinsey’s assessment of the future of the global gas market suggests that the Asian market for gas will be even more difficult than oil, making interdependence even more critical. There are four main impediments for collaboration that countries need to consider:

**First, the lack of a liquid market for gas in Asia will make investments risky.** Asia does not yet have the number of buyers and sellers,

**Figure 11: Proposed Gas Projects in Asia**



*Note:* \* New capacity includes Asia-Pacific countries, Oman, Qatar, UAE and Russia.  
*Source:* BP Statistical Review 2001; Energy Information Administration; Press Research.

liquidity, physical infrastructure or institutional trading mechanisms necessary to sustain a traded gas market. One of the key reasons for the absence of liquidity is the lack of cross-border pipelines linking multiple demand and supply centers – such pipelines have been instrumental in creating liquidity in Europe.

**Second, gas investment plans, particularly in India and China, will need to factor in competition from coal in power generation.** As evident in the figure below, with some of the largest reserves of coal in the world available in the Asian region, Asian power generators are unlikely to be able to pay much more than about US\$3 per mmbtu on a sustainable basis.

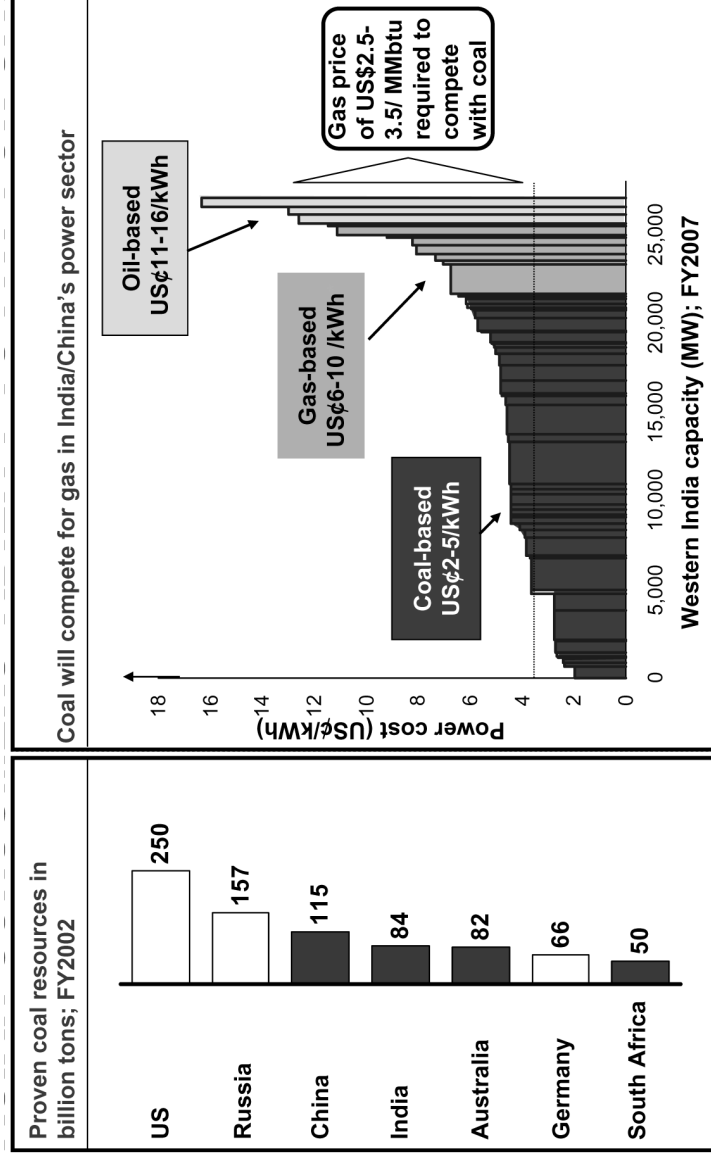
**Third, LNG and pipeline projects will compete for markets.** In comparison to the 1980s, the relative economics of LNG and pipelines are changing, with pipelines becoming competitive over longer distances. LNG, however, will continue to offer advantages over longer distances, over politically risky routes, and for market seeding.

**Fourth, gas pipelines inherently require nations to work together.** Already, gas pipelines from the Middle East to India, from South East Asia to India, and within South East Asia appear economically viable.

Therefore, creating a vibrant gas market and accelerating these various gas infrastructure projects will require a high level of collaboration and orchestration amongst countries.

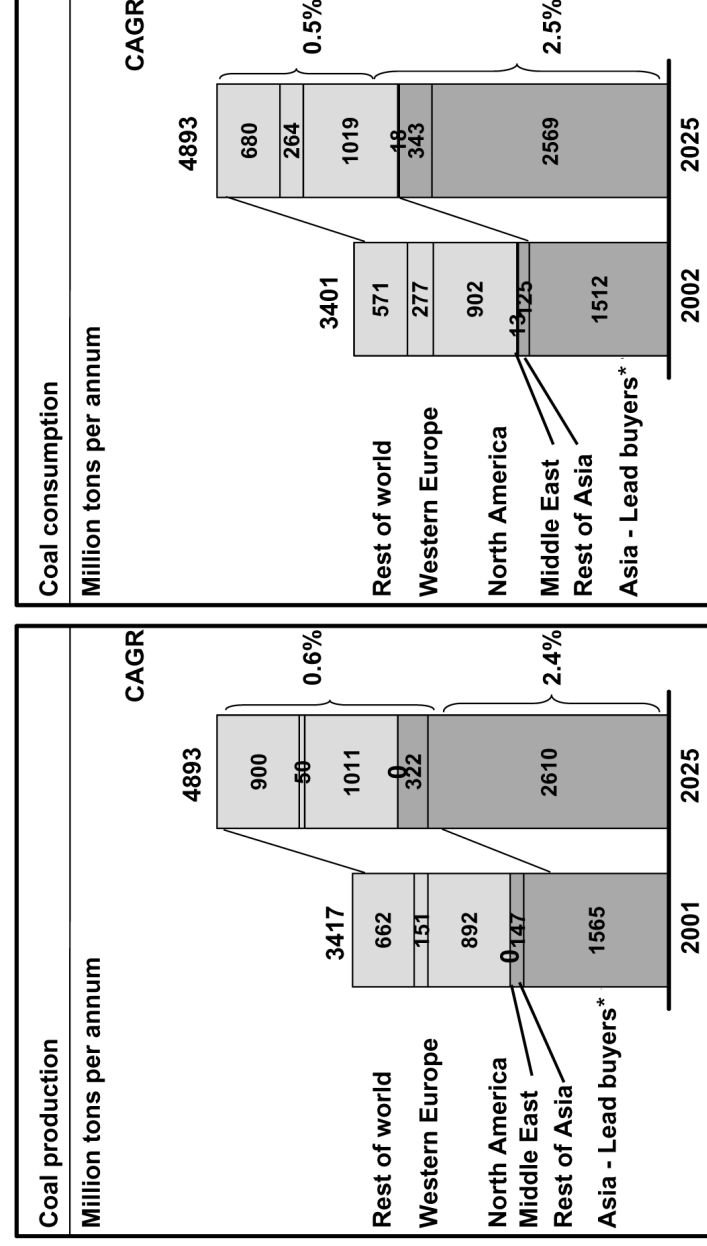
**The third set of issues pertains to Asian interdependence in coal.** Asia offers a large market for coal over the next 10 years. In fact as shown in figure 13, Asian region could be the largest consumer and producer of coal in the world by 2010. A drop in coal demand in Europe due to Kyoto could potentially accompany this increase in Asian demand. Therefore, Asian countries need to make substantial investment in coal mining and development of clean coal technology (CCT).

Figure 12: Coal vs. Gas in Power Generation in Asia



Note: \* Assumes gas price of US\$4/MMBtu.  
 Source: International Coal Handbook; BP Statistical Review; McKinsey analysis.

Figure 13: Coal Production and Consumption in Asia, 2001-2025



Note: \* Japan, Taiwan and Korea.  
 Source: International Annual Outlook (IEA).

McKinsey’s assessment of the coal industry suggests that opening up of the coal sector in countries like India is critical to attract the required investment and technology. There are three main reasons for this:

- **Closed nature of the coal mining sector**

The coal mining sector in India and China is dominated by government-owned mining companies and private investment (either domestic or foreign) is limited to certain types of investors. There is little competition in the coal market and as a result, mining costs are higher, despite lower labour costs. This prevents transfer of skills through JVs and partnerships from large coal exporters like Australia, South Africa and Indonesia.

- **Weak financial and execution capability of National Coal Companies**

Incumbent coal companies often lack the financial capability and skills to bring the domestic reserves to market. India, for instance needs to double its coal production by 2012 to meet the growing demand for electricity.

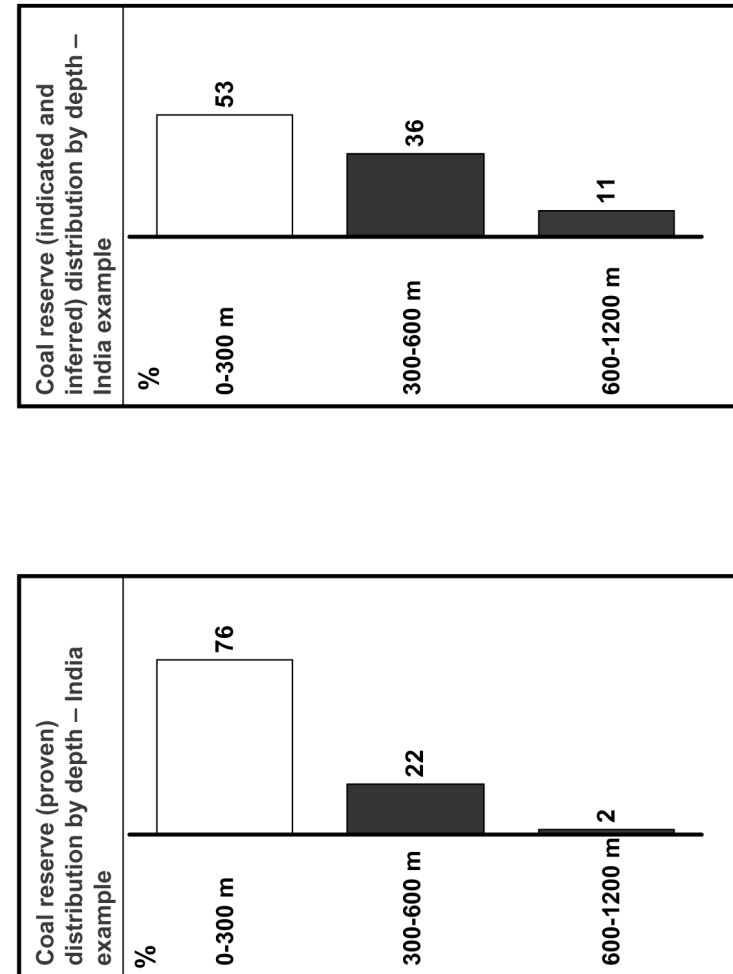
- **Limited access to alternative technology required to bring to production deep coal reserves.**

Moreover, in Asia a large part of the untapped reserves are located deeper than proven reserves see Fig. 14. They are likely to require new technologies like underground coal gasification and coal bed methane extraction for an economical exploitation. In addition, coal is a more polluting fuel as compared to natural gas. This is all the more true for high ash coal that is available in India. Using coal in an environment-friendly manner again requires access to technology like integrated gasification, combined cycle generation.

**Opportunities to increase Collaboration within Asia**

If we agree that it is important for Asian countries to pursue common ground and that the above factors are impeding greater interdependence in Asia, we would like to leave behind some preliminary ideas to consider. Most of these ideas require debate and careful evaluation, but we believe they could help move the dialogue forward and create win-win opportunities.

Figure 14: Asian Prospective Coal Reserves



Source: Industry interviews.

Increasing **energy stability** in the region will require buyers and seller to build a deep, liquid and transparent market in Asia for crude, oil products and gas. In addition, it requires a liberalization of the coal mining sector and strengthening of National Coal Companies.

A strong Asian market will require five building blocks:

- A marker crude that is relevant for the region and available in sufficient volume
- Support from key buyers and sellers to ensure adequate trading volumes and flexibility in trades
- Adequate physical storage infrastructure
- A conducive regulatory framework – specifically, standard contracts, settlement and eligibility processes and arbitration mechanisms; and
- Robust financial markets to support hedging and trading.

We strongly believe that creating a vibrant oil and gas market in the region will go a long way in addressing the stability concerns of both buyers and sellers.

To build **energy security** in the region, there is a wide range of options such as;

1. Countries should start with sharing detailed information on demand, supply and inventory positions among Asian and Middle Eastern countries. Higher information transparency between buyers and sellers will help improve energy security and avoid speculative tendencies. Experiences of agencies like the IEA will corroborate the positive impact of greater information sharing.
2. If countries wish to take this a step forward, buyers and sellers could co-invest in building emergency response mechanisms by increasing physical supply security in Asia through strategic reserves and cross-border inventories.
3. A more intense form of co-operation to build security will be for buyers and sellers to increase the scale and pace of joint investments in

oil and gas in the region. This would entail consumers making upstream investments in producing countries and suppliers making downstream investments in refining and gas. This might also require some longer term price and volume agreements to underpin the investments.

4. On another front, major coal bearing countries could reform the coal mining sector to allow private and foreign investment in this critical sector. This will enable them to reduce dependence on other countries for their energy requirements, thereby enhancing their energy security.
5. Finally, an enduring mechanism to improve energy security in the region will be to create a pan-Asian gas grid linking multiple demand and supply sources.

Lastly, ensuring **sustainability** will require building enduring multilateral partnerships. Specifically, the following steps could be adhered to:

1. Pursue longer term multilateral projects to strengthen cooperation, such as joint research on energy technologies relevant to Asia, jointly addressing key environmental priorities like standardizing specifications for gasoline and diesel across Asia, and broader sharing of mutual capabilities, including human resource development. In addition, there could be joint research on technologies for cleaner utilization of Asian coal reserves like underground coal gasification, integrated gasification combined cycle generation and coal liquefaction (developed by Sasol in South Africa).
2. Similarly in the coal mining sector, India and China can allow coal mining companies in Asia and other regional economies like Indonesia, South Africa and Australia to invest in commercial coal mining. Apart from bringing in much needed investment, this will enhance transfer of new skills and technology to the host country.
3. Strengthen National Oil Companies and National Coal Companies in the region through further corporatization, permitting joint ventures with regional coal companies and far-reaching regional cooperation.

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