

## ASEAN GAS SECURITY POLICIES

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### ***The Security of Supply Elements of Energy Policies***

There are three simple observations about developments in the petroleum industry since the 1970s that are having - and will continue to have - a profound effect on energy security policies of the Asean region.

#### **1. Global Shift of Energy Users**

Global trends in energy supply and demand is moving away from the established countries, for example, OECD countries will be consuming less than half of the world's commercial energy, compared with about two-thirds twenty five years ago. The increasingly large impact on world energy markets, and hence on the issue of energy security, will come from Asia, with a large influence from Asean countries. In a recent report (PowerGen, 1997), it was predicted that the top ten energy users in 2020 would be USA, China, South Korea, Japan, India, **Thailand, Indonesia**, France, Canada and Russia.

Although natural gas demand is the object of many petroleum company strategies, oil is still (and will remain) the dominant energy source. Globally, fossil fuels are expected to account for almost 90% of total primary energy demand in 2010; and world oil demand is projected to increase from around 70 million barrels a day in 1995 to about 95 million barrels a day by 2010.

#### **2. Increasing Environmental Awareness**

Governments have a desire to develop energy production for many reasons, but especially for the contribution to higher living standards. However they face a dilemma – the impact on development. The task of resolving the trade-off between meeting customers' growing demand and preserving the environment falls to industry as well as the government. The issues of global warming and the effects of greenhouse gas emissions on the global climate have not as yet been effectively resolved by either groups. The energy sector (from primary energy extraction to end-users) has been deemed to be the major source of CO<sub>2</sub> build-up. It is, therefore, a major part of the climate change problem and thus needs to be a major part of the solution. The Conference of the Parties (COP) to the UN Framework Convention on Climate Change (UNFCCC) is meeting in Kyoto next month to try and reach a commitment on the reduction of greenhouse gases, which will have significant implications for the use of primary energy sources. Policies that will minimize emissions on a least-cost basis will be favored. Natural gas, for example, is, in relative terms, an attractive fuel environmentally, although excessive reliance on gas could reduce diversity of fuels, especially in the power sector.

#### **3. Shift of Ownership and Control from Government to Private Enterprise**

Markets and trade are being taken out of the control of the Governments and the large trading monopolies; a process often called unbundling or liberalization. This commonly involves the steps of corporatization of state-owned companies, then of privatization (although often with a substantial Government stake). We are also seeing new infrastructure projects (especially pipelines and power plants) being undertaken by private enterprise.

Twenty years ago, transmission and supply of gas and electricity, especially in the embryonic industry in Asean countries, were subject to virtually no competition. The same was frequently true of production. The general picture was of state-owned and operated, vertically integrated utilities, with no choice for customers.

Similarly, oil markets in the 1970s were highly concentrated, typified by layers of bilateral relationships between a few large, vertically-integrated oil companies and a small number of major producing countries. Since then, oil markets have become much more competitive, interrelated and sophisticated (even though the underlying resource base remains highly concentrated). The emergence of a large menu of highly prominent paper markets in the 1980s and 1990s has added a new dimension to oil markets, as has the

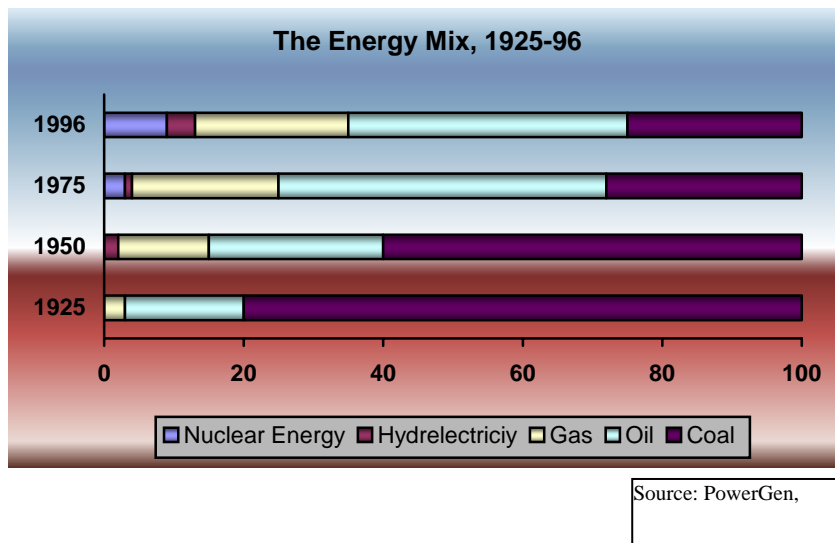
integration of producing countries into consuming country downstream sectors and the opening up of upstream investment opportunities (though, as yet, limited) for foreign companies in producing countries. Natural gas, because of its physical characteristics, has lagged behind, but we are seeing signs of change e.g. spot LNG cargoes.

Governments have encouraged the privatization and liberalization of the energy sector in order to boost their energy efficiency and to secure more diverse energy supply sources.

Any framework for consideration of energy security must, therefore, incorporate these three elements of the changing scene - global trends in energy supply and demand, environmental concerns and market liberalization. The matrix is a complex one, because policy makers have to grapple with a number of different objectives, which may not be fully compatible.

Of course these trends should be underpinned by the economy's ability to pay for the energy – in Asean countries there is a tremendous disparity between the more developed countries such as Singapore, and the developing countries such as Laos and Myanmar.

There is another feature that should be factored in - technology. Technology developments have the potential to effect radical change and can fundamentally alter the economics of markets. The energy sector has tended to be characterized by incremental changes that have had, nevertheless, had a significant impact. The development of Combined Cycle Gas Turbines (CCGTs) has been an ongoing process since the 1950s, with a significant acceleration in the 1990s. This has greatly enhanced the cost advantage of CCGTs over other power plants, and there is now a self-accelerating process at work in which CCGTs are coming to dominate the market for new power plants in most of the world. The following chart shows the considerable changes in the different fuel mix for world energy consumption in the last 75 years.



### Gas Security Policies

There are some major differences when we talk about security of gas supplies when compared with other forms of energy, particularly oil, including:

- **The rigid nature of transportation infrastructure.** In the case of gas transportation by pipelines this relates to their fixed physical location and in the case of LNG transportation this relates to the fact the economics of LNG projects usually means that all available supplies are generally committed to meet long term fixed supply contracts.
- **The difficulties associated with storing natural gas.** Unfortunately, the geology in Asean countries does not allow the use of natural gas storage reservoirs at this time.
- **The regional nature of gas markets.** There is no global market for natural gas, it is traded on a more regional basis in Europe, Asia and the Americas

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Risks to gas security fall in two main categories

- Physical risk of disruptions to existing supplies as a result of political events, economic conditions, accidents, extreme weather conditions
- Long term risk that new supplies will not come on stream to meet demand because of non-technical reasons (political and economic)

## Asean Gas Policies

### Gas industry organization

It is essential to understand the organizational structure of the gas industry in these countries in order to comprehend the gas policies of the governments. A summary follows:

#### Gas industry organisation

Country	Production	Transmission	Distribution (domestic market)
Brunei	present : <b>competitive bidding</b> past : <b>concession</b>	<b>pipeline</b> • Brunei Shell Petroleum Sendirian Berhad (BSP) (50% <i>govt</i> ) • Brunei LNG Sendirian (BLNG) (50% <i>govt</i> ) <b>LNG exports</b> • Brunei LNG Sendirian (BLNG) (50% <i>govt</i> ) • Brunei Coldgas (50% <i>govt</i> )	• Brunei Shell Marketing Company Sendirian Berhad (BSM) (50% <i>govt</i> )
Indonesia	<b>production sharing</b>	<b>pipeline</b> • Perum Gas Negara (PGN) ( <i>govt</i> ) • Pertamina ( <i>govt</i> ) • others ( <i>pvt</i> ) <b>LNG exports</b> • Pertamina ( <i>govt</i> )	• Perum Gas Negara (PGN) ( <i>govt</i> )
Malaysia	<b>production sharing</b>	<b>pipeline</b> • PETRONAS Gas Sdn Berhad (PGSB) (75% <i>govt</i> ) • Gas Malaysia Sdn Bhd (20% PETRONAS) <b>LNG exports</b> • PETRONAS (75% <i>govt</i> )	• Gas Malaysia Sdn Bhd (20% PETRONAS)
Philippines	<b>service contract</b>	<b>pipeline</b> • Joint venture - Shell Philippines Exploration B. V. and Occidental Philippines ( <i>pvt</i> )	concession • private company
Singapore		<b>pipeline</b> • Gas Malaysia Sdn Bhd (20% PETRONAS)	concession • Power Gas Pte Ltd ( <i>pvt</i> )
Thailand	<b>concession</b>	<b>pipeline</b> • Petroleum Authority of Thailand (PTT) ( <i>govt</i> ) • others ( <i>pvt</i> )	• Petroleum Authority of Thailand (PTT) ( <i>govt</i> )

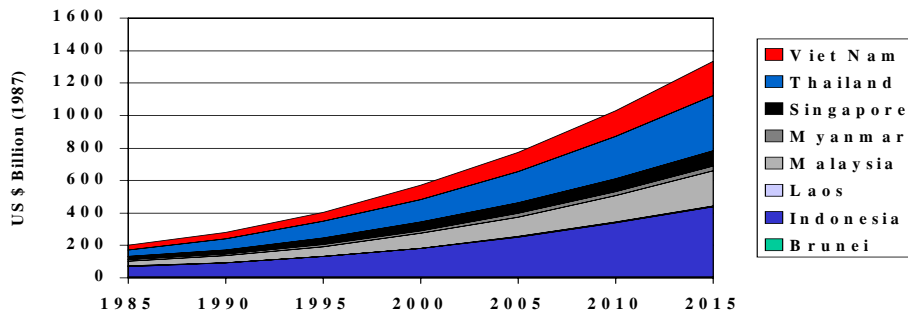
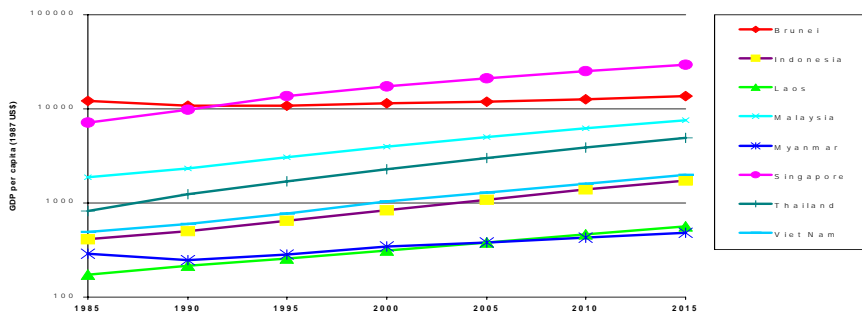
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It is commonly the situation that the companies (local or foreign) involved in gas development are oil companies which, have not, as a rule, looked for gas. Often, these companies are also hesitant to be involved in gas development because of the high cost of gas transportation, large economies of scale with pipeline cost, market uncertainties, and political risks. Furthermore, one must remember the opposing interests and objectives of oil companies (private benefits) and governments (social benefits) in gas development. The oil companies' interests in gas projects are to build-up ownership in hydrocarbon reserves and contracts, and to seek more immediate returns on investment, while those of the governments are the need for gas revenues to finance economic development and possible substitution for other primary energy resource, particularly oil.

### ASEAN Growth - an Important Part of the Picture

In order to discuss the importance of the gas sector in Asean countries, it may be worthwhile to review the significant growth forecasts, not only of population, but also of GDP per capita. This is very important as it indicates the ability to pay for the resource or commodity, in this case, natural gas.

## Asean GDP per Capita Trends



Source: Wood MacKenzie, 1997

Most Asean countries have relatively young gas sectors and gas consumption typically is still a relatively small share of TPES (see following table). Consequently gas security is not an issue that has so far been a major feature of gas regulatory policies in Asia. However, as domestic consumption increases within particular sectors of the economy, gas security will necessarily begin to take on a more significant priority.

Gas % of Fuel Mix	Total Primary Energy Supply						Fuel Mix
	1985	1990	1995	2000	2005	2010	2015
Brunei	93.6	86.1	80.6	80.8	80.8	80.6	80.4
Indonesia	31.5	31.2	26.1	29.5	26.5	23.5	22.5
Laos	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Malaysia	29.9	31.0	31.2	33.5	39.7	41.5	42.6
Myanmar	34.5	50.9	54.6	63.2	59.9	58.9	57.6
Philippines	0.0	0.0	0.0	0.0	7.4	6.3	5.7
Singapore	0.0	0.0	8.6	7.0	6.1	5.5	5.1
Thailand	16.7	19.0	20.9	31.9	30.0	27.6	25.5
Viet Nam	0.7	0.0	2.4	5.7	13.1	16.5	17.7

Source: Wood MacKenzie, 1997

The major natural gas growth in Asean is expected in the power sector, petrochemical, and to a lesser extent the residential market.

Gas	Total Inputs To Power Generation						Mtoe
Mtoe	1985	1990	1995	2000	2005	2010	2015
Brunei	0.4	0.5	0.6	0.6	0.7	0.7	0.7
Cambodia	-	-	-	-	-	-	-
Indonesia	-	0.3	4.0	9.1	12.0	13.9	16.0
Laos	-	-	-	-	-	-	-
Malaysia	0.5	1.4	5.3	6.8	11.4	13.0	15.9
Myanmar	0.2	0.2	0.3	0.8	0.9	1.5	2.1
Philippines	-	-	-	-	3.8	3.8	3.8
Singapore	-	-	1.5	1.5	1.5	1.5	1.5
Thailand	2.3	5.3	9.6	22.9	28.2	31.5	33.8
Viet Nam	0.0	0.0	0.2	0.7	2.1	3.5	5.1
<b>Asean Total</b>	<b>13.4</b>	<b>7.7</b>	<b>21.5</b>	<b>42.4</b>	<b>60.6</b>	<b>69.4</b>	<b>79.2</b>

Source : Wood Mackenzie, 1997

Currently Asean has only three gas exporters, Brunei, Indonesia and Malaysia, and of these Malaysia is the only exporter of gas by pipeline. All other Asean countries either utilise their own domestic gas resources (with the exception of Singapore that imports from Malaysia) - but this scenario is anticipated to change, as seen in the following table.

<b>Gas</b>	<b>Net Imports</b>							
	<b>Mtoe</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>
Brunei		-6.0	-6.2	-7.1	-7.7	-7.7	-7.7	-7.7
Indonesia		-17.6	-24.0	-33.0	-35.8	-36.5	-35.0	-33.7
Laos		-	-	-	-	-	-	-
Malaysia		-5.1	-8.7	-13.7	-28.9	-33.3	-34.4	-35.8
Philippines		-	-	-	-	-	-	-
Singapore		-	-	1.5	1.5	1.5	1.5	1.5
Thailand		-	-	-	7.0	8.9	10.7	17.9
Myanmar		-	-	-	-7.0	-7.0	-7.0	-7.0
Viet Nam		-	-	-	-	-	-	-
<b>Asean Total</b>		<b>-28.7</b>	<b>-38.9</b>	<b>-52.3</b>	<b>-70.9</b>	<b>-74.1</b>	<b>-71.9</b>	<b>-64.8</b>

Source : Wood Mackenzie, 1997



Physical storage of gas is inherently difficult with the major options as:

- Pipeline “linepack”
- LNG storage tanks
- Underground storage

As there is currently only one international pipeline (Malaysia to Singapore) in place, line pack is not a readily available option. However, some Asean exporters have varying amounts of LNG storage. If storage tanks are full, then stocks should be sufficient to allow for between two and five cargoes in the event of supply disruption into the LNG plant. So far, no exporting country has reported any disruptions to LNG supply over the period of past or existing contracts. There is a good degree of LNG supply diversity, either in place or being negotiated, amongst gas importers. Underground storage, thus far has been not deemed to be geologically feasible in ASEAN countries.

Only Malaysia has in place legislation that is specifically aimed at dealing with disruptions to gas supply. Some other countries have legislation that, while not specifically aimed at this type of disruption, could be used in the event that it occurs. Brunei and Malaysia both have over two thirds of their electricity being provided by gas fired power plants and several other countries have ambitious plans to increase the share of electricity provided by gas-fired plants. The growth of gas use for power generation could have security implications particularly if not much of this generating capacity is capable of fuel switching. Monitoring this situation will be important for countries everywhere, and we are certainly seeing trends towards CCGTs with dual fuel capabilities, especially in the IPP sector.

Countries that currently or potentially will rely heavily on imported gas, such as Singapore and Thailand, are concerned to ensure that the country does not become too reliant on any one source of imports. They have, therefore, encouraged diversification of import sources, as their major philosophy for security of gas supply.

Singapore is actively seeking further supplies from Indonesia and is also investigating LNG options. Thailand is hoping to be importing gas from both Myanmar and the JDA with Malaysia (and potentially, Indonesia) by 2000, while keeping LNG import options open. The Philippines is also reviewing LNG supply as a precursor to its Malampaya domestic gas development.

Some countries are less equipped than others to handle the risk of politically motivated disruptions. These are generally the countries with new and relatively small gas markets that were more heavily dependent on individual suppliers. These countries could continue their efforts to improve gas security by means of mechanisms such as a

- Diversification of supply sources
- Increased gas storage capacity
- Demand flexibility through use of interruptible contracts.

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	<b>Brunei</b>	<b>Indonesia</b>	<b>Malaysia</b>	<b>Myanmar</b>	<b>Philippines</b>	<b>Singapore</b>	<b>Thailand</b>	<b>Viet Nam</b>
Gas Share of TPES (1996)	80.6%	26.1%	31.2 %	54.6%	0.0%	8.6%	20.9%	2.4%
Dominant Sector	Power sector & LNG plant	Petrochemicals, LNG	Power sector	Power sector	N/A	Power sector	Power sector	
Importer/ Exporter	Exporter	Exporter	Exporter	N/A	N/A	Importer	N/A	N/A
Legal Basis for dealing with a disruption in supplies	In times of national emergency the govt has first right of purchase of all energy produced	N/A	The 1992 Gas Supply Act allows for supplies to be cut off or requisitioned in the event of emergency	N/A	N/A	N/A	N/A	N/A
Emergency measures	Some scope for redirecting gas flows	LNG storage and line pack (limited)	Line pack and pipeline looping improve security	N/A	N/A	N/A	N/A	N/A
Comments	Consideration is being given to expanding storage by 50%	Govt plans to require all gas-fired plants to be dual fired	Govt plans to require all gas-fired plants to be dual fired	N/A	N/A	N/A	N/A	N/A

### ***Asean Gas Sector Liberalization and its effect on supply security***

The governments in Asean countries have actively intervened in the gas sector. This is due to the fact that gas transport through pipelines has been considered to be a natural monopoly (state-owned). Governments have had to assess whether the consumers' needs are balanced with producers' interest. The intervention is in the form of ownership in transmission and distribution companies as in the case of Indonesia and Thailand (though in some cases, private companies are allowed to own gas pipelines in these countries) as well as in Brunei and Malaysia (with private sector equities). The Singapore government regulates the private company involved in gas distribution and this would probably be the case in the future set-up for gas transmission & distribution in the Philippines.

The structure of gas transmission and distribution (T & D) reflects the relative infancy of the gas industries in ASEAN countries. The gas market is segmented and there is no real competition in the gas sector. The existing gas has a quasi monopolistic character. Almost all Asean companies currently involved in T & D own the gas they carry. The Philippine Government, however, expressed recently that it intends to have an open access system once a gas infrastructure network is developed in the country.

As a result of lack of funds to develop the infrastructure needed for the increasing demand for natural gas in Asean countries which is coming mainly from the electricity and petrochemical sectors, an unbundling of these monopolies is slowly occurring, with a resultant market liberalization.

Market liberalization involves two fundamental shifts:

- The first is to move decision-making from governments to the private sector, through the process of privatization. This privatization process is thought to be a method of expanding the capacity to deliver energy and as a step towards the resource industry becoming more market-focused. The perceived advantage is the substitution of government regulation rather than government control, and the incentives that this provides for resource sales companies to increase both efficiency and service standards.
- The second, and related shift, is to create a bottom-up rather than a top down decision-making framework in which the end users (or customers) at the bottom find a voice and participate in the decision making process with producers. This is caused by liberalization of the industry that opens up the energy market to competition with some regulatory frameworks and relies on competition, rather than regulation to provide an efficient, high-quality service to customers.

As the private sector is increasingly taking over these strategic sectors from the Asean Governments, this causes some quandaries – how does the Government retain control without a fiscal ownership, how will these "empowered" market players make their decisions; and how to define the remaining political responsibility, in a free(er) market economy, for public policy objectives such as security of supply. What will be the role of Governments and state owned companies beyond what the markets will determine through the interplay of supply and demand?

Should governments define a standard, or leave it to private enterprise dominated markets? In other words, will there still be a political dimension to energy security in Asean countries, where the Governments own the resource (natural gas)?

The benefits of free markets have been well-documented – increased trade, more efficient resource allocation, better productivity, more innovation, and reduced costs to consumers, but come with the price of reduced State control. There is already powerful empirical evidence of these benefits, where markets have been opened, especially in Europe and in USA. Energy security itself can be enhanced, in important ways, through these developments. For example, increased international trade helps to spread risk through diversity of sourcing; and a more efficient use of resources reduces energy intensity, thereby reducing the absolute level of demand.

### **The Effect of Liberalization on Demand**

It is not yet clear how consumers of natural gas and electricity will use their increasing freedom to choose between fuels, between suppliers and between contractual options for their supplies. Liberalization as a process is far from complete. Indeed, there is, as yet, not much (or any) choice for the consumer in any Asean country.

Choice of gas supply is only gradually being made available to industrial and commercial gas consumers; whether this choice should be extended to the retail consumer is a topic of emotive discussion.

If markets are working effectively to internalize the real costs and value of security, this should eventually be reflected in prices and tariffs. However, historically this has not been so – indeed, in the European gas distribution sector, costs related to security of supply (overdimensioning of pipelines, storage facilities, the cost of using interruptible contracts) are not always well reflected in prices.

However, in the UK, where unbundling and privatization has been taken further than elsewhere in Europe, security costs are beginning to be explicitly addressed. For example, there are now explicit tariffs for storage services, and transport and distribution services are priced to include overdimensioning of these facilities as a security feature. This, incidentally, emphasizes the importance of unbundling the different elements of the supply chain to the customer, which helps to bring out security costs explicitly and to give them a market value.

With natural gas, it could be expected that a variety of contractual options to become available to customers and a shift away from the traditional long term contracts which have characterized the gas sector to reflect new and different customer needs. For example, end users can more readily purchase supplies to satisfy unexpected shifts in demand, and those with fuel switching capabilities might acquire gas on a short-term basis from an area where supplies are abundant.

However, there is an issue - though it may be a transitional one - about the so-called "empowered" consumer's choice of tariffs and contracts. Will consumers be inclined to take the "least cost" approach, with little regard for security? Do they fully appreciate the trade off between price and security? There is some evidence that consumers who sign up for cheap gas do not fully appreciate the small print in their contract about interruptible supplies. Several UK hospitals have recently switched their gas contracts from firm to interruptible contracts for cost reduction reasons. They may have failed to appreciate that interruptible contracts are precisely that - interruptible - and that their hospital status does not exempt them from losing their gas supply during periods of peak demand. As I said, this may be a transitional issue, as consumers learn to deal with a new situation. It does, however, raise a question for governments as to whether they need to intervene with rules to protect customers who, though newly empowered, may not yet be fully informed.

However, ASEAN countries have a fundamental issue in that almost all of the region's policies for the gas and electricity markets stop short of full liberalization. This is, in part, because of the existence of monopolies (mostly Government) at different parts of the supply chain, especially transmission. Thus, limited market liberalization, now or in the future, does raise an issue of fractured responsibilities for security. For example, most governments will be inclined to insist on rules for the protection of "captive" consumers, i.e., those (generally retail) consumers whom the market liberalization process fails to reach.

Governments are also concerned (at least, for electricity) about supply to remote consumers and about the tariffs which such consumers - who may well cost more than others to supply - should pay. In fact, there is a real issue about whether suppliers in a liberalized market might "cherry pick" the customers to whom they offer service, especially in island nations such as the Philippines and Indonesia.

## The Effects of Liberalization on Supply

With the advent of private enterprise and the trend towards project financing, investment decisions in liberalized markets will be conditioned by the need to earn a rate of return properly related to risk and the cost of capital - and this rate may well be higher than was the case when the industries were state controlled (Governments often had access to "cheap" financing). Add to this the potential issue of cyclical capacity where energy markets may experience bottlenecks in capacity over the medium to longer term.

In principle, of course, price signals in the market should function to trigger "adequate" investment. However, there is some discussion about what the industry itself terms "security of demand", i.e., whether today's decisions by consumers are an accurate enough signal to underpin long-term investment in energy hardware without which the possibility of "the lights going out" - or, at least, flickering - becomes an issue.

## Political Risk and Market Liberalization

Political risk has been defined by the IEA in terms of “long-lasting disruptions for politically motivated reasons”, or “failure to mobilize economically available supplies from a particular source because political risks are too high”.

It is unrealistic to think that this risk of political disruption can be entirely eliminated. Rather, it is a question of defining the acceptable level of risk that should be incurred, and whether markets can do this unaided.

For example, many might judge that the risk of a supply disruption of gas from Malaysia to Singapore is remote. But it could happen. How do provide for this?

And, of course, the growing economic linkages between different parts of the world mean that there will, increasingly, be a mutual interest not to rock the boat. For example, as part of a shift in strategy toward maximizing profits, Aramco has been involving itself in downstream ventures in some of the countries it serves

### ***How could ASEAN Governments resolve this security/privatization dichotomy?***

1. They need to continue with unbundling of the natural gas chain. It is a process that delivers many benefits. It should not be allowed to stop partway. Governments need to contemplate on how far the process needs to be taken in order to ensure that there is no confusion of responsibilities, and where rules remain necessary, to find approaches that minimize distortion to market decisions.
2. There is a need to monitor the situation, for example, to track the evolution of tariffs and contracts and the investment decisions that are being taken in the new conditions.
3. Governments need to have a mechanism, both practical and legal, to deal with market failure.

For example, with the planned regional ASEAN pipeline, there will be some complex issues ahead, including financing guarantees, liquidated damages, different forms of joint ventures, mergers and alliances. Where such long-term investments are at stake, investors may be looking for a degree of concentration and guaranteed market presence to justify the high sunk costs. Thus there is a need to deepen the analysis of the role of anti-trust and competition law and how it should be applied in this market.

Governments may also need to consider whether any further support is needed to facilitate cooperation between ASEAN countries (over and above the existing Agreement on ASEAN Energy Cooperation of 1986, and the ASEAN Petroleum Security Agreement of 1986) in order to encourage long-term commitments for the development of supplies and bringing them to market.

Thus a harmonious political climate between ASEAN governments will become even more important for effective gas security in the region.

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**Overview on natural gas demand and supply prospects in Southeast Asia.**

Domestic gas utilization in Southeast Asia is commonly supply driven. For oil and gas-rich countries, the lack of domestic users of natural gas and lack of gas infrastructure in the past had made the governments to consider its alternative option as LNG exports. In oil and gas short regions the most productive alternative has been to take steps to provide gas for domestic consumption. Furthermore, with increasing demand projections for this energy resource, some gas-short countries such as Thailand has signed agreements with neighboring countries for gas supply through pipelines and has considered the possibility of importing LNG from the Middle East in the future. The convergence of energy policies of these countries (both the net energy exporting and the net energy importing countries), shown in table ??, created a common trend to develop gas infrastructure and to promote its domestic utilization. Energy policies such as to reduce oil dependence, primary energy resource diversification and environmental protection, favor the exploitation of natural gas resource for domestic users.

At present, natural gas domestic consumption in the six Southeast Asian countries is relatively low compared to other fuel types. It accounted 9% (9.92M toe) of the aggregate final energy demand in 1993 and was primarily utilize for electricity production in industrial uses<sup>1</sup>. Demand prospects are primarily placed in these sectors while those of the transport, residential and commercial sectors are considered to be marginal. The total gas demand prospects of the six countries are summarized in table 2.

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<sup>1</sup> Only 5 among 6 countries utilized natural gas in 1993, namely : Brunei, Indonesia, Malaysia, Singapore and Thailand.



**Table 1. Main Features of Energy Policies in Asean Asian Countries (Pacudan, 1997)**

<b>Policy objectives</b>	<b>Brunei</b>	<b>Indonesia</b>	<b>Malaysia</b>	<b>Myanmar</b>	<b>Philippines</b>	<b>Thailand</b>	<b>Singapore</b>
<b>Diversification of Energy Sources/supplies</b>	-	•	•	•	•	•	•
<b>Intensification of Energy Sources/Exploration</b>	-	•	•	•	•	•	-
<b>Energy conservation/ efficient use of energy</b>	•	•	•	•	•	•	•
<b>Environmental protection</b>	•	•	•	•	•	•	•
<b>Commercialization</b>		•	•	•	•	•	•
<b>Energy pricing</b>							
market prices						•	•
reasonable prices			•	•	•		
equitable prices	•	•					

**Table 2. Gas demand in the 5 Southeast Asian countries**

<b>Year</b>	<b>Domestic market (excluding feedstocks)</b>	<b>Power generations</b>	<b>Total gas demand (including LNG exports and feedstocks)</b>
2000	32 - 42 million toe	22 - 28 million toe	105 - 115 million toe
2010	62 - 99 million toe	34 - 56 million toe	145 - 182 million toe
2020	108 - 191 million toe	64 - 120 million toe	191 - 274 million toe

Source : Figures are taken from P. Bourcier and K. Sirmou, 1996

Total gas production in the region reached 100.5 Mtoe in 1993, amounting to around 5% of the world natural gas production<sup>2</sup>. Indonesia was the biggest producer, followed by Malaysia and Brunei. The aggregate production of these three countries constitute 91% of the total production in Southeast Asia. In terms of total reserves, Brunei, Indonesia, Malaysia and Thailand registered a total of 4.5 trillion cubic meters which represented 3.22% of the world's total reserves in 1995 (BP Statistical Review, 1996). An updated estimation of gas reserves and yet-to-be found resources is presented in Table 3.

The comparison of the demand forecasts to supply prospects gives the potential long term position of each country concerning this resource. Currently, the 6 Southeast Asian countries is a mix of oil- and gas-exporting and importing countries. Assuming that the existing gas export policies continue in the future, the position of the current exporting countries would probably change in year 2020, and eventually become net importer in the longer term. This is shown in Table 4.

<sup>2</sup> Only 5 countries are gas-producing at present, namely : Brunei, Indonesia, Malaysia, Thailand and Vietnam.

**Table 3. Unrisked current remaining reserves and yet-to-be found resources (as of January 1994)**

	Unrisked Current Remaining Reserves (Bcm) as of 1 January 1994				Yet-to-be-found Resources	
	proved	probable	possible	total	high case	low case
Brunei	226	107	50*	383	212	141
Indonesia	1967	931	365	3263	2336	1332
Malaysia	1270	1150	-	2420	780	382
Philippines	86	-	53	139	828	141
Singapore	-	-	-	-	-	-
Thailand	175	65	152	392	167	83
<b>TOTAL</b>	<b>3724</b>	<b>2253</b>	<b>621</b>	<b>6597</b>	<b>3777</b>	<b>2079</b>

\*subjective estimate

Source : Figures are taken from J. R. Lacey, 1996

**Table 4. Current and projected energy supply situation based on known economically recoverable reserves and known export commitments.**

	Current Situation		Potential Gas Trend	
	Energy Trade	Gas Trade	Year 2020	Long-Term
Brunei	exporter	exporter	exporter/importer	importer
Indonesia	exporter	exporter	exporter/importer	importer
Malaysia	exporter	exporter	importer	importer
Myanmar		neutral	exporter	
Philippines	importer	neutral	importer	importer
Singapore	importer	importer	importer	importer
Thailand	importer	neutral	importer	importer
Vietnam		neutral		

Source : P. Bourcier and K. Sirmou, 1996; Pacudan, 1997