Asia-Pacific
Economic Cooperation

GREAT EXPECTATIONS:

CROSS-BORDER NATURAL GAS TRADE IN APEC ECONOMIES

APEC Energy Working Group

November 2004

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RESOURCESLAW INTERNATIONAL

A Report to the APEC Energy Working Group on Best Practice in Cross-Border Interconnection of Natural Gas in APEC Member Economies

(EWG Project 01/2004T)

Great Expectations: *Cross-Border Natural Gas Trade in APEC Economies*

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This report is based on a series of three APEC workshops held between May and August 2004 and on research carried out by ResourcesLaw.

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This report sets out the views of the consultants. It does not represent the official views of APEC or any of its member economies.

CONVERSION TABLE

1 trillion cubic meters (tcm) = 734 million metric tons
1 billion metric tons = 1.38 trillion cubic meters (tcm)
1 cubic meter of gas = approximately 0.036 million British thermal units (Btu)
1 million Btu = 27.8 cubic meters of gas

All currencies are stated in United States dollars except where otherwise specified.

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CHAPTER 1:

INTRODUCTION AND EXECUTIVE SUMMARY

- **APEC economies possess abundant stranded natural gas resources representing huge export potential. By 2025, the value to APEC exporting economies of this additional volume of trade at current prices should exceed $100 billion per annum.**
- **Greater use of natural gas is supported by APEC at the highest political level as one of the solutions to global energy insecurity.**
- **Greater use of natural gas is also supported by APEC as a key strategy in delivering a sustainable global economy and a sustainable global environment.**
- **Domestic gas markets in most APEC importing economies are immature and require development. This is a major bottleneck for cross-border natural gas trade.**
- **There is a paucity of gas transportation infrastructure in APEC economies, requiring an unprecedented level of expenditure on development of new infrastructure. Some $10-15 billion per annum will need to be invested within the APEC region. Without this massive investment, cross-border natural gas trade cannot occur.**
- **Globally, there are great expectations of natural gas as the preferred "swing fuel" for the energy industry.**
- **Safety fears have been expressed about the siting of additional liquefied natural gas (LNG) import terminals. There is a need to educate and inform communities of the outstanding 40-year safety record of LNG import terminals.**
- **The great expectations of natural gas will not be fully realized unless there is collaboration amongst governments, investors and communities in developing and operating natural gas supply chains. A collaborative institutional mechanism is recommended for this purpose, as part of a three-level best practice regime.**
- **The goal of energy sustainability must be the unifying theme for the pursuit of APEC's cross-border natural gas strategy.**

About the APEC Energy Working Group (EWG)

APEC economies currently account for around 60 percent of world energy demand. The APEC region overall is a net energy importer, meaning that aggregate annual consumption of energy exceeds annual domestic production, with the balance imported from third-party economies. Energy imports to APEC economies are projected to increase by some 92 percent, as

indigenous (or "within economy") supply fails to keep pace with expanding energy demand driven by economic growth, industrialization and urbanization.

The EWG was launched in 1990 and comprises representatives of the governments of APEC economies who meet twice a year. The EWG seeks to maximize the energy sector's contribution to the region's economic and social well being, while mitigating the environmental effects of energy supply and use. Facing the challenges of short-term energy supply disruptions and ever increasing long-term demand for energy, the EWG works to ensure energy security in the region.

Business and Private Sector Participation in the EWG

The EWG has long recognized that business makes an important contribution to the development and implementation of its work program. It is one of the APEC Working Groups that first established its own public and private sector dialogue mechanisms. The EWG established the APEC Energy Business Network (EBN) in 1999. Under the guidance of the APEC Energy Ministers, the EWG has invited the EBN representatives to participate in its working group meetings over the past two years.

According to the EWG's projection, with huge and ever-increasing demand for energy, the energy sector in APEC economies faces significant challenges in mobilizing private capital and international financial resources to fund an estimated US$3.4 trillion to US$4.4 trillion in energy investments required in the next 20 years.

Meetings of APEC Energy Ministers

APEC Energy Ministers' Meetings provide policy guidance and momentum for the work of the EWG in implementing measures consistent with the goals established by APEC Economic Leaders. APEC Energy Ministers have met six times since their first meeting in Sydney in 1996.

The Fundamental Importance of Energy and Energy Trade

Energy is the lifeblood of modern economic activity. As economies expand, their energy consumption accelerates relative to the rate of expansion. There is however a great geographic disparity in energy supply and demand in the world. Cross-border energy trade is of fundamental importance to energy-importing economies, as it underpins their economic structure.

In January 2004, the Asia-Pacific Economic Cooperation Energy Working Group (APEC EWG) appointed ResourcesLaw International of Sydney, Australia (ResourcesLaw) to undertake a study of best practice in cross-border interconnection of natural gas in APEC member economies, with the aim of accelerating APEC cross-border natural gas trade.

ResourcesLaw initially developed a framework paper. After this, it collaborated with the United States Department of Energy (US DOE) to run a workshop in San Francisco. ResourcesLaw then organized workshops in Tokyo and Singapore to review the framework paper with a wide cross-section of government officials and industry participants.[1] Between the first and second workshops, APEC Energy Ministers held their 6th biennial meeting and encouraged member economies to move towards best practice in facilitating the development of APEC LNG trade.[2]

[1] The first workshop, focused on LNG trade into the West Coast of the United States, was organized by the USDOE and held in San Francisco, California, USA on 29-30 April 2004. A second, also on LNG trade, was organized by ResourcesLaw and held in Tokyo, Japan on 16-17 June 2004. The third workshop, on the Trans-ASEAN Gas Pipeline, was organized by ResourcesLaw and held in Singapore on 12-13 August 2004. Case studies based on all three workshops are contained in appendices 1-3 of this report.

[2] The APEC LNG trade best practice principles were drafted at the San Francisco workshop and were tabled at the 6th meeting of APEC Energy Ministers in Manila, Philippines on 10 June 2004. The principles are set out in full in appendix 1 of this report.

Changes in Specific Energy Dependencies

At a global level, except for a handful of major energy exporters, mainly in the Middle East and Russia, all economies now depend on the efficient functioning of an open global trading system for their energy supplies. They are especially dependent, directly or indirectly, on a secure supply of oil from exporters in the Middle East.

Rising global oil prices are an indicator of an increasingly narrow gap between supply and demand and of an increasing mismatch between points of production and centers of demand. Since the 1973 Arab embargo on the supply of oil to the United States, the major focus of global attention has continued to be on the general dependence of all oil importing economies on exports of oil from the Middle East. This has distracted attention from some of the specific energy dependencies of regions and individual economies. These include:

- Japan's continuing dependence on imports for virtually all of its energy supplies
- Europe's heightened dependence on its largest supplier (Russia) for ever-increasing supplies of natural gas
- Indonesia and Australia having shifted from being oil exporters to net oil importers
- China's recent greatly heightened and growing dependence on imports of oil and gas, which is expected by 2020 to grow to 60 percent of its needs, to fuel its rapid economic expansion and
- the United States' continuing and heightened dependence on imports of oil and gas, as its domestic production of both of these energy forms has failed to keep pace with demand.

Global Energy Security and the Paucity of Infrastructure

Although cross-border energy trade takes place today between a much larger number of sellers and buyers than ever before, the above energy dependencies highlight the risk for energy importing economies of a major global oil supply disruption. A major supply disruption is not predicted to occur but, if one did occur, it could have major economic, social and environmental consequences for most energy importing economies – hence the search for other energy supply options such as natural gas.

Increased utilization of natural gas is therefore supported by APEC at the highest political level.

The contemporary quandary about global energy security involves two main elements: one is the "peak oil debate" that we constantly read about in the daily media: the question whether the energy resources are adequate ("is the oil/gas running out?"). This is in our opinion currently a peripheral issue. The fundamental issue is the barely-appreciated question of whether there is sufficient energy infrastructure to reliably handle the volumes of energy that must be produced and transported across national borders and the sequential question of whether this infrastructure is secure against sabotage and other events of force majeure.

The paucity of infrastructure is a major bottleneck for cross-border natural gas trade and requires an unprecedented level of investment to be made. This is easier said than done. For example, although LNG import terminals have an outstanding 40-year safety record, a number of stakeholders are opposed to their development because of concerns about safety.

Sustainable Development and Global Climate Change

On top of questions relating to the adequacy of energy resources, the risk of energy supply disruption and energy transportation capacity, there looms the specter of global climate change.

The now almost-universally accepted wisdom is that greenhouse gas (GHG) emissions from energy production must be minimized in the interests of tempering the effects of this widely-feared global phenomenon. Many now claim there is a need to reduce GHG emissions to 40-60 percent below 1990 levels to achieve long-term climatic stability at 450 ppm of atmospheric carbon, with a two-degree temperature rise. Irrespective, natural gas offers the lowest GHG emissions of any fossil fuel and the acceleration of cross-border natural gas trade is a key strategy in making progress towards sustainability of the global economy and the global environment.

Nuclear energy generation and new renewable energy technologies (including wind and solar power) may also play an increasingly significant part in reducing GHG emissions. However, renewable technologies, because they are coming off a very low base and are currently available in only small-scale units, may be hard pressed to practically and commercially meet global demand growth.

Natural Gas – The "Swing Fuel" or "Bridging Fuel" Towards Sustainability

Taking into account all of the economic, energy security and environmental implications of energy production and utilization, the world has expressed a preference for natural gas as the "swing fuel" to lead the world in the direction of more sustainable energy systems for at least the next quarter century. Natural gas is also commonly spoken of as the "bridging fuel" on the way to a hydrogen economy in 30 – 50 years or more from now.

The world has an abundance of resources of natural gas. These resources are adequate for at least the next 50 years, and perhaps for as long as 200, at current levels of consumption. Many of these resources are, however, "stranded" in the sense that they are isolated from markets and cannot be taken to markets without installing very costly transportation channels. The two main transportation channels are currently gas pipelines and shipment by special tankers as liquefied natural gas (LNG).

Globally, by 2025, the value at current prices of the additional volume of cross-border natural gas trade should exceed $200 billion per annum. Within APEC alone, the value of the additional trade should exceed $100 billion per annum.

The Crucial Linkage between Trade and Investment

The development of cross-border natural gas trade is inextricably intertwined with the requirement of investment on a major scale. At its simplest, without massive investment, cross-border natural gas trade cannot occur.

Giving effect to the world's preference for natural gas will require capital of around $30 billion per annum to be mobilized and invested in the global natural gas sector for the period to 2025 (around $25 billion per annum on infrastructure and $5 billion per annum on exploration and gas field development).

Some $10-15 billion per annum will need to be invested in APEC economies. This provides a major commercial opportunity for investors, but it also poses a development challenge of unprecedented magnitude.

It is to be remembered that very large natural gas projects have very long, often decadal, exploration, appraisal and development cycles. It is simply not feasible to ramp up projects quickly to meet either a shortfall in supply or an increase in demand.

Market Forces Alone Are Not Enough

Assuming adequate transportation infrastructure can be installed to enable exports of natural gas to reach importing economies, many APEC domestic gas markets are too immature to utilize large additional volumes at the present time and their long build-up periods pose huge challenges for gas sellers.

Gas markets do not automatically happen – they need to be created and they need very substantial investment to underpin them. Enabling regulatory frameworks are required for this purpose.

The Missing Link

In the modern communications age, an abundance of indiscriminate and extravagant information is circulating about the energy industry in general and about the natural gas industry in particular. As well, there are conferences and information-peddlers everywhere. Still, many communities do not understand the economic, social and environmental implications of energy production and use. These communities are unlikely to trust what they do not understand.

There is a missing link … the dots need to be connected. In pursuing this challenge, APEC's unifying theme must be the goal of energy sustainability.

Overcoming all of the trade, investment and information challenges in the natural gas sector in a timely manner requires proactive and collaborative involvement by governments, investors and communities in facilitating the development of natural gas supply chains. In pursuing this, transparency is an essential ongoing requirement.

This report recommends, as part of a three-level best practice regime, a collaborative international forum through which the great expectations that are held for cross-border natural gas trade and investment within APEC can be realized within a reasonable timeframe. A collaborative forum of the type recommended would facilitate the maintenance of the energy balance of the APEC region.

CHAPTER 2:

AN ABUNDANCE OF STRANDED RESOURCES

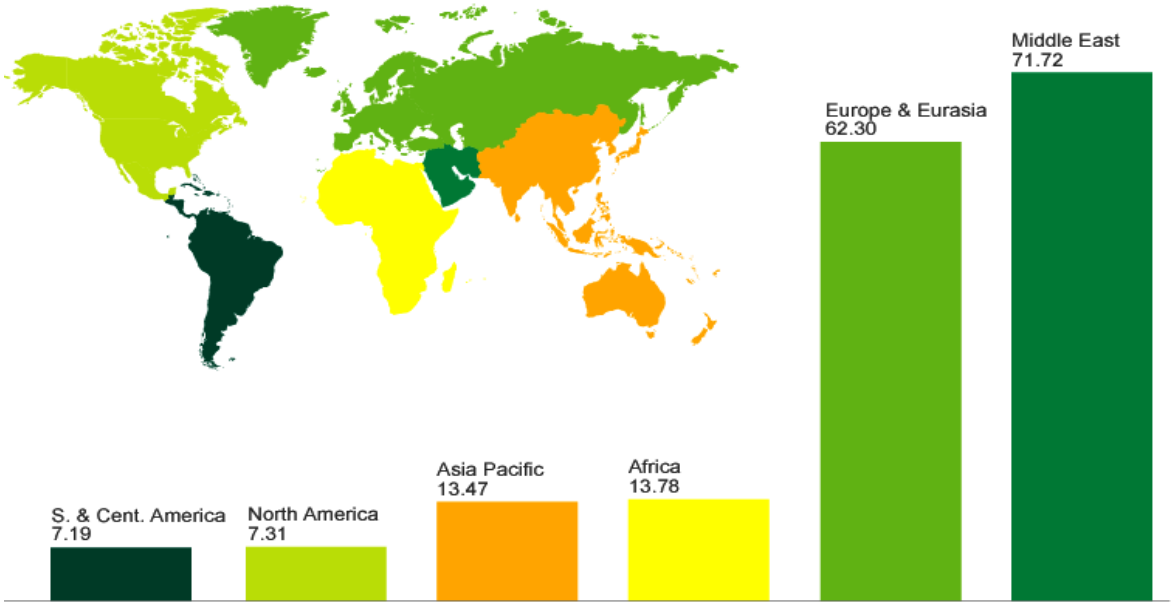
- **There is an abundance of natural gas globally and within APEC but much of it is stranded (isolated from established markets).**
- **There is a huge geographic disparity between the locations of the gas resources and centers of demand.**

There is an abundance of natural gas globally. Proved global reserves of natural gas are estimated to be 176 trillion cubic meters (tcm), or 67 times the volume used in 2003.[3] Recently, an International Gas Union committee was very much more optimistic, claiming that global natural gas reserves were adequate to support current levels of production for the next 200 years.[4] Higher rates of demand growth and downgrades of reserves can of course shorten all such projections significantly.

Much of natural gas is "stranded" because it is isolated from established markets. There is also a huge geographic disparity between the locations of the resources and the centers of demand. This disparity is illustrated in table 1:

Table 1: Natural Gas Reserves by Region at End 2003

Trillion cubic metres



Source: BP 2004 Statistical Review of World Energy

[3] BP plc, 2004, "Statistical Review of World Energy", London, UK, page 20.

[4] International Gas Union, 2003, "Gas Prospects, Strategies and Economies", 22nd World Gas Conference, Tokyo, Japan (Report of IGU Working Committee 9).

As illustrated in table 2, nine of the 21 APEC member economies, including Russia, are exporters or potential exporters of gas. Russia alone holds over a quarter of global gas reserves.

Table 2: Natural Gas Reserves by Country at End 2003

Country	Proved Reserves (tcm)	World Reserves (%)
Russia (APEC member)	47.00	26.7
Iran	26.69	15.2
Qatar	25.77	14.7
Saudi Arabia	6.68	3.8
United Arab Emirates	6.06	3.4
United States (APEC member)	5.23	3.0
Nigeria	5.00	2.8
Algeria	4.52	2.6
Venezuela	4.15	2.4
Iraq	3.11	1.8
Indonesia (APEC member)	2.56	1.5
Australia (APEC member)	2.55	1.4
Norway	2.46	1.4
Malaysia (APEC member)	2.41	1.4
Turkmenistan	2.90	1.6
Kazakhstan	1.90	1.1
Uzbekistan	1.85	1.1
China (APEC member)	1.82	1.0
Egypt	1.76	1.0
Netherlands	1.67	0.9
Canada (APEC member)	1.66	0.9
Libya	1.31	0.7
Oman	0.95	0.5
Bolivia	0.81	0.5
Trinidad/Tobago	0.74	0.4
Yemen	0.48	0.3
Brunei Darussalam (APEC member)	0.35	0.2
Peru (APEC member)	0.25	0.1
Rest of World	13.14	7.6
Subtotal 9 APEC members	63.83	36.31
Subtotal 9 APEC members excluding Russia	16.83	9.57
TOTAL WORLD	**175.78**	**100.0**

Source: BP 2004 Statistical Review of World Energy

Natural gas is the simplest of hydrocarbons and occurs in underground reservoirs either in association with oil or separately as “dry gas”.

Canada has been a major exporter to the United States of natural gas by pipeline for many years. Within APEC, there are five economies that have the most to gain in terms of boosting their future export revenues by supplying natural gas from their abundant domestic resources: Russia is by far the best positioned in this respect but Indonesia, Australia, Malaysia and Brunei Darussalam have much to gain as well.

Japan, the Republic of Korea and Chinese Taipei have been major importers of LNG for many years. The two APEC economies that have most to gain, in terms of their gaining future access to increased natural gas imports for their domestic consumption, are China and the United States. Both economies are currently planning or installing new LNG receiving terminals along their respective coastlines. Mexico may also become a significant importer.

At the time of writing this report, Indonesia, New Zealand, Singapore and the Philippines are undertaking studies for the future import of LNG (Indonesia may possibly become an importer as well as a major exporter).

CHAPTER 3:

APEC CROSS-BORDER NATURAL GAS TRADE

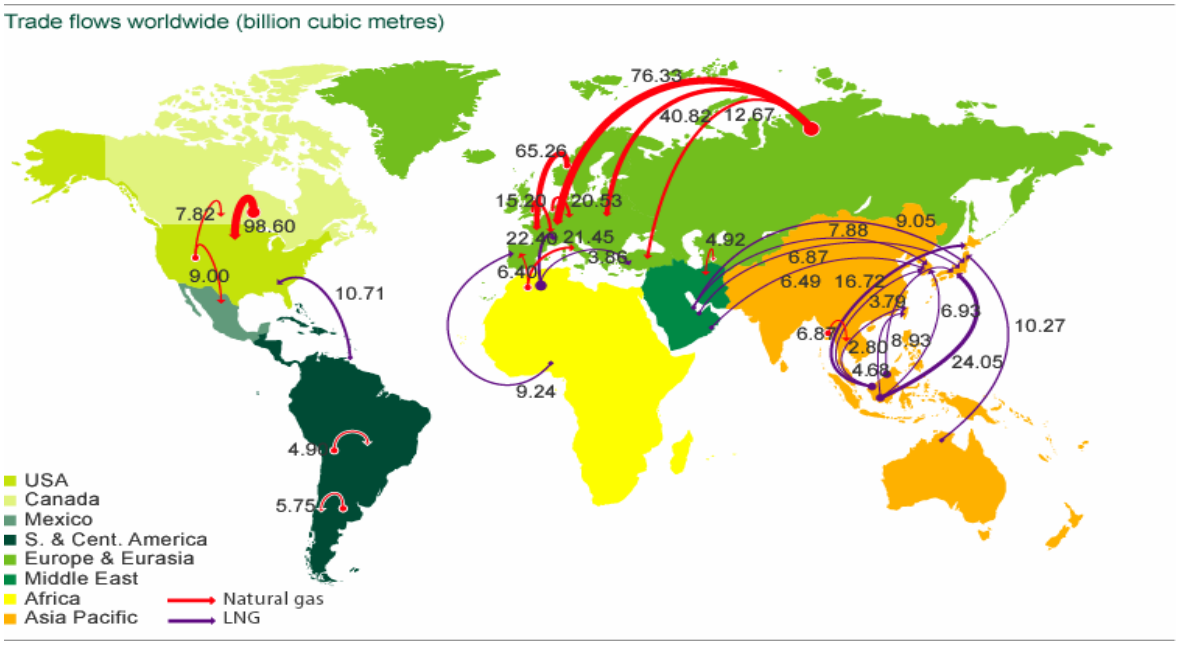
- **The dominant global energy issues have shifted. In what is becoming a hydrocarbon-limited and carbon-constrained world, the main focus is now squarely on energy security and sustainability, rather than simply on supply and price.**
- **Despite the increased vulnerability to supply disruption of energy importing economies, energy has generally remained readily available to them by the efficient operation of open global energy markets, albeit at unexpectedly sustained high prices.**
- **Global annual natural gas consumption is expected to double from 2.3 trillion cubic meters (tcm) to 5.1 tcm between 2000 and 2025, having doubled from 1.1 tcm to 2.3 tcm in the previous quarter century. In 2003, it was 2.6 tcm with power generation being the main use.**
- **Changes in global energy supply and demand, in particular the increasing demand for natural gas, now provide an unprecedented opportunity to interconnect stranded gas resources with potential consumers around the globe. Three quarters of all new gas production can potentially be traded across borders.**
- **In aggregate, the present value of domestic and cross-border gas trade is over $400 billion per annum at current prices.**
- **APEC economies should be able to participate in at least half of new global cross-border trade, with a value that should exceed $100 billion per annum by 2025.**
- **LNG trade will increase faster than total natural gas trade in percentage terms because of the inherent efficiency of open global energy markets and because transactions are usually bilateral in nature.**

1. Natural Gas Trade Flows

Since the 1973 OPEC crisis, natural gas has progressively increased its share of global primary energy production, doubling to 24% in 2003. Huge disparities in gas use, both as a percentage of total energy and in absolute volume terms, remain between different economies.

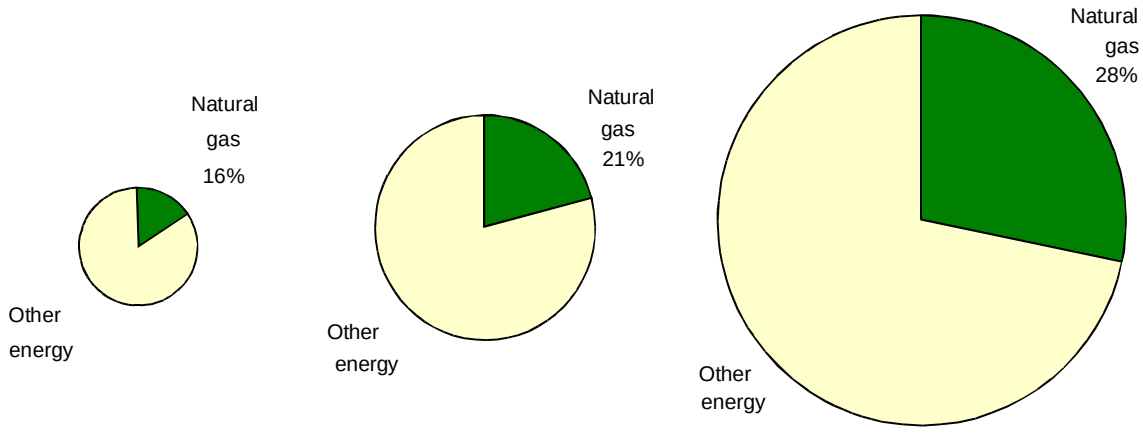
The volume of global cross-border natural gas trade in 2003 was 624 billion cubic meters (bcm). The direction of these trade flows is depicted in table 3:

Table 3: Direction of Natural Gas Trade Flows for the Year Ended 31 December 2003



Source: BP 2004 Statistical Review of World Energy

International trade in natural gas has been growing at a faster rate than overall natural gas consumption. In addition, natural gas consumption is expected to increase faster than overall energy consumption. The United States Energy Information Administration forecasts that natural gas consumption will reach 5.1 tcm by 2025 and increase its share to 28 per cent of primary energy consumption.[5] This is illustrated below in figure 1:



1975: 1.1 tcm **2000**: 2.3 tcm **2025**: 5.1 tcm

Figure 1: Natural Gas' Share in Primary Energy Consumption

[5] Energy Information Administration, 2003, "International Energy Outlook 2003", DOE/EIA-0484, May, (www.eia.doe.gov/oiaf/ieo/index.html).

Global demand for natural gas has been growing faster than population and GDP growth while domestic gas production has been declining in Western Europe, North America and North Asia. This doubling of the gas market every 25 years, combined with the disparity in the locations of demand and supply, will continue to drive rapid growth in cross-border gas trade.[6] The high growth rate is unlikely to abate for the reason that natural gas is increasing in importance in energy supply, particularly as a fuel in power generation, where it has become more competitive with coal on a unit electricity price basis as well as offering significantly lower times for new-build capacity. Notwithstanding the investment in hydrogen and other energy delivery systems, its early displacement by an alternative fuel is unlikely.

A breakdown of the most recent global domestic consumption and export data is set out below in table 4:

Table 4: Breakdown of Global Natural Gas Consumption and Exports for the Year Ended 31 December 2003

	bcm	Share of exports	Share of global consumption
Domestic consumption	1967		76.0%
Pipeline exports	455	73%	17.5%
LNG exports	169	27%	6.5%
Subtotal exports	624	100%	24%
Total	2591		100%

Source: Extrapolated from provisional Cedigaz data as reported in the BP 2004 Statistical Review of World Energy.

To meet the expected level of future demand, three quarters of new natural gas production has the potential to enter into cross-border trade. However, achieving this potential will require an unprecedented level of investment, project financing, improved transportation systems, off-take support, and policy and regulatory changes.

The channel for natural gas interconnection has historically been, and still largely remains, a choice between cross-border gas pipelines and shipping of gas in the form of LNG. This is elaborated in chapter 4. LNG exports for some years have been increasing at a faster rate than pipeline exports.

2. The Size of the Prize

In aggregate, the present value of domestic and international natural gas trade is estimated to be over $400 billion per annum, of which international flows presently account for 24%, with a value of approximately $100 billion per annum.

Shell has predicted that, by 2030, domestic gas supply will have increased by 75% over the 2000 level but that, for the same period, pipeline exports will have doubled and LNG trade will have increased by five times.[7]

[6] International Energy Agency, 2003, "World Energy Investment Outlook: 2003 Insights", OECD, Paris.

[7] Van der Veer, J, 2004, "Securing the Promise of Natural Gas", International Energy Business Forum, Amsterdam, The Netherlands.

It has also been predicted by Shell that natural gas trade could overtake oil by 2025.[8] We have estimated that, by 2025, the total annual value of domestic and international gas trade will be over $800 billion. [9] The annual value of the additional gas sold, at current prices, will be around $400 billion.

APEC economies should be able to participate in at least half of new global cross-border trade, with a value of more than $100 billion per annum.

For LNG alone, within the APEC region, the present value of trade is in the range of US$20 billion per annum, based on historical prices of supplies to the major customer, Japan. A projected doubling in LNG trade by 2015 can generate additional LNG sales revenue for exporters within and outside the APEC region. These projections seem conservative in comparison to estimates that by 2025, the annual value of the increased APEC LNG trade could be a multiple of $20 billion.

3. Structural Change in the Global Energy Economy

Since 1973, the global energy economy has undergone two major structural changes, the implications of which are not yet widely or fully appreciated. In essence, these changes are:

- a wave of liberalization of trade and investment in global and regional energy markets, which has been quite pronounced in the natural gas sector, and
- a wave of liberalization and reform of domestic energy markets, including the abandonment of central planning in the former communist economies.[10]

In other words, energy trade has “gone global", causing most energy importing economies to be relatively far more vulnerable to global energy supply and price disruptions than they were at the beginning of the period.[11] Furthermore, the IEA emergency stockpiling system is now relatively much less effective than when it was created and, as its name implies, it was only ever intended to deal with emergency situations.

However, increased competitive activity in global and domestic energy markets over the post-1973 period has easily counterbalanced the increased supply vulnerabilities of energy importing nations. Most of the developed world has continued during the period to prosper from the availability of affordable energy. In making this observation, we remain acutely conscious of the chronic energy impoverishment of two billion people, mainly concentrated in large populations in developing economies. Energy poverty is a very sad state of affairs that has its roots in a range of other issues that are not addressed in this report.

[8] Brinded, M, 2004, “The Vital Role of Gas in a Sustainable Energy Future”, CERA Conference, Houston, USA.

[9] All forecasts of future energy consumption and prices are based on assumptions that are inherently imprecise, and should always be treated with caution. These estimates are based on an assumed global gas price of $4.50 per million Btu, equivalent to $0.16187 per cm. According to the BP 2004 Statistical Review, the price of LNG sold to Japan in 2003 was $4.77 cif, the European Union price for natural gas was $4.40 cif, the US “Henry Hub” price was $5.63 and the Canada (Alberta) price was $4.83 (all prices stated in USD per million Btu). A global price of $4.50 was therefore assumed by ResourcesLaw as the basis for the illustrative global forecasts in this report.

[10] Nonetheless, it should be noted that in domestic gas markets, monopolistic or excessive anti-competitive activity, where it still occurs, needs to be controlled by regulators in the interests of optimizing the level of intensity (fairness) of competition. At the same time, great caution needs to be exercised against regulatory activity becoming heavy-handed and scaring away investors. This is discussed further in chapter 8.

[11] Alhaaji, A and Williams, J, 2003, “Measures of Petroleum Dependence and Vulnerability in OECD Countries”, Middle East Economic Journal 46:16, 21 April.

Despite energy importing economies having become increasingly susceptible to supply disruption and increasingly constrained by environmental regulations, energy has remained readily available and affordable to most economies. This surprising result has largely been brought about by the simple expedient of liberalizing energy markets so they can operate more freely. However, the question must now be asked: will the same hold true for increased cross-border trade in natural gas as it has for oil?

4. Governance of the Global Energy Economy

Global energy markets are now, more than at any time in history, vulnerable to logjams in delivery systems which can impede their free operation. Delivery log-jams can occur at a variety of upstream and downstream points, particularly across national borders. This applies to ports, roads, railways, pipelines and all other forms of energy processing and transportation infrastructure.

Although energy trade has gone global, *governments can only enact domestic laws.* Although national sovereignty remains sacrosanct, governments can further international cooperation through multilateral treaties which they can adopt domestically.

Numerous intergovernmental organizations (IGOs) have been created to facilitate international energy resource allocation and trade and its environmental impacts but have enjoyed only limited success.[12] As the very protracted negotiations over the Kyoto Protocol have demonstrated, it is an extremely difficult task for national governments to reach a consensus on global laws which will apply to them all and which will have an impact on their economic and environmental sovereignty. It is interesting to note, however, that the Carbon Sequestration Leadership Forum, established in 2003, seems to have moved very rapidly towards stakeholder engagement, development of a common understanding and then initiation of positive action to address one possible way of reducing atmospheric carbon.

Despite all their best efforts and without denying their individual achievements, the world's IGOs have thus far been unable to effectively underwrite or reliably facilitate the resource development and utilization aspirations of the majority of nations. The Energy Charter Conference stands out as one IGO that in the recent past has significantly increased its global influence, although it has yet to conclude its transit protocol.

Some non-governmental organizations (NGOs) have attempted to plug the gaps.[13] Largely in response to the ineffectiveness of global economic and environmental governance, NGOs have proliferated over the past few decades and some have intervened in energy projects.

In summary, there is still a major void in the governance of the global energy economy vis a vis domestic energy economies. As APEC Energy Ministers have recognized, some type of "best practice" is necessary to fill this void. What form this might take is discussed in the final chapter of this report.

[12] These IGOs include Asia-Pacific Economic Cooperation (APEC), the ASEAN Center for Energy (ACE), the Energy Charter Conference (ECC), the Gas Exporting Countries Forum (GECF), the International Atomic Energy Agency (IAEA), the International Energy Agency (IEA), the International Energy Forum (IEF), the Organization of Arab Petroleum Exporting Countries (OAPEC), Organización Latinoamericana de Energía (OLADE), the Organization of Petroleum Exporting Countries (OPEC), and the United Nations Conference on Environment and Development (UNCED).

[13] Two of the main energy NGOs are the London-based World Energy Council (WEC) and the Amsterdam-based International Gas Union (IGU).

5. An Investment as Well as a Trade Challenge

There are substantial environmental and economic benefits to be derived from increased trade in natural gas for both gas consumers and producers – and APEC includes some of the world's largest gas importers and exporters.

The use of natural gas is widely accepted as offering less of an environmental concern, as it is the cleanest and least polluting of all fossil fuels. Gas is also highly efficient, flexible and generally cost competitive with other fuels. Increased trade in gas offers economies greater access to competitive energy resources and the energy security associated with diversity of fuels and suppliers. For investors, there are opportunities to develop resources, to develop processing and transportation facilities and to earn export revenues.

APEC economies can now build on their past successes and anticipate the development of further bilateral pipelines and their extension to trilateral and multilateral arrangements. APEC economies can also anticipate a substantial increase in LNG trade amongst a much larger number of buyers and sellers. All of this activity will require an unprecedented level of investment, which we discuss further in chapter 7.

6. Energy Security: Policy Support by APEC for the Increasing Use of Natural Gas

There are 21 APEC Member Economies: Australia; Brunei Darussalam; Canada; Chile; the People's Republic of China; Chinese Taipei; Hong Kong China; Indonesia; Japan; the Republic of Korea; Malaysia; Mexico; New Zealand; Papua New Guinea; Peru; the Republic of the Philippines; Singapore; Russia; Thailand; the United States and Viet Nam. Together, APEC member economies account for almost 60% of global energy consumption. The US alone accounts for around 25% of global energy consumption and APEC developing economies are projected to have the strongest growth in electricity demand in the world over the next 20 years**.**

In recent years, APEC Energy Ministers have consistently supported the acceleration of investment in infrastructure and systems to facilitate cross-border gas trade. This report represents the latest outcome of the endorsement by APEC Energy Ministers in 1998 of "the APEC Natural Gas Initiative".[14]

APEC has been very concerned about the issue of energy security since well before the events of September 11, 2001. "The APEC Energy Security Initiative" was developed at a series of informal APEC EWG workshops and ultimately adopted in its present format at the 22nd meeting of the APEC EWG in Port Moresby on 28 September 2001. The APEC Energy Security Initiative seeks to address energy security concerns in two ways: first, it sets out certain measures to respond to temporary supply disruptions and, secondly, it proposes certain longer-term policy responses that it considers are "practical in a policy context and politically acceptable."

At their 5th meeting in Mexico City in 2002, APEC Energy Ministers reaffirmed their commitment to the APEC Natural Gas Initiative, recognizing its importance in pursuing the objectives of strengthening energy security and increasing the sustainability of energy supplies. One of the recommendations endorsed by Ministers was this study.[15] At the APEC Leaders' meeting in Bangkok in 2003, APEC leaders agreed to accelerate the implementation of the Energy

[14] APEC Energy Working Group, 1998, "Recommendations Concerning Accelerating Investment in Natural Gas Supplies, Infrastructure and Trading Networks in the APEC Region", APEC Energy Ministers 3rd Meeting, Okinawa, Japan.

[15] APEC Energy Working Group, 2003, "APEC Energy Security Initiative Implementation Plan", www.apecenergy.org.au/welcome/home/story1.html.

Security Initiative by endorsing its Implementation Plan and a new Action Plan to enhance regional and global energy security.[16]

Over the last several years, therefore, global energy security has become the most important topic on the energy policy agenda.[17] With natural gas emerging as the fossil fuel of choice and in the light of the disparity in supply and demand in the APEC region, cross-border natural gas trade is likely to play a key role in strengthening the energy security of APEC economies as well as enhancing their energy sustainability.[18]

7. Sustainability: The Single Most Dominant Public Policy Issue

Sustainability, or sustainable development, has inexorably become the single most dominant issue in mainstream public policy. Although energy security has become the most widely-discussed issue on the energy policy agenda, the consultants consider it is properly viewed as a component of the broader issue of energy sustainability.[19] In the ten-year period between the UN Conference on Environment and Development in Rio de Janeiro in 1992 and the World Summit on Sustainable Development in Johannesburg in 2002, sustainable development in its three dimensions, economic, social and environmental, has become integrated into mainstream public policy in general and into energy policy in particular.

The environmental effects of utilizing all forms of energy must of course be minimized. Although this represents a challenge to cross-border energy trade, it is an essential, universal requirement of the infrastructure development process that all responsible parties must willingly accept.

Some NGOs also support sustainability but, at the same time, oppose the increased use of natural gas as environmentally and socially flawed. They recommend a shift away from dependence on fossil fuels and towards renewable energy, conservation and energy efficient technologies.[20]

Interconnected energy systems offer APEC economies more opportunities for environmentally favorable outcomes than geographically isolated, smaller systems. In particular, interconnected natural gas systems should reduce greenhouse gas (GHG) emissions. The use of natural gas for industrial and domestic use and for power generation offers the lowest GHG emissions of any fossil fuel. This should in turn create GHG reduction credits that are tradeable between buyers and sellers under the Kyoto Protocol or under any other regional, bilateral or local carbon trading or offset regimes that may come into force.

Although there is still uncertainty about how carbon intensities will eventually be reduced and valued, producers of natural gas should endeavor to extract full value for its clean burning attributes. This is not presently occurring where LNG producers are "cleaning up" LNG prior to export and suffering the "carbon penalty" domestically. It will become necessary for energy buyers to recognize the value of the "fossil fuel of choice" and to share any future windfall gains from GHG emission reductions with the resource owner. Carbon trading, offset and tax regimes as they evolve are likely to underpin and support this trend.

[16] APEC Energy Working Group, 2003, "APEC Action Plan to Enhance Energy Security", www.apecenergy.org.au/welcome/home/story1.html.

[17] Pritchard, R, 2004, "Global Energy Security: The Hottest Energy Topic", Oil Gas and Energy Law Intelligence (OGEL) Volume 2 Issue 1 www.gasandoil.com/ogel/.

[18] International Energy Agency, 2004, "Security of Gas Supply in Open Markets: LNG and Power at a Turning Point", Paris, France.

[19] Pritchard, R, 2002, "Searching for Sustainable Solutions to Energy Security Concerns in APEC Economies", World Energy Council, London, UK.

[20] Greenpeace, 2004, "Liquid Natural Gas: A Roadblock to a Clean Energy Future", Washington DC, USA.

8. Globalization of Natural Gas Trade

With the worldwide growth in natural gas demand and the depletion of resources in some domestic markets, the gas sector is now undergoing radical change. After years of being utilized in mainly domestic markets, natural gas resources in isolated locations are now being taken across national borders to foreign markets.[21]

This is bringing about a revolution in the way energy is supplied to the global economy.[22]

[21] Dupin, H, 2004, "Globalization of the Gas Market: From a Regional to a Global LNG Market", 19th World Energy Congress, Sydney, Australia.

[22] *"Presently underway is a full-scale revolution in the way that the global economy is powered and how people around the world are inter-connected to eco-friendly, clean and abundant energy supplies. The growing globalization of natural gas trade is unmatched in potential to erect the three pillars of sustainability in terms of social, economic and environmental advancement and eradicate the plagues of poverty and pollution. LNG is the thread that can cross the seas, reconnect the tectonic plates and deliver the promise of natural gas. Natural gas is no longer the fuel of the future, but rather the fuel of the present given the need for clean and efficient supplies to meet energy and environmental targets. LNG is the future for natural gas",* Sweet, D, 2004, "The LNG Renaissance – Delivering Sustainability from Global Gas to Local Distribution", 19th World Energy Congress, Sydney, Australia.

CHAPTER 4:

CROSS-BORDER TRANSPORTATION OPTIONS

- **The two main transportation channels for cross-border natural gas trade are pipelines and projects for conversion into LNG for shipment by special tankers.**
- **Both transportation channels involve organizational complexity.**
- **Cross-border natural gas trade is inseparable from the process of investment. The development of natural gas transportation infrastructure within APEC requires massive, unprecedented levels of investment.**

1. Pipelines or LNG? Three Stages or Five?

Gas pipeline and LNG projects are alternative delivery channels for cross-border trade. Either one or the other is more suited to a particular application. In some projects, both pipelines and LNG are required.[23]

When condensed by cooling into a liquid, LNG occupies only 1/600th the volume of its gaseous state, enabling its transport by special tankers. LNG is a clear and colorless liquid with half the density of water. Liquefaction is not a chemical process; it is just a multi-stage refrigeration process.

As in the case of wireless telephones, we may be seeing the early emergence of energy conversion and delivery technologies that will allow new entrants to "leapfrog" the status quo. Energy conversion and transportation technologies that are already in some cases competitive with gas pipelines and LNG projects are:

- compressed natural gas (CNG)
- gas-to-liquids (GTL) and
- gas-by-wire (electricity transmission).[24]

[23] An example is the Sakhalin 2 project presently being developed on Russia's Pacific coast. After being brought onshore, gas is piped 800 km to a liquefaction plant in the south before being transported by ship as LNG.

[24] For further explanation of the various conversion and transportation technologies, their potential application and their relative economics, see:

- Clerici, A, et al, 2001, "Synergy Between Gas and Electric Energy Transportation", 18th World Energy Congress, Buenos Aires, Argentina.
- Antari, A et al, 2003, "Developmental Prospects for International GTL Trade by 2015: a Gas Producer's Viewpoint," 22nd World Gas Conference, Tokyo, Japan
- Cornot-Gandolphe, S et al, 2003, "The Challenges of Further Cost Reductions for New Supply Options (Pipeline, LNG, GTL)", 22nd World Gas Conference, Tokyo, Japan, and
- Lakahal, S, 2003, "The Economics of Gas Transportation — Pipelines vs LNG vs GTLs vs Gas by Wire", 22nd World Gas Conference, Tokyo, Japan.

Other energy conversion and transportation technologies are in development, such as gas hydrates, super conductors, hydrogen and fuel cells. None of these technologies are considered in this study.

Pipelines involve three basic stages and LNG five, as illustrated below:

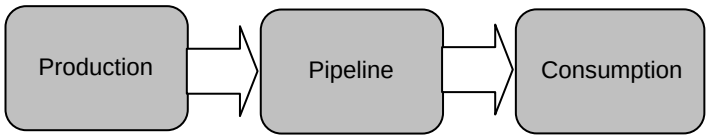


Figure 2: Stages in Gas Pipeline Projects

Figure 3: Stages in LNG Projects

Each stage in a cross-border gas project is typically a separate infrastructure project with its own sub-set of characteristics. Each stage can, and usually does, require the involvement of separate investment consortia and separate financing arrangements and supply/off-take agreements.

Historically, all stages of cross-border gas projects have been strongly tied together by contractual methods, although recent transactions in the expanding gas market have shown that some degree of decoupling is possible. In addition, all cross-border projects attract the regulatory supervision of not less than two governments. In combination, these contractual and regulatory factors give rise to organizational complexity.

2. Factors in the Choice

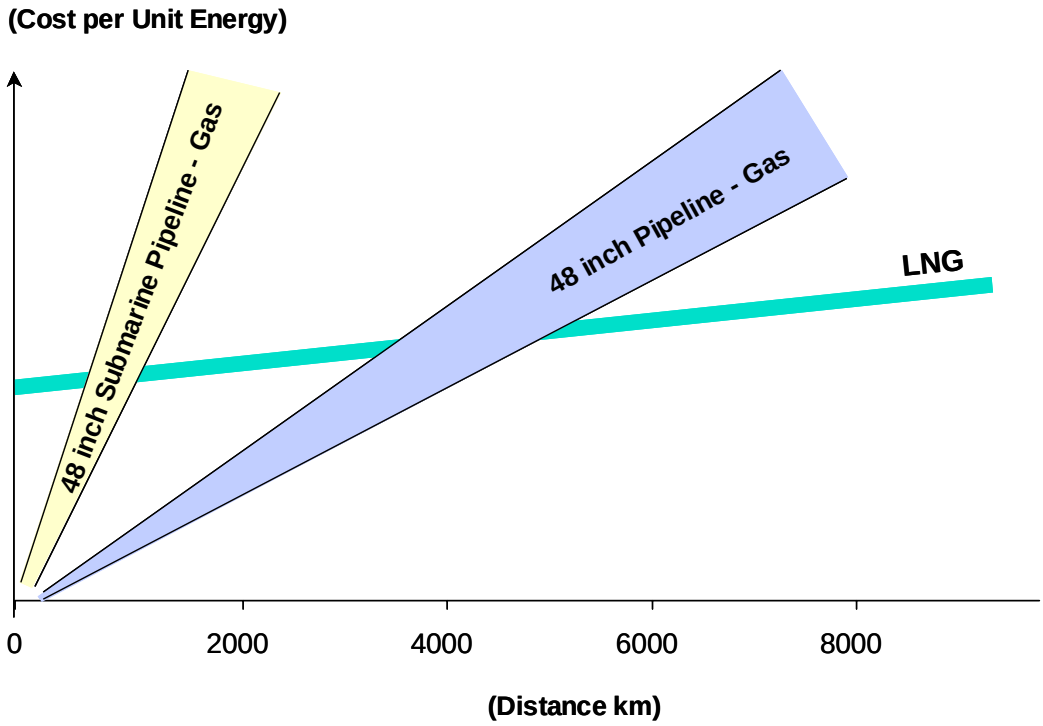
The main factors influencing the choice between pipelines and LNG projects are:

- distance by land and/or sea
- availability of rights of way and transit arrangements
- costs of gasfield development and construction
- transit arrangements
- delivered gas price/volume and price – producer “netbacks”
- project size and gas volumes and
- financing costs and project financeability.

As a consequence of economies of scale, technology improvements, competitive forces and the globalization of the energy industry, the costs of liquefaction, shipping and regasification of LNG have declined in recent years.

The competitiveness of gas pipeline and LNG projects is illustrated in a simplified way in table 5:

Table 5: Competitiveness of Pipelines v LNG Projects



Source: Sakhalin Energy Investment Co

The above table is only indicative. Exact costs will be project-specific and will depend on the precise details of individual pipelines and LNG projects. However, it can be seen from table 5 that, for a generic 48-inch onshore gas pipeline, LNG becomes cheaper for distances of between 3,000 and 5,000 km, depending on the terrain and pipeline characteristics.

3. Contrasting Features

The contrasting features of pipelines and LNG projects are summarized in table 6:

Table 6: Summary of Contrasting Features — Pipelines versus LNG Projects		
Feature	**Pipelines**	**LNG**
Comparative economics	Cost competitive over shorter distances — under 4,000 km (onshore pipelines) and 2,000 km (undersea)	Cost competitive over longer distances
Market risk	Opportunities for market developments along the pipeline route	Concentrated regional market required near the LNG receiving terminal (such as a power station)
Demand fluctuations	Demand fluctuations and emergencies require a buffer facility (such as underground storage)	Demand fluctuations and emergencies are catered for by LNG storage tanks and facilities or by use of “spot” or “swapped” cargos.

Supply source	Typically based on a single source or very limited range of supply sources. May be subsequently expanded.	Historically a part of a single buyer/ seller relationship. New LNG markets seek "open access" regimes, yet must recognize the need for long term contracts to underpin the facilities
Government involvement	Intergovernmental agreements are required amongst supply, consuming and transit countries before transactions are possible	Transactions are possible between supplier and consumer without government involvement. Cross-border LNG trade is almost entirely driven by market forces.
Regulatory risk	Usually exposed to regulatory risk — pipelines are seen as monopolies ultimately delivering low risk, low margin returns to investors	The LNG industry is in transition from bilateral "life-long" arrangements to a more flexible portfolio of contract types. Currently free of regulatory controls — each contract is separately priced based on pre-agreed formulae or market factors
Number of stages	Three project stages are required, strongly tied together	Five project stages are required, strongly tied together but with some decoupling as short-term markets emerge

4. The Tendency of New Cross-Border Projects to Languish

Despite the increasing global demand for natural gas, and despite high-level policy support for its increasing use, new cross-border natural gas projects have tended to languish because of a complex aggregation of interrelated factors. These factors include:

- the immaturity of gas markets in many importing economies
- the degree of "stranding" (that is, the relative isolation of gas reserves from established or potential markets)
- the sheer scale, cost and financeability of developing the required infrastructure (cross-border natural gas trade cannot be undertaken without very heavy investment) [25]
- the difficulties of obtaining development and environmental approvals (so-called "permitting difficulties")
- the diversity of historical, political and ideological positions in relation to resource ownership, product values and value flows/beneficiaries
- differences in, or incompatibility of, national policies, investment rules, regulatory regimes and pricing regimes
- differences between the economic and/or pricing expectations of some stakeholders and marketplace reality and
- a variety of other complexities and risks that are specific to cross-border gas trade and investment or are specific to individual projects.

[25] It should be particularly noted that the differential in the level of capital investment between natural gas and crude oil development projects can be 5-6 times if delivery is to be made by pipeline. It can be 20 times if an LNG project has to be established.

It appears certain that the rate of growth of LNG projects will greatly exceed that of cross-border gas pipeline projects. To a large extent, this will be the result of the inherent flexibility of open global energy markets, contrasted with the regulatory burdens that tend to dampen investment in gas pipelines.

CHAPTER 5:

IMMATURE NATURAL GAS MARKETS

- **Natural gas markets do not automatically happen – they must be created.**
- **In some importing economies, there are unrealistic expectations of the level of future demand, the rate of demand build-up and the level of achievable prices.**
- **There is great value for natural gas importing economies in adopting an "industry vision" to guide their transition to a mature market environment.**

1. Liberalization of Natural Gas Markets

In chapter 3, reference was made to the process of structural change in the global energy economy. Since 1973, a wave of liberalization of global, regional and domestic energy markets has taken place. This has created a host of interrelated political and commercial challenges for both exporting and importing economies, causing some tensions in relation to natural gas markets.[26]

2. Gas Market Creation

The June 2004 Tokyo workshop, described in appendix 2 of this report, highlighted the pivotal need to secure a market to underpin investment in new LNG projects. The same need arises in new pipeline projects and was highlighted at the August 2004 Singapore workshop on the Trans-ASEAN Gas Pipeline, described in appendix 3 of this report.

Natural gas markets do not automatically happen – they must be created. However, the creation of a gas market may be hindered by:

- political barriers
- economic limits (low standards of living)
- inter-fuel competition
- the lack of gas distribution infrastructure

[26] *" … I have to make reference to the concern of the producing countries about the impact of certain decisions by the consuming countries regarding gas import that were made without consulting the exporters. One example is the European Union's deregulation plan to set a market that suits their own interests without discussing it with the gas producing countries. I believe such a plan is short sighted in that it may only put further obstacles in front of the development of the gas industry and would not encourage producers or energy companies to invest. It will eventually increase the burden on the consumers who will end up paying more. We therefore invite the European Union to open dialogue to understand the views of the investors and the exporting countries. It is too risky to look at gas as any other product and subject it to similar market mechanisms",* Al-Attiyah, A, 2003, Minister of Energy and Industry of Qatar, 3rd Ministerial Meeting of the Gas Exporting Countries' Forum, Doha, Qatar. Similar comments have been made by LNG suppliers at APEC workshops and elsewhere about the critical importance of long-term, creditworthy customers for the development of cross-border natural gas trade.

- the lack of investment in new technology, such as CCGT generation
- heavy-handed regulatory regimes
- uncertainty about GST and other ad-valorem taxes that may be imposed by the importing government
- deregulation (if deregulation constrains buyers from committing to long-term offtake or supply contracts or disaggregates buyers so as to reduce their financial capacity to undertake such commitments) and
- the lack of recognition of the "environmental value" of gas.

Market creation involves both contractual and regulatory issues. The former can be dealt with by commercial negotiations amongst sellers and buyers but regulatory regimes often constitute a major barrier and require a degree of government vision and involvement. Regulatory regimes are discussed in detail in chapter 8.

Commercial solutions must be tailored for the maturity of each market. Conditions in a mature gas market, such as Japan, are to be contrasted with conditions in an emerging market, such as China.

3. Gas Demand and Build-Up

For a successful cross-border natural gas project to eventuate, a gas demand profile, matched to a similar supply profile has to be achieved. In the private sector, this has to translate into a bankable project, with adequate risk-weighted returns to the investors over the life of the project. This same consideration is true for the gasfield developer, who will have to prove up and maintain adequate gas reserves for the project life.

The major challenge for cross-border gas projects is to secure a creditworthy, long-term offtaker or capacity-taker who is able to "underpin" the project. Given the very large volumes of gas to be used, this typically requires substantial switchable base load capacity and cannot rely on the gradual building of reticulation systems and the gradual build-up of gas demand, nor on peaking power stations. Factoring in the build-up period can be a substantial challenge for all parties to a gas project. In this regard, long-term "take-or-pay" contracts remain vital for bringing gas to market.

4. Differences Between Domestic and International Prices

Differences between domestic gas prices (often capped by regulation) and internationally traded prices cause difficulty for the development and financing of most new cross-border gas projects. Domestic gas tariffs often require rebalancing. Arbitrage opportunities in both electricity and gas markets occur in some economies where there are distinct seasonal patterns of energy use.

Continued high international gas prices can be expected to cause difficulties for exporters, who have low or subsidized domestic fuel pricing, as producers seek to sell to those able to pay the highest price for the energy they supply. This may result in conflicts between national energy policy and free market activities.

5. The Need for a More Flexible Natural Gas Business Model

The development of a truly international market for natural gas may only be possible if there is a paradigm shift in the way gas imports are treated institutionally and commercially. Much greater flexibility and competitiveness will be required. This is analogous to the way that the business model for natural gas changed in the US and UK during the mid-1980s. Some of the considerations to be borne in mind in achieving this change are:

- there is a risk that exporting governments could take unilateral action to reduce or even terminate gas exports in times of domestic shortage
- there is the possibility of reserves or production downgrades as well as major disruptions to production
- gas supply contracts are vulnerable to termination of the production licenses or production sharing contracts that may have fixed terms in themselves and
- there is a need for a sufficient number of transactions to set a price that is responsive to market changes in the same way as crude oil.

6. Impacts of Carbon Intensity Reductions, Carbon Taxes and Emissions Trading

Any future imposition of a point-of-source CO_2 emissions reduction regime could impact on gas prices. If imposed at the production level, well-head prices will rise, the impact of which will flow through to end-users. If emission taxes are imposed on stationary generation, this may favor CCGT generation or conversion of existing coal-fired plants to CCGT, in turn raising gas demand and prices.

The latter impact has been felt in the United States over the past two years as a result of tightened environmental licensing. Gas prices have risen significantly as a number of merchant CCGT generating plants have come on line and as coal-fired generating plants have been converted to gas.

Depending on how any future emissions trading market is structured, it is highly likely that gas prices will increase differentially relative to other fuels.

7. The Impact of Industry Consolidation

After gas markets have been liberalized in many economies, we have seen the convergence of the gas and electricity industries, often accompanied by a change in the pattern of ownership of the energy industry. Some companies are moving away from specialized operation in a single market segment towards the management of a portfolio of physical and contractual energy assets.

Three factors are driving companies towards consolidation. The first is that many services in both industries are still negotiated under bilateral arrangements. An energy company can more easily manage market risks by vertical integration into power generation and gas production and into electricity and gas retailing.

The second factor is that there are synergies between gas and electricity markets that make it more profitable to operate in both. For example, in the northern hemisphere, if the difference between the gas and electricity price is high enough, an integrated energy company can divert gas supplies away from power generation into downstream gas retailing. Equally, the trader can divert gas supplies over winter months so as to benefit from high gas prices in the market and over the summer months benefit from higher electricity sales prices. This portfolio-based approach to operating in electricity and gas markets is given the generic name of “spark spread trading”.

The third is that there are economies of scale in both industries. These economies of scale come in part from having access to a larger resource position or end-user customer base but also come by minimizing diversifiable portfolio risk. The pursuit of these economies of scale drives companies not only towards larger agglomerations of customers but also to ever-larger portfolios of suitably tailored physical and contractual assets.

To counterbalance these tendencies, governments can impose cross-ownership restrictions to ensure that sufficient competition remains in the market.

8. The Value of "Industry Vision" in Importing Economies

Natural gas markets cannot be created overnight – they need time to evolve.

Participants in all three APEC workshops in 2004 strongly emphasized the need for importing economies to actively facilitate market creation. Workshop participants also emphasized the great value of importing economies adopting an "industry vision" to facilitate an orderly transition to a mature market environment for natural gas.

CHAPTER 6:

THE PAUCITY OF TRANSPORTATION INFRASTRUCTURE

- **At a global level, an average expenditure of $25 billion per annum will be required on natural gas infrastructure development for the next 21 years. Within APEC, some $10-15 billion per annum will be required, a large part of which will be for transportation infrastructure.**
- **Cross-border natural gas projects raise a range of community and political concerns, including serious concerns in many importing economies about energy security.**
- **There are indications that some importing economies may have underestimated the seriousness of the paucity of infrastructure for cross-border gas trade and overestimated the ability and timeliness of cross-border gas trade and investment to meet gas demand.**
- **Accelerating the rate of development necessitates collaboration across the entire gas supply chain, for which some type of international initiative is necessary.**
- **There are physical and practical limits to how much acceleration can be achieved, given the very long lead times involved in developing all types of cross-border gas projects.**

1. Unprecedented Expenditure Required

To meet global expectations of gas production and supply over the 21-year period to 2025, it is estimated that capital expenditures totaling about $630 billion will be required. About $520 billion will be required for infrastructure and the remaining $110 billion for exploration and production.[27]

The average annual level of expenditure required over the 21-year period to 2025 for natural gas infrastructure development is estimated to be $25 billion, with another $5 billion required for exploration and production.

Within APEC, some $10-15 billion per annum will be required.

2. Community Opposition

In the 21st century, with a highly interconnected and usually better-informed public, the importance of public consultation and the importance of providing balanced, unbiased information and education at all levels of the involved communities about the impact of energy projects cannot be over-emphasized. It is apparent that the securing of appropriate sites for energy infrastructure development cannot be taken as a foregone conclusion in today's globally-interconnected and information-overloaded environment.

[27] Estimated by Douglas-Westwood Ltd, 2004, "The World LNG and GTL Report", Canterbury, UK.

In the context of proposed developments relating to cross-border energy trade, people typically express four basic fears: a fear of unfair treatment, a fear of foreign capital, a fear of energy insecurity and a fear for their personal safety.[28]

The Fear of Unfair Treatment

Many communities fear that they could be unfairly treated, in either economic and environmental terms, in a number of possible ways. These fears relate to:

- reliance on supply from competitive international energy markets
- exposure to "excessive" international prices
- monopolistic business practices
- "dumping" of international energy at low prices, which could put their local generators out of business and cause job losses and
- international companies extracting unfair value from development of resources.

The Fear of Foreign Capital

Many people remain fearful of foreign direct investment (FDI) and of the loss of their autonomy. They fear that FDI carries the risk that decisions of importance may be made abroad in disregard of their national interest (perhaps influenced by the national interest of the foreign investor's home economy). This fear of FDI is neither imaginary nor a matter of great concern either; it needs to be weighed up against the fact that the host economy retains the sovereign right to set the rules governing business activities within its borders and the sovereign right to impose taxes and other imposts.

With proper regulation, there is no reason why FDI should not be utilized in the energy sector by host economies.[29] All economies aim to be as "sovereign" and economically self-sufficient as they possibly can. They need therefore to encourage the highest possible level of domestic savings and to develop efficient domestic capital markets. However, any economy undergoing development which wants to invest at a greater rate than it saves itself must utilize foreign capital to do so.

The Fear of Energy Insecurity

Well before "September 11", events such as the California energy crisis had resulted in energy security becoming a topic of wide concern. It remains at the forefront of energy policy review and public debate.[30]

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[28] These "people barriers" were outlined in a previous report to the APEC Energy Working Group on cross-border interconnection of electricity grids: ResourcesLaw International, 2002, "Cross-Border Power", APEC Secretariat, Singapore.

[29] FDI offers a number of advantages to a host economy over public sector borrowing and portfolio investment:

- FDI is almost invariably accompanied by the transfer of technology and know-how to the host economy
- FDI reduces the vulnerability of a host economy to downturns in world economic conditions and
- FDI (especially in gas infrastructure) is "bolted down" in the host economy and cannot leave easily If there is a financial crisis.

[30] Pritchard, R, 2004, "Global Energy Security: The Hottest Energy Topic", Oil Gas and Energy Law Intelligence (OGEL) Volume 2 Issue 1 www.gasandoil.com/ogel/.

The fundamental energy security issue in the modern global energy economy is whether there is sufficient energy infrastructure to reliably handle the volumes of energy that must be produced and transported across national borders and whether this infrastructure is secure against sabotage and other events of *force majeure*. The discomfiting question should be asked: what would be the consequences for cross-border natural gas trade if a bomb were to explode at a key natural gas facility or on an LNG tanker? The answer is probably very little so long as energy importing economies have successfully diversified their supply sources.

As individual economies come to rely more and more on imported energy, the more they will be concerned to ensure their security of supply. Some of the responses to this concern are:

- individual consumers and community groups can provide on-site fuel storage, or alternative sources of energy, as a back-up against disruption of supply
- major users may operate a portfolio approach to supply procurement, with a diverse mix of suppliers and fuel types
- importing economies may similarly operate a diversified portfolio approach, be it overt or covert, with consideration to the fuel type, source of supply, strategic storage, political stability of the supply source and economic benefit or impact.

Gas pipelines provide large-volume, low-cost transport over their lives. However, if a pipeline must transit a third country en route to markets, this requires the payment of transit fees and raises the perceived or real risk of supply interruption. If there is more than one pipeline, and preferably supply source, the risk is considerably reduced.

As the global LNG market expands, with an increasing number of LNG terminals, the sources of supply will increase. As the market matures from its early days of long-term contracts and occasional spot cargos, multiple buyers and multiple sellers and a wider range of swaps and other arrangements are emerging. These developments should progressively enhance security of supply and reduce the risk of supply interruption by any one facility, shipping route, vessel or other factor.

The Fear for Personal Safety

The natural gas industry has an excellent safety record.[31] Nonetheless, natural gas, like all hydrocarbons, is a hazardous fuel and the processing and handling of both pipeline gas and LNG involve various levels of risk. Both LNG tankers and land-based facilities are, like many other essential facilities, vulnerable to terrorism, accident, equipment failures and human error, act or omission. Tighter safety and security regimes for LNG receiving terminals and carriers have been evident in the United States since September 11, and increased public concerns about the risks of accidents and sabotage are evident globally. An equipment failure and explosion at the LNG liquefaction plant in Algeria in 2003 served to heighten those concerns, under the broad heading of "LNG", as opposed to any factually-based concerns about the safety of LNG receiving terminals.

The NIMBY ("not in my backyard") phenomenon tends to affect the development of nearly all infrastructure projects. In the energy sector, it is most pronounced with the development of nuclear and coal-fired power plants but it can also seriously impede, or even derail, gas pipeline and LNG project development. The demand for clean energy must therefore be balanced by community consultation and education programs, and by implementation of appropriate and proper technical and safety regulations, to ensure that risks to health, safety and the environment are kept to industry standards and within agreed boundaries.

[31] Congressional Research Service, 2004, "Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress", Washington, DC, USA.

3. Environmental Barriers

Minimization of the environmental effects of utilizing natural gas and developing new cross-border gas projects is an essential requirement that all responsible parties in the gas industry accept. We do not single it out as an absolute barrier. Nonetheless, the cost of sequestering or offsetting CO_2 from some new gas production projects is likely to be formidable, as acceptable limits of stripping and venting are exceeded.[32] The proposed Gorgon LNG project in Australia is just one project that is presently addressing this issue.

4. Political Barriers

Political barriers to cross-border energy projects can often be attributable to the "people fears" described above. Without a supportive political background, the pursuit of an energy-related interconnection proposal is almost impossible. Should an economy choose to isolate itself politically, or show hostility towards another economy, or merely indicate an unwillingness to enter into negotiations to interconnect its energy industry with that of another economy, there is little point persisting. More commonly, the political leaders of an economy will not make a clear statement about their position on an interconnection proposal. Instead, they will drag their feet and not respond either one way or the other to the proposal until they are satisfied there are no political risks associated with it, or so much time has passed that the project itself goes away.

Political barriers cannot be broken down overnight but there is one obvious way of doing so. The first is by each economy participating in the international institutions that regulate international trade and investment, such as the Energy Charter Conference, which enables each participating economy to realize its full potential for political influence and for economic development.

5. Have Expectations Been Raised to Unrealistic Levels?

For the last three decades, Japan has repeatedly expressed concern about the vulnerability of its economy to energy supply disruptions. APEC economies that have recently joined Japan in publicly expressing their concerns have been, most prominently, China, New Zealand and the United States.[33]

Before the commencement of this study, the World Energy Council had expressed doubts about achieving a sustainable global energy balance by market forces alone:

> *"Energy supply constraints may play an important role as a negative driver of the energy scene in the coming years in spite of the best efforts of governments and companies. … The uncertainties in energy markets, particularly with respect to moving plentiful supplies to where they are needed, coupled with the long times for new investments in exploration and production to meet new demand, reinforce the view that market forces alone are not enough to guarantee a sustainable balance among producer and consumer interests,"*[34]

[32] There are currently no internationally recognized limits, in percentage or absolute terms, of allowable CO_2 releases.

[33] With the Australian Bureau of Agricultural and Resource Economics (ABARE), ResourcesLaw International is presently studying the economic impact of energy supply disruptions on APEC economies and the short and long-term responses to energy supply disruptions. This study is expected to be completed in late 2004.

[34] World Energy Council, 2003, "Drivers of the Energy Scene", London, UK, p 79.

6. Facilitation of Solutions

Despite being much better informed in the age of modern communications systems, many communities, especially local communities, retain a high level of mistrust of whatever they do not fully understand.[35]

Although there is some momentum for policy and regulatory cooperation in relation to interconnection of energy systems, which is encouraged by APEC Energy Ministers, the willingness of governments to cooperate has not yet resulted in a fully effective international mechanism. So far, the willingness of governments to cooperate has been mainly limited to a somewhat vague consensus about policies and principles. It is a type of "wait and see" approach.

To accelerate the rate of development of natural gas supply chains, there is a need for proactive collaboration amongst governments, investors and communities.[36] This is elaborated in chapter 12.

[35] *" … the development process remains something of an international intrigue. The cast of this absorbing plot includes host countries, international organisations, politicians of all persuasions, large and small investors (whether domestic or foreign), banks, trade unions, environmental groups, many other institutions and special interest groups, as well as billions of citizens with a stake in the process. Then there are the experts and advisers who formulate the options, influence policies and assist in the negotiations. Many of the cast of this intrigue are still very suspicious of each other",* Pritchard R, 1996, "Economic Development, Foreign Investment and the Law", International Bar Association and Kluwer Law International, London, UK.

[36] The Trans-ASEAN Gas Pipeline project, described in appendix 3, is an example of how supportive political arrangements, flowing from ASEAN membership, have successfully facilitated the development of new pipelines in South-East Asia. At a more general level, all of the activities of the APEC Energy Working Group are gradually contributing to the delineation of regional solutions.

CHAPTER 7:

THE CHALLENGES OF PROJECT SCALE, COST AND FINANCING

- **The dominant characteristics of all cross-border gas projects are their long gestation periods, large scale, high cost and difficulty of packaging a financial solution. These factors pose permitting, technical and organizational challenges.**
- **The larger the number of parties involved in a particular project, the more complex the negotiations become and the greater the range of risks that investors face.**
- **Any illegal activity, such as corruption, should be treated as an absolute barrier to investment in all new infrastructure projects.**
- **Although the financing of cross-border gas projects always involves project-specific challenges, there are some basic rules that must be satisfied. These concern the robustness of the project revenues and the creditworthiness of the offtakers.**
- **Completion risk is a great risk for new cross-border gas projects – often so great that conventional lenders are unwilling to accept it. Proponents of projects therefore need to be not only creditworthy but technically experienced as well.**

1. Project Scale

The larger a cross-border natural gas project becomes, the larger may be its potential impact on affected communities and the environment. Although larger projects may bring lower unit prices, they require larger markets, greater reserves, greater upstream investment to prove up, requiring greater time. It often takes 5 – 7 years and longer to develop a new gas project. This provides a competitive advantage for existing projects that are able to expand.

The cost of proving up sufficient reserves is the “economies of scale dilemma” for gas projects. Small-scale, cross-border gas projects are very difficult to develop. In the longer term, however, it may be possible for new entrants to “skip a technology” and commence operations utilizing remote power, transported fuels and fuel cells. Gas infrastructure may also be eligible for use in the future “hydrogen economy”, should that eventually replace gas, not as a fuel but as an energy transfer medium.

2. Development Costs

Pipelines

The cost of developing a pipeline onshore involves the acquisition of rights of way, cost of the pipes, compressor stations and the cost of construction. The estimated cost of some of the major planned pipelines in APEC, excluding the cost of gas field development itself, are set out in table 7:

Table 7: Estimated Total Cost of Selected Pipelines	
Kovykta, Russia to China pipeline	$6-8 billion
The Trans-China East-West pipeline	$10 billion
The Asian Gas Trunkline	$8 billion
The PNG – Australia pipeline	$3 billion

LNG Projects

LNG project costs can be highly variable and are very project-specific. The costs of gasfield development, may include the cost of offshore or onshore gas gathering, processing and compression facilities and/or pipelines to transport the gas to the nearest port. Apart from these costs, the largest cost component of an LNG project is the liquefaction plant. As discussed in the Tokyo workshop, this latter point is now being challenged by the cost of pre-treatment of gas prior to liquefaction, where the cost of CO_2 and/or H_2S removal is expected to exceed the cost of the liquefaction plant in some future major gas developments.

The indicative cost of a typical 8 million ton per annum LNG project is estimated at around $6 billion. The main cost components are set out in table 8.

Table 8: Indicative Cost Components for an 8 Million tpa LNG Project	
Exploration and gasfield development	$1 billion
Liquefaction plant	$2 billion
Ten standard 142,000 cm LNG tankers	$2 billion
Receiving terminal and regasification plant, including the receiving port and marine facilities	$1 billion
TOTAL	$6 billion

3. The Negotiation Process

The negotiation of investment agreements for infrastructure projects is an expensive and lengthy process, and as a result it is only the most substantial investors who can afford the cost and time to see the negotiations through to the end.[37] In international negotiations involving projects for the private development of infrastructure, there can be an unequal understanding of the "rules of the game" and confusion about total trade flows versus values created from the various stakeholders. There is often great tension in public-private sector deals, especially if a developing economy is involved and its officials are participating in project negotiations for the first time.

[37] Even before such negotiations can occur on many major gas projects, the delineation of borders, ownership of reserves and apportionment of benefits have to be agreed. As these issues may include sovereignty, national policy and other issues, it is important to recognize the benefits of reaching agreement on a commercial solution, even if the boundary issue resolution is deferred.

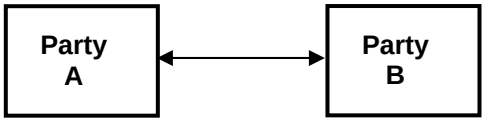
In projects that involve multiple parties, it is essential for the parties to test their preconceptions, to re-evaluate their goals and to redesign their proposed dealings so as to either reduce the number of contracting parties or minimize the level of contractual complexity.

Negotiating sound and durable investment agreements for cross-border projects does not involve special science but it often requires special facilitation and guidance[38]. To begin with, such projects normally bring together in an international transaction various participants, including public officials, who would otherwise have had little to do with each other. These people need in their negotiations to transcend national and cultural boundaries and establish an overriding mutuality of purpose. Public officials for their part may need to contend with competing or unsympathetic constituents within their own government.

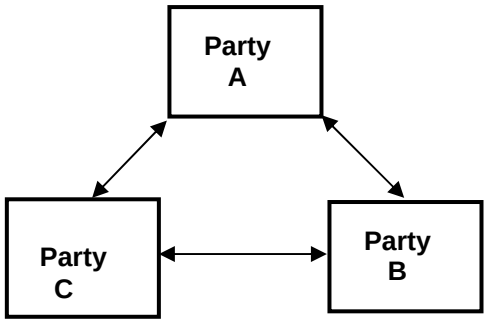
Until the essential parameters of the transaction have been settled, it can sometimes be unwise to directly bring bankers or other non-essential parties into the negotiations. To do so can exacerbate tensions amongst the participants if non-essential parties actively support one side or another. Parties who succeed in putting others into legal strait-jackets can unwittingly sow the seeds of instability in the real relationship if they fail to appreciate that the legal issues are inseparable from the surrounding political, financial, policy and social issues.[39]

Most trilateral or quadrilateral deals involve contractual complexity to a degree well beyond the level to which parties and their lawyers have been trained to cope with or may have ever encountered. This is illustrated in figure 4.

Figure 4: The Complexity of Multi-Party Contractual Relationships



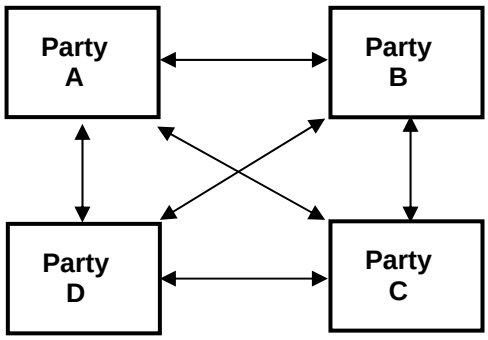
A bilateral relationship depends on two sets of rights and obligations



A trilateral relationship has three times the complexity of a bilateral relationship because it depends on six sets of rights and obligations

[38] Hager, M and Pritchard, R, 1999, "Deal Mediation: How ADR Techniques Can Help Achieve Durable Agreements in the Global Markets", ICSID Review – Foreign Investment Law Journal, Vol 14 No 1, Spring, International Center for Settlement of Investment Disputes, Washington DC, USA.

[39] Pritchard, R, 2001, "The Energy Lawyer Through a Looking Glass", Journal of Energy & Natural Resources Law, Vol 19 No 1.



A quadrilateral relationship has six times the complexity of a bilateral relationship because it depends on 12 sets of rights and obligations

A five-party relationship (not depicted in the illustration) involves 10 times the complexity of a bilateral relationship and easily outstrips the capacity of the parties and their lawyers to stabilize their relationship by orthodox contractual means.

It is important from the beginning of negotiations to strive to minimize contractual complexity. One technique of achieving this in the case of jointly-owned projects is to utilize incorporation laws to establish joint ventures in preference to contractual structures. This process itself requires substantial work to allow effective tax planning and expense-offsetting to take place.

4. A Warning about Illegal Activity such as Corruption — an Absolute Barrier

Any activity which is illegal under the legal system of any economy can be the cause of collapse of an otherwise quite secure project. Illegal activity includes corruption, although it is by no means limited to corruption. It can, in many legal systems, include:

- breach of labor laws
- illegal import or export of goods or currency
- illegal payments, fees, commissions or entitlements
- inappropriately directed or distorted share or equity entitlements
- tax evasion
- breach of environmental laws and
- breach of consumer protection laws.

Under most legal systems, any contract (including an investment contract with a host government) which is obtained by corrupt or other illegal means is not only illegal but also unenforceable. In addition, an unenforceable contract jeopardizes the enforceability of banker's securities. We can suggest no better way of investors increasing their investment risk than by participating in illegal activity of any type. Bankers for their part will be anxious to satisfy themselves that their borrowers have not been involved in any such activity. Corrupt and illegal practices should therefore be seen as an absolute barrier to investment in any project.

5. Project Financing

Are There Sufficient Funds?

Financing barriers were debated at length in the text of the "Monterrey Consensus" at the International Conference on Financing for Development, convened by the United Nations in Monterrey, Mexico in March 2002. A 1997 World Energy Council study concluded that the major issue in financing energy projects was how to mobilize capital rather than the adequacy of

either the supply or demand for investment funds.[40] The consultants strongly agree with this conclusion. Invariably, the solution to the capital mobilization issue in a particular economy depends on the difficulty of making adjustments to domestic institutional structures that have a long history and that reflect the political, social, and economic fabric of domestic economies. At the workshop held in Tokyo, there was a clear and direct suggestion that there was no shortage of financial capacity to support these levels of expenditure to expand the gas industry within APEC. It was also emphasized that each project needed to be robust in all respects to attract and secure the required funding.

Is Project Finance Always Needed?

The simple answer to this question is almost always yes. Project financing or refinancing is almost always needed for energy infrastructure projects because the scale of projects is so large that project proponents cannot shoulder the financing burden alone. Where the government or the project proponent (or project sponsor) is unable or unwilling to utilize additional sources of public finance or corporate finance, as the case may be, "project finance" must be sought.

If a government is able to finance an infrastructure project out of public funds, or can gain access to funds to develop the project based on its own international reputation or creditworthiness, no financing barrier arises. Similarly, if an independent energy enterprise, whether state-owned or privately-owned, has adequate funds available from its internal resources, or can obtain corporate finance to develop an infrastructure project based on its own assets and creditworthiness, no financing barrier arises. However, the scale of energy infrastructure projects makes this almost impossible.

For many governments, an important advantage of project financing is that the large-scale financing burden of an infrastructure project can be moved "off balance sheet", reducing financial pressures on the government itself. Most private sector proponents also prefer to keep large-scale financing off their balance sheets, not just because of the large scale but also because, if a consortium of investors is involved, the individual members will not wish to expose themselves to joint and several liability. In most cases, the private sector proponents will establish a special-purpose investment vehicle to undertake the project and to procure project finance.

What Exactly is "Project Finance"?

The term "project finance" is often loosely used to describe any debt financing of a project. However, what distinguishes true project finance from other types of lending transactions is that the lenders look primarily to the cash flow of the project itself for repayment and to a lesser degree to the project assets as collateral security, rather than depending upon the creditworthiness of the project proponents. For this reason, project finance is often called "non-recourse" or "limited recourse" finance. Project finance is however only available to projects that satisfy the requirements of "bankability". This is further discussed below.

With some of the less risky projects, it is not uncommon for project finance to be utilized for 80% or more of total project costs, although 70% is a more conventional level. Project finance is only concerned with debt finance. The balance has to be provided by the project proponents as equity capital, typically from their internal resources.

How is "Bankability" Established?

"Bankability" is the term typically used to signify to the capability of a particular project to attract project finance. The bankability of infrastructure projects is always economy-specific and project-specific. In gas projects, it is highly dependant on the quality and creditworthiness of the offtake arrangements.

[40] World Energy Council, 1997, "Financing the Global Energy Sector – The Task Ahead", London, UK.

For new energy export projects in some countries, the risk for major investments relates to the fixed nature of the assets installed, as well as the upstream reservoir and delivery systems. The risks include expropriation, seizure, detention, confiscation, nationalization of assets, as well as the risk of insurrection and terrorism. It may be possible to phase in the development, which allows the host economy to build confidence with the financial community — however this is often at the expense of being unable to fully capture the economies of scale benefits.

For projects where the gas is to be sold to an emerging economy, the creditworthiness of the offtaker and the economic and industry climate in the buying economy become pivotal to bankability.

For projects that connect new suppliers and buyers, or pass through new transit economies, many additional challenges and complexities arise. Historically, the biggest single challenge in establishing bankability is completion risk. In considering whether a particular infrastructure project is bankable, banks will study the complete range of economy-specific and project-specific risk issues, the creditworthiness, experience and track record of the project proponents (the equity investors) and the investment structure and risk mitigation mechanisms proposed for the project.

Questions Banks Will Ask

In the case of cross-border gas projects, banks will usually begin by asking the basic question of whether there is an existing market for the gas or whether a market needs to be created, the same basic questions as the equity investors should have already examined.

In addition, banks will also expect answers to a range of targeted questions like those set out in table 9:

Table 9: Questions Banks Will Ask
By what deadline will the project be completed?
What will it finally cost?
Who will pay for any overruns?
Will it function efficiently?
Will it have reliable reserves of gas available?
Will the gas be sold on profitable terms to a creditworthy offtaker, free from risk of intervention?
When will the project become cash flow positive?
What taxation rules apply to the borrower?
Are any tax concessions and exemptions available?
Are any loans available from concessional sources?

If different lenders are involved, will they rank equally and, if not, what priority of repayment will apply amongst them?
Is any government approval required for the financing plan?
Could the banks attract any environmental liability?
Is political risk and other key insurance coverage available?
Can security over the project assets be obtained?
Will the project security be freely assignable by the banks in the event of default without the requirement of further government approval?

Before the project proponents and the banks consider these project-specific issues, they should check the current standing of the host economy with international institutions such as the IMF, the World Bank, MIGA, ADB and IADB. These enquiries will invariably reveal issues which will be of importance to bankers in the future financing negotiations.

Apart from commercial banks, the government export credit agencies of many economies are an important source of finance and financial guarantees for projects which involve exports to other economies. These agencies will sometimes be prepared to accept levels of political risk and completion risk that banks will not. However, following the Asian financial crisis and a number of loan defaults and project delays, these agencies are today much more cautious than they were during the 1990s. For instance, in fiscal years 1998 and 1999, the Export-Import Bank of the United States virtually ceased writing project finance business, although expanding its export credit insurance activities.

The First Crucial Financing Issue — Creating a Robust Revenue Stream

Where there is no active market for natural gas (as is often the case with a new cross-border gas project), the whole of the project's capacity will need to be dedicated under a long-term contract for use by a single entity. The lending banks will then rely almost wholly on the robustness of the contracted revenue stream and on the creditworthiness of the offtaking party.

Whether and in what circumstances the contracted revenue stream could be interrupted, is invariably the most crucial issue in the development and financing of all cross-border projects.

Banks know that, if the project proponents are unable to construct or operate an infrastructure project successfully, the banks themselves will probably experience even more difficulties in doing so. Because of this, the banks, the project proponents, and any third parties against whom the lenders expect to have recourse, all depend for the repayment of moneys advanced on the ability of the project to meet its cash flow projections once in operation.

The Second Crucial Financing Issue — Reducing Completion Risk

The commencement of the contracted revenue stream obviously depends on the successful completion of the project. The value of the physical assets of an infrastructure project prior to commissioning will ordinarily be only a fraction of the capital expended. Even after commissioning, the physical assets may have very little value without the contracted revenue stream that goes with the assets. Although project financiers will require security over all of the project assets, this is usually done as a means of ensuring compliance with restrictions against dealing with or encumbering the assets of the project, rather than with the expectation that realizing on the security will be a realistic means of recouping the monies advanced.

In fact, with most new infrastructure projects, completion risk typically represents such a great risk that many conventional lenders are unwilling to accept it. In such cases, project proponents will need to obtain "bridging finance" from commercial banks or other sources by providing the financiers with recourse to governmental or corporate balance sheets and/or other collateral security (often at more expensive rates) until all of the "completion tests" are satisfied. After that, non-recourse or limited-recourse project finance can be substituted. The ability to obtain bridging finance will however require the project proponents to be highly creditworthy entities.

Removing the Mystery and Remembering the Basic Requirements

There is always an air of mystery about the availability of finance and what needs to be done to turn on the tap. Claims of some investment banks to be the leaders in "financial engineering" add to the mystery. There are four basic points that must be emphasized in relation to the bankability of energy infrastructure projects:

- the main requirement is to create a robust and uninterruptible revenue stream to support the repayment obligations
- before this can be achieved, a satisfactory solution must be found to reduce completion risk
- these two points underscore the importance, in the first place, of sound project fundamentals, principally the existence of a strong market appetite for the output of the project, and
- they also underscore the importance of having experienced, reliable and highly creditworthy project proponents and turn-key construction contractors involved in the project.

Obviously, a proposal to finance the expansion of capacity of a project that is already in operation is much more attractive to both investors and financiers.

CHAPTER 8:

WIDE VARIATIONS IN POLICIES, REGULATORY REGIMES AND PRICING PRACTICES

- **Almost all APEC economies are in a period of transition and there are wide variations in regulatory regimes.**
- **Natural gas industry regulation within APEC economies has ranged from interventionist to light-handed. In the past decade, many have adopted new legislation or regulations to liberalize, or partially liberalize, their natural gas industry. These measures have facilitated gas-to-gas competition and promoted cross-border natural gas trade but further harmonization is required.**
- **The overall goal of regulatory harmonization is simplification and transparency. Standardization is not the goal.**
- **Regulatory harmonization is two dimensional - procedural and substantive. Harmonization can be achieved through a process that uses one or a combination of multiparty agreements, international treaties or special-purpose enabling legislation.**
- **Harmonizing the fiscal or taxation features of a regulatory regime is crucially important for financing. The methodology for apportioning revenue amongst the respective economies must be absolutely clear. This can be accomplished most efficiently if excise taxes, transit fees, withholding taxes and customs duties can be eliminated in favor of a uniform method of assessment.**

1. A Period of Transition

In almost all APEC member economies, the energy industry is in transition towards greater liberalization. This is likely to substantially boost cross-border gas trade by lowering prices and raising demand.[41]

There are wide variations in the regulatory regimes for the natural gas industry across APEC member economies, ranging from state-owned monopolies to total deregulation. The policy approach taken towards regulation is largely influenced by whether the gas market is considered to be 'mature' or 'emerging'. Regardless of the extent to which deregulation has been pursued, several aspects of the natural gas industry have characteristics of natural monopolies, making some form of governmental oversight prudent.

Disharmonious policies and regulatory regimes are a major barrier to cross-border projects if sections of the pipeline are not only in different economies but are owned by different parties and financed by different debt providers. Trade relationships are stabilized by regulatory harmonization and become more sustainable. The prospect of sustainability stimulates investment in natural gas exploration and development, in particular the more costly offshore and cross-border projects.

[41] Asia-Pacific Energy Research Centre, 2003, "Natural Gas Market Reform in the APEC Region", Tokyo, Japan.

2. Policy Considerations

Gas policy is part of an economy's overall energy policy. Natural gas policy is determined according to security of supply and competition. Where the use of natural gas is constrained by supply, the policy will be investment-oriented. Conversely, economies with abundant resources or supply will opt for policies that enhance competition and promote utilization of its domestic resources.

Supply considerations tend to dominate the policy toward cross-border trade in natural gas. In some 'mature' markets, gas imports supplement domestic supply while in some 'emerging' markets reserves may be sufficient for domestic requirements and can be exported.

Irrespective of the stage of market development, the natural monopoly characteristics of the natural gas industry, particularly transmission and distribution, are considered to require some level of regulation. The principal regulatory concerns in the natural gas industry are the control of entry, the establishment and approval of tariffs or prices (including reviews), unbundling or functional disaggregation of pipelines, third party access, gas-to-gas competition, and new taxes in conjunction with one or more of these measures.

The fundamental problem with regulation, reform and pricing in both developing and non-developing economies has always been to reconcile the industry's history with sound economic principles. Because the history, the political inertia and vested interests that the historical development of the gas industry has created vary from economy to economy, so too must the solutions. Creating a uniform regulatory framework within APEC would be a highly complex, time-consuming and perhaps impossible process.

Trade relationships may be stabilized by regulatory harmonization and made more sustainable. The prospect of sustainability stimulates investment in natural gas exploration and development, in particular the more costly cross-border projects.

It is important to separate regulatory functions from policy making, although the distinctions are often blurred in practice.

Two policy considerations are central to the development of a regulatory regime for a country's natural gas sector:

- competition and
- supply security

On the one hand, the promotion of competition is seen as the means for enhancing benefits to the consumer and achieving efficient resource allocation. On the other hand, the creation of a stable and attractive environment for private investment is necessary for the long-term development of an adequate supply of natural gas. Both policies are intended to promote public welfare and are not mutually exclusive. Ultimately, the desired outcome is to reach a point where market forces provide the signals and incentives for investment in resource exploration and development.

Countries with emerging natural gas markets face a dilemma in deciding which factor is to receive emphasis at the outset. The decision is largely dependent upon the answers to the following questions:

- who are the gas customers (high volume, industrial end users or small load commercial and residential)?
- what is the extent and condition of pipeline network and other facilities that are the infrastructure for the gas sector?
- where does the gas supply come from (domestic or imported)?

- how much is the burner-tip price for competing alternative fuels?

The use of natural gas as a domestic source of energy is primarily influenced by the fiscal regime contained in the national energy policy. Where the policy specifically addresses the development of natural gas for domestic use, the regulatory regime may provide incentives for natural gas use including provisions for extending contract development periods as well as purchase commitments, oil equivalent pricing, and payment guarantees. Other provisions can be adopted which govern access by third parties to production-related facilities such as processing plants, mixed phased pipelines and storage facilities for gas liquids in order to reduce development costs and provide market access.

Economies with mature natural gas markets must decide whether deregulation to promote competition through the 'commoditization' of natural gas will maintain security of supply. Natural gas competes with other fuels in the end-user market and is priced according to market value ("market-based pricing"). Under this approach, cross-border gas trade promotes gas-to-gas competition.

Policy towards cross-border gas trade tends to be sensitive to the stability of supply.[42] Importing economies look to imported natural gas to supplement or provide domestic supply. Exporting economies have generally determined that they have sufficient reserves both to meet domestic requirements and to supply export markets.

3. The Need for Effective, Stable and Fair Regulation

In the longer term, each economy will need to establish an effective, stable and fair scheme of independent regulation. The role of government is to design and put in place the regulatory scheme; the role of the regulator is to implement it. The regulator does not, or certainly should not, make its own regulatory rules. Some principles of effective regulation are set out in table 10.[43]

Table 10: Principles of Effective Regulation
The regulator should be legally and organizationally separate from the government and the utilities
The objectives of the regulator should be specified in clear and unambiguous terms
The scope for the regulator to exercise personal discretion should be limited (in order to maintain confidence in the impartiality of the regulatory process)
Regulatory procedures should be transparent and easy to administer
Regulatory procedures should be carried out promptly
A method of review of network pricing should be specified which enables network operators to benefit from efficiency improvements and which leads to simple, automatic adjustments
The regulator should be able to obtain direct access to information about service quality and user satisfaction, with mechanisms to consult with the public

[42] Japan and the Republic of Korea import over 95% of their natural gas which is mainly supplied by other APEC economies (Australia, Brunei Darussalam, Indonesia and Malaysia) as well as from outside the region (Qatar).

[43] Taken from Pritchard, R and Webb, D, "Privatisation and Private Provision of Infrastructure", chapter 4 in Pritchard, R (ed), 1996, "Economic Development, Foreign Investment and the Law", International Bar Association and Kluwer Law International, London, UK.

The regulatory system should function free from political interference
The regulator should be legally accountable for its actions by a prompt and effective appeal process

Independence of the regulator, both from the government and the regulated entities, is a crucial issue. Without independence, conflicts of interest are likely to arise and the stability and fairness of regulation is prone to deteriorate. At the same time, the regulator must be held legally accountable for its actions; regulatory independence and accountability must go hand in hand.

There are two broad options by which the establishment of an effective regulatory scheme can be achieved: the first is by the enactment of legislation to establish an independent regulatory scheme applicable to the entire industry; the second is "regulation by contract", by the negotiation of contractual regulatory arrangements with the energy facility operator on an individual basis.

For governments in economies which are not accustomed to independent regulatory systems, it may be more palatable for political reasons for regulatory controls to be negotiated and set out in particular contractual arrangements. These may be easier for some governments to implement than the establishment of an independent regulatory agency at the outset and may be seen by investors as offering more certainty, security and stability for their investment. Such contractual arrangements must however be enforceable against governments.

In the longer term, there is an absolute need to avoid the "dead hand of the regulator", to encourage new capacity, competition, market entrants, efficiency gains and carbon intensity reductions.

4. Regulatory Variations

In general, regulations are adopted to correct for market imperfections and to reduce uncertainty for investment. Regulations in the gas industry primarily focus on:

- **entry criteria**, implemented through licenses and permits. Licenses can either be exclusive or non-exclusive. Exclusive licenses can be awarded via public tendering or similar process to ensure the public interest is protected.

- **economic issues**, such as prices, return on investment and access to transportation related facilities, implemented by tariffs and unbundling of transportation from the sale of gas as a commodity.

- **taxation**, implemented by rules defining assessable income and limits for deductions.

Other regulations in the gas sector may be concerned with technical specifications for construction and maintenance, gas quality specifications, environmental protection, land access, and limitations on flaring or venting gas.

The range and types of regulation and their features are depicted in figure 5 below:

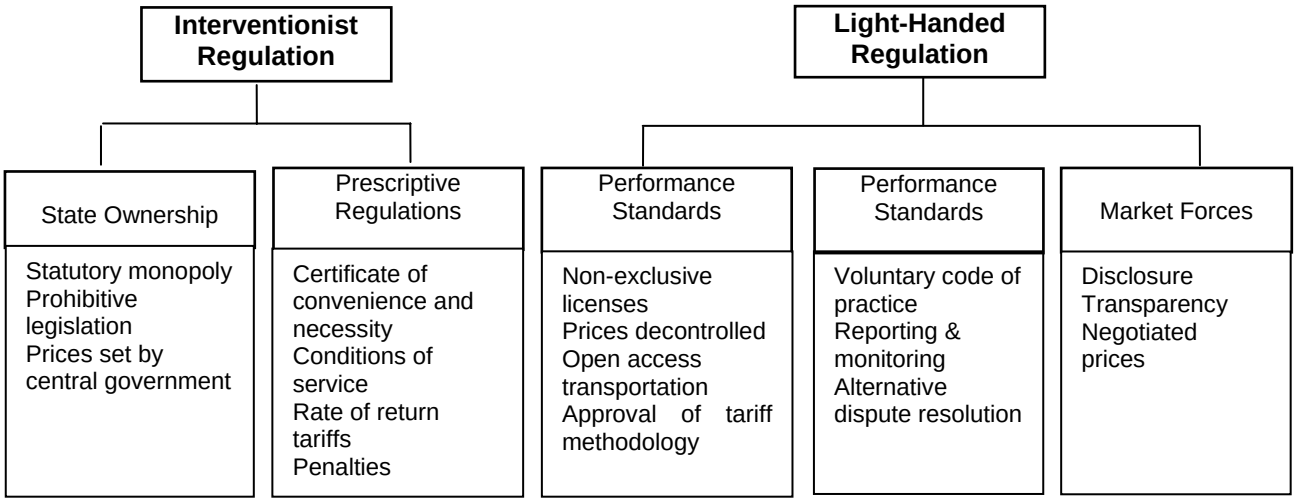


Figure 5: Gas Sector Regulatory Variations

Rather than establish an independent regulatory body for natural gas, some economies have relied on the line agency or ministry that is vested with oversight for energy or power. Often the department or bureau responsible for natural gas oversight is not independent from the line ministry that is responsible for the promoting investment in upstream operations or the national oil company. [44]It is important that the regulatory regime for the natural gas industry distinguish between the commercial functions of the government, either as a participant or beneficiary in profit-sharing from the sale of gas, and its other functions in allocating the right to develop gas resources and as regulator of the industry.[45]

During the workshops in Japan and Singapore, the establishment of a single energy regulator in both Singapore and Australia was noted.

5. Regulation of Entry

The primary purpose in regulating entry into the gas industry is to ensure that owners and operators of pipelines and LNG terminals have adequate operational qualifications and financial resources. This type of regulation also allows the government to facilitate the coordination of investments within the gas industry, as well as related sectors such as power generation, and to avoid creating redundant capacity and 'stranded assets'. Permits or Certificates of Public Convenience and Necessity are issued by a regulatory authority following a review of the pipeline route, market requirements, engineering design and environmental impact. The license may be exclusive or non-exclusive depending upon the level of competition for the right to serve

[44] Several APEC economies have their energy or related ministries performing gas regulatory functions. In Thailand, the Energy Policy and Planning Office (EPPO) regulates pipeline tariffs and rates of return from gas supply and distribution. In the Philippines, upstream petroleum operations and pipeline licensing is within the Department of Energy. In Malaysia, the Department of Electricity and Gas Supply, under the Ministry of Energy, Communications and Multimedia, regulates the natural gas industry. In Vietnam, the Prime Minister's Office sets prices for natural gas while the Ministry of Trade and Tourism directly controls the state entity responsible for the distribution system.

[45] The World Bank, 1995, "Legislative Framework Used to Foster Petroleum Development", Policy Research Working Paper 1420.

a market.[46] Competitive bidding may be desirable.[47] Restriction of entry has been used to create statutory monopolies by awarding exclusive franchises and concessions, or by restricting entry to state-owned enterprises.

6. Economic Regulation

The approach taken for economic regulation is often more complex because a gas user pays for two components:

- the energy or 'commodity' value of the gas and
- the cost of storing and transporting the gas from the source of supply.

Economic regulation is principally concerned with economic regulation as a means to limit the market power that is characteristic of the natural monopolies found in the gas sector. In the gas sector, market power typically arises from the vertical integration of the sale of gas, as a commodity, with transmission and distribution (the "gas merchant pipeline").

Due to the capital-intensive nature of the gas industry, economic regulation that sets the rate of return that is allowable on qualifying assets has also been used. Selection of a particular tariff design depends primarily depends upon whether the return on the pipeline owner's equity is subject to performance risk if throughput declines over time. Regulatory intervention attempts to promote economic efficiency by applying the Cost of Service model, which sets tariffs such that total revenue is equal to total average cost.

The Value of Service tariff is the deregulation alternative to Cost of Service and is based upon charging what the market will bear. This approach is best suited to a commercial environment where the parties have equal bargaining power or where there are competing alternative fuels. The level of the tariff is settled by arm's length negotiation between the users and the pipeline owner. If the pipeline supplying the natural gas has a monopoly position in the market, the tariff may not achieve an outcome that is economically efficient.

Gas sector reforms have been implemented in various forms depending upon the specific circumstances in each country. For example in the United States, the regulator for interstate gas sales adopted a series of regulations that allowed gas producers to arrange for pipeline transmission in order to directly market to end-users on the condition that the producers release the pipelines from claims for take-or-pay under long-term supply contracts.[48] Access to gas pipelines and production-related facilities in the United Kingdom resulted from concerns about the monopoly power of a gas merchant pipeline company.[49]

7. Gas Pricing

The most common regulatory tool for dealing with natural gas prices is to impose controls on the price at the point-of-sale (wellhead, city gate, and burner-tip). International experience has shown this form of intervention has often led to under-investment in resource development as well as infrastructure and has resulted in reduced supply. For example, in the United States producer prices were subject to different prices depending upon whether it was 'old' or 'new'

[46] Practices vary from Japan where licenses are granted for twenty years to New Zealand which has abolished geographical exclusivity.

[47] See for example Article 40 Mexico Natural Gas Reglamento (Nov. 1995).

[48] Federal Energy Regulatory Commission, Orders 380, 436, 500 and 636. The FERC Orders were subject to a series of appeals before the D.C. Circuit Court of Appeals, American Gas Assn. v. FERC 824 F.2d 981; 888 F.2d 136; 893 F.2d 349; 912 F.2d 1496 which upheld the majority of the rule-making.

[49] Monopolies and Mergers Commission, 1993, "Report on British Gas Under the Gas Act 1986".

gas.[50] It was considered to be unnecessary to extend the higher price to old gas because the reserves had been developed at a time of lower cost, and the higher would confer a windfall on such producers.

In economies where prices have been subject to rate-making practices applied to public utilities, rate-regulated natural gas companies must engage in complex and lengthy proceedings to determine the Cost of Service tariff that could charged in order to obtain an acceptable rate of return. In other economies, the price of gas was set by the central government with differentials depending upon whether the end-use was for power generation, agricultural applications or commercial purposes.

A number of economies have introduced gas industry reforms that stressed elimination of price controls on gas in combination with new rules for access to so-called 'essential facilities'.[51] This approach is referred to as "unbundling". In its most basic form, unbundling means that the commodity price of gas is quoted separately from the cost of transmission.

Gas prices may be fully decontrolled or only regulated for commercial and residential customers who lack the bargaining power to deal with producers and transporters on an equal level. Other regulators set maximum prices only. In more extreme applications, pipeline ownership is divorced from gas production and marketing by regulation. The approach taken in a specific country must take into consideration such factors as the maturity of the gas sector, as reflected by market penetration and extent of infrastructure, as well as the existence of long-term commercial and financial obligations.

In some APEC economies, there are domestic gas prices that are mandated by government and which may reflect subsidies for agriculture, domestic use and regional development. At the APEC workshops in Tokyo and Singapore, the preference for economies to adopt market-based energy prices and then to use a system of rebates as the policy mechanism for adjustment was suggested as best practice.

Regulators have adopted market-sensitive tariffs to allow wholesalers to purchase gas without having to file a new rate case when gas prices change. Similarly, power generators have been given permission to pass through increased gas costs under fuel cost adjustment provisions in their tariffs.

8. Cross-Border Natural Gas Regulation

Regulation of cross-border gas has taken several forms. In those economies that have adopted production sharing contracts (PSCs), the contractor typically has the right to ". . . lift, dispose of and export its share of petroleum production . . ." Unless the host government has enacted legislation that regulates natural gas exports, this contractual provision is sufficient authority for cross-border natural gas trade.

Other exporting economies have taken a formulaic approach where exports could only be sanctioned when either the level of gas reserves or the capacity to deliver gas to the domestic market had been satisfied.[52] Papua New Guinea requires either a ministerial instrument or agreement with the state before natural gas can be exported.

Cross-border natural gas can become subject to two masters when importing countries also regulate this trade. Regulators in the importing country have required evidence of competitive

[50] *Permian Basin Area Rate Cases,* 390 U.S. 747 (1968).

[51] OECD, 1994, Natural Gas Transmission: Organisation and Regulation.

[52] For example, until 1986 the National Energy Board of Canada conditioned gas exports on the "Reserves Test of Formula" and the "Deliverability Test of Appraisal" when a market-based procedure was for granting export licenses. A similar situation has been evident in Bangladesh.

pricing, market demand and security of supply before granting approval. The trend is for a light-handed approach that allows imported gas to be judged on its economic merits in competition with domestic supplies.[53]

9. Approaches Towards Regulatory Harmonization

Regulatory harmonization does not mean that each economy involved with the project, whether as exporting, importing or transit nation, will adopt a uniform or standardized regulatory regime. Rather, to the extent possible, it is a commitment to provide a regime that is simple, transparent and that supports the natural gas industry's commercial and financial structure. The goal of harmonization is to remove the uncertainty of local law and regulatory regimes. Within such a framework, the project sponsors can structure a project entity that facilitates financing.

The process of regulatory harmonization is dependent upon the legal, commercial and cultural similarities of the exporting and importing countries. Possible approaches include:

- multiparty project agreements between the respective governments and the commercial sponsors
- project-specific agreements or framework treaties between sovereign states and
- special purpose enabling legislation and regulations.

A combination of the above approaches could be necessary where there are serious political and commercial risks.[54]

Multiparty project agreements also raise concerns about the extent that the respective governments are willing to give undertakings regarding:

- waiver of sovereign immunity
- whether foreign law will control the interpretation of the agreement
- performance guarantees and credit support for state-owned enterprises and
- consent to participate in and be bound by international arbitration and dispute resolution procedures rather than invoking the jurisdiction of its courts.

Some APEC economies have had experience as host governments in contracting directly with international oil companies through exploration and production investment agreements.[55] Often these agreements contain so-called 'gas clauses' that provide for the negotiation of supplemental agreements if natural gas rather than oil is discovered. A contractual approach is particularly useful where there are either major gaps in domestic law or fundamental differences in legal systems. There has also been a substantial number of international arbitrations concerning the interpretation and enforcement of such contracts which support the credibility of using a contractual approach to regulation.

[53] In Mexico, imported natural gas is exempt from price regulation under Article 8 of the Natural Gas Reglamento (Nov. 1995).

[54] For example, the legal framework for the West African Gas Pipeline Project involving Benin, Ghana, Nigeria and Togo includes an international project agreement between the states and the commercial group of companies, a treaty between the governments and harmonizing legislation as well as an administrative body specifically created to regulate the project on behalf of the states.

[55] Production sharing contracts, service contracts and petroleum agreements are examples of such contracts.

Project agreements or framework treaties have been used successfully to promote cross-border natural gas trades. Typically, they are used where the natural gas is transported by pipeline and have tended to recognize the right of the respective states to assert regulatory authority over the portion of the pipeline system that is within their jurisdiction rather than adopt uniform rules.[56]

Regional trade agreements have also served as platforms for securing access to both supplies and markets. In terms of regulatory harmonization the signatory states agree to limit regulatory measures that discriminate in favor of its nationals, restrictions on imports and exports and export taxes.[57] Specific directives on natural gas transportation have been issued under these trade agreements.[58]

Special legislation may be necessary when contracts and trade agreements are not sufficiently robust for the project participants and their financial backers.[59] Regulatory exemptions, waivers of law, and tax holidays have also been used to underwrite governmental support for cross-border gas projects.

10. Substantive Elements of Regulatory Harmonization

The substantive elements of regulatory harmonization will vary according to whether the process is contractual, intergovernmental, or legislative. Irrespective of the procedural approach, the critical issues for harmonization are:

- whether the project will have an exclusive right to serve the market
- non-discriminatory treatment for projects that either export or import natural gas
- market-based pricing, including the ability to pass through contractual price adjustments and take-or-pay payments
- recognition of a tax-efficient project entity to own, finance and operate the project that allows income to flow to the sponsors
- simplification of project construction permitting and licensing in coordination with project milestones
- coordination of environmental base-line studies, permits and public involvement processes
- the extent and time frame for third parties to have access to project facilities
- regulatory bodies in each jurisdiction to avoid the disruption of contractual relationships to the maximum extent
- a single layer of taxation with a mechanism agreed between the States for the distribution of revenue and
- elimination of separate excise (VAT) taxes, withholding taxes, customs duties and transit fees.

[56] For example, the Agreement Between The United States of America and Canada On Principles Applicable To A Northern Natural Gas Pipeline (Sept. 20, 1977; June 6, 1978).

[57] North American Free Trade Agreement (NAFTA), Art. 606 – Energy Regulatory Matters.

[58] Directive on the Transit of Natural Gas Through Grids, Council Directive No. 91/296 EEC (31 May 1991)

[59] For example, special legislation was passed in Canada (Northern Pipeline Act 1978) and the United States (Alaska Natural Gas Transportation Act 1976) to facilitate the Alaska Natural Gas Pipeline Project.

In terms of pricing, regulatory harmonization entails recognition that governments will not act to control prices either at the points of supply or sale; market forces should determine energy product prices. In the era of market-based pricing, the ability to approve tariff methodology is a powerful tool. A particular concern is whether the methodology allows charges for supply to be passed through 'as billed' to the market.

Market-based pricing does not mean that governments abrogate oversight responsibilities for reviewing project rates of return. This is particularly important where the charge is a delivered price that is inclusive of transportation costs. Regulators have a legitimate interest in determining whether the market is supplied at the lowest competitive tariff. Scrutiny of the sponsors' development costs, financing charges and related-company transactions is a prime responsibility. These arrangements must be transparent and subject to audit.

11. Harmonizing Fiscal Regimes

Harmonizing fiscal regimes primarily requires a single method for assessing income and capital allowances. It is preferable to grant the project exemptions from excise taxes, withholding taxes on dividends, customs duties and transit fees. Often these issues are dealt with in bilateral investment treaties.

Once the fiscal regime is established, there are three variations for apportioning tax revenues from cross-border gas projects where there are facilities located in more than one economy:

- the value of facilities or length of pipeline located in each economy
- the quantity of natural gas delivered in each economy or
- some combination of these two.

Harmonized fiscal regimes provide support for financing as revenue flows and tax obligations are easier to forecast. Financiers will always have more confidence in a project whose fiscal structure is transparent.

Like other commercial sectors, the natural gas industry is subject to the imposition of taxes on company income and shareholder dividends. Corporate tax rates can vary substantially, making business structures important in determining 'tax domicile'. Many countries have adopted income tax provisions specifically for the petroleum industry that provides for accelerated write-off of development expenditures or depletion allowances for both domestic and foreign oil and gas.

Further liberalization and adjustment to the taxing of energy projects is required, in particular when complex joint ventures are established for different parts of an energy project and the ability of proponents to efficiently structure or restructure their projects is hampered by inflexible tax laws.

The facilities and infrastructure required for efficient and reliable production and marketing of natural gas are supported by complex contractual and financing provisions that specify delivery rates and mechanisms for price adjustment for many years into the future. These provisions, such as take-or-pay obligations, can have tax implications as well.[60]

In a world of higher energy prices, gas exporters can be faced with a potential dilemma of higher netback prices for export gas over those available in the domestic market. Whilst this may not be a problem in economies where the government controls or owns the energy-

[60] For example, take-or-pay payments made by a gas purchaser are usually treated as a deferred charge that is only included in the purchaser's cost of gas when it is made up. If the gas is never taken and the take-or-pay payment is not refunded, the amount is allowable as a loss in the tax year that it was determined it was not possible to make-up by delivery.

producing assets, a free market environment will see the resource developer striving to secure the highest returns for its shareholders.

Gas sales and transportation arrangements also attract excise taxes on the sale of goods and services. As a general rule, taxes should be imposed as close as possible to the point of final use so that consumers are aware of the true cost of supply. Determining tax jurisdiction where the point-of-sale occurs can have significant tax consequences. Some countries also have special levies that are paid on natural gas.

CHAPTER 9:

INVESTMENT PROTECTION

- **Private investors have a fundamental need for a predictable and consistent investment environment.**
- **A checklist of basic questions about a host economy's investment laws and specific questions about cross-border gas projects is provided in this chapter.**
- **Sometimes, investors will choose to accept risks in order to gain a strategic advantage. Their lenders will ordinarily never do so.**
- **Predictability of investment conditions must be provided by each host government.**

1. Requirements of Investors

The main drivers of most private investment decisions are, of course, economic although it is well-established that law played an important role in Asia's remarkable economic growth during the second half of the 20th century.[61] When contemplating investment in an infrastructure project in a foreign economy, investors will take account of whether they will have the right, legally enforceable if necessary, to do all of the following things:

- obtain security of tenure over land titles and rights of way
- engage local personnel and local contractors
- procure local items of plant, equipment and materials
- engage foreign personnel and foreign contractors
- import items of plant, equipment and materials from abroad
- sell their goods or services to agreed customers or into either a local or an export market
- obtain payment in a freely convertible currency
- convert that currency into the currency which was originally invested and do this at an adequate conversion rate
- repatriate profits and
- repatriate capital at a future date.

[61] Asian Development Bank, 1998, "The Role of Law and Legal Institutions in Asian Economic Development, 1960-1995", Manila, Philippines.

By reducing risk and transaction costs, an adequate legal framework will generally encourage investment by the private sector and enhance the operation of the economy. Building such protection into the basic legal framework increases investor confidence. Conversely, shortcomings in the legal framework directly diminish the willingness and ability of domestic and foreign investors to invest.[62]

In addition, investors will be acutely conscious of the need to obtain financing by satisfying the requirements of lenders, in particular by being able to provide sufficient security and generate a reliable revenue stream to service loan repayments.

Investors will seek comfort that an acceptable political risk environment exists, or can be achieved through the use of insurance, the involvement of a multilateral agency (such as the ADB or World Bank) or the use of quasi-government guarantees, offset or other extra-territorial agreements.

Prospective investors will tend to ask the questions set out in table 11.

Table 11: A Basic Legislative Checklist for Investors

Foreign investment law	Can investment approval be obtained and under what conditions?
International Investment Treaties	Has the government enacted legislation to authorize its adherence to any international investment treaties and what safeguards does this provide?
Property law/ Law of credit securities	Can foreigners freely acquire, charge and transfer land and other property? Are any government approvals required? Could the requirement for approvals jeopardize financing? Do the rights acquired have a proprietary character which is suitable for practical lending requirements (mortgages; liens; charges)
Land use development law	Under what conditions can development approval be obtained and conditions varied?
Environmental protection	What standards must be observed? Are they international standards? What penalties apply for failure to comply? Can an operating license be suspended or revoked? Is there a right of appeal?
Incorporation of companies	Can foreigners establish and control companies?
Taxation	What is the host country tax system? How stable is it and how does it interact with that of the investor's residence country?
Import and export law	What approvals are necessary and what duties apply?

[62] Pritchard, R (ed), "Economic Development, Foreign Investment and the Law", International Bar Association and Kluwer Law International, London, UK,1996.

Competition law	Is market power regulated? Are mergers allowed?
Consumer protection	What price controls or other consumer safeguards apply?
Intellectual property	How is intellectual property protected?
Dispute resolution	What law can be used to govern investment agreements? Can statutory rights and contractual rights be readily enforced and can disputes be speedily resolved in a neutral forum?
Administrative law	Is there any right of appeal against invalid decisions of government officials?
Regulation of the energy industry	What operating licenses and approvals are required? Can they be transferred freely? Is there an industry regulator which is independent of government? Are adverse regulatory decisions subject to review and appeal? Is the procedure efficient? Could any restrictions jeopardize financing? Are there transparent and practical rules for providing access to public (or private) monopolies in the area of gas transport? Are there clear rules on congestion management for gas transmission? For calculating transport tariffs? For dealing with capacity reservation, previous contract commitments versus new requests for access?
The judiciary	Is the judiciary entirely independent of government?
Regulation of the legal profession	Are lawyers entirely independent of government?

Notwithstanding these questions which most prospective investors will tend to ask, no economy ever provides a risk-free legal environment. It is necessary therefore to focus on what is realistically achievable and what issues are likely to be of critical concern to prospective investors in particular projects.

2. How Investors Make Decisions

Most intending investors will carry out their investment decision-making process in three stages:

- first, they will evaluate the potential economic return
- second, they will assess the investment risks and
- third, if the potential risk-adjusted economic return is considered to outweigh all of the risks, and the requirements of “bankability” are satisfied, they will decide whether or not to go ahead.

Generally speaking, if a host economy does not provide a secure and stable legal framework for infrastructure investment, most investors are likely to balk. In the absence of an adequate legal framework, it may not matter how attractive the project might be or what taxation or other financial inducements the government might offer.

3. Why and When Some Investors Will Accept Risks

There is a limited category of investors for whom conventional legal safeguards sometimes do not matter. Some very large companies, for example, may consider that their reputation or position enables them to influence government without the need to rely on legal safeguards. Other investors may place special importance on whether a particular economy has good economic policies, a large and growing market, is experiencing sustained economic growth and itself has a good reputation, particularly for political continuity and stability.[63] But, even in such a "good reputation" economy, an improvement in legal and institutional security is likely to accelerate and increase investment flows above the level that otherwise would be likely.

Investors that may be willing to take the gamble of investing with few legal safeguards would ordinarily be companies that wish to gain a strategic foothold in the host economy. Such investors will look to be appropriately compensated for assuming the risks. The rate of return sought will be higher than the investor would require under an adequate legal framework.[64]

Because there are no universally accepted standards for overcoming legal inadequacies, it is always a question of what will satisfy an investor in a particular case. Investment agreements with host governments can frequently overcome legal inadequacies. Each economy should, however, promulgate contracting rules and tender procedures and develop model agreements to ensure the transparency, integrity, predictability and success of the contracting process.

When gas pipeline tariffs are capped at low levels or are vulnerable to regulatory intervention, investors will be much less likely to accept an inadequate legal framework. There have been some recent and widely noted failures of energy infrastructure investment projects, notably in Indonesia, Pakistan, India and Argentina; these as a rule have followed an economic and financial crisis. Various disputes about terms and conditions (in particular tariffs and revoked take-or-pay contracts) have since been arbitrated, adding to investors' caution. Often the real problem has been a lack of hard currency and the solution can only be found in work-out procedures after the event of default has occurred.

The problem remains that banks will not provide loans if there are high risks involved, which we discuss later in this paper. In addition, banks will charge interest rates higher than prevailing rates to compensate for the higher country risk. Banks are generally restricted from seeking, or unable to compensate for higher equity risks by seeking, a share of profits.

4. Investment Agreements with Host Governments

Sometimes, the constitutional and legislative safeguards offered by a particular host jurisdiction will not be sufficient by themselves to satisfy the needs of investors. Apart from seeking improved legislation, other measures to overcome legal inadequacies, such as investment agreements with the host government and equity participation by the host government, can be considered. "Investment agreement" in this context means either an agreement, a license or a concession, or a combination of any of these, entered into with, or granted by, the host government to underpin an infrastructure investment.

Investment agreements can make appropriate provision for approvals processes, regulation of prices, technical and operational issues and environmental and other matters. Such agreements may overcome some of the other legal problems inherent in the lack of legislation.[65]

[63] Wälde, T, 1998, "Law, Contract and Reputation in International Business: What Works?" CEPMLP Internet Journal, Vol 3-18, University of Dundee, Dundee, Scotland.

[64] Enron's decision to invest in the Dhabol project in India, based on securing a high return through an unsustainable tariff, would cause the project to eventually fail.

[65] Wälde, T and Ndi, G, 1996, "Stabilizing International Investment Commitments", 31 Texas International Law Journal 215-268.

If there is no existing regulatory regime, or if it is considered to be inadequate, investment agreements can establish a legally secure regulatory framework under which an investment can be made.

5. Host Government Participation — a Dated Concept

In infrastructure projects and other projects of national importance, some governments expect that the host economy (often through a state-owned enterprise) should have a direct equity stake in the venture. However, the reconciliation of government and private sector objectives is very difficult from the outset and tends to diverge over time because markets are never static and the business environment is always evolving. Host governments and foreign investors therefore do not always form enduring commercial relationships.

If, for example, a host government lacks hard currency, the foreign investor might be expected to allocate to the host government a share of the joint venture equity in exchange for "soft" contributions. These could comprise leases of land, buildings, equipment, labor, supplies or other services, even government approvals, tax exemptions or tax holidays. Although this type of requirement can distort the joint venture structure, it does not necessarily provide an insuperable obstacle; the foreign investor can always make its own assessment of the real worth of soft contributions which it can trade off into its assessment of risk and rate of return requirements.

So far as we can ascertain, none of the electricity or gas interconnectors successfully established or presently at the planning stage within the EU or within the East European "accession countries" involve an investor/host state joint venture. This is seen as a dated concept no longer reflecting the reality of an effective market-economy approach. The EU over the last 15 years has seen a continuous shedding of state participation in energy and infrastructure projects.

`Soft´ contributions should however be limited to the establishment stage of the venture. If all subsequent inputs of capital and operating costs by the host government are not based on arm's length, market-based calculations, the economic equilibrium of the joint venture will soon become skewed and there will be fertile ground for disputation. The host government will also need to provide continuing security or support for borrowings by the joint venture on a pari passu basis with the foreign investor.

6. Agreement on Environmental Standards

Agreement on the applicable environmental standards is of pivotal importance for a secure investment framework.

In an age when the principle of sustainable development is almost universally upheld, it is suggested that reliance on, or incorporation of or referral to, internationally recognized environmental standards offers a much more reliable basis for investment than domestic standards. In the event of the domestic law failing to specify any environmental standards, investors are likely to seek a stable contractual agreement as to applicable requirements. Particularly sensitive issues for investors are any unexpected liability for pre-existing environmental damage or any subsequent tightening of environmental regulation in excess of recognized international standards.[66]

[66] Wälde, T and Kolo, A, 2001, "Environmental Regulation, Investment Protection and Regulatory Taking in International Law", 50 International and Comparative Law Quarterly 811-848.

CHAPTER 10:

CONCERNS SPECIFIC TO GAS SUPPLY BY PIPELINES

- **Pipelines allow for large volumes of gas to be transported economically.**
- **Domestic pipelines offer low risk/low yield Infrastructure investments but cross-border pipelines may raise a number of additional risks.**
- **Most pipelines suffer from the "chicken or egg" problem: projects cannot be developed unless markets exist but the markets cannot be created and developed until the infrastructure is in place.**
- **Pipelines are not easily replicated or re-routed if supply or other problems eventuate.**
- **Heavy-handed or uncertain regulation has a chilling effect on pipeline investment, as it does on any investment.**

1. Development Challenges

Pipelines enable large volumes of gas to be transported economically at distances up to 4000 km (onshore). They are generally the best commercial solution for supply shortages in domestic and nearby economies.

Where gas resources are located offshore, subsea pipelines have been required to transport the gas to land-based facilities, even if the gas has then to be liquefied for shipping by sea. However, advances in technology and risk management are expected to provide additional or alternative offshore solutions for the economic and efficient delivery of gas. These offshore solutions pose some additional barriers that need to be overcome in addition to the specific technical challenges. These are expected to relate to value creation, risk management, economic value-sharing and local employment issues.

The volume of gas that can be transported by pipeline is directly dependent on a combination of pressure rating and pipe diameter. Technical innovations have allowed larger gas volumes to be transported over longer distances, as a result of progressive falls in the unit cost of transporting gas over time, through use of aircraft derivative gas turbines for compression, plus significantly higher pressure-rated and larger diameter pipes.

When gas moves down a pipeline, the pressure falls and compression stations are needed at regular intervals, typically between 250 km to 350 km. Eventually, as volumes increase, the pressure drops become too great and it is necessary to loop the pipeline rather than add new compression facilities. The longest pipeline systems to date are approaching 3500 km from Siberia to Europe and approximately 3000 km across Canada. The proposed West-East pipeline in China from the Tarim Basin to Shanghai, the Alaska Gas Pipeline Project and the Kovykta project (Siberia-China) are of a much greater scale at 4000 km to 5000 km. With projects of this size, options for pipeline cost reduction through the use of higher-grade line pipes, use of highly efficient "plug and play" gas turbines for compression, appropriate changes to the design basis and improved construction methods can combine to significantly improve project economics.

The development of offshore pipelines has been constrained by a combination of water depth and distance. To met the challenge of increasing water depths and pipe diameters, pipe lay and reel-barges have progressively improved and enhanced lay methods and tension capability, with water depths significantly in excess of 2000 meters now being possible for pipe sizes in the range of 600 mm (24") to 700 mm (28") diameter.

With offshore pipelines, the cost of installing compression facilities at regular intervals along the pipeline to mitigate pressure drop is usually prohibitive due to the cost of the supporting structures, unless these are combined as part of other offshore facilities, or can be located in shallow waters. Even though increased pipe diameters and higher operating pressures can be used to offset this effect, offshore pipelines are typically limited to 500 to 700 kilometers.

Within APEC economies there are already many examples of cross border gas pipeline projects. There is a long-established pipeline system between Canada and the United States. In Southeast Asia, there is the Trans-ASEAN Gas Pipeline (TAGP) project.[67]

2. The Risk of Disruption

A joint UNDP/World Bank study has reported that:

> *" … cross-border oil and gas pipelines have a history of vulnerability to disruption and of generating conflict. While it is true that most operating pipelines have avoided such problems, the minority that have such a history have cast a much greater shadow than their actual numbers might justify. This negative perception inhibits both the operation of existing lines and the building of new ones."*[68]

3. Transit through Third Economies

Some cross-border pipelines need to transit a third economy. Where this is the case, transit arrangements must be settled before development is able to commence. These arrangements include transit fees, offtake and input arrangements, taxation and regulation.

There are six factors which should be weighed, before any legal factors are considered, in considering whether a transit economy will offer a secure transit route for pipeline investors. The factors are:

- the politics of the economy
- the importance to the economy of foreign investment
- the importance of "the prize" (this means the absolute amount of the transit fee and its relative importance in terms of the transit economy's access to revenue and foreign exchange — which may also take into account whether a pipeline will enable the economy to make oil or gas sales)
- the dependence by the transit economy on offtake from the transit line
- the availability of alternative routes and

[67] See appendix 3 table 22 – existing pipelines within ASEAN.

[68] United Nations Development Program and the World Bank, 2001, "Cross-Border Oil and Gas Pipelines: Problems and Prospects", New York, NY, USA.

- competition with the transit economy as a competing source of oil or gas.[69]

Treaty-based transit protection reduces political risks at the same time as leaving it to the parties and the transit country to work out their detailed contractual arrangements. The Energy Charter Treaty (ECT) provides a ready-made mechanism by transit rights can be entrenched, as referred to in Article 7 of the Treaty (there are analogous provisions in Chapter 12 of the North American Free Trade Agreement (NAFTA). It has been suggested that:

> *"… the failure of the MAI negotiations highlights the potential role of the ECT as a model for sectoral and regional economic regulation. Already Mongolia has acceded to the Treaty and the ECT institutions have been in discussions with China and North Africa".*[70]

The ECT has adopted a Protocol on Energy Efficiency and Related Environmental issues.

A lower risk of disruption is one of the competitive advantages that an LNG project enjoys over a pipeline project that needs to transit a third economy. Under the ECT, negotiations for a detailed Protocol on Transit have been going on for some years. It is hoped they will be successfully concluded in 2004.

4. Markets at the End of the Pipeline

The greatest difficulty for pipeline development is the "chicken or egg" problem: usually, gas markets do not yet exist and need to be created to enable the pipeline to be built in the first place.

Major gas infrastructure projects also require an agreement to take-or-pay for large volumes of gas and/or pipeline capacity over a prolonged period. A traditional coal-fired or oil power plant can generally be built without the need for a long term energy supply contract, as it is accepted that the market will be able to supply these freely-traded products.[71]

A gas-fired, or gas turbine-based power plant, which may require only 60% of the capital of a coal-fired plant, will typically require a take-or-pay supply contract for 15, 20 or 25 years. For a 1,000mw LNG-fuelled plant, costing perhaps $800 million, this equates to a guaranteed minimum payment of approximately $250m per annum for the take-or-pay period [$5 billion over a 20-year period].

Creating a base load demand that will financially underpin any substantial gas infrastructure project is a significant barrier. New power plants, or conversion of existing towns gas companies, are problematic in their build-up period. The conversion of high efficiency liquid-fuel plants, re-powering or conversion of brownfield sites and the promotion of value-adding industries may provide the base load to underpin a new gas supply project.[72]

In the longer term, the staged development of a new gas market through the introduction of LPG provides another option.

[69] Stevens, P, 2000, "Pipelines or Pipe Dreams? Lessons from the History of Arab Transit Pipelines," Middle East Journal, Volume 54 No 2. ResourcesLaw International suggests similar factors exist within APEC.

[70] Bamberger, C, Linehan, J and Wälde, T, "Energy Charter Treaty in 2001: in a New Phase", Journal of Energy and Natural Resources Law, Vol 18, No 4 November 2000.

[71] An exception may be the use of tightly-specified "ultra light" crude for advanced CCGT operations.

[72] An example is the acquisition by BG plc of the Ballylumford power station in Northern Ireland.

5. Markets Along the Pipeline Route

Once a pipeline is installed, opportunities will emerge for value creation along the pipeline route. One of the most obvious opportunities is to install local power generation and cogeneration plants in towns along the pipeline route to provide electricity and steam to potential domestic and industrial consumers.

The Russian gas grid was substantially built under a centrally planned economy, where economic logic and rationale was considered along with political agendas and national development. Extensions to Europe, Turkey and elsewhere have benefited from the economies of scale and existing infrastructure. A region as diverse as APEC does not have the benefit of such a gas grid, or single major energy infrastructure supplier, to build upon.

6. Regulation of Pipeline Transportation Charges

In the early life of projects, typically for the first 15 years or so, investors have a strong preference for pipelines to enjoy a regulation-free period or at least clarity about regulation for its project term and envisaged expansions. This enables investors to negotiate freely with the gas suppliers and customers for use of the pipeline and enables the investors to establish a secure revenue stream to service and retire debt. Heavy-handed or uncertain regulation has a chilling effect on pipeline investment.

In the longer-term, in order to maintain investment incentives, pipeline owners and operators and users have to operate in a credible and sustainable regulatory environment. This requires a regulatory regime which uses transparent and objective approaches and which has clear rules as to how to deal with all eventualities. With such a regime:

- regulation has the characteristics of a long-term implicit contract between companies and the regulator
- cost recovery and profit-taking for investments with a long technical lifetime takes place over several regulatory periods
- rules, including price formulae, have to be clearly elaborated so that they can be predictably applied a
- the triggers for a regulatory review have to be clearly defined as well as the procedures to be used for reviews and
- regulation must allow new infrastructure to be built and introduced as required into the system to meet projected demand and back-up requirements.

It should be in the “normal” commercial interest of the pipeline operator to maximize throughput. Industry requires minimal transaction costs, minimization of negotiating delays, avoidance of any obstruction by the pipeline operator and avoidance of disputes; in short, it requires maximum standardization. The proper approach is to make the pipeline operator indifferent to the competitive situation in the supply market and in fact keen to sell transport services to the maximum degree possible to whoever requires service. If there is a sufficient stream of access requests, the operator should, without compulsion, want to expand its transmission capacity to serve such new custom. The ultimate logic of open energy markets is the complete divestment by pipeline operators of any other gas supply interests so as to exclusively serve all producers and consumers.

A system of regulated and published prices for network access for all is the method of permitting access to the network that produces the most effective and transparent competitive market. Not only does it ensure that discrimination between market players on price grounds cannot take place, it also allows companies to plan future electricity purchases with advance knowledge of transmission tariffs.

The "use-it-or-lose-it" principle should apply: that is, if a company contracts for capacity but does not intend to use it, it must inform the pipeline operator so that it can then make this capacity available to the market.

7. The Move Towards Regional Pipeline Regulation

For cross-border gas pipelines, there is an emerging need for, and there is already a tendency to move towards, regional regulation.

The regional initiatives which have been seen to date have been relatively informal cooperative initiatives taken by domestic regulators with the approval of domestic governments and have not required to be supported by international legal regimes.[73]

Within the EU, there is an emerging model of a regional regulatory framework and consistent standards between its member countries which has evolved since the EU initiated the annual Madrid Forum. The Madrid Forum provides a mechanism by which all gas industry stakeholders can present their proposals for improving cross-border regulation and voice their concerns. This model may be of further interest to APEC and its members.

8. Key Messages from the Singapore Workshop

On 12-13 August 2004, 17 participants from governments, energy companies and other energy industry stakeholders attended a workshop in Singapore to discuss the Trans-ASEAN Gas Pipeline (TAGP) project. A case study based on the Singapore workshop is contained in appendix 3 of this report.

The key messages arising from the Singapore workshop were:

- the obvious, but not widely appreciated, impediment to cross-border natural gas trade is the lack of adequate installed energy infrastructure to transport and utilize the product
- ASEAN Energy Ministers have recognized that the further development of the TAGP project requires a congruence of essential elements involving political, social, economic and environmental concerns and an appropriate legal, regulatory and institutional framework
- the ASEAN Council on Petroleum (ASCOPE) is playing a pivotal role in this. The ASCOPE Gas Center is now being established in Malaysia to facilitate the TAGP project
- the TAGP project is viewed by its proponents as a "work in progress", consisting of a series of bilateral projects that will ultimately become the TAGP, a complex multilateral project

[73] Some of these recent regional and other international initiatives include:

- APEC Energy Regulators Forum
- Canadian Association of Members of Public Utility Tribunals (CAMPUT)
- Council of European Energy Regulators (CEER) in Europe
- Energy Regulators Regional Association (ERRA) in countries of Central and Eastern Europe and the newly independent states of Eurasia
- Ibero-American Association of Electricity Regulators (ARIAE) in Latin America, Spain and Portugal
- National Association of Regulatory Utility Commissioners (NARUC) in the US
- Utility Regulators Forum (URF) in Australia
- World Forum on Energy Regulation

- this approach is commended to the broader APEC community
- there is a desire and recommendation for greater collaboration between APEC, ASCOPE and industry participants and
- nine “challenges” to cross-border gas pipeline development (as distinct from “barriers”) were delineated by Singapore workshop participants and “best practice” recommendations were suggested for overcoming or coping with the nine identified challenges.

CHAPTER 11:

CONCERNS SPECIFIC TO LNG SUPPLY

- **LNG continues to build on its 40-year record of reliability in supply and delivery.**
- **LNG has more links in its supply chain and in theory is more prone to disruption than gas transported by pipeline. However, global energy markets have relatively more freedom in which to operate and LNG offers the potential for more diversity and flexibility.**
- **Dramatic structural changes are now occurring in a rapidly expanding and diversifying LNG market.**
- **A short-term LNG market is now evolving but both sellers and buyers agree that it is vital to preserve long-term, "take-or-pay" contracts for LNG supply.**

1. An Expanding and Changing LNG Industry

12 countries, with approximately 28 percent of world gas reserves, currently export LNG. Russia and three other countries with another 33 percent of the world's reserves are currently building their first LNG liquefaction facilities, with others as potential players. Five APEC members (Australia, Brunei Darussalam, Indonesia, Malaysia and Russia) are vying to expand the export of LNG to new and existing markets.

The LNG industry continues to expand and change: project life cycles are shortening and the number of buyers and sellers expanding almost exponentially. LNG projects offer an increasingly viable and attractive mechanism for interconnecting stranded gas resources and consumers.

Early LNG projects were developed bilaterally between buyer and seller. Historically, long term take-or-pay contracts have underpinned entire projects, many with government or quasi-government support. Recently, however, significant trade in "spot" LNG cargos at the margins, has emerged, where additional cargos are bought and sold, by many parties, in addition to the base contracts.

The rapid expansion of the LNG market has seen many proposals for new receiving terminals. Only some of them may be built. Sellers are moving to capture "first mover advantage" in new markets and buyers are moving to aggregate demand and secure gas for their own businesses. What has transpired is that links have been formed between buyers and suppliers and the links across the chain entrenched by cross-investments to ensure "alignment" over the life of the project. In future, we may see the development of merchant LNG plants, LNG traders and the offering of commodity LNG into the market.

Even if LNG does not form part of cross-border trade, LNG offers for some APEC members (most especially Indonesia and Australia) the benefits of inter-island and interstate connections.

Natural gas is not a commodity like oil and the LNG market is not, and is unlikely ever to be, as flexible as the world oil market.[74]

2. Growth in Global LNG Trade

LNG accounted for 26 percent of total cross-border gas trade in 2002. In that year, 12 countries shipped 5.4 Tcf of natural gas (113 million tons of LNG) to 12 LNG-importing countries.

New projects under construction in Australia, Russia, Norway, and Egypt, together with expansions of existing facilities throughout the world, will increase annual liquefaction capacity by 2.8 Tcf (58 million tons) by 2007, increasing global capacity to 9.4 Tcf (197 million tons) per year.

3. Growth in Pacific Basin LNG Trade

The Pacific Basin[75] is the largest LNG-producing region in the world, supplying 49 percent of all global exports in 2002. Indonesia alone supplied 21 percent. Three countries in the Pacific Basin – Japan, the Republic of Korea, and Chinese Taipei – accounted for 68 percent of global LNG imports in 2002.

As of late 2003, five Pacific Basin exporters had 3.1 Tcf (63 million tons) of annual liquefaction capacity. Annual liquefaction capacity in the Pacific Basin is expected to increase to more than 3.8 Tcf (80 million tons) by 2007.

The US has recently re-commissioned its mothballed LNG receiving terminals and is expected to become a major LNG importer, adding a number of additional import terminals to its inventory. China has announced a third receiving terminal, in addition to the two currently under construction. Other potential LNG importers in the future could include Indonesia, Mexico, Singapore, New Zealand, and the Philippines (in all of which interest in potential sites has been announced).

4. Structural Changes in the Global LNG Market

The structure of the global LNG market is being affected by six main factors:

- an expected convergence in prices between the Atlantic and Pacific Basins
- an increasing flexibility in LNG trade
- the declining trend of LNG costs throughout the value chain, although the APEC workshops suggested that these curves may now be flattening
- gas/electricity arbitrage
- the taking on of additional roles and the addition of new participants in the market and
- the emergence of gas “hubs”.

[74] Jensen, J, 2004, “The Development of a Global LNG Market – Is It Likely? If So, When?”, Oxford University Press, Oxford, UK.

[75] In this report:

- “Pacific Basin” is used to describe LNG activity along the Pacific Rim (including Alaska) and in South Asia (including India)
- “Atlantic Basin” is used to describe LNG activity in Europe, Africa (including North and West Africa) and the Western Hemisphere (but not including the Alaskan terminal on the Pacific Ocean).

Convergence in Prices

LNG trade evolved differently in the Atlantic and Pacific basins, and this continues to affect volume, pricing systems, and contract terms. Countries in the Atlantic Basin use domestic supplies and pipeline imports as well as LNG to meet natural gas demand but importing countries in the Pacific Basin are almost totally dependent on LNG.

LNG prices are usually expressed in U.S. dollars per million Btu (MMBtu) and directly linked by a price formula and mechanism to crude prices. LNG prices have historically been higher in the Pacific than in the Atlantic Basin, averaging about US$4/MMBtu in the former and US$3/MMBtu in the latter over the past 10 years.

The rapid growth in Middle East LNG supply and demand in the United States and China may contribute to a convergence of the Atlantic and Pacific prices. It is believed that the China contracts will continue to emphasize a shift away from the very high degree of coupling of LNG to crude prices.

Increased Flexibility

LNG was traditionally supplied only on long-term contracts. Recent changes in the LNG market have trended towards increased flexibility, in term, volume and price. Flexibility and greater total tonnage of LNG shipping has led to an increase in short-term contacts.

Declining Costs

Costs of liquefaction, shipping, and regasification have declined over time, lowering costs to producers. However, because the LNG market is primarily driven by long-term contracts with pricing mechanisms pegged to petroleum products, lower operating costs may not immediately be reflected by lower LNG prices.

Over time, the development and pre-treatment of higher-cost gas resources, many of them distant from markets, for conversion into LNG can be expected to reverse the effect of declining costs and to result in higher delivered LNG prices.

Gas/Electricity Arbitrage

Developments in energy markets are giving rise to gas/electricity arbitrage opportunities, especially where there are distinct seasonal patterns of energy use.

New Roles and New Participants

Both buyers and sellers have been taking on new roles:

- buyers, including Tokyo Gas, Osaka Gas, Tokyo Electric Power Company and Chinese buyers have been investing in upstream resources and reserves as well as in liquefaction plants[76] and
- traditional sellers, such as BG, BP and Shell, have leased capacity at terminals and are extending their role into LNG and gas trading.

As well, new participants such as independent power producers and major gas buyers purchasing terminal capacity have been emerging.

[76] See for example:

- Okuda, K, 2004, "Bridging the Future: LNG Strategies for Changing Times", 19th World Energy Congress, Sydney, Australia.
- Arai, T, 2004, "Expansion of LNG Business and the New Business Challenge", 19th World Energy Congress, Sydney, Australia.

Gas Hubs

Gas "hubs" involving both LNG and pipeline gas are emerging in the United States, Belgium, and the United Kingdom, presenting opportunities for price arbitrage and eventual convergence of prices. In the US market, LNG prices are linked to Henry Hub prices, which have risen substantially and inexorably of late. Prices for natural gas in the United States are expected to remain above the $5 per million Btu range, which would reduce the LNG price differential between the Pacific and Atlantic markets.

The European Union is insisting that LNG sellers remove destination clauses from their contracts.

5. LNG Pricing

Traditional LNG supply contracts focused on security of supply for the buyer. Contracts were long-term (often 20–25 years) and rigid. Take-or-pay clauses shifted the volume risk to the buyer. LNG was shipped either on an FOB or on a CIF basis delivered ex-ship (DES), that is, the LNG was transported in designated tankers. Contracts also contained "destination clauses" that prevented buyers from reselling the cargos to third parties. LNG facilities which were historically designed to ensure supply, with substantial "over-capacity" and in many cases both storage and strategic storage built in, are being complemented by "fit for purpose" designs with much-reduced infrastructure investment that is tailored to the end-market requirements.

Today, most new contracts are FOB which buyers believe provide them more control over the landed price and allows them to trade surplus LNG cargos.

When Japanese utilities recently renewed an expiring 20-year, bcm-per-year (7.4 million tpa) contract for Malaysian LNG, they reportedly obtained a five percent price reduction, a two-tier contract arrangement whereby bcm (1.2 million tons) per year is sold for 4 years and the rest for 15 years, and an agreement that about one-fourth of the volumes will be sold F.O.B., increasing shipping flexibility and reducing freight costs for the buyers. The contract also covered short-term purchases.[77]

In the last few years, LNG suppliers have reportedly offered more favorable terms, including substantially lower prices, to new importers in India and China. For example Australia's Northwest Shelf project reportedly agreed to sell LNG to China for around $3 per million Btu when crude oil prices were $20 per barrel (with the actual LNG price varying in part with the price of crude oil). Existing contracts with Japanese buyers are reportedly about 20 percent higher than the Chinese contract.[78]

These recent LNG supply deals are likely to encourage existing LNG buyers to seek lower prices when renegotiating their own contracts,[79] at least for as long as the market is perceived to be long on supply.

[77] LNG Express, 2003, "Shorter Periods, Partial FOB Transactions Spice Japanese-Malaysian LNG Contracts", Zeus Development Corporation, Houston, Texas, USA.

[78] Morita, K, 2003, "LNG: Falling Prices and Increasing Flexibility of Supply-Risk Redistribution Creates Contract Diversity," International Institute of Energy Economics, Tokyo, Japan.

[79] Yoshitake, J, 2003, "Review of Natural Gas Market in Asian Pacific Region and Future Natural Gas Industry Issues in Japan", 22nd World Gas Conference, Tokyo, Japan.

6. Evolution of the Short-Term LNG Market

Short-term LNG sales jumped to a record-high 8 percent of traded LNG in 2002.

The short-term LNG market was virtually nonexistent until a few years ago, and few LNG facilities were built until sales contracts were signed for the entire capacity. Recently, some projects (for example, Sakhalin 2) have proceeded to development with capacity uncommitted.

Growth of the short-term LNG market is being driven by:

- uncommitted production capacity, as some new plants are being built without committing the full production volumes or buyers ramp up their off-take commitments, leaving spare or wedge capacity available for sale into the spot market
- market demand for more LNG, especially in Spain and the United States, where receiving terminals have excess capacity, and the Republic of Korea, which needs greater volumes in winter
- willingness of buyers to purchase "wedge" or spare capacity at liquefaction plants as the base load/contracted demand of sellers builds up on new trains
- counter-cyclical demand
- seasonal (summer/winter) pricing differentials
- the availability of ships not committed to particular projects and
- greater contract flexibility.

In 2002, 32 companies traded 218 shipments of LNG either as short-term transactions or as swaps. The leading short-term sellers in 2002 were Algeria, Oman, Qatar, Trinidad and Tobago, and the UAE. Short-term imports were dominated by the United States and Spain, followed by the Republic of Korea and France.

LNG arbitrages (spot and swap transactions) escalated dramatically from 1999 onwards, reflecting what is considered to be a fundamental shift in the world energy balance. It has been suggested that future changes in the LNG market will be as dramatic as the changes in the oil market after 1973.[80]

Short-term trading is projected to continue to grow, especially in the Atlantic Basin. Although it could reach 15 to 20 percent of LNG imports over the next decade, long-term purchase agreements will remain a feature of LNG trade for the foreseeable future because of the challenges of project scale, cost and financing that are discussed in this paper.

7. LNG Shipping

151 LNG tankers were in operation worldwide as of October 2003. These comprised:

- 16 ships with a capacity of less than 50,000 cm
- 15 in the 50,000 to 120,000 cm range and
- 120 in the 120,000 cm – 150,000 cm range.

[80] Jean-Marie Boudaire, 2003, "The Growth of Natural Gas in Electricity: A New LNG Role for Supply and Flexibility", 22nd World Gas Conference, Tokyo, Japan.

Over 50 ships are under construction, most being designed to carry at least 138,000 cm. Much larger ships with 250,000 cm capacity are also under consideration. However such large ships will not be compatible with all existing LNG terminals and harbor conditions.

The addition of new ships to the fleet is expected to raise total fleet capacity 44 percent from 17.4 million cubic meters in October 2003 to 25.1 million cubic meters in 2006.

Tanker costs have fallen from around $280 million in 1995 to a reported low of $160 million for a 138,000 cm ship in 2003 (still more than double the price of a very large crude oil tanker which carries 4 to 5 times as much energy). The main reason for this high cost is that LNG tankers require expensive, insulated cryogenic containment for the cargo.

Shipping accounts for 10 to 30 percent of the delivered cost of LNG (depending on the distance from the reserves to the market), compared with less than 10 percent for oil, because of the significantly higher cost of manufacturing and operating LNG tankers.

Most of the current LNG fleet is dedicated to particular LNG projects and the ships are owned by LNG importing and exporting companies through self-owned or independent shipping companies. Completely independent shipping companies own only about a dozen ships in the fleet.

In the conventional oil tanker market, most ships are built on speculation. This has not been the case in LNG where, traditionally, ships have been commissioned for dedicated routes from specific projects to specific markets. However, several large companies that import or export LNG, including BG, BP, Shell, and Tokyo Gas, have recently ordered ships that are not dedicated to a particular project.

The substantial growth in spot or short-term LNG sales has been made possible due to surplus LNG and shipping capacity at the margins and due to replaced vessels being used for this purpose. With the further expansion of the LNG market it is expected that there will be some limited further availability of tankers that are not dedicated to long or longer-term trade.

LNG shipping costs are determined by journey distance, voyage durations and the daily charter rate, which is a function of the price of the ship, the cost of financing, and operating costs. There is no set market for LNG tanker day rates as there is for crude oil tanker rates. Charter rates vary widely, from as low as $27,000 per day to as high as $150,000, with the average in 2003 for long-term charters between $55,000 and $65,000.

8. Key Messages from the Tokyo Workshop

On 16 – 17 June 2004, 34 participants from governments, energy companies and other energy industry stakeholders attended a workshop in Tokyo to discuss barriers to the expansion of LNG trade across the APEC region and possible strategies to overcome these barriers.

The key messages arising from the Tokyo workshop were:

- by 2015, APEC LNG trade has the potential to double to around 160 million tons per annum (this growth rate significantly exceeds that for natural gas trade as a whole, which is predicted to double in the 25 year period from 2000-2025)

- this increased level of APEC LNG trade is likely to have a value of around US$20 billion per annum

- buyers of LNG need a secure and uninterruptible supply of contracted volumes and they need price certainty, but they would also like as much flexibility as they can get (obviously, they cannot always get all these things; their indispensable requirement is security and uninterruptibility of supply)

- at the production end of the supply chain, sellers of LNG need good, long-term, creditworthy customers – this is their indispensable requirement
- for the foreseeable future, long-term contracts will continue to underpin the market but 20% of transactions are expected to be made up of swap or spot transactions and
- installation of adequate LNG receiving terminal capacity and interconnecting pipelines is the critical prerequisite to market access and to market expansion in importing economies.

Nine barriers to the expansion of APEC LNG trade were delineated by workshop participants and strategies to overcome them were recommended, as described in appendix 2 of this report.

CHAPTER 12:

TOWARDS BEST PRACTICE: INTERNATIONAL COLLABORATION, "INDUSTRY VISION" IN INDIVIDUAL ECONOMIES AND A "TOTAL PACKAGE" APPROACH IN INDIVIDUAL PROJECTS

- **The goal of energy sustainability must be APEC's unifying theme for the development of new cross-border natural gas projects.**
- **Without massive investment in essential infrastructure, APEC cross-border natural gas trade faces impossible bottlenecks to the achievement of its true growth potential.**
- **Best practice in APEC cross-border natural gas trade must be pursued at three complementary levels: international, individual economy and individual project-level.**
- **INTERNATIONAL BEST PRACTICE:**

  Best practice at the international level calls out for a collaborative mechanism in which all key stakeholders can be engaged. Expectations of natural gas as the preferred "swing fuel" will not be fully realized unless there is multilateral and bilateral collaboration amongst governments, investors and communities to facilitate the development and operation of natural gas supply chains and to foster conducive investment environments.
- **INDIVIDUAL ECONOMY BEST PRACTICE:**

  Best practice at the level of the individual economy requires investments to be facilitated, an "industry vision" devised, markets created and policies and regulations harmonized. To participate fully in cross-border natural gas trade, both exporting and importing economies should strive for as much compatibility and transparency as possible, giving rise to the need for each economy to consider its own best practice.
- **INDIVIDUAL PROJECT BEST PRACTICE:**

  Best practice at the project-specific level requires "total package project management" — a comprehensive project management approach in which the interests of all project stakeholders, from governments to project participants to community groups, are taken into account. The interests of all stakeholders in each specific project must be carefully aligned from the very beginning and straightforward and transparent risk-management mechanisms must be utilized to maintain the economic equilibrium of the project over its entire life.

1. Energy Sustainability – the Unifying Theme for APEC

In an increasingly resource-constrained and carbon-constrained global economy, it is recommended that the APEC Energy Working Group should adopt the goal of energy sustainability as the unifying theme for the acceleration of cross-border natural gas trade.

2. The Crucial Linkage Between Trade and Investment

Cross-border natural gas trade is wholly dependent on a massive level of investment being made in requisite infrastructure. Without this investment, cross-border trade simply cannot occur on the scale and within the time-frame required by APEC economies.

There are wide differences amongst APEC member economies in their political systems, in their stages of economic development, in their industry structures and in their legal and regulatory frameworks. These differences provide complexity and pose a great challenge to cross-border gas trade and investment. Overcoming these must commence with goodwill and cooperation but there must also be proactive planning, coordination and management of new projects and of ongoing relations amongst the participating economies.

3. Best Practice at the International Level – The Need for a Collaborative Mechanism

There is no need for yet another IGO or for additional levels of bureaucracy. There must, however, be proactive and collaborative involvement by governments, investors and communities in facilitating cross-border natural gas supply chains and in fostering conducive investment environments.

It is insufficiently appreciated that the essential infrastructure for cross-border energy trade and investment includes a range of "soft infrastructure": policies, laws, rules, regulations, codes, principles, precedents, practices and customs, not to mention the good old-fashioned virtues of trust and respect for other people and cultures. Furthermore, all of these matters are inseparable from politics.[81]

In the modern global economy, state sovereignty has entered a new era: no nation-state can afford to be a unitary player.

To be a player in the modern global economy, each nation-state must actualize and exhibit its sovereignty by participating in the international regimes that not only regulate international trade but also now regulate international investment and environmental protection. International regimes manage the collective suboptimality that would otherwise emerge from individual state behavior. In part, this is a consequence of realization of the excesses and shortsightedness of the nationalization policies of many host countries in the 1970s. Today, isolation is tantamount to a failure to realize the nation state's potential for economic development and political influence.

[81] As the Secretary-General of the Energy Charter Secretariat recently reminded the energy industry: *"It is perhaps not realistic to expect that the operation of the energy business, not only in transition countries but across the world, will ever be dissociated from politics. Indeed, there are strong reasons to suppose that the interrelation between energy policy and foreign and security policy will become even closer in the years ahead. But what is realistic to imagine is that governments, of both producer, transit and consumer countries, can recognize their complementary interests in the energy sector and come together to agree some common "rules of the game". By establishing such rules, and committing themselves to observe them in practice, governments can help substantially to mitigate the non-commercial risks associated with investments in major energy projects involving cross-border transportation",* Kemper, R, 2004, "Meeting the Challenge of Trans-Border Supply: The Role of Multilateral Investments", 19th World Energy Congress, Sydney, Australia.

APEC economies have already signaled their commitment to be international players. So also have economies that have become signatories to, for example, the Framework Convention on Climate Change, the World Trade Organization, the North American Free Trade Agreement (NAFTA) and the Energy Charter Treaty (ECT).[82]

By reducing risk and transaction costs between parties, treaties such as NAFTA and the ECT seek to establish a global level playing field for investors. Nonetheless, the case should not be over-stated – although NAFTA and the ECT may have a positive influence on the rate of inflow of foreign investment, the two treaties are only one of many factors that influence this. They should not be overshadowed by other fundamental factors such as geological potential, political stability, macro-economic policy, exchange rate volatility and the like. NAFTA and the ECT should therefore be seen as providing a process, or a continuous mechanism, as distinct from a static, two-dimensional framework.[83]

In the specific field of cross-border natural gas trade, best practice at the international level calls out for a mechanism to enhance greater collaboration and trust. Mountains of information are in circulation but much of it is indiscriminate and extravagant. There is definitely a missing link … the dots between all players need to be connected and a greater sense of mutuality needs to be fostered.

In responding to this challenge, the pivotal need for APEC economies is to establish a mechanism which highlights the mutuality of interest of key stakeholders in accelerating the development of the natural gas industry, which captures the imagination of those with a stake in the future success of the sector and which engages them in a search for solutions. The emphasis should be, first, on regional and sub-regional (rather than global) solutions, secondly, on the mutual advantages to be derived from increased cross-border trade and investment in the natural gas sector within APEC and, thirdly, on the unifying goal of energy sustainability.

The support expressed by APEC Energy Ministers in June 2004 for “best practice principles” to accelerate APEC LNG trade is an encouraging start, but more is required to give impetus and force to these principles. Natural gas markets are not commodity markets like oil markets. They require active facilitation by APEC governments in collaboration with all stakeholders.

Some of the concerns and needs of stakeholders that are deserving of attention are listed in table 12.

[82] NAFTA and the ECT are the offspring of recent market reform and are having an increasingly pervasive effect. The NAFTA is a trilateral treaty that brought Canada, Mexico and the US into the North-American free trade area. The ECT is a unique multilateral treaty, limited in scope to the energy sector, which establishes rights relating to both trade and investment within that sector. The ECT breaks away from the mould of other treaties by making governments accountable before arbitral tribunals to aggrieved investors for breaches of the Treaty. Host states can attract investors by offering them the security of market-based economic systems – underpinned by market-oriented legal systems. The purpose of market-oriented legal systems is to define and protect the rights of market participants and support fundamental business relationships between private parties.

[83] *“The long-term significance of NAFTA and the ECT, as a whole, stretches out beyond the investment, or even economic, sphere. They both increase economic links. Consequently, they draw diverse nations into closer contacts. This results in a dramatic upsurge in the number and range of formal and informal transactions between citizens of the participating states”,* Omalu, M, 1999, “NAFTA and the Energy Charter Treaty”, Kluwer Law International, The Hague, Netherlands.

Table 12: APEC Natural Gas Supply Chains: Some Stakeholder Concerns and Possible Responses

Stakeholder Concern	Possible Institutional and Commercial Responses
1. Sustainable development of the natural gas industry	• Intergovernmental treaties, agreements and understandings, such as NAFTA and the ECT • An APEC regional forum for stakeholders to promote greater transparency and trust • Web-based information support for collaborative regional endeavors • Public communication plans
2. Long-term energy supply security	• An APEC regional forum for stakeholders • Shared vision by exporting and importing economies about the role of cross-border trade • Definition of regional markets (after energy flows and benefits are understood) • Alignment of compatibility of national policies of exporting and importing economies to shared objectives • Regulatory dialogue and harmonization • Long-term take-or-pay contracts between sellers and buyers
3. Adequacy of upstream resources	• Government incentives for exploration and production • Investment by gas buyers in upstream resources and production facilities in exporting countries
4. Acceleration of upstream development, LNG production, transportation infrastructure and delivery systems	• An APEC regional forum for stakeholders • Stable investment conditions and taxation regimes • Government facilitation of financing
5. Market creation and development in importing economies (including developing economies currently without supply)	• Reliable demand forecasts • A “market vision” by governments • Ongoing market and regulatory reforms • Investment by gas sellers in storage facilities and LNG receiving terminals • Access to infrastructure • Realistic gas specifications to facilitate interchangeability
6. Health and safety	• Transparency of technical regulations • Transparency of commercial practices, especially in workplace health and safety management • Participation in dialogue with government and industry

Both inside and outside APEC, precedents are evolving:

- in APEC itself, the many achievements of the APEC EWG since its launch in 1990 are testament to the virtue of consistent application of "APEC-style" methods and procedures in pursuing mutually agreed goals in the energy sector
- in North America, collaboration amongst Canada, Mexico and the United States is being actively pursued and this is given impetus by NAFTA and by the work of the North American Energy Working Group
- in the ASEAN region, the progress in the development of the ASCOPE-led Trans-ASEAN Gas Pipeline is a tangible example of the success of a collaborative cross-border initiative
- in Northeast Asia, the pioneering work of the Northeast Asian Gas and Pipeline Forum, established in 1997, is now opening the way for a new era of regional economic development
- in the EU, the establishment of the Florence Electricity Forum and the Madrid Gas Forum has considerably accelerated Europe's progress towards a single energy market and
- at a global level, the Carbon Sequestration Leadership Forum (CSLF), only established in 2003, has quickly developed its own momentum.

The consultants recommend that regularly, perhaps once a year, all stakeholders in the natural gas industry, including representatives of governments at national and provincial levels, industry, academia and NGOs, should be invited to engage in an APEC-sponsored forum to exchange position papers and identify practical solutions to the many issues that challenge the further development of cross-border natural gas trade. There should be a disciplined focus on definitive actions that can be taken and on mutually agreed outcomes that can be monitored and measured in the ensuing 12 months. Both multilateral and bilateral initiatives should be explored.

Such a forum could be styled as the Asia-Pacific Gas (APGAS) Forum. It need not be an "official" APEC activity but APEC sponsorship is seen as an essential element, in much the same way as EU sponsorship has been responsible for the success of the Madrid Gas Forum. A flexible APEC-sponsored forum would develop its own distinctive style as experience is gained. Over time, such a forum could adjust its focus and level of intensity on particular issues in much the same way as the EWG itself has evolved since 1990.

4. Best Practice at the Level of Individual Economies – Investment Facilitation, Market Creation, "Industry Vision" and Transparency

It is to be hoped that both exporting and importing economies within APEC will respond positively to the encouragement of APEC Energy Ministers to move towards best practice in facilitating the development of APEC LNG trade, as set out in appendix 1 of this report.

However, more is required to be done; three main best practice requirements need to be catered for in considering best practice in cross-border natural gas trade at the level of individual economies: the first is facilitation of investment (mainly but not only in the producing and exporting economies), the second is market creation in the importing and consuming economies and the third is the need for transparency.

Investment Facilitation Best Practice

The efficiency of cross-border natural gas trade requires predictability and consistency of investment conditions to be provided by host governments – this applies not only in exporting economies but in importing economies as well. Modern investment agreements for energy

infrastructure projects do not need to be, and should never be, negotiated behind closed doors. Each economy should not only promulgate a clear set of contracting rules and tender procedures but should develop model agreements wherever possible. It is in everyone's interests for the resulting investment agreements to be completely transparent and unchallengeable.

Market Creation Best Practice

In the interests of maximizing the efficiency of its own natural gas sector, it is recommended that each economy should consider the need to adjust its own policies and practices to dovetail with the requirements of an increasingly dynamic, open global market in natural gas.

For importing economies, it is important to remember that natural gas markets do not automatically happen – they must be created. There can often be unrealistic expectations of importing economies in relation to the level of future gas demand, the rate of demand build-up and the level of achievable prices – there is great value to be derived if importing economies adopt an "industry vision" to guide their transition to a mature market environment

Transparency Best Practice

Transparency stands out as a top policy priority in almost everything that is done. Transparency makes it apparent to everyone what is going on and facilitates their collaboration.

5. Best Practice at the Individual Project Level – "Total Package Project Management"

Concurrently with initiatives at the international and individual economy levels, best practice solutions at the individual project level can and should be explored amongst stakeholders. Project stakeholders are not limited to the proposed contracting parties but they include governments, regulators, industry, environmental interest groups and affected local communities.

Best practice for each new cross-border natural gas project will vary because each project will have its own set of variables, that must be very carefully weighed, and often many participants, whose interests must be very carefully aligned, before the project can commence. These issues must then be very carefully managed before a project can reach the stage of commissioning and operation. There is no single development model.[84]

The structuring of any infrastructure project is closely tied to:

- the range of risks applicable to the particular project
- the way in which these risks are allocated amongst the parties involved
- social and environmental factors and
- the capacity of each of the parties to manage the risks and obligations for which it agrees to be responsible.

[84] "*There is no single model that can be applied to the development of gas projects. Each resource-owning nation and market place has different needs and conditions, and the selection of monetization or supply scheme is driven by more than physical boundaries and economics. International politics, diversification, security of supply and environmental issues all play a part. It is also important to consider lifetime costs as well as initial capital costs of each scheme",* Gower, S and Howard, M, "Changing Economics of Gas Transportation", 22nd World Gas Conference, Tokyo, Japan, June 2003.

Developers and investors must be allowed to achieve a rate of return on their investment consistent with the level of risk they assume. No cross-border gas project can be completed without utilizing sophisticated project management techniques, which must be enlightened by a full understanding of the dimensions and the dynamics of contemporary global gas trade.

The careful alignment of the interests of all project stakeholders is crucial from the very beginning. Parties with more bargaining power than others need to be wary of deals that are reluctantly entered into by counter-parties or which may be unsustainable. Cross-border gas projects have long life cycles, often over half a century, and require durable structures that are capable of adjustment as circumstances change, as they certainly will.

Careful alignment of interests is necessary to address the high level of contractual interlinking and complexity, to induce investment of the necessary equity capital and to provide "bankability" for providers of debt.

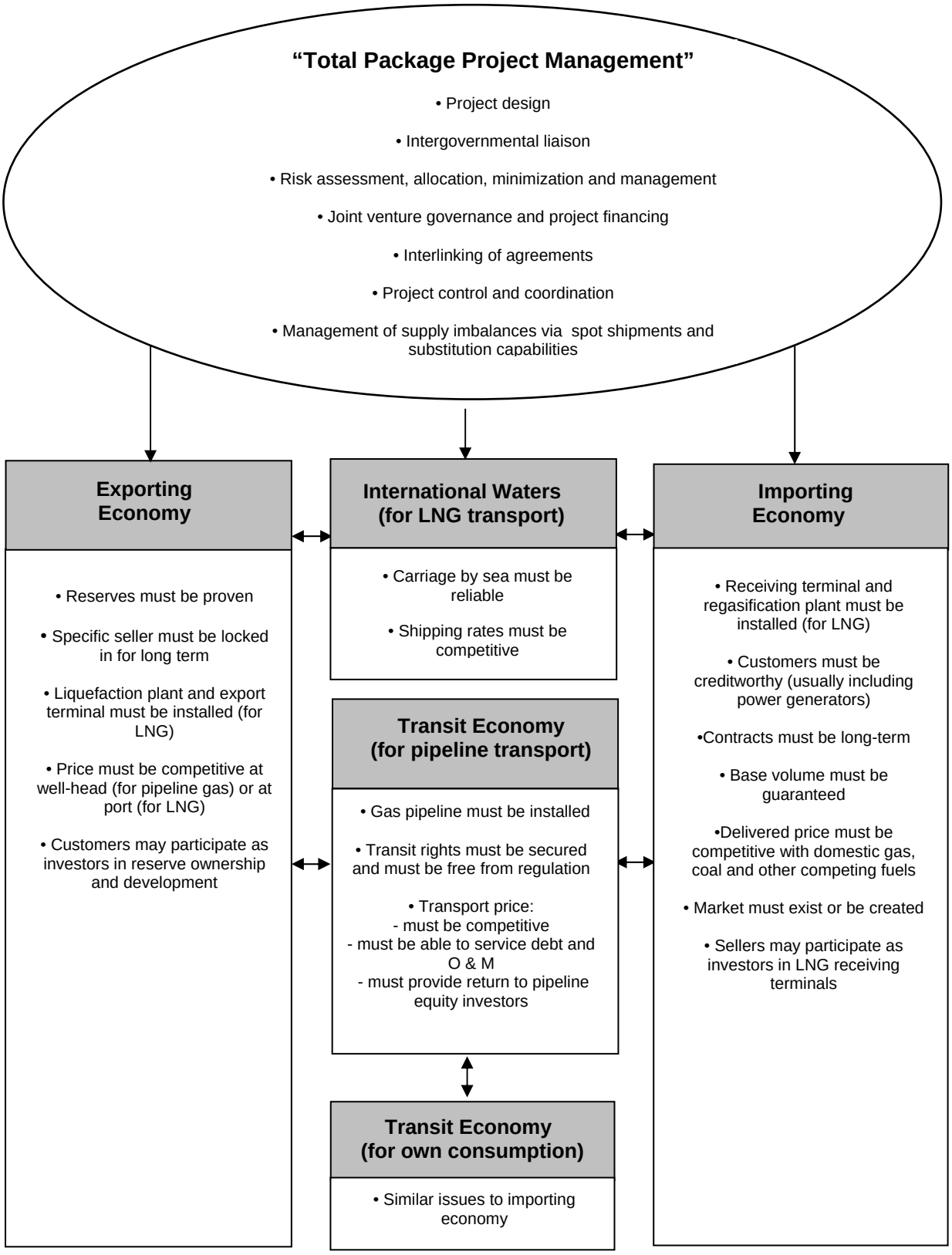
Risk management tools must be assiduously employed. Straightforward, "no-regrets" options should always be preferred to more complex ones — where barriers are found to stand in the way of the development and financing of feasible interconnection projects, straightforward policy, technical, structural, regulatory and legal strategies and solutions are generally available and should be formulated and implemented. From the owners of the gas resources to the transporters to the consumers, a chain of interlinked contracts must eventually be put in place in order to regulate a highly interdependent series of investment decisions involving multiple parties.

For individual companies, there is also a case for improved business reporting and communications as a tool to guide capital allocation decisions and to promote energy sector investment.[85]

Despite the absence of a single development model, project-level best practice requires "total package project management" of the natural gas supply chain as it affects each new project. A recommended framework for this is depicted in table 13.

[85] Bray, M, 2004, "Business Reporting and Communications: Promoting Adequate Investment in the Energy Sector", 19th World Energy Congress, Sydney, Australia.

Table 13: A Recommended Framework for Project-Level Best Practice in Cross-Border Natural Gas Projects



6. Conclusion

The acceleration of cross-border natural gas trade, and the concomitant need for massive investment in infrastructure, raises many issues that transcend the ability of the sovereign governments of individual economies to deal with them efficiently.

Natural gas is not a commodity like oil. Best practice in cross-border natural gas trade must therefore recognize the importance of the "soft infrastructure" of global policies, politics, norms, customs and trust. None of this is straightforward because many of the issues overlap with each other.

In a dynamic, open global economy, there are indistinct boundaries, rights and responsibilities. As well, different behaviors and behavioral expectations are frequently encountered.

Both multi-stakeholder and individual project solutions must be explored and developed in a transparent and open manner.

It is recommended that best practice in cross-border natural gas trade in APEC economies should be approached at three complementary levels:

- best practice at the **international level** calls for the establishment of a flexible, collaborative forum in which all key stakeholders may be engaged

- best practice at the **individual economy level** requires investments to be facilitated in exporting and importing economies, and "industry vision" to be devised, markets to be created and regulatory reform to be implemented in importing economies and

- best practice at the **individual project level** requires a "total package project management" approach.

How the three best practice levels would complement each other is illustrated in table 14. The goal of energy sustainability must be the unifying theme.

It is the belief of the consultants that a collaborative forum would contribute to the maintenance of the energy balance of the APEC region.

Table 14: Three Recommended Complementary Levels of Best Practice in Cross-Border Interconnection of Natural Gas in APEC

1. INTERNATIONAL LEVEL

Collaboration and engagement of stakeholders on sustainability goals, environmental standards, natural gas supply chains, cross-border trade and investment facilitation (including gas supply to developing economies), transparent trade, investment and environmental regimes, project financing and provision of all other elements of "soft infrastructure" – involving both multilateral and bilateral initiatives

Asia-Pacific Gas (APGAS) Forum

2. INDIVIDUAL ECONOMY LEVEL

Trade and investment facilitation, financing facilitation, "industry vision", market creation, policy and regulatory harmonization, environmental enforcement and transparency

MAIN APEC GAS EXPORTING ECONOMIES

Brunei Darussalam
Australia
Indonesia
Malaysia
Russia
Canada

MAIN APEC GAS IMPORTING ECONOMIES

China
Thailand
Chinese Taipei
Singapore
Japan
Republic of Korea
Mexico
United States

3. INDIVIDUAL PROJECT LEVEL

"Total package project management" of all environmental, commercial and project financing issues, joint venture governance and alignment of interests, upstream and downstream participation by buyers and sellers, management of multiple buyer and seller relations, transparency and contractual best practice

Project 1

Project 2

Project 3

APPENDIX 1:

CASE STUDY ON FACILITATING LNG TRADE INTO THE WEST COAST OF THE UNITED STATES

1. Key Messages from the San Francisco Workshop

On 29 – 30 April 2004, the United States Department of Energy (US DOE) hosted a workshop in San Francisco[86] to discuss ways to facilitate LNG Trade in the Asia-Pacific and to develop best practice principles for consideration by APEC Energy Ministers at their 6th Meeting in Manila in June 2004.

The key messages arising from the workshop were:

- **Natural gas is an environmentally beneficial fuel which can be safely and economically supplied across international borders in the form of LNG in order to diversify the supply of energy and enhance energy security.**
- **There is a need to share knowledge, expertise and experience relating to the supply of LNG with all potential stakeholders, including politicians and the public.**
- **There is a special need to dispel public myths about the dangers of LNG.**
- **Permitting difficulties are an issue for a number of APEC economies; for example, in California and elsewhere in the United States, they loom as a significant risk to US energy supply, to US energy security and to the US economy as a whole.**
- **APEC economies should endorse best practice in facilitating the development of LNG trade across the APEC region.**

The San Francisco workshop was chaired by Jim Shultz, Assistant Secretary of the US DOE, and was attended by 41 representatives of governments, energy companies and other stakeholders. The workshop presenters were:

Robert Pritchard and Stuart Bensley, ResourcesLaw International, Australia	The APEC Study on Cross-Border Gas Trade
Yonghun Jung, APERC, Japan	The Pacific LNG Market
Tom Hecht, North West Shelf LNG, Australia	The Pacific LNG Market
Kardaya Warnika, BP Migas, Indonesia	The Pacific LNG Market
Tom Fisher, Unocal, USA	The Investment Environment
Gerald Schuppert, ConocoPhillips, USA	LNG Technology Update
James Bronfen-Brenner, Air Products, USA	LNG Technology Update
Steve Meheen, BHP Billiton, USA	Permitting of New LNG Facilities
Robert Smith, East-West Center, USA	LNG Contracting Practices
David Maul, California Energy Commission, USA	The Californian LNG Market

[86] A planned APEC/ResourcesLaw workshop which was to be held in Washington DC with the International LNG Alliance (ILNGA) was amalgamated with this workshop, to maximize the benefits for all stakeholders and to avoid repetition.

Presentations were made on progress of the APEC cross-border gas trade project, updates and changes to the LNG market, contracting and technology advances.

Expert opinions were offered on the future of LNG trade, in particular buyers' and sellers' views of the changes that are likely to occur in LNG markets with the confluence of the Atlantic and Pacific LNG markets in the United States.

Given the location of the workshop in San Francisco, and the importance of increasing LNG imports into the United States to meet projected increases in demand for natural gas, the majority of workshop presentations focused on barriers to entry of LNG into the West Coast of the United States. This case study focuses on the presentations and discussions relating to the US experience.

2. The "Tram-line Model" of LNG Trade

The representative of one oil major explained to workshop participants that LNG trade had evolved around the "tram-line model" because:

- LNG projects are very capital intensive, for both sellers and buyers
- projects are generally built for specific supply purposes, with little extra capacity built into the supply chain
- LNG must be transported in very large "chunks" by special-purpose tankers and
- LNG markets are historically supply-constrained, requiring shipments to arrive on schedule in the quantity expected.

It was emphasized that LNG could not be traded like a commodity.

3. The Effect of Gas Market Liberalization on LNG Pricing

The East-West Center reported to workshop participants that:

> *"The latest developments in the APEC market have demonstrated that the market is gradually moving away from its traditional pricing formulae, and is becoming increasingly competitive and flexible. Although surplus LNG supply is an important factor responsible for the evolution and relaxation of Asia-Pacific contracts, the more important reason for the change is overall market liberalization in Asia. The Asia-Pacific region's markets are moving towards LNG being priced competitively with competing fuels, rather than buyers paying a premium for supply security."*

The East-West Center recommended that efforts should be focused on making the APEC LNG market more transparent and efficient. They suggested that the Asia-Pacific market is still far from what has been achieved in North America and in much of Europe in terms of transparency.

4. The Potential for LNG Supply to California

The California Energy Commission (CEC) is required by Californian law to adopt an Integrated Energy Policy Report every two years and to update it a year later. In its 2003 report, the CEC highlighted that:

> *"California's energy demand is growing, fueled by an expanding population and a growing business sector. State government must act now to reduce demand, secure additional energy supplies, give consumers more energy choices, and build needed infrastructure improvements to protect California from future supply disruptions and high prices … [and that, amongst a number of other recommendations] the state should … encourage the construction of liquefied*

natural gas facilities and infrastructure and coordinate permit reviews with all entities to facilitate their development on the West Coast".

David Maul of the CEC told workshop participants that:

- power generation in California now accounts for 40% of natural gas consumed and demand is increasing
- natural gas prices are expected to remain high and to exceed $4.50 per million Btu in the future
- although LNG is not presently supplied into California, it has the potential to provide significant economic benefits to California in terms of:
  - potential overall price reduction
  - fuel diversity and
  - additional import capacity, reducing the risk of disruption to energy supply
- steps would be necessary to ensure that LNG should have equal access to gas markets
- California needed to be sure that long-term LNG purchase contracts would not result in California paying too much or buying too much
- because there was no single-stop permitting agency in California and the division of responsibilities between state and federal jurisdictions was in dispute, and because LNG receiving terminals were very capital-intensive, uncertainty in terminal permitting needed to be reduced and
- local communities were concerned about safety risks and terrorism associated with LNG receiving terminals and there was a need for objective information.

Workshop participants learned that, on 24 March 2004, the US Federal Energy Regulatory Commission (FERC) had issued an order asserting exclusive federal regulatory authority over the siting and construction of LNG import terminals onshore in the United States.

Subsequent to the workshop, on 9 June 2004, the FERC denied an application by the California Public Utilities Commission to be designated as the lead state agency for environmental review of a proposed LNG terminal at Long Beach. In seeking to clarify its March 2004 order, the FERC emphasized the importance of "uniform federal oversight of siting, construction, operation and safety of facilities to be used to import foreign LNG to meet the nation's critical energy needs." The FERC decision is likely however to be appealed.

5. Further Information About US LNG Trade

Extensive further information is available on most issues relevant to possible future LNG supply to California from the CEC's website www.energy.ca.gov.

An interesting 2003 CEC Staff White Paper, "Liquefied Natural Gas in California: History, Risks and Siting", may be downloaded from www.energy.ca.gov/reports/2003-07-17_700-03-005.pdf.

An extensive 2003 report by the Energy Information Administration within the US Department of Energy, "The Global Liquefied Natural Gas Market: Status and Outlook", may be downloaded from www.eia.doe.gov/oiaf/analysispaper/global/pdf/eia_0637.pdf.

A very recent report on US LNG markets, "US LNG Markets and Uses: June 2004 Update" may be downloaded from
www.eia.doe.gov/pub/oil_gas/natural_gas/feature_articles/2004/lng/lng2004.pdf

On 22 June 2004, the Chairman of FERC, Pat Wood, gave testimony to a US House of Representatives Committee on the siting of LNG import facilities in the United States. This may be downloaded from
www.ferc.gov/eventcalendar/files/20040622140778-wood%20LNG%20testimony.pdf.

6. Barriers and Potential Solutions to US LNG Imports

Workshop participants noted that natural gas imports into the United States would need to increase substantially, as gas demand increased and domestic production declined. Imports by pipeline from Canada and Mexico and imports in the form of LNG will all be required. The consultant's views of the main barriers and potential solutions to entry of LNG to the West Coast of the United States which were discussed in San Francisco are summarized in table 15:

Table 15: Barriers to US LNG Market Entry and Potential Solutions – the Consultant's Views

BARRIERS	POTENTIAL SOLUTIONS
1. Procedures for the obtaining of permits for new LNG receiving terminals (permitting procedures) are highly dislocated and confused	❖ Offshore terminals are a partial solution ❖ Terminals can be sited in Mexico and on the US Gulf Coast with pipeline interconnections ❖ Canadian LNG could be imported into the USA ❖ Clear regulatory pathways, timing and processes to permitting are required ❖ The most efficient solution would be state siting legislation
2. Safety fears concerning LNG are very exaggerated	❖ Public education must be improved at all levels ❖ Site visits to existing operating facilities should be arranged ❖ LNG's exemplary 40-year safety record should be publicized
3. There is a lack of harmony in pricing and contracting between the Atlantic and Pacific LNG markets (Pacific prices are historically oil formula price-linked, a linkage that is changing with a smaller oil component; US gas prices are driven by Henry Hub pricing, which is a market price that is supply/demand driven and substantially unrelated to oil prices)	❖ US buyers may use a portfolio approach to LNG with a mix of short, medium and long-term contracts ❖ Future LNG prices may be arbitraged around US electricity prices
4. There is a risk that the currently high gas and energy prices in the US cannot be sustained (the US has gone from a "gas bubble" to high prices in a few short years)	❖ Large volumes of LNG will serve to temper pricing and remove spikes ❖ LNG storage should assist with peak demand and increase security of supply

5. The US gas market is characterized by a highly fungible domestic gas price, suiting commodity energy supply, lacking high credit-rated offtakers and long-term contracts (historically, Pacific LNG projects have been project-financed, based on long-term, fixed-volume offtake agreements, with spot cargos at the margin; the market requires large volumes of gas at the then current domestic market price; the price risk profile is thus substantially changed)	❖ California should become a portfolio buyer to get the LNG market started and to provide security of supply
6. The US lacks adequate gas storage and transportation infrastructure (much new generating capacity has been built with CCGT technology; generators have very limited choice of fuels)	❖ Regulation does not encourage new investment ❖ Buffer storage facilities would manage any future supply imbalances ❖ In the absence of multiple terminals, a large-scale common LNG receiving terminal and adequate pipelines is needed ❖ Because LNG projects are notoriously long lead-time events, the early permitting of new investments is urgently required to meet market needs
7. There is a need for "best practice principles" to guide officials in APEC member economies	❖ The support of APEC Energy Ministers will provide a better climate for all stakeholders (see the subsequent decision of Ministers set out below in table 15)

7. The Workshop Conclusions

In considering how to facilitate the development of LNG Trade in the Asia-Pacific region, workshop participants agreed that:

- **Natural gas is an energy source that is both economically and environmentally attractive**

Natural gas has the lowest greenhouse gas emissions of any fossil fuel. It is in strong demand (globally and within the APEC region), with gas consumption growing at a faster rate than total energy consumption, doubling in the past 25 years and projected to double in the next 25 years.

- **Natural gas is abundant within the APEC region**

The APEC region possesses approximately 40% of global reserves, projected to be adequate to support current levels of production for the next 200 years. However, the majority of natural gas reserves are 'stranded' (isolated from established markets), and it is estimated that 75% of all new gas production could potentially enter into cross-border trade (by pipeline and LNG).

- **Natural gas can be safely transported as LNG**

LNG takes up about $1/600^{th}$ of the volume that it does in a gaseous state, making LNG economical to transport. The flexibility and cost competitiveness of LNG transportation, particularly over long distances, and the fact that it can be transported safely, highlights the potential for greatly expanded LNG trade within the APEC region.

- **To capitalize on LNG's enormous, untapped potential, APEC economies should support policies that facilitate the development of further LNG trade in the APEC region**

LNG liquefaction capacity of 100 million tons per annum is currently dedicated to serve the APEC region, equating to annual trade of approximately $25 billion. Trade in the APEC region has grown steadily in recent years, underpinned by the principles of free trade between buyers and sellers and by the establishment of long-term commercial agreements that support the significant investments required.

8. Best Practice Principles to Facilitate the Development of LNG Trade

Workshop participants recommended 17 best practice principles for consideration by APEC Energy Ministers, principles which were regarded as necessary for facilitating LNG trade in the Asia-Pacific region (including to address barriers of entry into the West Coast of the United States). These principles, which APEC Energy Ministers have now encouraged APEC economies to adopt, are set out in table 16:

Table 16: Best Practice Principles – Facilitating the Development of LNG Trade In the APEC Region

Trade – General

1. Economies should promote, or not impose measures that impede, the development of a proper and transparent LNG trading system that allows free and open markets to set the price across the LNG value chain.
2. Economies should promote, or not impose measures that impede, the development of a flexible LNG trading system that may include short term/spot trade, the capacity to develop a futures/options market for gas and LNG, and the removal of unnecessarily restrictive contractual practices.
3. Economies should establish predictable and stable legal and fiscal frameworks that protect the sanctity of contracts and do not distort the market through subsidies, inequitable cost allocation, uneconomic tariffs, or retroactive legislation. Legal frameworks should be clear and transparent to promote LNG investment and the fiscal regime should support non-discriminatory policies for LNG trade and investment.
4. Economies should remove legislative and regulatory impediments to the economic transportation of LNG without compromising safety and security.
5. Economies should promote, or not impose measures that impede, the development of flexible access arrangements that encourage competition, anti-monopolistic behavior and investment.

Financing/Investment

6. When establishing and reforming energy market structures, economies should not impose measures that impede the development of economically viable LNG projects.
7. Economies should develop energy market structures that promote investments with the capacity to support longer-term LNG contracts to get green-field LNG projects up and running and encourage increased LNG trade in the APEC region.
8. Multilateral financial institutions should be encouraged to support the development and expansion of LNG projects.

Emergency Scenarios

9. Economies should develop and coordinate their security frameworks to enable LNG to continue to be transported in a secure and safe manner, including sharing information on counter-terrorism measures.

10. Economies should promote, or not impose measures that impede, the development of a capacity to ameliorate "sudden shocks" to the LNG system (e.g. increase storage capacity, secure multiple sources of supply and excess capacity, establish time trade arrangements, encourage more trading flexibility among stakeholders).

Technology Transfer and Knowledge Sharing

11. Economies should facilitate technology and skills transfer to help build the capacity of related sectors within member economies and reduce costs through the LNG value chain.

12. Economies should facilitate LNG trade through the collection and dissemination of natural gas data and the exchange of non-confidential commercial information among member economies (e.g. exports, imports, prices, supply, and demand). This sharing of information should be balanced with commercial and security concerns.

Permitting Processes and Regulatory Issues

13. Economies should develop clear, transparent, non-discriminatory, coordinated and timely project approval processes for permitting LNG facilities, including providing justifications for decisions.

14. Where appropriate, economies should consider the potential for making available government-owned land for the siting of LNG infrastructure (e.g. receiving terminals).

15. Economies should share information on LNG-related regulations, standards and quality specifications and, to increase the flexibility of LNG trade, consider ways to further their harmonization.

Public Education

16. Economies should promote public education campaigns to build positive perceptions about LNG by highlighting its demonstrated safety and reliability and emphasizing its economic, environmental and energy security benefits.

17. Economies should clearly articulate their energy security policies as they relate to LNG.

At their 6th Meeting in Manila on 10 June 2004, APEC Energy Ministers "encouraged member economies to move towards best practice as identified in *Facilitating the Development of LNG Trade in the APEC Region*."

9. Workshop Attendees

Name	Company	Country
Bensley, Stuart	ResourcesLaw International	Australia
Billiot, Stephen	BHP Billiton	Australia
Blanford, Sarah	US Energy Association	USA
Bonini, Simon	Woodside Energy	USA
Bronfen-Brenner, James	Air Products	USA
Chern, Jyuung-Shiauu	Ministry of Economic Affairs	Chinese Taipei
Clark, Morgan	Unocal	USA
Donovan, Rob	US Energy Association	USA
Ducca, Ann	US Department of Energy	USA
Feakes, Craig	Shell	Australia
Fenech, Kevin	Natural Resources	Canada
Fesharaki, Shahriar	East-West Center	USA
Fisher, Tom	Unocal	USA
Foran, John	Natural Resources	Canada
Glass, Peter	ChevronTexaco	Australia
Hariadi, Eko	BP Migas	Indonesia
Hecht, Thomas	North West Shelf LNG	Australia
Hermantoro, Edy	Ministry of Energy & Mineral Resources	Indonesia
Hosoe, Tomoko	East-West Center	USA
Hudson, Laura	Unocal	USA
Jung, Yonghun	APERC	Japan
Kavonic, Cliff	BHP Billiton	Australia
Kay, Paul	Department of Industry Tourism & Resources	Australia
Lin, Lu Jia	Petronas	Malaysia
Maul, Dave	California Energy Commission	USA
Meheen, Steven	BHP Billiton	USA
Mogi, Tadashi	Agency for Natural Resources & Energy, METI	Japan
Mohindroo, Raj	ConocoPhillips	USA
Muzaffar, Yunan	Ministry of Energy & Mineral Resources	Indonesia
Naylor, Joe	ChevronTexaco	USA
Nur, Isnaini	Ministry of Energy & Mineral Resources	Indonesia
Price, Bob	US Department of Energy	USA
Pritchard, Robert	ResourcesLaw International	Australia
Rahman, Annis Ahmed Abd	Petronas	Malaysia
Schuppert, Gerald	ConocoPhillips	USA
Schwebs, Monica	California Energy Commission	USA
Slutz, Jim	US Department of Energy	USA
Smith, Robert	East-West Center	USA
Storer, Aidan	Department of Industry, Tourism & Resources	Australia
Warnika, Kardaya	BP Migas	Indonesia
Yunarso, Mukti	Ministry of Energy & Mineral Resources	Indonesia

APPENDIX 2:

CASE STUDY ON LNG TRADE IN THE APEC REGION

1. Key Messages from the Tokyo Workshop

On 16 – 17 June 2004, 34 participants from governments, energy companies and other energy industry stakeholders attended a workshop in Tokyo to discuss barriers to the expansion of LNG trade across the APEC region and possible strategies to overcome these barriers. The workshop was conducted by ResourcesLaw International (ResourcesLaw) and was hosted by Tokyo Gas Co Ltd (Tokyo Gas).

The key messages arising from the Tokyo workshop were:

- **By 2015, APEC LNG trade has the potential to double to around 160 million tons per annum. This growth rate significantly exceeds that for natural gas trade as a whole, which is predicted to double in the 25-year period from 2000-2025.**
- **This increased level of trade is likely to have an annual value of around US$20 billion per annum.**
- **Buyers of LNG need a secure and uninterruptible supply of contracted volumes and they need price certainty but they would also like as much flexibility as they can get. Obviously, they cannot always get all these things; their indispensable requirement is security and uninterruptibility of supply.**
- **At the production end of the supply chain, sellers of LNG need good, long-term, creditworthy customers – this is their indispensable requirement.**
- **For the foreseeable future, long-term contracts will continue to underpin the market. However, 20% of transactions in the LNG market are expected to be made up of swap or spot transactions.**
- **In importing economies, the installation of adequate LNG receiving terminal capacity and interconnecting pipelines is the critical prerequisite to market access and to market expansion.**
- **Nine barriers to the expansion of APEC LNG trade were delineated and discussed by workshop participants and are described in this case study.**

On 25 June, all workshop participants were provided with an electronic and cryptic summary, in bullet point format, of discussion during the two-day workshop so that feedback could be provided to ResourcesLaw for inclusion in this case study.

Included with the summary were the results of a questionnaire that was completed by the participants to rank their concerns, in order of importance, and to suggest others that might also need to be considered. The results were collected and weighted according to the position of the buyer in the LNG chain, so that the differing perspectives of importance could be identified and understood. These results are shown in Section 3.

ResourcesLaw commends this interactive approach to the APEC EWG for use in future workshops.

2. Background: The Supply and Demand Outlook for LNG

(a) The General Outlook

Shigeru Muraki of Tokyo Gas opened the workshop with an overview of supply and demand for LNG in the APEC region, providing the data set out in table 17:

Table 17: LNG Demand and Supply Outlook in the APEC Region (millions of tons)

LNG Demand Outlook

	2003	2005	2010	2015
Japan	59.1	57 – 61	64 – 70	68 – 75
Korea	19.4	21 – 23	25 – 28	30 – 33
Chinese Taipei	5.5	6 – 8	10 – 12	12 – 15
India*		1 – 3	5 – 10	10 – 20
China			7 – 10	12 – 15
Philippines			0 – 2	0 – 3
US West Coast			5 – 10	10 - 15
Total	84.1	85 – 95	116 – 142	142 – 176

LNG Supply Outlook

Existing Contracts	80.7	86.5	88.2	58.0
Likely Extensions to Existing Contracts			94.2	94.3
Additional Potential Supply Contracts			100 +	

*India is not an APEC member but it is convenient to include India in this table as it sits naturally in the Asia-Pacific gas trading region.

A doubling of APEC LNG trade from 80 million tons per annum would result in increased sales of around US$20 billion per annum, based on historical prices of LNG supplied to the major importer, Japan.

Mr Muraki also provided workshop participants with a summary of key issues in the natural gas supply chain and the principal elements for stakeholders in the LNG value chain.

These are depicted in tables 18 and 19:

Table 18: The Natural Gas Supply Chain — Key Issues

Supply
• High supply potential • LNG continues to be the major supply source • Cost reduction in LNG production
Trade
• Long-term contracts continue to be the basis of trade • Emergence of an LNG open market (up to 20%) • LNG trading opportunities • Destination flexibility • Interactions between Pacific and Atlantic markets • Cost reduction in LNG transportation • Cross-border pipeline trade increase
Market
• High demand potential - demand increase in both existing and emerging markets • Deregulation, liberalization • Intensified competition • Competitive conditions - flexibility - competitive pricing (gentle slope, fixed price, oil-products link, power link etc) - downward trend of pricing - LNG vs pipeline (competition or complement)

Table 19: The LNG Value Chain: Principal Elements for Stakeholders

• Sellers' participation in downstream • Buyers' participation in upstream and shipping • Investors' interest in upstream, LNG production, transportation infrastructure and delivery systems • Buyers' interest in long-term supply security • All stakeholders' interest in sustainable development of the natural gas industry

Workshop participants then briefly reviewed the LNG export and import capacities of APEC economies.

(b) APEC Economies with LNG Export (Liquefaction) Capacity

Indonesia

Indonesia is the world's largest LNG producer and exporter. In 2002, Indonesia exported 1.1 Tcf (23 million tons) of LNG or 21 percent of the world's total LNG exports. Most of Indonesia's LNG is imported by Japan with smaller volumes going to Chinese Taipei and the Republic of Korea.

BP is leading the development of a new two-train, 341 Bcf pa (7.0 million tpa) project at Tangguh scheduled to start up in 2007. The Tangguh LNG is destined for China, other Asian markets and the United States. Indonesia also has further large gas reserves that may be converted to LNG at Donggi and Natuna.

Malaysia

Malaysia is the world's third largest LNG exporter after Indonesia and Algeria. In 2002, Malaysia exported 741 Bcf (15.6 million tons) in 2002. These exports went primarily to Japan, with smaller volumes to Chinese Taipei and the Republic of Korea. Three liquefaction terminals have been developed at the Bintulu LNG complex in Sarawak, raising the total capacity of the Bintulu complex to an annual 1.1 Tcf (22.7 million tons).

Australia

Australia exported 367 Bcf (7.7 million tons) of LNG from the Northwest Shelf project in 2002, primarily to Japanese utilities. The project owners are now commissioning an additional 205 Bcf pa (4.2 million tpa) train. An additional train is under consideration.

Three new projects are also in various stages of development. ChevronTexaco, in partnership with ExxonMobil and Shell, is leading a two-train Gorgon project offshore Northwest Australia with an annual capacity of 487 Bcf (10.0 million tons) and with an initial sales contract with the China National Offshore Oil Corporation.

Australia/Timor L'este

ConocoPhillips has begun construction on a 175 Bcf p a (3.6 million tpa) Darwin LNG project in the Timor Sea which is to be supplied with gas from the Bayu Undan project in the joint area shared by Australia and Timor L'este.

ConocoPhillips is also working with Shell, Osaka Gas, and Woodside Petroleum to develop the 258 Bcf pa (5.3 million tpa) Greater Sunrise project via a floating LNG facility, with a possible pipeline to Timor L'este mooted.

Brunei Darussalam

Brunei Darussalam has a two-train liquefaction terminal at Lumut with an annual capacity of 351 Bcf (7.2 million tons). About 90 percent of its output goes to customers in Japan and the remaining 10 percent to the Republic of Korea. Expansion is being considered.

United States of America

The United States has a 68 Bcf pa (1.4 million tpa) liquefaction terminal at Kenai, Alaska, that has been exporting LNG to Japan for more than 30 years. There are currently no plans to expand this facility.

Russia/Sakhalin

Russia's first LNG plant is under construction on Sakhalin Island off Russia's Pacific coast. The two-train facility will have an annual capacity of 466 Bcf (9.6 million tons), with exports of 234 Bcf (4.8 million tons) per year from the first train scheduled to begin in 2007. Shell is leading this project with Mitsui and Mitsubishi of Japan. The partners have already secured sales contracts with three Japanese utilities for 136 Bcf (2.8 million tons) per year over 20 years.

A brief presentation on the history of the Sakhalin 2 project and its development was made to the workshop by a representative of Sakhalin Energy Investment Co.

Peru

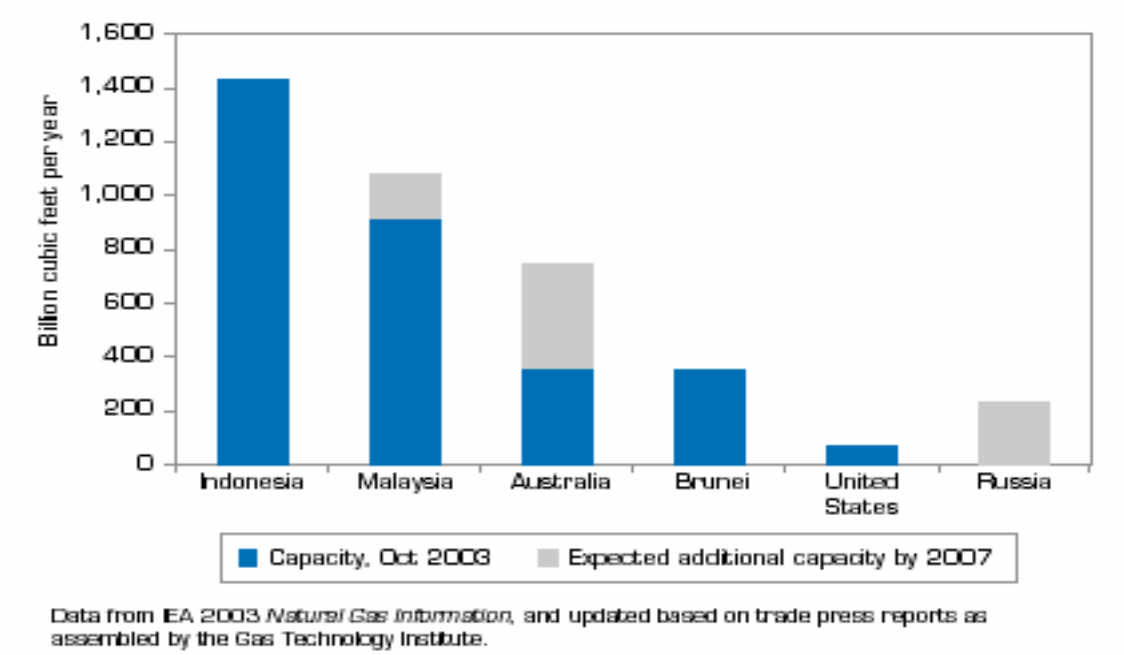
Peru is proposing to export natural gas from the Camisea field to a terminal in Mexico. Several European and U.S. companies are proposing a project to pipe gas from Bolivia to either Peru or Chile on the Pacific Coast where it could be liquefied and shipped to a terminal on the West Coast of North America.

Papua New Guinea

Papua New Guinea has been suggested as a potential site for an LNG export facility, although no firm plans have been announced.

A summary of liquefaction capacity in the APEC region is set out in table 20.

Table 20: APEC Region Liquefaction Capacity, October 2003



Data from IEA 2003 *Natural Gas Information*, and updated based on trade press reports as assembled by the Gas Technology Institute.

(c) APEC Economies with LNG Import Capacity

Japan

Japan is the world's largest LNG importer, accounting for 48 percent of world imports in 2002. The country's 23 receiving terminals have a combined theoretical design send-out capacity of 9.2 Tcf (188.3 million tons) per year. The terminals are owned mainly by electric and gas utilities. Natural gas currently supplies 12 percent of Japan's energy needs, and more than 95 percent of that natural gas is imported as LNG. Natural gas growth is expected to increase to 18% of the energy mix within 10 years. Approximately two-thirds of Japan's natural gas consumption is used for power generation. Japan's largest suppliers are Indonesia and Malaysia, with substantial volumes from Qatar, the UAE, Australia, Oman and Brunei Darussalam. The United States also supplies LNG to Japan from the Kenai terminal in Alaska. The ongoing liberalization of energy markets in Japan is encouraging significant market changes, and Japanese utilities are spearheading the drive for increased contract flexibility, including lower take-or-pay requirements and a mixture of short-, medium-, and long-term contracts.

Republic of Korea

The Republic of Korea was the world's second largest LNG importer in 2002, importing most of its LNG from Indonesia, Qatar, and Oman with smaller volumes from Malaysia, Brunei Darussalam, the UAE and Australia. The Republic of Korea has three regasification terminals owned and operated by state-owned Korea Gas Corporation (KOGAS) with a combined sent-out capacity of 2.0 Tcf (40.7 million tons) per year. KOGAS is adding storage capacity. A fourth terminal is under construction at Kwangyang by Pohang Iron and Steel Corporation, the country's first independent LNG project. The Republic of Korea has strong seasonal swings in demand and has become a major buyer of volumes on a short-term basis. Korean energy markets are being liberalized, and KOGAS may lose its monopoly position. Like Japanese companies, KOGAS has been seeking greater flexibility in contract terms.

Chinese Taipei

Chinese Taipei currently has one LNG regasification terminal, with a sendout capacity of about 363 Bcf (7.5 million tons) per year. It receives cargos from Indonesia and Malaysia. A second terminal is being considered.

China

China is building its first LNG receiving terminal in Guangdong on the southeast coast. The facility is scheduled for completion in 2006/2007 with an annual capacity of 158 Bcf (3.3 million tons). Partners in the terminal and an associated pipeline are the China National Offshore Oil Corporation (CNOOC), BP, and various local and Hong Kong companies. Initial shipments will come from Australia's North West Shelf expansion. A second terminal will be built at Fujian, which will receive LNG from the BP-led Tangguh project in Indonesia starting in 2007. Three other terminals are being considered.

Philippines

The Philippines is presently considering a 68 Bcf p a (1.4 million tpa) LNG receiving terminal.

New Zealand

New Zealand is currently conducting a detailed feasibility study for the import of LNG. The study has been brought forward due to the early decline of the Maui gas field. At this time neither the size nor start date for the terminal have been fixed.

Indonesia

Indonesia is presently considering building an LNG receiving terminal on the island of West Java, close to Jakarta, to be supplied from elsewhere in Indonesia or possibly imports/swaps.

Australia

Currently produces large volumes for exports and consumes a small but growing amount of LNG internally (in Alice Springs and Victoria) with expansion of this trade underway in the Northern Territory for remote power applications. LNG is a possible alternative to a massive long distance cross-country pipeline to transfer gas from the Northwest Shelf to the eastern seaboard of Australia.

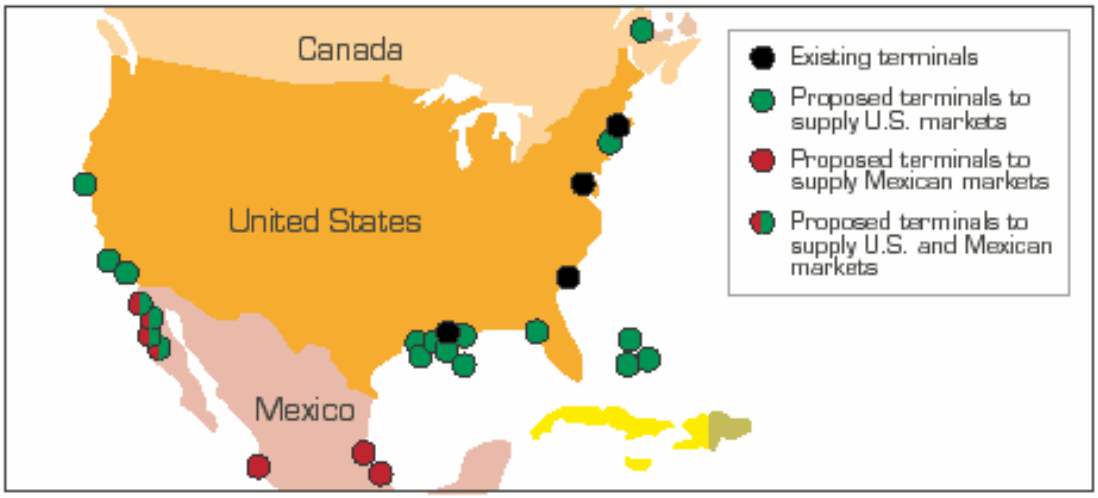
United States

The United States is likely to again become an importer of LNG, this time on a substantially increased and sustained basis. It has recently been affected by a substantial increase in gas demand/prices and a decline in domestic gas production.

US LNG imports in 2003 jumped to 540 Bcf (11 million tons) from 229 Bcf (4.8 million tons) in 2002. While historically Algeria was the United States' largest supplier of LNG, since 2000 it has been far surpassed by Trinidad and Tobago, which now serves as the source for 66 percent of imports.

There are currently four LNG import terminals in the continental United States: Cove Point, MD, Elba Island, GA, Everett, MA and Lake Charles. The four US LNG import terminals currently have an estimated combined peak capacity of about 1.2 Tcf (26.0 million tons) per year and an estimated baseload capacity of 880 Bcf (18.5 million tons) per year. All terminals either have recently completed an expansion or plan to expand by 2006. There are over 30 proposals to build new LNG regasification terminals in North America over the next several years as shown in table 20. By 2010, projects could be located in the Gulf of Mexico, Bahamas (with pipelines into Florida), offshore the US West Coast, Mexico's West Coast (with supply into the Southwest and/or California), and the US and Canadian East Coasts.

Table 21: Potential Locations for LNG Regasification Terminals in North America



Source: Energy Information Administration

US natural gas consumption is projected to increase from 22.5 Tcf in 2002 to 26.2 Tcf in 2010 and 31.4 Tcf by 2025. Domestic gas production is expected to increase more slowly than consumption over the forecast period, rising from 19.0 Tcf in 2002 to 20.5 Tcf in 2010 and 24.0 Tcf by 2025. The difference between consumption and production will be made up by imports. The net imports are projected to rise from 3.5 Tcf in 2002 to 7.2 Tcf by 2025.

Nearly all the increase in net US natural gas imports from 2002 to 2010 is expected to come from LNG, with an almost 2.0 Tcf (42.0 million tons) increase expected over 2002 levels.

Net pipeline imports from Canada are expected to reach 3.7 Tcf in 2010, and then decline as Canadian fields mature and Canadian demand increases.

Mexico

Mexico is expected to remain a short-term net importer of US natural gas in order to supply industry located on the United States–Mexican border. This is expected to change after 2005 as terminals in Mexico come on line to supply both the US and the Mexican markets.

In Mexico, nearly a dozen LNG terminals have been proposed, all but two targeting the Pacific Coast. The Mexican regulatory agency, CRE, has granted permits to four projects, three of them on the Pacific Coast, which would also supply US markets. The fourth terminal, on the Gulf of Mexico, to be developed by Shell, will be used to supply electricity to Mexico.

3. Questionnaire Results and Priority Commercial Concerns

A questionnaire was completed by all workshop participants which produced the following results.

What the buyers want

Most Important	1st	**Uninterruptible deliveries**
	2nd	Maximum Flexibility
	3rd	Affordability/price certainty
		Variable volumes
		Affordable shipping

What sellers believe the buyers want

Most Important	1st	**Affordability and price certainty**
	2nd	Uninterruptible deliveries
	3rd	Variable volumes
		Maximum flexibility

What the sellers want

Most Important	1st	**Long contract periods**
		Creditworthy customers
		Minimum volumes
	2nd	Minimum prices

What buyers believe the sellers want

Most Important	1st	**Irrevocable export permits**
		Bankability of projects
	2nd	Growth in global demand
		Creditworthy customers

Summary of results

- Buyers want uninterruptible deliveries and certainty of price but also as much flexibility as they can get. Obviously, they cannot always get all these things
- Sellers want long-term, creditworthy customers.

Additional issues suggested by respondents that were not on questionnaire

What the buyers want

- Capped prices
- Price re-openers (if prices drop)
- Ongoing transparency of index formula relevant to buyer
- No assignment of sales contracts by sellers

- Long-term security of supply
- Access to upstream equity
- Supply diversification
- Political stability
- Control of shipping
- Division of supply rights for %
- Available gas users
- Default provisions
- No destination/use provisions
- 3rd party access to receiving terminals

What the sellers want

- Fast ramp-up to full capacity
- Constant rate of off-take
- Affordable shipping (ex-ship)
- Control of shipping
- % of arbitrage opportunity
- Sovereign and parent guarantees
- Political stability of buyer and seller country

What the terminal operators want

- Avoidance of open access (defined period)
- Ability to move equity LNG into captive market
- Low/affordable terminal cost
- Security/safety support from government

4. Barriers to Expansion of APEC LNG Trade and Strategies to Overcome Them

The complaint is frequently voiced that financing is the greatest barrier to expansion of the LNG industry. Participants in the Tokyo workshop discussed the fact that the LNG sector is very capital intensive, with limited players, and heard that the cost of new expenditure on gas exploration, production and infrastructure is estimated at $30 billion per annum. However, banking industry representatives at the workshop assured participants there is tremendous liquidity in the global project finance market – the market has at least a $150 billion per annum financing capacity versus the estimated $30 billion per annum required by the natural gas industry.

All participants agreed that long-term, take-or-pay contracts and a high credit quality of offtakers are prerequisites for financing of new LNG developments.

Participants discussed nine barriers to expansion of LNG trade. In producing a list of only nine barriers, it was understood that there was considerable overlap between many of the barriers and that they should be looked at in total, rather than attempting to validate each barrier separately.

1ST BARRIER: THE DIFFICULTY OF SECURING A MARKET

Workshop participants agreed that the pivotal need for investment in, and the financing of, any new LNG project is to secure a sufficient market for its output, which will underpin the investment required.

Participants agreed that preservation of the take-or-pay concept in long-term contracts is vital for unlocking and bringing new gas to market.

Importing economies are very receptive to LNG because security of supply and risk of price shocks are high on their political agendas. Nonetheless, market creation involves both contractual and regulatory issues. The former can be dealt with at a commercial level but regulatory issues constitute another barrier and require a degree of government vision and involvement (see 8th Barrier below).

Commercial solutions must be tailored for the maturity of each market, contrasting a mature gas market, such as Japan, with an emerging market, such as China. In many countries, the market is too immature for open access terminals.

Doubts over access to the US West Coast market currently pose a huge uncertainty for the entire Asia-Pacific LNG market.

In addition to the need for adequacy of market capacity, there is a need for contractual start date flexibility, build-up profile and wedge or declining volume gas sales.

Swaps are expected to increase system utilization and flexibility potentially goes up. Gas quality variations and differences may nonetheless impede this.

Some sponsors are apparently prepared to share market risk (through value-chain integration). It is unclear if this is emerging as a common trend or is a project-specific solution.

The penetration of gas can be hampered by inter-fuel competition and by failure to invest in new technology such as CCGT generation.

Why is there not a more rapid uptake of LNG in the APEC region? This is hindered by:

- deep-seated political barriers
- economic limits – low standards of living
- the lack of gas distribution infrastructure
- heavy-handed regulation
- uncertainty about GST and other ad-valorem taxes that may be imposed by the importing government
- deregulation (if deregulation constrains buyers from committing to long-term offtake or supply contracts – although the ability to aggregate demand may be a solution)
- the lack of recognition of the “environmental value” of gas

However, there is no uniform policy regulatory framework, nor is there the need for such uniformity, to suit all markets.

2ND BARRIER: THE NEED TO SECURE THE UPSTREAM RESOURCES

The upstream gas location, reserves, CO_2 content, timing of development, maturity of exploration acreage and development costs are major considerations and determinants. All reserves are unique and require a project-specific solution. This is seen more as a challenge than a barrier.

How can a buyer be certain of uninterruptible supply? Workshop participants agreed that cross-investment and contractual inter-linkages are emerging as risk mitigators, principally by buyers participating in upstream development, liquefaction and in shipping.

The liquefaction stage may fit more realistically in the definition of "upstream" because natural gas is not economically marketable over long distances until processed into LNG for shipment by tankers.

It was thought unlikely that a Gas "OPEC" would emerge. However, some suppliers may cooperate in reducing risk of fall-off of production or interruption of supply, as has been recently discussed between Qatar and Indonesia. It was however suggested that regional cooperation between LNG suppliers in APEC, involving an explicit element of risk sharing, may evolve from the current "informal" arrangements. LNG supplies from a single resource can be sent to several markets for risk-spreading.

Floating or offshore LNG liquefaction plants may be feasible for new gas reserves in sheltered or benign deep water locations.

Reserve certification requirements are a normal contractual stipulation in LNG sales contracts. The ability to secure a long-term export permit for gas/LNG is a contractual prerequisite with resources proven to underpin the investment. Greater clarity and standardization of 3P / 2P definitions may be useful. Gas reservoir properties to be taken into account include:

- H_2S
- CO_2
- calorific value
- hydrates.

Feedstock may become more expensive over time as it is widely believed that cost of pre-treatment for the removal of H_2S and CO_2 will rise. Any future requirements for subsequent CO_2 sequestration will further increase the cost.

Participants believed that technology transfer will take place if FDI is allowed. There should nonetheless be support for R & D in the forms of:

- people exchange and knowledge transfer
- joint R & D
- university / private / public partnerships.

3RD BARRIER: DISTANCE TO MARKETS

The determinants of long-term competitiveness of LNG development projects are:

- location (in terms of distance from markets)
- diversity of fields
- frontier areas
- whether stranded or not
- depth of water in case of offshore reserves
- disputed borders
- marine transit routes (risks vary)
- feasibility of utilizing larger ships/pipelines
- gas quality differences
- efficiency gains from multiple fields
- need for compressors
- speed of delivery
- availability of swap and spot cargos (although gas quality differences may impede this)

There is great difficulty in aligning buyers' and sellers' volume needs. Individual buyers and sellers have to deal with:

- very large trains – with a resultant requirement to aggregate demand to "fill" a train
- large reserves
- large shipping size [Qatar to USA = $1.20 (200kcum) vs $1.50 (140kcum)] being more suited to long haul transit, yet restricted in both terminal choice and point of origin.

It was suggested that LNG supplies can be sent to multiple buyers for risk spreading, thus distance can actually contribute to the security of supply.

For new LNG projects under development in Sakhalin, Indonesia, Malaysia, Brunei Darussalam and Australia, traditional importing markets, such as Japan and the Republic of Korea, are cheaper to reach than new markets in the United States or Mexico.

Emergence of inter-island trade in economies such as in Indonesia is a new factor that will bring its own set of complexities around pricing and utilization.

In relation to resources that straddle international boundaries, there may be a need for regional infrastructure to unlock reserves. The North Sea gas grid grew organically – with smaller reserves, the economics of the smaller fields come into play. Participants believed there was an important role for APEC in promoting the peaceful solution of border disputes through regional cooperation. With some border disputes, LNG can be the solution, by issuing sea lanes, and avoiding a transit pipeline or border dispute.

Standardization of ships and facilities (and safety requirements) will lead to greater efficiency and economies over time.

4TH BARRIER: THE NEED FOR LNG INFRASTRUCTURE

The LNG sector is highly capital intensive, with a limited number of major players.

All participants agreed that LNG receiving terminals and the associated regasification plants with adequate capacity are a prerequisite for market entry and expansion.

Many terminals are now proposed in many countries. It is recognized that only a small number of these will actually get built, with others deferred or cancelled. Whilst countries may start with just one terminal, for the purpose of security of supply, there is an advantage for each importing economy to have more than one terminal.

With regard to terminal ownership, participants believed there is no single model:

- there is a need to separate developing markets and mature markets as they have totally different characteristics
- terminal ownership does not necessarily carry a supply right nor access to customers
- Hazira is a rare example of a merchant terminal
- the market in many developing economies is not sufficiently mature for "open access terminals"
- it was noted that Japan has multiple owners with substantial "spare" capacity in its receiving terminals and
- the Korean model, with KOGAS as the owner of the receiving terminals and the gas transmission system, was seen to have been a success.

Models for terminals included:

- a monopoly or franchise system
- government sponsorship such as by using government investment vehicles and national oil companies or
- a combination of the above.

Overall, participants agreed that rationalization of infrastructure would equate to lower LNG costs.

With new players in the market , trading becomes an option – the terminal becomes open access as do transmission lines, so any competitor can sell through to retail customers.

A move from a closed-access terminal structure to open access can nevertheless endanger the property rights and investments of the terminal operator/ owner when bringing in new players. The reforms need to be managed with care.

The clear trend is to move away from monopolistic/oligarchic structures and to allow for:

- sharing of facilities
- limited access until original owners have recouped their original investment and
- regulatory "holiday periods" of 12-15 years, after which open access to all users can be offered.

Japan's recent experience with open access of LNG terminal has been that, in 2003, the Fair Trade Commission proposed open access of LNG under the control of the anti-trust law. However, the proposal was dismissed and the Ministry (METI) and the Commission are now setting up guidelines to facilitate negotiations between the owners and users of the terminal.

Participants suggested that:

- the highest levels of regulation lead to the higher/highest cost provider
- competition should not be equated with open access; competition may not increase for some years after open access rules are introduced
- it should be the investor's choice to build open or closed access terminals, as long as they can meet the efficiency of the importing market and
- APEC could institute an "R & D" effort to establish a market development facility.

5TH BARRIER: COMMUNITY OPPOSITION TO LNG RECEIVING TERMINALS

Participants agreed that, since the events of September 11, 2001, environmental concerns about energy have largely been overtaken by concerns over safety and security of supply.

Natural gas offers diversity and security of supply to importing economies – reduction of dependence on oil is a key market enabler

Participants agreed that LNG has a "fantastic" 40 year track record and that the safety of LNG is an important element in pursuit of sustainable development . There is a need to ensure this record is maintained and is shared and by implication a warning not to let new entrants lower standards.

Although any new major infrastructure or energy project faces challenges and questions, it was considered that there are highly exaggerated (any in many cases uninformed) fears about the safety risk of LNG. These concerns appear to be concentrated at the receiving end of the LNG chain.

It was thought that there is an increasing radicalization of issues and polarization of views with a lack of both fact and balance. In particular, aggressive, well-funded and well-prepared NGO activity is being encountered and some have become global. There is a need to provide a balance to the "NGO view". It was also suggested that opposition by communities has a flow-on effect from one economy to another. It was recognized that there would likely be different levels of "community concern" in each APEC economy.

There is an urgent need to educate and inform the general public with education based on credible and unbiased information required to eliminate misconceptions and create trust amongst stakeholders. It was thought necessary to bring stakeholders to the table early – including allowing them to review the options and impacts of taking NO ACTION. Japan's gas science museums and school age children's programs were cited as best practice.

The United Nations environmental standards and agreements (including the Kyoto Protocol) are considered to be highly relevant to the expansion of LNG in APEC.

Concerning safety regulations for terminals and facilities – there is a need to know and clearly define what is "safety best practice?"

There is a need to provide and spell out local economic benefit, whenever possible, with a need for an honest and clear depiction of any economic benefits that may flow to the community. For example, on the West Coast of North America, prices of LNG could be 10-20 cents lower that on the East Coast, so many consumers may stand to benefit. This translates to 5 cents a gallon equivalent.

Finally, BOTH governments and developers share the same problem, **not just one of them**!

6TH BARRIER: STRUCTURAL CHANGES IN LNG MARKETS

Portfolio buyers of primary energy forms are switching their energy mix in response to government requirements. For example, some governments are requiring a stipulated percentage of gas use or require gas to be selected for certain uses (such as feedstock for new power generation projects).

Participants considered it risky for governments to over-regulate in an effort to "open" markets.

Some LNG producers and suppliers are participating in the downstream sector and becoming buyers and offtakers. It is expected that more players will be chasing an integrated "energy island" model as risks become more complex and interactive.

Some (but only some) LNG is being traded on a spot basis. "Swaps" will increase and so will spot sales, reducing transport costs. Spot and short-term transactions will evolve as spare capacity, wedge capacity and shipping surpluses develop.

Price formulae, indexing, linkages all being reviewed and revised by the market players (a paper by the East West Center on contracts and pricing for the San Francisco workshop was referred to – see the case study described in appendix 1 of this report).

Long-term contracts nonetheless remain fundamental for sellers to underpin their investment and for buyers to underpin their supply security and are unlikely to be replaced by any sort of commodity market. It was emphasized that there is no strategic gas or LNG storage, as there is for oil. Contracts and other risk management mechanisms must be used instead.

LNG price volatility may be further reduced with lower oil-linkage formulae as reputedly recently established with LNG sales from Australia to Guangdong. This may also enhance bankability.

LNG should be compared to the "gas" and "power" market, rather than oil. Contracts may go through an intermediate step with firm volume and more price risk?

In developing the more remote gas fields, particularly in deeper offshore locations, production costs will be high. This may act as a further counter to the downward trend in liquefaction and shipping costs.

7th BARRIER: THE CHALLENGE OF PROJECT SCALE, COST AND FINANCING

Workshop participants were assured by bankers at the workshop that they have access to a US$150 billion per annum bank debt capacity which is considered ample to finance the estimated US$30 billion required each year for global LNG liquefaction, shipping and receiving terminal infrastructure. However, higher oil prices, if they are sustained at above US$40/barrel, may make debt financing of all oil and gas projects less attractive.

The large scale and cost of new projects poses a real a challenge but is not an absolute barrier to their development. The financing challenge is not the size of the project or the quantity of money required but to develop a suitably risk profiled, commercially viable, project which is actually in competition for funds with other competing projects. Best practice involves benchmarking projects against their peers (economies of scale, location etc).

Over the last 30 years significant LNG cost reductions have been achieved [liquefaction - 50%, transport - 40%], however these could be offset by future increases in upstream development, gas treatment and disposal costs. For high Co2 and H2S fields the cost of pre-treatment of gas prior to liquefaction may exceed the cost of liquefaction itself.

The trend toward ever-larger ships and LNG trains in the quest for lower unit prices may be sub-optimal for all projects. The example cited being shipping for Qatar to the USA vs Trinidad to the USA, where very large ships suit one project, not the other. Bigger may not always be better.

The separation of trade-flow values from net-back values, taxes, royalties, value and margins needs to be more widely articulated and understood.

"Non-recourse" project financing is almost always more expensive and more time-consuming than "corporate finance". Oil majors prefer corporate finance but their non-major partners may not. It was suggested that the oil majors would be unlikely to walk away from "non-recourse" projects should the project fail.

Participants discussed the role of incorporated versus unincorporated joint ventures for LNG projects. Unincorporated ventures clearly multiply the degree of legal complexity. It was suggested that project structuring is a tax driven decision, highlighting the need for more tax-efficient investment structures.

It was acknowledged that there are credit limits that can affect lenders, including:

- single borrower limits
- country limits and
- club approach

At the construction stage, regulatory risk is never tenable for financiers although completion risk may be.

The number one driver of bankability remains the creditworthiness of buyers and enforceability of long-term sales contracts. Long-term contracts remain absolutely essential to underpin LNG projects.

8th BARRIER: UNCLEAR POLICIES, REGULATION AND PRICING

The need for LNG projects to be recognized first of all as a "partnership" with the host government and then as a partnership between exporting and importing economies was emphasized. It was considered that regional cooperation will result in enhanced security of supply.

There is a need for transparency between governments on all policy issues. The decision by APEC Energy Ministers in June 2004 to encourage member economies to adopt best practice in facilitating LNG trade was recognized as a significant step forward in this respect.

Concern was raised about importing governments imposing GST and/or other taxes on LNG imports.

Governments need to establish clear and concise guidelines. Unclear or ambiguous policies, regulation and pricing all may create or contribute to unpredictable investment conditions. Participants emphasized that high levels of regulatory intervention lead to high-cost gas supply.

There is a need to co-ordinate policy/ guideline development between gas and electricity. A single regulator for gas and electricity is considered to be an important and efficient mechanism, such as proposed in Australia and Singapore.

Lower efficiency/ high cost in importing economies inevitably result in lower netbacks to sellers.

Deregulation of the power sector via disaggregation of utilities is an opposing force for LNG expansion due to the potential unwillingness of disaggregated utilities to enter into long term contracts. In some economies, there is no need to deregulate, just a need to mandate higher gas usage.

The market enablers in mature markets are:

- the profit motive
- risk/reward balance
- lower cost to consumers
- the promise of rapid growth in the market and
- incumbents being given grace periods, with protection being reliably phased out according to a pre-determined timetable.

In the transition from developing to mature markets

- there are many models and ways the transition can be managed
- sufficient time must be provided for the pioneer developers to move from a protected to a competitive market environment and
- market creation (development) in each importing economy can be facilitated by the APEC Energy Working Group and must be facilitated by each individual economy.

Several participants spoke of the importance of “government vision” in developing LNG opportunities in any emerging/developing market, emphasizing the question of “market readiness”. The timing of LNG imports must be correct relative to market readiness.

The development of the Hong Kong power market, where a government scheme of control was put in place to encourage investment, was suggested as an example of best practice and it may still be appropriate to meet reliability/customer demand in Hong Kong and elsewhere.

Market development can often be more about “government push” than “market pull” – markets can generally only be created with government vision and drive.

In mature markets, the seller must accept more risk.

Regulatory solutions must however be staged and implemented at the right time. In optimizing market operation, uncompetitive small players are gradually “filtered out”. As markets mature, protections can be removed and competition can be progressively introduced (remembering the need to ensure an adequate number of players); open access to terminals and grids can be made available and franchise areas can be systematically eliminated.

All of these policy and regulatory reforms should drive costs down and create economic efficiencies.

9TH BARRIER: INSTABILITY OF INVESTMENT CONDITIONS

Stable, predictable and fair overall returns are clearly the drivers of LNG investment.

Because LNG projects are so large, governments must provide "proper", stable investment climate with appropriate fiscal incentives to encourage investment. A progressive fiscal regime is essential to incentivize the extraction of marginal or difficult gas resources. In all cases, new projects will not proceed without resolution of investment uncertainties.

In addition to instability of investment conditions, disruptions to investment can arrive from a variety of possible causes:

- unclear availability of reserves
- liquefaction plant disruptions
- changes in government take
- price controls
- export embargos and
- limitation of export volumes.

There are substantial, real and perceived, variations in levels of country risk amongst APEC economies.

Disputes amongst nations can hinder cross-border gas trade, especially where boundary definition and resource ownership is unclear. The solution can be through the use of joint development areas and field unitization although government-to-government negotiations are typically very protracted.

5. The Workshop Plan of Action to Expand APEC LNG Trade

Workshop participants supported the plan of action set out in table 22.

Table 22: Barriers to LNG Trade and Strategies to Overcome Them

Barriers to Expansion of LNG Trade	Key Strategies
1. The Difficulty of Securing a Market	• Engage governments of importing countries in facilitation of market creation. • Encourage joint R & D amongst exporting governments.
2. The Need to Secure the Upstream Resources	• Buyers can participate at the upstream level and in shipping. • Call for clarity and standardization of reserves definitions from the securities industry regulatory bodies, although buyers will still require certified reserves as a contractual stipulation.

3. Distance to Markets	• Emphasize to exporting governments and resource owners the necessity to preserve the take-or-pay concept for unlocking their gas resources and getting the gas to market.
4. The Need to Develop LNG and Gas Infrastructure	• Encourage importing governments to adopt “an industry vision”. • Draw the attention of governments and customers in importing economies to the different characteristics of mature and emerging gas markets and recommend that they: ❖ consider multiple receiving terminals and large-scale multi-user receiving terminals to provide security of supply and to offer “open access” as needed by the domestic market and ❖ develop plans for an orderly transition from emerging to mature market environments.
5. Community Opposition to LNG Receiving Terminals	• Emphasize to all stakeholders that : ❖ education programs are necessary to overcome safety fears and ❖ education programs must be honest, clear, bipartisan and must involve governments, developers and all stakeholders.
6. Structural Changes in LNG Markets	• Emphasize to all stakeholders that: ❖ long-term take-or-pay contracts with creditworthy customers remain fundamental to the LNG industry and ❖ enhanced commercial spot/swap transactions will expand LNG system utilization.

7. The Challenges of Project Scale, Cost and Financing	• Communicate to all stakeholders that financial markets have the depth (and oil majors have the capacity) to accommodate a major expansion of the LNG industry but that all projects are unique and need project-specific analysis • Remind new upstream project sponsors that: ❖ long-term take-or-pay contracts remain essential if non-recourse project finance is to be obtained ❖ more flexible contract mechanisms will require new and innovative commercial structures and ❖ bigger LNG trains and bigger shipping may not always be better.
8. Unclear Policies, Regulation and Pricing	• Communicate to all importing governments: ❖ the need to establish clear and concise guidelines for market development ❖ the need for regulatory processes to be transparent and subject to appeal and ❖ the need to recognize and share the premium value of natural gas as a primary fuel.
9. Instability of Investment Conditions	• Emphasize to all governments that stable and fair overall returns will drive LNG investment • Emphasize to exporting governments that: ❖ investment conditions must be stabilized, clear and transparent ❖ progressive fiscal regimes are required, especially to incentivize the development of marginal gas and ❖ incentives may be necessary to attract the required investment.

6. Workshop Attendees:

Name	Company	Country
Abdoellah, Rachmat	Unocal	Indonesia
Amakawa, Kazuhiko	Japan Bank for International Cooperation	Japan
Bensley, Stuart	ResourcesLaw International	Australia
Chiu, Edward	CLP Power	Hong Kong
Cockcroft, Peter	Premier Oil	Singapore
Ear, Chow Foo	Energy Market Authority	Singapore
Harper, Gavin	ChevronTexaco	Republic of Korea
Hecht, Thomas	North West Shelf Australia LNG	Australia
Kamis, Niksum	Prime Minister's Department	Brunei Darussalam
Kato, Mitsutoshi	Calyon Investment Bank	Japan
Kosugi, Koji	Tokyo Electric Power Co	Japan
Kusno, Broto	Directorate General of Oil & Gas	Indonesia
Li, Jin-Shiuan	Energy Commission	Chinese Taipei
Morimoto, Kazuhiro	Agency for Natural Resources & Energy, METI	Japan
Muraki, Shigeru	Tokyo Gas Co	Japan
Murozumi, Yuka	Agency for Natural Resources & Energy, METI	Japan
Nagata, Fumio	Chiyoda Corporation	Japan
Pratomo, Sucahyo Wahyu	BP Migas	Indonesia
Pritchard, Robert	ResourcesLaw International	Australia
Pritchard, Tanya	ResourcesLaw International	Australia
Rahman, Anis	Petronas	Malaysia
Rowe, Michael	Woodside Energy	Japan
Seck, Andrew	Sakhalin Energy	Russia
Sidemen, Gusti	APERC	Japan
Sirait, Darwin	Directorate General of Oil & Gas	Indonesia
Siswanto, Djoko	Directorate General of Oil & Gas	Indonesia
Taib, Razali	Malaysia LNG Tiga Sdn Bhd	Malaysia
Tanimizu, Seiichi	BP Japan	Japan
Tokuhara, Toru	Tokyo Gas Co	Japan
Urano, Hiroshi	Tokyo Gas Co	Japan
Vix, Nicolas	Calyon Investment Bank	Hong Kong
Walker, Michael	North West Shelf Liaison Company Pty Ltd	Japan
Yamada, Ryota	Liquefied Natural Gas Ltd	Australia
Yamamoto, Hirosuke	Shell Gas and Power	Japan

APPENDIX 3:

CASE STUDY ON THE TRANS-ASEAN GAS PIPELINE (TAGP) PROJECT

1. Key Messages from the Singapore Workshop

On 12- 13 August 2004, 17 participants attended a 2-day workshop at the APEC Secretariat in Singapore to discuss the Trans-ASEAN Gas Pipeline (TAGP) project.

The key messages arising from the Singapore workshop were:

- **The obvious, but not widely appreciated, impediment to cross-border natural gas trade is the lack of adequate installed energy infrastructure to transport and utilize the product.**
- **ASEAN Energy Ministers have recognized that the further development of the TAGP project requires a congruence of essential elements involving political, social, economic and environmental concerns and an appropriate legal, regulatory and institutional framework.**
- **The ASEAN Council on Petroleum (ASCOPE) is playing a pivotal role in this. The ASCOPE Gas Center will be established in Malaysia to facilitate the TAGP Project.**
- **The TAGP is viewed by its proponents as a "work in progress", consisting of a series of bilateral projects that will ultimately become TAGP, a complex multilateral project.**
- **This approach is commended to the broader APEC community.**
- **There is a desire and recommendation for greater collaboration between APEC, ASCOPE and industry participants.**
- **Nine "challenges" to cross-border gas pipeline development (as distinct from "barriers") were delineated by workshop participants and "best practice" recommendations were made for overcoming or coping with the identified challenges.**

2. Natural Gas in ASEAN

In ASEAN, there are seven economies that are also members of APEC: Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, Thailand and Viet Nam. There are three non-APEC members: Cambodia, Lao PDR and Myanmar.

Currently more than 70 percent of the natural gas consumed in ASEAN is used as fuel for power generation, with new power plants using CCGT technology to produce electricity with high thermal efficiency and low carbon dioxide emissions. The biggest challenge for the region

is to diversify the use of natural gas to remote power applications as well as in the non-electricity sector, that is, in the industrial, residential/commercial and transportation sectors.

The importance of ASEAN energy cooperation was underscored in the 1995 Bangkok ASEAN Summit Declaration, which stated, “ASEAN shall ensure greater security and sustainability of energy supply through diversification, development and conservation of resources, the efficient use of energy, and the wider application of environmentally sound technologies”. This aspiration was reinforced in the “ASEAN Vision 2020”, as agreed in the Informal Summit in December 1997 in Kuala Lumpur.

3. History of the TAGP Project

The TAGP project was first discussed in 1990. It was followed by the Masterplan on Natural Gas Development and Utilization in 1995 and 1996, which mapped out possible pipeline linkages between major gas reserves and demand centers in Southeast Asia. The then estimated cost was around US$10-15 billion to build a regional pipeline network which could meet demand until 2020.

The ASEAN Council on Petroleum (ASCOPE), the association of Southeast Asian state-owned oil and gas companies, has since updated the Masterplan to include the new ASEAN member economies (Viet Nam, Myanmar, Laos PDR and Cambodia).

In 2002, ASEAN Energy Ministers signed the ASEAN Memorandum of Understanding (MOU) for the TAGP Project. The MOU identified nine cross-border issues on which ASEAN agreed to cooperate towards the realization of the TAGP project. These issues were:

- Financing (recognizing the important role of the private sector)
- Standardization of technical specifications
- Ensuring open access
- Ensuring security of supply and pipeline safety
- Mitigating risk to health, safety and the environment
- Measures to ensure transit rights
- Mutually agreed taxation and tariff arrangements
- Measures concerning abandonment
- Determining jurisdiction and responsibility over pipelines, particularly in the high seas.

In 2003, ASEAN Ministers agreed to establish the ASCOPE Gas Center in Malaysia to facilitate the development of the TAGP project.

4. The First Seven Cross-Border Pipelines in ASEAN

Within just over a decade of the first ASEAN cross-border interconnection, five of the ASEAN economies have bilateral gas interconnections, namely, Malaysia, Indonesia, Myanmar, Thailand and Singapore. A total of seven cross-border pipelines are in operation over a total distance of 3,212 kilometers (distance here is counted from the gas source to the market) with a total flow capacity of 51.65 MMCMD) (see table 22).

Table 22: Existing Cross-Border Pipelines in ASEAN

Pipeline	Economies connected	Total distance (km)	Initial flow capacity (MMCMD)	Year of completion
PGU II - Singapore	Malaysia, Singapore	714	4.2	1992
Yadana – Ratchaburi	Myanmar, Thailand	649	14.7	1998
Yetagun – Ratchaburi	Myanmar, Thailand	170	5.6	2001
West Natuna - Singapore	Indonesia, Singapore	656	9.1	2001
Trans Thai-Changlun	Thailand, Malaysia	423	11.05	2002
West Natuna-Duyong	Indonesia, Malaysia	100	2.8	2002
Sumatra –Batam Singapore	Indonesia, Singapore	500	4.2	2003
TOTALS		3,212	51.65	

(i) The Malaysia-Singapore Pipeline

ASEAN's first cross-border pipeline was completed in 1992, and involved Peninsular Malaysia's national pipeline (PGU-II) of 714 kilometers being extended at its extreme south to Singapore, with an export capacity of 4.2 MMCMD. The initial 15-year gas supply contract will expire in 2007. All of the gas supplied by this pipeline is restricted for use as fuel in Singapore's power stations.

(ii) The First Myanmar-Thailand Pipeline

ASEAN's second cross-border pipeline came into existence when the Myanmar-Thailand project was completed in late 1998, connecting Myanmar's Yadana gasfield to Thailand's power plant in Ratchaburi. The 649-kilometer pipeline was designed with a total flow-rate of 18.2 MMCMD, with 3.2 MMCMD of the gas to be domestically used by Myanmar, and 14.7 MMCMD to be exported to Thailand.

(iii) The Second Myanmar-Thailand Pipeline

A further pipeline from Myanmar's Yetagun gasfield to Ratchaburi was completed in 2001. This pipeline is connected to the existing Yadana-Ratchaburi pipeline at the Myanmar-Thailand border, bringing an additional gas imports to Thailand by 5.6 MMCMD. A separate 153-kilometer pipeline has been constructed from Ratchaburi to Wangnoi to transport gas to the Wangnoi power plant.

(iv) The West Natuna-Singapore Pipeline

ASEAN's third cross-border pipeline, with a total length of 656 kilometers, connects Indonesia's West Natuna gasfield to Singapore, with gas being delivered since 2001. The pipeline was designed for a flow capacity of 19.6 MMCMD and maximum capacity of 28 MMCMD (with upgrade), enabling Singapore to import more gas from Indonesia in the future.

(v) The Trans Thai-Malaysia Pipeline

The Trans Thai-Malaysia Pipeline connecting Thailand and Malaysia is under construction. Total pipeline distance is 423 kilometers, with the first phase of the pipeline connecting Block-A of the Malaysia-Thailand Joint-Development Area (MT-JDA) to Songkha on the east coast in Thailand's border (277 kilometers, 34-inch diameter), and inland from Songkha to Changlun in Kedah, Malaysia (96 kilometers, 36-inch diameter).

In the second phase of the project, additional gas (8.4 MMCM) from Block 17 of the MT-JDA will add further supply to the Trans Thai-Malaysia pipeline. This will be made possible by the installation of a 28-inch diameter 50 km pipeline connecting Block 17 to Block 18.

At Changlun, Malaysia, the Trans Thai-Malaysia Pipeline will be connected to the existing Phase III of Peninsular Malaysia's domestic pipeline, the Peninsular Gas Utilization pipeline (PGU-III) which stretches from the central part of the peninsula to the Malaysia-Thailand border. The delivery of gas in 2002 with Malaysia and Thailand taking the gas in equal shares marked the completion of ASEAN's fourth cross-border gas pipeline.

Because Thailand had a current surplus of natural gas, PETRONAS (Malaysia) agreed to take 100 percent of initial production.

(vi) The West Natuna-Malaysia Pipeline

In 2000, PETRONAS of Malaysia and PERTAMINA of Indonesia signed a sales and purchase contract for the supply of natural gas from Indonesia's West Natuna field to Peninsular Malaysia. This 20-year contract will earn $6.2 billion revenue for Indonesia. This agreement is the first implementation of a Memorandum of Collaboration in Strategic Alliance and Synergistic Business.

The first delivery of gas commenced in 2002. The export volume will increase to 7.0 MMCMD in 2004. The gas comes from Conoco's block B field in West Natuna. It is first delivered to the PETRONAS gas facilities on Duyong island off Malaysia, from where it will be passed to Peninsular Malaysia.

(vii) The Sumatra-Batam-Singapore Pipeline

Singapore Power signed a letter of agreement with Indonesia's PERTAMINA in 1999 for the supply of natural gas from three fields in the Jambi area of Central Sumatra, starting in 2002. The gas supply will increase form an initial quantity of 4.2 MMCMD in 2002 to 9.8 MMCMD in 2008. The majority of supply will go to power generation.

5. Review of the APEC Gas Study to Date

The consultants reviewed the discussions of the San Francisco LNG workshop with participants. Two points were thought noteworthy:

- US market risk for LNG – the workshop highlighted that gas importing markets may need to be created, build-up periods may be required and regulatory reforms may be necessary

- LNG price risk – at present US price is benchmarked between the "Japan crude cocktail" (JCC) and the US Henry Hub price. Participants agreed that the two prices will not remain disconnected forever.

The discussions of the Tokyo LNG workshop were also reviewed. Again, two points were thought noteworthy:

- security of supply and over-reliance on Middle East suppliers remain of concern to energy markets

- the current inability to value greenhouse gas (GHG) emission reductions poses a key challenge (geosequestration has been proposed for Natuna, Gorgon and other new fields).

Gas storage in ASEAN, where it could occur and how it could work, was suggested as a key challenge. Singapore's LNG storage hub concept and its commercial viability was discussed.

Several participants spoke of the potential benefits of cooperation between ASCOPE and the APEC EWG.

6. Discussion of the TAGP Project

Workshop participants emphasized that the TAGP project must be seen as a work in progress, a series of bilateral projects that are proceeding under the broad ASEAN umbrella, independently and in their own right, eventually to yield a major grid. Initially, the project is based on known gas resources but ultimately will be dependent on a commercial solution to the development of the Natuna Besar gas resource, with its high [70%] CO_2 content.

Natuna needs a lower cost solution for CO_2. There should be recognition of the potential CO_2 emissions reduction value or an ability to commercialize emissions reductions through use of CDM/JI and other offset mechanisms.

The lack of a single gas energy regulator or commissioner to regulate cross-border trade flows in ASEAN is a problem (some member economies are producers and others buyers). This requires a staged process to move towards the establishment of this single commissioner. A one-step change is thought unlikely.

ASEAN is committed to consensual solutions. Decision-making can be protracted but, once issues are resolved, decisions are more likely to be durable.

The TAGP requires private sector participation and input to be realized. On the question of whether financing is a barrier for the TAGP, participants believed that, for the majors and the big NOCs, it is not an issue at all but, for the smaller players and emerging economies, it is a serious issue.

The creditworthiness of some utility companies is a barrier to the TAGP project, as is the lack of willingness of some governments to allow foreign investment or new players into the market.

It was suggested that there may be future significant increases in the cost of gas treatment before dispatch via pipelines and/or LNG as less-clean gas is used.

The lack of third party access to pipelines is considered an impediment to the further exploration and development of gas. Without such access, on known terms, investment is hard to find.

7. Discussion of Other Pipeline Projects in the APEC Region

The China West-East pipeline

The pipeline is due to go into service later this year after 10 years of effort, with multiple proponents. Although the pipeline crosses several provinces, with multiple tariff issues, the Chinese Government has made it happen. Thus a possibly sub-economic project, that will form a key element part of the national gas grid, has been brought to fruition.

It was noted that FDI partners in the project ultimately decided not to participate, seemingly over failure to agree allowable rates of return on their investment.

The project has entailed high risk for the off-taker as well as construction risk due to an apparent lack of transparency in tendering processes.

The PNG-Australia pipeline

Having nine upstream PSC contractors is a challenge, each with different hurdle rates and country risk perceptions. The owners of the pipeline are different to the upstream players and there have been substantial changes in the project proponents over time.

As to market risk, there is no single demand center and the corridor for the pipeline route is thus not finally settled. In the absence of any major industrial/power buyers, the market is really only Sydney and Brisbane. There is a case for a two-part tariff comprising capacity and energy charges, with the capacity charges reducing as debt is retired.

Overall, the project is languishing because of different agendas and financial drivers for the resource owners and governments and a recent government decision to allow the development and use of local CBM resources to fuel a major power plant.

The Northeast Asian Natural Gas Trunkline

Russia is a key gas supplier to Northeast Asia in future, whether by pipeline or as LNG.

The main challenge for this project is competing fuels, especially coal. Increased gas and LNG use will provide an interim solution but it is NOT seen as the ultimate panacea due to the magnitude of volumes required. It was noted that ASEAN, even if Natuna is developed, will not be able to supply China, which will require other gas sources. Nuclear power is expected to be a larger component of the Chinese energy equation over time.

Workshop participants recommended that these major cross-border pipeline projects are best developed initially as a series of smaller bilateral projects with the aim of subsequent interconnection.

Indonesian pipelines

There continues to be an important role for multilateral funding to assist with not-yet-commercial projects in Indonesia. However, this may involve delays, an example being the Sumatra to Batam pipeline where the financing is believed to have taken part 4 years to finalise with JBIC.

The creditworthiness of gas offtakers is presently a major challenge. PGN, the Indonesian State Gas Company, is able to support project investment but the State Electricity Company, PLN, may not.

A major barrier to expansion of gas use in Indonesia is the issue of subsidies which amounted to $50bn in 2003, compared for example to a national budget of US$3bn for health and education combined. However it was suggested that an overnight removal of subsidies would result in a change of government, highlighting the challenge of moving to a market based price.

It was recommended that economies move from subsidized pricing to market based pricing and use a rebate system to assist specific industry or market segments.

The government is reluctant at present to allow State entities to secure foreign debt or to allow foreign entities to take equity in utility companies.

There is also an ongoing concern over lack of title and price of gas at the point of transfer.

At the moment in Indonesia, it is necessary to get market reforms through the parliamentary system.

It was noted that the Malaysia/Thailand Joint Development Area (JDP) pipeline had been delayed by environmental concerns.

8. Which Barriers Did the Workshop Delete, Add or Amend?

The consultants initially suggested seven barriers to gas pipelines for discussion but workshop participants suggested two be deleted:

- **Investment unpredictability** – this was not considered a barrier for either ASEAN or the TAGP although it could be in the broader APEC context.

- **Community opposition** – it was believed that ASEAN governments have the ability to manage community issues and to ensure projects are approved. The necessity to provide compensation to affected communities was recognized (the reasons for the delay on the Malaysia/Thailand JDA pipeline were not discussed).

Participants emphasized that ASEAN pipeline projects faced challenges rather than barriers. Their random views on specific issues were:

- The number one issue is **competing fuels –** this is seen as the key impediment to more gas being used in ASEAN

- Regulatory practices must include both **technical and economic** elements. Regulatory harmonization rather than commonality should be emphasized

- The issue of **project scale** is best handled via breaking down a multi-billion dollar project into smaller bite-sized bilateral chunks. Cost and project economics are just as important as scale itself

- **Constructability** should be linked with the challenge of distance, to recognize technical, geographic and other issues

- **CO_2** is an issue – especially for Natuna Besar. Participants suggested there should be more R&D in this area, including on commercialization issues. The work of the new ASCOPE Gas Center in Malaysia should complement work being done by USA/Japan/Australia on geosequestration to resolve long-term liability issues

- **TPA** resolution is necessary to encourage more gas to be developed and to allow for access to storage.

- **Regulatory grace periods** are necessary so that investments can be protected and certainty provided without the risk of interference

- **Security of supply and pipeline security** – obviously these are important issues

- **Transit protection** is necessary – the only question is whether the Energy Charter Treaty offers the best model.

9. Financing

The workshop benefited by a comprehensive presentation by ING Bank on project financing. The workshop also discussed alternative sources of financing in the market and risk management. Points arising were:

- Suppliers need to understand the buyer's ability to pay as per contract over the long term, not just what the contract says, as the situation will almost certainly change. The sales contract must be sustainable and it must be adaptable – it must be recognized that renegotiation will inevitably be part of the process.

- It is essential to have international dispute resolution or arbitration mechanisms. Ideally, dispute mechanisms should not only have teeth but provide cushions and allow for compromise and accommodation of the concerns of all stakeholders. It was suggested that ASCOPE could act as a mediator in cross-border disputes within ASEAN.

10. The Way Ahead for APEC and ASEAN Natural Gas Trade

- The "ASEAN plus 3" group has a great demand for energy but ASEAN will NOT be able to supply China. There will remain an important need for ongoing cooperation between oil importing economies and Middle East suppliers.

- It was agreed that a total package approach is essential to major gas pipeline projects. Discussion centered on how to share the benefits across and between participants in the supply chain.

- It was suggested that there should be a mechanism to allow for greater collaboration between APEC and ASCOPE, such as a joint forum that includes industry stakeholders as well as government representatives. The Florence Forum [Electricity] and the Madrid Forum [Gas] were cited as examples of European best practice. The possible use of the ASEAN Business Forum (ABF) was discussed, with a suggestion that it would need to be revamped to allow for agendas, plans, action items, follow up and reviews as well as a disciplined annual meeting.

- Industry representatives suggested there is a major disconnect between the gas industry players and APEC/ASEAN think tanks. Again it was suggested that a Madrid Forum look-alike might be a way to "fill the gap".

- There is in any case an urgent need for ASCOPE to finalize and get its framework agreements and documents into the market to enable wider use.

- The need for more accurate demand forecasts was emphasized, with a degree of industry skepticism over some forecasts. Better and more accurate demand forecasts were suggested as key incentives to gas exploration and development.

- Within ASCOPE, crude oil data is already shared: the next step is to share data on petrochemicals, and, finally, on gas. A timetable is yet to be fixed for the completion of data sharing on all three levels.

- The failure of the 1980's EU/ASEAN cooperation grant, the AGB/ENI "dream", due to "lack of ownership", was referred to.

- There was some debate around why some companies are able to work across difficult boundaries, or in difficult countries, when others cannot. This was not felt to be something governments should attempt to address formally; rather, the market should be left to determine what works best, where and with whom.

- The need to emphasize policies of sustainable energy development as well as security of energy supply was discussed. Policy must transcend political tenure.

11. The Workshop Plan of Action to Expand APEC Gas Pipeline Trade

Workshop participants finally reviewed the agreed nine "challenges" and supported the best practice recommendations to address them as set out in table 23.

Table 23: Challenges to Gas Pipeline Trade and Best Practice Recommendations

Challenge	Best Practice Recommendation
1. Alternative fuels, energy mix and policy	• There is a need for all Governments to have published energy policies • These policies need to transcend political tenure and be consistently applied • Policies need to promote energy security in context of sustainable development • Shift to market/cost based pricing away from subsidies and cross subsidies – best practice suggested as using rebates where required. • Pricing should reflect: ❖ the state of development of the economy and ❖ the total life-cycle cost of production
2. Business climate and investment policies	• Recognize the need to attract foreign investment, especially in more risky parts of gas chain. • The market currently has the highest gas and oil prices in history, yet the lowest exploration spend. Therefore: ❖ there is a need to encourage finding and development of more gas ❖ explorers should be rewarded by fiscal terms ❖ developers need greater freedom to market gas • Governments should be encouraged to be more open and offer more attractive terms to attract investment and participation in expanding gas availability.
3. Need for a secure gas market	• There is an essential need of access to market and market growth ❖ this will eventually require TPA ❖ regulation must allow for returns for investment in "surplus capacity" ❖ some producers are willing to become buyers and thus create demand for gas. ❖ government support may be needed during start up period.

4. Security of supply – both pipeline and gas/alternative fuel back-up	• Buyers are taking upstream equity • The continued use of long term contracts is required by both buyers and sellers • LNG should be available as a back-up fuel • Other interconnection, bi-directional interconnectors and alternative fuel sources provide diversity • There is a need to encourage and develop gas storage.
5. Project scale, commercial viability and financing	• In many countries gas is a resource of the State but governments should be willing to provide comfort or support to investors • The role for MLAs in this regard needs to be expanded • Interests must be freely assignable • It should be recognized that ROR hurdles are different for different stakeholders • Wherever possible, competition should be injected into the process to get lowest prices and best deals. But there is a need to ensure the outcome is win-win and not win-lose. • There is an overwhelming need for increased R&D and more technical transfer. This will require additional government incentives and tax breaks.
6. Distance and constructability	• More value extraction for host economies should be encouraged via local involvement in construction, services and support.
7. Project complexity	• Increasing integration across gas chain increases complexity dramatically. A series of back to back projects, interspersed with corporate risk taking at critical points, simplifies the process • There is an urgent need and role for simplified ownership structures of energy processes: ❖ taxation pass-through mechanisms are required ❖ ASCOPE "JV vehicles" should be considered as basis for best practice.

8. Variations in technical specifications regulation and pricing	• The ASCOPE Gas Center has a role in harmonization and standardization for pipeline gas within ASEAN • An annual forum should be established to share best practices (noting that the Washington-based ILNGA seems to be doing same on LNG and shipping, where best practice emerges from a peer group approach).
9. Technical and environmental complexity	• There is a need to address CO_2 content and its commercialization • Carbon trading offers lowest cost mechanism and access for developing economies to CDM/JI possibilities.

12. Workshop Attendees

Name	Company	Country
Amin M Farid B M	PETRONAS	Malaysia
Bensley, Stuart	ResourcesLaw International	Australia
Cockcroft, Peter	Premier Oil Company	Singapore
Ear, Chow Foo	Energy Market Authority	Singapore
Hong, Sarah	Singapore Petroleum Company	Singapore
Hulme, Mike	Premier Oil Company	Singapore
Lim, Serene	Singapore Petroleum Company	Singapore
Matassan, Zainal A B	PETRONAS	Malaysia
Notodisuryo, Endro Utomo	Indonesian Electrical Power Society (MKI)	Indonesia
Pritchard, Robert	ResourcesLaw International	Australia
Latif Zainal Rashid B Abd	PETRONAS	Malaysia
Soo Ho, David	ChevronTexaco	Singapore
Tan, Josephine	Energy Market Authority	Singapore
Tan, Wilson	Singapore Petroleum Company	Singapore
Tangnoi, Vijit	PTT Public Company	Thailand
Teo, Wee Guan	Energy Market Authority	Singapore
Wong, Silas	ING Bank	Singapore

APPENDIX 4:

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