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Toward the Globalization of the LNG Market

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Executive Summary

Gas has grown from a marginal fuel consumed in regionally disconnected markets to a fuel that is transported across great distances for consumption in many different economic sectors. Increasingly, natural gas is the fuel of choice for consumers seeking its relatively low environmental impact, especially for electric power generation. As a result, world gas consumption is projected to more than double over the next three decades. While gas consumption has risen strongly, indigenous gas production in many countries has not expanded at a similar pace. With many of the world's gas reserves located far from centers of demand, gas trade has become increasingly important. In particular, trade in liquefied natural gas (LNG).

The LNG market is characterized mainly by two regions; the Pacific Basin players and the Atlantic basin players.

Worldwide LNG supplies are plentiful, but the problem is would the proposed LNG terminals be approved and constructed at the right time to face LNG growth , in addition, the Current U.S natural gas specification could be an limiting factor for this growth. the long-term contract between buyer and seller for LNG – known as the Sale and Purchase Agreement or SPA was characterized by: the volume obligation which was embodied in the take-or-pay clause and the limitation of the ability of the buyer to resell any surpluses that he might experience to his own account embodied in the 'Destination restriction' clause. The risk sharing logic of the contract was embodied in the phrase 'the buyer takes the volume risk and the seller takes the price risk'.

Nowadays knew the emergence of the short-term LNG market which was virtually nonexistent a few years ago and the future would be as dramatic as the changes in the oil market after 1973-80, one other feature of the LNG market today is the possibility of arbitrage which enables the trading company to divert cargoes to those markets that provide the highest netbacks. But the capability to arbitrage requires sufficient excess capacity in tankers and receipt terminals to take advantage of market opportunities when they occur. The global LNG marketplace is really just a vision till now. But it can blossom and can prosper and the world will see an evolution from several regional LNG markets to a truly global market.

TABLE DES MATIERES

I. THE WORLD GAS SCENE

I.1 Natural Gas

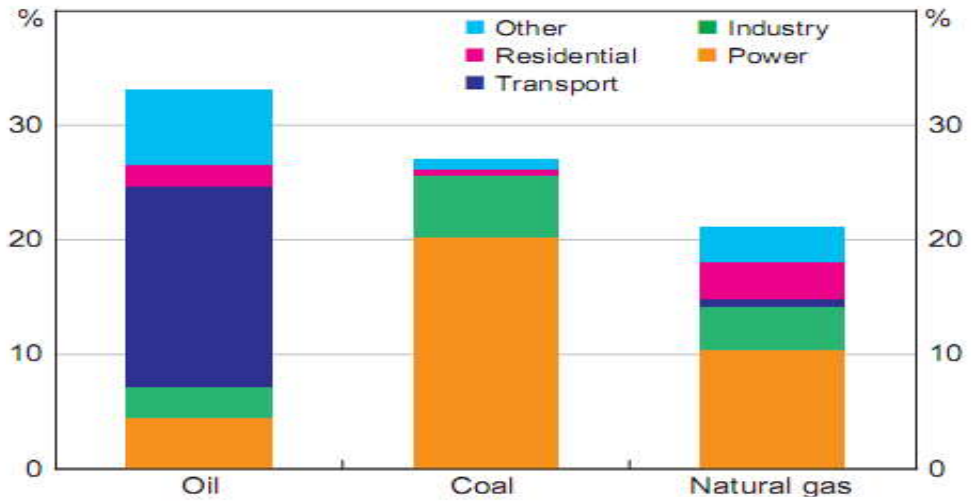
Natural gas supplies around one-fifth of the globe's energy needs, compared with one-third from oil and one-quarter from coal (Figure 1). Natural gas has a wide variety of uses with the largest being power generation, followed by industrial uses (such as the production of chemicals) and residential uses (including heating and cooking). In recent decades, there has been strong growth in natural gas consumption in the Asia-Pacific region and the Middle East, although North America remains the largest gas consumer (Figure 2).

Natural gas is the cleanest-burning fossil fuel, producing significantly lower carbon emissions than coal or oil, as well as lower levels of other pollutants (Table 1). As a result, natural gas has made up a large portion of new electric power generation capacity in recent years, particularly in developed economies where it accounted for nearly three-quarters of capacity growth between 2000 and 2009. The shift toward gas power generation also reflects: lower capital outlays and shorter project lead times compared with coal and nuclear plants; flexibility in providing either peak or base load power or a supplement to intermittent renewable sources; and energy diversification policies. Global 'proven' reserves of natural gas – that is, known deposits that can be recovered with reasonable certainty given current technology and prices – represent around 60 years of current production (Table 1).

Based on energy content, proven gas reserves are around 80 per cent of the size of oil reserves, but only 40 per cent the size of coal reserves. Proven reserves of gas have increased gradually over time as a result of exploration and improved technology. In recent years, advances in drilling have meant that 'unconventional' reserves of gas have become more economical to extract. Unconventional reserves are found in rock formations through which gas does not flow easily so is more difficult to extract – these include coal seam gas, shale gas and tight gas.

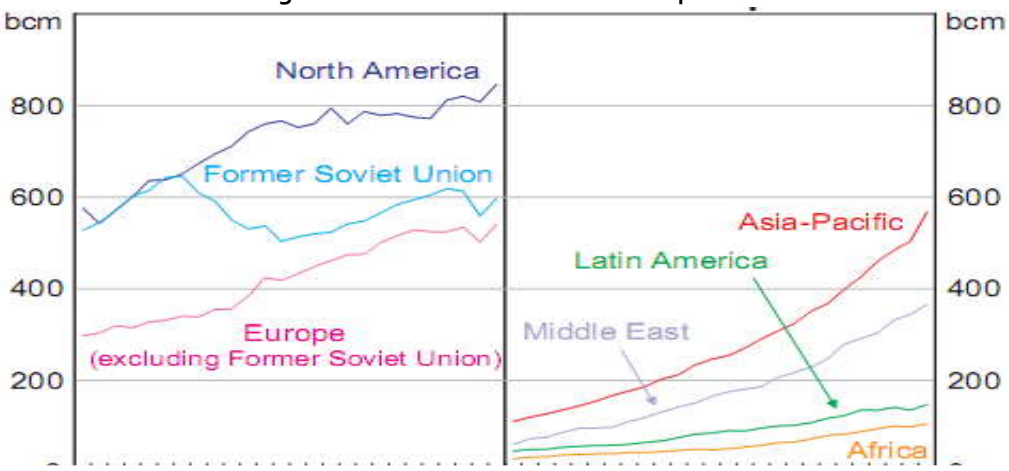
The world's total recoverable reserves of gas are likely to be much larger than proven reserves, which are a relatively conservative measure requiring a high degree of certainty. While total recoverable reserves are difficult to measure, the International Energy Agency (IEA) estimates that they equate to around 120 years of current production for conventional deposits, and around 250 years of production including unconventional deposits (IEA 2011b).

Figure 1: world energy consumption by fuel in 2008



Sources: International Energy Agency; RBA

Figure 2: Global Natural Gas Consumption



Sources: BP Statistical review

Tableau 1: Energy commodities- reserves and production

	PROVEN RESERVES 2013 Billion tonnes oil equivalent	production 2013 Billion tonnes oil equivalent	Reserves to production ratio	Carbon emissions Grams CO2 per kilowatt hour
Natural Gas	171,858	3,142	55,1	370
Crude Oil	238	4,132	53,3	640
Coal	575,92	3,881	113	720-940

I.2 Natural Gas Trade and the Role of LNG

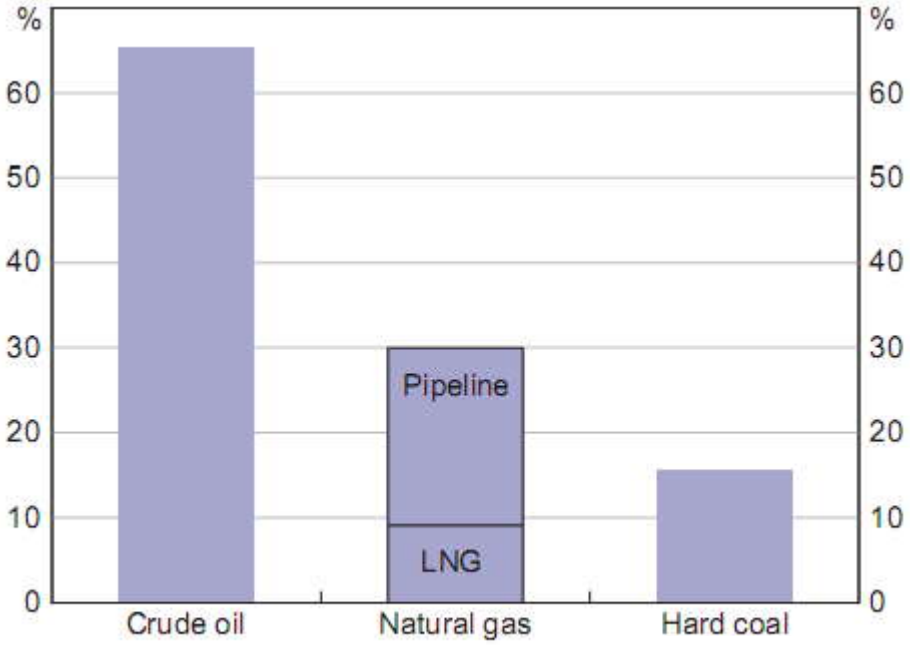
As with other energy commodities, reserves of natural gas often do not lie near major centers of demand, resulting in international trade. Around 30 per cent of natural gas produced is internationally traded – much lower than for crude oil, which has around two-thirds of production traded, reflecting the greater difficulties in transporting gas (Figure 3). However, natural gas is traded more than coal, which had only around 15 per cent of production internationally traded in 2010.

There are two main technologies for transporting and trading natural gas:

- Pipelines, where gas is transmitted under high pressure through steel pipes; and
- LNG, where gas is cooled to a liquid at minus 160 degrees Celsius in large 'trains', reducing its volume by more than 600 times for transport in specialized tankers.

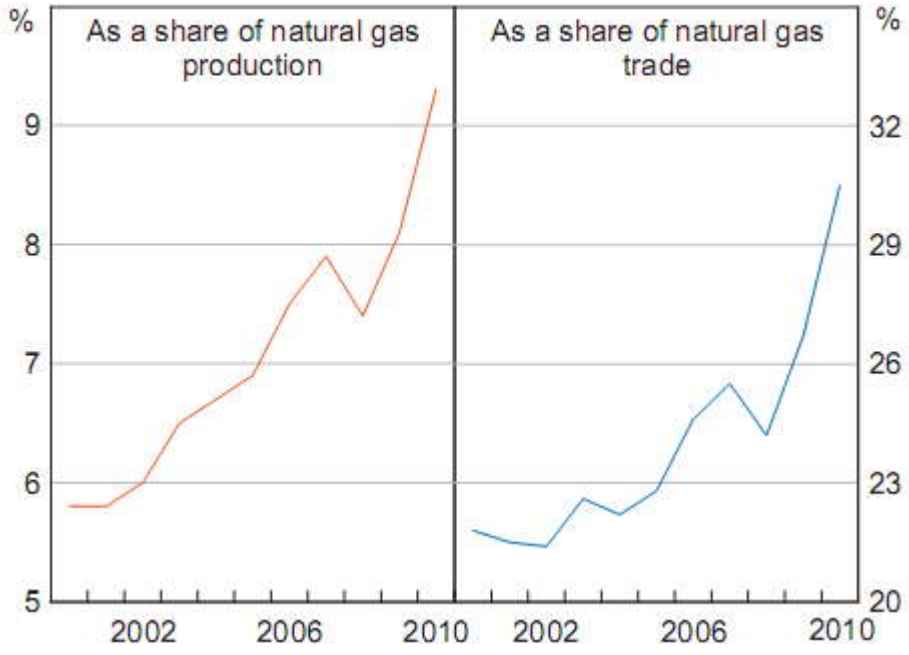
International pipeline trade is around twice the size of LNG trade. However, LNG is more economic than pipelines over long distances, particularly across oceans. Accordingly, it is used to bring production to market from remote or 'stranded' gas fields, provides traditional pipeline customers with alternative supply options from further afield, and is particularly useful in servicing coastal population centers. Reflecting this, LNG accounts for nearly three-quarters of long-distance natural gas trade. In recent years, LNG has risen substantially as a share of both gas production and trade (Figure 4). Since 2000, global LNG trade has more than doubled while pipeline trade has risen by only around one-third. In part, this reflected falling costs in the 1990s and early 2000s, as technical advances facilitated larger trains and transport tankers.This expansion in LNG trade has been underpinned by large capital investmentsaround the world, with further projects currently under way or being planned (see the section 'Investment in New Capacity'). As investment has picked up in recent years, costs have risen as projects have competed for skilled labor, become more complex, and taken longer to complete.

Figure 3: International trade in energy commodities in 2010



Sources: International Energy Agency;

Figure 4: International trade in LNG

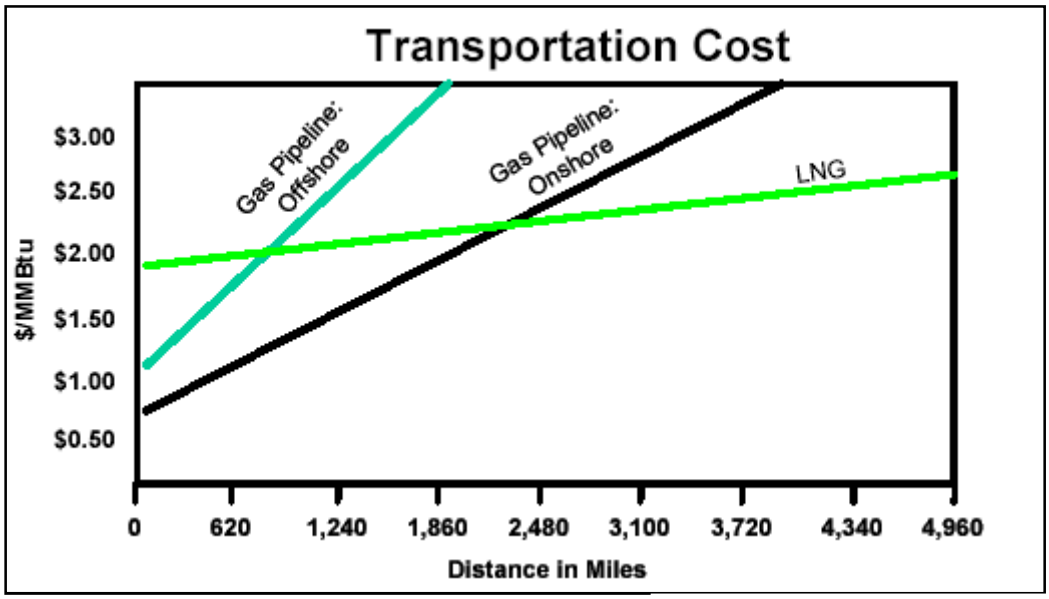


Sources: International Energy Agency;

I.3 LNG challenge to pipeline GAS:

A pipeline is the most used option for transporting natural gas. About 75% of the gas that is traded internationally is moved via pipeline. However. Thecost ofdelivering large quantities of gas by pipeline rise rapidly with distance even though, pipeline can get advantage of economies of scale for larger diameters. At some point, it becomes more economical to transport the gas as LNG. Several comparisons of pipeline and LNG have been published. LNG is competitive with distances greater than 700 miles for offshore pipeline and more than 2,200 miles for onshore pipeline.

Figure 5: Gas transportation cost



Sources: Institute of gas technology

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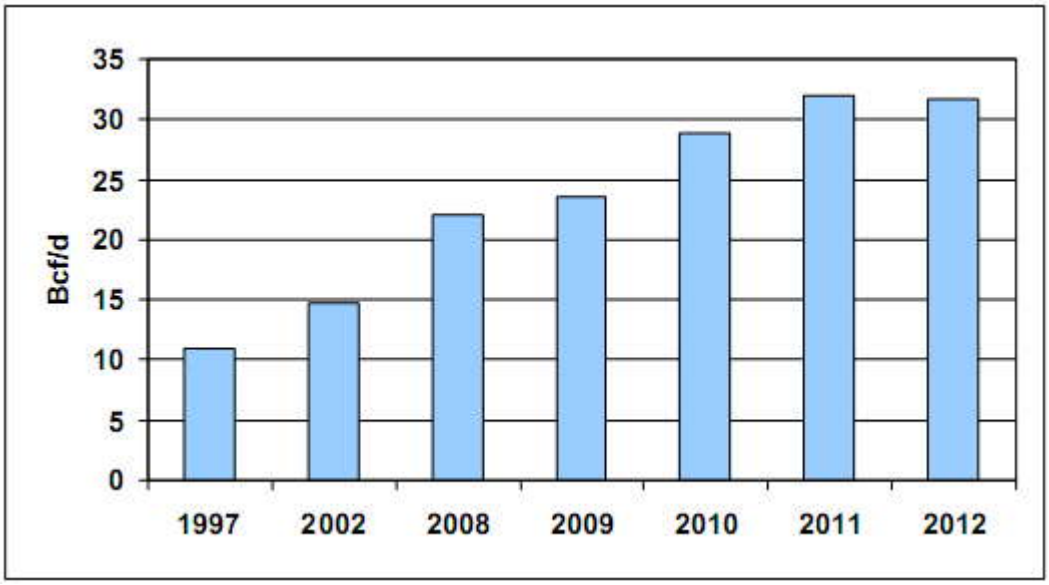
Although gas inputs for LNG facilities are relatively cheap, the processing and transportation equipment is highly specialized and capital intensive requiring billions of dollars of investment for each new LNG project through the whole chain. The costs to produce and supply LNG can be divided among the necessary elements that make up the whole value chain.

II. OVERVIEW OF THE WORLD LNG MARKET

World trade in LNG has grown dramatically over the last fifteen years. As shown in Figure 1, trade in LNG more than tripled, growing from just over 10 Bcf/d in 1997 to 32 Bcf/d in 2012. It is anticipated that this market will continue its rapid expansion as better production technology means more gas reserves worldwide are available for development while demand for energy, particularly for those with cleaner-burning properties, is expected to grow.

Figure 6: world LNG trade (Bcf/d)



Sources: EIA, OGJ, BP Statistical Review of World

II.1 World LNG Supply

The current suppliers of LNG to world markets and those that are expected to emerge as significant suppliers in the future come, not surprisingly, from those countries that are endowed with the largest natural gas reserves.

In addition to these conventional reserves, vast resources of unconventional gas are now being unlocked by better technology. Advances in horizontal drilling and hydraulic fracturing mean that shale gas that was once considered uneconomic to produce, is now ripe for production. In 20013, the United States Potential Gas Committee increased its estimate of potential U.S. gas resources from 1,898 Tcf to 2,384 Tcf, an increase that was largely due to the inclusion of 1,073 Tcf of potential shale gas resources, up from the previous estimate of 686 Tcf. In June 2013, the US Energy Information Administration completed an assessment of world shale gas resources that exist outside of the United States. The report examined 137 shale formations in 41 countries outside of the United States. The report found that there was the potential to recover 6,634 Tcf and of this total, Canada comprised 573 Tcf.

With these large reserves of natural gas in place, the US EIA is forecasting healthy growth in world natural gas production. World natural gas production is expected to increase from just over 300 Bcf/d in 2010 to 512 Bcf/d in 2040. Currently about 10% of all natural gas production finds its way into the LNG market.

Tableau 2: Global LNG supply (Bcf/d)

Exporter	2009	2010	2011	2012
Malysia	2,8	3	3,22	3,1
Indonesia	2,5	3	2,82	2,4
Australia	2,3	2,5	2,51	2,7
Brunea	0,9	0,8	0,91	0,9
Russia	0,7	1,3	1,39	1,4
Alaska	0,1	0,2	0,2	0,1
Peru	0	0	0,5	0,5
Total Pacific Basin	**9,3**	**10,8**	**11,55**	**11,1**
Qatar	4,8	7,3	9,92	10,2
Oman	1,2	1,1	1,06	1,1
Abu Dhabi	0,7	0,8	0,77	0,7
Yemen	0	0,5	0,86	0,7
Total Middle Easte	**6,7**	**9,7**	**12,61**	**12,7**
Trinidad	1,9	2	1,83	1,8
Algeria	2,1	1,9	1,66	1,5
Nigeria	1,5	2,3	2,5	2,6
Egypt	1,2	0,9	0,83	0,6
Norway	0,3	0,5	0,38	0,5
Equatorial Guinea	0,4	0,5	0,51	0,5
Libya	0,1	0,3	0,01	0
Total atlantic Basin	**7,5**	**8,4**	**7,72**	**7,5**
Total World	23,5	28,9	31,88	31,3

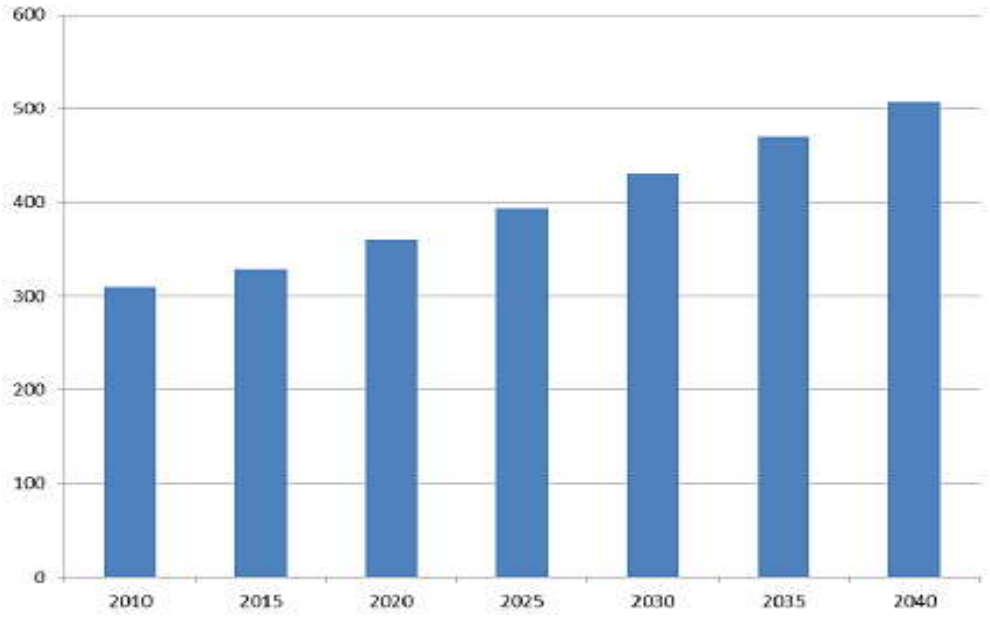
Source: Oil and Gas Journal & BP World Energy Statistical Review

Of those countries located in and supplying markets in the Atlantic Basin, Trinidad, Algeria and Nigeria are currently the dominant suppliers. Nigeria, however, has a number of LNG liquefaction projects being planned and developed that should increase its relative significance as an LNG supplier in years to come. Exports of LNG from the Middle East are dominated by those from Qatar, which is currently the largest exporter of LNG in the world. This status, however, could come under threat from Australia over the next decade as this country has a considerable number of LNG liquefaction projects being planned and developed. LNG exports from the Middle East serve markets located in both the Pacific and Atlantic basins.

II.2 World Demand for LNG

The Energy Information Administration is expecting world-wide natural gas consumption to increase from 310 Bcf/d in 2010 to 507 Bcf/d in 2040 (see Figure 7 below). Much of this increase is due to the anticipated growth in the use of natural gas for power generation as countries take advantage of the cleaner burning properties of this fuel. Natural gas consumption is expected to grow considerably faster in developing countries as consumption in the developed world as represented by the OECD countries. As the world wide use of natural gas increases, the size of the LNG market will grow as well. While currently about 10% of natural gas produced globally is liquefied, the LNG market will likely account for a growing share of world natural gas trade as worldwide liquefaction capacity increases.

Figure 7: World Natural Gas Consumption (Bcf/d)



Sources: EIA 2013 International Energy Outlook

The current consumers of LNG are mainly to be found among the energy hungry economies of South East Asia as well as a number of the more developed Western European countries. Some LNG is also imported into North and South America. The Pacific Basin is the largest consuming region and is also expected to exhibit the highest future growth rate given the underlying economic growth of the countries found in this region and their burgeoning demand for energy. With respect to the South East Asian importers of LNG, (Table 3below) shows that Japan is by far the largest importer in this region and in fact the whole world with more than 30 LNG import terminals currently in service and several more being planned. Japan currently accounts for over 35% of the entire world wide consumption of LNG and with the substantial damage to Japanese nuclear power generating capacity as a result of the Tsunami that occurred in March 2011, LNG imports may grow higher in the future to

compensate for the loss of nuclear power generating capacity. China has recently emerged as a net importer of natural gas. With its almost insatiable demand for energy, it is expected to become a major importer of LNG in the future. India is also expected to increase its future demand for LNG.

The developed economies of Western Europe imported 6.6 Bcf/d in 2012, down from 8.7 Bcf/d in 2011 as the economics of the region continue to struggle. These nations are not expected to increase their demand for LNG anywhere near the same rate as the growing Asian economies. LNG is also consumed in the Americas, but as will be discussed in the more detailed country analysis, the emergence of shale gas in North America means that this region is more likely to become a net exporter of LNG rather than an importer.

Tableau 3: Imports of LNG (Bcf/d)

	2009	2010	2011	2012
France	1,26	1,34	1,41	1
Spain	2,56	2,66	2,34	2,1
Portugal	0,29	0,3	0,3	0,4
Turkey	0,54	0,77	0,6	0,7
Belgium	0,62	0,63	0,64	0,4
Italy	0,27	0,88	0,85	0,7
Greece	0,08	0,11	0,13	0
UK	1,02	1,81	2,45	1,3
US	1,2	1,18	0,97	0,5
Puerto Rico	0,07	0,08	0,07	0
Dom.Republic	0,05	0,08	0,09	0
Mexico	0,34	0,55	0,39	0,5
Brazil	0,07	0,27	0,1	0,3
Argentina	0,09	0,16	0,42	0,5
Chile	0,06	0,3	0,37	0,4
Canada	0,08	0,19	0,32	0,2
Kuwait & United arab Emirates	0,09	0,27	0,43	0,4
Total Atlantic Basin & Americas	**8,69**	**11,58**	**11,88**	**9,4**
Japan	8,39	9,04	10,34	11,5
South Korea	3,36	4,3	4,77	4,8
Taiwan	1,07	1,45	1,58	1,6
India	1,18	1,18	1,65	2
China	0,72	1,23	1,61	1,9
Total Pacific Basin	**14,72**	**17,2**	**19,95**	**21,8**
World Total	**23,41**	**28,78**	**31,83**	**31,2**

Source: OGJ & BP World Energy Statistical Review

II.3 LNG Supply and Demand Outlook

There are a large number of countries that currently participate as suppliers or consumers in the world-wide LNG market. In the future even more countries are expected to participate as new sources of supply become developed and more countries seek to rely on the clean-burning properties of natural gas to meet their energy needs. This section begins by looking at the outlook for new liquefaction capacity that is expected to add to the world's supply of LNG. The section concludes by examining more closely those countries that currently consume LNG and their prospects for future growth.

Tableau 4: World LNG Liquefaction Capacity Outlouk (Bcf/d)

(Includes Facilities that are Existing, Under Construction & Proposed)

	2011	2012	2013	2014	2015	2016	2017	2018	2019
Algeria	3,08	3,08	4,36	4,36	4,36	4,36	4,36	4,36	4,36
Angola	0,00	0,73	0,73	0,73	0,73	0,73	0,73	0,73	0,73
Australia	2,79	3,39	3,39	6,68	9,73	12,15	15,46	16,30	16,30
Brunei	1,01	1,01	1,01	1,01	1,57	1,57	1,57	1,57	1,57
Canada	0,00	0,00	0,00	0,00	0,25	0,25	0,98	1,99	3,78
Egypt	1,71	1,71	1,71	1,71	2,41	2,41	2,41	2,41	2,41
Equatorial Guinea	0,52	0,52	0,52	0,52	0,52	1,13	1,13	1,13	1,13
Indonisia	4,21	4,21	4,21	4,48	4,48	4,48	4,48	4,48	4,48
Libya	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32
Malysia	3,36	3,36	3,36	3,36	3,36	3,81	3,81	3,81	3,81
Nigeria	2,96	2,96	2,96	2,96	8,83	8,83	8,83	8,83	8,83
Norway	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Oman	1,44	1,44	1,44	1,44	1,44	1,44	1,44	1,44	1,44
Papua New Guinea	0,00	0,00	0,00	0,92	0,92	0,92	0,92	0,92	0,92
Peru	0,62	0,62	0,62	0,62	0,62	0,62	0,62	0,62	0,62
Qatar	10,78	10,78	10,78	10,78	10,78	10,78	10,78	10,78	10,78
Russia	1,34	1,34	1,34	1,34	1,34	3,65	5,33	5,33	5,33
Trinidad	2,16	2,16	2,16	2,16	2,88	2,88	2,88	2,88	2,88
UAE	0,78	0,78	0,78	0,78	0,78	0,78	0,78	0,78	0,78
United States	0,00	0,00	0,00	0,00	2,52	2,52	7,18	11,38	11,38
Yemen	0,94	0,94	0,94	0,94	0,94	0,94	0,94	0,94	0,94
Total	38,61	39,94	41,22	45,70	59,37	65,16	75,54	81,59	83,38

Source: Petroleum Economist

Qatar-gas, established in 1984, pioneered the liquefied Naturel Gas (LNG) industry in Quatar Today, Qatargas is the largest LNG producing company in the world, with an annual LNG production capacity of 42 million tonnes per annum (MTA). Qatargas has seven LNG trains, of which four are the largest in the world, each with a production capacity of 7.8 MTA. A second company, RasGas, oversees and manages the operations associated with seven LNG trains in Qatar, for which it has a total production capacity of approximately 37 million tonnes per annum. Much of this development has come on stream in recent years so that with a total of 79 million tonnes per annum of LNG capacity, Qatar has emerged as the world's leading LNG producer and exporter. Table 4above shows that there exists the potential for a huge increase in liquefaction capacity over the next six to seven years. An examination of all the projects world-wide that are either under construction or are in the proposal stage shows that there exists the potential to increase liquefaction capacity by more than 100% within the next decade. The table shows that in particular Australia, and to a lesser extent Nigeria, could emerge as significant LNG suppliers with Australia challenging Qatar as the world's largest LNG exporter. In addition, the United States has seen a number of LNG export projects announced in the last couple of years.

It is, however, unlikely that all the projects identified in Table above will proceed, at least in the timeframe currently contemplated. There are a limited number of LNG Engineering, Procurement and Construction (EPC) contractors and in Australia, for example, conventional LNG developments will be competing with Coal seam gas-to-LNG for scarce resources. This is likely to lead to an overheated construction market in Australia, and rising costs may have a negative impact on project timing.

The challenges of a limited number of LNG EPC contractors and the impacts of an overheated construction market will not only be felt in Australia but will also be felt worldwide, likely resulting in some projects being cancelled or significantly delayed. Regardless of this fact, however, it appears that the world is undoubtedly in line for a substantial increase in liquefaction capacity over the next several years.

Nigeria, which is currently one of the larger exporters of LNG, also has plans to significantly increase its production. Its output currently comes from the Nigeria Liquefied Natural Gas (NLNG) facility on Bonny Island. This facility has 6 trains currently in operation but plans for building a 7th train that would lift total production capacity to over 30 Million tonnes per annum (4.2 Bcf/d) are currently at an advanced stage. Additional future projects include Brass LNG, a project that is owned by Nigerian

National Petroleum Corporation (NNPC) and ConocoPhillips that proposes to have two trains with a total capacity of 10 Million tonnes per annum (1.4 Bcf/d). An in-service date of 2015 is

currently envisaged. At a much earlier stage of development is the OKLNG project that would comprise 4 trains for a total export capacity of 22 Million tonnes per annum (3.8 Bcf/d). The project sponsors of this development include NNPC, Chevron and BG Group. An in-service date has yet to be announced. With the potential for such a marked increase in LNG supply on the horizon, it is important to examine the prospects for world demand to soak up these incremental supplies. The continuation of significantly higher prices being realized today on world LNG prices compared to their North American counterparts will hinge, in large part, on the ability of world demand growth to keep up with the additional supplies being forecast. The remainder of this section looks more closely at the countries that import LNG today and those expected to import LNG in the future to assess the prospects for world demand growth for LNG.

III. THE STRUCTURE OF THE LNG MARKET

III.1 The Atlantic and Pacific basins:

While LNG links buyers with distant reserves, the global market is segmented between the two great ocean basins – the Atlantic and Pacific (Table 5). Because the Middle East is located between the two basins, it exports to both markets. The Asia-Pacific market is larger than the Atlantic market, accounting for a higher share of both imports and exports.

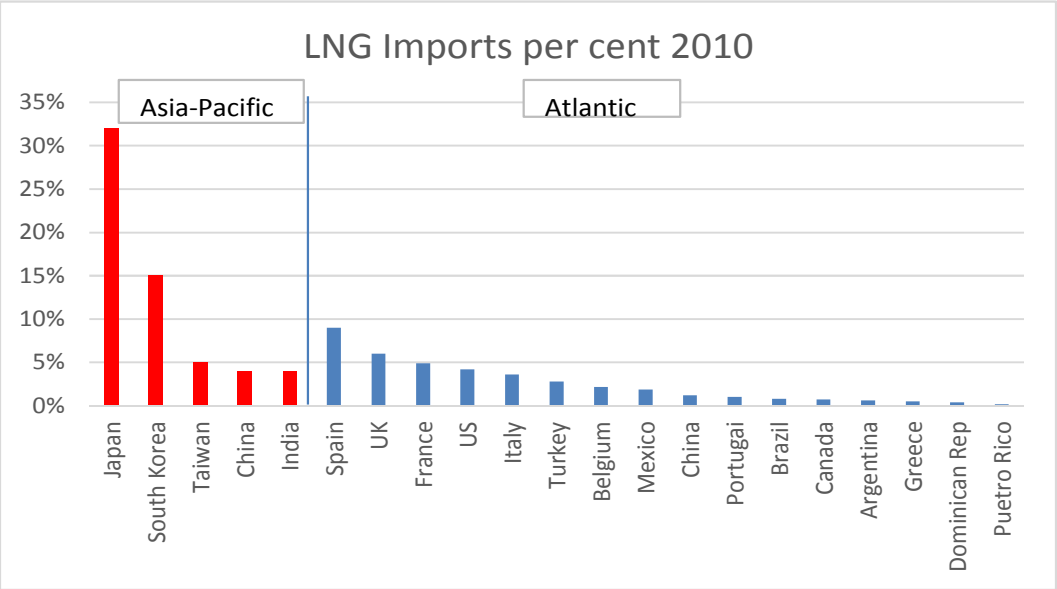
However, its share of LNG trade has declined over time, as the Middle East has emerged as a major exporting region and a more diverse group of buyers has emerged in the Atlantic market.

Tableau 5: Composition of the LNG trade 2010

	To		
From	Asia-Pacific	Atlantic	Total
Asia-Pacific	36	1	37
Middle East	19	14	33
Atlantic	4	25	29
Total	59	41	100

The LNG market developed significantly in the Asia-Pacific in the 1970s and 1980s. This was driven by the major industrial economies in the region atthe time – Japan, Korea and Taiwan – seeking to diversify their energy supplies following the surge in oil prices between 1973 and 1980. These economies have little in the way of domestic gas reserves, and are not easily served by pipelines, so they have sought to import gas in the form of LNG. By 1990, Japan alone accounted for two-thirds of global imports and although this share has since fallen, Japan remains the world's largest importer of LNG by a wide margin (Figure 8). China and India have only recently begun importing LNG receiving their first shipments in 2006 and 2004, respectively, and each accounts for a relatively small share of world imports. In the Atlantic, a wide group of buyers has developed, including a number of European nations looking to diversify supplies away from pipeline gas, offset declines in local production and secure supply for expanded gas power generation.

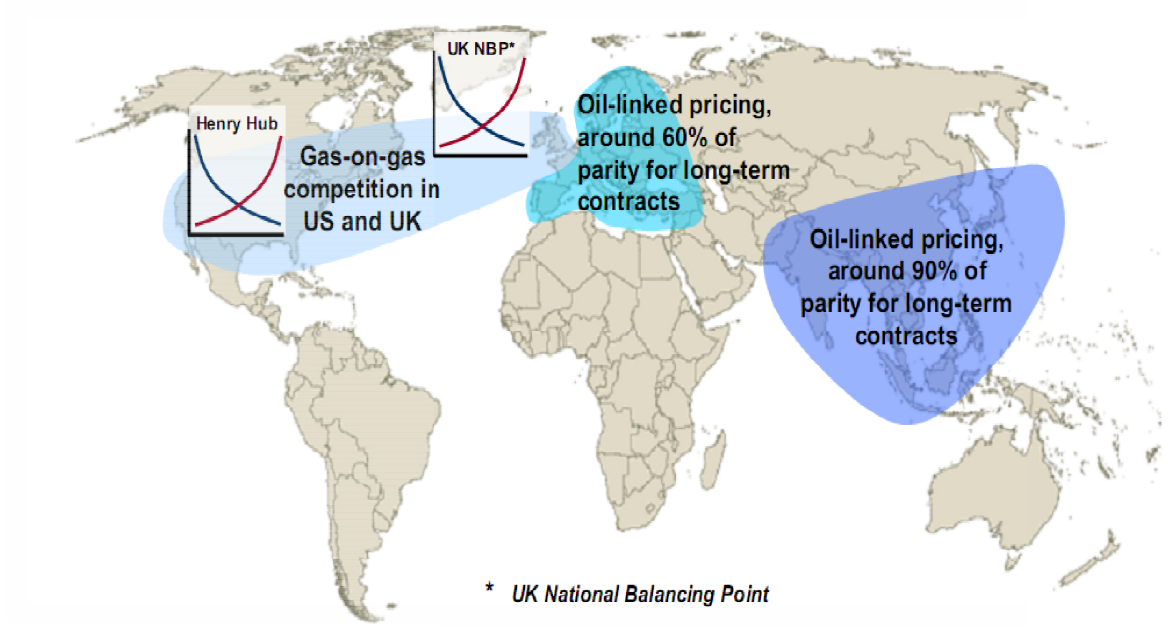
Figure 8: LNG imports per cent of total - 2010-



III. 2 Pricing of LNG

There are three major pricing systems in the current LNG contracts:

- Oil indexed contract used primarily in Japan, Korea, Taiwan and China;
- Oil, oil products and other energy carriers indexed contracts used primarily in Continental Europe; and
- Market indexed contracts used in the US and the UK.



The formula for an indexed price is as follows:

$$CP = BP + \beta X$$

- BP: constant part or base price
- β: gradient
- X: indexation

The formula has been widely used in Asian LNG SPAs, where base price refers to a term that represents various non-oil factors, but usually a constant determined by negotiation at a level which can prevent LNG prices from falling below a certain level. It thus varies regardless of oil price fluctuation.

Given the capital-intensive nature of liquefaction projects, long-term ship or pay contracts are used to ensure high utilization rates and to meet investment hurdle rates. In Asia almost all LNG is sold under long term contracts based on oil prices. In Japan, contracts are linked to

the Japanese Customs Cleared (JCC) price for crude oil which is the price of a basket of crude oil types imported in Japan that is tracked by the Japanese government.

Some market observers have questioned, however, whether these types of contracting arrangements will continue to predominate, particularly if oil continues to trade at a significant premium to natural gas. In addition, a proliferation of LNG liquefaction plants being planned and developed throughout the world will bring on significant sources of new supply. Thus we may see the emergence of Henry Hub linked contracts in Asia as an alternative pricing formula to oil. Also, while the spot market for LNG is comparatively small today compared to those volumes of LNG sold under long term contracts, any surplus of supply situation could lead to more deals being made on a spot basis.

Other seasoned market observers dispute that there will be a significant move away from the current trend of oil-indexed long term LNG contracts in Asia. These observers contend that the majority of suppliers will still prefer oil-indexation because of the transparency, reliability and traditional acceptance by all players.

The evolution of contracting practices that took place during the deregulation of natural gas markets in North American may hold some clues as to what might occur in the global context. Shortly after North American natural gas markets were deregulated in the mid to late 1980's, the level of Canada's exports of natural gas to the United States soared. Initially a significant portion of these exports took place under long term contracts where natural gas prices were either fixed with some provision for escalation over the contract life or were linked to prices of competing sources of energy, such as oil. Over time, however, the North American market moved away from such long term contracting practices and Canadian exports have been sold essentially on a spot basis. This change in practice occurred as Canadian production grew and the market became more comfortable contracting on a short term basis as fears around supply security subsided.

In the case of the global LNG market, over the past few decades suppliers have been challenged to keep up with the pace of demand. Consumers of LNG have placed a premium on security of supply and have been willing to sign up for long term contracts. LNG suppliers have in turn sought long term contracts to underpin the large capital investments involved. As a result, to date the spot market for LNG has been very limited compared to the size of the market overall.

This trend could change if those countries that are aggressively seeking to expand their LNG liquefaction capacity create surplus of supply in world LNG markets. More intense gas on gas competition would see the emergence of a larger spot market with less volumes being sold on a long term basis with prices linked to those of crude oil. Australia alone has a series

of LNG export projects in various stages of development that could increase this country's export capacity from 2.5 Bcf/d today to over 16 Bcf/d in 2018. Thus if the anticipated high rates of growth in demand in the emerging South East Asian economies of China and India fail to take place as anticipated, a surplus of supply of LNG will translate into a more significant spot market with prices reflecting greater gas on gas competition and less linkage to oil prices.

IV.3 LNG Contracts:

a) Main Terms in a Typical LNG Contract:

A typical LNG contract, or a Sales and Purchase Agreement (SPA), is a definitive contract between a seller and buyer for the sale and purchase of a quantity of LNG for delivery during a specified period at a specified price. LNG contracts/SPAs define details and clauses covering specific issues mainly those listed below:

- Duration
- Volume
- Take-or-pay and destination clause.
- FOB versus CIF/ex-ship
- Price
- Force majeure
- Other relevant procedures

A.1 Duration:

Traditionally, long-term sales agreements are necessitated by project economics to guaranteerevenues to remunerate large capital investments. Therefore, most of the existing long-termcontracts are for periods of at least 20 years. Buyers did not have a problem in accepting long-term contracts in the 1960s/1970s, since they needed to finance investment in terminals, power plants, and distribution systems. In recent contracts, however, some buyers—especially Japanese buyers—are asking for a mixture of long-term, medium-term and shorter-term contracts, as an uncertainty over demand prospects due to stagnant economic growth and market liberalizationwhich have made it very difficult for some buyers to commit to long-term contracts without greater flexibility. Sellers are reluctant to move away from long-term contracts, but they are starting to make concessions in this area to win new contracts or to ensure contract extensions. It should be noted that new buyers in developing markets (including China and India) are an exception to the trend toward shorter contracts, as they tend to want long-term (20 years) contracts so they can arrange financing for terminals and power plants.

A.2 Volume

In most SPA's there is a "build-up" period before buyers take the annual contracted volumes. Some buyers need a slower build-up period to meet market growth. For sellers, rapid build-up is important, as build-up volumes provide the early cash flow to remunerate investment.

A contract also provides the buyer with "upward flexibility and "downward quantity tolerance." .Upward flexibility provides the buyer with the right to receive additional volumes that the seller has the ability to supply. Downward quantity tolerance, meanwhile, is the volume the

buyer can elect "not to take" without triggering a take-or-pay obligation. While typically the quantity tolerance on older contracts is quite narrow, some of the newer contracts and extensions have adopted wider quantity tolerances.

A.3 Take-or-Pay and Destination Clauses:

A take-or-pay clause in a contract requires a minimum quantity of LNG to be paid for, whether, or not delivery is accepted by the buyer. The take-or-pay clause provides sellers with a secure stream of revenue, as it ensures that the buyer does not fail to take its contractually required quantities. The take-or-pay level is typically at least 90 percent of the contracted quantity in most existing contracts, but some sellers are softening take-or-pay terms in recent contracts. Older projects have been able to creatively relax take-or-pay levels by transferring portions of renewed contracts to a short-term basis, which effectively reduces take-or-pay commitments. Similarly, some expansion projects have offered a mixture of long-term and short-term volumes to create greater off take flexibility. Examples of recent contracts with relaxed take-or-pay levels include Malaysia LNG (MLNG) Satu with Tokyo Gas and Tokyo Electric Power Co. (TEPCO), and MLNG Tiga with a Japanese buyers' consortium However, take-or-pay terms for new or "Greenfield" projects—with the exception of internally funded projects—will likely remain high as it is often necessary to finance a new project. Most existing contracts limit the buyer's ability to transfer cargoes to other buyers. Under destinations clauses, some contracts even limit the buyer's ability to take cargoes to alternate terminals owned by the buyer. Buyers are already requesting more flexible destination clauses and contracts like ConocoPhillips' Bayu-Undan agreement with Tokyo Gas and TEPCO—where the seller gets a share from certain redirected/ resold cargoes.

A.4 FOB versus CIF/ex-ship:

- **FOB:** In a FOB contract the buyer lifts the LNG from the liquefaction plant and is responsible for transporting the LNG to the receiving terminal. The buyer is responsible for the shipping, either owning the LNG ships or chartering them from a ship owner. Under an FOB contract the seller typically requires an assurance that the shipping protocols provide a safe and reliable off take of the LNG to prevent a disruption in the contract.
- **CIF:** Under a CIF contract, the seller is responsible for transportation and insures the cargo on behalf of the buyer. The buyer takes ownership of the LNG either as the LNG is loaded onto the vessel or during the voyage to the receiving terminal. Payment is made at the time ownership transfers.
- **EX-SHIP:** Under an ex-ship contract, which is more common than CIF, ownership of the LNG transfers to the buyer, as the LNG is unloaded at the receiving terminal and payment is due at that time.

In both FOB and CIF/ex-ship deals, the contract must delineate shipping related issues, including the obligation of a responsible party to provide sufficient LNG tankers to lift the contracted volume and relevant operating procedures.

A.5 Price:

Up to now, the LNG industry have developed as inter-regional business, there is no an international for LNG nor for pipeline gas. generally , the pricing procedures, a secret between the dealers , are tied in the contracts clauses .mainly, the well-known procedure were adopting special formulas to which was incorporated indexation factors to help integrating the changes occurring in the energy market . In this context it should be noted that in addition to the base-price formula the contract states procedures for price renegotiations under “a sudden change of circumstances.” Also, some buyers have a “side agreement” under their long-term contracts (namely the Japanese buyers) which allows for regular price reviews, usually every 4 to 5 years.

A.6 Force Majeure:

In essence force majeure is a clause that, under special circumstances, allows a party to be

Released of certain obligations that are specified in a contract. Force majeure is defined as, “Any circumstance which is beyond the reasonable control of the party effected and prevents or hinders due performance of obligations under the contract and which cannot overcome by due diligence.” It should be noted that force majeure is rarely invoked.

The contract provides details of the force majeure events such as acts of war, labor disputes,damage to facilities (which are not due to negligence), and failure of a third party to performunder a contract. If LNG cannot be delivered or received due to force majeure, such cargoes will operate either as a reduction to the basic contract quantity to be taken by the buyer during a relevant period, or as an exception to the buyer’s take-or-pay obligation for the period. Usually, the buyer restores the undelivered quantities in a subsequent period. The contract provisions normally require the parties to try to schedule the delivery of restoration cargoes before the end of the contract term.

A.6 Other Relevant Procedures:

In addition to these main terms discussed above, the contract includes other relevant procedures and details, such as quality of LNG, measurement and testing of LNG when it is loaded or discharged, invoicing and payment, and the applicable law.

b) **Contracts trends and flexibilityissues:**

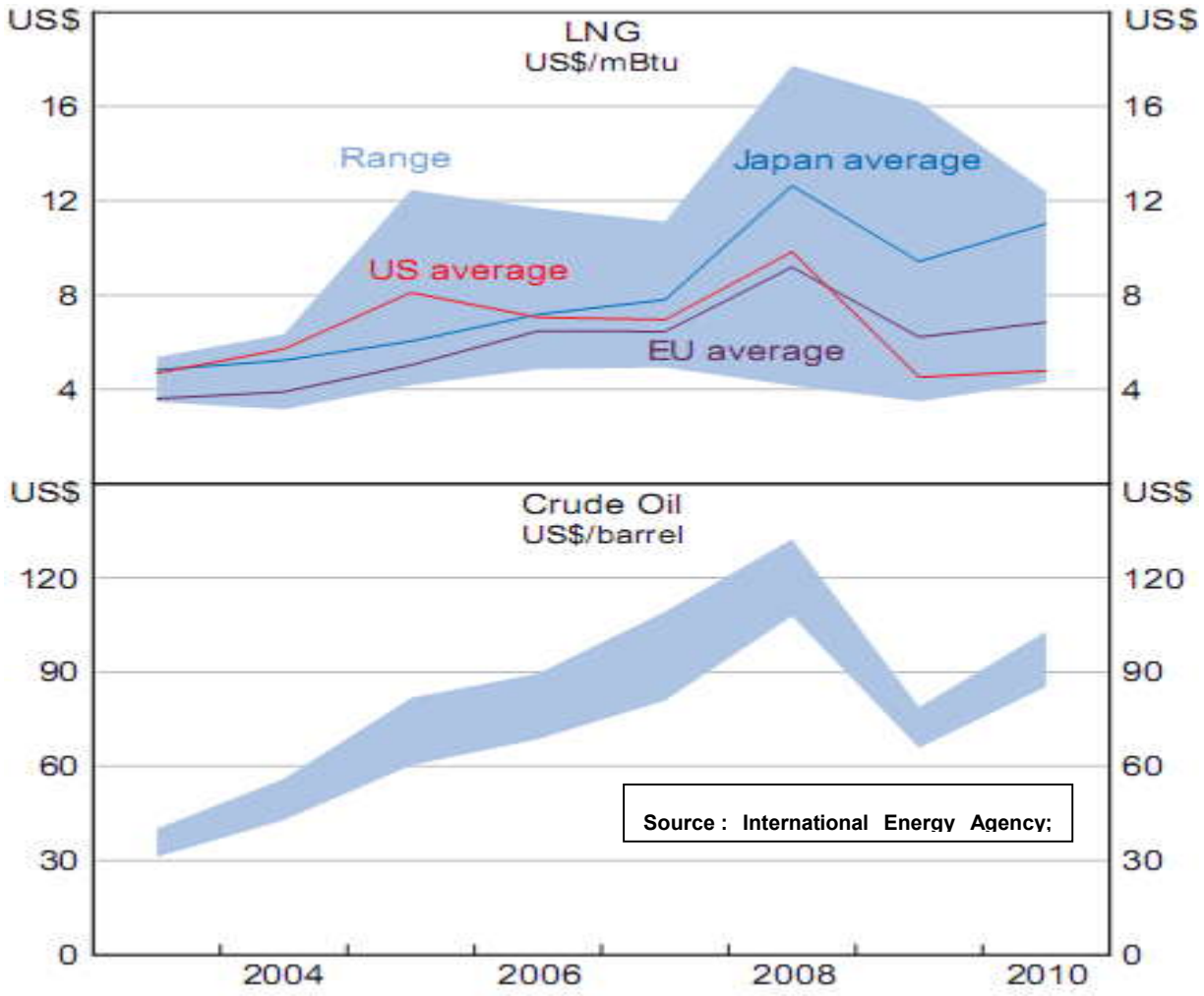
The LNG market is predominantly based on long term sales contracts between buyers and sellers. Long term supply contracts in the Asia Pacific market tend to be around 20 years in duration and often include take or pay and destination clauses. The use of long term contracts has enabled both buyers and sellers to undertake the large scale infrastructure investment involved in LNG transactions with some certainty. However, LNG contracts have become more flexible in recent years. Some of the newer contracts include less rigid take or pay and/or destination clauses, and free on board pricing. Buyers thus have more control over import destination and the ability to swap cargoes among themselves. Other recent changes in some contracts include increased flexibility in the timing of deliveries, and a reduction in the linkage of LNG prices to crude oil prices. Weakening the link to crude oil prices limits the subsequent fluctuation in LNG prices when oil prices rise or fall. Further, a number of LNG supply projects are being developed with a smaller share of production secured under long term contracts than in previous projects. Recent examples include MLNG Tiga and the Russian Federation's Sakhalin 2 project, the latter of which announced its final investment decision following sales agreements that amounted to less than half the capacity of the first of two proposed trains (Sakhalin Energy 2003).

c) Prices trends:

Because of the diversity in pricing arrangements, the segmented nature of the global market, and differences in gas quality, prevailing LNG prices can vary significantly around the world (Figure09). While only limited data are available, the highest reported LNG import price in 2010 was around three times the lowest reported price (on an annual average basis).

In contrast, there is much less variation in crude oil prices across the world. LNG prices have become more dispersed in recent years. This has been due primarily to different supplyand demand developments across regions, and between the gas and oil markets. After falling during the global recession, oil-linked contract prices in the Asia-Pacific have risen as a result of higher oil prices; the average cost of Japanese LNG imports from Australiahas doubled since its trough in 2009. However, spot gas prices in the Atlantic haveremained relatively subdued, particularly in North America, with the Henry Hub spot price having risen little since 2009. The low level of US spot prices has reflected large growth in unconventional gas production, as well as weak energy demand.

Figure 9: International LNG and Oil prices



LNG import prices are typically benchmarked to competing fuels.

- In the Asia Pacific market, LNG prices have generally been linked to the average price of imported crude oil as measured by the Japanese custom cleared crude oil price (JCC). Reflecting this link, regional LNG prices followed oil price movements fairly closely over the past decade. Higher LNG import prices in Japan and Korea since 2000, for example, have reflected higher international oil prices during this period.
- In Europe, LNG prices are related to those of competing fuels such as low sulfur residual fuel oil, although LNG prices are now beginning to be linked to natural gas spot and futures market prices in some countries.
- In the United States, the competing fuel for LNG pricing purposes is pipeline natural gas, and the benchmark is usually the Henry Hub price. Suchas, importers and exporters involved in US LNG transactions are exposed to a significant level of risk given the high degree of price volatility in US natural gas markets.

IV.4) the Emergence of Arbitrage to Link Prices among Regions

An important part of this new trading pattern is the emergence of arbitrage between markets. This phenomenon is the furthest developed within the Atlantic Basin, primarily involving supplies from Trinidad and Nigeria and markets in the United States and Europe (primarily in Spain). Thus gas moves to whichever market will offer the highest netback and flows shift accordingly.

Another pattern of arbitrage has developed between Northeast Asian markets and Atlantic Basin markets via shipments from the Middle East. Middle East suppliers, principally Qatar, are in a position to ship either to Asia or to the Atlantic Basin as markets dictate.

Arbitrage enables the trading company to divert cargoes to those markets that provide the highest netbacks. But the capability to arbitrage requires sufficient excess capacity in tankers and receipt terminals to take advantage of market opportunities when they occur. Some of the excess capacity is the result of the normal imbalances between supply and demand which can be utilized when available to seek out the best netbacks. The surplus receipt capacity in the terminals in the USA was in part a lingering result of the collapse of the Algeria/US trade in the 1980s.

But companies can elect to create excess tanker and terminal capacity in order to take advantage of arbitrage trading. However, the deliberate creation of excess capacity is not a costless exercise. To create an annual surplus capacity in receipt terminals of 25% involves about a 10% increase in the costs of regasification. The creation of excess tanker capacity through purchases of new build tankers is somewhat more costly. A 25% spare capacity may cause about a 21% increase in tanker costs. However, the short-term tanker trading has tended to concentrate on used tankers that are no longer in their original service. For such vessels the costs can be considerably reduced below new build excess capacity levels.

V) THE GLOBALIZATION OF THE LNG MARKET AND SHORT TERM TRADING:

LNG markets have traditionally been regional in nature, reflecting their geographic separation and the high costs of LNG transport. LNG prices also tend to be regional and are typically benchmarked to competing fuels in each market.

The present market for LNG is not that set of traditional regional isolated gas markets it hadbeen in earlier decades. There is an active arbitrage within Atlantic markets, with LNG cargoes diverted between the United States and Europe, depending on price. With the Middle East increasingly supplying both Asia Pacific and Atlantic markets, price signals can also be transmitted between the two regional markets. But nevertheless volumes of LNG in this type of trading are small compared with the size of the gas markets they serve. This is likely to limit potential gas market price linkages between regions. There are other limitations to the development of a global LNG market. These include difficulties associated with transporting LNG over long distances and differences in gas specifications between markets that is mainly the case for the USA. Besides, the LNG terminals are not constructed in such a way to cope with bigger ship size.

In 2012, spot and short term LNG trade accounted for around 12 per cent of total LNG trade, with more than 80 per cent sold to the United States followed by Spain and SouthKorea.

Some of the expansion in short term trading represents a genuine trend toward a more flexible, responsive and globalized LNG market. However, growth has also been fuelled by extraordinary circumstances mainly:

More flexible in recent years in response to buyer demands, with some of newer contracts including less rigid take or and/or destination clauses, free on board pricing and increased flexibility in the timing deliveries.

- Unexpected closures in Japan's nuclear generating capacity.
- Delays by the Korean Government in signing long term contracts.
- Some of the long term contracts approached their end (Japan)
- And the ability of some LNG plants to produce above design capacity.
- Uncommitted production capacity (Tiga in Malaysia).
- Availability of ships not committed to a specific projects.
- The increasing use of self-contracting by suppliers — that is, writing sales contracts

With their own marketing affiliates to keep their destination clause open.

However, the industry will continue to be underpinned by long term contracts. The use of long term contracts has enabled both buyers' sellers to undertake the large scaleinfrastructure investment involved in LNG transactions with some certainty. In fact now new LNG project launched without an anchor long term contract. An indication of the importance of these contracts is that despite the strong outlook LNG demand in the next few years, and the relatively few projects that can come on line in period, most projects continue to delay construction until significant volumes have been sold. The leading short term sellers are mainly Algeria, Oman, Qatar, Trinidad and Tobago and UAE.

Figure 10: LNG Exports by Contract Type 2010

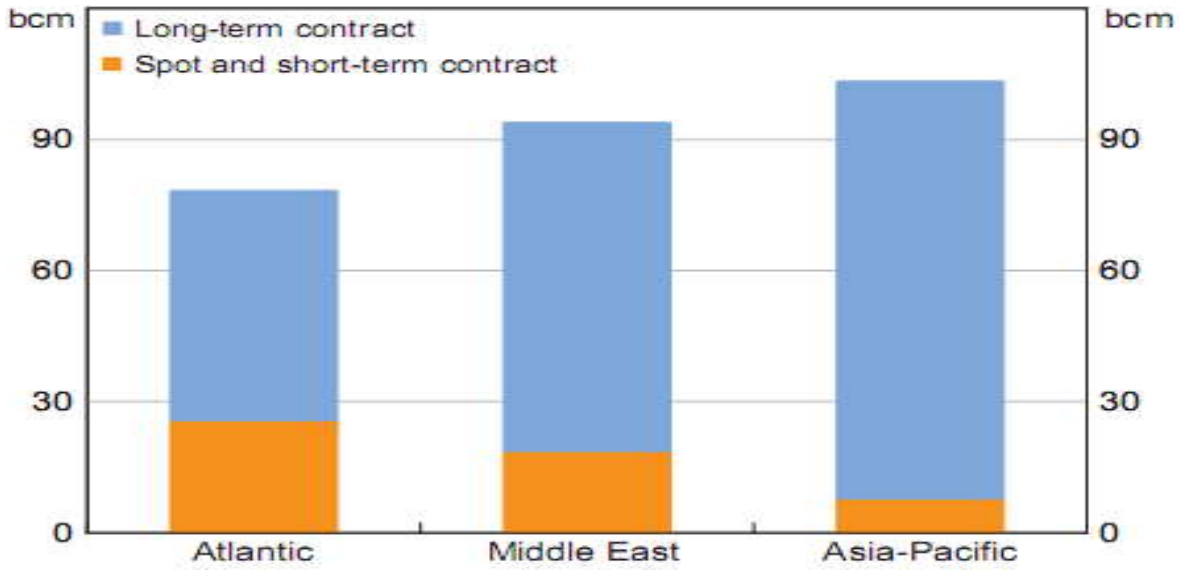
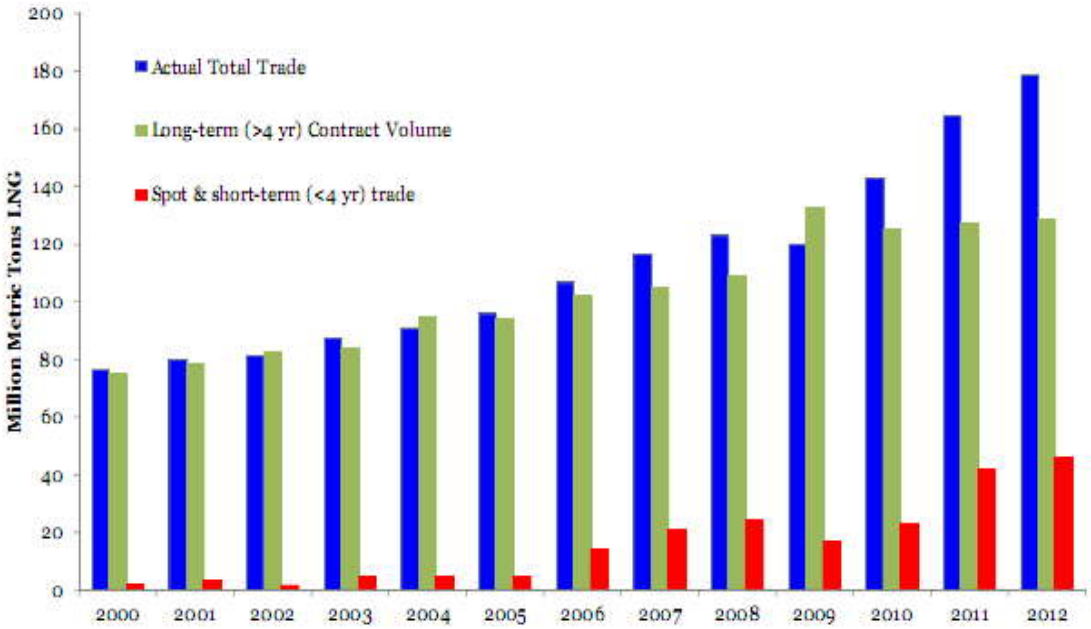


Figure 11: Increasing spot and short-term LNG Trade: pacific Basin



Source: International Group of Liquefied Naturel Gas Importers (GIIGNL)

CONCLUSION

World trade in LNG has grown dramatically over the last fifteen years. Trade in LNG has more than tripled, growing from just over 10 Bcf/d in 1997 to 32 Bcf/d in 2012. It is anticipated that this market will continue its rapid expansion as better production technology means more gas reserves worldwide are available for development while demand for energy, particularly for those with cleaner-burning properties, is expected to grow.

The LNG market is not – nor will it ever be – as flexible as the world oil market. The high costs of LNG transportation still make it difficult to move the commodity physically over long distances.

Only when there is surplus capacity in liquefaction plants and tankers can LNG compete in distant markets. The long-term contract in LNG has been the vehicle for sharing the large up-front investment risks that characterize LNG projects. The short-term LNG market, while growing, still remains at less than 12% of total trade. But more significantly, no new LNG train has been launched without at least some long-term contract coverage. Thus it appears that the long-term contract in LNG will remain a mainstay of international LNG trade even if it has all but disappeared in onshore North America. The concept of using financial derivatives to manage risk on these multi-billion dollar projects is probably unrealistic.

Nonetheless, the declining costs of delivering LNG, the growing diversity of supply sources and a loosening of the traditional rigid industry structure, have created a system which can transmit price signals freely between previously isolated regional gas systems. Small shifts in sources and destinations can provide a basis for international price arbitrage. Even if the volumes are not that large compared to the size of the markets they serve, but price arbitration will have its limits in actually establishing long-term price equilibrium among different gas market regions. In each market, LNG will add to supply and thus influence the supply/demand/price relationships. But it is unlikely in fact that they will determine prices in most markets. If that more ambitious goal is the definition of a 'global gas market', LNG may well not live up to expectations.

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International Gas Union Research Conference
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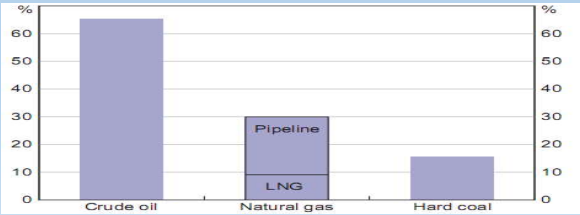
Gas Innovations Inspiring Clean Energy

THE GLOBALIZATION OF THE LNG MARKET

Will the LNG market be as flexible as the world oil market?

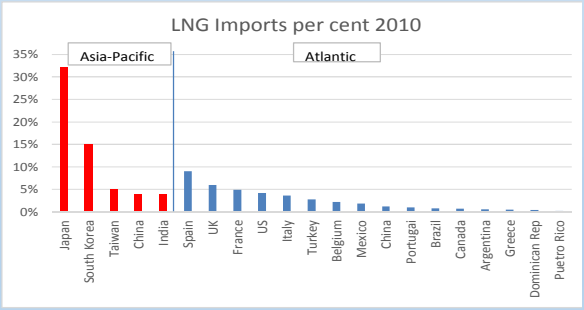
Gas has grown from a marginal fuel consumed in regionally disconnected markets to a fuel that is transported across great distances for consumption in many different economic sectors. Increasingly, natural gas is the fuel of choice for consumers seeking its relatively low environmental impact, especially for electric power generation. As a result, world gas consumption is projected to more than double over the next three decades. While gas consumption has risen strongly, indigenous gas production in many countries has not expanded at a similar pace. With many of the world's gas reserves located far from centers of demand, gas trade has become increasingly important. In particular, trade in liquefied natural gas (LNG).

The LNG market is characterized mainly by two regions; the Pacific Basin players and the Atlantic basin players.

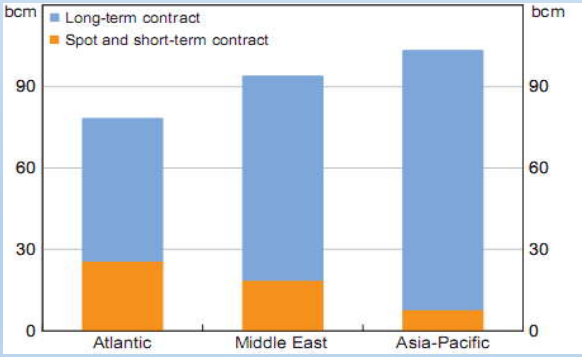


International trade in energy commodities in 2010

Worldwide LNG supplies are plentiful, but the problem is would the proposed LNG terminals be approved and constructed at the right time to face LNG growth , in addition, the Current U.S natural gas specification could be an limiting factor for this growth. the long-term contract between buyer and seller for LNG – known as the Sale and Purchase Agreement or SPA was characterized by: the volume obligation which was embodied in the take-or-pay clause and the limitation of the ability of the buyer to resell any surpluses that he might experience to his own account embodied in the 'Destination restriction' clause. The risk sharing logic of the contract was embodied in the phrase 'the buyer takes the volume risk and the seller takes the price risk'.



Nowadays knew the emergence of the short-term LNG market which was virtually nonexistent a few years ago and the future would be as dramatic as the changes in the oil market after 1973-80, one other feature of the LNG market today is the possibility of arbitrage which enables the trading company to divert cargoes to those markets that provide the highest netbacks. But the capability to arbitrage requires sufficient excess capacity in tankers and receipt terminals to take advantage of market opportunities when they occur. The global LNG marketplace is really just a vision till now. But it can blossom and can prosper and the world will see an evolution from several regional LNG markets to a truly global market.



LNG Exports by Contract Type 2010

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