

DRIVERS FOR DEMAND OF LIQUEFIED NATURAL GAS (LNG) IN A GROWING GLOBAL MARKET

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Abstract

Global demand for natural gas is expected to expand significantly as more Nations adopt environmentally cleaner fuels to meet future economic growth and prioritize alternatives to minimize the impact of increasing oil-based energy costs. The environmental benefits of natural gas are obvious. Natural gas emits 43% fewer carbon emissions than coal and 30% fewer emissions than oil, for each unit of energy delivered. Many of the most rapidly growing gas markets are in emerging economies in Asia, particularly India and China, the Middle East and South America - economies which battle the balance between air quality and living standards on a daily basis. According to the U.S. Energy Information Agency (EIA), worldwide natural gas demand grew by 57 Bcf/d from 2000 to 2007, an increase of nearly 25%. The EIA also projects global natural gas demand to grow over 40 Bcf/d by the year 2015 and projects a further growth in demand of over 50 Bcf/d by 2025.

LNG is the fastest-growing component of the global natural gas market, increasing at a 7% annual rate over the last decade. For countries that lack indigenous natural gas resources and delivery infrastructure, LNG represents a rapid and cost-effective means of introducing natural gas into their local fuel mix. Currently there are 25 LNG-importing countries in Europe, Asia, South America, Central America, North America and the Middle East, as against 17 importing countries in 2007. Numerous developing countries, including Poland, Croatia, Bangladesh, Jamaica, Colombia, Panama, El Salvador, Costa Rica and Lebanon, among others, are considering plans to build new LNG terminals and enter the global LNG trade.

The past few years have indeed been transformational for the LNG industry and 2010 was an equally eventful year. With volumes having doubled between 2006 and 2010, LNG has become an increasingly important medium for transporting natural gas across borders. Countries which used to be small LNG importers have now emerged as major buyers, while several others have now joined the list of LNG importers. Latin America, the Middle East and Southeast Asia will all become importers by the end of 2011. This paper lists the driving factors for the growing global LNG market and how traded LNG volumes have doubled over the last decade with several new countries joining the LNG market.

Keywords: *Liquefaction, regasification, OECD regions, LNG Ships, Charterer, Spot Market*

Introduction:

While the global natural gas market is large and growing, only a small portion of international trade is transacted based on liberalized spot market prices. The pricing paradigm underpinning the world's gas trade is heavily dominated by oil indexation, which adjusts prices for natural gas by referencing lagged oil product prices. Oil indexation is the dominant method for long-term contracting across Europe

and Asia, and has historically defined terms between suppliers and customers of LNG projects. In 2008, only 16 Bcf/d of the international gas trade was transacted on the basis of spot gas pricing, and the bulk of this trade took place between Canada, the U.S. and Mexico.

Oil indexation pricing practices have come under unprecedented strain in recent years, as a rise in U.S. natural gas production has coincided with

the start-up of large-scale LNG supply trains in the Middle East and Asia-Pacific to create a global gas supply bubble, at the same time that major gas consuming countries have seen a retrenchment in demand owing to the global recession.

The result has been an increased spot-LNG sales, and surging liquidity at freely traded gas hubs, particularly in Northwest Europe. There, wholesale buyers have opted for cheaper spot gas and turned down to minimum or, even below minimum, thresholds for buying oil-indexed gas. This development resulted in the partial or temporary “re-engineering” of many traditional long-term oil indexed contracts to avert crisis, but has opened the door further toward the unified and liberalized gas market European policy makers aim for. [1]

The growing gap between prices for oil and natural gas in freely traded markets is widely expected to persist and potentially widen. Whereas gas is increasingly available and can be transported to markets by both pipeline and LNG, oil prices are widely expected to be pressured upward by demand for transportation fuels in emerging economies, led by China and India. This dynamics has encouraged established LNG buyers to consider alternative pricing mechanisms for their gas supply, such as indexation to the US Henry Hub market hub, to meet their future demand needs.

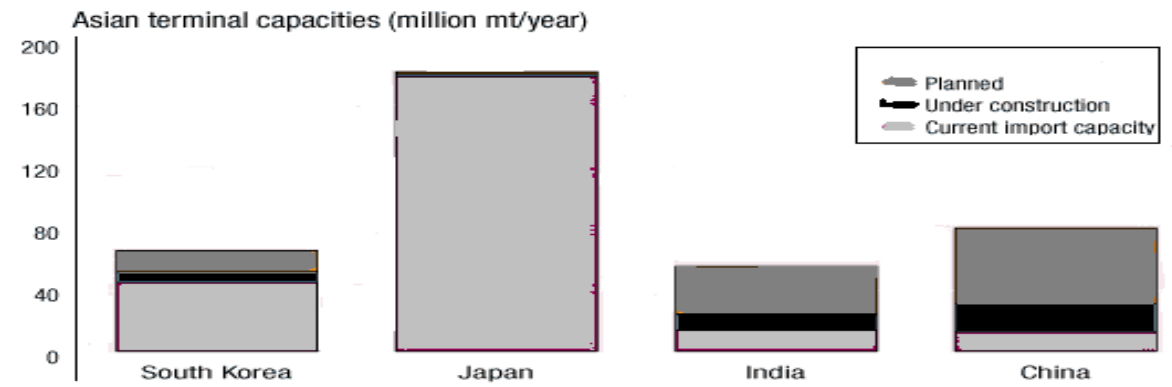


Figure 1: Asian Terminal capacities – current scenario for cargo handling

Lng Shipping Sector: High Demand, High Profit particularly after Japan earthquake:

Like oil, LNG is now shipped all over the world. It has become one of the most profitable parts of the global energy patch. Shipping LNG is the most profitable sector in the global shipping industry.

Day rates are soaring for these large ocean tankers. According to Fearnley LNG, a unit of Norway’s second largest ship-broker, LNG tanker rates rose to \$97,630 last year from \$43,663 in 2010.

Daily rates are expected to average \$147,000 in 2012 — a big rise from the low \$40,000s in early 2010. The gross operating profit is now very high for ship owners at the 2012 price levels. [2]

It wasn’t always such a profitable business, though in the middle of the last decade, most shipping firms avoided running LNG tankers. The sector was written off as expensive, moribund and not likely to earn anyone a profit.

The LNG industry bottomed out during the period 2006-2010. The shipping industry had geared up for huge LNG imports into the US,

ordering a lot of ships. They were delivered on time, but then, to everyone's surprise, US gas production started to increase because of the shale revolution, and gas prices in the US started to go down making LNG imports into the US uneconomic. And so that liquefaction capacity, where LNG is returned to its regular gaseous form that is used to heat your home was never built.

Asia did start ordering a lot of LNG contracts, but with a glut of supply, they were able to offer the ship owners only marginal returns. Nearly all gas was moved on ships signed on with charters of 20 or 25 years.

A short-term and more profitable spot market never really developed for such vessels. This forced many tanker owners to idle their ships. These are vessels that had cost them about \$200 million plus each. As recently as two years ago, roughly one-third of the world's 374 LNG carriers were laid up or out of use. But today, every single LNG ship that is seaworthy is active. There is ZERO spare capacity, anywhere in the world. With high costs to build new ships, and low returns, the industry has not ordered new ships for a few years.

Then events occurred which shook the industry. The devastating earthquake and tsunami in Japan on January 2011 forced the closure of many of its nuclear power facilities. This forced Japan, which was already the world's largest importer of LNG, to import even more. Luckily for that Country, it had already embarked on a major project to expand its existing LNG terminals and to build new ones. The CEO of Norway's Hoegh LNG said in May 2011 "I've been in the LNG market for more than 20 years and I've never seen the market change this rapidly or this strongly."

In addition to Japan, the next two biggest importers of LNG are South Korea and China. In total, Asia accounts for about 60% of global demand for LNG, and their imports are still

rising. So after the Japanese earthquake, the industry's supply/demand fundamentals – which were already turning positive – accelerated the revival in LNG shipping.

Demand for LNG, particularly from Asia where natural gas ranges from between \$15 and \$20 per million BTUs rose due to the Japanese disaster and economic growth. To take advantage of the higher prices in Asia, energy companies vied for unused LNG tanker capacity around the world, offering tanker owners higher prices and an unprecedented range of short-term contracts in the spot market. The CEO of one of the world's biggest LNG carrier owners BW Gas, Andreas Soehmen-Pao, spoke of the change in the market, "What has happened... is that the destinations have become more flexible, to the extent that cargoes will move according to price differentials."

According to Bloomberg, there were 13 ships redirected to Asia from Europe. For the first time in history there is now a truly global natural gas market thanks to LNG. In fact, LNG imports into Japan alone this year are expected to hit a record of 79 million metric tons, according to Norway's Arctic Securities. Now all of the world's LNG ships were brought back into use after the Japanese earthquake. Rates in the once-sleepy spot market for transporting the commodity revived to a level where owners are again able to operate their ships very profitably.

Thus, LNG shipping is now one of the most profitable subsets of the global energy sector. LNG shipping companies are now ordering new vessels in order to meet the surging demand. But there will be a very tight LNG shipping market for several years. That means day rates, company cash flows and investor profits in this sector should increase as well. ^[3]

There are four major reasons for this:

- The huge capital cost of a ship which is a barrier to more competitors entering the industry.
- One is that there are but a few LNG shipping companies.
- Rome wasn't built in a day and neither are LNG tankers. It now takes two years from start to finish.
- Very few companies make LNG tankers and getting a spot in their production schedule is very difficult.

And the most important reason over the above mentioned ones is In conclusion, there is growing demand for LNG from the likes of Japan, South Korea and China keeping natural gas prices high. And there is increased production of cheap natural gas from Qatar and Australia, so shipping LNG to capture that price gap makes sound economic sense right now. If the US can permit LNG export terminals to bring its super cheap gas into the global LNG mix, the LNG shipping sector will get busier... and become more profitable yet.

Drivers for Demand of LNG:

The consumption / demand for LNG have been increasing in recent years due to a number of factors:

- Global economic growth and energy demand are increasing.
- Natural gas is a cleaner burning fuel than coal and oil, encouraging an increase in power plants that run on natural gas.
- Natural gas is widely applicable as a fuel source for power generation, industry and commerce.
- The consumer trend is to greater diversity of fuel sources.
- The natural gas market is undergoing deregulation in several key markets.

- LNG prices have dropped as the cost of liquefaction and regasifications have declined. This is due to improved technology, efficiency gains and more competition.
- LNG vessel construction costs have declined, resulting in lower shipping costs.
- Domestic gas production in many areas is insufficient to meet rising energy demand. These factors are represented in Fig.2, below

A Growing Global Market:

Total demand for natural gas is projected to increase from 3,149 billion cubic meters (bcm) in 2008 to 4,535 bcm in 2035. This is a 44% increase over the period at an average annual growth rate of 1.4%. 84% of the increase in global gas use in the period to 2035 is expected to come from non-OECD regions. Chinese demand is expected to grow by 5.9% p.a., more than any other region, driven by booming demand in the power, residential and industrial sectors. Demand in the Middle East, non-OECD Asia (in particular India) and Latin America is also expected to grow rapidly over the forecast period. ^[4]

Despite much less rapid economic growth, North America and Europe still account for 12% of the expected growth in world gas consumption to 2035. In many cases, gas continues to be the favored choice over coal and oil for environmental reasons, especially in power generation.

In Europe, carbon penalties help gas to compete against more carbon-intensive coal in the power sector and heavy industry. Inter-regional natural gas trade is projected to increase from 670 bcm in 2008 to 1,187 bcm in 2035. This is a 77% increase over the period at an annual average rate of 2.1%. Trade rises much faster than demand due to the pronounced geographical

mismatch between regions of production and consumption. The volume of LNG trade is projected to increase from 210 bcm in 2008 to 500 bcm in 2035. The share of LNG in total natural gas trade versus pipelines is projected to grow steadily from 31% in 2008 to 42% in 2035.

Japan, Korea and India are the biggest Asian importers. In 2009 these countries received about 55 percent of total global LNG trade. Spain, France and the US are the Atlantic Basin's biggest importers closely followed by the UK. China is currently the world's ninth largest LNG importer and is expected to become a major buyer of LNG in the future.

Qatar, Malaysia and Indonesia are the biggest producers accounting for 44% of all LNG exports in 2009. Other major producers include Nigeria, Algeria, Australia and Trinidad & Tobago.

The pattern of global LNG trade is expected to change in the future. Up to now LNG trade has been concentrated in the Asia-Pacific region with gas sourced from Asia and the Middle East. Although this market will continue to expand, LNG demand from the Atlantic basin is also expected to increase.

As of June 2010 global liquefaction capacity totaled around 360 bcm per year. An additional 77 bcm per year is under construction while a further 500 bcm per year is currently in the planning stage. Australia, Nigeria, Iran and Russia account for 77% of the planned new production capacity, though not all of these projects are expected to come online due to political and economic barriers.

The global LNG fleet is growing rapidly to meet increasing demand. As of November 2010 there were 360 LNG vessels in service with a further 24 vessels on order.

Evolution of New Asian LNG Market:

Asia's LNG market is set to come of age in 2011 as the volatility of the last few years has shaken up the region and increased players' appetite for a more sophisticated approach. Demand in Asia bounced back in 2010 on the back of extreme cold and hot temperatures coupled with economic recovery across the region, after the global financial crisis at the end of 2008 curtailed LNG cargoes purchased in 2009.

Requirements for 2011 are expected to remain robust among traditional buyers, while a series of new players are also entering the fray. The region continues to be the dominant force in LNG. Growing shale gas production in the US has reduced the need for imports there to virtually nil. Europe's gas demand remains largely focused on pipeline imports, while the growth in LNG imports into the northwest of the continent has been offset by a decline in imports into the southwest.

While the final figures for 2010 have yet to be collated, the previous year saw Asia take 62.8% **[see Table:1]** or 1.09 billion barrels of oil equivalent of the world's total imported LNG, according to data from independent LNG consultant Andy Flower. And the initial data for last year give every indication of repeating that pattern. Japan's LNG imports in 2010 were up 8.6% year on year at 70.01 million mt, reaching a new record for annual volumes and surpassing the pre-financial crisis level seen in 2008 of 69.26 million mt, customs data from the Ministry of Finance show. The figure looks all the more impressive when compared with 2009's dramatic drop in imports to 64.49 million mt. [See Table: 1]

Similarly, South Korea's 2010 LNG imports were up 26.26% year on year at 32.6 million mt, from 25.82 million mt in 2009, according to the country's customs data compiled by Platts over the year. But, Asian buyers imported more LNG

in 2010 compared to the previous year. Meanwhile, though the traditional buyers in Japan and South Korea, which currently have almost 180 million mt/year and 40 million mt/year of LNG import capacity respectively, will likely continue to remain the dominant force in the market, Asia's largest countries are beginning to make their presence felt.

China and India are building a further 20 million mt/year and 10 million mt/year of regasification capacity respectively. Two Chinese LNG terminals, both being built by state-owned PetroChina, will startup this year -- the 3.5 million mt/year Rudong facility in April and the 3 million mt/year Dalian terminal in June -- bringing China's total import capacity to 18.8 million mt/year.

And a further three terminals are due for completion in the following few years. Meanwhile India has two terminals under construction, building on its existing import capacity of 13.6 million mt/year. And, like China, there are plans for a host of further regasification facilities in India in the years ahead.

The GDPs of China and India are projected to grow by around 10% this year and in 2012,

outperforming both Japan and Korea at 2% and 5% respectively over the same period, according to the IMF World Economic Outlook. Coupled with state support for gas use, there is significant potential for increased LNG imports into the two countries.

But despite their muscular economies and large populations, China and India have both faced constraints on their LNG imports in the last year or so, with the former's ability to bring in shipments curtailed by a small number of import terminals and limited storage facilities, while India is limited by the capacity of its downstream gas pipelines.

And any forecasts are further clouded by the potential for domestic production of unconventional gas coalbed methane and shale gas in both countries, which could limit the need for LNG purchases in the future. Japan is the world's largest importer of liquefied natural gas (LNG) followed by South Korea and Spain, according to the 2008, 2009 and 2010 data. Sustained oil prices over \$100 a barrel, as a result of instability in the Middle East & North Africa, could also have a negative effect on economy of Asia.

Table: 1-Quarterly LNG Imports in 2008 and 2009 ^[5]

Importers	1Q08	2Q08	3Q08	4Q08	Total 2008	1Q09	2Q09	3Q09	4Q09	Total 2009	%Change 4Q09/4Q08	%Change 2009/2008
Japan	18.1	16.6	17.6	17.0	69.3	16.9	14.7	16.4	16.5	64.5	-2.9%	-6.9%
Korea	9.4	5.8	5.2	7.7	28.2	8.5	4.5	3.5	8.5	25.0	9.6%	-11.2%
Taiwan	1.9	2.5	2.8	2.0	9.1	1.4	2.3	2.7	2.3	8.9	14.0%	-3.8%
India	2.2	2.1	2.0	1.9	8.2	2.0	2.5	2.8	2.3	9.6	18.0%	16.1%
China	0.5	1.0	1.1	0.7	3.3	0.9	1.2	1.9	1.6	5.6	120.2%	66.5%
Kuwait	-	-	-	-	-	-	-	0.5	0.2	0.7	-	-
Total Asia	32.1	28.0	28.7	29.3	118.1	29.8	25.2	27.8	31.2	114.1	6.6%	-3.4%
France	2.4	2.4	2.0	2.6	9.5	2.6	2.5	2.0	2.8	9.9	5.7%	4.1%
Spain	6.0	5.3	5.1	5.6	22.1	5.2	4.7	5.2	5.0	20.1	-11.5%	-9.0%
Portugal	0.5	0.6	0.5	0.4	2.0	0.6	0.6	0.5	0.4	2.1	-13.1%	7.7%
Turkey	1.5	1.0	0.7	0.9	4.1	1.4	0.8	0.9	1.4	4.5	55.1%	8.8%
Belgium	0.5	0.6	0.3	0.6	2.1	1.3	1.4	1.2	0.8	4.7	19.2%	126.9%
Italy	0.5	0.2	0.3	0.3	1.3	0.2	0.3	0.3	1.6	2.3	448.8%	74.6%
Greece	0.2	0.1	0.1	0.2	0.7	0.3	0.1	0.1	0.1	0.6	-57.5%	-14.4%
UK	0.2	0.1	0.0	0.6	0.8	0.9	1.3	2.4	3.5	8.1	518.0%	890.2%
Total Europe	11.9	10.3	9.0	11.3	42.5	12.5	11.7	12.5	15.5	52.2	36.5%	22.8%
USA	1.6	2.0	2.0	1.7	7.2	1.8	3.2	2.3	1.9	9.2	12.8%	26.6%
Puerto Rico	0.1	0.2	0.2	0.2	0.7	0.1	0.1	0.2	0.2	0.5	-14.3%	-18.0%
Dominican Republic	0.1	0.1	0.1	0.1	0.4	0.1	0.1	0.1	0.1	0.4	90.3%	20.8%
Mexico	0.6	0.8	0.8	0.5	2.7	0.4	0.6	0.9	0.8	2.7	40.7%	-2.4%
Canada	-	-	-	-	-	-	0.1	0.3	0.5	0.9	-	-
Argentina	-	0.1	0.2	-	0.3	-	0.3	0.4	0.1	0.7	-	122.2%
Chile	-	-	-	-	-	-	-	0.2	0.2	0.4	-	-
Brazil	-	-	-	-	-	0.1	0.1	0.2	0.1	0.5	-	-
Total Americas	2.4	3.2	3.3	2.5	11.3	2.5	4.4	4.5	3.9	15.3	56.6%	35.4%
World Total	46.3	41.5	41.0	43.1	171.9	44.8	41.3	44.9	50.6	181.6	17.3%	5.6%

Note: LNG imports are 0.116mt lower than exports because there were two reloaded cargoes (one from Zeebrugge, Belgium and one from Freeport, USA in transit at the end of the year. These cargoes were recorded as exports when they were unloaded at their original destination but they will only be recorded as imports when they arrive at their final destination.

Source: Independent LNG Consultant Andy Flower

Thus the LNG demand is driven by many factors which are presented in a systemic diagram as shown below:

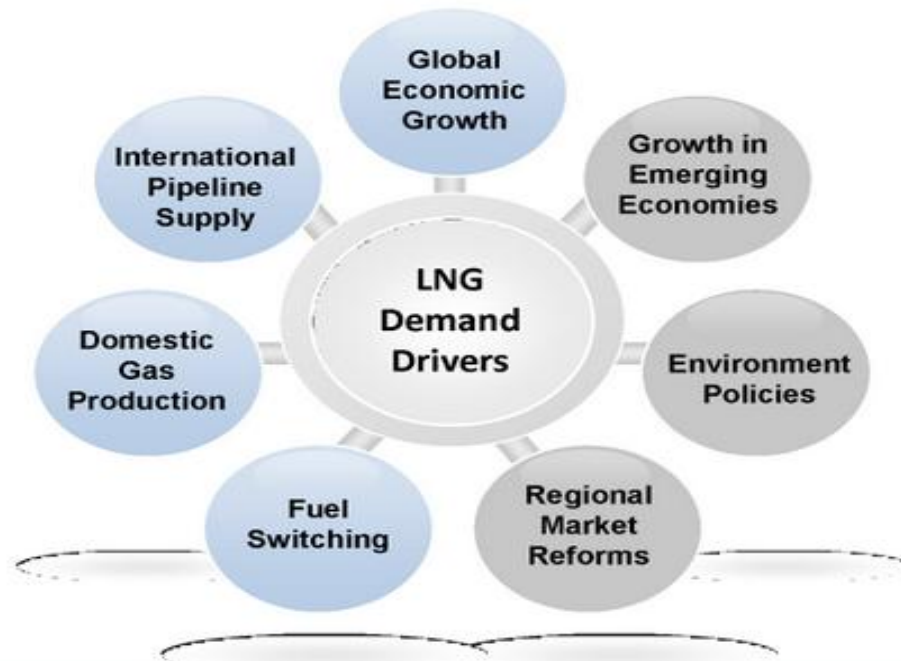


Figure 2: Global and Regional Issues Driving LNG Demand

Conclusion:

There is a bubble in global shipbuilding and not only is it growing every day, it is keeping the entire industry afloat. The bubble is demand for the ships that carry the world's fastest growing energy source, liquefied natural gas (LNG). Today, global demand for LNG is rocketing, assisted largely by the flight from nuclear power after reactor meltdowns at Japan's Fukushima Dai-ichi nuclear plant a year ago. And the demand for LNG ships to deliver this specialist hydrocarbon energy source is tied to the rocket's tail. "So, day rates [to charter] LNG ships in 2010 were US\$37,000. Those rates soared to a peak of \$160,000 in 2011. And even though they've come down a bit, they'll still likely average around \$140,000 in 2012, possibly even going as high as \$200,000 per day," says Matthew Carr, an analyst with Investment U Research in the United States. "If you're doing the math, a jump in rates to \$200,000 would be a 441 per cent increase in just two years. And here's the other kicker, there's a shortage of

LNG carriers."The existing global fleet of 365 LNG carriers is 98 per cent utilised, and brokers such as Clarksons of London say usage is not likely to fall below that level until 2015.

Also, LNG carriers are highly complicated ships to manufacture, and few shipyards have the capability to build them. Suddenly, however, the world needs more of them. From five LNG carriers on order in 2010, there are now more than 70. However, there needs to be over 100 more if the required 175 new LNG tankers are to be built by 2017 to meet rising demand from China and Japan. And that does not even begin to deal with the growing LNG spot market. Needless to say, the shipyards are delighted. Within the past month South Korea's two leading shipbuilders announced a slew of new orders. Hyundai Heavy Industries won orders worth \$1.1 billion (Dh4bn) to build four LNG carriers for an unidentified European company, while its affiliate Hyundai Samho Heavy Industries secured a separate

contract with Norway's Golar LNG for two LNG carriers with options for two more. The vessels are expected to be delivered between the second quarter of 2014 and the first half of 2015. STX Offshore & Shipbuilding also announced orders for two LNG carriers in a \$395 million deal with Sovcomflot of Russia.

A report by Danish Ship Finance showed the size of the global order book is 46 per cent below the 2008 peak and expected to be almost halved within the next 12 months. "Shipowners' ability to take delivery is correlated with the situation in the freight markets and the ship financing squeeze," the report said. "If market conditions deteriorate any further some owners may fail to take delivery in 2012, not to mention that their appetite for ordering new vessels will be reduced." For the South Korean and Chinese yards with LNG-vessel capability, however, the prognosis is brighter. "We expect that South Korean shipyards together with the largest Chinese shipyards will be the better positioned to stick it out over the next two years," said the Danish report, but it warned: "On average, we forecast that new building prices for less sophisticated vessels [non-LNG vessels] and shipyard profitability could decline by as much as 15-20 per cent in 2012." Most of these LNG orders are not "flash-in-the-pan" contracts but are a function of the long-term nature of the LNG business, says Lloyd's Register. "Most LNG carriers ordered to date have been associated with big gas projects, such as Qatargas out of Ras Laffan, or Australia's Pluto gas project," says Nick Brown of Lloyd's Register. "They are part of so-called LNG trains supplying LNG on a dedicated route, like floating infrastructure, and are part of 20 to 25 year projects." But many new ships have been ordered on the basis that

there was an expectation that a large spot market would develop.

"The industry newspaper TradeWinds agrees, reporting: "If there is a shipping sector to be in

right now it is LNG." "The LNG carrier order book has a strong presence of independent owners," says Mike Corkhill, the editor of LNG World Shipping. "Greek ship owners, Owners in northern Europe and Scandinavia, Japanese owners."^[6]

The overwhelming majority of their LNG ship orders have been placed on a speculative basis. The fact that almost 90 per cent of the current fleet is fixed on long-term charter means that relatively few LNG carriers are available to meet the industry's spot cargo and short to medium-term needs," says Mr Corkhill. "This will ensure that owners with uncommitted ships will continue to accrue healthy returns for at least the next two years. "But as early as last September, the international energy analyst Wood Mackenzie was warning against this building boom. "While near-term prospects remain good, the danger is that ships ordered in today's rising market are likely to be delivered into a declining freight market," wrote Andrew Buckland, Wood Mackenzie's senior LNG shipping analyst. He predicts the bottom will fall out of LNG charter rates as ship orders are filled and new gas-supply projects in the Pacific Basin come on stream, removing the need to move LNG cargoes over long distances. "Ships ordered now which will be delivered around 2014-2015 have no guarantee that new supply projects will choose to charter these vessels rather than order their own purpose-built ships," Mr Buckland says.

"If the recent wave of speculative LNG ship orders were to continue, they would risk uncertain employment upon delivery." Current charter activity would seem to reflect Mr Buckland's warnings that the bottom will eventually fall out of the market. Recent reports in TradeWinds show charter rates up to three years ahead holding firm. The integrated energy firm Eni recently chartered the 174,000-cubic-metre LNG carrier Stena Crystal Sky for three years at about \$145,000 per day. However,

"longer-term deals of five years plus on some of the LNG new buildings are being quoted at between \$80,000 and \$85,000 per day, with the majors pushing for daily levels of sub-\$80,000", the shipping journal reports

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