

A Global Perspective on LNG*

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Search and Discovery Article #70102 (2011)

Posted July 31, 2011

*Adapted from oral presentation at AAPG Annual Convention and Exhibition, Houston, Texas, USA, April 10-13, 2011

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Abstract

The first commercial supply contracts over LNG supply were signed in the early 1960s between Algeria and the United Kingdom and France (Atlantic market). The United States started shipping LNG from Alaska to Japan in 1969, establishing the Pacific market. By the end of 1970s new liquefaction capacity was installed in Algeria, Libya, Alaska, Brunei, Abu Dhabi, and Indonesia. LNG buyers and new receiving terminals evolved in the UK, France, Japan, the U.S., and Italy, later in Belgium, Spain, Taiwan, and Korea. In the 1980s, only two new exporters entered the market: Australia and Malaysia. Between the 1970s and 1990s the Asian market dominated world trade; in 1984 Japan purchased 72% of world's LNG, mainly used for power generation. Only in the late 1990s Europe and North America have renewed their interest in LNG. The Middle East joined the world market with supplies to both the Atlantic and the Pacific Basins.

Until recently all LNG supply was organized on a project basis; buyers and sellers built the supply chain together. Huge upfront investment cost induced partners to agree on long-term commitment; supply contracts were signed for a period of 25-30 years. To share risks and rents contracts included "take-or-pay" clauses. Such contracts fixed the price a buyer is obliged to pay and the quantity a seller is obliged to deliver. In some contracts price had been fixed for the whole duration of the contract, while in others the price could be renegotiated if market conditions changed. Except for the U.S. and UK, the LNG prices in Northeast Asia were linked to crude oil prices and those in Europe were pegged to a mix of fuel oil and pipeline gas prices. Although such contracts continue to dominate the market, LNG trade has become increasingly flexible, with growing short-term and spot trade and destination diversions becoming more common. Although there is no consensus on significance and pace of these developments, it is generally accepted that arbitrage opportunities have increased. Shale gas boom in the U.S., hurricanes in the Gulf of Mexico, extreme cold weather in Europe, hydro shortage in Spain, nuclear outages in Japan and more "remote" factors can now impact LNG movements and prices around the

globe. Equally, availability of flexible and spot LNG cargoes impact investment in upstream gas projects, including shale plays as well as investment in long distance pipelines. Large LNG suppliers such as Qatar play a central role in these developments.



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Global Perspectives on LNG

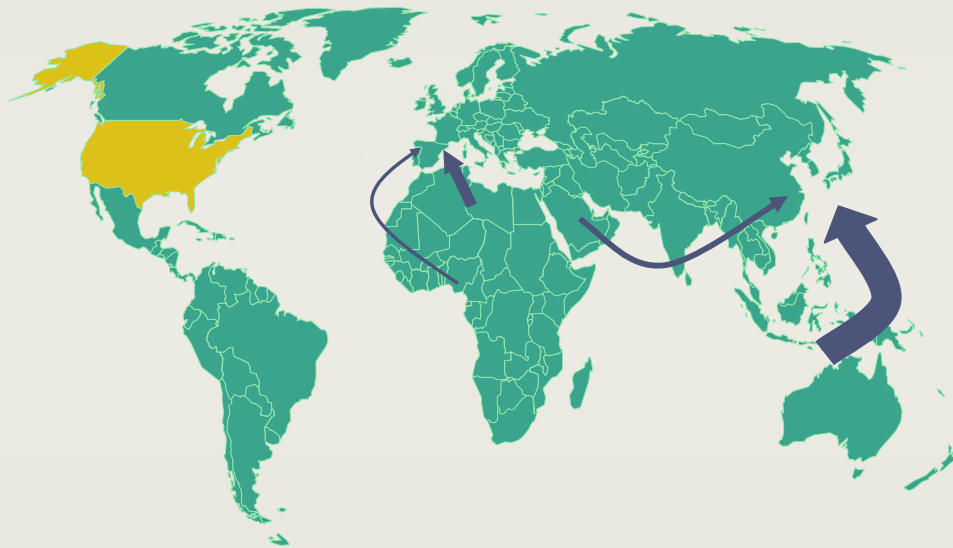
AAPG 2011 Annual Convention & Exhibition

April 12, 2011

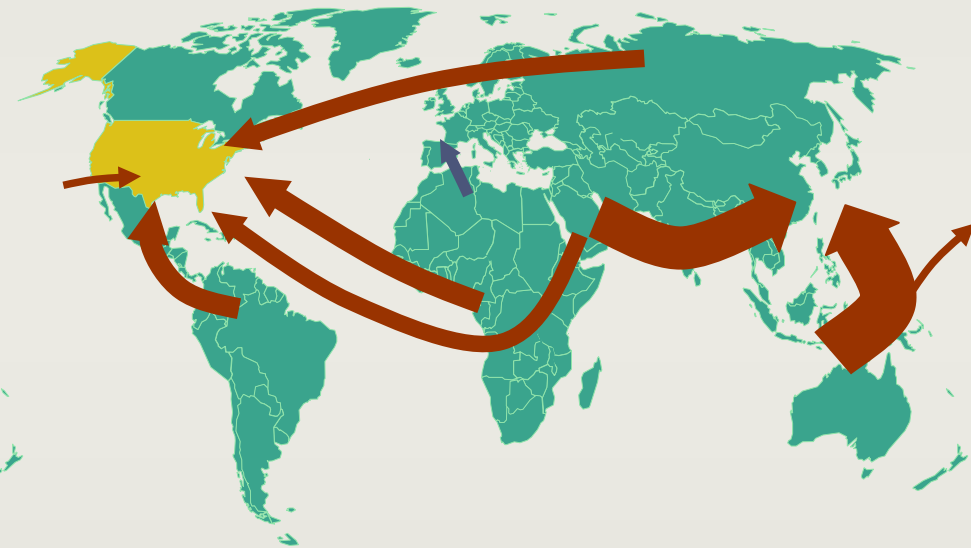
Gürcan Gülen, Ph.D., Senior Energy Economist

Global LNG Trade – Expectations Few Years Back

2000



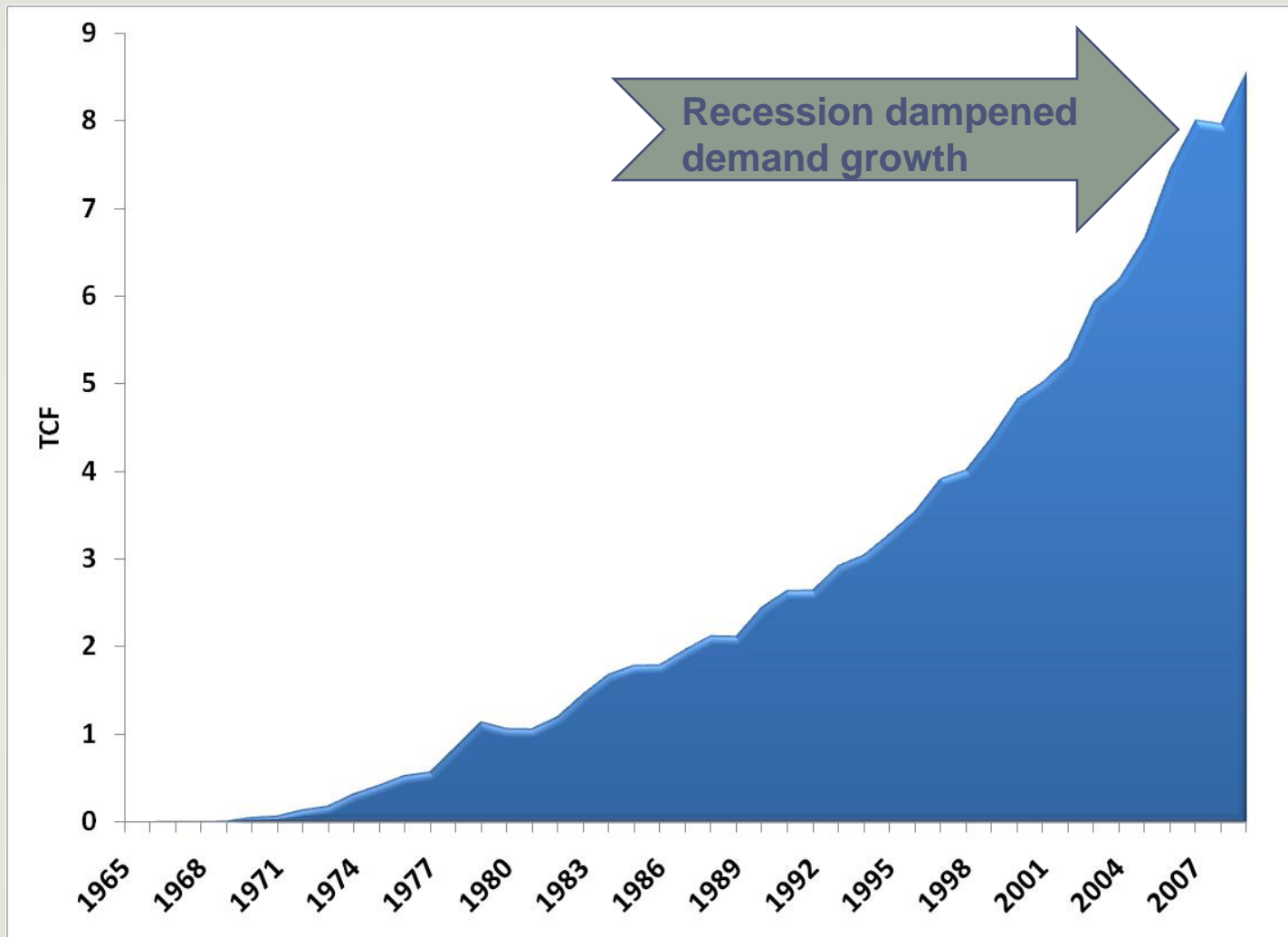
2030



 EXPANDING FLOW TRENDS

Source: NPC 2007, consolidated forecasts

LNG Trade Grew



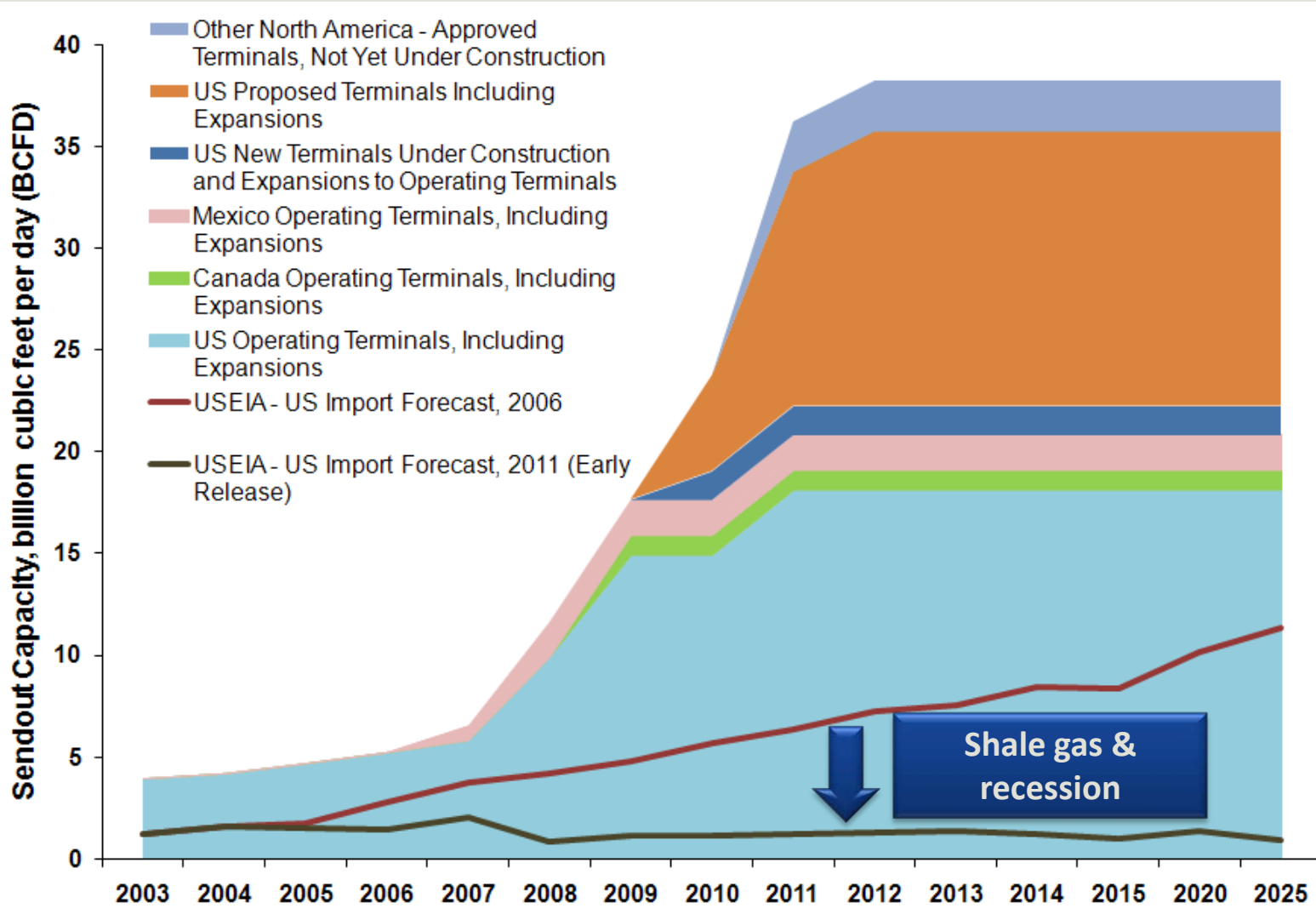
Growing LNG Export Capacity

- Export capacity in 2009 was >10 TCF (versus 8.5 TCF imported)
- Export capacity grew by >60% between 2005 and 2010
- It is expected to grow another 25-30% by 2015

Softening Markets

- Excess LNG supply
- Weak U.S. price impacting UK and Europe
- Pressure on oil indexed contracts
- LNG displacing pipeline gas in Europe:
Russia and Algeria lose market share
- 25%-50% decrease in prices from 2008 to 2009

Much Idle Capacity in NA

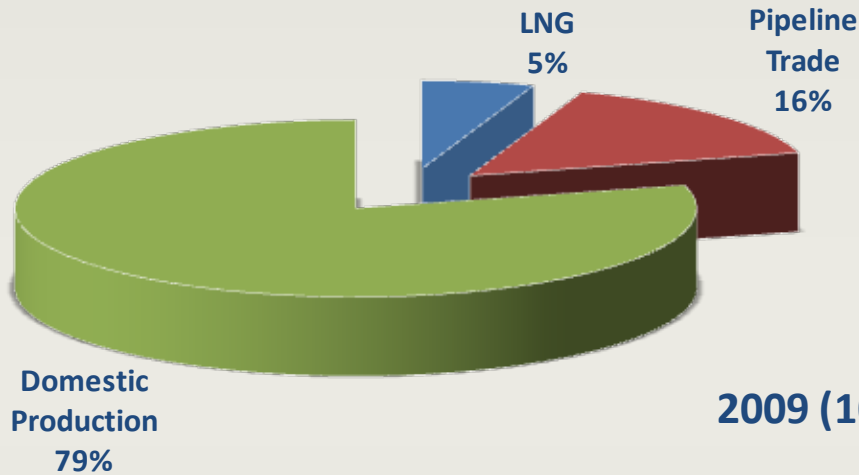


US LNG Exports Not Likely

- Gas feedstock in the U.S. is more expensive, especially in the Atlantic Basin
 - Panama canal expansion may render exports to Pacific Basin a possibility
- Excess LNG export capacity globally
- Gas is quite abundant globally
- The U.S. may need all of its domestic gas (consumption in 2010 surpassed 24 TCF for the first time in history)

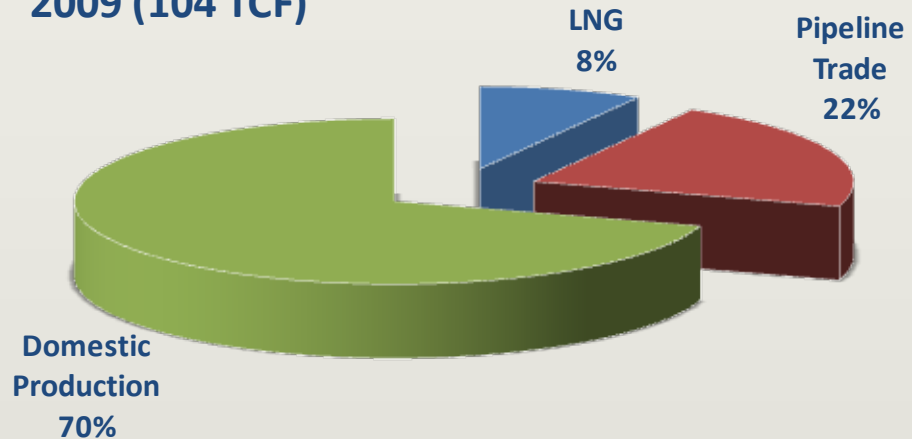
Global Natural Gas Trade Growing

1999 (Total Consumption 81 TCF)

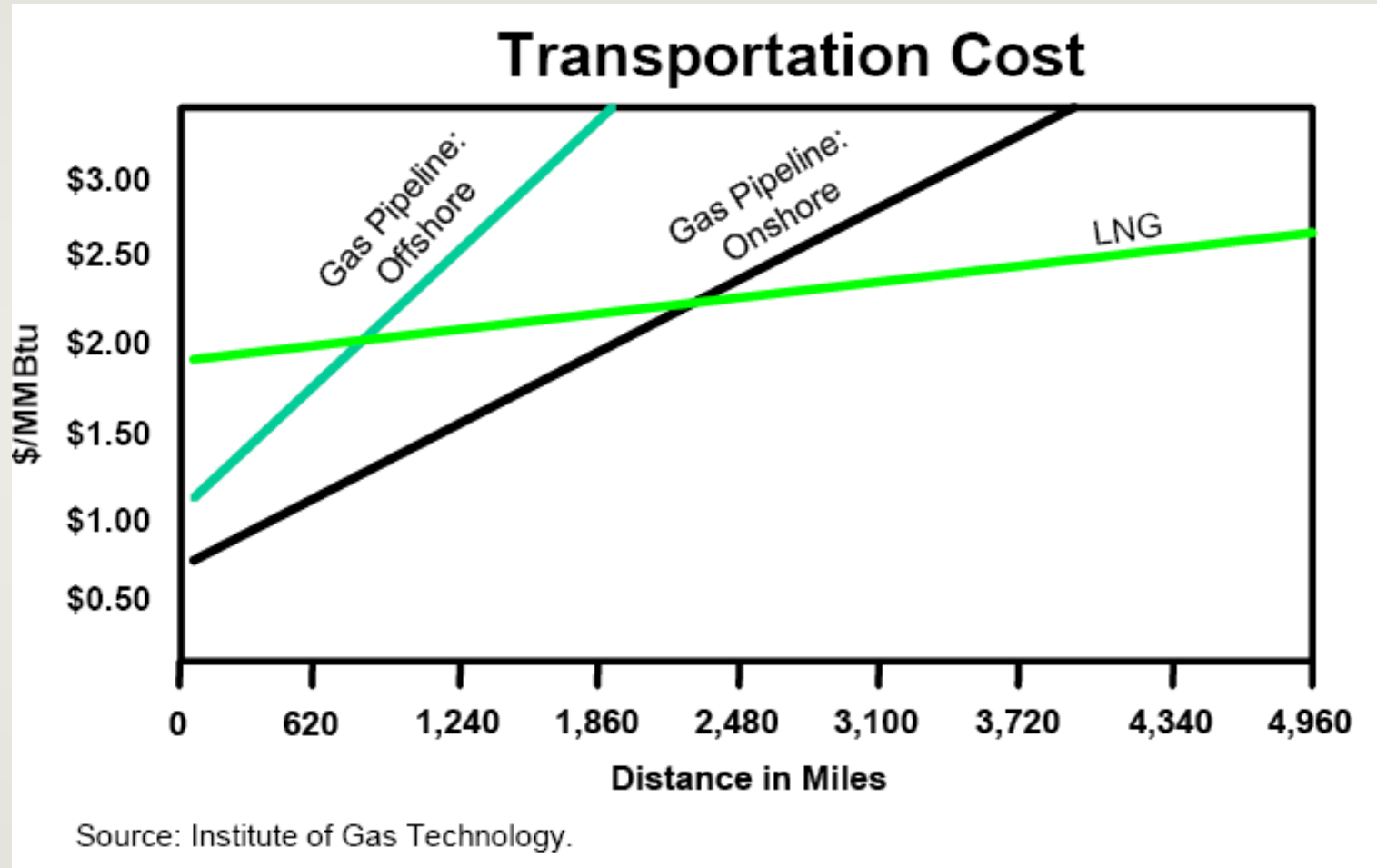


Pipelines still dominate international trade of natural gas.

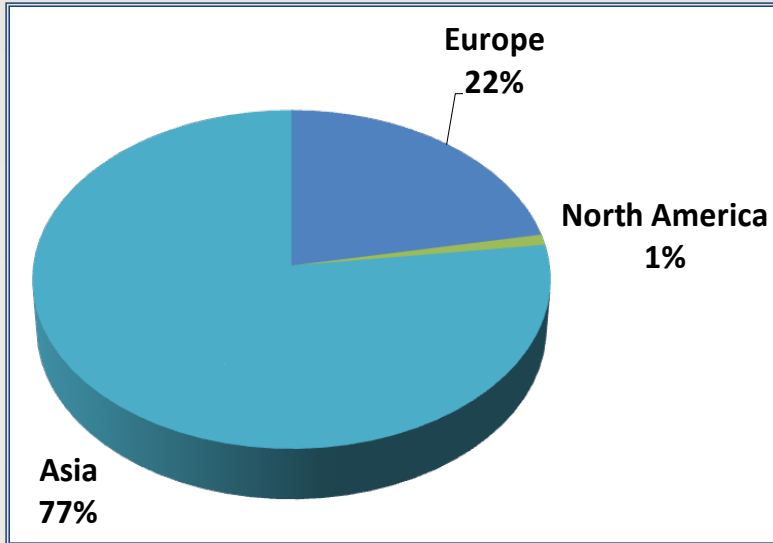
2009 (104 TCF)



Pipeline vs LNG: Representation

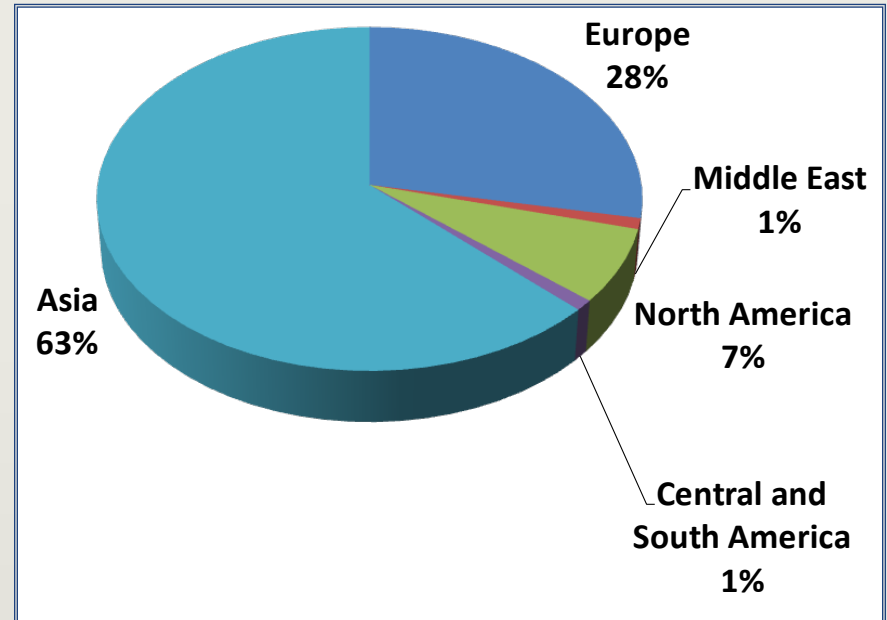


Changing World LNG Trade – Importers Mix



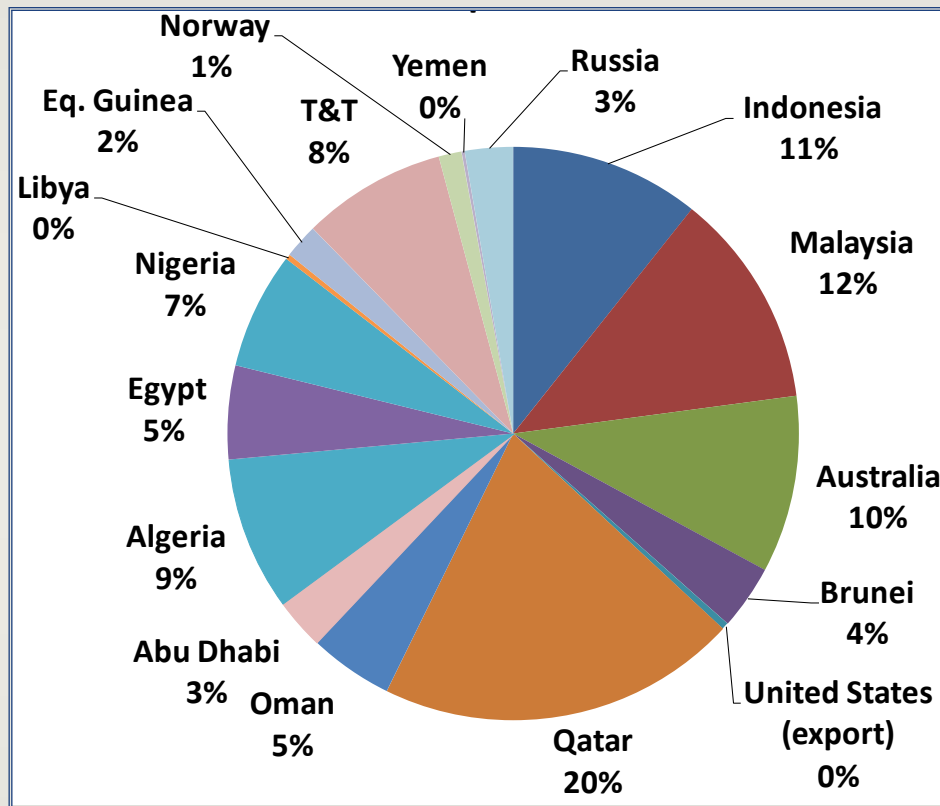
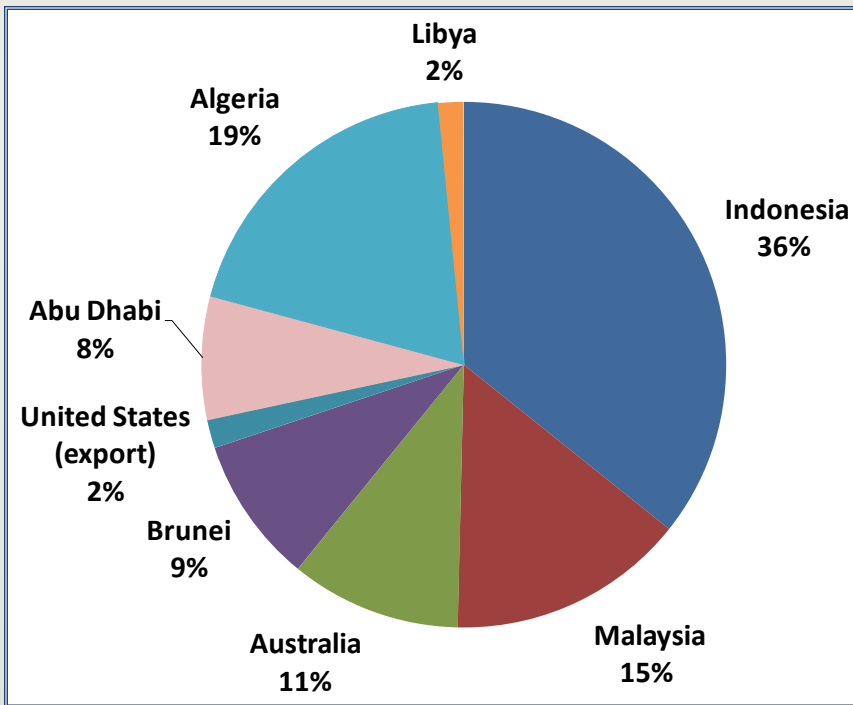
Asia (Japan) dominated the LNG trade for a long time (1995)

Many new players entered the market (Mexico, Canada, Brazil, Chile, Argentina, Portugal, Greece) and others needed LNG again (UK) since the late 1990s (2009)



Changing World LNG Trade – Exporters Mix

Small group dominated by Asian suppliers (1995)



Much more diversified, emerging Middle East suppliers led by Qatar (2009)

Some Changes in LNG Trade – Arbitrage opportunities

- Increased flexibility in terms of
 - Contract duration (5-10 years versus 25-30 years)
 - Shifting away from oil-based formulas to gas-based pricing (at least in the Atlantic Basin)
 - Less than 100% take-or-pay obligations
 - Ability to divert cargoes
 - Ability to share windfall profits
- Increased arbitrage opportunities (16% of trade was in the short-term market in 2009)
 - With more suppliers, especially from the Middle East
 - Panama Canal?

LNG Netbacks: Algeria Example

	Barcelona	Everett	Isle of Grain	Lake Charles	Sodegaura	Zeebrugge
1/1/2010	6.65					
1/2/2009	12.08					
1/4/2008	7.73					
1/5/2007	7.88					
1/6/2006	5.77	9.68	12.64	7.75	4.39	5.84
1/7/2005	4.07	8.54	5.20	3.81	3.44	4.23
1/2/2004	3.54	10.27	4.76	4.41	2.50	2.95
1/3/2003	3.32	6.70	2.44	2.99	2.31	2.59

Late 2005 to early 2006: Hurricane Katrina, UK became a net importer, hydro shortage in Spain, cold weather in Europe, tightness in Asian markets

Still an Expensive Business

- \$4-10 billion for the value chain
- Project financing requires cash flow security
- Long-term contracts provide anchor
- Flexibility will help with taking advantage of arbitrage opportunities

LNG Value Chain Costs

			
EXPLORATION & PRODUCTION	LIQUEFACTION	SHIPPING	REGASIFICATION & STORAGE
\$0.65-\$1.30/ MMBtu	\$1.04-\$1.56/ MMBtu	\$0.53-\$1.30/ MMBtu	\$0.39-\$0.65/MMBtu

Total 2002 = \$2.00 - \$3.70

Total 2007 (with cost escalation) = \$2.60 - \$4.80

Sources: Industry (estimates exclude some O&M and tax costs)