

# LNG market grows but uncertainties persist

By Bill White

Driving much of the discussion at a liquefied natural gas conference in London were two relatively recent events that have rattled how the global LNG industry views its short-term future.

The events help explain the unusual LNG pricing trends of late, underscore some of the volatile dynamics of supply and demand, and amplify the uncertainty forecasters have of their own predictions.

The first event was the rise of U.S. shale-gas production over the past five years, sweeping aside the world's biggest gas market – North America – as an LNG customer. Companies mistakenly targeted billions of dollars for construction of new gas liquefaction capacity and U.S. import terminals. The lack of U.S. customers cast adrift that new LNG production, which needed to find a new destination and did so in Europe, helping soften short-term and spot LNG prices there. The continued rise of Lower 48 shale-gas production also has engrossed the LNG industry in a guessing game: Will the United States export some of its new-found gas bounty as LNG?

Event two: A tsunami stifling nuclear power production at Japan's Fukushima plant last March. This boosted short-term LNG demand in Japan, raising prices there and diverting to Asia spot shipments that had been aimed at Europe.

Shale gas and Japan were two currents flowing through presentations at the LNG Global Congress held in London during the last week of September. I was invited to present on Alaska natural gas and to learn the latest developments in an industry undergoing rapid change.

A key message from the conference is that the spectacular expansion of LNG supply and demand worldwide should continue over the next decade, although LNG traders, analysts and consultants offered



Tanker loads LNG at Karratha plant in Australia. Photo courtesy of Woodside Energy Ltd.

no consensus on the exact timing and details of that growth.

The LNG conference covered a breadth of other topics, from the rise of Qatar and Australia as gas liquefiers, to China's energy appetite, the prospect of U.S. LNG exports, whether North America's shale-gas revolution will be replicated elsewhere, and how a wider Panama Canal and a new technology called floating LNG might be game changers for the industry.

Conference attendees gushed optimism about the LNG industry, while mumbling uncertainty about how exactly the future will unfold.

Alaska helped pioneer the world of LNG exports when the Nikiski liquefaction plant opened in 1969 to supply Japanese utilities with natural gas from the new Cook Inlet discoveries. Alaska since has been eclipsed as an exporter by Indonesia, Malaysia, Egypt, Trinidad & Tobago and, more recently, by such countries as Qatar, Yemen, Russia and Norway.

People attending the conference were generally aware that Alaska is about to exit the game, with the last LNG shipment expected to leave the Nikiski plant this fall. Why Alaska would drop out just as Japanese demand is

spiking did puzzle them, however. They didn't understand that the historic Cook Inlet fields are petering out. I explained that some Alaskans hope the state can re-enter the fray within a decade by exporting North Slope gas from a resuscitated Nikiski plant or a new mega-plant at Valdez, if a proposed pipeline from the Slope gets built.

Here's a snapshot of themes discussed at the conference.

## Supply and demand

The LNG market has been defined for decades by long-term contracts between LNG makers and buyers of the gas. LNG makers needed these 20-year-plus deals to underwrite the huge upfront cost of building plants to liquefy gas – superchilling it to minus 260 degrees Fahrenheit transforms methane into a liquid that is more compact and economical to transport via special tankers.

But thanks to their rapid expansion in recent years, the world's LNG exporters now have far more capacity to liquefy natural gas than is needed to fulfill current demand. This imbalance has given rise to short-term contracts and spot sales, which last year comprised about 20 percent of the LNG volume traded. That's roughly akin to the percentage of oil under short-term and spot deals, said Kasper Walet, principal with Amsterdam-based energy consultant Maycroft. But he noted that these spot and short-term deals, while 20 percent of the LNG trade, comprised just 2 percent of all natural gas movement. Most speakers said they expect long-term deals to continue to characterize the industry.

Japan needed 110 billion cubic feet of additional LNG this year after Fukushima, and it got about 48 billion of it on the spot market, buying from Algeria, Egypt, Yemen and Nigeria, said Frederic Deybach, an LNG executive with European energy conglomerate GDF Suez.

The imbalance will end soon, as demand catches up with the capacity to supply LNG. When? The presenters' estimates ranged from 2012 to 2015.

Here are key unknowns that make this future so hard to predict: Will low coal prices tilt China and other emerging Asian economies away from natural gas for future fuel supplies? Will Japan and Germany phase out nuclear power and need more natural gas (as well as

coal and oil) to make electricity, and if so, how quickly will the phase-outs occur? Will the world economy double-dip into another recession, or even triple-dip? Will geopolitical events disrupt LNG supply, as they did this year in Libya, a gas exporter, and could do in unstable Yemen, another LNG exporter?

After 2015, start-up of new liquefaction plants – particularly in Australia but also in Papua New Guinea, possibly Canada and other locations – probably will ease any worries about LNG supply shortages for several years.

But timing is everything. If capacity comes on slow and demand rises fast, expect to see LNG prices rise, several speakers said. Prices could fall if liquefaction capacity gets built faster than demand rises.

Andre Mernier of Belgium sees a bright future in Asia for LNG because of its geology and geography. Geology – not enough of its own gas reserves and generally too distant for gas deliveries through pipelines. Geography – lots of need for electrical generation fuels in coastal population centers, where deliveries can be made easily. Mernier is secretary general of the Energy Charter Secretariat, a group with 53 member countries that upholds international laws to ensure the smooth flow of energy between exporters and importers.

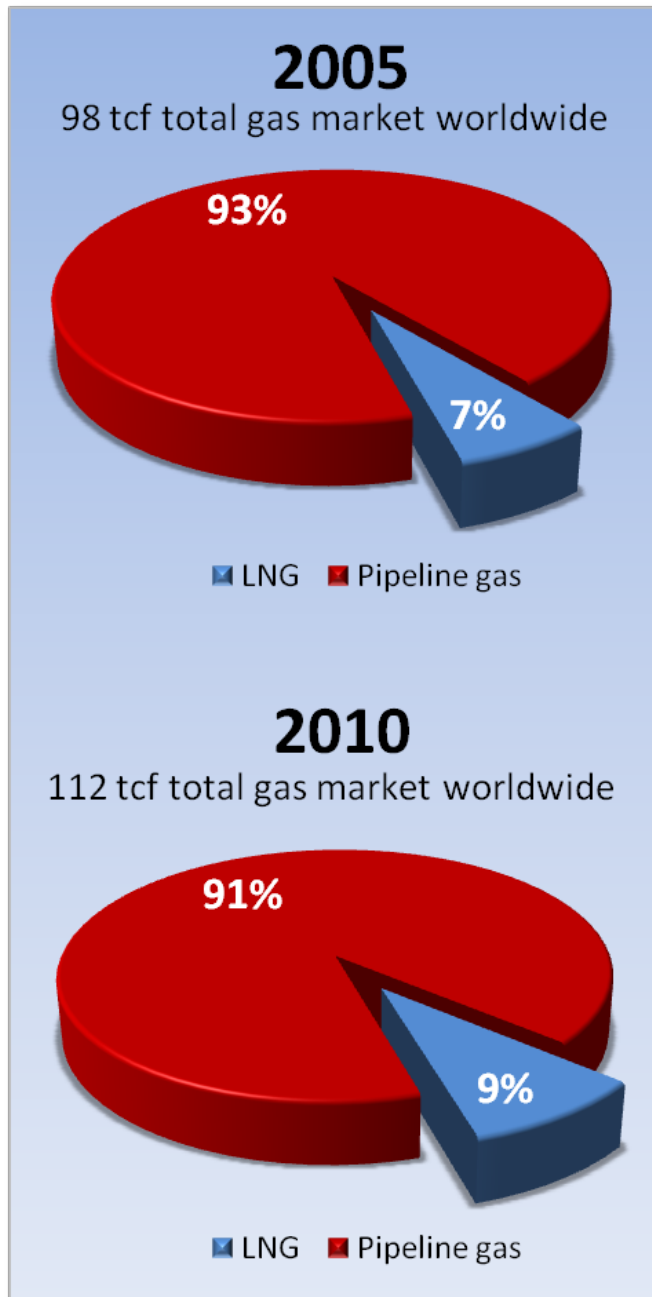
Deybach of GDF Suez, said much of the expected new demand for LNG imports to 2020 will come from nations “where demand uncertainty is greatest.” These importers include developing nations in Asia, the Middle East and Latin America.

## Ship charter rates soar

The LNG fleet has expanded rapidly in recent years, from 195 ships at the end of 2005 to 360 ships at the end of last year, according to the International Gas Union.

That expansion hasn't been fast enough, said Walet of consultancy Maycroft. Most tankers are sailing under entrenched contracts. The few available for short-term hire are demanding premium rates.

The rate for chartering an LNG tanker last year averaged \$41,000 a day. That price jumped to \$80,000 in the first half of this year, particularly after Japan's Fukushima disaster boosted that nation's short-term need for gas, Walet said. Claire Wright, principal gas analyst with Lloyd's List Intelligence, said some spot-shipment rates have reached \$100,000 a day.



Sources: BP, International Gas Union

Chris Meyer, a European LNG consultant with Poten & Partners, said shipyards are busy building tankers, and that day rates will fall within 18 to 24 months, after the new boats get launched. About 60 new ships have been ordered, Wright said.

### Hot commodity

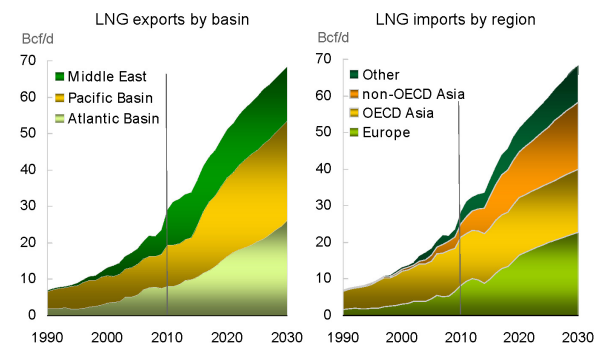
Worldwide demand for natural gas last year rebounded from the drop in demand caused by the 2008-2009 global recession. Overall demand leaped 7.4 percent,

with LNG demand up 21 percent, said Hideomi Ito, natural gas analyst for the International Energy Agency. (LNG tends to be a niche product desired by places like Japan, South Korea and Taiwan that lack the option of pipeline deliveries. As was mentioned, less than 10 percent of the world's gas consumption involved LNG last year.)

Growth in gas demand should slow over the next five years to perhaps 2.4 percent a year, Ito said, with LNG demand growing faster than that because it would help fuel hotter economies such as China and India.

Christof Ruehl, chief economist for BP, said European demand for LNG might even fall next year although he expects it to grow over time.

LNG trade grows twice as fast as global gas production



Source: BP

© BP 2011

### China's big appetite

Natural gas comprises 4 percent of China's energy needs now, Ruehl said. Coal provides 70 percent. China consumes less than one-tenth the amount of gas that Europe uses.

But China is just getting going as a natural gas consumer, Ruehl said. By 2030, China will consume far more energy than today, and natural gas will supply 9 percent of it. Within 20 years, China will consume as much natural gas as all of Europe consumes now, he predicted.

China will get about half of its gas in 2030 from domestic production, particularly tapping shale and other unconventional reservoirs, and it will import the other half via pipelines and LNG tankers, Ruehl said.

Ito noted that China has been investing furiously to secure new supplies. These investments include

developing conventional, shale and coal-bed methane resources within China; securing long-term LNG-supply contracts with Australia, Qatar and Papua New Guinea; opening of an almost 4 billion cubic feet a day pipeline from Turkmenistan in late 2009 (expected to reach full capacity next year); and building a 1.1 bcf a day pipeline from Myanmar that should start in 2013.

Ito said China's total gas demand could rise from about 10 bcf a day on average last year to 25 bcf a day in 2015, with LNG sating some of that growth.

## Australia

### - boom towns, boom nation

Australia is the Wild West of LNG – a brawny frontier toward which the industry's future is migrating.

Alan Copeland of the Australia Bureau of Resources and Energy Economics said his nation exported about 19 million metric tons (2.5 bcf a day on average) of LNG last year from two plants. That's about the same LNG volume Alaska would export from Valdez if that idea ever catches on.

But that volume is dwarfed by what's planned for Australia: Seven projects totaling 57.1 million metric tons (7.5 bcf a day) at some stage of development (a combined price tag of \$144 billion), plus another six totaling 44.4 million metric tons (5.8 bcf a day) proposed but not under way.

The seven projects are supposed to be done by 2016. Can Australia really pull that off? Copeland called it "a huge challenge, an enormous task," but noted the companies involved are sticking to their start dates. Others at the conference said start-up delays are all but certain.

Still, nearly everyone expects Australia will become the world's No. 1 LNG exporter by 2020. Last year it was No. 4, behind Qatar, Indonesia and Malaysia. Qatar

exported 56 million metric tons of LNG, the equivalent of 7.4 bcf a day on average.

Australia is developing gas fields relatively close to its East Coast population center. These include coal-bed methane fields that some local farmers oppose, Copeland said. But the giant plays are in remote areas, including in deep water far off the nation's northwest coast. Australia, through a Shell project called Prelude, is pioneering the emerging technology called "floating LNG," where liquefaction occurs at sea rather than piping the offshore gas to an onshore LNG plant.

The rapid build-out of Australian LNG is straining the country. An LNG development called Wheatstone plans to bring 3,500 workers to a town of 800 people – raising issues of where to house them, how to feed them and what they will do for fun. Some projects have adopted a work schedule familiar to those who labor at Alaska's North Slope oil fields: one or two weeks of 12-hour days followed by extended time off.

With coal and iron ore developments occurring as well in Australia, engineers and equipment are in short supply, Copeland said. A big winner is the average laborer, who is pulling in wages of \$225,000 to \$300,000 a year on remote LNG projects, Copeland said. The audience gasped when Copeland mentioned this.

## U.S. LNG exports

Several speakers said U.S. exports of LNG are inevitable. The United States will have the supply, due to fast expanding shale-gas production. And if the big gap between gas prices in North America and those in Asia linger, liquefying U.S. gas production could be very profitable.

Deybach of GDG Suez noted that a race is afoot within the Lower 48 by companies positioning themselves to make and export LNG. One or two of them will win. Possibly three.

Simon Bonini, a consultant and former LNG director for Centrica, a British utility, said that of course the United States will export LNG. "I'm a firm believer that if you can have a stampede into Queensland (one of Australia's gas hotbeds), you can have anything."

Leslie Palti-Guzman, a New York-based analyst with political-risk consultant Eurasia Group, said at least six serious LNG export proposals are in play in the United States and Canada. If they all came together they could

Australia LNG projects under way			
Project	Cost	Capacity (bcf/day)	Startup
Pluto	\$12 billion	0.57	2012
Gorgon	\$43 billion	1.97	2015
Curtis Island	\$16 billion	1.12	2015
Gladstone	\$16 billion	1.03	2015
Wheatstone	\$29 billion	1.17	2016
Australia Pacific	\$18 billion	1.18	2016
Prelude	\$10 billion	0.47	2016

Source: Australia Bureau of Resources & Energy Economics



export 70 million metric tons of LNG, or 9 bcf a day. That's twice the volume TransCanada and ExxonMobil hope to flow into the Lower 48 from Alaska's North Slope. Asian utilities or governments are involved directly or indirectly in the push for North American LNG, Palti-Guzman said.

"In practice only half of that amount at best will be expected to be exported but that is still a significant volume," she said.

U.S. projects that are finished by 2016 could "hit a window of opportunity" if Australian projects fall behind schedule and LNG demand grows as some expect, Palti-Guzman said.

She noted the opposition to exports from the U.S. petrochemical industry, which uses natural gas as a feedstock and wants a supply glut to hold down prices. But, she added, "U.S. LNG export is definitely going to happen." The exports would reduce the nation's trade deficit, providing political reason to allow gas to leave the country, she said.

The current price gap between North American gas and Asian LNG is about \$12 per million Btu. U.S. gas can be liquefied and shipped from the Gulf Coast to Asia for about half that price, Palti-Guzman said. The economics are even better for LNG from British Columbia – as long as the price gap holds, a risky assumption, she said.

Lower 48 natural gas prices could rise by \$2 to \$2.50 per mmBtu if the nation starts exporting significant volume, she predicted.

Some analysts believe U.S. LNG exports, and the resulting price rise, would heighten the Lower 48's need for North Slope gas from Alaska.

Possible North America LNG export projects		
Project*	Capacity (bcf/day)	Startup
Sabine Pass (La.)	1 to 2	2015
Freeport (Texas)	1.4	2015
Lake Charles (La.)	2	TBD
Jordan Cove (Ore.)	1.2	TBD
Kitimat (B.C.)	1.4	2015
LNG Export Co-op (B.C.)	0.12	2014
Cove Point (Md.)	1.8	2015
Prince Rupert (B.C.)	1 to 2	TBD
*Each project is a new terminal or a modified import terminal. No project yet has all of its permits/licenses, customers and financing.		

Sources: Eurasia Group, Natural Gas Week

## Panama Canal

Palti-Guzman said expansion of the Panama Canal will help U.S. LNG exports to Asia.

LNG tankers traversing the Panama Canal can sail from the U.S. Gulf Coast to Asia in 22 days, shorter than a trip around South America or Africa, she said. Proposed LNG projects in British Columbia would hold a travel advantage, however: an eight-and-a-half-day trip to East Asia, she said.

Right now, only 6 percent of the LNG fleet of under 400 ships can squeeze through the canal, and none of them try, said energy consultant Walet.

But when the Panama Canal expansion is done, scheduled for 2014, 80 percent of the fleet will fit through the canal.

"It should be a real game changer," Walet said.

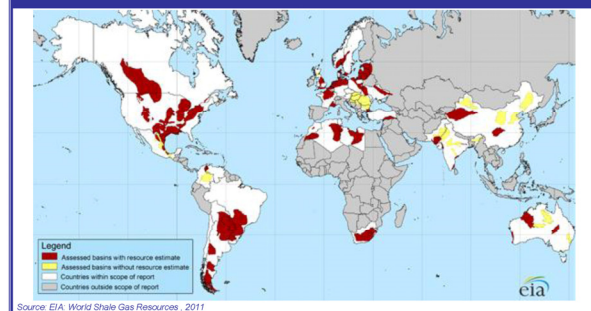
The canal will transform how LNG flows around the world. In particular, diverting a cargo load in the Atlantic over to Asia will become more cost effective.



### Introduction to UCG and resources

Many of the recent exploration activities had been successful, thus shale gas resources are steadily increasing in all parts of the world

#### SELECTED GLOBAL SHALE GAS RESOURCES



Source: EIA: World Shale Gas Resources, 2011

TEAM CONSULT

Gas Power Experience

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Sources: U.S. Energy Information Administration, Team Consult

## Shale gas globally?

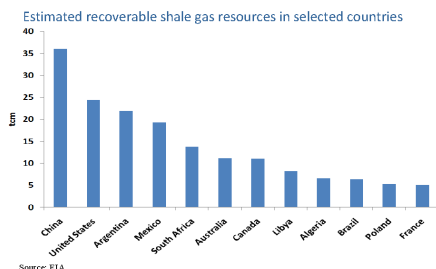
Can the U.S. shale-gas revolution be duplicated elsewhere in the world?

Not easily, several speakers noted.

The United States is the perfect setting for shale gas. The country has lots of independent producers and service companies. A skilled labor force exists. Regulators generally understand gas production. Technology such as hydraulic fracturing and horizontal



### Unconventional gas still to affect markets



- There are over 400 tcm of estimated recoverable unconventional gas resources, half of them are shale
- North American LNG imports at technical minimum, several LNG export projects under consideration

Source: International Energy Agency

drilling are easily disseminated and improved on. The pipeline network to move production to market is vast.

China is estimated to have even greater shale-gas resources than the United States, but it falls short of the U.S. on know-how, competitiveness and market structures, said Madjid Kubler, owner of energy analyst Team Consult. Germany falls far short of China, he said, particularly on competitiveness and the regulatory/social environment for accepting unconventional gas development.

### Will floating LNG sink or swim?

A new idea that many are watching to see how fast and how well it catches on is called floating LNG.

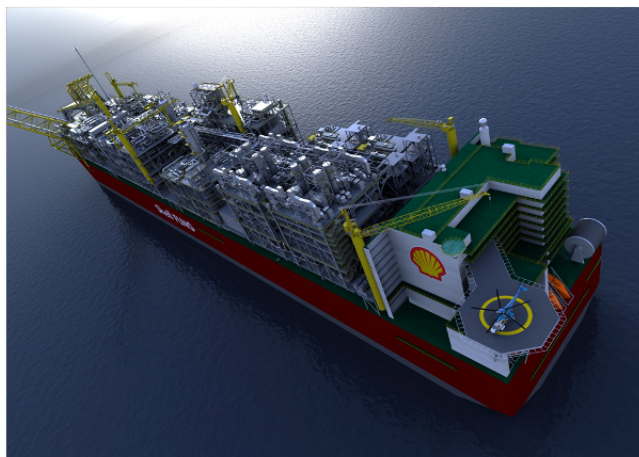
Shell is the first mover with this technology, approving a FLNG vessel to be built in South Korea and deployed to the company's \$10 billion Prelude development far offshore Northwest Australia. Shell estimates the field will start up in 2016, with 3.6 million metric tons of annual output (processing about 500 million cubic feet a day of natural gas).

A company called Flex LNG is involved in a smaller proposal off Papua New Guinea – an onshore field with offshore liquefaction, unlike Prelude where the entire

operation will be offshore. Other projects are envisioned, including a couple more off Australia's coast.

The attractions: FLNG fields could be developed more quickly for less cost, with no long-distance pipelines, fewer environmental challenges and less bureaucratic red tape ... if the concept proves itself.

The actual cost of building and operating FLNG units is unproven. This is causing some in the financial industry to wait and see, some speakers said.



Artist's rendering of the 1,600-foot floating LNG plant Shell is developing for use in Australia.

Source: Shell

But Wouter Pastoor, business development vice president with Flex LNG, said the technology is custom-made for small and medium-scale LNG production – 2 million metric tons a year (260 million cubic feet a day) in production or less, a bit more than the peak output from the ConocoPhillips/Marathon plant at Nikiski that is closing. This will let smaller countries and smaller fields get into the LNG business, and smaller volumes are easier to market, he said.

However, he noted that FLNG is "a novel idea whose risk profile is being defined."

For more information, please visit our website: [www.arcticgas.gov](http://www.arcticgas.gov)

#### Contact information:

Bill White, Researcher/Writer  
011.907.271.5246  
[bwhite@arcticgas.gov](mailto:bwhite@arcticgas.gov)

#### General Questions:

[info@arcticgas.gov](mailto:info@arcticgas.gov)

#### Locations:

OFC Washington, DC  
1717 H St. NW, Suite 801, Washington, DC 20006  
011.202.478.9750

OFC Alaska  
188 W. Northern Lights Blvd., Suite 600, Anchorage, AK 99503  
011.907.271.5209