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Perfect Match? European Natural Gas Markets and North American LNG Exports

Christopher Goncalves and Anthony Melling

European natural gas markets and North American liquefied natural gas (LNG) exports could be seen as a perfect match.¹

Europe needs reliable new supplies of gas because indigenous reserves are declining as new discoveries fail to match annual production.

Europe needs reliable new supplies of gas because indigenous reserves are declining as new discoveries fail to match annual production. Europe's long-term supply contracts with existing external suppliers will terminate in the next 10 years. Many of Europe's potential new supply sources come from the Caspian, Middle East, and North Africa regions and involve one or more unattractive features: oil-indexed prices, greenfield oil and gas production, expensive long-distance and/or subsea pipeline transportation, and increased levels of political risk (as compared to the supplies they replace). By contrast, LNG supply from North America is extremely attractive to

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Other Features

Focus: European Gas and Power Outlook

Electric Transmission

Underground HVDC Supergrid Can Work in Europe

Roger W. Faulkner 10

Electric Vehicles

Electric Vehicles May Reduce Oil Imports While Stabilizing Grid

Benjamin Schlesinger 18

Energy and the Environment

New Data Supports Need for Climate Vulnerability Assessment by Transmission Providers

Howard W. Balentine 23

Columns

NERC and Enforcement Issues

NERC Provides Best Practices for Effective Procedures

Deborah A. Carpentier 30

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European buyers because it offers transparent hub pricing, relatively short LNG shipping distances, and relatively little political risk.

The primary concern for European buyers and/or the LNG aggregators and traders that would supply them is that the differential between North American hub prices and European gas prices falls to levels below the combined cost of liquefaction and shipping to produce and move North American LNG to Europe. But that could be a good problem for a European buyer to have.

Thus far, the commodity price differentials between North American and foreign markets have not been a significant concern for North American LNG terminal developers because most of the terminals will be tolling facilities that will sell capacity and not LNG. The risk of shrinking commodity price differentials will thus fall to the LNG buyer, aggregator, or trader and not to the North American terminal developer or the feed gas supplier. As long as a creditworthy buyer or trader provided the necessary terminal capacity or tolling contract to support the terminal investment, the commodity price outlook was not a major concern.

But this is changing. Project financiers are beginning to question and analyze the sustainability of the price spreads underlying each financing transaction, irrespective of the tolling agent's capacity contract. Recent indications suggest that the level of scrutiny will only increase with time.

Project financiers are beginning to question and analyze the sustainability of the international price spreads that drive North American LNG exports.

Over the last two years, the development of new North American LNG export projects has been remarkable, with a few dozen projects proposed and permitted for exports to Free Trade Agreement (FTA) countries, a small handful approved for exports to non-FTA countries, several in financing, and one under construction. Exports are currently projected to reach 100 billion cubic meters per year by 2020.

This projection compares to approximately 70 billion cubic meters approved by the US Department of Energy for export to non-FTA countries (including, for example, Japan and Europe) and approximately 320 billion cubic meters of export capacity approved for export to FTA countries.

Exports are currently projected to reach 100 billion cubic meters per year by 2020.

The direct and indirect implications for European natural gas markets are potentially substantial because of the following:

- European markets are eager to diversify supply options and enhance supply competition to enhance bargaining power with a small number of high-volume pipeline gas suppliers in Russia, Norway, Algeria, and potentially soon the Caspian and Middle East regions.
- Even if the volumes of US LNG delivered to Europe are limited by comparison to Asian deliveries, the indirect implications for global LNG prices are potentially significant for European gas prices and price competition in the downstream markets.

Therefore, European buyers are highly interested in understanding the timing, volume, availability, and price of the new LNG exports from North America and the implications of these exports for global and European markets and prices. In turn, understanding the potential for North American exports requires long-term evaluation of the sustainability of North America's underlying shale gas resources, the demand for these resources in North America, and the ability of global markets to absorb the surplus shale production in the form of LNG exports.

BOOM AND GLOOM? SHALE PRODUCTION AND LNG PRICES

The viability of US LNG liquefaction projects can be understood using the concept of "shale spreads,"² which represent the price

Exhibit 1. Atlantic and Pacific Shale Spreads



differential between shale-driven US natural gas prices and other regional gas benchmark gas prices in Europe and Asia (**Exhibit 1**):

- *Atlantic shale spread*—The differential between the Henry Hub gas price and the UK National Balancing Point price
- *Pacific shale spread*—The differential between the Henry Hub gas price and the average Japanese LNG import price

The outlook for key shale gas spreads will determine the viability of US LNG exports. For North American liquefaction projects to achieve financial close, investors and lenders must be convinced of sufficient shale spreads over the period of project financing, and gas off-takers must be convinced of viable gas prices over the life of their LNG sale and purchase agreements.

In the overheated markets leading up to the financial crisis of 2008, shale spreads between North American, Asian, and European gas and LNG prices had fallen to very low levels. However, shale spreads subsequently widened due to shifting fundamentals, including the continued decline of US gas prices due to booming shale production and the growth in natural gas and LNG prices in Europe and Asia. As a result, Pacific and Atlantic shale spreads

grew rapidly, as presented in **Exhibit 2** and described below.

- Pacific shale spreads increased to levels ranging from \$4.00 to \$8.00 per million Btu's in 2009 and 2010. More recently, the Japanese nuclear shutdowns following the tragic Great East Japan Earthquake and Tsunami (and resulting Fukushima nuclear incident) in March 2011 have enabled Japan to absorb some of the surplus LNG and retighten global LNG markets. Consequently, Japanese prices have strengthened, and shale spreads climbed to over \$12.00 per million Btu's.

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- Atlantic shale spreads were much lower and ranged from zero to \$4.00 per million Btu's through 2010 because a flood of LNG supply into European markets drove hub prices down. Europe became a “sink” market for surplus LNG supply. European natural gas and LNG prices collapsed to levels that fell

between Asian and North American prices. After the Fukushima tragedy, however, global LNG markets tightened, European hub prices increased, and shale spreads climbed to a range of \$6.00 to \$8.00 per million Btu's.

The increasing price differentials have opened a substantial window of opportunity for North American LNG exports to Asian and European markets. This window occurs because the shale spreads have grown to levels that far exceed the liquefaction and shipping costs from US ports to LNG markets in Asia (approximately \$5.00–\$6.00 per million Btu's) and Europe (\$3.00–\$4.00 per million Btu's).

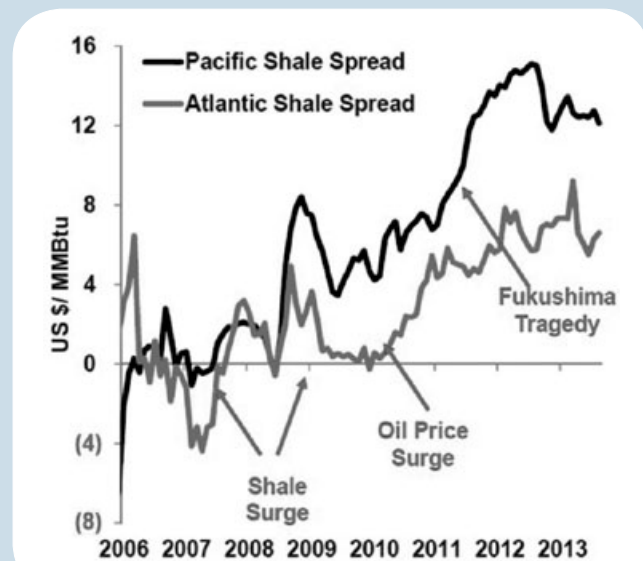
Increasing international price differentials have opened a substantial window of opportunity for North American LNG exports to Asian and European markets.

Looking forward, it is critical to evaluate for how long these large price differentials will persist to justify sustained LNG exports. There are several reasons to expect that the shale boom and North American LNG exports will eventually yield an equilibration of global gas markets that will be bad news for premium LNG prices.

It is critical to evaluate for how long these large international price differentials will persist.

- In the United States alone, the growing expectations for LNG exports now approach 100 billion cubic meters by 2020, and potentially more thereafter. This amount would rival the LNG supply contributions from Qatar at the end of the prior decade, which, combined with the global recession and US shale boom, also led to a global supply glut.
- Such levels of US LNG exports would increase by over 30 percent the current base of LNG trade, which last year reached a modest 328 billion cubic meters of supplies to cus-

Exhibit 2. Shale Spreads



tomers (after the first 50 years of industry growth).

- The US LNG exports will follow a similar wave of LNG production growth from Australia between now and 2020, and there may also be incremental supplies from existing suppliers such as Nigeria, Equatorial Guinea, Russia, Angola, and Qatar.
- Just after 2020, the LNG supply boom could be further compounded by new LNG supplies expected from East Africa, the East Mediterranean, and elsewhere.
- The North American LNG exports would elevate global supply growth beyond the range of historical experience and could present substantial downward pressure on global LNG prices, especially given the low opportunity cost of North American natural gas supplies at regional hub prices.
- The ability of global LNG demand to grow quickly enough to absorb the new supply growth remains subject to uncertainty about the speed and timing of new regasification projects, downstream market infrastructure and regulation, and the price elasticity of demand in critical markets such as China, India, Southeast Asia, Eastern Europe, and South America.

Further, as the LNG business has grown in scale, it has also become commercially and geographically more diverse.

- The vintage practice of LNG trade based on destination-specific, long-term, oil-indexed, bilateral contracts has been replaced by an increasingly wide variety of commercial structures with ever-greater levels of volume and destination flexibility, cargo diversion rights, and so forth.
- These new structures have provided for greater levels of market flexibility and liquidity that foster greater trade linkages between the world's major regional gas markets in North America, Europe, and East Asia.

If the prevailing supply-constrained LNG markets of recent years give way to a supply surplus by the end of the decade, then LNG prices and shale spreads could have a good distance to fall. But if demand grows rapidly enough to absorb incremental supply, then significant regional price differentials could persist for a longer period of time.

The global gas glut of mid-2008 to mid-2010 demonstrated that when LNG supplies are in surplus and prices fall to competitive levels, world markets have had little problem rapidly absorbing lower-cost LNG supplies. There appears to be very substantial potential for increased LNG sales when LNG is priced to compete with downstream natural gas and coal prices for power generation (with adjustments for generation technology heat rates, emissions regulations, carbon taxes, and so forth).

There appears to be very substantial potential for increased LNG sales when LNG is priced to compete with downstream natural gas and coal prices for power generation.

In the future, LNG market and supply diversity will be even greater than in the recent past as North American LNG exports introduce new Henry Hub-priced supplies into the global market for the first time. The introduction of Henry Hub pricing to global markets and the evolution of global LNG supply-demand balances will determine whether the downward

impacts on LNG prices are marginal or structural, substantial, and sustained.

As a result of the factors described above, the level of LNG downward price pressure in Asia and Europe could be substantial. The magnitude of LNG price softening will depend largely upon the degree to which LNG demand from buyers willing to pay high, oil-indexed prices can grow swiftly enough to absorb the incremental supply.

LNG'S GROWING IMPORTANCE IN EUROPE

Europe's gas markets are relatively mature by world standards, with extensive coverage in populated areas to all categories of customers, and in some countries there is supply to more than 90 percent of households. Furthermore, there is supply competition across market sectors.

From 1990 to 2010, the natural gas consumption of the EU27 countries grew from 333 to 520 billion cubic meters per year. The power generation sector was the main driver, as it accounted for more than 60 percent of incremental demand growth, as depicted in **Exhibit 3**.

From 1990 to 2010, the natural gas consumption of the EU27 countries grew from 333 to 520 billion cubic meters per year.

Although the European power generation fleet includes sizeable tranches of renewables, nuclear, oil, and hydro generation, gas-fired power generation competes almost exclusively with coal. For European natural gas markets to thrive, gas must remain competitive with coal.

LNG trade has become critical to European natural gas markets, which are increasingly sensitive to the swings in global LNG trade patterns and prices. The increasing importance of LNG in Europe is outlined below.

- From 1990 to 2010, global LNG trade quadrupled, while world gas consumption grew by 62 percent, and EU27 gas consumption grew by only 55 percent.

- From 1990 to 2010, LNG supplies to EU27 rose from 18 billion cubic meters (5 percent of market) to 80 billion cubic meters (15 percent of market).
- In the decade from 2010 to 2020, global LNG trade is expected to almost double again such that it will probably exceed the size of the entire European gas market.

LNG already plays a key role in the physical gas supplies of several European countries. European buyers' interest in LNG supplies has been driven by three primary commercial motives:

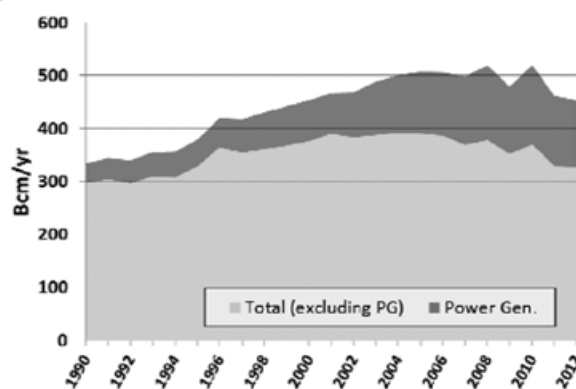
1. Procuring a critical resource to anchor the early stages of gas-market development (e.g., in Spain, Portugal, and Greece)
2. Increasing the diversity of supply in order to mitigate political risk (e.g., in Belgium, France, Spain, the United Kingdom, and Italy)
3. And increasingly as a stabilizing resource or hedge as buyers trade around their supply portfolios.

INCREASING IMPACT OF NORTH AMERICAN MARKETS

From 2008 onward, gas-market fundamentals in the North American markets began to exert a three-phased impact on European gas demand.

- Phase I began in 2006 as shale gas production began to accelerate. This increase was felt in Europe a few years later when shale volumes began to exceed the decline in conventional gas production. As US LNG demand expectations contracted, LNG was released to purchasers in Europe and other regions.
- Phase II came in 2009–10 as the US gas markets became saturated, prices declined, and gas began to displace coal in US power generation. The US coal producers responded by exporting coal, with northwestern Europe as a key target destination. European coal prices fell, and together with depressed carbon markets, coal began to displace gas in European power generation, leading to a dramatic decline in the utilization rates of gas-fired power plants since the peak of 2010 (as illustrated in **Exhibit 4**).

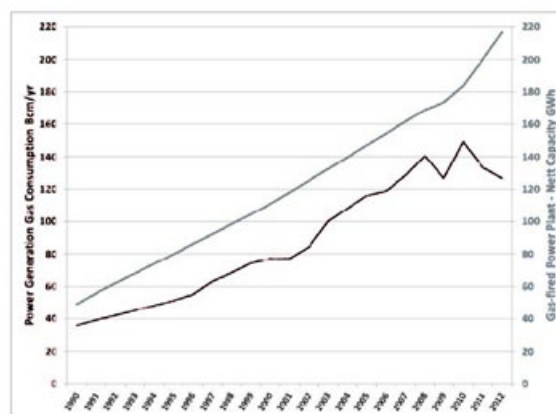
Exhibit 3. EU27 Gas Demand



Sources: Eurogas and *BP Statistical Review of World Energy*.

- Most recently, Phase III has resulted from the growing perception of a prolonged US gas glut. Terminal developers, beginning with Cheniere, have set about retrofitting existing LNG import terminals as liquefaction and export terminals for exports beginning in 2015. And others began developing new

Exhibit 4. Gas Consumption for Generation and Gas Plant Capacity



Sources: Eurelec, Eurogas, and BP.

greenfield terminals for exports later this decade and early next.

Meanwhile, just as Europe became accustomed to the idea of low-cost gas supplies, the Great East Japan Earthquake and Tsunami led to policies that resulted in the following chain of events:

- Caused most of Japan's nuclear power plants to suffer prolonged outages
- Required significant additional volumes of LNG for thermal generation to replace the lost nuclear generation
- Thereby reoriented the surplus LNG in the Atlantic Basin toward Asian markets
- As the indirect result, caused global LNG prices and European natural gas prices to climb

The impact of the Great East Japan Earthquake may be limited to a period of several years.

The impact of the Great East Japan Earthquake may be limited to a period of several years. Even as Japan began to absorb global LNG surpluses in 2011–12 and global prices and shale spreads began to climb, US LNG developers prepared the groundwork for substantial LNG exports after 2015.

EUROPE'S INTEREST IN NORTH AMERICAN LNG

In the future, increasing natural gas demand in Europe will depend heavily on competitive price levels, national and European energy policies, and the interfuel competition in power generation. Assuming a moderate softening of prices due to increased supply, the outlook is for moderate demand growth. But markets could thrive if LNG and natural gas prices decrease to levels competitive with coal.

The European supply panorama is more complex, filled with supply options and risks.

The European supply panorama is more complex, filled with supply options and risks.

There is a vast portfolio of existing long-, medium-, and short-term supply, but the outlook is uncertain.

- Most prominent in the EU27 supply picture are indigenous supplies, which are trending downward.
- Indigenous supplies are followed by imports from Russia, Norway, and Algeria. Supplies from Norway and Algeria are likely to decline with reserves (and rising domestic usage), but Russia has ample potential resources in Siberia and abundant pipeline capacity to Europe.
- New basins such as those in the Caspian, Iraq, and the Eastern Mediterranean are beginning to supply volumes and/or developing potential supply fields aimed at Europe. These supplies are abundant but suffer the disadvantages of lengthy supply routes and sometimes unattractive political risk.
- The wild-card supply source will be LNG supplies from around the world.

On balance, from 2015 onward, Europe expects a steady reduction in the volumes of gas contracted to European purchasers and, therefore, a growing gap between contracted supplies and European gas demand. To meet this uncontracted demand, European buyers will be enthusiastic purchasers of LNG from North America because of the following:

- The increasingly abundant offering of LNG from North America is perceived to be relatively “risk-free.”
- The North American LNG would enhance the liquidity of Atlantic LNG trade, and thereby could act to stabilize European gas-market prices.

The only apparent problem is that in a high oil-price environment, European buyers have been unable or unwilling to pay the same lofty, oil-indexed prices as East Asian buyers. Therefore, much of the new North American LNG under development is directed toward Asia (even if the initial purchaser is European). Also, it is unclear if Atlantic shale spreads can sustain LNG exports over the long term because their margin above liquefaction and shipping

costs is relatively thin. Based on the information provided earlier, the Atlantic shale spread margin above logistic costs is now only about \$3.00 to \$4.00 per million Btu's versus a margin of \$6.00 to \$7.00 per million Btu's in the Pacific.

POTENTIAL INDIRECT BENEFITS

Even though lower delivered LNG prices in Europe will cause North American exports to Europe to be dwarfed by exports to Asia, the overall exports could have important indirect benefits for Europe.

European LNG and natural gas markets have become a pendulum that swings with time between the Asian and North American markets.

- On the one hand, when global markets are supply-constrained, European market prices gravitate toward alignment with the historically undersupplied, oil-indexed, LNG-dependent markets of East Asia.
- On the other hand, when global markets are in surplus, European markets swing more toward the largely self-sufficient and increasingly oversupplied natural gas markets of North America that have supported highly liquid traded hub pricing at sustained low levels.

In other words, Asian prices form the ceiling and US prices the floor for European prices (after adjustments for liquefaction and shipping costs between Europe and each region).

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Large-scale North American LNG exports to Asia could reduce the substantial Pacific shale spread, probably by increasing US prices a little and applying substantial downward pressure to lofty Asian LNG prices. This, in turn, could have two indirect and favorable benefits for European buyers:

- Providing downward price pressure to prices as Atlantic and Middle Eastern supplies currently directed to Asia are liberated for increased deliveries to Europe


- Tightening the amplitude of future price swings in Europe by bringing the Asian ceiling and North American floor prices into closer alignment

Such enhanced supply and price stability would be good for the European gas industry and its customers.

European markets present a logical short- to mid-term outlet for surplus supplies

For US LNG exporters, LNG aggregators, and traders, European markets present a logical short- to mid-term outlet for surplus supplies that will not be needed in or deliverable to Asia. Over the long term, European LNG sales may also present a useful netback price hedge against the risk that Asian demand and prices do not sustain the high costs of liquefaction and shipping needed to serve those markets.

Over the long term, European LNG sales may also present a useful price hedge against the risk that Asian demand and prices do not sustain the high costs.

However appealing the direct and indirect benefits of North American LNG may be for Europe, the commercial reliability of North American supply should be studied early and often. North American LNG exports are the third commercial surprise to burst upon the world stage since the middle of the last decade—following first the shale gas boom and then the elimination of regional LNG import demand. The rapidly growing projections for North American LNG exports are promising but also need to be constantly challenged and stress-tested in relation to their long-term sustainability, possible limitations, and global and European market impacts. 

NOTES

1. This article builds on Gonçalves, C. (2014, January). North American LNG exports present epic opportunities and risks. *Natural Gas & Electricity* 30(6), 9–16.
2. Christopher Gonçalves coined the terms “shale spread,” “Pacific shale spread,” and “Atlantic shale spread” at a CWC Conference in November 2011.