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OIL & GAS MARKET NOTES

Floating LNG Import Projects— The Next Small Thing

INTRODUCTION

The liquefied natural gas (LNG) market has reached a decisive point in its development. LNG supply is increasing from Australia and new supply will soon be available from North America. Meanwhile, demand in the traditional gas-consuming markets is stalling. The question is: How will the industry react to these changes?

On the supply side, Australia is set to become the world's largest LNG exporter, surpassing Qatar's output of 77 million tonnes per year by the end of the decade. Over the same time period, North America will add nearly 60 million tonnes per year of supply from new projects in the Gulf of Mexico and potentially elsewhere. Most of these projects were conceived and approved at a time of sustained high oil and gas prices. Demand for gas at that time, particularly in China, was expected to continue increasing rapidly. However, the world today is very different.

Demand for gas continues to stagnate in Europe. Despite government commitments to reducing greenhouse gas emissions, coal-fired power generation is typically more economic than gas. Only in the United Kingdom, where a carbon price floor has been implemented, is gas competing successfully with coal. In continental Europe, there may be initial signs of a recovery in gas demand, but there is still a long way to go before gas reaches the same consumption levels seen before the 2008 financial crisis.

In Asia, the two big LNG purchasing nations of Japan and South Korea are seeing gas demand challenges. Following the Fukushima Daiichi incident in Japan, over 10 million tonnes per year of additional LNG was consumed as the nuclear fleet was shut down. Due to a combination of increasing investment in renewable generation and a slow but steady return of nuclear power in the near term, gas consumption is anticipated to flatline (at best). However, consumption could steadily decline over the next decade to near pre-2011 levels. China appears to be finding a new normal level of economic growth, much reduced from previous years, but still impressive by the standards of Western Europe or the United States. Yet, without a significant policy shift and associated energy pricing changes, it seems that China may be fully supplied with gas for the next few years.





THE NEXT OPPORTUNITY

So if the traditional LNG markets are not going to be the required source of new demand growth, where should LNG suppliers be looking for new customers?

Gas has a significant role to play in the transportation sector, both for road and marine. Navigant considered road transport in an [earlier edition](#) of *Oil & Gas Market Notes*. In the marine sector, emissions control areas, such as those in the Baltic and North Sea, for example, are opening new opportunities and will lead to increasing demand for LNG over time.

Another development is the continued addition of new regional LNG markets: the Middle East, Latin America, and selected countries in Africa and Asia. What connects the majority of these new LNG purchasers is the mechanism through which the LNG is imported.

An LNG import terminal 5 years ago was typically a multi-hundred million-dollar capital investment requiring a port and marine facility with two or three large onshore LNG tanks. Development of such facilities would require a long-term (i.e., 20-year) commitment to LNG purchases and gas consumption. Financing of these projects would be complex and time consuming. Construction of the import facility would require 3 to 4 years following agreement of the financing arrangements. This reality meant that LNG imports were limited to those with deep pockets and a credit rating sufficiently strong to support a large, long-term financing.

However, floating storage and regasification units (FSRUs), first pioneered by Exceleerate Energy, can now be deployed in months (with the appropriate existing infrastructure) and at a capital cost that can be measured in tens of millions of dollars, not hundreds. While operating costs for this type of facility are higher than for an onshore terminal, due to the charter fees for the FSRU, the overall cost structure is much easier for smaller importers to finance. The other significant advantage of an FSRU solution is the short time commitment required to secure the project development. As the main asset is flexible in both use (it can revert to utilization as a standard LNG carrier) and location (it can sail to a new import project), an FSRU project can be economic over a period as short as a 5 years.

Exceleerate, Golar, Hoegh, BW, Engie, etc. have implemented FSRU projects in locations as diverse as Kuwait, Dubai, Jordan, Egypt, Argentina, Brazil, Indonesia, Pakistan, China, and others. Although the individual projects are not that large in the context of the global LNG market, their number and potential speed of execution makes them significant.

Using the recently completed Jordanian project as a reference, Navigant has identified and analyzed a number of the critical success factors for the implementation of FSRU-based LNG import projects. An appropriate approach to the issues described below can deliver tangible and valuable results. The Jordanian LNG project was implemented at a similar time to projects in Egypt and Pakistan. Some of the costs of these projects have become publicly available and a comparison reveals significant benefits to the Jordanian project. Most of these benefits can be attributed to the thoughtful and considered project development approach taken by the two project sponsors: Jordan's Ministry of Energy and Mineral Resources (MEMR) and National Electric Power Company (NEPCO).

LESSONS LEARNED

The critical success factors can be grouped in three broad categories: planning and communication; timeline; and contracting strategy.

Planning and Communication

Identifying how the project will be structured and then procured sets the overall project execution strategy. Using a methodical approach to identify potential options for the project structure and procurement, as well as speaking to several different potential suppliers and contractors to understand their perspective, is highly recommended. It is only through discussion with a large number of project stakeholders that an appropriate, achievable solution that meets the procuring agencies' requirements can be identified and selected. This process should then lead to the creation of a comprehensive implementation plan, risk matrix, and battery limits for each of the project elements that clearly defines each party's role and responsibilities. As the project develops, these definitions should be regularly communicated to the stakeholders.



The importance of nominating a single, coordinating authority within the procuring agency cannot be underestimated. For example, the competing aims of rapid implementation and cost control can come into conflict, with different stakeholders promoting different points of view. Thus, a single point of authority (an individual or committee) needs to be able to make rapid decisions and direct the project execution. The project's suppliers and contractors will have much greater confidence in the project, the implementation plan, and timeline if a clear and consistent approach is communicated from the outset.

Consideration of the environmental impact early in the planning stage is also vital to the project's success. For example, it was identified that the FSRU to be deployed at Aqaba, Jordan would sit over an area of coral reef. This delicate ecosystem had to be relocated to a marine nature reserve several kilometres up the coast before construction could begin.

Timeline

As part of a project's implementation plan, a detailed project schedule should be developed. This schedule can then be used to identify the project's critical path and therefore those activities that should be prioritized. While a key objective is often to complete the project as quickly as possible, it is also important that any target timetable is achievable. Experience on the Jordanian LNG and other projects has demonstrated that an unreasonable timeline leads to both a lack of supplier confidence in the project and increased costs (which usually result from the perception of higher risks). A period of 28 months is typically achieved from final investment decision to commissioning for a greenfield site. If an existing port can be utilized, implementation can be considerably faster.

The identification and completion of critical baseline studies, such as the environmental impact assessment, early in the project execution is also vital. Important requirements can then be identified in the planning stage of the project, and therefore, fundamental changes can be accommodated with relative ease and with limited implications to the project cost and schedule. However, if these issues come to light during procurement or construction, the implications can be far more difficult to address.

LNG import projects require the procurement of a myriad of complex equipment. Some of these are only available from a few specialist suppliers and can be bespoke to each project. As a consequence, it often takes 12-18 months to procure these items. Early ordering (and to the extent possible, standardization) of this equipment will shorten the project schedule, often by significant periods.

Contracting Strategy

The contracting approach needs to be matched to the overall project requirements. If, as is often the case with FSRU-based LNG import projects, implementation speed is the most critical objective, a lump sum turnkey EPC contract is usually not the best approach. With speed of execution comes the need to be flexible and reactive to new information and requirements as these become available. A lump sum bid from a contractor based on incomplete information has inherent risks. Thus, the prices offered will be high, reflecting contractor uncertainty. Additionally, the process of negotiating change orders will be time consuming and costly. A target price, cost plus, or other flexible approach is likely to lead to faster implementation times and lower overall costs.

The financing of the LNG import project will depend on the overall commercial structure selected. The financing approach will itself affect both cost and schedule. Hence, this needs to be considered at the outset of the project. Linked to this is the credit support required. The use and type of letter of credit, government guarantee, and partial risk guarantee, etc. from development banks need to be considered early in the planning process. Both short-term procurement issues and long-term contract performance need to be addressed. Any perceived risk to cash flow will be priced in by suppliers and may even result in a lack of interest in the project if significant.

Finally, the quality and structure of the documentation will have a massive influence on the project's success. This includes the information memorandum used to brief suppliers, any tender documents, and the draft contracts. These must be consistent and comprehensive while also apportioning project risk reasonably. The first two requirements are common sense, but risk allocation merits further consideration. At first sight, it can appear attractive for the procuring agency to require suppliers and contractors to manage all of the project's risks and uncertainties. However, it is important to recognize that this approach has consequences for both project cost and schedule that may be detrimental to the overall project objectives. Suppliers will seek to mitigate risk through higher prices and the imposition of a series of constraints in their proposals. Extensions to procurement timelines can be expected where suppliers have to identify, consider, and then approve their response to a high risk project. Therefore, a balanced approach to risk is often a better overall solution for procurer and supplier alike.



CONTINUED DEVELOPMENT OF LNG MARKETS

FSRU projects will continue to be developed around the world, providing gas to new markets. Most of these will require demand of at least 1.5 million tonnes per year to be economically viable. Yet, technology and commercial solutions continue to adapt to new opportunities. Several companies are now looking at small-scale LNG solutions that can be deployed in areas such as the Caribbean or South East Asian Archipelagos, either aggregating demand for several small purchasers or developing solutions specific to an individual small-scale project. These will open yet more markets to LNG by the end of the decade.

HOW CAN NAVIGANT HELP?

Using its in-depth industry knowledge and experience, Navigant's Oil and Gas consulting practice specializes in helping clients understand the issues, develop solutions, and execute on their strategy. Our team has deep experience in helping to drive value in highly volatile times, through upstream, midstream, and downstream operations.

/ RICHARD BASS

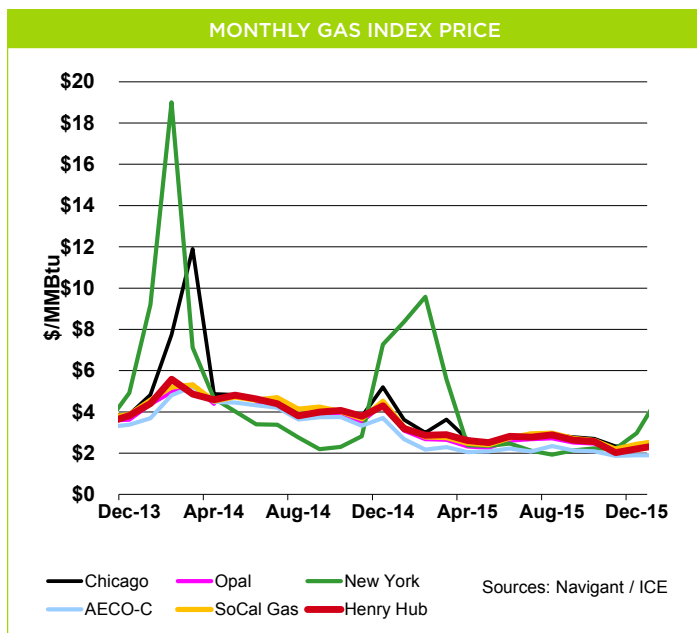
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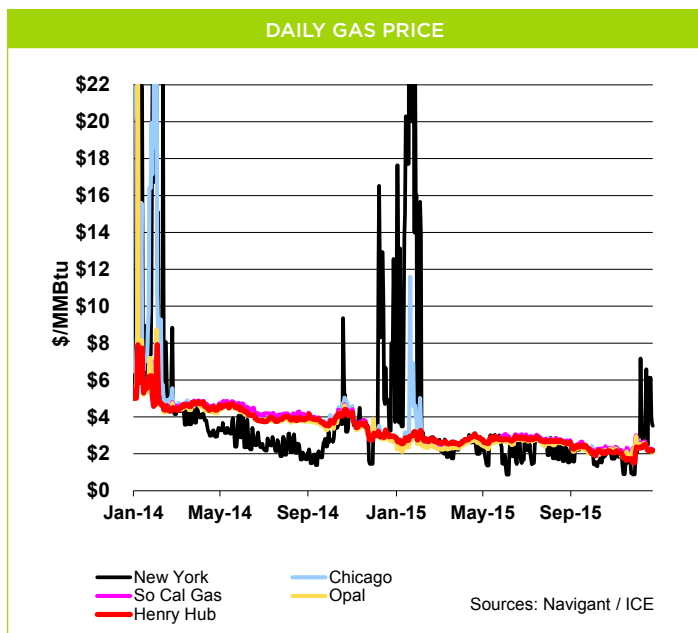
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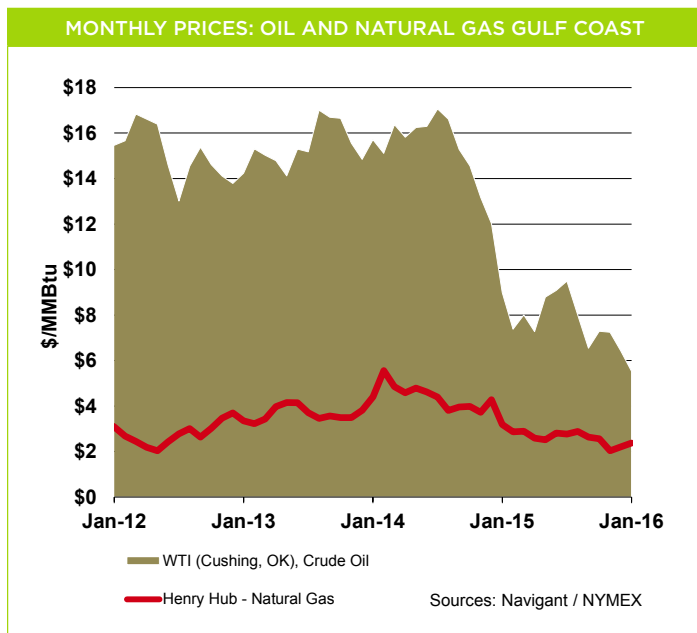
Natural Gas Market Charts



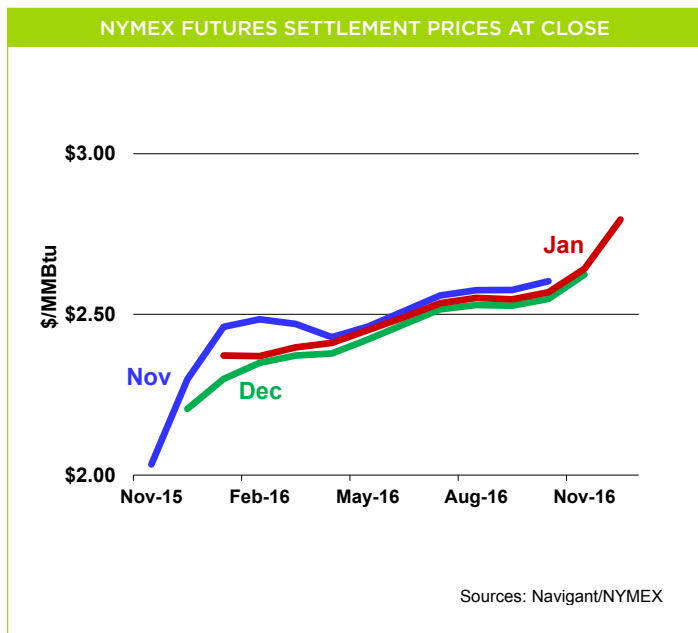
Monthly index gas prices increased 8%, with Henry Hub at \$2.38/MMBtu for January versus \$2.21/MMBtu for December. The January 2016 price was below the January 2015 price of \$3.19/MMBtu by \$0.81/MMBtu.



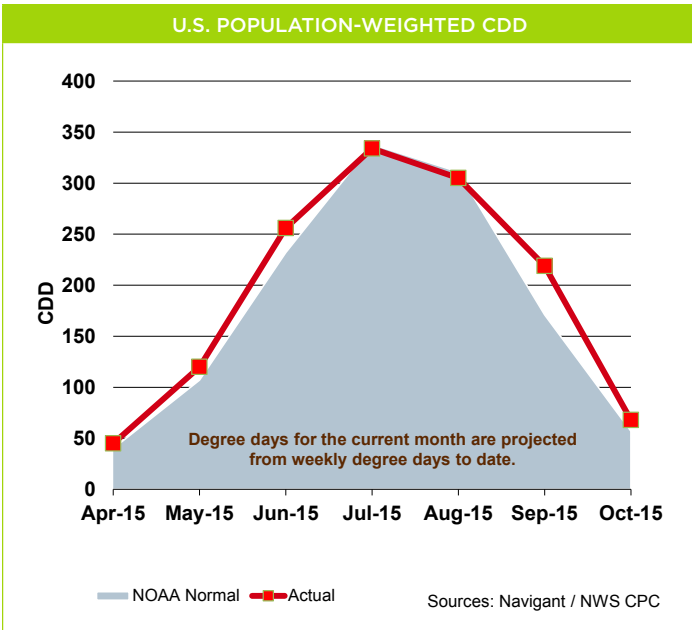
The daily spot prices came down in January 3% versus the end of December, with Henry Hub at \$2.20/MMBtu versus \$2.27/MMBtu.



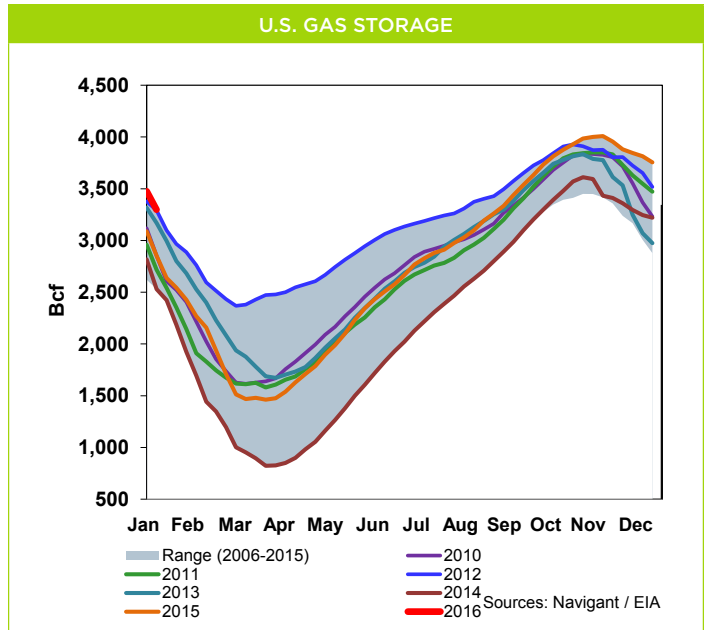
The most recent gas/oil price ratio decreased to 2.3 times, with Henry Hub natural gas price at \$2.38 per MMBtu versus WTI crude oil price at \$5.53. The ratio one year prior was 2.8 times.



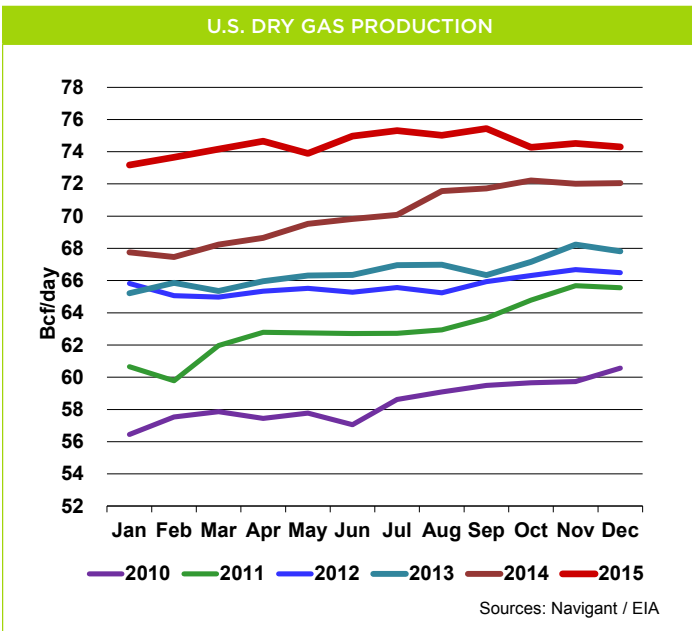
The average 12-month strip price increased 3% to \$2.51/MMBtu for the strip starting January 2016, versus \$2.44/MMBtu for the December strip.



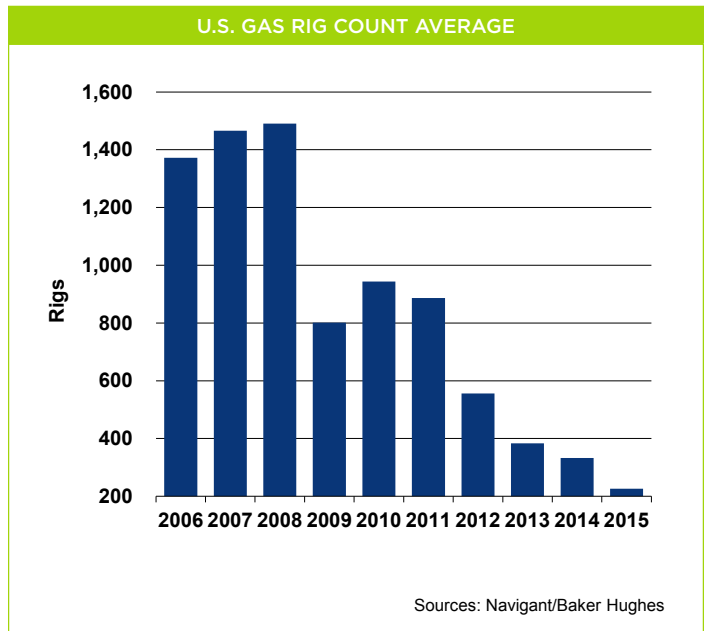
The heating season continued warm with heating degree days at 30% below normal for December, 24% below normal for the season.



U.S. storage inventories were at an all-time high for the end of December at 3,297 Bcf, 16% above the average of the prior ten years at this time.



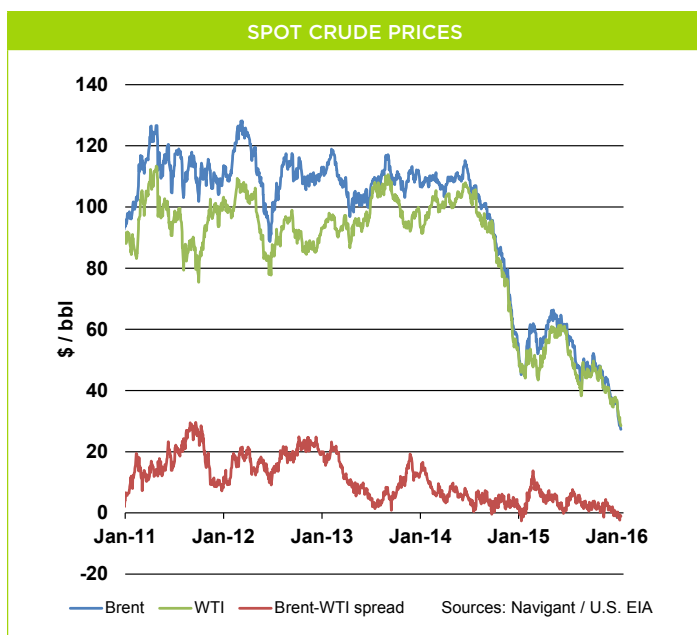
U.S. dry gas production tapered off slightly to just over 74 Bcf/d.



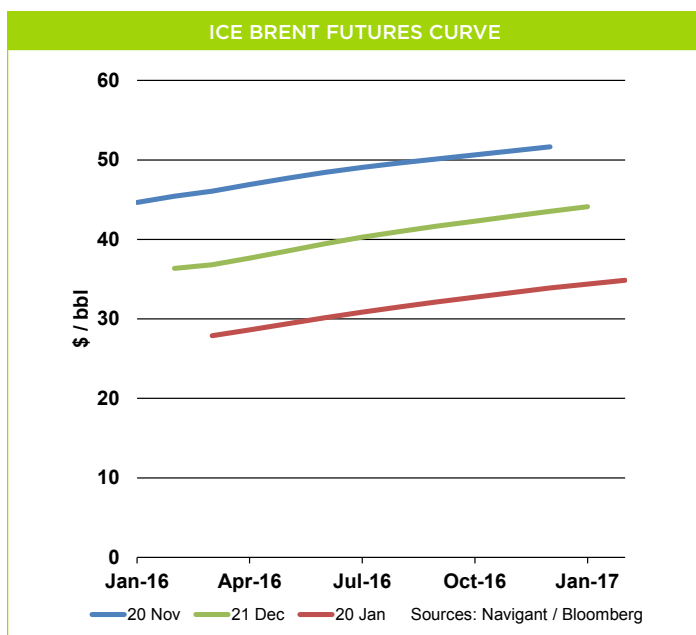
U.S. gas rig count dropped 32% to an average of 226 in 2015 from 333 in 2014.



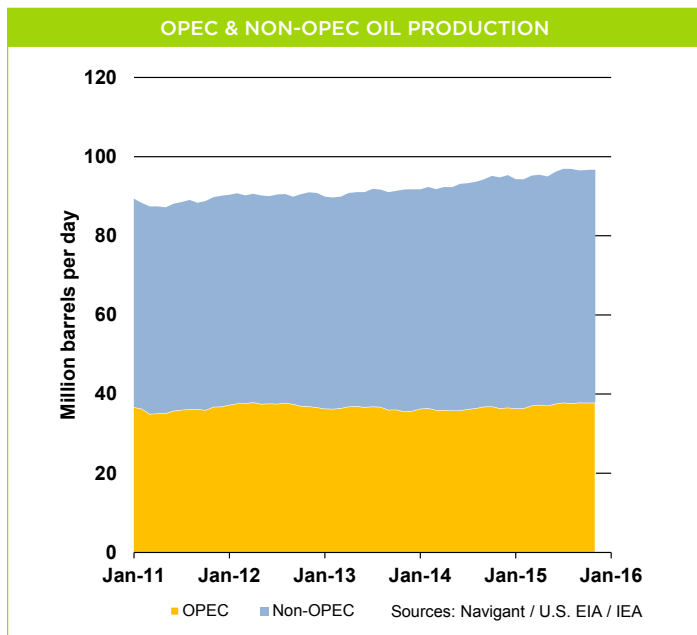
Oil Market Charts



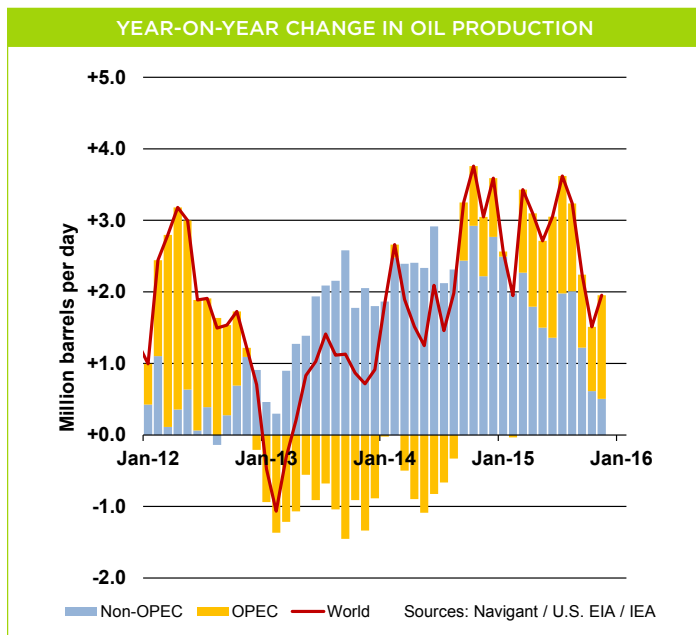
Crude prices averaged \$38/bbl (Brent) and \$37/bbl (WTI) in December 2015 but have since dipped under \$30/bbl to reach 12-year lows.



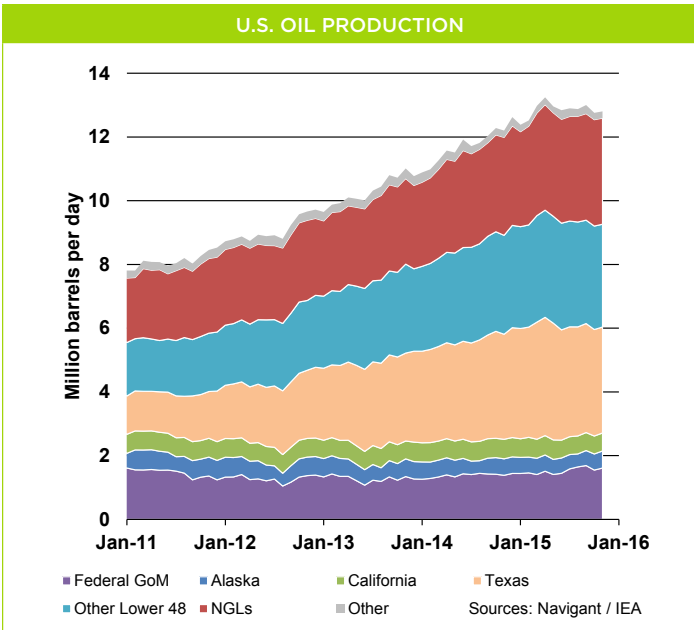
The average 12-month strip price on 20 Jan 2016 was \$32/bbl, a 22% fall from a month ago.



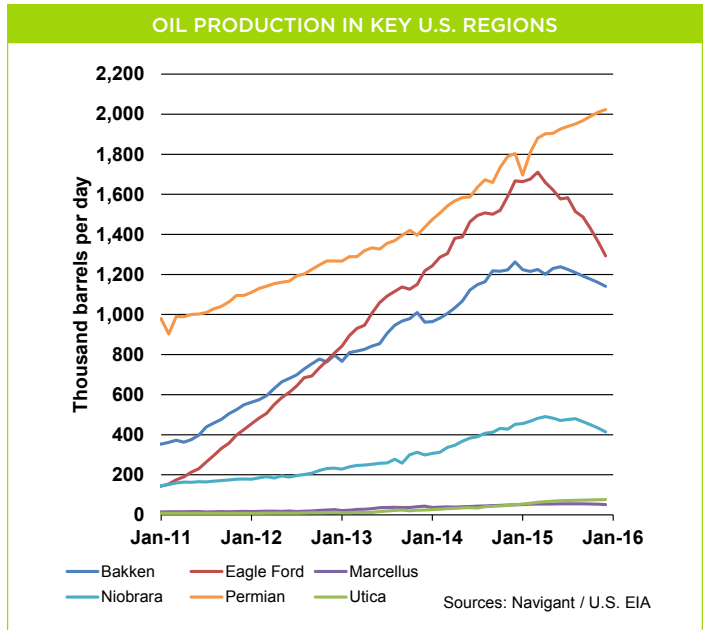
Global oil production increased from 94.7 million barrels per day a year ago to an estimated 96.7 million barrels per day in November 2015, of which 39% was supplied by OPEC.



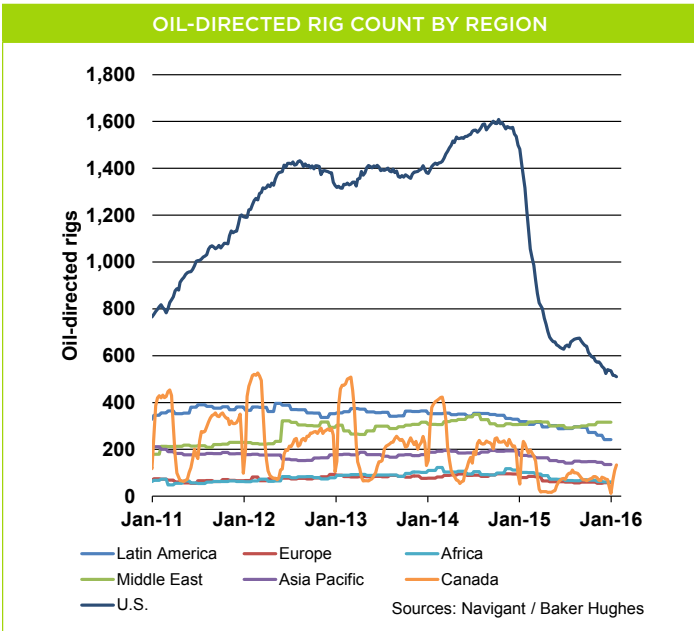
Oil production growth in recent years has been led by non-OPEC countries, particularly the U.S.



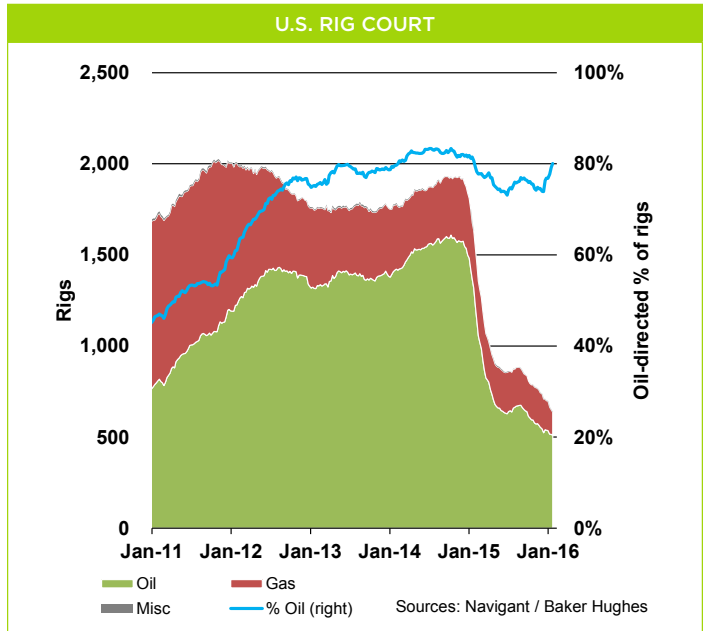
In the United States, oil production climbed by 5% over the year to an estimated 12.8 million barrels per day in November 2015. However, production has fallen 3% since April.



In December 2015, oil production reached an estimated 2 million barrels per day in the Permian but continued to drop in other regions. Eagle Ford is down 24% from its March 2015 peak.



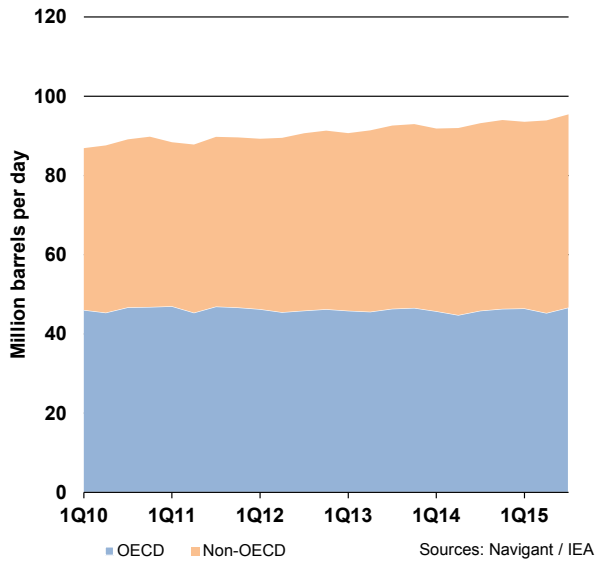
Rig counts have continued to follow oil prices downwards. The U.S. hit a fresh low of 510 oil rigs in January, a level last seen in April 2010.



80% of U.S. rigs were oil-directed in January 2016.

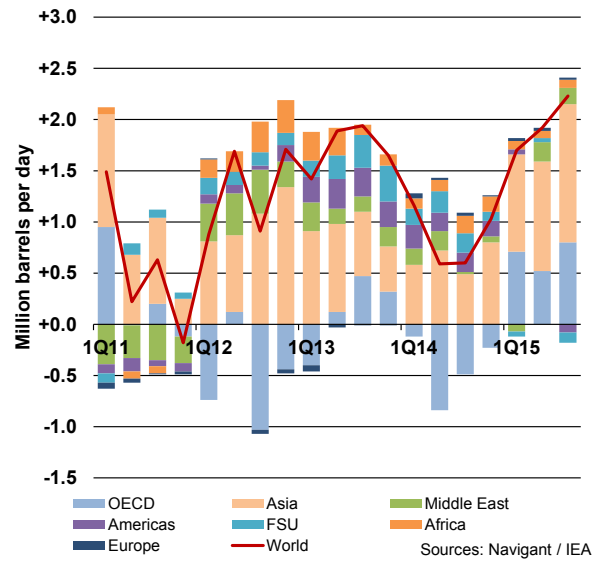


OECD & NON-OECD OIL CONSUMPTION



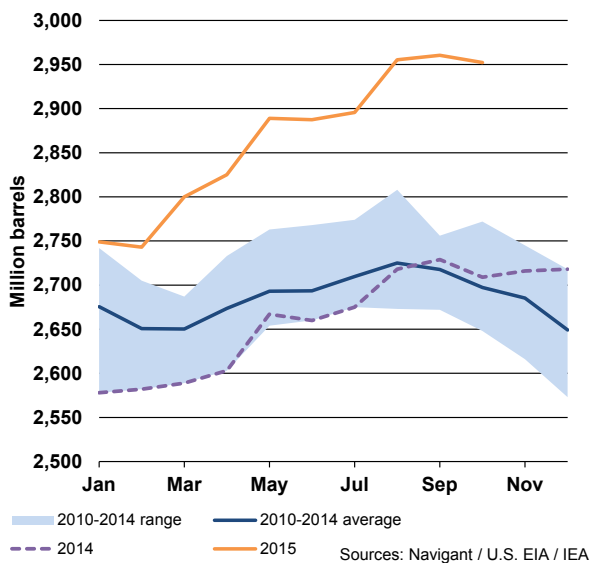
Global oil consumption increased from 93.2 million barrels per day in Q3 2014 to an estimated 95.4 million barrels per day in Q3 2015, of which 49% was consumed by OECD countries.

YEAR-ON-YEAR CHANGE IN OIL CONSUMPTION



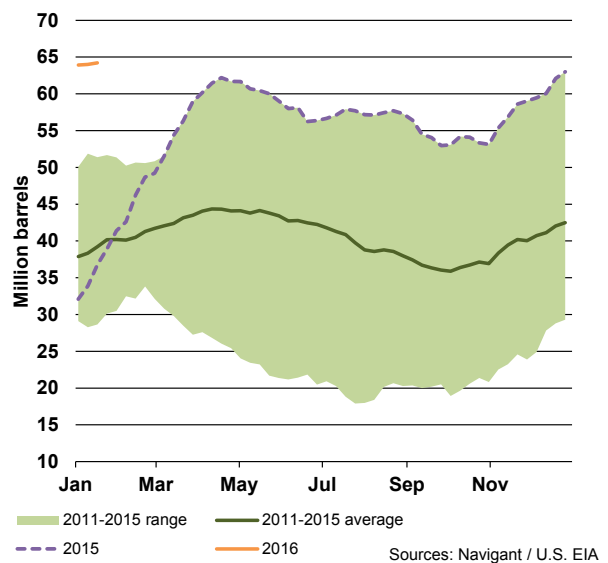
Oil demand growth in recent years has been led by non-OECD countries, particularly in Asia (e.g. China).

OECD COMMERCIAL STOCKS OF CRUDE & PRODUCTS

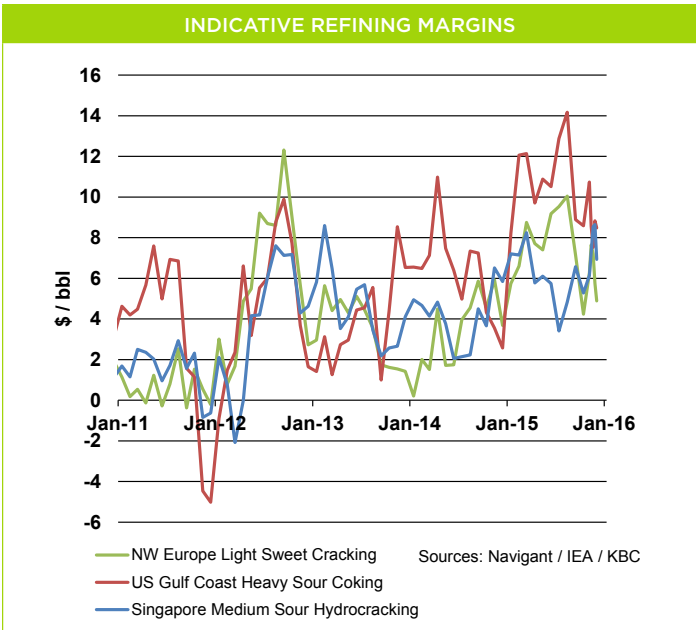


OECD commercial inventories reached an estimated 2,950 million barrels of crude and products in October 2015, remaining 9% above the 2010-14 average.

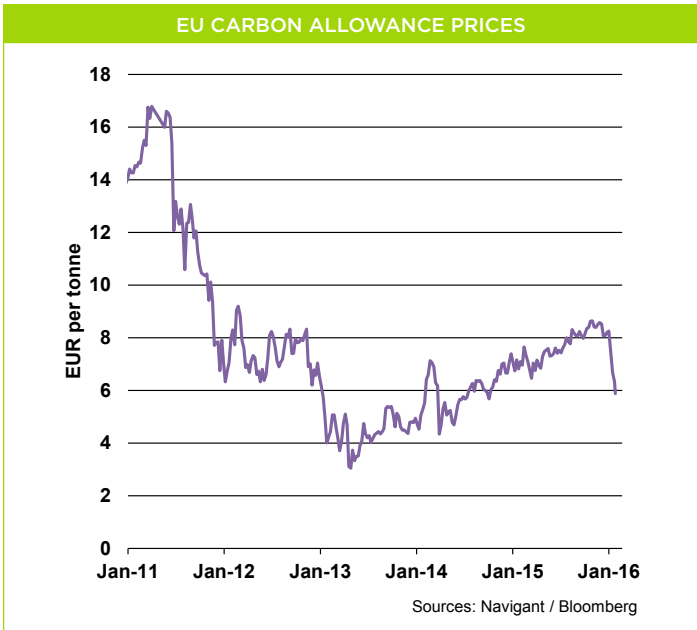
CRUDE STOCKS AT CUSHING, OKLAHOMA



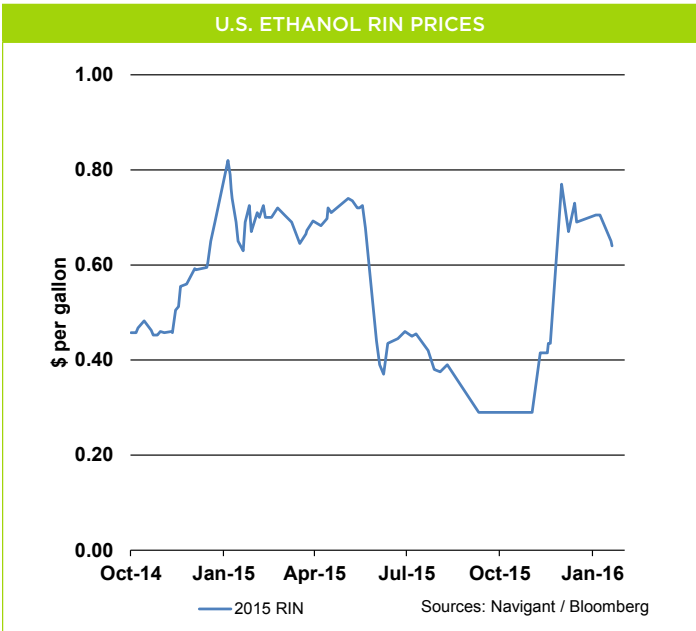
In January 2016, crude inventories at the Cushing hub (the delivery point of the WTI contract) hit a new record of 64.2 million barrels.



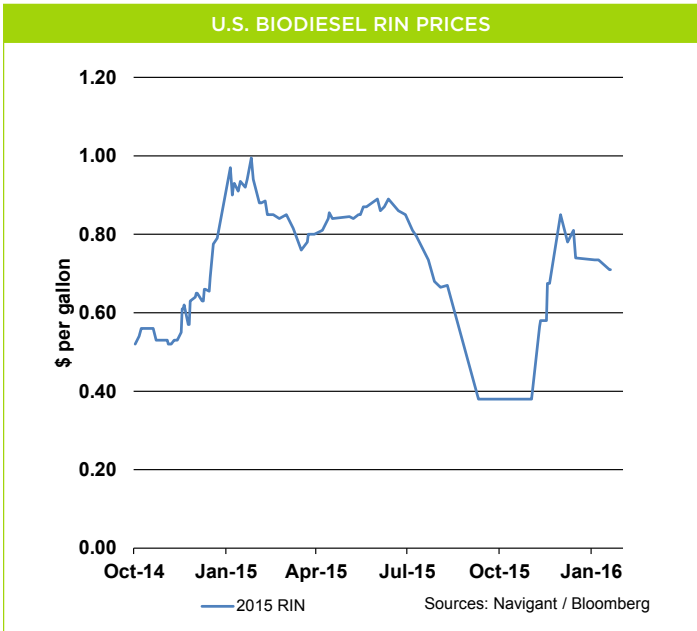
At the start of December 2015, indicative refining margins were \$4.89/bbl for NWE light sweet cracking, \$8.48/bbl for USGC heavy sour coking and \$6.93/bbl for Singapore medium sour hydrocracking.



EU carbon prices dropped sharply at the turn of the year in line with weakness across energy markets.



The value of ethanol RINs rebounded dramatically with the EPA's announcement of final volume requirements under the Renewable Fuel Standard programme.



Biodiesel RINs also rebounded in value thanks to the EPA's announcement.



Legislative and Regulatory Highlights



NATIONAL

FERC Commences Investigation of Pipeline Rates

On January 21, the Federal Energy Regulatory Commission announced its initiation of investigations into the rates charged by four interstate natural gas pipeline. The four pipeline companies are Tuscarora Gas Transmission, Empire Pipeline, Iroquois Gas Transmission, and Columbia Gulf Transmission. Upon review of company filings, FERC became concerned that the rates charge greatly exceeded pipeline costs.



APPALACHIA / NORTHEAST

Forest Service Sends Atlantic Coast Pipeline Routing Back for New Alternatives

On January 19, the U.S. Department of Agriculture, through its Eastern and Southern regional offices, announced that the proposed route for the Atlantic Coast Pipeline does not meet initial screening requirements. Because of inconsistencies with the Forest Plan for national forests to be crossed, the Forest Service instructed the applicant to develop alternatives consistent with the forest protection requirements, together with appropriate comparative analyses. Issues involved include protected species as well as crossing of the Appalachian National Scenic Trail and Blue Ridge Parkway.



SOUTHWEST

BP to Acquire Devon Assets in San Juan Basin

On December 18, BP announced its acquisition of all of Devon Energy's assets in the San Juan Basin straddling northern New Mexico and southern Colorado, its first major acquisition of U.S. onshore assets in more than seven years. BP expects to take over operations of 480 wells currently producing in the Northeast Blanco Unit in San Juan and Rio Arriba counties in New Mexico in early 2016.

Kinder Morgan to Expand Sierrita Pipeline

On January 19, Kinder Morgan announced its planned expansion of the Sierrita Gas Pipeline project by an additional 230 MMcfd beyond fully-subscribed current capacity of 201 MMcfd. The additional capacity will be earmarked for Mexico's Comision Federal de Electricidad, which has an option to increase its capacity to 309 MMcfd by election before February 29, 2016. The pipeline extends from El Paso Natural Gas south mainlines near Tucson, Arizona to the U.S.-Mexico border near Sasabe, Arizona.



NATIONAL ENERGY BOARD

New Well Productivity Climbs in Western Canada

On December 21, the National Energy Board released a Market Snapshot summarizing the state of natural gas production in western Canada. The Snapshot stated that new well productivity enhancement due to hydraulic fracturing and horizontal drilling has meant that a decreasing number of wells account for the majority of western Canadian gas production. The proportion of wells producing 80 percent of western Canadian natural gas has dropped from 18 percent in 2008, to 12 percent in 2015.



BRITISH COLUMBIA

NEB Approves Exports by Kitsault Energy LNG Project

On January 21, the National Energy Board issued a Letter Decision approving the application of Kitsault Energy Ltd. to export natural gas in the form of LNG totaling 22.7 Tcf over the course of a 20-year term, or 3.1 Bcfd. The approved export point will be the proposed project near Kitsault, British Columbia. The NEB determined that the quantity of gas to be exported is surplus to Canadian needs.

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Navigant's Global Energy Practice includes more than 400 experts focused on issues across the entire energy value chain, including renewables, climate change, energy efficiency, demand response, emerging technologies, global oil and gas, generation, resource procurement, transmission, markets, performance improvement, fuel sourcing, rates, and regulation. The Practice also provides energy market research reports in the areas of clean technologies, smart grid, and emerging energy-related markets. More information about Navigant's Energy Practice can be found at navigant.com/energy.

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