AMERICAN CLEAN SKIES FOUNDATION

EUROPEAN VIEWS ON AMERICAN NATURAL GAS EXPORTS

A STRATEGIC PRIMER

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About American Clean Skies Foundation

Established in 2007, ACSF seeks to advance America's energy independence and a cleaner, low-carbon environment through expanded use of natural gas, renewables, and efficiency. The Foundation is a 501(c)(3) not-for-profit organization.

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Preface

> **"[O]ur country is not and cannot be an island when it comes to energy markets."**
>
> **Hillary Rodham Clinton,**
> **U.S. Secretary of State - Georgetown University, October 18, 2012**

North American production of natural gas, increasingly from deep shale formations, is currently at record levels: production averaged approximately 80 billion cubic feet (bcf) per day in 2012 with the bulk of this output coming from the United States (67 bcf/day). The question now is whether the public interests of the United States are served by exporting a portion of this growing supply—perhaps up to 10–15 percent of U.S. output by 2025—to almost any bidder in the form of liquefied natural gas (LNG). The U.S. Department of Energy (DOE) is preparing to resolve this issue in 2013.

Much attention has been given to the domestic arguments for and against LNG exports. Key considerations include the impact on future gas supplies (e.g., to what extent export authorizations will stimulate production) and consumer prices, especially for home heating and industrial uses (e.g., manufacturers, refiners, fertilizer plants). In December 2012, however, a long-awaited study commissioned by the DOE found that allowing LNG exports would have net economic benefits for the U.S. under a wide variety of export scenarios, despite resulting in marginally higher domestic natural gas prices (the estimated price increase was typically about 12 percent or roughly 50 cents per thousand cubic feet [mcf] of gas in the scenarios analyzed). And scenarios with unlimited exports always had higher net economic benefits than corresponding scenarios with limited exports.

But what about the international dimensions of the argument? As Secretary of State Hillary Clinton put it in a landmark 2012 address, the U.S is far from being an island when it comes to energy issues, and domestic energy policy decisions must be considered in terms of their larger impact on the energy security of America and its allies. This is particularly true for natural gas, Clinton suggested, where major gas exporters such as Russia, Iran, and Qatar have traditionally been a major force.

In this context, the geopolitical impact of policies that would increase future exports of gas from North America cannot be ignored; indeed, some would-be importers (and their Washington allies) contend that America's friends, especially Europe and Japan, should have first call on this valuable resource so as to reduce the sway of their legacy suppliers. Others argue that traditional free trade considerations should be paramount given that the U.S. has long opposed other countries' efforts to impose conditions on the import of American agricultural and manufacturing goods.

But what about the view from the other side—from the countries that would likely receive new LNG imports from America? How do they see it? And how do they view the energy security and trade aspects vis-a-vis the environmental and climate concerns related to an increase in the worldwide take up of natural gas?

To be sure, several major European companies—BG, BP, Shell, Statoil, and Total (to name but a few)—are likely to profit from expanded LNG exports. Since 2007, these companies alone have invested more than $25 billion to develop U.S. shale gas resources, a huge inflow of foreign capital that has created local jobs and helped to bolster many American producers. Having welcomed the capital and the jobs, BG et. al. plainly wish to see some DOE accommodation when it comes to exports, especially when such exports are likely to support U.S. jobs and production.

This paper also draws attention to several other European perspectives on LNG exports that have received much less attention in the United States. These include:

1) The role that LNG imports may play in promoting greater competition for cross-border energy services within the European Union (EU). Alternative supplies of natural gas may not only reduce the power of incumbent natural gas providers, (e.g., complementing the EU's current antitrust probe of Russia's Gazprom), they may also provide new options for the electricity sector in Europe, and thus an overall improvement in energy efficiency.

2) The continuing power of Europe's coal industry (and coal-fired utilities) which, along with other incumbent energy providers, would prefer to see American LNG go elsewhere. In this regard, the public discussion about LNG exports on both sides of the Atlantic seems strangely divorced from any debate regarding the global trade in coal, which has grown sharply in recent years. In fact, exports of U.S. coal to the EU have increased by more than 120 percent since 2009 (total U.S. exports are now well over 13 percent of production). That has significant ramifications for the environment and for climate action, of course, which brings us to a third point.

3) The EU's assessment of the environmental consequences of LNG imports (and associated shale gas production) seems to have been conducted with very limited attention to U.S. research on this subject, much as the U.S. government's own environmental assessments of natural gas (and other energy sources) commonly pay scant attention to parallel work in Europe. This is especially unfortunate when it comes to LNG because, unless some of the current misconceptions regarding shale gas are addressed, export opportunities may be unfairly diminished.

Simply put, the current debate over U.S. natural gas exports has underscored the fact that a much greater transatlantic exchange of information and dialogue is needed. This is particularly so with respect to climate change and other environmental implications. Our Foundation stands ready to help with that exchange, and we hope that this paper will serve as one of the starting points for a fuller discussion of the issues associated with expanded U.S. trade in LNG.

Gregory C. Staple, CEO
American Clean Skies Foundation
Washington, DC

1 Introduction

This report explores the significance of potential U.S. natural gas exports to Europe. In the face of an unprecedented expansion of domestic natural gas production and record low gas prices, roughly 20 companies are currently seeking permits to export U.S. liquefied natural gas (LNG) overseas. Gas prices in Europe and Japan currently are five to nine times higher than in North America. Selling gas abroad could provide economic opportunities for natural gas producers, and many argue, for the U.S. as a whole. While much attention has been paid to the domestic impact of potential American LNG exports, little has been heard from the perspective of countries that could receive the gas.

European energy companies will benefit from American LNG exports, in part, because most European energy majors have upstream investments in American shale gas plays. However, the significance of American LNG exports for Europe is far broader.

The size of the European natural gas market and its strong business ties to the U.S. make Europe a key destination for American LNG. Importing LNG from the U.S. may help the EU secure its energy supply, reinforce geopolitical ties between the U.S. and Europe, strengthen transatlantic trade, displace more carbon-intensive fuels (coal, oil), and reduce natural gas prices for residential and industrial consumers.

Still, a number of factors in Europe may create an unfavorable environment for American gas. The low price of coal in Europe is currently pushing natural gas out of the energy mix in some countries. Furthermore, Europe's historic climate policies and shale gas production may dampen policymakers' interest in pursuing LNG even though gas imports ultimately could have a positive impact on the EU's carbon footprint. It will be up to the Europeans to decide how to balance the potential benefits of importing American LNG with their trade, climate, environmental, and other policy priorities.

Many points of contention today could be addressed with greater communication between the U.S. and the EU on regulatory advances, environmental concerns, and geopolitical interests in both regions. The increasing integration of energy markets in the Atlantic Basin, not only for natural gas suppliers but for coal as well, necessitates greater cooperation between Washington and its European counterparts.

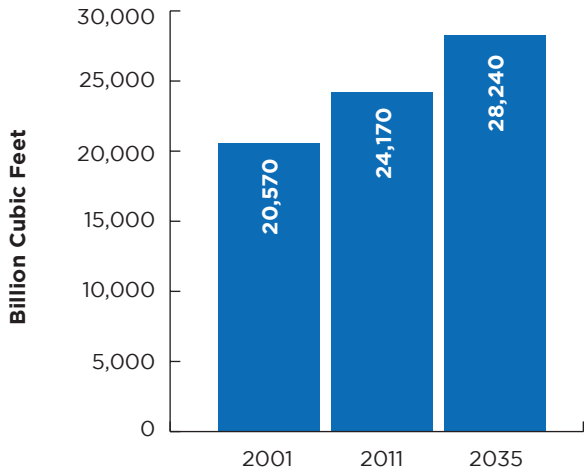
This report first lays out the current prospects for American LNG exports and explains the European natural gas market. It proceeds to illustrate European oil and gas companies' stakes in U.S. shale gas exports. Lastly, the report evaluates potential benefits to Europe from American shale gas exports and potential obstacles to expanding these exports.

2 The Debate Over North American Shale Gas and LNG Exports

It is hard to overstate the impact of U.S. shale gas production on American and global natural gas markets. A decade ago, energy experts anticipated a decline in American natural gas production and companies began building terminals to import LNG. Today, the United States is on the road to greater energy self-sufficiency and is preparing to export its natural gas overseas. Natural gas production in the United States has grown by more than 17 percent since 2001, and the International Energy Agency projects that it will grow another 17 percent to more than 28,000 billion cubic feet (bcf) by 2035.[1] Because of shale gas, the United States passed Russia as the largest gas producer in the world in 2011.[2]

The rise of shale gas has also made natural gas cheaper in the United States than in Europe or Asia. U.S. Henry Hub prices fell from an average of $8.81 per million British thermal units (MBtu) in 2005 to a low of $1.82/MBtu in April 2012. Gas prices in Europe and Japan are five to nine times higher.

Figure 1.
U.S. Natural Gas Production



Sources: EIA, IEA.
BP 2012, *BP Statistical Review of World Energy*.
June 2012, EIA, EIA (See footnotes 1, 2)

Table 1.
Natural Gas Prices ($/Mbtu) October 2012[3]

Country	$/Mbtu
U.S. Henry Hub	$3.50
Europe	$11.58
Japan	$16.65

The low price of American natural gas provides a business opportunity for companies to export LNG overseas. Europe is a critical market for U.S. LNG exports. Because LNG from the Gulf of Mexico and the Atlantic Coast can reach Europe quickly and easily, industry officials conclude that U.S. LNG could play a larger role in Europe than in Asia.[4]

1. Energy Information Agency (EIA) (2012). "U.S. natural gas marketed production levels off in the first half of 2012," http://www.eia.gov/todayinenergy/detail.cfm?id=8190; International Energy Agency (2012). World Energy Outlook. Paris: OECD/IEA, New Policies Scenarios. For consistency, this report generally states natural gas volumes in cubic feet; although Europeans commonly use cubic meters. One cubic meter of gas is equal to approximately 35 cubic feet. See Appendix 1 for a conversion chart.
2. International Energy Agency (2012). *World Energy Outlook*. Paris: OECD/IEA, p. 136.
3. Data from the World Bank and U.S. Energy Information Agency.
4. Karen Boman (2012). "U.S. LNG Exports Likely to Play Larger Role in Supplying Europe vs. Asia." *Rigzone*. 23 May 2012. www.rigzone.com/news/oil_gas/a/118112/US_LNG_Exports_Likely_to_Play_Larger_Role_in_Supplying_Europe_vs_Asia.

Box 1: LNG in Japan and China

Asia is the world's largest and fastest growing LNG market. Japan buys over half of Asia's LNG and pays the world's highest prices for natural gas. Although China currently imports limited quantities of LNG, its natural gas demand is anticipated to grow. Asia's lucrative and expanding markets are driving the growth of LNG trade worldwide.

Japan imports more LNG than all European countries combined. After the Fukushima nuclear disaster, Japan closed down its nuclear power stations and increased its natural gas imports. The country's future demand for natural gas will depend on its policies with respect to nuclear power.

China is Asia's largest natural gas consumer, but still uses only one-third as much natural gas as Europe. China is planning to increase its gas consumption as part of a shift to cleaner energy sources. The International Energy Agency (IEA) predicts that China's natural gas use will quadruple to 19,203 bcf (544 billion cubic meters [bcm]) in 2035, although that would still be approximately 20 percent below current U.S. demand. Pipeline gas, LNG, and domestic shale gas production will all play a role in China's gas market. Although China has large shale gas reserves, limited water resources may prevent their full exploitation.

Many Asian oil companies and utilities have invested in U.S. shale gas production and have signed contracts with U.S. LNG export terminals. Korea's Kogas and India's GAIL are slated to receive LNG from Cheniere's Sabine Pass terminal in Louisiana. Japanese companies have committed to buying LNG from Dominion's Cove Point terminal in Maryland and Sempra's Cameron LNG terminal in Louisiana. PetroChina, in turn, has invested in Shell's Kitimat LNG terminal in Canada.

Natural Gas Trends in Asia 2011–2035

	Natural Gas Consumption (bcf)		
	2011	2020	2035
Japan	4282	4060	4342
China	4614	10731	19203
	Natural Gas Imports (bcf)		
Japan	4095	4024	4342
China	1094	4554	7978
	Share of Global Consumption		
	2011	2020	2035
Japan	3%	3%	2%
China	4%	8%	11%

Sources:
International Energy Agency (2012). *Medium-Term Gas Market Report 2012*. Paris: OECD/IEA.
International Energy Agency (2012). *World Energy Outlook*. Paris: OECD/IEA.
BP (2012). *BP Statistical Review of World Energy June 2012*, p. 29.

Moreover, European demand for new sources of LNG will grow. Analysts predict that as demand for LNG rises in Asia, the LNG deliveries currently planned for European markets may be diverted to the Far East.[5] This would further increase demand for LNG in the Atlantic Basin and provide export opportunities for U.S. producers.

Asia is also a potential market for American gas, especially for gas delivered to export terminals on the Pacific Coast (see Box 1). Natural gas prices are higher in Asia, which could give exporters higher profit margins in that market. Additionally, LNG from terminals on the Gulf Coast will be able to reach Asian markets through the Panama Canal starting in 2014.[6]

North American LNG Exports: Regulatory Framework and Political Opposition

The United States has limited experience in exporting natural gas. The Kenai LNG export terminal in Alaska has sent LNG to Japan since 1969,[7] but companies opening new export terminals face numerous hurdles.

Exporters of LNG from the United States must obtain the approval of the federal government. The permitting process is divided between the U.S. Department of Energy (DOE) and the Federal Energy Regulatory Commission (FERC). DOE issues licenses to import and export natural gas, while FERC is responsible for approving the site selection, construction, and operation of LNG export terminals. FERC is also in charge of preparing environmental impact statements and coordinating federal and state reviews for LNG projects. Getting the necessary permits is time-consuming, as the process can take two years or more.[8]

Obtaining a license to export gas to a country that has a free trade agreement (FTA) with the U.S. is almost automatic. Yet with the exception of Korea, no major LNG-importing country currently has an FTA with the United States.[9] To obtain approval for exports to other countries, including to the European Union, LNG export projects must be in the "public interest" (see Box 2).[10] Some industry and environmental groups that are opposed to natural gas exports have argued that new terminals fail to meet this requirement. As a result, only one LNG export project has been approved for non-FTA countries to date.

Meanwhile, DOE has put a hold on further applications pending its own review of the impacts of natural gas exports. The issue was the subject of a major economic study, commissioned by DOE and conducted by NERA Consulting, that was completed in December 2012.[11] DOE is currently taking public comments on the NERA study,[12] which evaluated the impacts of a broad range of LNG export scenarios and reached the following conclusion:

> "Across all these scenarios, the U.S. was projected to gain net economic benefits from allowing LNG exports. Moreover, for every one of the market scenarios examined, net economic benefits increased as the level of LNG exports increased."[13]

5. *Ibid.*
6. Platts (2012). "Consultant Expects More than $1 Million in Panama Canal Fees." 12 September 2012. http://www.platts.com/RSSFeedDetailedNews/RSSFeed/Shipping/8716172.
7. Becky Bohrer (2012). "ConocoPhillips Temporarily Resumes Kenai LNG Plant Exports." Associated Press. 13 June 2012. http://www.ktuu.com/news/conocophillips-temporarily-resumes-kenai-lng-plant-exports-061312,0,6433954.story.
8. Charles Ebinger, Kevin Massy, and Govinda Avasarala (2012). *Liquid Markets: Assessing the Case for U.S. Exports of Liquefied Natural Gas.* Washington: Brookings Institution, p. 13; Patricia Outtrim (2012). Cheniere Energy (2012). "LNG Exports - How Much & How Soon." Presentation at the Aspen Forum on Global Energy, Economy & Security. July 19-22 2012.
9. International Energy Agency (2012), *Medium-Term Gas Market Report 2012.* Paris: OECD/IEA, p. 118.
10. 1938 Natural Gas Act. Available at: http://www.mde.state.md.us/programs/ResearchCenter/FactSheets/Documents/www.mde.state.md.us/assets/document/Natural%20Gas%20Act%20as%20Amended_1.pdf.
11. W. David Montgomery et al. (2012). *Macroeconomic Impacts of LNG Exports from the United States.* Washington: NERA Economic Consulting. Available at: http://www.fossil.energy.gov/programs/gasregulation/reports/nera_lng_report.pdf.
12. "Department of Energy: 2012 LNG Export Study. Notice of availability of 2012 LNG Export Study and request for comments." Federal Register 77:238 (11 December 2012) p. 73627- 73630. Available at: http://www.fossil.energy.gov/programs/gasregulation/reports/fr_notice_two_part_study.pdf.
13. W. David Montgomery et al. (2012). *Macroeconomic Impacts of LNG Exports from the United States.* Washington: NERA Economic Consulting, p.1. Available at: http://www.fossil.energy.gov/programs/gasregulation/reports/nera_lng_report.pdf.

However, critics of the study, including Senator Ron Wyden, the incoming chairman of the Senate Energy and Natural Resources Committee, and Congressman Edward Markey, argue that DOE should not base its decisions concerning LNG exports on this conclusion because of flaws in the study methodology.[14] Taking these and other considerations into account, DOE could impose a cap on total daily export volumes or approve only a limited number of applications.[15]

In the United States, the debate on LNG exports has focused primarily on domestic ramifications. Advocates of LNG exports say that exports could provide employment opportunities, reduce the U.S. trade deficit, replace coal usage abroad, and improve U.S. national security. Opponents argue that exports would raise domestic gas prices, hurt the manufacturing and petrochemical industries, weaken American energy security by sending valuable domestic resources abroad, and threaten the environment—especially water resources—through increased drilling.[16]

Even if the United States chooses to restrict exports of LNG to non-free trade agreement countries, a significant volume of American shale gas could reach international markets through Canada. This may occur because U.S. natural gas exports to Canada may free up greater volumes of Canadian gas to be sent abroad, or because U.S. producers may contract directly with Canadian LNG export terminals. The U.S. and Canadian natural gas markets are integrated by virtue of the North American Free Trade Agreement, and the United States exported 939 bcf (26.6 bcm) of natural gas to Canada in 2011.[17] Although Canada currently does not have any liquefaction capacity, European and American energy companies have proposed four LNG export projects from British Columbia to Asia (see Table 2).

Box 2: Conditions Necessary for DOE Approval of LNG Exports

The 1938 Natural Gas Act sets the legal framework for permitting natural gas exports from the United States. The law states that natural gas exports to countries that have signed an FTA with the United States "shall be deemed to be consistent with the public interest, and applications for such importation or exportation shall be granted without modification or delay." For countries without FTAs, DOE must grant licenses "unless, after opportunity for hearing, it finds that the proposed exportation or importation will not be consistent with the public interest"[A] Energy exporters argue that the law "creates a statutory presumption in favor of approval," and that opponents must prove that the export application would not be in the public interest.[B]

In 2012, the United States had signed FTAs with nineteen countries: Australia, Bahrain, Canada, Chile, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Israel, Jordan, Korea, Mexico, Morocco, Nicaragua, Oman, Peru, and Singapore.

A. Section 3, 1938 Natural Gas Act. 15 USC §717b

B. Patricia Outtrim, Cheniere Energy (2012). "LNG Exports - How Much & How Soon." Presentation at the Aspen Forum on Global Energy, Economy & Security, July 19-22, 2012.

14. Edward Felker (2013). "Wyden tells DOE to revamp nat gas exports study." *Energy Guardian.* 10 January 2013. http://energyguardian.net/wyden-tells-doe-revamp-nat-gas-exports-study. For a full list of comments on the NERA study, see http://www.fossil.energy.gov/programs/gasregulation/authorizations/export_study/export_study_initial_comments.html.

15. Jenny Mandel (2012). "LNG: Fine points of DOE's export approach could determine project permits – report." *E&E.*

16. For a thorough look at the domestic considerations, see the following: Charles Ebinger, Kevin Massy, and Govinda Avasarala (2012). *Liquid Markets: Assessing the Case for U.S. Exports of Liquefied Natural Gas.* Washington: Brookings Institution; Amy Jaffe and Meghan Sullivan (2012). "The Geopolitics of Natural Gas: Report of the Scenarios Workshop of Harvard University's Belfer Center and Rice University's Baker Institute Energy Forum." Cambridge, MA: Harvard University; Michael Levi (2012). *A Strategy for U.S. Natural Gas Exports.* The Hamilton Project. Washington: Brookings Institution.

17. BP (2012). *BP Statistical Review of World Energy June 2012*, p. 29.

Table 2.
Applications Received by DOE to Export Domestically Produced LNG (Lower-48 States)

Project	Quantity (Bcf/d)	FTA Applications	Non-FTA Applications	Location
Proposed U.S. Projects				
Sabine Pass	2.2	Approved	Approved	Louisiana
Freeport	1.4	Approved	Under DOE Review	Texas
Lake Charles	2.0	Approved	Under DOE Review	Louisiana
Carib Energy	0.03: FTA 0.01: non-FTA	Approved	Under DOE Review	SE Atlantic, Florida, Gulf Coast, Texas
Dominion Cove Point	1.0	Approved	Under DOE Review	Maryland
Jordan Cove Energy	1.2: FTA 0.8: non-FTA	Approved	Under DOE Review	Oregon
Cameron LNG	1.7	Approved	Under DOE Review	Louisiana
Freeport Expansion	1.4	Approved	Under DOE Review	Texas
Gulf Coast LNG	2.8	Approved	Under DOE Review	Texas
Gulf LNG	1.5	Approved	Under DOE Review	Mississippi
LNG Development (d/b/a Oregon LNG)	1.25	Approved	Under DOE Review	Oregon
SB Power Solutions	0.07	Approved	n/a	Atlantic/Gulf Coast
Southern LNG	0.5	Approved	Under DOE Review	Georgia
Excelerate Liquefaction	1.38	Approved	Under DOE Review	Texas
Golden Pass	2.6	Approved	Under DOE Review	Texas
Cheniere Marketing	2.1	Approved	Under DOE Review	Texas
Main Pass	3.22	Approved	n/a	Louisiana
CE FLNG	1.07	Approved	Under DOE Review	Louisiana
Waller LNG	0.16	Approved	n/a	Louisiana
Pangea LNG	1.09	Pending Approval	Under DOE Review	Texas
Magnolia LNG	0.54	Pending Approval	n/a	Louisiana
Total U.S.		**29.21 Bcf/d**	**24.80 Bcf/d**	
Proposed Canadian Projects				
Kitimat LNG	0.7			Kitimat, BC
BC LNG Export Coop.	0.25			Douglas Island, BC
Shell Canada	1			Prince Rupert Island, BC
Progress LNG	1.2			Prince Rupert Island, BC
Pierdae Energy	0.67			Goldboro, Nova Scotia
Total Canada	**3.82 Bcf/day**			

Data as of January 4, 2013. Source: Office of Oil and Gas Global Security and Supply, Office of Fossil Energy, U.S. Department of Energy. http://www.fossil.energy.gov/programs/gasregulation/reports/summary_lng_applications.pdf and http://ferc.gov/industries/gas/indus-act/lng/LNG-proposed-potential.pdf.

Proposed Projects

Many companies are interested in exporting American shale gas overseas, but not all projects will be commercially viable. As of January 2013, twenty-one export applications had been submitted to DOE. All but four involved the export of LNG to both FTA and non-FTA countries (see Table 2). If all of the projects were approved, the total volume of LNG proposed for export—at 29.21 billion cubic feet per day (Bcf/d)—would comprise 44 percent of daily U.S. natural gas production in 2012.[18]

Some American shale gas already appears likely to be headed to European and Asian consumers by 2016. In May 2011, DOE granted Cheniere Energy permission to export LNG to non-FTA countries.[19] Upon construction of its new export terminal in Sabine Pass, Louisiana (the terminal is due to be completed in 2015–2016), the company has commitments to export 2.2 bcf/d to four customers: Britain's BG Group, Barcelona-based Gas Natural Fenosa, India's GAIL, and South Korea's Kogas.[20]

Cheniere's pricing structure provides insight into the competitiveness of American LNG on the global market. Cheniere's LNG prices are linked to Henry Hub prices rather than oil prices. LNG prices are assessed according to the following formula:

- 115 percent of Henry Hub prices,
- a liquefaction cost between $2.25 and $3.00/MBtu, and
- transportation prices between $2.00 and $6.00/MBtu.[21]

The LNG that South Korea's Kogas buys from Cheniere will be 30 percent cheaper than oil-indexed LNG available in the Pacific Basin.[22] The IEA predicts that margins for U.S. LNG exports based on Henry Hub prices would be $1.4/Mbtu to Europe and $4.3/MBtu to Japan in 2020.[23] IEA analysis suggests that U.S. LNG exports will be able to compete on the global market even with Henry Hub prices as high as $7/MBtu.[24]

18. Data from the Department of Energy and Energy Information Agency (2012). "U.S. marketed natural gas production levels off in the first half of 2012." http://www.eia.gov/todayinenergy/detail.cfm?id=8190.

19. Department of Energy (2011). "DOE/FE ORDER NO. 2961. Sabine Pass Liquefaction, LLC, FE Docket No. 10-111-LNG, Opinion and Order Conditionally Granting Long-Term Authorization to Export Liquefied Natural Gas from Sabine Pass LNG Terminal to Non-Free Trade Agreement Nations." Available at: http://www.fossil.energy.gov/programs/gasregulation/authorizations/Orders_Issued_2011/ord2961.pdf.

20. International Energy Agency (2012), *Medium-Term Gas Market Report 2012.* Paris: OECD/IEA, p. 120.

21. *Ibid.*

22. Ben Sharples (2012). "Cheniere Considers 50% Expansion of LNG Plant at Sabine Pass." *Bloomberg*. 25 October 2012. http://www.bloomberg.com/news/2012-10-25/cheniere-considers-50-expansion-of-lng-plant-at-sabine-pass.html.

23. International Energy Agency (2012). *World Energy Outlook. Paris*: OECD/IEA, p. 130.

24. International Energy Agency (2012). *Medium-Term Gas Market Report 2012*. Paris: OECD/IEA, p. 120.

3 Natural Gas in the European Union

Europe is a significant natural gas consumer and, therefore, is a prime potential market for U.S. LNG. In 2011, the EU used 15,721 bcf (447.9 bcm) of gas, nearly 14 percent of global natural gas consumption. Although it used less natural gas than the United States, the EU consumed over three times as much as China and over four times as much as Japan.[25] Many large European states have extensive LNG import infrastructure in place (see Table 3 and Figure 2 for trade flows).

Other factors contribute to Europe's potential receptiveness to U.S. LNG. Europe needs secure natural gas supplies because of its particular sensitivity to high gas prices and supply disruptions. Europe relies on natural gas largely for household use, which means that high prices for natural gas in Europe impact consumers directly. Furthermore, Europe's growing dependence on a limited number of natural gas suppliers makes it vulnerable to losing heat and electricity if those suppliers fail to deliver natural gas on time.

These factors make natural gas and energy policy highly politicized issues. The European Commission and individual countries are working to improve the security of their natural gas supplies by integrating the EU's natural gas market and diversifying natural gas suppliers. But other EU efforts aim to reduce vulnerability by lowering natural gas consumption altogether. For example, the EU's Energy and Climate Package promotes the use of renewable energy and sets ambitious energy efficiency targets.[26]

The EU's renewable energy policies, along with an increase in coal use, place the EU on a trajectory of lower natural gas consumption in the short term. A recent increase in EU coal use is partly the result of cheap coal from the United States entering European markets after being displaced by shale gas in the United States, and partly because of a low carbon price in the EU's Emissions Trading System (ETS). The ETS is meant to incentivize the use of cleaner fuels such as natural gas over coal, but low prices have instead meant that coal is significantly cheaper than natural gas for power generation.

By the end of the decade, experts expect that natural gas will be more competitive than coal in Europe and that Europe's natural gas demand will continue to grow. The IEA predicts that lower natural gas prices, new environmental restrictions, and higher carbon prices in the ETS will mean that gas will regain its advantage over coal by 2017. And, if the EU wishes to reach its emissions targets, efforts to switch from coal to natural gas in the European power sector will probably need to accelerate.[27]

25. BP (2012). *BP Statistical Review of World Energy.* June 2012.

26. The EU's Climate and Energy Package of 2009 targets a 20 percent reduction in greenhouse gas emissions, a 20 percent increase in renewable energy, and a 20 percent improvement in energy efficiency by 2020. See http://ec.europa.eu/clima/policies/package/index_en.htm.

27. International Energy Agency (2012). *Medium-Term Coal Market Report 2012.* Paris: OECD/IEA, p. 13.

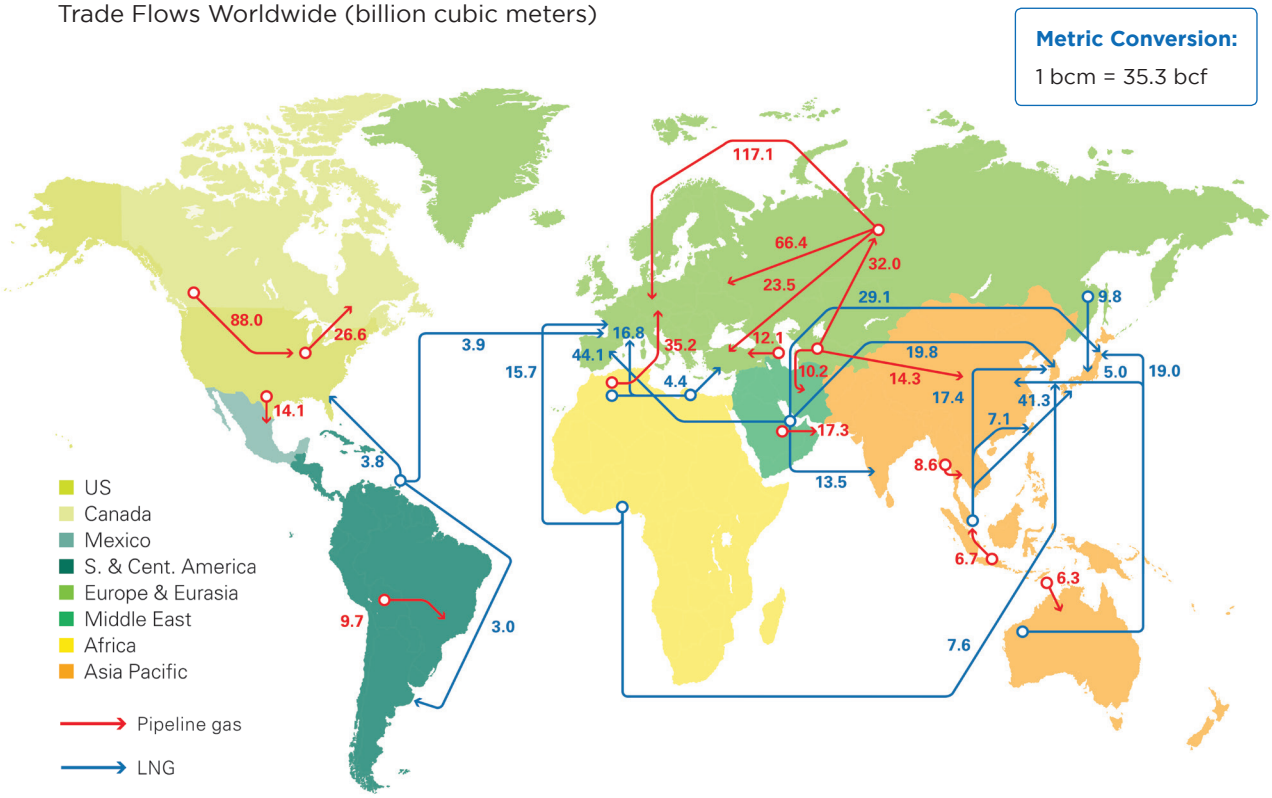
Table 3.
European LNG at a Glance[28]

	UK	France	Spain	Italy	Netherlands	Germany	Poland
Existing LNG Regasification Terminals	4	3	6	2	1	0	0
Terminals Under Construction	0	1	3	2	0	0	1
LNG Imports 2011 (bcm)	25.31	14.57	23.98	8.52	0.70	0	0
LNG Imports 2011 (bcf)	893.42	514.16	846.56	300.60	24.60	0	0
Natural Gas Consumption 2011 (bcm)	80.2	40.3	32.1	71.3	38.1	72.5	15.4
Natural Gas Consumption 2011 (bcf)	2831.06	1422.59	1133.13	2516.89	1344.93	2559.25	543.62
Main LNG Suppliers	Qatar, Nigeria	Algeria, Qatar, Nigeria	Nigeria, Qatar, Algeria, Trinidad & Tobago, Egypt	Qatar, Algeria	Qatar		
Major Oil Companies	BP, BG Group, Royal Dutch Shell	Total SA, GDF Suez	Gas Natural Fenosa, Repsol	Eni	Royal Dutch Shell		PGNiG

Sources: Gas LNG Europe 2012, BP 2012

28. Wim Groenendijk (2012). "LNG Terminals: Key Players in the Gas Market." GLE presentation at GIE Annual Conference 2012. 25 May 2012. http://www.gie.eu/conference/presented/2012/S3/1.%20Wim%20Groenedijk%20-%20GLE%20Presentation%20at%20GIE%20Annual%20Conference%202012%20draft%20v4.pdf;

Figure 2.
Global Natural Gas Trade Movements 2011
Trade Flows Worldwide (billion cubic meters)

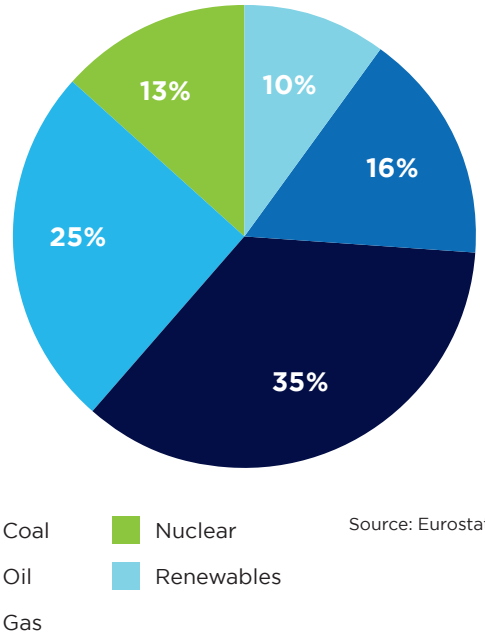


Sources: BP (2012). *BP Statistical Review of World Energy*. June 2012. Page 29 with permission of BP p.l.c.
Includes data from Cedigaz, CISStat, GIIGNL, Poten, Waterborne.

The EU's Energy Mix and Natural Gas Demand

Natural gas plays a crucial role in Europe's energy mix, but consumption has recently fallen. In 2010, natural gas accounted for one-quarter of overall EU energy consumption.[29] In 2011, however, natural gas consumption fell 10 percent,[30] as a weak economy, high natural gas prices, cheaper coal, and stronger renewable energy sources reduced power sector demand. But experts suggest that this drop in consumption is temporary.[31] The IEA projects that the EU's overall demand for natural gas will grow by nearly 74 percent between 2011 and 2035.[32]

Figure 3.
EU Energy Mix 2010



Source: Eurostat 2012

Natural gas is a politically sensitive issue in the European Union because price variations hit consumers directly. In 2010, households in both the UK and Germany consumed 43 percent of the natural gas used in each country.[33] That is more than double the 20 percent household share in the United States, where industry is a larger natural gas user (see Figure 4).[34, 35]

Import Dependency

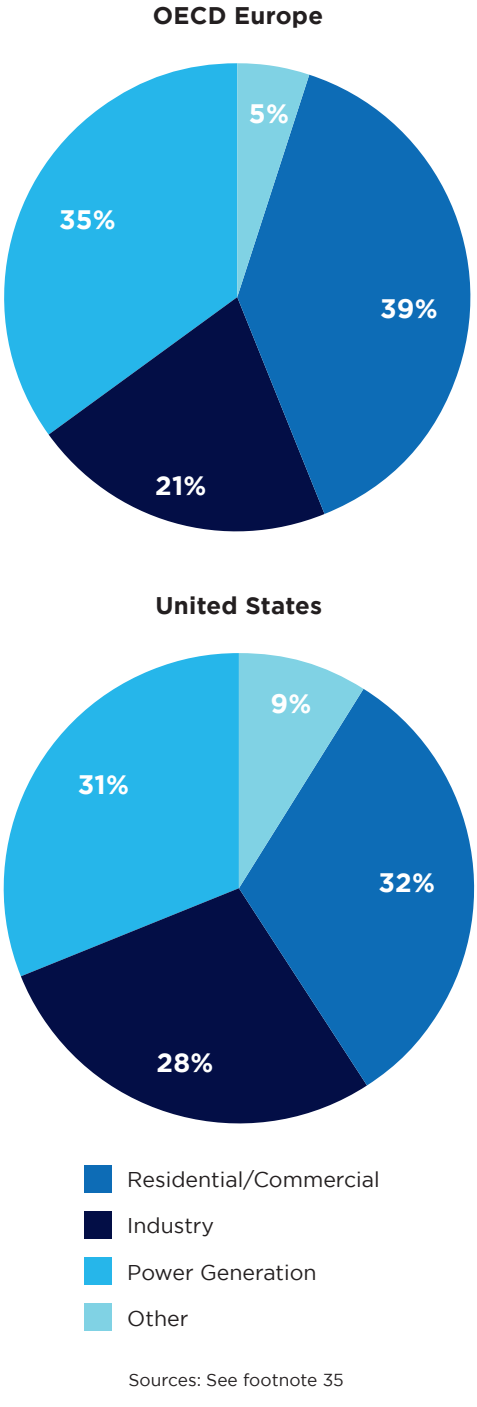
The European Union depends on imports to meet most (60.3 percent) of its natural gas demand, and this dependence is growing.[36] A decade ago, Europe was able to meet half its natural gas demand with domestic production, but production volumes have since fallen by a third.[37] Because a limited number of countries now supply the EU with natural gas, there is a strong interest in greater diversity of supply.

In 2011, the EU imported 11,543 bcf (327 bcm) of natural gas, the vast majority of which came through pipelines.[38] LNG accounted for about a quarter (2,963 bcf or 84 bcm) of natural gas imports.[39] Natural gas supplies came from a limited number of countries.

Two non-EU countries—Russia and Norway—are the dominant suppliers of natural gas to the EU. Gas from both countries is largely delivered to Europe through pipelines. Many policymakers have expressed concerns about this dependence, and some EU member states are more at risk than others. A number of countries in eastern and northern Europe not only rely on imports for all of their natural gas supply, but also obtain natural gas exclusively from Russia. The European Union

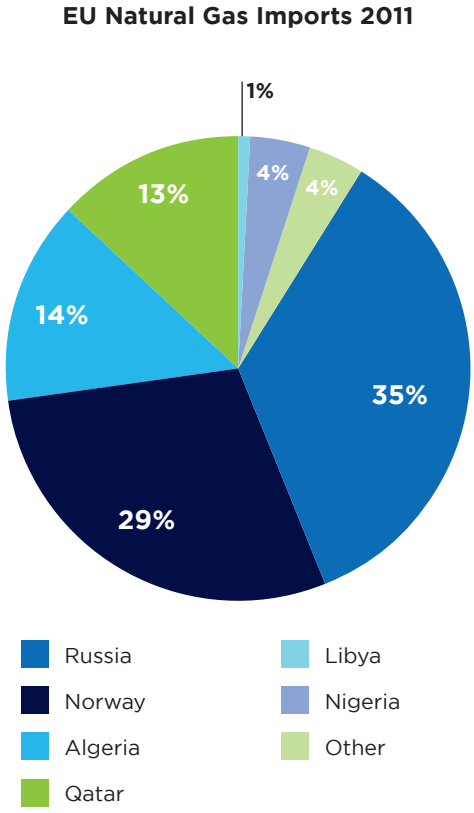
29. European Commission (2012). *EU Energy in Figures: Statistical Pocketbook 2012*. Luxembourg: European Union, 2012. http://ec.europa.eu/energy/publications/doc/2012_energy_figures.pdf.
30. BP (2012). *BP Statistical Review of World Energy*. June 2012.
31. International Energy Agency (2012). *Medium-Term Gas Market Report 2012*. Paris: OECD/IEA, p. 11, 15, 18.
32. International Energy Agency (2012). *World Energy Outlook*. Paris: OECD/IEA, p. 147.
33. Eurostat (2012). *Energy Balance Sheets 2009-2010: 2012 Edition.* http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-EN-12-001/EN/KS-EN-12-001-EN.PDF
34. U.S. Energy Information Administration (2012). Annual Energy Outlook 2012. http://www.eia.gov/forecasts/aeo/pdf/0383(2012).pdf
35. US Data – Energy Information Agency (2012); Europe Data - International Energy Agency (2012). *Medium-Term Gas Market Report 2012*. Paris: OECD/IEA, p. 154
36. Eurostat (2012). *Natural gas consumption statistics*. May 2012. http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Natural_gas_consumption_statistics.
37. BP (2012). *BP Statistical Review of World Energy*. June 2012.
38. *Ibid.* Alternative data: The IEA suggests that the EU imported 302 bcm [International Energy Agency (2012). *World Energy Outlook*. Paris: OECD/IEA, p. 147]
39. BP (2012). *BP Statistical Review of World Energy*. June 2012.

Figure 4.
Natural Gas Consumption by End Use 2011



Sources: See footnote 35

Figure 5.
EU Natural Gas Suppliers[40]



has passed regulations to help Finland, the Baltic States, and Slovakia, among others, address this vulnerability. It has also funded new electricity and natural gas interconnections between member states.

LNG is a growing factor in efforts to diversify supply, but Europe's LNG imports, too, are largely supplied by a single source. Half of all LNG imports to Europe in 2011 came from Qatar. This means that Qatar has a larger share of Europe's LNG market than Russia does of the pipeline market (47 percent). Algeria, Nigeria, Trinidad and Tobago, Egypt, and Peru also supply LNG to European markets.[41]

40. Chart source: BP (2012). *BP Statistical Review of World Energy*. June 2012. Historical Statistics.
41. *Ibid.*

Natural Gas Prices

Natural gas prices are significantly higher in Europe than they are in the United States and this price difference is expected to persist. In the past five years, natural gas prices in Europe have ranged from $6–$12/MBtu, but they vary widely between countries (see Figure 5).

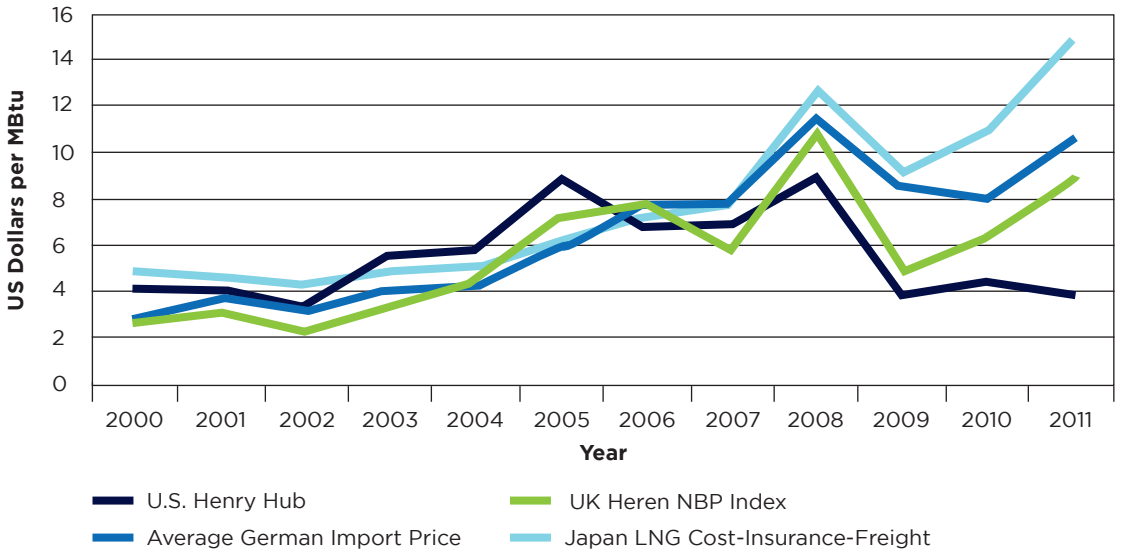
Traditionally, natural gas import prices in Europe have been set through long-term contracts that keep natural gas prices linked to oil prices. In the case of supplies from Russia, these contracts have included take-or-pay clauses. But the advent of LNG imports in Europe has provided a new model for pricing. Spot market pricing of natural gas, like that in the United States, decouples natural gas from oil prices and allows gas-on-gas competition.

Decoupling natural gas from oil prices has allowed the UK to have lower gas prices than member states that import gas through pipelines. The UK's Heren National Balancing Point (NBP) Index represents spot market prices in the UK. As illustrated in Figure 6, prices in the UK have been consistently lower than in Germany since 2007. In Germany, natural gas is imported by pipeline and is still subject to long-term contracts.

The recent entry of greater supplies of LNG on global markets has put downward pressure on European natural gas prices,[42] even on pipeline gas prices. The large discrepancy between spot market and oil-indexed prices has forced major suppliers like Gazprom and Statoil to take spot market rates into account. European importers including Italy's Eni, Poland's PGNiG, and Germany's E.ON were able to renegotiate lower prices with Gazprom in 2012.[43] Experts predict that in the future, pipeline contracts will be based on prices derived from a combination of spot market and oil-linked rates.[44]

The IEA predicts that European natural gas prices will be close to $12/MBtu in 2030, remaining significantly higher than the estimated American Henry Hub price of $7.10/MBtu.[45]

Figure 6.
Historical Natural Gas Prices



Source: BP (2012). *BP Statistical Review of World Energy*. June 2012.

42. Joint Research Centre (2012). *Unconventional Gas: Potential Energy Market Impacts in the European Union*. JRC Scientific and Policy Reports. European Commission. http://ec.europa.eu/dgs/jrc/downloads/jrc_report_2012_09_unconventional_gas.pdf.

43. International Energy Agency (2012). *World Energy Outlook*. Paris: OECD/IEA, p. 151.

44. International Energy Agency (2012). *Medium-Term Gas Market Report 2012*. Paris: OECD/IEA, p. 30.

45. International Energy Agency (2012). *World Energy Outlook*. Paris: OECD/IEA, p.41.

Europe's LNG Market

The EU is the world's second largest LNG market, consuming a quarter of global LNG imports.[46] The UK, Spain, and France are the EU's largest LNG consumers (see Table 3).[47] To maintain its LNG supply, the EU will need to diversify its supply portfolio and increase its import capacity.

Table 4.
EU LNG Imports in 2011

EU LNG Imports 2011	Bcf	Bcm
European Union Total	2963.31	83.95
United Kingdom	893.42	25.31
Spain	846.56	23.98
France	514.16	14.57
Italy	300.60	8.52
Belgium	231.97	6.57
Portugal	106.32	3.01
Greece	45.69	1.29
Netherlands	24.60	0.70

Source: BP 2012

Recent analysis from Barclays Capital suggests that Europe may lose up to 70 percent of its LNG supplies to the growing Asian market. To sustain current levels of LNG imports after 2015, Europe will need to rely more on new production from Australia and North America or fall back on pipeline gas.[48] This timeline is well suited to U.S. shale gas exports, as the first U.S. export terminal is slated to come online in 2015.

Most EU countries do not have access to LNG regasification facilities, but the EU's LNG import infrastructure is growing. In 2012, Europe's regasification capacity was over 5,295 bcf (150 bcm) at 19 LNG import terminals in eight member states. But regasification capacity is projected to double by 2020.[49] Three existing terminals are undergoing expansion, and six new ones are under development.[50] These new facilities will allow the EU to receive more LNG and will provide access to new supplies in countries that currently rely on pipeline gas.

Improved energy infrastructure can spread the benefits of LNG to countries that do not have terminals of their own. Even Germany, Europe's largest natural gas importer, does not have a regasification plant and, therefore, relies solely on pipeline gas. With an expanded network of pipelines and import terminals, gas and LNG could flow more easily between EU states. Further diversification could be achieved by expanding cross-border transmission ties so that larger volumes of gas-fired electricity could be transmitted between countries, in some cases substituting for direct pipeline or LNG terminal imports.

EU Policies and Priorities

The European Union is seeking to integrate the energy markets of its member states while also achieving its environmental goals. Policymaking in the EU is complicated because authority is split between the EU and national governments. Certain aspects of energy policy remain the sole domain of member states. National governments determine how they exploit their energy resources and shape their energy mix. Prominent examples of national level energy policy are Germany's decision to phase out nuclear energy and France's ban on hydraulic fracturing.

Most energy policies of international significance, however, derive from EU legislation. Within the European Commission, three different directorates-general (DGs) propose legislation that influences energy issues. Natural gas typically falls under the purview of the Energy Directorate-General. But issues such as shale gas are also of interest to the Environment and Climate Action DGs.

46. International Energy Agency (2012). *Medium-Term Gas Market Report 2012*. Paris: OECD/IEA.

47. BP (2012). *BP Statistical Review of World Energy*. June 2012.

48. Reuters (2012). "Europe's LNG suppliers to drop 70 pct by 2015." *Barclays*, 9 August 2012.

49. Joint Research Centre (2012). *Unconventional Gas: Potential Energy Market Impacts in the European Union*. JRC Scientific and Policy Reports. European Commission. http://ec.europa.eu/dgs/jrc/downloads/jrc_report_2012_09_unconventional_gas.pdf.

50. Wim Groenendijk (2012). "LNG Terminals: Key Players in the Gas Market." GLE presentation at GIE Annual Conference 2012. 25 May 2012. http://www.gie.eu/conference/presented/2012/S3/1.%20Wim%20Groenedijk%20-%20GLE%20Presentation%20at%20GIE%20Annual%20Conference%202012%20draft%20v4.pdf.

The EU's Directorate-General for Energy has initiated legislation to promote greater integration of natural gas markets. In the United States, the energy market allows free movement of natural gas supplies. As a result, increased drilling in one area has the effect of pushing down natural gas prices across the country. The EU has begun efforts to imitate this approach by passing legislation to separate or "unbundle" energy generation from transmission infrastructure. The Directorate-General for Energy has also worked to coordinate and fund new pipelines into Europe, build LNG terminals in the Baltic Sea, and lay under-sea electricity cables.

On the environmental side of European policymaking, the EU has adopted a combined set of environmental and energy targets for 2020:

- Achieving a 20-percent reduction in EU greenhouse gas emissions from 1990 levels;
- Raising the share of EU energy consumption produced from renewable resources to 20 percent;
- Implementing a 20-percent improvement in overall EU energy efficiency.

These "20-20-20" targets are part of the EU's wider growth strategy. A broad package of binding climate and energy legislation supports these targets.

European energy policy is also influenced by climate change goals. The central piece of the EU's climate policy is the EU Emissions Trading System (ETS). The ETS was recently reformed to replace national limits on emissions with a single emissions cap for the EU as a whole. Complementary legislation seeks to reduce emissions in sectors not covered by the ETS, such as agriculture and transport. Lastly, a recently passed Energy Efficiency Directive puts legally binding measures in place to reduce energy consumption.[51]

Box 3: EU Regulations Relevant for Importing American LNG

Liquefied natural gas from the United States does not face major regulatory obstacles in the European Union. In fact the EU has worked to remove barriers to entry for new suppliers of LNG. In 2009, the EU adopted a package of legislation for gas and electricity markets that extended requirements for third-party access to LNG facilities, unbundled LNG terminals from distribution networks, and set standards for non-discriminatory tariffs. The intent of the EU regulations is to facilitate openness to new suppliers rather than limit access. Although third-party access is generally mandatory, certain LNG terminals were able to secure exemptions if they enhanced competition and security in the gas markets.

Nevertheless, American LNG would need to meet certain standards in order to enter European markets. European states, individual LNG operators, and natural gas transmission systems operators have requirements that pertain to natural gas quality and the creditworthiness of suppliers. These requirements vary by European state, but they are not tied to country of origin of the gas. This means that American LNG would not be treated differently than LNG from anywhere else on account of its origin.

For more information, please see the Third Energy Package:[A]

Directive 2009/73/EC of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC

Regulation (EC) No 715/2009 of 13 July 2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005

A. Available at http://ec.europa.eu/energy/gas_electricity/legislation/legislation_en.htm.

51. The legislation behind these policies can be found at European Commission (2012). *Climate and Energy Package.* http://ec.europa.eu/clima/policies/package/index_en.htm.

4 European Oil and Gas Company Interests in American LNG Exports

European oil and gas companies are heavily invested in U.S. shale gas production, giving them a stake in finding new markets for their gas. By exporting American shale gas, European companies would be able to provide cheaper natural gas to their customers at home while also spurring the growth of their own shale gas investments.

The impetus for exports is especially strong when natural gas prices in the United States are at record lows. Low prices benefit consumers but hurt producers. In 2012, BP, BG Group, Total, and Shell lost money on their shale gas investments. The scale of the losses is enormous: BP took a write-down of over $1 billion on its U.S. shale gas assets and BG Group announced a write-down of $1.3 billion in August 2012.[52]

Exports would provide new markets for U.S. shale gas. They could also cause U.S. natural gas prices to rise, though the extent of the increase is subject to debate.[53] Higher prices, in turn, would spur increased production.[54] Therefore, it is not surprising that many European energy companies have either backed new U.S. LNG terminals or have committed to buying LNG from them.

Stakes in American Shale Gas

Table 5 shows the investments of European companies in American shale gas plays. The European majors Statoil, Royal Dutch Shell, BP, and Total have all made substantial investments in the past few years. Norway's Statoil, for example, has the most active oil and gas exploration program in North America and is planning to increase production through the end of the decade.[55] But participation in the North American shale gas boom is not limited to energy majors. Smaller European gas companies such as Italy's Eni and Spain's Repsol are also taking part.

Most European companies have signed joint venture agreements with American producers. Several have partnered with Chesapeake Energy, for example. But others such as Statoil and Shell have chosen to become operators in their own right. European companies are not only investing in production, but also helping to develop associated industries. Shell is opening a petrochemical plant in Pennsylvania that will use gas produced from the Marcellus shale.[56]

52. Malcolm Maiden (2012). "Burnt Fingers All Round in US Shale Gas Boom." *The Sydney Morning Herald*. 2 August 2012. http://www.smh.com.au/business/burnt-fingers-all-round-in-us-shale-gas-boom-20120801-23g03.html.

53. Assuming 6 bcf of LNG exports per day, domestic natural gas prices were anticipated to increase between 2 and 11 percent between 2015 and 2035 (Ebinger et al., 2012).

54. Michael Levi (2012). *A Strategy for U.S. Natural Gas Exports.* The Hamilton Project. Washington: Brookings, p. 14.

55. Ed Crooks (2012). "Statoil Looks to Tap Into US Shale Boom." *Financial Times*. 20 June 2012. http://www.ft.com/intl/cms/s/0/44fcc6c8-bae6-11e1-b445-00144feabdc0.html.

56. Eduard Gismatullin (2011). "Shell Says Exports, Truck Fuel Among Options for U.S. Shale Gas." *Bloomberg*. 7 December 2011. http://www.bloomberg.com/news/2011-12-07/shell-says-exports-truck-fuel-among-options-for-u-s-shale-gas.html.

Table 5.
European Company Stakes in U.S. Shale Gas Plays

Company	European Affiliation	Shale Gas Plays (Location)	Net Acres	U.S. Partners
Statoil	Norway	Marcellus (PA, WV, NY, OH)	689,000	JV: Chesapeake Energy[i]
		Eagle Ford (TX)	88,000	JV: Talisman
		Bakken* (ND/MT)	375,000	Purchase: Brigham Exploration Company[ii]
Royal Dutch Shell**	UK and the Netherlands	Marcellus (PA)	650,000	Purchase: East Resources[iii]
		Haynesville (TX/LA)	180,000	JV: Encana[iv]
		Eagle Ford (TX)	250,000	Purchase: East Resources
		Permian Basin (TX)	618,000	Purchase: Chesapeake Energy[v]
		Sand Wash Basin (CO)	115,000	JV: Quicksilver Resources[vi]
BP	UK	Woodford (OK)	90,000	Purchase: Chesapeake Energy[vii]
		Eagle Ford (TX)	450,000	JV: Lewis Energy[viii]
		Haynesville (TX/LA)	300,000[ix]	n/a
		Utica (OH)	84,000	Lease: Associated Landowners of the Ohio Valley[x]
		Fayetteville (AR)	135,000	JV: Chesapeake Energy[xi]
BG Group	UK	Marcellus (PA, WV)	186,000	JV: Exco Resources[xii]
		Haynesville (TX/LA)	120,000	JV: Exco Resources[xiii]
Total	France	Barnett (TX)	270,000	JV: Chesapeake Energy[xiv]
		Utica (OH)	618,000	JV: Chesapeake Energy[xv]
Eni	Italy	Barnett (TX)	13,000	JV: Quicksilver Resources[xvi]
Repsol	Spain	Mississippian (KS)	364,000	JV: SandRidge Energy[xvii]
Total			**5,480,000**	

* Activities in the Bakken play focus on oil production.
** Shell has additional operations in Wyoming and in British Columbia and Alberta.
JV: Joint Venture
Note: references for the table are provided as endnotes in Appendix 4 of this report.

European Views on Shale Gas Development

Europe's multinational energy companies are involved in shale gas production in the United States in spite of concerns in the EU about the environmental impact of extraction. Some of these companies invested in American shale gas to expand their natural gas holdings. Others did so to gain expertise in producing unconventional gas and have applied the same techniques elsewhere. Italy's Eni, for example, has used its experience in the Barnett shale to pursue shale gas development in Poland and Ukraine.[57] Repsol is developing unconventional gas reserves in North Africa and South America.[58]

Environmental opposition to shale gas production in Europe generally has not affected the business practices of most EU energy companies. France banned hydraulic fracturing on its own soil, but GDF SUEZ, a company partly owned by the French government, is involved in fracking abroad.

Commercial interests appear to lie at the heart of GDF SUEZ's actions. In 2012, the company began shale gas exploration in Algeria.[59] More importantly, GDF SUEZ has stated that while the company will not produce shale gas in the United States, it will invest in liquefaction and export instead.[60] GDF Suez has signed an agreement with Sempra Energy to develop the third liquefaction "train," a processing unit that compresses and super-cools natural gas, at its proposed Cameron LNG export terminal in Louisiana.[61]

Stakes in American LNG Export Projects

Many European majors have either signed agreements with proposed LNG export terminals in the United States or have entered discussions to do so (See Table 6). Whether permission to export to non-FTA countries will be granted is still a question, but a number of projects may be approved. In addition to Cheniere's Sabine Pass terminal in Louisiana, the Freeport LNG project in Texas, the Lake Charles Exports and Cameron LNG projects in Louisiana, and Dominion's Cove Point LNG project in Maryland are positioned to serve European markets.

The European companies that have made the largest investments in U.S. shale gas production—Statoil, BP, and Royal Dutch Shell—have yet to commit to LNG export projects outside of Alaska or Canada. But it is clear that they are interested in exports: all three were in discussions with Dominion over access to its Cove Point, Maryland export terminal, and Shell is in talks with Freeport LNG.

Some European companies have selected LNG export projects close to their shale gas production sites. BG Group, for example, has committed to two LNG projects in Louisiana, not far from its holdings in the Haynesville shale play. Freeport LNG, now negotiating with Shell, has a terminal between the Eagle Ford and Haynesville shale gas plays; Shell has significant investments in both of these plays.

57. Oil & Gas Financial Journal (2010). "Italy's Eni takes Barnett knowledge to Polish shale gas play." http://www.ogfj.com/content/en/articles/2010/12/italy_s-eni_takes.html.

58. UPI (2012). "Repsol makes gas find in Algeria." 9 November 2012. http://www.upi.com/Business_News/Energy-Resources/2012/11/09/Repsol-makes-gas-find-in-Algeria/UPI-79081352462085/; see also Victor Mallet and Sylvia Pfeifer (2011). "Repsol announces big shale oil find in Argentina." 7 November 2011. http://www.ft.com/intl/cms/s/0/b77004b0-0969-11e1-a20c-00144feabdc0.html#axz-z2E6N8y61g.

59. GDF Suez (2012). "GDF SUEZ announces the discovery of natural gas in Algeria." 8 November 2012. http://www.gdfsuez.com/en/journalists/press-releases/gdf-suez-announces-discovery-natural-gas-algeria/.

60. Benjamin Mallet (2012). "GDF Suez s'intéresse au gaz de schiste américain." *Le nouvel Observatuer*. 11 April 2012. http://tempsreel.nouvelobs.com/economie/20120411.REU3840/gdf-suez-s-interesse-au-gaz-de-schiste-americain.html.

61. GDF SUEZ (2012). "GDF SUEZ signs an agreement with Sempra Energy to access natural gas liquefaction capacity in the United States." 3 May 2012. http://www.gdfsuez.com/en/journalists/press-releases/gdf-suez-signs-agreement-sempra-energyto-access-natural-gas-liquefaction-capacity-united-states/.

Table 6.
European Company Stakes in Potential LNG Export Terminals

Company	European Affiliation	Export Terminal	Status and Details
Statoil	Norway	Cove Point (MD)	Statoil discussed participation in Dominion's Cove Point facility, which is near Statoil's gas assets in the Marcellus Shale. But Statoil decided against it in April 2012.[xviii]
Royal Dutch Shell	UK and the Netherlands	Kitimat, British Columbia	Shell is working with partners from China, Korea and Japan to develop a LNG export terminal in Canada.[xix]
		Freeport LNG Development (TX)	Freeport reported in July 2012 that they were in talks with Royal Dutch Shell.[xx]
		Cove Point (MD)	Shell was in talks with Dominion over potential exports from the Cove Point, Maryland terminal, but will not comment on its final status.[xxi]
BP	UK	North Slope LNG	BP is developing an export terminal in Alaska's North Slope with U.S. and Canadian partners to export conventional gas to Asian markets.[xxii]
		Cove Point (MD)	BP discussed exporting LNG from Cove Point. It presently uses Cove Point's import facilities, and the terminal is well positioned to export shale gas from Marcellus.[xxiii] BP has not commented on its participation.
BG Group	UK	Sabine Pass (LA)	BG will receive the first liquefaction train in 2015. The source and destination of the gas has not been disclosed.
		Lake Charles (LA)	BG Group is working with US-based Southern Union to develop the Lake Charles export terminal.[xxiv]
Total	France	Sabine Pass (LA)	Total negotiated with Kogas for a share of the third train at Cheniere's Sabine Pass terminal.[xxv]
		Sabine Pass (LA) Expansion	Total is seeking a potential fifth liquefaction train at Sabine Pass.[xxvi]
GDF SUEZ	France	Cameron LNG (LA)	GDF Suez signed up for the third production train in Sempra's Cameron LNG project.[xxvii]
Gas Natural Fenosa	Spain	Sabine Pass (LA)	Gas Natural Fenosa purchased the second liquefaction train at Sabine Pass. GNF supplies markets in Southern Europe and Latin America, and it also has a supply agreement with India's GAIL.[xxviii]
Eni	Italy	None	
Repsol	Spain	None	

If participation is confirmed If under discussion

Note: references for the table are provided as endnotes in Appendix 4 of this report

5 Benefits to Europe from U.S. LNG Exports

American LNG exports could provide a number of benefits for European countries and the EU as a whole, and some EU officials have expressed interest in importing U.S. LNG.[62] A steady flow of gas would help Europe secure its supply needs, strengthen U.S.-EU relations, and allow European states to act more freely in their relations with present gas suppliers (e.g., Qatar, Russia). Improved U.S-EU ties would contribute to larger efforts to liberalize transatlantic trade and would be consistent with principles put forward by the World Trade Organization. Additionally, LNG from the United States could aid Europe in its efforts to reduce carbon emissions while also mitigating domestic energy costs. This chapter reviews these benefits from a European perspective, starting with energy security.

Energy Security

U.S. LNG would help the EU meet its official aim of securing sufficient, reliable, and affordable energy. Europe has a history of disruptions in natural gas supply from Russia. To address this source of energy insecurity, the EU has enacted policies to lower energy demand, increase renewable energy use, strengthen its internal gas market, and diversify its portfolio of natural gas suppliers. But these measures have fallen short. Importing LNG from the United States could give Europe a more diverse natural gas supply mix. Furthermore, the reliability of the United States as a trading partner makes it especially desirable.

The EU's past experience with natural gas supply disruptions includes a dispute between Gazprom and Ukraine. The conflict caused Gazprom to cut off gas supplies to Ukraine, and by extension, to southeastern Europe in January 2009. To prevent this from happening again, Europe has supported new pipelines, such as Nord Stream, which transports gas directly from Russia, under the Baltic Sea, to Germany, thereby reducing problems in transit countries. But politically motivated supply disruptions are not Europe's sole concern.

Technical disruptions also put Europe at risk. Gas supplies from Russia fell short in 2012 because of a weather-related surge in Russian demand. The EU was able to avert a crisis by taking natural gas out of storage facilities, permitting gas-to-oil switching in Italy, and letting new gas trading hubs direct natural gas to the areas of highest demand.[63] However, according to the IEA, Europe's ability to compensate for the missing Russian gas was due mainly to fortuitous circumstances. If the surge in Russian demand had occurred later in the season, it would have been very difficult for European states to pull extra gas out of storage.[64] The 2012 demand shock illustrates that even with additional pipelines, reliance on a limited number of natural gas suppliers jeopardizes Europe's energy security.

LNG provides a flexible and responsive alternative to pipeline gas. LNG is sought as a means of securing energy supply in Eastern Europe in particular, where countries are more dependent on Russia for gas, and interconnections with European markets are incomplete.[65]

62. Marlene Holzner, spokeswoman for Energy Commissioner Günther Oettinger, expressed interest the U.S. supplying LNG to all EU member states, not only NATO members, within the context of a discussion of former Senator Lugar's bill to provide gas to European NATO members. See Marie-Martine Buckens (2012). "EU willing to buy US shale gas." *Europolitics*. 20 December 2012. Available from: http://www.europolitics.info/external-policies/eu-willing-to-buy-us-shale-gas-art346578-44.html.

63. International Energy Agency (2012). *Medium-Term Gas Market Report 2012*. Paris: OECD/IEA.

64. *Ibid*, p. 21.

65. The EU passed energy legislation to integrate the EU energy market by 2014, but the European Commission announced in November 2012 that the EU will not meet this goal. See European Commission (2012). "Making the Internal Energy Market Work." COM(2012) 663 final. http://ec.europa.eu/energy/gas_electricity/doc/20121115_iem_0663_en.pdf.

American LNG could be especially helpful to states on the Baltic sea that are seeking to reduce their dependence on Russian gas. In Poland, the EU is helping fund a LNG regasification terminal in Swinoujscie that is set to open in 2014. Poland currently imports 63 percent of its gas supply from Russia; the new terminal will allow it to diversify suppliers. One-third of the LNG will be imported from Qatar based on oil-indexed prices, but the rest will be imported based on spot-market prices on the international LNG market.[66] American LNG, if priced on Henry Hub terms (i.e., at the Texas transfer point), would offer a cheaper alternative to Russian or Qatari gas. Notably, Cheniere Energy has started discussions with Lithuania about providing gas to a planned LNG terminal from Sabine Pass.[67]

The United States is likely to be a relatively reliable supplier of LNG to European markets and would reduce Europe's dependence on Qatar. Over-reliance on a single major LNG exporter such as Qatar can be as dangerous for Europe as its dependence on Russia for pipeline gas. If a regional security crisis such as a war with Iran blocked ship travel through the Strait of Hormuz, for example, or if a technical problem interrupted Qatar's production of LNG, Europe could lose more than the share of its LNG that Qatar currently supplies. A disruption in the Qatari supply could redirect LNG shipments normally destined for Europe to the more profitable Asian market, leaving a larger gap in Europe's supply. The UK, which relies almost exclusively relies on Qatar for its LNG supplies, would be most affected.[68]

Europe could compensate for a gap in LNG deliveries by importing more gas from Russia and using more coal for power generation.[69] But these options would be costly for Europe in environmental and economic terms. All of these factors drive Europe's keen interest in securing additional LNG supplies from new sources such as the United States.

Transatlantic Cooperation

Energy policy is already a key area of cooperation between the United States and the European Union. LNG exports from the U.S. to Europe would complement this established transatlantic partnership. Europe benefits from cooperation with the United States on global energy policy, in part, because a common stance from these two economic powers creates a stronger front with third-party energy suppliers. The EU is already learning from America's shale gas experience to advance its goal of diversifying its energy supply. Directly benefiting from U.S. shale gas exports would take this one step further.

The United States shares the EU's energy security goals. In a major October 2012 speech on the subject of "energy diplomacy in the 21st century," Secretary of State Hillary Rodham Clinton said that one plank of U.S. diplomacy was "to promote competition and prevent monopolies." In this instance Secretary Clinton was specifically alluding to European nations' dependence on pipeline gas from Russia. Clinton also stated that the increase in U.S. natural gas production already had benefited Europe by putting "a lot more gas in the global market."[70]

One mechanism for coordinating energy policy is the U.S.–EU Energy Council, which aims to promote global energy security, improved energy markets, and diversified energy sources. The Council views energy issues not only from the point of view of economics, but also as "a matter of national and international security."[71] It has provided a forum for U.S.–EU discussions on new pipeline infrastructure and, recently, regulatory issues and expertise with respect to unconventional gas as well.[72]

The U.S. and the EU frequently interact on shale gas issues. The U.S. State Department's Unconventional Gas Technical Engagement

66. Euractiv (2012). "LNG terminal set to redraw Poland's energy." November 21. http://www.euractiv.com/energy/poland-takes-decisive-step-lng-t-news-516165.
67. Baltic News Service (2012). "Lithuania Says LNG Supply Talks with Cheniere." *Move Forward*. 11 September 2012. http://www.15min.lt/en/article/business/lithuania-says-lng-supply-talks-with-cheniere-move-forward-527-248129.
68. International Energy Agency (2012). *Medium-Term Gas Market Report 2012*. Paris: OECD/IEA, p. 109.
69. *Ibid*.
70. Hillary Rodham Clinton (2012). "Energy Diplomacy in the 21st Century." Speech at Georgetown University, 18 October 2012. http://www.state.gov/secretary/rm/2012/10/199330.htm.
71. *Ibid*.
72. European Union (2012). "The EU-U.S. Energy Council." Brussels, 5 December 2012, Joint Press Statement. A 560/12. http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/EN/foraff/134058.pdf.

Program shares technology and lessons learned from the U.S. shale gas revolution with European governments. This program has helped countries such as Poland develop their shale gas resources by allowing U.S. local and state-level officials to share their expertise with counterparts abroad.[73]

Relations with Energy Suppliers

Until recently, dependence on Russia for natural gas has not only led to high energy prices in Europe, it has also shaped foreign policy. European criticism of Russia's stances on a wide range of issues has been tempered by fear that Russia could use the "energy weapon" against its European neighbors. For example, a report by the Baker Institute argues that Europe's dependence on Russian gas prevented European leaders from supporting Viktor Yushchenko in the Ukrainian presidential elections and discouraged them from objecting to Russia's invasion of Georgia in 2008.[74]

Today, however, it appears that the growing scope for competitive gas supplies has made it easier for the EU to pursue a more aggressive line with Moscow. Perhaps the most significant development in this regard has been the September 2012 decision by the EU's Directorate-General for Competition to initiate a landmark antitrust case against Gazprom. The EU has taken down giants like Microsoft with the same laws, fining the software company nearly €1.68 billion ($2.18 billion) for anti-competitive practices over the course of the past decade.[75]

Lithuania's complaints to the European Commission about Gazprom's unfair pricing practices provided the impetus for the recent Commission action. Lithuania, which is completely dependent on Russia for its gas supply, argued that Gazprom charged Lithuania more for gas than it did other European states.[76] The Commission's willingness to act on this complaint indicates a new willingness to risk tensions with Russia despite Russia's position as a major gas supplier to Europe.

Box 4: Gazprom: Europe's Antitrust Case of the Decade?

The European Commission has taken a three-pronged approach toward Gazprom. The EU argues that destination clauses and prohibitions for buyers to resell gas impede the proper functioning of the EU's single market. The free movement of goods is one of the principal freedoms in the European Union, and the free movement of gas, in particular, is critical for energy security. Secondly, the EU alleges that Gazprom is preventing the diversification of natural gas supplies in the EU by not allowing third-party access to infrastructure and by impeding the progress of alternative supply projects, such as the construction of LNG terminals. Lastly, the EU charges that Gazprom has engaged in unfair pricing practices by sticking to oil-indexed pricing.[A] Russia appears unlikely to settle this outside of court. It may take as long as four years to get to the EU General Court, and a further appeal to the European Court of Justice is possible after that.[B]

A. Alan Riley (2012). "Commission v. Gazprom: The Anti-Trust Clash of the Decade?" *CEPS Policy Brief No. 285*. Centre for European Policy Studies.

B. Baker Institute Policy Report (2011). "Shale Gas and U.S. National Security." Number 49. Baker Institute. http://www.bakerinstitute.org/publications/EF-pub-PolicyReport49.pdf.

73. Robert F. Cekuta (2012). "Unconventional Natural Gas: The U.S. Experience and Global Energy Security." Address to the 2nd U.S.-Indonesia Energy Investment Roundtable, Jakarta, Indonesia. http://www.state.gov/e/enr/rls/rem/2012/183875.htm.

74. Baker Institute Policy Report (2011). "Shale Gas and U.S. National Security." Number 49. Baker Institute. http://www.bakerinstitute.org/publications/EF-pub-PolicyReport49.pdf.

75. Alan Riley (2012). "Commission v. Gazprom: The Anti-Trust Clash of the Decade?" *CEPS Policy Brief No. 285.* Centre for European Policy Studies.

76. *Ibid*.

But access to larger and more diverse supplies of LNG is not only important for the EU's relations with Russia. Greater energy self-sufficiency in the Atlantic basin would also reduce dependence on the oil and gas wealth of the Middle East, giving Europe (and America) greater freedom in setting policies toward that region. For example, U.S. LNG exports could help reduce European demand for Iranian natural gas, weakening Iran's influence with the EU.[77] Furthermore, analysts from the Eurasia Group have argued that U.S. LNG could provide Pakistan with an alternative to the Iran-Pakistan-India natural gas pipeline.[78] This in turn could benefit European and American political interests in the region.

Box 5: Whither Russia?

Russia has the world's largest natural gas reserves, but its dominance is threatened by competition in Europe and at home. Moreover, Gazprom has fallen behind in maintaining its infrastructure and developing new natural gas fields. As a result, Russia is seeking new markets for its gas and is playing catch-up in modernization and exploration.

The relationship between Russia and Europe is one of mutual dependence: Russia is Europe's primary supplier of pipeline gas, and Europe is Russia's main export market. The growth of LNG exports to Europe worries Gazprom and Russian officials, who are paying especially close attention to the status of LNG exports in the United States. As energy expert Alan Riley explains, "for Gazprom, the greatest danger would be significant exports of U.S. shale gas into the European market."[A]

Gazprom also is facing increased competition at home as independent producers ramp up natural gas production. Novatek produced 1,870 bcf (53 bcm) in 2011 and is purchasing new gas fields to double its production by 2020.[B] Novatek wishes to sell Russian gas abroad and is working with France's Total to develop a LNG terminal in the Yamal peninsula.[C]

Just as Europe seeks to diversify its natural gas supply options, Russia is building liquefaction facilities to serve new markets. It is particularly interested in expanding pipeline and LNG trade with Asian countries. Russia currently operates one LNG export terminal on the Pacific Coast and is in talks with Japan to develop two LNG export projects in Vladivostok and Sakhalin III.[B]

Russia will need to increase investments in its natural gas infrastructure to stay competitive in the global market. In the last decade, Gazprom has pursued high-profile international projects such as the Nord and South Stream pipelines at the expense of domestic infrastructure.[D] These natural gas pipelines, which run under the Baltic and Black Seas, respectively, provide a way to reach gas customers in the EU without passing through transit countries. Concentrating inward first will allow Russia to continue its foreign pursuits in the long term.

A. Alan Riley (2012). "Commission v. Gazprom: The Anti-Trust Clash of the Decade?" *CEPS Policy Brief No. 285.* Brussels: Centre for European Policy Studies, p.4.

B. International Energy Agency (2012). *Medium-Term Gas Market Report 2012.* Paris: OECD/IEA, p. 82-84.

C. Olesya Astakhova (2012). "Novatek eyes gas trading in Germany, elsewhere in Europe." *Reuters.* 30 October.

D. Will Englund and Kathy Lally (2012). "Cumbersome Gazprom losing its clout." *The Washington Post.* 24 September.

77. Baker Institute Policy Report (2011). "Shale Gas and U.S. National Security." Number 49. Baker Institute. http://www.bakerinstitute.org/publications/EF-pub-PolicyReport49.pdf.

78. Robert Johnston and Leslie Palti-Guzman (2013). "The Foreign Policy Uses of an Energy Bounty." *The Wall Street Journal*. 9 January 2013. http://online.wsj.com/article/SB10001424127887324374004578217803412316408.html.

Trade Objectives

LNG exports are also likely to factor into a major new round of trade negotiations between the EU and United States that could lead to a historic FTA during President Obama's second term.[79] Both parties already have long-standing ties in the oil and gas sector. Investments by European energy majors in U.S. shale gas extraction have been mirrored by American oil company investments in shale gas exploration and development in Poland, Germany and the Czech Republic.

The United States and the EU are also each other's largest major trading partner, conducting roughly $485 billion in trade for the first nine months of 2012 alone. And though U.S.–EU tariffs are currently low—approximately 3 percent—regulatory barriers on both sides of the Atlantic remain.[80]

For these reasons, the prospect of completing an FTA is attractive to both sides and in November 2012, German Chancellor Angela Merkel and British Prime Minister David Cameron pressed President Obama to move forward with negotiations for a new treaty.[81]

The proposed agreement would remove the regulatory barriers to U.S. gas exports to the EU in a single action, without the need for protracted case-by-case proceedings. If the United States signed an FTA with Europe, approval for U.S. exports of LNG to the EU would be as automatic as they currently are for South Korea or Singapore. Moreover, it might be difficult for Europe to propose environmental or other restrictions on U.S. LNG while at the same time arguing for more open trade in the context of FTA negotiations. (This issue is discussed further in Chapter 6 of this report).

Wholly apart from the FTA option, unrestricted energy trade from the United States to Europe would be consistent with the principles of the World Trade Organization (WTO). Article XI of the WTO rules forbids "prohibitions or restrictions other than duties, taxes or other charges, whether made effective through quotas, import or export licenses or other measures..." Michael Levi of the Council on Foreign Relations interprets this law to mean that U.S. restrictions on LNG exports are inconsistent with the WTO's rules. And while the WTO grants an exception where domestic production is also being restricted, this is not the case in the United States with LNG exports.[82] It follows, of course, that WTO rules arguably also prevent the EU from imposing restrictions on American LNG.[83]

Emissions Reductions

Imported American LNG could help Europe meet its emissions targets by replacing coal in power generation and crude oil products in the transportation sector. The United States reduced its carbon dioxide (CO2) emissions by 7.7 percent between 2006 and 2012 by reducing demand for gasoline, increasing energy efficiency, and replacing coal with natural gas for power generation.[84]

Fuel switching in the power sector can have a large impact on emissions. Coal comprises 16 percent of the energy mix in the EU, but its share of the power generation sector rises to 24.7 percent.[85] Low coal prices and low carbon prices in the EU Emissions Trading System have made coal more attractive to utilities (see Chapter 6 for more details). Because coal emits almost twice as much CO2 as does natural gas,[86] switching

79. Interviews, September 2012.

80. Jack Ewing (2012). "Trade Deal Between U.S. and Europe May Come to the Forefront." *The New York Times*. November 25. http://www.nytimes.com/2012/11/26/business/global/trade-deal-between-us-europe-may-pick-up-steam.html?pagewanted=all.

81. *Ibid*.

82. Michael Levi (2012). *A Strategy for U.S. Natural Gas Exports*. The Hamilton Project. Washington: Brookings.

83. *Ibid*. Levi also argues that it is in the interest of the U.S. and Europe to abide by the WTO's rules because they have joined with Japan to object to China's restrictions on exports of rare earth metals.

84. IEA (2012). "Global carbon-dioxide emissions increase by 1.0 Gt in 2011 to record high." May 24, 2012. http://www.iea.org/newsroomandevents/news/2012/may/name,27216,en.html.

85. European Commission (2012). *EU Energy in Figures: Statistical Pocketbook 2012*. Luxembourg: European Union. http://ec.europa.eu/energy/publications/doc/2012_energy_figures.pdf.

86. Rachel Nuwer (2012). "A 20-Year Low in U.S. Carbon Emissions." *The New York Times*. 17 August 2012. http://green.blogs.nytimes.com/2012/08/17/a-20-year-low-in-u-s-carbon-emissions/.

Box 6: Conflicting Models for U.S.–EU Trade in LNG

There are three different mechanisms through which the United States can permit LNG exports to Europe.

1. First, DOE can give permission to U.S. terminals to export LNG to non-FTA countries on a case-by-case basis, once it is established that doing so is not contrary to the "public interest." This process can be time-consuming and is subject to political pressures.
2. Second, the United States could sign a free trade agreement with Europe, which would eliminate trade barriers between the two regions and obviate the need for special permissions (see section on Trade Objectives).
3. Third, the United States could pass legislation to permit LNG exports to specified, friendly nations. For example, U.S. Senator Richard Lugar, now retired, proposed a bill in December 2012 that would have given NATO states equivalent status to FTA states with regard to LNG exports.[A] Senator Lugar was especially concerned about providing European allies with alternatives to Russian gas supplies.[B]

At present, the first option is the main path for obtaining permission to export LNG and, despite the many complications and delays involved, offers the most promising route for expanding U.S. LNG trade in the near term. The two other mechanisms conflict with each other and face their own challenges. Free trade agreements are predicated on reducing barriers to trade between the parties, whereas a preference for U.S. allies would undermine current and future FTAs for other countries.

A selective permit process that benefits friends of the United States may also be difficult to implement in Europe. Senator Lugar's proposed bill sought to promote connections between America and its European allies, but it likely would have complicated relations between the two parties. A spokeswoman for the EU's Energy Commissioner has said that the EU would not accept U.S. LNG if it is was available only to NATO member states since doing so could undermine the EU's commitment to a single natural gas market.[C]

In January 2013, Senators John Barrasso, Jim Inhofe, and John Cornyn introduced a similar bill that would expedite LNG exports to NATO allies and Japan: "Expedited LNG for American Allies Act of 2013 (S.192)."[D]

A. Kate Winston (2012). "US Senator Lugar unveils bill to authorize LNG exports to NATO allies." *Platts*. 12 December 2012. http://www.platts.com/RSSFeedDetailedNews/RSSFeed/NaturalGas/6900774.

B. Bryan Schutt (2012). "Senator: NATO allies should have easier access to US LNG exports." *SNL Energy Daily Gas Report* 6:240. 13 December 2012.

C. Marie-Martine Buckens (2012). "EU willing to buy US shale gas." *Europolitics*. 20 December 2012. http://www.europolitics.info/external-policies/eu-willing-to-buy-us-shale-gas-art346578-44.html.

D. LNG Global (2013). "U.S. Senators Introduce the Expedited LNG for American Allies Act of 2013." 31 January 2013. http://www.lngglobal.com/latest/u-s-senators-introduce-the-expedited-lng-for-american-allies-act-of-2013.html.

to natural gas for power generation would allow the EU to cut its carbon emissions and meet its most ambitious environmental targets. Oxford energy expert Dieter Helm has argued that "gas is already a much cheaper way of getting down emissions quickly than renewables or nuclear."[87]

Additional environmental benefits from LNG could come in the transportation sector, the only sector in the EU where greenhouse gas emissions are rising.[88] Replacing petroleum-based fuels such as gasoline and diesel with natural gas would help the EU reduce CO2 and sulfur emissions, which would bring the EU closer to its climate and air quality goals.

Natural gas is already a familiar fuel for buses and cars. Usually, these vehicles run on compressed natural gas (CNG). But LNG has the potential to be used directly as a fuel for heavier vehicles. For example, Gazprom has forecast that heavy-duty vehicles, such as long-haul trucks, will be the largest LNG consumers in Europe in 2030, using up to 1,412 bcf (40 bcm) of LNG a year.[89]

LNG can also help Europe meet emissions goals for maritime shipping. In 2012, European governments agreed to new International Maritime Organization standards that limit the maximum sulfur content of bunker fuels. The maximum sulfur content of fuels will be limited to 0.1 percent in "Emissions Control Areas" starting in 2015, and to less than 0.5 percent sulfur content elsewhere (down from today's limits of 1.5 and 3.5 percent, respectively) beginning in 2020.[90]

Industry strategists have argued that LNG is the best fuel for meeting the new shipping fuel requirements.[91] LNG would almost completely eliminate sulfur-oxide emissions and reduce nitrogen-oxide emissions by up to 90 percent.[92] Royal Dutch Shell is leading the way by piloting LNG as a bunker fuel in northern Europe.[93]

In January 2013, the European Commission announced a clean fuel strategy that includes a large role for LNG as a transportation fuel. The Commission proposed that LNG refueling stations be installed in all major maritime and inland ports by 2020-2025 and that LNG refueling stations be available for trucks at 400 km (249 mi) intervals along core trans-European roads by 2020.[94]

87. Dieter Helm (2012). *The Carbon Crunch*. New Haven: Yale University Press, p. 201.

88. European Commission (2012). *Road Transport: Reducing CO2 Emissions from Vehicles*. Climate Action. http://ec.europa.eu/clima/policies/transport/vehicles/index_en.htm.

89. Gazprom Export (2012). *LNG as a Transportation Fuel: Potential for LNG Bunkering and Heavy-Duty Vehicles.* http://www.gazpromexport.ru/files/2012.01.31._LNG_as_a_Transportation_Fuel-_93.pdf.

90. Euractiv (2012). "Europe tackles sulphur emissions from ships." May 24 2012. http://www.euractiv.com/energy-efficiency/europe-cracks-sulphur-emissions-news-512957.

91. Industry Interviews, October 2012; Gazprom Export (2012). *LNG as a Transportation Fuel: Potential for LNG Bunkering and Heavy-Duty Vehicles*. http://www.gazpromexport.ru/files/2012.01.31._LNG_as_a_Transportation_Fuel-_93.pdf.

92. Gazprom Export (2012). *LNG as a Transportation Fuel: Potential for LNG Bunkering and Heavy-Duty Vehicles.* http://www.gazpromexport.ru/files/2012.01.31._LNG_as_a_Transportation_Fuel-_93.pdf.

93. Leslie Palti-Guzman (2012). "Shell's Promising Gasnor Win and Momentary Cove Loss." *Natural Gas Europe*. 23 July 2012. http://www.naturalgaseurope.com/shells-promising-gasnor-win-and-momentary-cove-loss.

94. European Commission (2013), "EU launches clean fuel strategy," Press Release 24 January 2013, http://europa.eu/rapid/press-release_IP-13-40_en.htm.

6 Potential Obstacles to American LNG Exports to Europe

Obstacles to American LNG in Europe mainly stem from economic and environmental concerns. These barriers are genuine, even if they appear somewhat contradictory. Both Europe's historic reliance on coal—and coal's resurgence in Germany in the face of nuclear plant closings—as well as the EU's simultaneous commitment to renewables and carbon caps could make policymakers disinclined to import American LNG. Better information and the changing regulations applicable to U.S. shale gas production could well moot their objections, however.

Coal

The EU is known for its environmentally friendly policies, but it has the second fastest-growing coal demand in the world. Europe's coal consumption rose 7 percent in 2011.[95] Low prices for coal on the global market and low carbon prices in the EU's Emissions Trading System (ETS) have made coal attractive to European utilities. Analysts argue, however, that the attractiveness of coal as a fuel choice for European utilities is unlikely to last beyond the end of the decade.

Europeans blame their rising coal use on growing coal exports from the United States. In the first quarter of 2012, half of U.S. coal exports went to Europe.[96] This oversupply of coal caused the price of coal to fall from $130/tonne in March 2011 to $95/tonne in May 2012.[97]

Low coal prices are only one factor in the rise of coal in Europe, however. The slow economy in Europe has suppressed demand for carbon permits, leading carbon prices to fall to €5.89 ($8.01) per metric ton in November 2012, which is insufficient to discourage emissions.[98] The carbon price would have to be ten times higher to put coal and gas on an equal footing, but EU officials do not consider such a rise in prices to be feasible.[99]

Even though European power sector carbon emissions are rising, utilities argue that the high price of natural gas gives them no choice but to construct more coal-fired facilities.[100] In Germany, gas-fired power stations lose €11.25 ($15.30) per megawatt-hour, whereas coal-fired power stations make a profit of €14.22 ($19.34) per megawatt-hour. As a result, utilities in the UK and Germany have closed, delayed or put many new gas-fired power plants on hold.[101]

In Germany, utilities are turning to coal to replace lost generating capacity from nuclear power plants. The IEA argues that this strategy will prevent Germany from reaching its carbon reduction goals. Replacing nuclear power with renewable sources may keep emissions flat, but Germany will have to switch at least 180 terawatt-hours (TWh) of electricity production from coal to gas generators to reduce emissions overall.[102]

95. International Energy Agency (2012). *World Energy Outlook*. Paris: OECD/IEA, p. 178.

96. ENDS Europe Daily (2012). "US Exports its Emissions to the EU, Says Report." 29 October 2012.

97. International Energy Agency (2012). *Medium-Term Coal Market Report 2012*. Paris: OECD/IEA, p. 13.

98. Nina Chestney (2012). "EU climate fight hit by new record low carbon price." *Reuters*. 30 November 2012. http://www.reuters.com/article/2012/11/30/carbon-price-idUSL5E8MU1P820121130.

99. Interviews, October 2012.

100. Matthew Carr (2012). "Coal Era Beckons for Europe as Carbon Giveaway Finishes." *Bloomberg*. 21 September 2012. http://www.bloomberg.com/news/2012-09-21/coal-era-beckons-for-europe-as-carbon-giveaway-finishes.html.

101. Matthew Brown (2012). "Gas Golden Age Darkens in Europe on U.S. Coal: Energy Markets." *Bloomberg*. 31 October 2012. http://www.bloomberg.com/news/2012-10-31/gas-golden-age-darkens-in-europe-on-u-s-coal-energy-markets.html.

102. International Energy Agency (2012). *Medium-Term Gas Market Report 2012.* Paris: OECD/IEA, p. 27.

Europe's coal lobby is a powerful alliance of coal producers, energy companies and industry organizations, centered on Germany, Great Britain and Poland, the most coal-dependent countries in the EU.[103] Many of these countries are also large coal producers. Germany, in particular, has the largest coal reserves in the EU (40,699 million tonnes). However, Poland, whose reserves are only 14 percent the size of Germany's, produced the most coal in Europe in 2011, significantly surpassing German production (56.6 million tons of oil equivalent or [mtoe] versus 44.6 mtoe, respectively).[104] Because coal use is high in former Eastern Block countries—Poland and the Czech Republic in particular—supporters of coal in Europe have sought to cast the debate over coal use as stemming from an East–West divide.[105] This has made the issue a question of internal European politics rather than simply of environmentalism.

Domestic Shale Gas

The development of Europe's own shale gas resources could reduce demand for U.S. LNG exports. It would also supplement conventional gas production and would arguably provide emissions benefits over imported gas.[106] But European shale gas development has suffered many setbacks. Environmental opposition led France and Bulgaria to ban hydraulic fracturing. And the technical feasibility of producing shale gas in Europe is still uncertain, as exploratory drilling efforts have disappointed early movers. Even as public sentiment is warming to shale gas development, large-scale production is still far off.

A number of regions in the EU could have the potential to produce shale gas. The continent's three major shale gas plays include the Cambrian-Ordovician shale, which runs from Denmark through Sweden, Poland's Silurian shale, and the Carboniferous shale, which stretches all the way from the UK to Poland. In total, Europe could have up to 53 tcf (15 tcm) of recoverable shale gas.[107] The promise of shale gas could have major implications for Europe's energy security; the Netherlands, Spain, Lithuania, Denmark, Sweden, Hungary and some states in Germany are interested in pursuing shale gas production.[108]

Shale gas, however, is controversial in Europe primarily because of its environmental impacts. Concerns over water pollution, tremors, and fugitive emissions have led the EU to consider new regulations on hydraulic fracturing. The European Commission is currently seeking input on regulatory gaps with regard to unconventional gas development, and it will release a framework for regulating domestic shale gas production in 2013.[109] The aim of the new rules is to ensure there are adequate "health, climate and environmental safeguards in place, with maximum legal clarity and predictability for citizens and operators."[110] Issues likely to be evaluated by the EU include seismic activity, water and air pollution, well casings, and chemical additives in hydraulic fracturing fluids.[111]

The political climate for shale gas in Europe is improving. Notably, in December 2012, the UK lifted a moratorium on hydraulic fracturing that had been in place since May 2011, when exploratory drilling caused tremors near Blackpool. The government removed the ban but put in place additional

103. Arthur Neslen (2012). "Polish energy firms intensify coal lobbying in Brussels," *Euractiv.com*, 6 November 2012. http://www.euractiv.com/climate-environment/brussels-coal-lobby-sponsored-po-news-515851.

104. BP (2012). *BP Statistical Review of World Energy June 2012*.

105. Friedbert Pflüger (2012). "European climate policy must distinguish between East and West." *European Energy Review*. 13 September 2012. http://www.europeanenergyreview.eu/site/pagina.php?id=3850. Daniel Forster and Jonathan Perks (2012), Climate impact of potential shale gas production in the EU. Report for European Commission DG CLIMA. AEA. http://ec.europa.eu/clima/policies/eccp/docs/120815_final_report_en.pdf.

106. Daniel Forster and Jonathan Perks (2012), *Climate impact of potential shale gas production in the EU.* Report for European Commission Directorate-General for Climate Action. AEA. http://ec.europa.eu/clima/policies/eccp/docs/120815_final_report_en.pdf.

107. Maximillan Kuhn and Frank Umbach (2011). *Strategic Perspectives of Unconventional Gas: A Game Changer with Implications for EU's Energy Security*. EU Centre for Energy and Resource Security (EUCERS) Strategy Paper. London: King's College London, p. 28. http://www.kcl.ac.uk/sspp/departments/warstudies/research/groups/eucers/strategy-paper-1.pdf.

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109. Barbara Lewis (2012). "Shale gas needs regulation, not a ban: European Parliament." *Reuters*. 21 November 2012. http://www.reuters.com/article/2012/11/21/us-eu-shalegas-idUSBRE8AK16220121121.

110. European Commission (2012). "Environment: Commission consults public on unconventional fossil fuels (e.g. shale gas) in Europe." Press Release RAPID IP/12/1429. 20 December 2012.

111. ENDS Europe Daily (2012). "EC Consults on Shale Gas Ahead of Review." 20 December 2012.

measures to ensure that drilling proceeds gradually, making sure that no seismic activity occurs. The government hopes that shale gas development will improve the UK's energy security and reduce energy prices.[112] Tentative interest in shale gas also extends to the top of the EU. In November, the European Parliament voted not to forbid hydraulic fracturing. Germany and Romania also chose not to impose a blanket ban on this technique.[113]

There may also be strong environmental reasons to pursue shale gas development in Europe. In terms of greenhouse gas emissions, domestically produced shale gas likely would be preferable to LNG imports, at least based on current EU data. According to a recent EU study, electricity generated from domestic shale gas would produce 2 to 10 percent lower emissions than either conventional gas imported by pipeline or LNG imports.[114] (See section on Climate and Emissions)

Even if the EU passes legislation that adequately addresses the safety concerns of environmental groups and political opposition recedes, economic and technical barriers to the large-scale production of shale gas in Europe remain high. Poland has been the EU's most promising potential shale gas producer, yet its production prospects have flagged. Initial assessments concluded that Poland had approximately 5 tcm of recoverable shale gas. However, Poland's geological authorities have recently revised this estimate to a fraction of the initial levels. In addition, early exploration efforts have yielded disappointing results. ExxonMobil found production unprofitable and pulled out of Poland in 2012.[115] The economic viability of Europe's shale gas plays will be crucial to the prospects for European shale gas development.

Climate and Emissions

The EU has a history of targeting high-emissions energy sources for special tariffs that significantly reduce the economic viability of those fuels. Despite an incomplete record, it is possible that American LNG could be considered an especially high-emissions energy source.

For example, a recent EU study on the relative greenhouse gas emissions of natural gas from different sources suggested that shale gas imported from America has a higher emissions profile than natural gas obtained from any other source used by the EU today. Although the study in question did not specifically address shale gas used for LNG, it found that global warming emissions from the production of shale gas are higher than those from the production of conventional gas.[116] Furthermore, the study suggests that LNG generally has higher full fuel-cycle greenhouse gas emissions than pipeline gas.[117] Because LNG exports from the U.S. would be at least partly comprised of shale gas, U.S. LNG exports would have higher emissions than conventional LNG from Qatar or Algeria. Unless rebutted, therefore, this new EU finding could be used to restrict U.S. shale gas exports on grounds of climate impacts. It is important to note, however, that estimates of greenhouse gas emissions associated with shale gas production are controversial. A November 2012 study by Francis O'Sullivan and Sergey Paltsev of MIT found that actual emissions at shale gas wellheads in the United States in 2010 were significantly lower than scientists had previously estimated.[118]

The EU already uses emissions evaluations to shape its policies on transportation fuels. For example, the EU's Fuel Quality Directive requires suppliers of transportation fuels to achieve a 6-percent

112. ENDS Europe Daily (2012). "Fracking Given the Green Light in the UK." 13 December 2012.

113. Barbara Lewis (2012). Shale gas needs regulation, not a ban: European Parliament. *Reuters*. 21 November 2012. http://www.reuters.com/article/2012/11/21/us-eu-shalegas-idUSBRE8AK16220121121. See also Alex Morales (2012). "U.K. Plans to Allow Shale Gas Drilling to Resume This Year." *Bloomberg*. 16 October 2012. http://www.bloomberg.com/news/2012-10-16/u-k-plans-to-allow-shale-gas-drilling-to-resume-this-year.html and Stefan Nicola (2012). "Germany Urged to Ban Shale Gas Fracking Near Water Reservoirs." *Bloomberg*. 6 September 2012. http://www.bloomberg.com/news/2012-09-06/germany-urged-to-ban-shale-gas-fracking-near-water-reservoirs.html and Ladka Bauerova (2012). "Czech Government Proposes Temporary Ban on Shale-Gas Exploration." *Bloomberg*. 4 September 2012. http://www.bloomberg.com/news/2012-09-04/czech-government-proposes-temporary-ban-on-shale-gas-exploration.html.

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117. *Ibid.*

118. Francis O'Sullivan and Sergey Paltsev (2012). "Shale gas production: potential versus actual greenhouse gas emissions." *Environmental Research Letters* 7:044030. http://iopscience.iop.org/1748-9326/7/4/044030/article?site_preference=normal.

reduction in the lifecycle emissions of their fuels by 2020. The EU has proposed to implement this directive by assigning default emission values to transportation fuels according to their carbon intensity. Under the EU's proposal, tar sands and oil shale are assigned higher emissions values than crude oil. If accepted, these default values would make transport fuels made from highly carbon-intensive sources such as Canadian tar sands more expensive for EU consumers. Because of lobbying by Canadian officials, the European Commission has pushed back a decision on this measure until 2013.[119]

Some observers also suggest that the EU is unlikely to impose regulations against American shale gas, particularly after its recent experience with international aviation and the ETS. The U.S. government rebuffed the EU's attempt to compel airlines to pay a fee based on carbon emissions for flights into and out of Europe.[120] As a result, the EU delayed implementation of the law.

Other Environmental Issues

While the prospect of American shale gas exports has just begun to attract the attention of European environmentalists, many are likely to side with U.S. opponents of such trade, such as the Sierra Club.[121] For this reason, European officials interested in advancing American LNG exports would prefer to see prompt U.S. action on pending export applications so as to avoid potential opposition from EU (and U.S.) environmental groups.[122]

Debates on shale gas in Europe are focused on the local environmental effects of hydraulic fracturing. A European Commission study on the environmental impacts of shale gas found that hydraulic fracturing poses a high risk of water contamination and has negative air quality, land use, biodiversity, noise pollution, and traffic effects.[123]

Concern regarding the environmental risks of hydraulic fracturing, however, need not result in a ban on shale gas development. As noted in a previous section, the UK lifted its moratorium in December 2012. But the green light came with conditions: operators must now meet strict environmental and seismic safeguards.[124] In Germany, environmental policies have significant government and public support, but the government has voted against a blanket moratorium on fracturing technologies on three separate occasions. Instead of a total ban, as exists in France, Germany is reviewing legislation to expand the use of environmental impact assessments on smaller wells, and potentially ban the use of certain chemicals for well completion.[125]

The fact that environmental groups in America and Europe have similar concerns might also be seen in a more positive light. So long as the United States adequately addresses local environmental impacts from drilling practices, American shale gas exports could ultimately win some environmental backing given the relatively clear-cut climate benefits of fuel switching in the power sector.

Europe's environmental concerns over shale gas development also open the door for greater cooperation between EU and American officials. European states, and the EU as a whole, are developing regulations and defining best practices for shale gas production, much as the United States is doing on both the state and federal levels. Although the U.S. State Department already has knowledge-sharing programs in place to spread lessons learned from U.S. production, greater communication between researchers and policymakers could benefit both sides.

119. Barbara Lewis (2012). "EU Vote on Tar Sands Oil Delayed Until 2013." *Reuters*. 20 April 2012. http://www.reuters.com/article/2012/04/20/energy-tar-idUSL6E8FK33620120420.

120. Valerie Volcovici (2012). "Obama shields U.S. airlines from EU carbon fees." *Reuters*. 27 November 2012. http://articles.chicagotribune.com/2012-11-27/news/sns-rt-us-usa-airlines-emissionsbre8aq1ar-20121127_1_airlines-from-eu-carbon-republican-senator-john-thune-eu-ets.

121. The Sierra Club is calling on DOE to conduct a full environmental impact assessment for all potential export applications before giving final assent to any specific LNG export terminal. For more information on the Sierra Club's opposition to the Cove Point export terminal in Maryland, see Tom Schoenberg and Julie Johnsson (2013). "Dominion Can Export LNG From Cove Point, Court Says." *Bloomberg*. 4 January 2013. http://www.bloomberg.com/news/2013-01-04/dominion-may-export-lng-from-cove-point-maryland-court-rules.html and Sierra Club (2012). "Sierra Club Rejects Liquefied Natural Gas Export Terminal in Cove Point." 26 April 2012. http://maryland.sierraclub.org/action/p0401.asp.

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7 Conclusion

The shale gas revolution in the United States has already changed Europe's energy market. In recent years, LNG from Qatar, once intended for the United States, has landed in Europe, providing the EU with a viable alternative to its dependence on Russian gas. Coal, which has been displaced from the United States power-generation sector, has also entered European markets, causing coal prices to decline sharply and changing the face of the electricity sector.

These recent developments make it clear that the energy markets of the European Union and the United States are becoming ever more integrated. LNG exports from the United States to the EU would only broaden that relationship, further reducing natural gas prices in Europe and providing the continent with greater access to a lower-emissions fuel for power generation and transportation. European companies with significant investments in U.S.-based drilling and liquefaction operations would also benefit.

Regardless of the outcome of DOE's pending export decisions, closer engagement between the United States and EU on these issues provides opportunities for working together on natural gas and energy policy more broadly. The potential obstacles to expanding U.S. LNG exports are not unique to Europe. Many countries now face the challenge of reducing greenhouse gas emissions, switching to cleaner fuels, protecting indigenous resources, and managing a more global and integrated energy market.

Europe and America have much to learn from each other as they contend with the need to establish sustainable regulations for hydraulic fracturing. A variety of discussions are taking place in Europe that could serve as models for similar dialogue in the United States.[126] In turn, as European officials review their own regulations, they could benefit by reviewing new state-level regulations in Ohio, Colorado, Texas, and Pennsylvania. Moreover, European officials might also look at how the U.S. power sector has reduced harmful emissions through fuel switching.

Beyond that, increased cooperation on technical energy policy questions can feed a wider political conversation between the United States and the European Union concerning issues of trade, energy security, and climate action. In that case, what now appears to be a rather narrow debate about LNG exports could ultimately yield far greater dividends for America and for its strongest European allies.

126. Exxon-Mobil sponsored an extensive discussion on fracking in Germany, InfoDialog Fracking, that brought together neutral experts and community members to explore the risks and benefits of developing shale gas in Germany. For more information, in German, see http://dialog-erdgasundfrac.de/ or, for a summary in English, see http://www.ufz.de/index.php?en=30201.

Appendices

Appendix 1.
Natural Gas Measurements and Conversions

Natural Gas and LNG Unit Conversions	To					
	1 billion cubic meters natural gas	1 billion cubic feet natural gas	1 million tons oil equivalent	1 million tons LNG	1 trillion British thermal units (Btus)	1 million barrels oil equivalent (Boe)
From	**Multiply by**					
1 billion cubic meters natural gas	1	35.3	0.9	0.73	36	6.29
1 billion cubic feet natural gas	0.028	1	0.026	0.021	1.03	0.18
1 million tons oil equivalent	1.111	39.2	1	0.81	40.4	7.33
1 million tons LNG	1.38	48.7	1.23	1	52	8.68
1 trillion British thermal units (Btus)	0.028	0.98	0.025	0.02	1	0.17
1 million barrels oil equivalent (Boe)	0.16	5.61	0.14	0.12	5.8	1

Adapted from *BP Statistical Review of World Energy June 2012.*

Appendix 2.
Glossary

European Union Member States: European countries that are members of a 27-nation political and economic union and share certain common policies on matters ranging from energy and financial regulation to infrastructure funding.

Emissions Trading: also known as cap-and-trade, is a market-based method of controlling pollution by capping emissions and establishing a market for permits to emit. The European Union has such a system in place for greenhouse gases.

Greenhouse Gases: gases that trap heat in the atmosphere, thus causing the Earth to be warmer than it would otherwise be.

Henry Hub: a Louisiana natural gas distribution hub whose centrality to the U.S. natural gas pipeline system means that it sets the price point for U.S. natural gas futures prices.

Hydraulic Fracturing/Fracking/Hydro-Fracking: A process by which high pressure is applied to hydrocarbon-producing rock formations, causing the rock to fracture and the hydrocarbons to be released.

IEA: The International Energy Agency, based in Paris, maintains statistics about the energy market and works as a policy adviser to its 28 members. It is tied to the Organization for Economic Cooperation and Development (OECD).

Liquefaction: The process of converting gas to a liquid, usually to make it easier to transport.

Liquefaction Train: The facilities of a liquefied natural gas plant that purify gas, then turn the gas into a liquid.

Liquefied Natural Gas: Natural gas whose temperature has been reduced to -260 degrees Fahrenheit at atmospheric pressure, thus turning it into a liquid. When pressurized, natural gas remains a liquid under somewhat warmer temperatures.

Natural Gas: A mixture of hydrocarbon compounds, mainly methane, that is a gas under normal atmospheric conditions.

Oil Indexation: The practice of tying natural gas prices to the price of oil in gas purchase contracts.

Regasification: The process of converting liquefied natural gas back into its gaseous state in order to transport it by pipeline.

Shale Gas: Natural gas produced typically through hydraulic fracturing from formations of shale, a sedimentary rock rich in organic materials.

Spot Market: The market for specific short-term amounts of gas.

Take-or-Pay: A clause in a gas supply contract that sets minimum amounts of gas that must be paid for over a certain period of time, whether or not the purchaser actually takes the gas.

Unconventional Gas: Gas extracted from new sources that differ from the oil deposits from which natural gas has traditionally been produced. The most typical unconventional sources include shale deposits, coal bed methane and tight gas sands.

Appendix 3.
Timeline 2012-2025

Relevant Political Backdrop and Economic Windows of Opportunity for American LNG Exports			
	US Politics	**European Politics**	**Global LNG Developments**
2014	Midterm Elections	European Parliament Elections and new European Commission	Start of "second massive wave of LNG projects." Australia: Four LNG export terminals come online amounting to 20bcm/year, and three more launch before 2017.**
2015		United Kingdom General Elections	US: Sabine Pass LNG Terminal's 1st train becomes operational. Freeport LNG* comes online LNG projects in Iraq and Israel could come online in 2015 at the earliest Malaysia: MLNG T9 comes online
2016	Presidential and Congressional Elections		US: Sabine Pass's 2nd train becomes operational. Cove Point LNG* comes online. Canada: Earliest expected date for LNG export terminals to come online in British Columbia. Nigeria: Brass LNG comes online Angola: Angola LNG comes online Equatorial Guinea: EG LNG T2 comes online
2017		German Federal Elections French Presidential Election	US: Jordan Cove Energy* terminal comes online. Russia: Earliest date for Yamal LNG to come online Indonesia: Abadi floating LNG comes online
2018	Midterm Elections		US: Lake Charles* and Corpus Christie* terminals come online. Indonesia: Tangguh LNG T3 expected to come online. Russia: Shtokman and Vladivostok LNG expected to come online Mozambique: Mozambique LNG comes online Nigeria: NLNG Train 7 comes online Papua New Guinea: Gulf LNG comes online
2019		European Parliament Elections and new European Commission	
2020	Presidential and Congressional Elections		
2021		German Federal Elections French Presidential Election	
2022	Midterm Elections		
2023			
2024	Presidential and Congressional Elections	European Parliament Elections and new European Commission	
2025		German Federal Elections	

* Awaiting approval for non-FTA countries Nov. 2012
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