



Europe's Energy Security: Options and Challenges to Natural Gas Supply Diversification

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March 15, 2013

Congressional Research Service

7-5700

www.crs.gov

R42405

Summary

Europe as a major energy consumer faces a number of challenges when addressing future energy needs. Among these challenges are rapidly rising global demand and competition for energy resources from emerging economies such as China and India, persistent instability in energy producing regions such as the Middle East, a fragmented internal European energy market, and a growing need to shift fuels in order to address climate change policy. As a result, energy supply security has become a key concern for European nations and the European Union (EU).

A key element of the EU's energy supply strategy has been to shift to a greater use of natural gas. Europe as a whole is a major importer of natural gas. Russia is Europe's most important natural gas supplier, accounting for 36% of Europe's natural gas imports. Europe's natural gas consumption is projected to grow while its own domestic natural gas production continues to decline. If trends continue as projected, Europe's dependence on Russia as a supplier is likely to grow. And, while it could be in Europe's interest to explore alternative sources for its natural gas needs, it is uncertain whether Europe as a whole can, or is willing to, replace a significant level of imports of Russian natural gas. Some European countries that feel vulnerable to potential Russian energy supply manipulation may work harder to achieve diversification than others.

Russia has not been idle when it comes to protecting its share of the European natural gas market. Moscow, including the state-controlled company Gazprom, has attempted to stymie European-backed alternatives to pipelines it controls by proposing competing pipeline projects and attempting to co-opt European companies by offering them stakes in those and other projects. It has attempted to dissuade potential suppliers (especially those in Central Asia) from participating in European-supported plans. Moscow has also raised environmental concerns in an apparent effort to hinder other alternatives to its supplies, such as unconventional natural gas.

Successive U.S. administrations and Congresses have viewed European energy security as a U.S. national interest. Promoting diversification of Europe's natural gas supplies, especially in recent years through the development of a southern corridor of gas from the Caspian region as an alternative to Russian natural gas, has been a focal point of U.S. energy policy in Europe and Eurasia. The George W. Bush Administration viewed the issue in geopolitical terms and sharply criticized Russia for using energy supplies as a political tool to influence other countries. The Obama Administration has also called for diversification, but has refrained from openly expressing concerns about Russia's regional energy policy, perhaps in order to avoid jeopardizing the "reset" of ties with Moscow. Nevertheless, although supplying natural gas to Europe from the Caspian Region and Central Asia has been a goal of multiple U.S. administrations and the EU, it is far from being achieved in volumes significant to counter Russian exports.

This report focuses on potential approaches that Europe might employ to diversify its sources of natural gas supply, Russia's role in Europe's natural gas policies, and key factors that could hinder efforts to develop alternative suppliers of natural gas. The report assesses the potential suppliers of natural gas to Europe and the short- to medium-term hurdles needed to be overcome for those suppliers to be credible, long-term providers of natural gas to Europe. The report looks at North Africa, potentially the most realistic supply alternative in the near-term, but notes that the region will have to resolve its current political, economic, and security instability as well as the internal structural changes to the natural gas industry. Central Asia, which may have the greatest amounts of natural gas, would need to construct lengthy pipelines through multiple countries to move its natural gas to Europe.

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Introduction: Change Is Afoot

The 27 member-state European Union (EU) has been a growing natural gas consumer and importer for decades. As Europe's natural gas production has declined in recent years, its dependence on imported natural gas has increased. This has left it more dependent as a whole on its primary supplier, Russia, which has shown some inclination to use its resources for political ends. Natural gas, unlike oil which is a global commodity, is a regional commodity with regional buyers and sellers exerting more influence.

Over the past decade, some European officials have become increasingly concerned about the potential for cutoffs or curtailments of Russian natural gas supplies to Europe. At least until recently, most Russian natural gas exports to Europe flowed through Ukraine and Belarus. Fragile and sometimes hostile relations between Kyiv, Minsk, and Moscow have in the past resulted in interruptions in the flow of natural gas to parts of Europe, as happened in 2006 and 2009. Some countries in Eastern Europe, which are in some cases almost exclusively reliant on Russian gas imports, have been particularly susceptible to these fluctuations.

In response to past supply cutoffs and the potential for future energy supply interruptions, European leaders, sometimes with the support of the United States, have sought to increase their energy security by exploring supply diversification options. One such response, though contrary to the U.S. perspective of energy security through diversification, has been the decision by some EU members to support alternative transit routes for Russian gas. This includes Germany's decision to support construction of the Nord Stream pipeline, which directly connects Russia and Germany, Russia's largest importer. Russia has also committed to building the South Stream pipeline across the Black Sea, connecting Russia, Bulgaria, and Hungary. While these pipeline projects bypass transit states such as Ukraine and Belarus, they also bypass EU member states like Poland and Lithuania that are more critical of Russian policies. The Russian-backed projects are also widely seen as rivals to other pipelines supported by the EU.

The opening of Nord Stream—the second pipeline began operations in October 2012, raising its capacity to 2 trillion cubic feet per year (tcf)—and the proposal for South Stream highlight challenges Europe faces in diversifying its natural gas supplies: Russia has demonstrated a willingness to go to great lengths to maintain its hold on European market share of natural gas. However, while some European countries, Germany included, maintain that projects such as Nord Stream enhance European security by providing alternate routes for Russian supplies, a number of EU member states, including Poland and Lithuania, opposed Nord Stream and have questioned Russia's reliability as an energy supplier. Critics tend to argue, for example, that projects like Nord Stream could give Moscow additional political and economic leverage in its dealings with countries that have been bypassed by the pipeline.

A second EU response to concerns over Europe's reliance on Russian natural gas supplies is what has become known as the Southern strategy or the Southern Corridor to transport natural gas from the Caspian region and Central Asia. Although the long-time centerpiece of this strategy, the proposed Nabucco natural gas pipeline, is no longer considered a commercially viable project, it has been replaced by the planned smaller-scale Trans-Anatolian natural gas pipeline (TANAP), which would connect to either the so-called Nabucco West pipeline or the Trans Adriatic Pipeline (TAP). Nabucco West would transport natural gas from Turkey's western border to Austria, while TAP would move natural gas to Italy. Meanwhile, alternative supplies from other regions (e.g., North Africa and Central Asia) face several significant challenges.

A third aspect of Europe's energy security policies involves Europe's own fragmented internal energy market. In early February 2011, European heads of state pledged to: complete the integration and liberalization of the internal European energy market by 2014; ensure all European member states are connected to a Europe-wide energy supply grid by 2015; boost energy efficiency throughout Europe; and better coordinate external energy policies. European leaders hope that further market liberalization and interconnection of electric grids and pipelines will, among other things, allow member states to share and trade energy more flexibly than at present, mitigating the impact of supply interruptions and overdependence on a single supplier. The European Commission has estimated that over €1 trillion (about \$1.4 trillion) of infrastructure and other investment will be necessary to realize the EU goals.

Despite its growing dependence on Russian natural gas, some analysts argue that Europe is well positioned geographically to benefit from recent changes in global natural gas development. Since the advent of shale gas in the United States, the world appears to be potentially awash in natural gas. A 2011 study commissioned by the U.S. Energy Information Administration (EIA) showed that technically recoverable shale gas resources worldwide may exceed current global natural gas reserves.¹ Other key developments and possible alternatives to Russian natural gas are outlined below:

- Taken as a whole, North Africa could pose a credible alternative to Russian natural gas supplies. The change of regimes in Libya, in particular, and in Egypt as a result of the wave of regional unrest known as the “Arab Spring,” poses a potential opportunity to increase natural gas production and exports from these countries. Both Libya and Egypt have large natural gas reserves, but production and exports have been hampered by domestic policies, and Egypt announced last year that it will actually need to import natural gas.² Algeria, the largest exporter of natural gas in North Africa and the third largest supplier to Europe behind Russia and Norway, may also hold large volumes of undeveloped shale gas in addition to substantial conventional reserves. A terrorist attack and ensuing hostage crisis at a natural gas facility in Algeria in January 2013 highlighted security concerns that could present a key obstacle to further development of these resources, however.
- The Caspian region may hold the greatest potential for new natural gas supplies for Europe, but currently supplies in Central Asia have to transit Russia to arrive in the European market. The delays in expanding and fully developing southern corridor natural gas pipelines to Europe, including trans-Caspian links, have forced Central Asian countries to look east rather than west to bypass Russia and open new markets.³
- Liquefied natural gas (LNG) imports pose an additional alternative to Russian natural gas. In 2011, LNG comprised almost 20% of the EU's natural gas imports and 19% of its consumption. The EU has LNG import capacity to meet its peak winter demand for natural gas, but during most of the year the facilities are

¹ U.S. Energy Information Administration, *World Shale Gas Resources: An Initial Assessment of 14 Regions Outside the United States*, Washington, DC, April 5, 2011, p. 4, <http://www.eia.gov/analysis/studies/worldshalegas/>.

² “Egypt Pushes Ahead with LNG Imports as Domestic Output Falls Short,” *International Oil Daily*, December 31, 2012.

³ The southern corridor refers to the area south of the Black Sea and into southern Europe.

underutilized. Nevertheless, some countries are considering building additional LNG import terminals to diversify their sources of natural gas. In addition to LNG import terminals, the EU could benefit from increased natural gas storage facilities in order to manage import capacity during non-peak periods, as well as more pipeline interconnections to move natural gas where it is needed. EU officials have identified both improvements as priorities and they are being pursued, but not without some difficulty.

- The prospect of significant U.S. LNG exports may pose an opportunity for the United States to play a bigger role in European energy security and global natural gas markets.⁴ Most proposed U.S. LNG export projects are located on the Gulf Coast or East Coast of the United States, making shipments to Europe probably economical. Additionally, the U.S. natural gas market is one of the only markets in the world where natural gas is not priced against oil, giving it a cost advantage in most of Europe. Should future U.S. LNG contracts not include an oil-indexed formula, pressure could be added for other countries, including Russia, to follow suit. Russian companies, including state-controlled natural gas giant Gazprom, have adamantly defended oil-indexed natural gas prices.

Context, Background and Different Points of Views

The U.S. Perspective

The primary focus of U.S. energy policy in Europe has been on establishing a southern corridor route for Caspian, Central Asian, and Middle Eastern natural gas supplies to be shipped by pipeline to Europe. Other efforts have been focused on EU market reforms, which are beyond the scope of this paper.

The George W. Bush Administration sharply criticized Russia for using energy supplies as a means to gain political influence over other countries and urged European countries to diversify supply sources.⁵ The Obama Administration has also called for diversification, but has refrained from openly expressing concerns about Russia's energy policy in the region, perhaps in order to avoid jeopardizing the "reset" of ties with Moscow. Additionally, the Obama Administration's backing of a significantly scaled back southern corridor pipeline project may indicate waning interest in the southern corridor strategy.

The progress of the TANAP project with two possible outlets in Nabucco West or TAP has greatly improved the chances of Caspian natural gas to flow to Europe in significant quantities. In June 2013, Azerbaijan's Shah Deniz consortium is expected to announce the next major development in the evolution of the Southern Corridor, choosing either the aforementioned Nabucco West or TAP. Both of these projects would be significantly smaller than the previously proposed Nabucco project, long a centerpiece of U.S. and European energy policy in the region. Despite political support from the United States and the European Union, Nabucco was not deemed to be commercially viable. U.S. officials have indicated that they "support any pipeline through the

⁴ For additional information on U.S. natural gas exports see CRS Report R42074, *U.S. Natural Gas Exports: New Opportunities, Uncertain Outcomes*, by Michael Ratner, Paul W. Parfomak, and Linda Luther.

⁵ The White House, *Vice President's Remarks at the Vilnius Conference*, May 4, 2006, <http://www.whitehouse.gov>.

Southern Corridor that provides gas to the most vulnerable countries in Europe and that includes concrete, written guarantees that the pipeline will be expanded as more gas becomes available.”⁶ The three projects mentioned above are all viewed as scalable as supply and demand changes.

Supporting a project such as TAP, that crosses Greece and includes a spur to Italy, could still raise concerns about Russian influence. Observers note that Russian companies have bid to purchase two major Greek gas companies; and that Italy and Russia historically have close ties on energy issues, including natural gas (especially under the government of former prime minister Silvio Berlusconi).⁷ Such concerns could, however, be mitigated depending on the policy measures taken by future Greek and Italian governments.

Despite the Obama Administration's stated support of the Southern Corridor, officials reject the view that Russia and the United States are competing for influence over Caspian and Central Asian energy supplies, emphasizing, among other things, that the Administration has formed a Working Group on Energy under the U.S.-Russia Bilateral Presidential Commission.⁸ That said, some critics contend that the Administration's willingness to support a project that is significantly smaller in size than Nabucco could signal diminishing interest in promoting the diversification policy.

The Arab Spring brought regime change to two large natural gas producers, Libya and Egypt, with potentially expanded sources of natural gas to Europe. The development of these resources will depend upon the policies of the evolving governments. North Africa already has significant natural gas infrastructure—LNG export terminals and pipelines—connecting it to Europe. However, it is too early to determine how the changes the Middle East and North Africa (MENA) will affect natural gas production and exports. The U.S. government, along with the EU, has indicated its desire to expand trade and investment with the MENA region, which could help foster economic growth and provide support for successful democratic transitions. For example, in a speech delivered at the State Department on May 19, 2011, President Obama outlined a new plan for U.S. engagement with MENA that includes a “Trade and Investment Partnership Initiative.”⁹ Some Members of Congress have also expressed interest in deeper trade and investment ties with Arab Spring countries.¹⁰ Although U.S. trade and investment with the MENA region overall is relatively limited at present, this region may present growing commercial opportunities for U.S. businesses in areas such as energy, transportation, and infrastructure.¹¹

⁶ Remarks by Ambassador Richard Morningstar, Special Envoy for Eurasia Energy at the Economist's Investment Energy Summit, Athens, Greece, March 28, 2012. <http://www.state.gov/s/eee/rmk/187662.htm>.

⁷ See, for example, “One Sure Winner Emerges in Southern Gas Corridor Race,” Euractiv.com, March 11, 2013.

⁸ U.S. House of Representatives, Committee on Foreign Affairs, Subcommittee on Europe and Eurasia, Hearing on European and Eurasian Energy: Developing Capabilities for Security and Prosperity, *Testimony of Ambassador Richard L. Morningstar, Special Envoy for Eurasian Energy*, June 2, 2011.

⁹ Office of the Press Secretary, “Remarks by the President on the Middle East and North Africa,” The White House, State Department, Washington, DC, May 19, 2011.

¹⁰ E.g., see Carnegie Endowment for International Peace, “Lieberman Delivers Remarks on Democratic Transition in Egypt,” July 22, 2011, http://carnegieendowment.org/files/Lieberman_Prepared_Remarks.pdf; John McCain, Lindsey Graham, Mark Kirk, and Marco Rubio, “The Promise of a Pro-American Libya,” *Wall Street Journal*, October 7, 2011. On November 18, 2011, Representative Dreier introduced a resolution, co-sponsored by Representative Meeks, that calls for the United States to initiate FTA negotiations with Egypt (H.Res. 472).

¹¹ For more information, see CRS Report R42153, *U.S. Trade and Investment in the Middle East and North Africa: Overview and Issues for Congress*, coordinated by Shayerah Ilias Akhtar.

The 113th Congress has already expressed concern about European energy security with the introduction of H.R. 580 and S. 192. The companion bills would, among other things, give member states of the North Atlantic Treaty Organization (NATO) the same status as free trade countries with regard to possible U.S. LNG exports. The 112th Congress has also expressed concern about European energy security. Section 1233 of the FY2012 National Defense Authorization Act requires the Secretary of Defense to submit to “the appropriate committees of Congress a detailed report on efforts by the Department of Defense, including within NATO, to address the energy security of the NATO alliance.”

European Natural Gas Consumption and the EU's Evolving Energy Policy

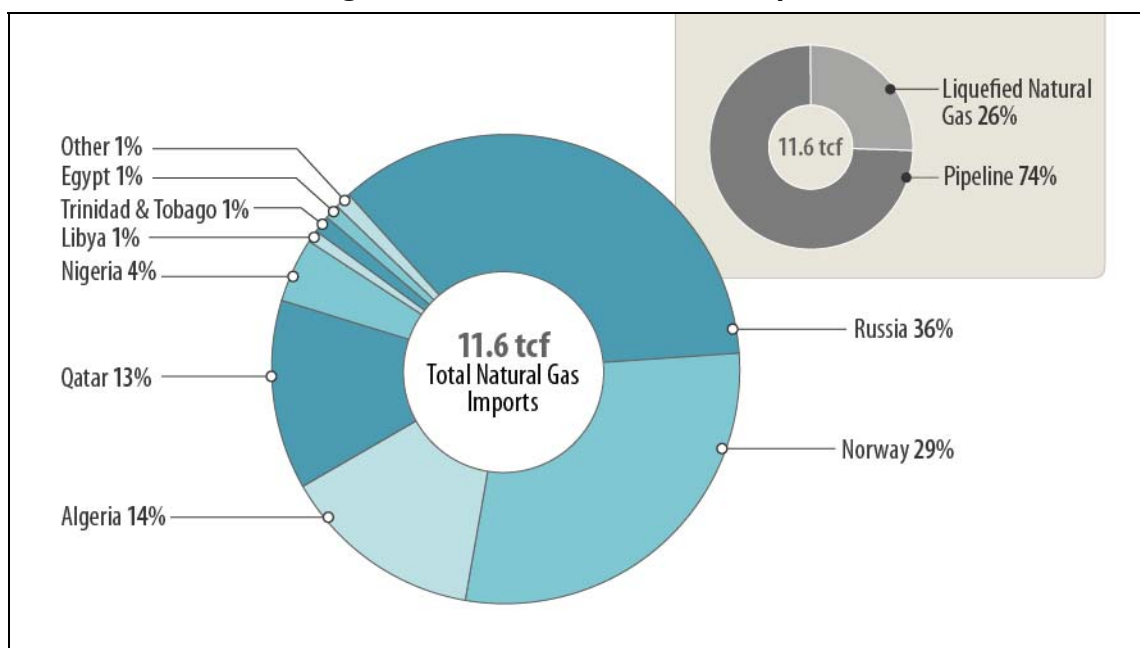
Collectively, EU member states are the world's largest energy importer, importing about 55% of their energy supply—approximately 84% of their oil and 64% of their natural gas.¹² EU member states increasingly rely on natural gas, particularly to reach ambitious targets to reduce carbon dioxide and greenhouse gas emissions. Natural gas comprised 24% of the EU's primary energy consumption in 2011, a number that is expected to grow to almost 30% by 2030.¹³ Oil made up about 38%, coal almost 23%, and nuclear 12% of the EU primary energy supply. Coal use rose significantly between 2010 and 2011, in part supplied by increased U.S. coal exports. The European Commission forecasts that the EU will import over 80% of its natural gas needs by 2030. Analysts note that recent policy decisions, such as a 2011 German announcement that it would phase out use of its nuclear power plants by 2020 and possible prohibitions on shale gas development by some EU members, could mean a more rapid rise in Europe's dependence on natural gas imports.

Russia has long been, and is expected to continue to be, the key supplier of natural gas to Europe. In 2011, Russia accounted for 36% of European natural gas imports, followed by Norway and Algeria (see **Figure 1**). Russian and European companies have developed an extensive network of infrastructure to transport Russian natural gas long distances to European markets. Observers expect natural gas to play a significant role in Europe-Russia relations for decades to come.

¹² European Commission, Market Observatory for Energy, *Key Figures*, June 2011. http://ec.europa.eu/energy/observatory/eu_27_info/doc/key_figures.pdf.

¹³ Eurogas, *Long Term Outlook for Gas Demand and Supply 2007-2030*, June 5, 2010, p. 5, http://www.eurogas.org/uploaded/Eurogas%20LT%20Outlook%202007-2030_Final_251110.pdf.

Figure 1. 2011 EU Natural Gas Imports



Source: BP Statistical Review of World Energy 2012.

Notes: The United States re-exported a minimal amount of LNG to Europe in 2011 and is included in Other. The percentages do not include imports from one EU country to another. Units are trillion cubic feet (tcf).

Different EU member states use natural gas to different degrees and import levels and sources vary by country (see **Table 1**). Some large natural gas consumers, such as Spain, do not import any natural gas from Russia. Germany, the second biggest natural gas consumer and Russia's largest market, relied on Russia for almost 40% of its imports in 2011. The opening of the Nord Stream pipeline in late 2011 and Germany's planned closure of its nuclear power plants highlights Germany's potentially greater reliance on Russia. Nord Stream is operating at approximately 80% of its 2 tcf capacity.

In a reflection of these national differences, the EU has traditionally exerted little if any influence over the energy policies of individual member states. However, in the face of rising concern about Europe's reliance on Russian energy and growing public pressure to address global climate change, EU member states have begun to increase cooperation toward an "Energy Policy for Europe." As stated earlier, European heads of state have committed to completing the integration and liberalization of the internal European energy market by 2014; promoting the interconnection of electric grids and natural gas pipelines; boosting energy efficiency; and better coordinating external energy policies. European leaders anticipate that these initiatives will allow member states to share and trade energy more flexibly than at present, mitigating the impact of potential supply interruptions and overdependence on a single supplier.

Even as EU leaders promote ideas on a common energy strategy, many question how far member states will agree to push Russia (and Gazprom) to adopt the EU's principles of competition and open its energy sector to outside investment. Some analysts believe that an EU commitment to further liberalize Europe's energy market and a September 2012 announcement that it would investigate suspected anti-market practices by Gazprom could signal the beginning of a firmer and more unified approach toward Russia. Moscow has strongly criticized the decision, which, among other things, would require energy companies that own pipelines to sell them, or manage

them separately. Under the EU's policy, Gazprom, which plays a key role in exporting natural gas to Europe, could be forced to sell its significant stakes in European distribution networks. In December 2011, Gazprom announced that its South Stream natural gas pipeline would end (discussed in more detail in "Russia's Role") in Italy rather than in Austria, as was previously planned. Company sources reportedly stated that the change was in reaction to an EU decision to block a Gazprom bid to purchase a 50% stake in the Central European Gas Hub (CEGH) in Austria.¹⁴ EU member states have committed to fully implementing the liberalization directive by the end of 2014. However, European officials reportedly consider the target date unlikely to be met.¹⁵

Some observers believe that regardless of the aforementioned efforts, Europe's energy security will continue to be largely under Russian control. Indeed, several member states have pursued bilateral energy deals with Russia that will increase their dependence on Russia for years to come. Both Germany and Italy, the largest importers of Russian natural gas, have negotiated long-term deals with Russia to lock in future natural gas supplies. For Germany and several others, Russia's role as a dominant energy supplier increases the importance of fostering good relations with Moscow. Further, bilateral deals with Russia are not limited to the major energy consumers. Bulgaria, Romania, Hungary, Greece, and others have entered into long-term energy agreements with Gazprom over the past several years.

Such instances of individual member states dealing with Russia bilaterally have in the past drawn harsh criticism from other EU member states, such as the Baltic states and Poland, that have had strained relations with Russia for some time over other issues as well. Governments in these countries have warned their European colleagues not to make energy deals that could give Russia increased political influence over European decision-making. Many of these nations believe that Europe's dependence on Russian energy is likely to last no matter how successful Europe may be in identifying energy supply alternatives. But they also feel Europe does not gain real security by becoming more dependent on Russia. In fact, the growing presence of Gazprom throughout the European energy market (for instance through its ownership of distribution and storage infrastructure) has led many to worry about the EU's ability to develop an energy policy insulated from Gazprom's influence.¹⁶

Although once heralded as the centerpiece for European energy diversification, the original Nabucco project and the Southern Corridor have lost their luster. As currently planned, beginning in 2018, the TANAP pipeline will initially transport 565 bcf of Azerbaijan gas from the Shah Deniz field. This would be about half the capacity of the originally proposed Nabucco project. Additionally, of the 565 bcf, 215 bcf would stay in Turkey, with the remaining 350 bcf destined to Europe via either TAP or Nabucco West. Although Russia has long been viewed as an opponent of Nabucco and the Southern Corridor strategy, it has not vocally expressed opposition to the new, smaller-scale projects. Nonetheless, Moscow continues to push forward with its South Stream pipeline, whose primary purpose some observers believe is to hinder European-backed diversification efforts.

¹⁴ Denis Pinchuk, "Gazprom Drops Austria from S. Stream Gas Route—Source," *Reuters*, December 14, 2011.

¹⁵ "Commission Prepares EU Energy Market 'Action Plan,'" Euractiv.com, September 17, 2012.

¹⁶ Comments provided through discussions with representatives of several European member states.

Table I. EU Natural Gas Data, 2011

Units equal billion cubic feet per year (bcf)

	Natural Gas Consumption	Natural Gas Production	Natural Gas Imports
Austria	335	58	339 ^a
Belgium	569	0	802 ^a
Bulgaria	102	0	101
Cyprus	0	0	0
Czech Republic	297	7	424
Denmark	148	251	0
Estonia	13	0	13
Finland	127	0	134
France	1,423	26	1,141
Germany	2,560	353	2,966 ^a
Greece	159	0	117
Hungary	360	88	237
Ireland	166	11	191
Italy	2,518	271	2,147
Latvia	23	0	23
Lithuania	120	0	120
Luxembourg	48	0	48
Malta	0	0	0
Netherlands	1,345	2,267	480 ^a
Poland	544	152	381
Portugal	180	0	180
Romania	487	388	99
Slovakia	219	4	187
Slovenia	31	0	31
Spain	1,134	4	1,296 ^a
Sweden	46	0	46
United Kingdom	2,832	1,596	1,886
TOTAL	15,786	5,476	13,289

Sources: BP Statistical Review of World Energy 2012, Eurogas, and the European Commission.

Notes: Imports plus internal production does not equal consumption because some countries export imported natural gas or their own production within the region. Imports include natural gas received from other EU countries.

- a. Some EU countries import more natural gas than they require in order to re-export the natural gas to other countries.

Russia's Role¹⁷

The Russian natural gas industry is one of the most important players in the global energy market. In 2011, Russia had the largest natural gas reserves in the world, about 21% of the world's total, was the leading exporter of natural gas, and placed second in production and consumption behind the United States. Russia was also a founding member, and currently holds the top position, in the Gas Exporting Countries Forum (GECF).

The Gas Exporting Countries Forum

The Gas Exporting Countries Forum (GECF), also known as Gas-OPEC, is composed of some of the world's leading natural gas producers and exporters. It is not a cartel in the same sense as OPEC, in that it does not control marginal production in an effort to influence prices. There are structural differences in global natural gas and global oil that make this type of control difficult. Nevertheless, the GECF provides a venue for its members to discuss topics of interest such as production projects, exports, etc. Its members—which include Algeria, Bolivia, Egypt, Equatorial Guinea, Iran, Libya, Nigeria, Qatar, Russia, Trinidad and Tobago, and Venezuela—control 36% of world production and 47% of global trade. Kazakhstan, the Netherlands, and Norway have observer status at the GECF. Major natural gas producers that are not affiliated with the GECF include Australia, Azerbaijan, Canada, Indonesia, Malaysia, Oman, Turkmenistan, the United States (the world's leading natural gas producer), and the United Arab Emirates.

As noted, Russia is currently the dominant supplier of natural gas to Europe, accounting for about one-quarter of the EU's natural gas supplies.¹⁸ (See **Figure 2**.) This dependency does not go only in one direction, however. Europe is also the most important market for Russian natural gas exports, a calculation Moscow may take into account when developing political relations with Europe. The bulk of Gazprom's natural gas exports go to Europe and Eurasia. Of the 7.8 tcf of natural gas exported by Gazprom in 2011, almost 53% went to the EU. Of the rest, 30% went to the Commonwealth of Independent States (CIS), many of which have been unreliable in paying what they owe and/or receive natural gas at subsidized prices.¹⁹ The rest went to Turkey, which is seeking EU membership, and other non-EU countries in Europe, and to Asia.²⁰

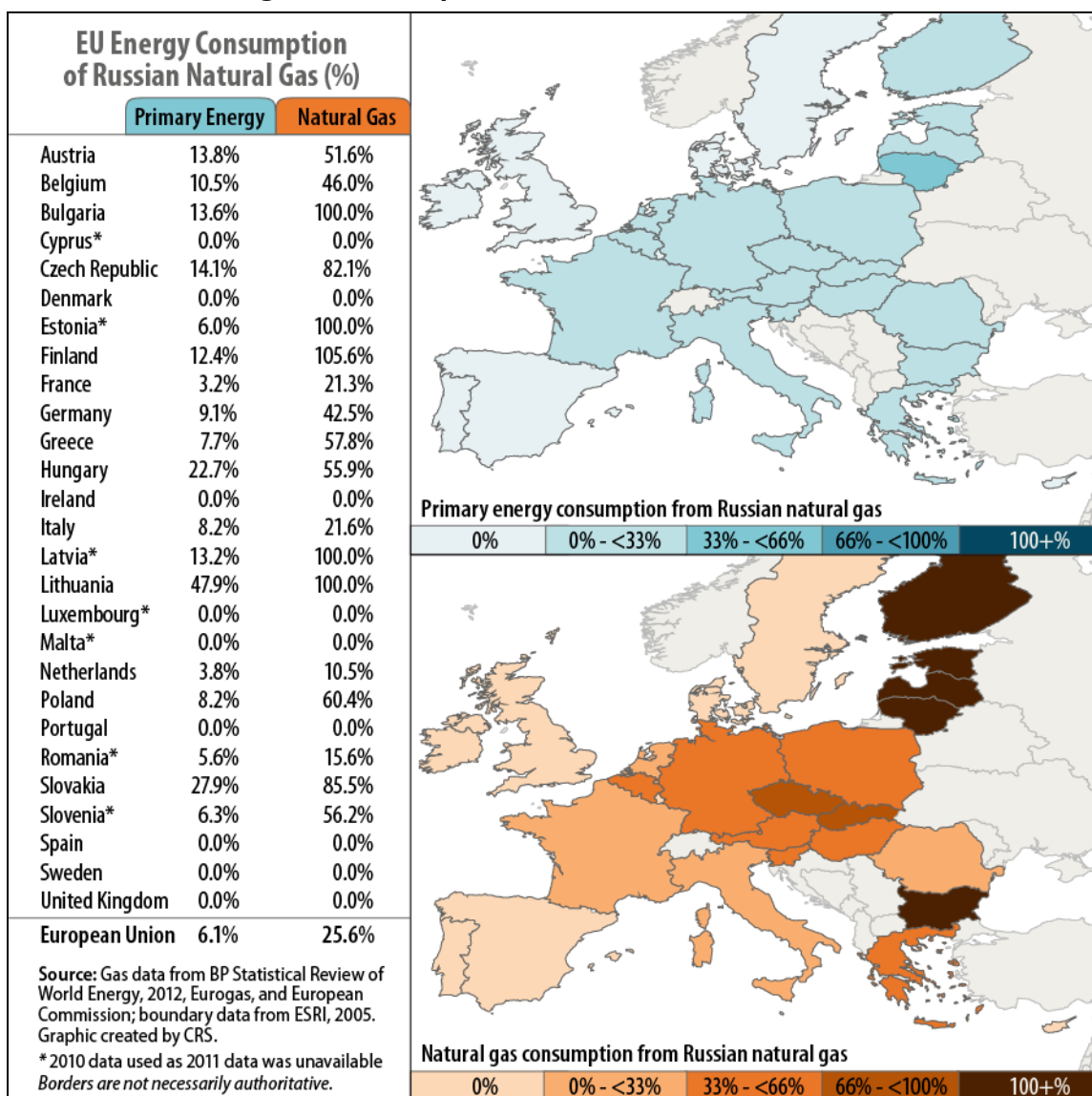
¹⁷ For additional information on Russia see CRS Report RL33407, *Russian Political, Economic, and Security Issues and U.S. Interests*, coordinated by Jim Nichol.

¹⁸ Russia also supplies the EU with about 27% of its oil imports, 24% of its coal imports, 30% of its uranium imports, and is the third largest supplier of electricity imports, but these fuel sources are beyond the scope of this report.

¹⁹ The Commonwealth of Independent States (CIS) includes Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, and Uzbekistan with Turkmenistan and Ukraine having unofficial status. Georgia withdrew from the CIS in 2009.

²⁰ Sergey Paltsev, "Russian Natural Gas Export Potential Up to 2050," MIT Center for Energy and Environmental Policy Research, July 2011.

Figure 2. EU Dependence on Russian Natural Gas



Source: CRS Graphics compiled this graphic.

Notes: For primary energy, which is the base source of energy used to produce electricity and perform other work, Russian natural gas does not comprise greater than 39% for any EU country.

The revenues generated by this trade are vital to the ruling Russian elite. At present, all Russian natural gas exports are controlled by Gazprom. As a state-controlled firm, Gazprom has the closest possible links with top Russian leaders (Russia's Prime Minister Dimitri Medvedev served as president of Gazprom). The personal and political fortunes of Russia's leaders are closely tied to Gazprom. In 2012, President Putin estimated that half of total Russian government revenue came from oil and natural gas taxes. Other estimates put the figure higher. Russia's economic revival in the Putin/Medvedev era has been heavily dependent on the massive wealth generated by energy exports to Europe. Gazprom offers natural gas to the Russian domestic market at subsidized prices, which also bolsters the ruling elite politically. Government proposals to decrease subsidies have not come to fruition.

In addition to their financial benefits, Russian natural gas exports to Europe and Eurasia may have important psychological benefits for the Russian elite. They may be viewed as demonstrating the resurgence of Russian power after the collapse of the Soviet Union over 20 years ago. Russia's "National Security Strategy to 2020," released in May 2009, stated that "the resource potential of Russia" is one of the factors that has "expanded the possibilities of the Russian Federation to strengthen its influence in the world arena."²¹

In the long term, Russia hopes to reduce dependency on Europe by diversifying its customer base as well. By 2030, the Russian government plans to increase gas exports to Asian countries such as China, South Korea, and Japan until they make up 19%-20% of the total. However, Russia has a considerable way to go to meet this objective. In 2011, gas exports to Asia made up about 7% of total Russian gas exports, all in the form of LNG. Russia opened its first LNG export facility in 2009 on its east coast. Long-standing Russian hopes of providing large amounts of natural gas to China by pipeline have been stymied by the fact that China has been unwilling to pay the price Europe pays for Russian natural gas.²²

Given this situation, most experts believe that, barring the failure of Russia to increase its own energy exploration and development, Russia will continue to remain Europe's primary energy supplier, including natural gas supplies, for many years and possibly decades. And, Europe will remain the primary market for Russian energy exports. Therefore, the main goal of state-run Russian energy companies, such as Gazprom, has been to try to solidify their dominance of Europe's energy sector by pursuing long-term bilateral supply contracts with some European countries such as Germany, Italy, and Bulgaria, and by seeking to buy stakes in European energy distribution networks and storage facilities. Russia has also used the allure of its vast resources to co-opt European companies that dominate Europe's energy sector.

Gas Crises of the 2000s and Russia and Europe's Search for Alternatives

Although widely believed by industry and in some political circles, evidence that Russia has been able to exploit its energy strength to manipulate the policy of EU and other European countries is ambiguous. Some experts, particularly those in central Europe, claim that Russia is able to use its dominant role in the energy sectors of their countries to exert influence over certain businessmen and politicians. Others, mainly in western Europe, claim that the fact that Europe remains Russia's largest energy market, and thus its biggest source of foreign income, has led Russia to exercise more caution in dealing with EU countries. Key customers of Gazprom have been able to extract better contract terms in recent years that link part of the price of natural gas to spot natural gas prices instead of solely oil.

Russian leaders have repeatedly said that they view the former Soviet countries as lying within Russia's "sphere of privileged interests." Some have pointed out that Russia has openly used energy to affect domestic and international policies in Belarus and Ukraine. In perhaps the most striking example, Russia and Ukraine agreed to extend the stay of the Russian Black Sea Fleet in Crimea until 2042, from the original withdrawal date of 2017. In exchange, Russia pledged to provide Ukraine with a discount of two-thirds on the standard oil-linked contract price for natural

²¹ The text of the National Security Strategy can be found at the website of the Russian National Security Council at <http://www.scrf.gov.ru/documents/99.html>.

²² For more information on Russia's official energy strategy, see Energy Strategy of Russia for the Period up to 2030, at [http://www.energystrategy.ru/projects/docs/ES-2030_\(Eng\).pdf](http://www.energystrategy.ru/projects/docs/ES-2030_(Eng).pdf).

gas supplies for 10 years. However, rising global oil prices (which have risen faster than spot natural gas prices), to which Russian contract prices are linked, have negated much of the savings Kyiv counted on, perhaps providing Moscow with additional leverage over Ukraine.²³

In contrast, Russia may view countries such as Germany and France as key players on the world stage like itself, and therefore entitled to more respect. Smaller, former Soviet-controlled countries such as the Baltic and central European states may fall between these categories, in the view of Russian leaders.

In the mid- and late 2000s, many European countries suffered several unexpected energy cutoffs due to confrontations between Russia and the key pipeline transit states of Ukraine and Belarus over natural gas supply and transit issues. In 2009, Gazprom halted all natural gas supplies transiting Ukraine for nearly three weeks after the two sides failed to reach agreement on several issues, including a debt allegedly owed by Ukraine to Gazprom and the price that Ukraine would pay for natural gas supplies. Prior to the opening of Nord Stream, about 80% of Europe's natural gas imports from Russia transited Ukrainian pipelines. A similar Russian-Ukrainian dispute had led to a natural gas cutoff to Europe at the beginning of 2006. In 2010 and 2011, disputes between Russia and Belarus over a variety of issues, including energy prices, debts owed by Belarus, and transit fees paid by Russia for the use of Belarusian pipelines, led to temporary reductions of oil and natural gas supplies to Belarus and neighboring countries.

Russia and some western European countries responded to these incidents by planning new pipeline projects to bypass what they viewed as problematic transit states. One new natural gas pipeline is the aforementioned Nord Stream, which transports natural gas from Russia to Germany via a pipeline under the Baltic Sea. It has a planned capacity of almost 2 tcf per year, as compared to the Ukrainian pipeline system's 4.0-4.5 tcf per year. The first supplies from the pipeline were delivered in late November 2011 and the pipeline is operating at about 80% of its capacity. Gazprom has proposed expanding Nord Stream's capacity still further, but Germany has rejected the idea so far.

Another pipeline project favored by Moscow is South Stream. It would run under the Black Sea to Bulgaria and then onto other European countries. Russia broke ground on South Stream in December of 2012, and plans to begin deliveries in late 2015. South Stream has a planned capacity of 2.2 tcf per year and is considered a main competitor to the southern corridor projects (see "Southern Corridor: Issues and Background" below for more on the Southern Corridor projects).

While building pipelines that circumvent Ukraine, Russia continues its long-standing efforts to gain control of Ukraine's pipeline system. In fact, Russia is using Ukraine's fear of the potential impact of Nord Stream and South Stream on transit volumes and thus associated revenues through Ukraine's pipeline system to try to secure control of those pipelines cheaply. Gazprom officials have strongly encouraged Ukrainian leaders that they should sell control of Ukraine's pipelines to it while they can get a good price.²⁴ Otherwise, they say, Gazprom may find it more profitable to build and use South Stream rather than modernize Ukraine's aging system. Ukraine has offered Russia joint operating rights over the Ukrainian pipeline system in exchange for a

²³ Luke Harding, "Ukraine extends lease for Russia's Black Sea Fleet," *The Guardian*, April 21, 2010, <http://www.guardian.co.uk/world/2010/apr/21/ukraine-black-sea-fleet-russia>.

²⁴ "Value of Ukraine Gas Transportation System Could Fall Seriously—Miller," *Interfax*, December 31, 2011.

reduction in the price of gas for Ukraine's domestic consumption and guaranteed transit volumes through Ukraine's pipelines. The two sides are currently negotiating over the proposal. In the meantime, Ukraine has sharply reduced the amount of gas it imports from Russia, provoking Russia to demand that Ukraine pay a \$7 billion fine for allegedly violating the terms of the current "take-or-pay" agreement between the two countries.

Russia has had more success in gaining control of Belarus's gas infrastructure. In December 2011, Gazprom completed a deal to buy the 50% of Beltransgaz (Belarus's natural gas pipeline transport company) that it did not own, in exchange for reduced gas prices. The Yamal-Europe gas pipeline, which runs through Belarus and Poland, currently carries about 20% of Russian gas exports to Europe. Gazprom is currently studying how to expand the gas transit capacity of its new possession, which could put further pressure on Ukraine.

Some Russian actions may be aimed at frustrating European efforts at diversification. These include trying to sign long-term contracts with Azerbaijan and Central Asian states to lock up supplies sought by the Europeans; lodging legal objections to the proposed Trans-Caspian Pipeline between Azerbaijan and Turkmenistan, which would be a key link in providing Caspian gas to Europe; attempting to coordinate natural gas export policies with other leading producers such as Qatar and Iran, perhaps with hopes of eventually creating a "gas OPEC" of the GECF; and the South Stream project itself.

Southern Corridor: Issues and Background²⁵

Establishing a non-Russian and non-Iranian natural gas pipeline system to transport natural gas from the Caspian region and Central Asia to Europe is a stated priority for the EU supported by the United States. However, achieving this goal has proved elusive. As noted above, current plans envision an initial pipeline network that would transport to Europe well under half the capacity of the originally proposed Nabucco pipeline.

²⁵ Since the mid-1990s, the United States had advocated building pipelines from the Caspian region to the west along diverse routes in addition to existing routes through Russia, and which avoided Iran. See below, and CRS Report 97-569, *Azerbaijan's Oil and Gas*, May 27, 1997, by Jim Nichol (out of print; available from the author of this report). The term "Southern Gas Corridor" was mentioned in Commission of the European Communities, Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee, and the Committee of the Regions, *Second Strategic Energy Review: An EU Energy Security and Solidarity Action Plan*, Com(2008) 781 Final, November 13, 2008.

Table 2. Prospective Non-Russian Southern Corridor Pipelines

Units = billion cubic feet per year (bcf)

Name	Anticipated Capacity	Anticipated In-Service Date	Partners
Trans Adriatic Pipeline (TAP)	350	2017	AXPO (Switzerland), E.ON Ruhrgas (Germany), Statoil (Norway)
Trans-Anatolian Gas Pipeline (TANAP)	565	2018	BOTAS (Turkey), SOCAR (Azerbaijan), TPAO (Turkey)
Nabucco West Pipeline	350	2017	BEH Bulgarian (Bulgaria), Botas (Turkey), FGSZ (Hungary), OMV (Austria), Transgaz (Romania)

Source: Company websites and various articles.

Notes: The Shah Deniz consortium will decide by the end of June on whether Phase 2 production from the field will go to Europe via TAP or Nabucco West. The South Stream pipeline project, Russia's response to developing the Southern Corridor for Caspian natural gas, is a 2,200 bcf per year pipeline sponsored by EDF (France), ENI (Italy), Gazprom (Russia), and Wintershall (Germany) to bring Russian natural gas to Europe. South Stream is also designed to bypass troubled transit states like Ukraine and Belarus.

- a. The South Caucasus Pipeline (SCP) began operations in 2006 and currently has a capacity of 250 bcf of natural gas.

In mid-November 2007, Greek Prime Minister Kostas Karamanlis and Turkish Prime Minister Recep Tayyip Erdogan inaugurated a natural gas pipeline connecting the two countries. Since some Azerbaijani natural gas reaches Greece, the pipeline represents the first natural gas supplies from the Caspian region to the EU.

As another alternative to natural gas shipments through Turkey, Azerbaijan, Romania, and Georgia signed a memorandum of understanding in April 2010 to transport liquefied natural gas (LNG) from Azerbaijan to the EU through Georgia and Romania. This Azerbaijan-Georgia-Romania-Interconnection (AGRI) project envisions the construction of a natural gas pipeline from Azerbaijan to the Georgian port of Kalevi, where the natural gas would be liquefied, shipped across the Black Sea, and regasified at the Romanian port of Constanta. This is an unusual proposal to use LNG as the distance across the Black Sea is relatively short—the industry norm for LNG utilization is 1,500 miles. The project output is expected to be 247 bcf per year, with 71 bcf of the natural gas used by Romania and the rest by other EU countries. The presidents of the three countries (and the prime minister of Hungary, which joined the project) met in Baku on September 15, 2010, to sign the Baku Declaration of political support for the project.

Some of the tensions between Turkey and Azerbaijan involving energy issues appeared resolved in June 2010, during President Aliyev's visit to Turkey, when the two countries signed accords on the sale and transportation of Azerbaijani natural gas to Turkey and to other countries via Turkey. A memorandum of understanding permitting Azerbaijan to conclude direct sales with Greece, Bulgaria, and Syria involving natural gas transiting Turkey was signed. In January 2011, President Aliyev and the President of the European Commission, Jose Manuel Barroso, signed a joint declaration committing Azerbaijan to supplying substantial volumes of natural gas over the long term to the European Union.

By the beginning of October 2011, the State Oil Company of Azerbaijan (SOCAR) had received final proposals for pipelines to export natural gas from the second phase development of the Shah Deniz offshore oil and natural gas fields. Proposals were received from consortia backing the ITGI, Nabucco, and Trans Adriatic Pipeline (TAP; from Turkey through Greece, Albania, and the Adriatic Sea to Italy) projects, as well as from BP, which reportedly proposed an 808-mile "South East Europe Pipeline" (SEEP) from western Turkey through Bulgaria, Romania, and Hungary to Austria. A substantial part of the project reportedly would involve building inter-connectors between existing pipelines. A proposal for AGRI was not reported. SOCAR and other members of the Shah Deniz consortium stated that they would decide on a pipeline within several weeks.

On October 25, 2011, Azerbaijan and Turkey announced that they had signed accords on the final terms for the transit of Shah Deniz phase 2 natural gas through the southern corridor. The agreements were signed during President Aliyev's visit to Turkey. They specified that 565-700 bcf of natural gas would transit Turkey, of which 210 bcf would be available for Turkey's domestic use. Another significant accord provided for the possible construction of a new "Trans-Anatolia" natural gas pipeline, so that the natural gas from Shah Deniz Phase 2 would not have to go through the Turkish pipeline system. In late December 2011, the Azerbaijani and Turkish governments signed a memorandum of understanding on setting up a consortium involving SOCAR, the Turkish state-owned TPAO energy firm, and TPAO's pipeline subsidiary, BOTAS, to construct the Trans-Anatolian Pipeline. SOCAR is designated initially to hold an 80% share in the consortium, although other companies may be invited to join later, primarily the members of the Shah Deniz consortium.

In late December 2011, the Azerbaijani and Turkish governments signed a memorandum of understanding on setting up a consortium involving SOCAR, the Turkish state-owned TPAO energy firm, and TPAO's pipeline subsidiary, BOTAS, to construct TANAP. SOCAR is designated initially to hold an 80% share in the consortium, although other members may be invited to join the consortium. Contract negotiations on setting up the consortium reportedly have been contentious, however.

In May 2012, the Nabucco consortium submitted new pipeline proposals to the Shah Deniz consortium, reportedly including the original route as well as the shorter Nabucco West route. The Shah Deniz Export Negotiating Team reportedly indicated in February 2012 that it preferred the TAP proposal over the ITGI pipeline proposal. In mid-2012, it rejected SEEP, leaving TAP and Nabucco West as the choices. The Shah Deniz Team has indicated that it will make a final decision about the pipeline by June 2013.

In late June 2012, the Azerbaijani and Turkish presidents and oil firm heads signed accords to build TANAP. The first stage, with a capacity of 565 bcf per year, is planned to be completed in 2018. Other investors are being invited to participate.

In late 2012, Russia finalized arrangements with transit states for the construction of the South Stream gas pipeline, with a capacity of 2.2 bcf per year, under the Black Sea to European markets, and began construction of the onshore portion in Russia in December 2012. The undersea portion will extend nearly 600 miles. From Bulgaria, the pipeline is planned to transit Serbia, Hungary, and Slovenia to Austria. The first phase of construction is planned to be completed in 2015. According to some analysts, the pipeline is not economically viable, but is being built by Russia to counter proposals to build the Nabucco West pipeline and perhaps a trans-Caspian pipeline, so that Russia may maintain a dominant gas presence in Europe. To bolster prospects for building the Nabucco West pipeline, the Shah Deniz consortium agreed with

the Nabucco consortium in January 2013 to finance up to one-half of the pipeline. Azerbaijan also has pledged to provide some financing for TAP if it chooses this pipeline.

Discussions on a Trans-Caspian Pipeline

In 1999, Turkmenistan signed an accord with two U.S. construction firms to conduct a feasibility study on building a trans-Caspian gas pipeline to Azerbaijan, but Turkmenistan failed to commit to the pipeline following objections from Iran and Russia. In September 2011, the Council of the European Union approved opening talks with Azerbaijan and Turkmenistan to facilitate an accord on building a trans-Caspian gas pipeline. Such a link would provide added gas to ensure adequate supplies for the planned Southern Corridor pipelines. Hailing the decision, EU Energy Commissioner Günther Oettinger stated that “Europe is now speaking with one voice.”

The United States has supported building a trans-Caspian pipeline and stated that no other country should be able to veto a decision by Azerbaijan and Turkmenistan to build such a pipeline.

Figure 3. Select European Natural Gas Infrastructure



Source: Compiled by the Library of Congress Cartography section.

Potential Sources of Alternative Supplies

Global natural gas reserves have increased every year for at least the last three decades, and the advent of shale gas makes the future of natural gas possibly even larger. The U.S. Energy Information Administration (EIA) estimates global natural gas reserves, both conventional and unconventional, at over 6,600 tcf and technically recoverable shale gas resources at about the same, while consumption was about 114 tcf in 2011—or almost 125-years' worth of natural gas.²⁶

Two regions—Central Asia and North Africa—hold great potential to produce more natural gas than they currently do, and given the proximity of both to Europe (see **Figure 3**) offer possible alternatives to Russian supplies. Central Asia has been a focus of U.S. and European efforts to provide Europe an alternative to Russia for natural gas through the southern corridor. North Africa already has multiple pipelines to Europe and LNG export terminals. The main issue for this region is whether the MENA nations, with existing reserves and infrastructure, can increase production and delivery of additional supplies to Europe.

There has been tremendous growth in LNG liquefaction over the last few years, mainly in Qatar, and more capacity is projected to be added by industry. Even the United States has multiple proposed LNG liquefaction projects at various stages of regulatory approval. The addition of more liquefaction capacity will provide the EU with other alternative suppliers even though their ability to use LNG is constrained by a lack of infrastructure.

The Caspian Region and Central Asia: The Focus of U.S. Policy²⁷

The Caspian region (see **Figure 4**) has emerged as a significant source of natural gas for world markets. The proven natural gas reserves of Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan are estimated at over 1,000 tcf, among the largest in the world (see **Table 3**). The International Energy Agency (IEA) estimates that the Caspian region's proven and recoverable natural gas reserves are about 7% of the world's reserves, but also stresses that further exploration could result in an upward revision of estimated reserves. Nonetheless, the Central Asian states remain geographically isolated from world markets. Natural gas pipelines must be built long distances and must traverse several countries, increasing political and economic risks. Those pipelines which head westward must traverse either the Caspian Sea, where the littoral states continue to argue over its legal status, pass through energy competitors Russia or Iran, or for Azerbaijan, across Turkey.

²⁶ U.S. Energy Information Administration, *World Shale Gas Resources: An Initial Assessment of 14 Regions Outside the United States*, Washington, DC, April 5, 2011, p. 4, <http://www.eia.gov/analysis/studies/worldshalegas/>.

Reserves and resources are not the same in the energy industry. Reserves are considered a subset of resources as they indicate that a resource is producible using today's technology at today's prices.

²⁷ For additional information on Central Asia see CRS Report RL33458, *Central Asia: Regional Developments and Implications for U.S. Interests*, by Jim Nichol.

Figure 4. The Caspian Region



Source: Compiled by the Library of Congress Cartography section.

Asia is a growing prospect for Central Asian natural gas. A natural gas pipeline from Turkmenistan to China exists, but China needs to upgrade its internal supply network to provide natural gas to the coastal industrial areas. Kazakhstan is in discussions with China to export natural gas as well. Turkmen natural gas fields could help meet both Pakistan's and India's growing energy needs and provide significant transit revenues for both Afghanistan and Pakistan.²⁸ If enough capacity is constructed to China and other parts of Asia, future supplies to Europe may be moot, which would benefit Russia.

Table 3. Key Central Asian Natural Gas Data, 2011

Units = trillion cubic feet (tcf)

	Reserves	Production	Exports to EU
Azerbaijan	44.9	0.5	0.0 ^a
Kazakhstan	66.4	0.7	0.0
Turkmenistan	858.8	2.1	0.0
Uzbekistan	56.6	2.0	0.0
TOTAL	1,026.7	5.3	0.0

Source: BP Statistical Review of World Energy 2012.

a. Azerbaijan does export natural gas to Turkey, which then sends some of it to Greece.

Azerbaijan: The EU's Best Hope For New Natural Gas Supplies?²⁹

U.S. administrations have contested that exports from Azerbaijan could boost energy security for European customers currently relying more on Russia. According to former U.S. Special Envoy for Eurasian Energy and current U.S. Ambassador to Azerbaijan Richard Morningstar, Azerbaijani natural gas “is absolutely essential to the development of the Southern Corridor.” As noted previously, Azerbaijan will supply all the natural gas for the TANAP pipeline and the forward project to Europe. It is also important to note that Azerbaijan will supply Turkey with an additional 215 bcf of natural gas to help Turkey meet its growing natural gas demand.

The natural gas will come from phase 2 development of Azerbaijan's Shah Deniz field, which is in the Caspian Sea. The consortium that owns the Shah Deniz field is led by BP as the operator, but also includes Statoil (Norway), SOCAR (Azerbaijan), LUKOIL (Russia), Total (France), NICO (Iran), and TPAO (Turkey). Recent U.S. legislation regarding sanctions against Iran has been constructed to avoid sanctioning the Shah Deniz project, even though one of the partners is an Iranian company.³⁰

²⁸ U.S. Department of State, *Secretary Clinton Co-Chairs the New Silk Road Ministerial Meeting*, DipNote, September 23, 2011; *Fact Sheet on New Silk Road Ministerial*, September 22, 2011. See also U.S. Department of State, *Remarks, Robert D. Hormats, Under Secretary for Economic, Energy and Agricultural Affairs, Address to the SAIS Central Asia-Caucasus Institute and CSIS Forum*, September 29, 2011; William J. Burns, Deputy Secretary of State, *Remarks at Istanbul Conference for Afghanistan*, November 2, 2011.

²⁹ For additional information on Azerbaijan see CRS Report 97-522, *Azerbaijan: Recent Developments and U.S. Interests*, by Jim Nichol.

³⁰ For additional information on U.S. sanctions towards Iran, see CRS Report RS20871, *Iran Sanctions*, by Kenneth (continued...)

Azerbaijan's relationship with Iran is important to U.S. foreign policy. At the end of 2005, Azerbaijan began sending about 7 billion cubic feet (bcf) of natural gas per year through a section of Soviet-era pipeline to the Iranian border at Astara, partly in exchange for Iranian natural gas shipments to Azerbaijan's Nakhichevan exclave.³¹ In January 2011, Azerbaijan signed a five-year accord with Iran to supply 35.3 bcf of natural gas through the pipeline in 2011, and possibly increasing amounts thereafter. This gas is used in northern Iran, and in exchange, Iran provides some gas to the Azerbaijani exclave of Nakhichevan.

Kazakhstan: Natural Gas Is Second to Oil³²

Most natural gas production in Kazakhstan has been associated with the development of oil fields, and most of the natural gas has been re-injected into the fields. Natural gas is mostly produced in the northwestern part of the country, while population centers in the eastern and southern parts are dependent on natural gas imported from Uzbekistan. In 2009, Kazakhstan became a net natural gas exporter. According to the BP Statistical Review, Kazakhstan exported about 406 bcf of natural gas from its western fields mostly to Russia in 2011. In December 2007, Kazakhstan, Turkmenistan, and Russia signed an agreement to renovate a branch of the Central Asia-Center Pipeline supplying natural gas to Russia and to build a new Caspian Coastal Pipeline, but these plans have been delayed by Turkmenistan's intentions to diversify its export routes away from Russia and by reduced natural gas demand by Russia. Kazakhstan nonetheless plans to boost its natural gas exports in coming years to Russia and China.

Until recently U.S. foreign direct investment (FDI) played a dominant role in the development of Kazakhstani oil and gas resources, amounting to about \$16.5 billion in Kazakhstan from 1993-2012.³³ According to some reports, China provided about \$13 billion in investments and loans to Kazakhstan's energy sector in 2009, highlighting its rising energy influence. Some U.S. energy firms and other private foreign investors have become discouraged in recent years by harsher Kazakh government terms, taxes, and fines that some allege reflect corruption within the ruling elite.

At the end of October 2008, China and Kazakhstan signed a framework agreement on constructing a natural gas pipeline from Beyneu, north of the Aral Sea, southeastward to Shymkent, where it will connect with the Central Asia-China Gas Pipeline. The 932-mile Beyneu-Shymkent Pipeline link is planned initially to supply 176.6 bcf to southeastern Kazakhstan and 176.6 bcf to China. Pipeline construction began in September 2011 and is expected to be completed by 2015.

(...continued)

Katzman.

³¹ The Nakhichevan exclave is Azerbaijani territory that is situated between the Armenian controlled area of Nagorno-Karabagh and Armenia proper.

³² For additional information on Kazakhstan see CRS Report 97-1058, *Kazakhstan: Recent Developments and U.S. Interests*, by Jim Nichol.

³³ U.S. House of Representatives, Committee on Foreign Affairs, Subcommittee on Europe and Eurasia, Hearing: U.S. Engagement in Central Asia, *Testimony by Robert Blake, Assistant Secretary, Bureau of Central and South Asian Affairs*, July 24, 2012.

Turkmenistan: European Orientation?³⁴

As shown in **Table 3**, Turkmenistan holds the largest natural gas reserves in Central Asia. A significant quantity of Turkmen natural gas production already flows to Europe via Russia. However, Turkmenistan's drive for alternative export routes for its natural gas has pitted it against some of the other Caspian countries. In September 2011, the Council of the EU approved opening talks with Azerbaijan and Turkmenistan to facilitate an accord on building a trans-Caspian natural gas pipeline. Russia and Iran oppose the building of trans-Caspian pipelines, claiming that the delineation of Caspian Sea borders and the use and protection of maritime resources must first be worked out by the littoral states. Many observers view such objections as partly driven by the status of Russia and Iran as natural gas producers in competition with Turkmenistan. Russia, in particular, appears to want to maintain its role as a major importer of Turkmen natural gas and to prevent it from competing directly with Russian natural gas exports to the EU. Turkmenistan's claims against Azerbaijan regarding some offshore oil and natural gas fields also have stymied a formal agreement on a trans-Caspian pipeline between the two countries. In mid-October 2011, Russian President Medvedev warned again that all the littoral states would need to agree to a trans-Caspian pipeline. The Turkmen Foreign Ministry retorted by terming this stance "counterproductive" to Turkmen-Russian relations. The Foreign Ministry pointed out that several bilateral agreements on sea use had been concluded by Russia and others, and repeated Turkmenistan's argument that it similarly could reach an agreement with Azerbaijan on a pipeline.

Despite Turkmenistan's desire to export more of its gas, thus far, its orientation seems to be toward the east and not yet toward Europe. Turkmenistan has been seeking alternatives to pipeline routes through Russia for some time. Since December 1997 Turkmenistan has opened two pipelines to Iran doubling Turkmenistan's export capacity to Iran to about 700 bcf per year.³⁵

In April 2006, Turkmenistan and China signed a framework agreement calling for Chinese investment in developing natural gas fields in Turkmenistan and in building a natural gas pipeline through Uzbekistan and Kazakhstan to China, which is in operation. Finally, Turkmen President Berdimuhamedow also has revived his predecessor's proposal to build a natural gas pipeline through Afghanistan to Pakistan and India (TAPI).

Uzbekistan: A Sleeping Natural Gas Giant?³⁶

Uzbekistan mostly uses its natural gas production domestically and is self-sufficient. It has, however, used its network of Soviet-era natural gas pipelines to export some natural gas to Russia and to other Central Asian states (Kazakhstan, Kyrgyzstan, and Tajikistan). Uzbekistan appears to have sufficient gas reserves to become a potential supplier of some gas to Europe if its infrastructure development begins to look westward.

However, Uzbekistan has been largely closed to Western energy investment, although efforts to attract international energy firms have appeared to increase in recent years. Russian firms

³⁴ For additional information on Turkmenistan see CRS Report 97-1055, *Turkmenistan: Recent Developments and U.S. Interests*, by Jim Nichol.

³⁵ According to the BP Statistical Review, actual Turkmen natural gas exports were about 230 bcf to Iran in 2010.

³⁶ For additional information on Uzbekistan see CRS Report RS21238, *Uzbekistan: Recent Developments and U.S. Interests*, by Jim Nichol.

Gazprom and Lukoil are the largest investors in Uzbek natural gas development and production and seem through their policies to want to keep Uzbek natural gas from competing with other Russian natural gas being supplied to Europe. In 2005, the China National Petroleum Corporation (CNPC) and Uzbekistan's state-owned Uzbekneftegaz announced that they would form a joint venture to develop oil and natural gas resources. In 2007, Uzbekistan and China signed an agreement on building a 326-mile section of the CNPC pipeline, and a construction and operation joint venture between Uzbekneftegaz and CNPC, Asia Trans Gas, began construction in 2008. Uzbekistan also has signed a framework agreement to eventually supply 353 bcf of natural gas per year through the pipeline. After delays, Uzbekistan has reported that these shipments began in August 2012. A production sharing consortium composed of Uzbekneftegaz, Lukoil, the Korea National Oil Corporation, and CNPC is exploring for natural gas in the Aral Sea region.

North Africa: Opportunities Amid Uncertainty

To date, U.S. energy strategy towards Europe has not focused on North Africa as a counter balance to Russian natural gas supplies. The Arab Spring may have created an opportunity, albeit with major challenges, to increase exports from the region. Taken as a whole, the three main existing suppliers to Europe in the region—Algeria, Egypt, and Libya—already supply natural gas to Europe by both pipeline and LNG (see **Table 4**) and hold tremendous natural gas resources that could be further developed. Collectively, the three countries supply about 44% of what Russia supplies, of which Algeria is the source for almost 90%. Difficult business environments and domestic demand, prompted by subsidies for natural gas consumption, have limited development of each country's natural gas resources. Regime changes in Egypt and Libya pose an opportunity for each to change its policies to promote expanded development of natural gas resources, but there has been little progress to date. At the same time, political and economic uncertainty could continue to characterize the situation in both countries in the short- to medium-term. In addition, burgeoning security concerns linked to instability and terrorism emanating from northern Mali and, potentially, southern and eastern Libya may constrain new and existing exploitation of energy resources in the region.

Table 4. Key North African Natural Gas Data, 2011

Units = trillion cubic feet (tcf)

	Reserves	Production	Exports to EU
Algeria	159.1	2.8	1.6
Egypt	77.3	2.2	0.1
Libya	52.8	0.1	0.1
TOTAL	289.2	5.1	1.8

Source: BP Statistical Review of World Energy 2012.

Algeria: Security Concerns Threaten Resource Development³⁷

The four-day hostage crisis that began when terrorists seized a natural gas compound with foreign workers (including U.S.) in southeastern Algeria on January 16, 2013, highlights stability concerns in North Africa's largest hydrocarbon producer. The ramifications of the incident are unclear, particularly how it will impact on Algeria's energy sector and foreign participation.

According to a study by the U.S. Energy Information Administration (EIA), Algeria may hold shale gas resources much greater than its conventional reserves, which are substantial. In March 2013, Algeria passed a new set of amendments to its hydrocarbon law to address shale gas in the country. Depending upon the development of its unconventional natural gas resources and its conventional resources, Algeria could become a more significant natural gas producer and exporter. However, a difficult business environment may continue to limit its potential.

A 2005 hydrocarbon law diminished the monopoly of the state energy company, Sonatrach, opening the sector for private and foreign investment. A 2006 law, however, required international companies to give Sonatrach a 51% stake in new oil, natural gas, and related transport projects. Additional foreign investment rules were enacted in the Complementary Finance Law (CFL) of 2009, which restricted imports and foreign investment. These measures require 51% Algerian ownership of new foreign investment. Further, the 2010 CFL, effective as of September 2010, requires foreign bidders who win construction contracts to invest in a joint venture with a local partner.³⁸ Such changes have prompted foreign investors, including U.S. and European businesses and governments, to appeal for greater stability of laws in Algeria, and may have contributed to a reported slowing of foreign investment in exploration and production.³⁹ Still, according to the State Department, "the 49/51 rule remains controversial but foreign investors have adapted."⁴⁰

Algerian natural gas production and exports have declined since 2005 when it produced over 3.1 tcf and exported more than 2.2 tcf. In 2011, Algeria produced 2.8 tcf and exported 1.8 tcf, with 1.6 tcf going to the EU. In 2005, Algeria's energy minister announced ambitious plans to increase production and export, with a goal of reaching 4.0 tcf of production and 3.5 tcf of exports by 2015. These targets are not on track to be achieved, and the country has changed its focus to preserving its resource base and not expanding production as quickly. Domestic consumption may outstrip exports within the next decade.

Nevertheless, Algeria continues to expand its connections to Europe. In 2011, a consortium led by Sonatrach opened the Medgaz natural gas pipeline. The new pipeline runs directly from Algeria's Beni Saf port to Spain's Perdigal Beach. The initial capacity of the line is approximately 280 bcf per year. Despite this new addition, Algerian exports to Spain do not have much impact on the rest of Europe, as the interconnection between Spain and France is limited. In addition to Medgaz, Algeria exports natural gas to Europe via the 425 bcf Maghreb-Europe pipeline to Spain

³⁷ For additional information on current events in Algeria, see CRS Report RS21532, *Algeria: Current Issues*, by Alexis Arief.

³⁸ State Department, Bureau of Economic and Business Affairs, "2013 Investment Climate Statement—Algeria," February 2013, <http://www.state.gov/e/eb/rls/othr/ics/2013/204588.htm>.

³⁹ Samuel Cizuk, "Abysmal Licensing Round Result in Algeria Confirms Energy Sector Malaise," *IHS Global Insight*, March 18, 2011; *Africa Energy Intelligence*, "Oil Companies Steer Clear of Algeria Due to Windfall Tax, Few Bid for Licenses," March 23, 2011.

⁴⁰ State Department, "2013 Investment Climate Statement—Algeria," February 2013.

and the 230 bcf Trans-Mediterranean pipeline to Italy. Algeria has also announced plans to expand its LNG export capacity.

Egypt: In Need of a Reorganization of Its Natural Gas Sector⁴¹

Since 2005, demand for natural gas in Egypt has been on the rise, increasing almost 57% over the time period. Although production has grown as well, the subsidy-driven demand has hindered the government in offering attractive terms for international companies to continue developing Egypt's resources. Additionally, much of Egypt's remaining natural gas is in difficult-to-access, high-cost areas, which contributes to the lack of interest by many international natural gas companies. That said, BP signed a deal in 2010 that was substantially higher than previous contract terms.

Since the resignation of former Egyptian President Hosni Mubarak in February 2011, Egypt's natural gas infrastructure in the Sinai Peninsula has been attacked many times by either disaffected Bedouin Arabs living in the Sinai or terrorist groups with camps in the peninsula. These attacks have disrupted gas shipments via two separate pipelines converging at El Arish to both Israel and Jordan. Egypt is no longer exporting natural gas to either country. No group has claimed responsibility for the attacks, and the Egyptian authorities have struggled to protect infrastructure in the demilitarized Sinai Peninsula.

Egyptian exports to the EU, which are solely in the form of LNG, dropped by almost 12% in 2011, after dropping almost 35% in 2010. The Arab Gas Pipeline from Egypt to Jordan, Lebanon, and Syria has been planned to extend to Turkey in order to move Egyptian natural gas to Europe, but given the issues surrounding Egypt's natural gas sector this is highly doubtful. Production in 2010 fell for the first time in over a decade, but stabilized in 2011. With domestic consumption likely to continue increasing and production probably declining, exports are not likely to increase for some time. In part to meet its export commitments, Egypt announced in December 2012 that it would begin importing LNG, possibly as early as 2013. Depending upon the orientation of a new government, if it promotes western investment in Egypt's energy sector, and the government addresses its natural gas subsidies, this deterioration of Egypt's natural gas sector could be reversed.

Libya: Untapped Potential⁴²

Similar to Algeria, the September 11, 2012, terrorist attacks on the U.S. diplomatic mission in Benghazi underscore security and stability issues facing the new government. Nevertheless, Libya may have the greatest potential to increase natural gas exports to Europe once a new regime is established and possibly a new state oil and natural gas company in a post-Qadhafi Libya. The civil war halted natural gas production, but production has since resumed and appears to be recovering quicker than most analysts had forecast.

⁴¹ For additional information on Egypt's energy sector see CRS Report R41632, *Implications of Egypt's Turmoil on Global Oil and Natural Gas Supply*, by Michael Ratner, and for additional information on current events in Egypt see CRS Report RL33003, *Egypt: Background and U.S. Relations*, by Jeremy M. Sharp.

⁴² For additional information on current events in Libya see CRS Report RL33142, *Libya: Transition and U.S. Policy*, by Christopher M. Blanchard.

Libya has one natural gas pipeline to Europe, Greenstream, which was closed during the recent unrest, as well as an LNG export terminal. Italy received almost all of Libya's natural gas exports in 2011, while Libya provided approximately 3% of Italy's natural gas imports. The pipeline was operating below its capacity in 2011. Libya's minimal LNG exports were to Spain in 2011. LNG exports were approximately 3% of the capacity of Libya's LNG facility.

Libya's natural gas production dropped almost 90% in 2011. However, domestic consumption, particularly for electric power generation, could increase Libya's consumption of natural gas, which has been stable over the past decade according to EIA.⁴³

Liquefied Natural Gas Imports

One of the most important developments for Europe has been the growing availability of natural gas in liquefied form (LNG). LNG represents about 25% of European natural gas imports, up from 15% in 2010. The United Kingdom leads Europe in LNG imports, followed by Spain and France. However, as noted earlier, the interconnection between Spain and France could be expanded to allow Europe to take advantage of Spain's excess import capacity for LNG or pipeline natural gas.

The principal suppliers of LNG to Europe include Algeria, Egypt, Oman, and Qatar. Qatar is the largest supplier of LNG to Europe, and also owns multiple LNG import terminals in Europe. Countries such as Poland and Estonia have also begun the process of building large LNG import terminals at their Baltic Sea ports that would enable LNG to be distributed throughout northern and eastern Europe.

Table 5. EU LNG Import Capacity

	Number of Facilities	Capacity (bcf)
Belgium	1	9.0
France	3	23.8
Greece	1	5.3
Italy	2	11.0
Netherlands	1	12.0
Portugal	1	6.5
Spain	6	60.1
United Kingdom	4	51.1
	19	178.7

Source: Gas Infrastructure Europe, <http://www.gie.eu.com/index.php/maps-data/lng-map>.

Possible U.S. LNG Exports: Pricing Not Volumes May Be Key

Proposed U.S. LNG export projects, if all were constructed today, would make the United States the largest LNG exporter. The proposed projects are at various stages in the regulatory approval

⁴³ U.S. Energy Information Administration, *Country Analysis Briefs - Libya*, Washington, DC, February 2011, <http://www.eia.gov/EMEU/cabs/Libya/pdf.pdf>.

process, with only one under construction. Nevertheless, analysts have already begun speculating on what a significant increase in U.S. LNG exports would mean to natural gas markets, especially to European markets. Any volumes of LNG from the United States would benefit the market, including Europe, by offering a new supplier to consumers. For parts of Europe, especially the Baltic region and Central Europe, where the United States enjoys strong and friendly relations, any decision to export U.S. LNG to that region would be welcomed as a potential offset to their dependence on Russian gas.

However, the bigger effect of U.S. entry into global LNG sales may be on pricing rather than supplies. The United States is one of the few countries that does not link its natural gas price to the price of oil and therefore may add to the pressure to delink the two commodities. Most natural gas sold in the world, by pipeline or as LNG, is sold under long-term contracts and indexed to the price of oil. Historically, the two commodities competed more directly in markets than they do today.

More Distant Alternatives

Eastern Mediterranean: A Recent Development

Although too early to tell and years from production for export, announcements of natural gas discoveries in the eastern Mediterranean by Israel and Cyprus may open a new source of European natural gas. Initial estimates pose a scenario in which Israel and Cyprus could become natural gas exporters, with Europe as the largest nearby market a likely recipient. Cyprus, which is an EU member, currently does not consume any natural gas in its economy and would require much infrastructure to do so. However, both Israel and the U.S. energy company Noble Energy, which is conducting the drilling, have raised the potential to help Cyprus build natural gas facilities for both domestic consumption and export. Additionally, other countries in the region, including Lebanon and Turkey, may begin exploration efforts that could increase the amount of natural gas produced in the region.

The Arctic Region and Players

Norway is not a member of the EU, but is the eighth-largest natural gas producer in the world and second-largest exporter of natural gas to the EU, behind Russia. The North Sea holds the majority of Norway's natural gas reserves, but there are also significant quantities in the Norwegian and Barents Seas. The United States Geological Survey has estimated that almost 25% of the globe's yet-to-be-discovered natural gas resources are located in the Arctic region and last year Norway and Russia reached agreement on Arctic energy exploration issues. Norway's Snohvit natural gas field along with Russia's field at Shtockman, in which Norway is an investor and development partner, promises to make the Barents Sea a new European energy region.

Potential Development of Alternative Sources in Europe

In addition to solidifying other sources of energy supply from other regions, experts point to several additional factors that could decrease European dependence on Russian resources. The development of previously difficult-to-develop "unconventional" natural gas deposits, including shale gas, in Europe and elsewhere could diversify supplies and keep prices down. EIA assessed the EU's technically recoverable shale gas resources at almost 500 tcf, more than 25 years of

supply at current consumption levels.⁴⁴ The growth of the spot market for natural gas and the development of liquefied natural gas infrastructure in Europe could also help diversify supplies as well as reduce dependence on Russian-controlled pipelines. Finally, developing alternative energy sources within Europe, in particular, hydropower, energy from the seas, biomass, wind power, solar energy, and geothermal energy could all contribute to further diversification of Europe's energy supply, reducing overall natural gas demand.

Prospects for Diversification

There are many alternatives to Russian natural gas for Europe to choose from, but it would be difficult, if not impractical, for Europe to consider replacing all Russian natural gas imports. Some EU countries and companies also appear reluctant to shift significantly from the status quo. Some of Europe's larger natural gas companies have huge financial interests in maintaining Russian supplies and do not see a problem in depending so much on one country. It is important to keep in mind that Russia not only holds the largest supplies of natural gas globally, but already has significant infrastructure connecting its resources to Europe, while some of the alternatives remain constrained. A major test for the EU in developing a more coherent energy policy for Europe could be how to balance these views with those of other member states that are more dependent on Russian energy and are concerned by the political leverage Russia could exert on parts of Europe if no alternatives are found to alleviate at least some of that dependence.

Although supplying natural gas to Europe from the Caspian region and Central Asia has been a goal of multiple U.S. administrations and the EU, it is far from being achieved in volumes significant to counter Russian exports. Some observers view the fact that the State Department has not appointed a new Special Envoy for Eurasian Energy since early 2012 as one indication of the Administration's waning interest in the Southern Corridor natural gas effort. In addition, given the interest in combating climate change both in Europe and in some quarters of the United States, some analysts believe that increasing the flow of Caspian natural gas to China, where a pipeline already exists, could have greater benefits. In this view, Chinese natural gas imports could help reduce carbon dioxide and other greenhouse gas emissions by, for instance, limiting the use of coal in China's electric power sector.

In North Africa, ongoing governmental transitions in Libya and Egypt are a key factor for natural gas development. In January 2012, Egypt held its first parliamentary elections since the ouster of President Hosni Mubarak, bringing to power the Muslim Brotherhood and new President Muhammad Morsi. Libya elected a new parliament in July 2012, in the country's first national election in 50 years, after the ouster of Muammar al Qadhafi's government in 2011. A new president and prime minister assumed office in August 2012 and September 2012, respectively. The type and character of the new governments will have an impact on natural gas development in each country as their energy sectors appear to offer a significant potential source of economic growth and income. Both countries have large natural gas resources, but historical political constraints have limited the development of these resources.

The United States and Europe are in a position to aid both countries in reforming their regulatory regimes governing natural gas development as well as establishing oversight by non-

⁴⁴ U.S. Energy Information Administration, *World Shale Gas Resources: An Initial Assessment of 14 Regions Outside the United States*, Washington, DC, April 2011, p. 4, <http://www.eia.gov/analysis/studies/worldshalegas/>.

governmental organizations and their respective parliaments. And U.S. and European energy companies seem eager to help further develop energy infrastructure and production in both countries. Redirecting U.S. and European efforts from Central Asia to MENA—especially Libya and Egypt—as an alternative to Russian natural gas supplies could improve the chances of more natural gas reaching Europe in the short run.

Meanwhile, new discoveries in the eastern Mediterranean pose a potential new source of European natural gas. However, neither Israel nor Cyprus has any experience in developing large scale natural gas projects. Both countries could benefit from the U.S. and European experience in developing their resources, both on a federal and state level.

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Acknowledgments

Vincent Morelli, Section Research Manager for Europe and the Americas, contributed to the conception, analysis, and conclusions of this report. Alexis Arieff, Christopher Blanchard, and Jeremy Sharp from CRS's Foreign Affairs, Defense, and Trade Division—Middle East/Africa Section contributed to this report. Elizabeth Roberts from CRS's Knowledge Services Group contributed to the research for this report. Amber Wilhelm in CRS's Publishing and Editorial Resources Section and Jacqueline Nolan with the Library of Congress's Geography and Map Division contributed to the report's graphics.