



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

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Summary

Europe as a major energy consumer faces a number of challenges when addressing future energy needs. Among these challenges are a 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 34% 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 defeat 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 the European-supported plans. Moscow has also raised environmental concerns in an effort to stymie 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 European corridor, as an alternative to Russian natural gas has been the mandate of the State Department's Special Envoy for Eurasian Energy. 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. Additionally, a change in tenor from the Obama Administration towards the Nabucco pipeline project may indicate waning interest in the southern corridor strategy.

This report focuses on potential approaches that Europe might employ to diversify its sources of natural gas supply, and Russia's role, as well as identifying some of the issues hindering 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, probably the most realistic supply alternative in the near-term, but notes that the region will have to resolve its current political and economic 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. However, 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. Most Russian natural gas exports to Europe flow 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 take steps to increase their energy security by exploring new supply diversification options. One such response, though contrary to the U.S. perspective of energy security through diversification, has been 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 bypasses transit states such as Ukraine and Belarus, they also bypass EU member states like Poland and Lithuania that are more critical of Russian policies and also present rivals to other pipelines being pursued by the EU.

The opening of Nord Stream and the proposal for South Stream highlights a challenge Europe faces with 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. Meanwhile, alternative supplies from other regions (e.g., North Africa and Central Asia) face several significant challenges.

A second EU response to concerns over Europe's reliance on Russian natural gas supplies is what has become known as the Southern strategy. The so-called Southern Gas Corridor's flagship initiative is the proposed Nabucco natural gas pipeline. The pipeline is intended to transport up to 1.1 trillion cubic feet of Caspian (and perhaps Middle Eastern) natural gas per year through Turkey into Bulgaria and on to Austria. The Nabucco project has, however, been beset by lengthy delays and ongoing questions about its viability. The six-company Nabucco consortium hopes to begin construction in 2013, but many observers question this timeframe, citing ongoing concerns about capacity and funding.

A third European energy initiative 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 estimates 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, 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. 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 shale gas yet to be developed in addition to their substantial conventional reserves.
- Central Asia may hold the greatest potential for new natural gas supplies for Europe, but currently those supplies would have to transit Russia to arrive in the European market. The delays in developing a southern corridor natural gas pipeline route to Europe have forced Central Asian countries to look east instead of west to bypass Russia and open new markets.²
- Liquefied natural gas (LNG) imports pose an additional alternative to Russian natural gas. In 2010, LNG comprised almost 20% of the EU's natural gas imports and over 15% 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 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 their 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.

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

- 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.³ Most of the proposed U.S. LNG export projects are located on the Gulf coast or east coast of the United States, making shipments, at least initially, more likely to go to Europe than Asia. 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 would 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. efforts has been on establishing a southern corridor route for 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 viewed the issue in geopolitical terms and sharply criticized Russia for using energy supplies as a means to gain political influence over other countries.⁴ 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, a change in tenor from the Obama Administration towards the Nabucco pipeline project may indicate waning interest in the southern corridor strategy.

Regarding Central Asian supplies and European energy security, in testimony to Congress in June 2011, Richard Morningstar, the State Department's Special Envoy for Eurasian Energy, said that U.S. policy encourages the development of new Eurasian oil and natural gas resources to increase the diversity of world energy supplies. A second U.S. goal is to increase European energy security, so that some countries in Europe that largely rely on a single supplier (presumably Russia) may in the future have diverse suppliers. A third goal is assisting Caspian regional states to develop new routes to market, so that they can obtain more competitive prices and become more prosperous. In order to achieve these goals, the Administration supports the development of the Southern Corridor of Caspian (and perhaps Iraq) natural gas export routes transiting Turkey to Europe.⁵ Of the three main vying pipeline consortia—the Nabucco, the Interconnector-Turkey-Greece-Italy (ITGI), and the Trans-Adriatic Pipeline (TAP) groups—the Obama Administration has said it will support the project "that brings the most gas, soonest and most reliably, to those

³ 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.

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

⁵ 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. For additional information on Turkey see CRS Report R41368, *Turkey: Background and U.S. Relations*, by Jim Zanotti.

parts of Europe that need it most.”⁶ However, given the historically close relationship between Russia and Italy on energy issues, including natural gas (especially under the government of former prime minister Silvio Berlusconi), supporting projects that terminate in Italy could also raise concerns about Russian influence. Such concerns could be mitigated depending on the policy measures taken by future Italian governments.

At the same time, Morningstar has rejected views that Russia and the United States are competing for influence over Caspian energy supplies, stating that the Administration has formed a Working Group on Energy under the U.S.-Russia Bilateral Presidential Commission.⁷ At a conference in Azerbaijan in November 2011, Morningstar stressed that while the United States still supports Nabucco, “if a smaller pipeline is chosen to ship [Azerbaijani] gas to Europe, we believe it should provide gas to vulnerable countries in Europe and there should be concrete, written guarantees that the pipeline will be expanded as more gas becomes available,” ostensibly so that Europe is less dependent on Russia as a source.⁸

The Arab Spring, which has brought regime change to two large natural gas producers, Libya and Egypt, offers potentially expanded sources of natural gas to Europe, but it 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 in North Africa and the Middle East (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.⁹ A key part of this plan is launching a “Trade and Investment Partnership Initiative” with the MENA countries. 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

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

⁶ At the time of the testimony, the South East Europe Pipeline (SEEP) and Trans-Anatolia projects did not exist.

⁷ 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.

⁸ U.S. Embassy, Baku, Azerbaijan, Office of Public Affairs, *Media Advisory: Special Envoy for Eurasian Energy Supports Southern Corridor*, November 17, 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 (forthcoming) CRS Report, *U.S. Trade and Investment in the Middle East and North Africa: Overview and Issues for Congress*, coordinated by Rebecca M. Nelson.

“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

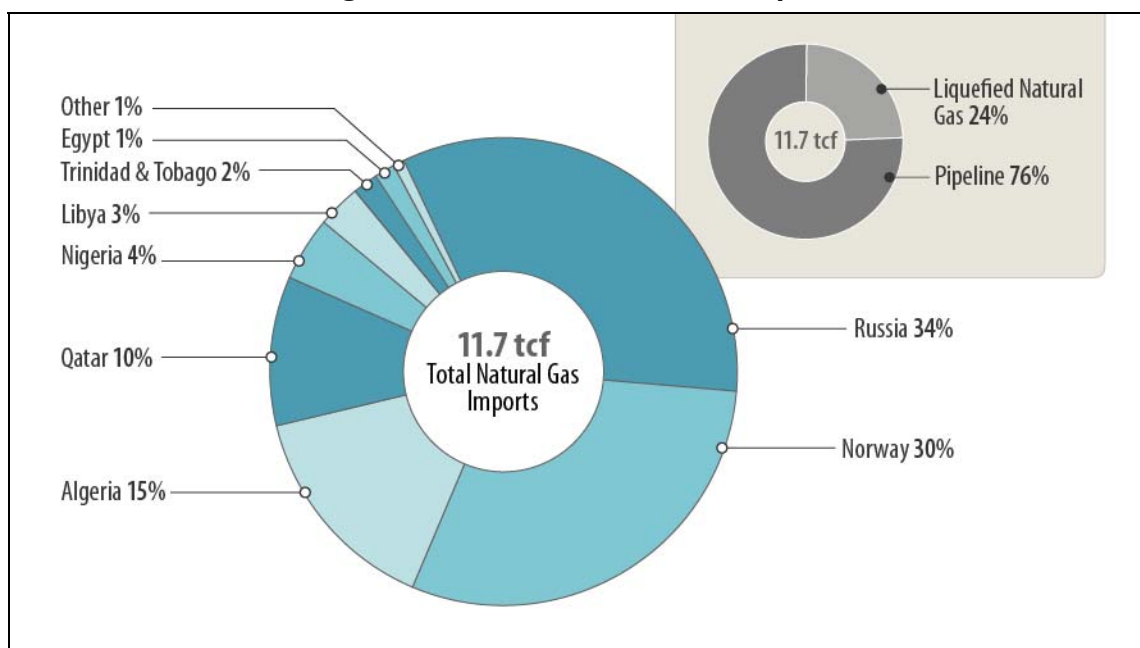
Collectively, EU member states are the world's largest energy importer, importing about 55% of their energy supply—approximately 84% of their oil and 64% of their natural gas.¹² EU member states increasingly rely on natural gas, particularly to reach ambitious targets to reduce carbon dioxide and greenhouse gas emissions. Natural gas comprised over 25% of the EU's primary energy consumption in 2010, a number that is expected to grow to almost 30% by 2030.¹³ Oil made up almost 40%, coal about 16%, and nuclear 12% of the EU primary energy supply. 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 a French decision to prohibit shale gas development, could mean a more rapid rise in Europe's dependence on natural gas imports. Other EU countries have made similar announcements, but are much smaller energy consumers.

Russia has long been, and is expected to continue to be, the key supplier of natural gas to Europe. In 2010, Russia accounted for 34% 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. 2010 EU Natural Gas Imports



Source: BP Statistical Review of World Energy 2011, <http://www.bp.com/sectiongenericarticle800.do?categoryId=9037130&contentId=7068669>.

Notes: The United States re-exported a minimal amount of LNG to Europe in 2010 and is included in Other. 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 2010. 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.

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 individual 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 believe that without such Russian concessions, Europe will ultimately find its energy security 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.

These examples 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, who 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.¹⁴

The EU's 2011 decision to further liberalize Europe's energy market could signal the beginning of a 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 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.¹⁵ EU member states have committed to fully implementing the liberalization directive by 2014. However, as of late 2011, at least 18 countries had yet to transform the directive into national law.¹⁶

EU and U.S. concerns about overdependence on Russian natural gas supplies have also led to the proposed Nabucco gas pipeline. Nabucco would run from eastern Turkey to Bulgaria, Romania, Hungary, and Austria and on to other European countries. Natural gas would be supplied primarily by Azerbaijan via pipelines transiting through Georgia. The Nabucco consortium had hoped to begin work on the pipeline in 2010, but the project has faced repeated delays. A key factor is uncertainty about Azerbaijan's production capacity and whether Azerbaijani supplies could alone justify building the pipeline. The participation of Turkmenistan and Iraq could be key to Nabucco's success, but it could be years before these countries are ready to ship gas through the proposed pipeline. Some Nabucco advocates in Europe have also raised the possibility of using the pipeline to transport Iranian gas, a remote alternative given current sanctions. The lingering effects of the global financial crisis could also make it difficult for the private sector to finance Nabucco and other projected pipelines. Indeed, reports in 2011 suggested that the total cost of the project could be almost double the €7.9 billion estimated by the consortium of European energy companies that have committed to build the Nabucco pipeline.¹⁷

¹⁴ Comments provided through discussions with representatives of several European member states.

¹⁵ Denis Pinchuk, "Gazprom Drops Austria from S. Stream Gas Route—Source," *Reuters*, December 14, 2011.

¹⁶ "Internal energy market in doubt as 18 states face court," *Euractiv*, October 3, 2011.

¹⁷ Tim Webb, "European gas pipeline costs double," *The Guardian*, February 20, 2011; the Nabucco consortium is (continued...)

Table 1. EU Natural Gas Data, 2010

Units equal billion cubic feet per year (bcf)

	Natural Gas Consumption	Natural Gas Production	Natural Gas Imports
Austria	297	58	239
Belgium	738	0	867 ^a
Bulgaria	77	<1	76
Cyprus	0	0	0
Czech Republic	415	7	408
Denmark	172	292	5
Estonia	13	0	13
Finland	159	0	159
France	1,699	26	1,727
Germany	3,206	449	3,278 ^a
Greece	137	0	137
Hungary	352	88	264
Ireland	198	11	187
Italy	2,949	293	2,661
Latvia	23	0	23
Lithuania	93	0	93
Luxembourg	48	0	48
Malta	0	0	0
Netherlands	1,750	3,034	599 ^a
Poland	508	150	358
Portugal	175	0	175
Romania	446	370	76
Slovakia	197	4	193
Slovenia	31	<1	31
Spain	1,248	4	1,285 ^a
Sweden	58	0	58
United Kingdom	3,329	1,988	1,894 ^a
TOTAL	18,317	6,773	14,855

Sources: BP Statistical Review of World Energy 2011, Cedigaz, 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.

(...continued)

made up of six European energy companies: OMV of Austria; MOL of Hungary; Transgaz of Romania; Bulgarian Energy Holding of Bulgaria; BOTAS of Turkey; and RWE of Germany.

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

Russia's Role¹⁸

The Russian natural gas industry is one of the most important players in the global energy market. In 2010, Russia had the largest natural gas reserves in the world, nearly 24% 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 46% 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, which collectively control 33% of world production and 28% of global trade.

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.¹⁹ (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 the Russians must take into account when developing its political relations with Europe. The bulk of Gazprom's natural gas exports go to Europe and Eurasia. Of the 7.1 trillion cubic feet (tcf) of natural gas exported by Gazprom in 2010, almost 55% went to the EU. Of the rest, over 28% 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.²⁰ The rest went to Turkey, which is seeking EU membership, and other non-EU countries in Europe, and to Asia.²¹

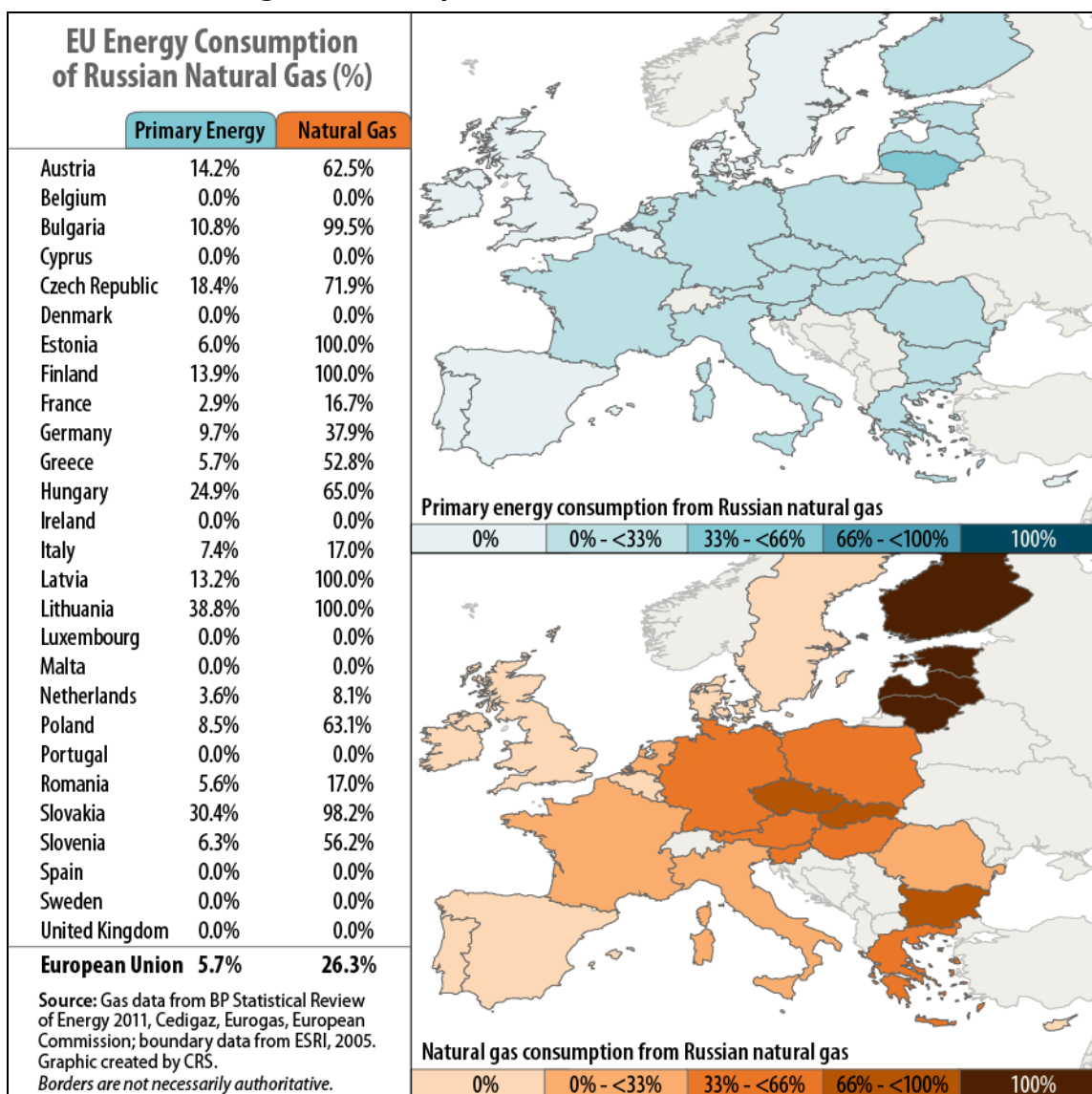
¹⁸ For additional information on Russia see CRS Report RL33407, *Russian Political, Economic, and Security Issues and U.S. Interests*, coordinated by Jim Nichol.

¹⁹ 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.

²⁰ 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.

²¹ 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 outgoing president Dimitri Medvedev served as president of Gazprom). The personal and political fortunes of Russia's leaders are closely tied to Gazprom. Russian government revenues (in 2010, 46% of total Russian government revenue came from oil and natural gas taxes) and Russia's economic revival in the Putin/Medvedev era have 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."²²

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 2010, 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.²³

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 from Russia standard oil-linked contract price for

²² 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>.

²³ 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).

natural 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.²⁴

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 trillion cubic feet (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, as stated earlier. 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 hopes to start construction of South Stream by the end of 2012, and 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, such as Nabucco and TAP (see "Central Asia Transit Constraints: Many Options but No Alternatives So Far" 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.²⁵ 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 partial ownership of the Ukrainian pipeline system in exchange for a share in natural gas fields in Russia and guaranteed transit volumes through Ukraine's pipelines. So far

²⁴ 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>.

²⁵ "Value of Ukraine Gas Transportation System Could Fall Seriously - Miller," *Interfax*, December 31, 2011.

Russia has not accepted Kyiv's terms. Russia has also rejected Ukraine's demands to renegotiate the current gas supply contract in order to cut the price Kyiv pays for gas, perhaps hoping that Ukraine's seeming desperation to secure lower gas prices could still induce it to give Gazprom de facto control over its pipelines.

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.

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, which may be as much an effort to thwart Nabucco as a viable pipeline project in its own right.

Central Asia Transit Constraints: Many Options but No Alternatives So Far

Establishing a non-Russian and non-Iranian natural gas pipeline system to transport Central Asian natural gas to Europe is a stated priority for the EU supported by the United States. Despite this, all the proposed projects face challenges from both cost and supply perspectives that raise questions about their viability (see **Table 2**). The main proposed pipeline, Nabucco, has had difficulty securing natural gas supplies and more recently cost questions have arisen.

Table 2. Prospective Non-Russian Southern Corridor Pipelines

Units = billion cubic feet per year (bcf)

Name	Anticipated Capacity	Anticipated In-Service Date	Partners
Interconnector Turkey, Greece, Italy (ITGI)	350	2015	BOTAS (Turkey), DEPA (Greece), Edison (Italy)
Trans Adriatic Pipeline (TAP)	350	2017	EGL (Switzerland), E.ON Ruhrgas (Germany), Statoil (Norway)
Trans-Anatolian Gas Pipeline (TANAP)	570	2017	BOTAS (Turkey), SOCAR (Azerbaijan), TPAO (Turkey)
South Caucasus Pipeline Expansion (SCP) ^a	565	2017	BP (United Kingdom), Lukoil (Russia), Naftiran (Iran), SOCAR (Azerbaijan), Statoil (Norway), Total (France), TPAO (Turkey)
South East Europe Pipeline (SEEP)	350	2017	BP (United Kingdom)
Nabucco Gas Pipeline	1,100	2019	BEH (Bulgaria), BOTAS (Turkey), MOL (Hungary), OMV (Austria), RWE (Germany), Transgaz (Romania)

Source: Company websites and various articles.

Notes: Not all of these projects will be built as many compete with each other for natural gas supplies. 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. If a pipeline extension is completed to Italy, this Interconnector Turkey-Greece-Italy (ITGI) natural gas pipeline could permit Azerbaijan to supply natural gas to two and perhaps more EU members, providing a source of supply besides Russia. The austerity measures undertaken by Greece may limit or prohibit the participation of DEPA, its state-owned natural gas company, in the ITGI pipeline.

The Nabucco pipeline has faced numerous delays, some of them attributable to Russia's counter-proposals to build pipelines that it asserts would reduce the efficacy of the Nabucco pipeline and to questions about supplies for the pipeline. In early September 2010, the European Investment Bank, the European Bank for Reconstruction and Development, and the World Bank announced a commitment—pending environmental and social feasibility studies—to provide \$5.2 billion to build the Nabucco pipeline. Latest EU planning calls for construction of the 1.1 tcf-capacity Nabucco pipeline to begin in 2012 and for shipments to begin in 2017. In 2011, new higher cost

estimates for building the pipeline appeared to place these plans at risk, pushing back shipments until 2019.

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. President Aliyev of Azerbaijan argued that the AGRI project would not make Nabucco less feasible.

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. Many observers viewed the MOU as increasing the feasibility of the ITGI and Nabucco pipelines.²⁶

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. Nonetheless, some analysts raised concerns that there would not be enough Azerbaijani natural gas to fill the ITGI and Nabucco pipelines (deliveries would be 406 bcf per year for ITGI and 158 to 459 bcf per year for Nabucco) and to provide for the proposed AGRI project without a trans-Caspian natural gas pipeline or participation by Iran or Iraq. In 2010, Azerbaijan produced about 530 bcf. Others suggested that Azerbaijan would be able to supply at least most of the needed natural gas for both the ITGI and Nabucco pipelines and the AGRI project, because of recent results from exploratory drilling off the Caspian seacoast.²⁷

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 natural gas pipeline. Such a link would provide added natural gas to ensure adequate supplies for the planned Nabucco and other pipelines. Hailing the decision, EU Energy Commissioner Günther Oettinger stated that "Europe is now speaking with one voice. The trans-Caspian pipeline is a major project in the Southern Corridor to bring new sources of natural gas to Europe. We have the intention of achieving this as soon as possible."²⁸ The Russian Foreign Ministry denounced the planned talks, and claimed that the Caspian Sea littoral states—Azerbaijan, Iran, Kazakhstan, Russia, and Turkmenistan—had agreed in a declaration issued in October 2007 that decisions regarding the Sea would be adopted by consensus among all the littoral states (Russia itself has violated this

²⁶ "Azerbaijan to Move Quickly to Negotiate Sales of Gas to Europe," *Oil Daily*, June 14, 2010.

²⁷ Eric Watkins, "New USGS Report Confirms Big Caspian Stakes," *Oil & Gas Journal*, January 3, 2011.

²⁸ European Commission, *Press Release: EU Starts Negotiations on Caspian Pipeline to Bring Gas to Europe*, September 12, 2011.

provision by agreeing with Kazakhstan and with Azerbaijan on oil and natural gas field development). It also claimed that the proposed pipeline was different from existing sub-sea pipelines in posing an environmental threat.²⁹

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. This pipeline could link to BP's proposed SEEP. 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.

²⁹ "Moscow 'regrets' EU decision on trans-Caspian gas pipeline," *RIA Novosti*, September 13, 2011, Web Edition.

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 112 tcf in 2010—or almost 125 years worth of natural gas.³⁰

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.

Central Asia and the Caspian Region: The Focus of U.S. Policy³¹

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 450 tcf, among the largest in the world and greater than those in Russia (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.

³⁰ 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.

³¹ 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: <http://www.david-sadler.org/pages/obx/ukraine.htm>.

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.³² 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, 2010

Units = trillion cubic feet (tcf)

	Reserves	Production	Exports to EU
Azerbaijan	44.9	0.5	0.0 ^a
Kazakhstan	65.2	1.2	0.0
Turkmenistan	283.6	1.5	0.0
Uzbekistan	55.1	2.1	0.0
TOTAL	448.8	5.3	0.0

Source: BP Statistical Review of World Energy 2011, pp. 20, 22, and 28.

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

³² 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.

Azerbaijan: The EU's Best Hope For New Natural Gas Supplies?³³

U.S. administrations have contested that exports from Azerbaijan could boost energy security for European customers currently relying more on Russia. According to Ambassador Morningstar, Azerbaijani natural gas “is absolutely essential to the development of the Southern Corridor,” and will be able to supply at least some if not most of the needed natural gas for both the proposed Interconnector-Turkey-Greece-Italy (ITGI) natural gas pipeline and the first phase of the Nabucco pipeline, if built.³⁴ In March 2007, Azerbaijan and the United States signed a memorandum of understanding on energy cooperation that called for discussions on the proposed ITGI and Nabucco natural gas pipelines. In August 2007, the U.S. Trade & Development Agency granted Azerbaijan \$1.7 million to fund feasibility studies on building both a natural gas and an oil pipeline across the Caspian Sea to link Central Asia to the SCP pipeline and the Baku Tbilisi Ceyhan pipeline.

Of importance to U.S. foreign policy is Azerbaijan's relationship with Iran. At the end of 2005, Azerbaijan began sending about 7 billion cubic feet 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.³⁵ On November 11, 2009, Azerbaijan signed an accord with Iran to supply 17.7 bcf of natural gas annually through the pipeline. These natural gas supplies could increase in coming years.

Kazakhstan: Natural Gas Is Second to Oil³⁶

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 424 billion cubic feet (bcf) of natural gas from its western fields to Russia in 2010. 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 natural gas resources, amounting to about \$29 billion in Kazakhstan (over one-third of all FDI in the country) from 1993-2009.³⁷ According to some reports, China provided

³³ For additional information on Azerbaijan see CRS Report 97-522, *Azerbaijan: Recent Developments and U.S. Interests*, by Jim Nichol.

³⁴ U.S. Embassy, Baku, Media Advisory, Ambassador Richard Morningstar, Special Envoy for Eurasian Energy: *Speech to Plenary Session of Caspian Oil and Gas Conference*, June 8, 2011.

³⁵ The Nakhichevan exclave is Azerbaijani territory that is situated between the Armenian controlled area of Nagorno-Karabagh and Armenia proper.

³⁶ For additional information on Kazakhstan see CRS Report 97-1058, *Kazakhstan: Recent Developments and U.S. Interests*, by Jim Nichol.

³⁷ U.S. Department of State. *Robert O. Blake, Jr., Assistant Secretary, Bureau of South and Central Asian Affairs: Remarks Before the Washington International Business Council*, February 24, 2010.

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 months 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.

Kazakh officials have appeared to make contradictory statements about providing natural gas for the prospective Nabucco pipeline. Kazakhstan's Deputy Energy and Mineral Resources Minister Aset Magaulov stated at a Euro-Atlantic Partnership Council Security Forum in June 2009 that Kazakhstan would not have a surplus of natural gas that it could send through the Nabucco pipeline.³⁸ Later that year, President Nazarbayev appeared to support the possible transit of Kazakh natural gas through Turkey. In late October 2009, however, the Kazakh Ministry of Energy reiterated that "the main problem for our country [regarding the supply of natural gas to Nabucco] is the limited availability of gas" because of existing contracts for projected natural gas production. It suggested that Kazakhstan might be a potential supplier for Nabucco if natural gas production exceeds expectations, but that Kazakhstan could not transport any natural gas via Nabucco until the legal status of the Caspian Sea was resolved, which would permit building a connection to Nabucco.³⁹ In early October 2011 Minister of Oil and Gas Sauat Mynabyev stated that "we do not have available resources for the gas pipeline yet."⁴⁰

Turkmenistan: European Orientation?⁴¹

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

³⁸ *ITAR-TASS*, June 25, 2009.

³⁹ *ITAR-TASS*, October 31, 2009.

⁴⁰ *Interfax*, October 6, 2011.

⁴¹ For additional information on Turkmenistan see CRS Report 97-1055, *Turkmenistan: Recent Developments and U.S. Interests*, by Jim Nichol.

“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.⁴²

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?⁴³

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 appeared to increase in 2010-2011. Russian firms 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 Central Asia-China Pipeline (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. 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: Transitions May Bring Opportunities⁴⁴

To date, U.S. energy strategy towards Europe has not focused on North Africa as a counter balance to Russian natural gas supplies. Nevertheless, the Arab Spring may have created an opportunity, albeit with potential problems, to increase exports from the region. Taken as a whole,

⁴² According to the BP Statistical Review, actual Turkmen natural gas exports were about 230 bcf to Iran in 2010.

⁴³ For additional information on Uzbekistan see CRS Report RS21238, *Uzbekistan: Recent Developments and U.S. Interests*, by Jim Nichol.

⁴⁴ For additional information on North African energy see CRS Report R41683, *Middle East and North Africa Unrest: Implications for Oil and Natural Gas Markets*, by Michael Ratner and Neelesh Nerurkar.

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 60% of what Russia supplies, of which Algeria is the source for almost 80%. 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. At the same time, political and economic uncertainty could continue to characterize the situation in both countries in the short- to medium-term.

Table 4. Key North African Natural Gas Data, 2010

Units = trillion cubic feet (tcf)

	Reserves	Production	Exports to EU
Algeria	159.1	2.8	1.8
Egypt	78.0	2.2	0.2
Libya	54.7	0.6	0.3
TOTAL	291.8	5.6	2.3

Source: BP Statistical Review of World Energy 2011, pp. 20, 22, and 28.

Algeria: Unconventional Resources May Be Its Future⁴⁵

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. 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.⁴⁶ 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.⁴⁷

⁴⁵ For additional information on current events in Algeria, see CRS Report RS21532, *Algeria: Current Issues*, by Alexis Arieff.

⁴⁶ State Department, Bureau of Economic, Energy and Business Affairs, "2011 Investment Climate Statement—Algeria," March 2011.

⁴⁷ 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.

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 2010, Algeria produced 2.8 tcf and exported 2.0 tcf, with 1.8 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.

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 Perdidal 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 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 Sector⁴⁸

Since 2005, demand for natural gas in Egypt has been on the rise, increasing almost 43% 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 at least ten 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. No group has claimed responsibility for the attacks, and the Egyptian authorities have struggled to protect infrastructure in the demilitarized Sinai Peninsula. Israel generates 40% of its electricity using natural gas, and Egypt provides 43% of its supplies. Egyptian natural gas supplies 80% of Jordan's power generation needs.

Egyptian exports to the EU, which are solely in the form of LNG, dropped by 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 doubtful. Production last year also fell for the first time in over a decade. With domestic consumption likely to continue increasing and production probably continuing to decline, exports are not likely to increase for some time. 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.

⁴⁸ 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 in Transition*, by Jeremy M. Sharp.

Libya: Tremendous Potential⁴⁹

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.

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 97% of Libya's natural gas exports in 2010, while Libya provided approximately 10% of Italy's natural gas imports. The pipeline was operating close to its capacity, so to significantly increase pipeline exports would require an additional pipeline to be constructed or the existing pipeline to be expanded. Libya's LNG exports were mostly to Spain and minimal in 2010. LNG exports were approximately 10% of the capacity of Libya's LNG facility.

Libya's natural gas production has almost tripled to about 560 bcf since 2003, in part to meet pipeline exports which started in 2004. 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.⁵⁰

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 15% of European natural gas imports. Spain, where 65% of natural gas imports are LNG, leads Europe in LNG imports, followed by Portugal and France. However, as noted earlier, the interconnection between Spain and France is small and does not allow Europe to take advantage of Spain's import capacity for LNG or pipeline natural gas.

The principal suppliers of LNG to Europe include Algeria, Egypt, Oman, and Qatar. Algeria is the world's third largest exporter of LNG, with almost all of its natural gas going to Europe. Countries such as Poland and Estonia have also begun the process of building large LNG import terminals at their Baltic Sea ports that will enable LNG to be distributed throughout northern and eastern Europe. Qatar, which supplied about 10% of the EU's imports, also owns multiple LNG import terminals in Europe.

⁴⁹ For additional information on current events in Libya see CRS Report RL33142, *Libya: Transition and U.S. Policy*, by Christopher M. Blanchard.

⁵⁰ U.S. Energy Information Administration, *Country Analysis Briefs - Libya*, Washington, DC, February 2011, <http://www.eia.gov/EMEU/cabs/Libya/pdf.pdf>.

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 second largest LNG exporter behind Qatar. The proposed projects are at various stages in the regulatory approval process. 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, recent 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 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.⁵¹ 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. There is also inertia on the part of some EU countries and companies regarding 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 not only does Russia hold 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 will 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 Central Asia, particularly through the proposed Nabucco pipeline, has been a goal of multiple U.S. administrations and the EU, it is far from

⁵¹ 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/>.

being achieved in volumes significant to counter Russian exports. Recent statements by Ambassador Morningstar suggesting that the U.S. administration would accept any economically viable pipeline could indicate waning U.S. interest in the Nabucco project. In addition, given the interest in combating climate change both in Europe and in some quarters of the United States, many analysts believe that having Caspian natural gas go to China instead, where a pipeline already exists, could help that country decrease its carbon dioxide and other greenhouse gas emissions by, for instance, limiting its 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. Libya is preparing for elections in June 2012 to replace the interim government in place since Muammar al Qadhafi's government was toppled in 2011. The type and character of the new governments will have an impact on natural gas development in each country as the energy sectors in each country appear to offer the fastest potential source of economic growth and income for the new governments. 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-governmental organizations and their respective parliaments. And both the 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 have 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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