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

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Summary

As a major energy consumer, Europe faces a number of challenges in addressing future energy needs. Among these challenges are rapidly rising global demand and competition for energy resources from countries such as China and India, tensions with Russia, persistent instability in the Middle East, a fragmented internal European energy market, and a growing need to shift fuels in keeping with European climate change policy. As a result, energy supply security has become a key concern for European governments 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, even though in recent years natural gas use has declined. Europe as a whole is a major importer of natural gas. Russia remains one of Europe's most important natural gas suppliers, regaining the top spot as Europe's biggest natural gas supplier in 2014. 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 from Russia. 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 increase its influence with 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, in parts of Europe.

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. 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 enough 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 obstacles to those suppliers becoming credible, long-term providers. The report looks at North Africa, potentially the most realistic supply alternative in the near term, but notes that the region faces political, economic, and security instability and problems in the internal structure of the natural gas industry. Central Asia, which may have the greatest amounts of natural gas of any of the alternatives to Russia, 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 28 member-state European Union (EU) has been a major natural gas consumer and importer for decades. As Europe's natural gas production has declined in recent years, its vulnerability to imported natural gas has increased. This has left it more dependent as a whole on its main supplier, Russia, which has shown an 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. Ongoing Russian aggression in Ukraine has not resulted in a cutoff of natural gas supplies to Europe, but has nevertheless revived questions about Russian reliability.

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. A key EU response in this regard has been the so-called Southern strategy or 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 the Trans Adriatic Pipeline (TAP), which goes from the Turkish border through Greece and Albania, and ends in Italy. A second aspect of Europe's energy security policies involves Europe's own fragmented internal energy market. In 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. These goals were reinforced in early 2015, with the adoption of a proposal for a new EU "Energy Union" (discussed below). 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.

Although European countries have generally supported the goal of supply diversification, some governments have continued to enhance energy ties with Russia, including by seeking to develop new supply routes that bypass countries such as Ukraine. At various times, U.S. policymakers and critics of Russian energy policy have argued that such actions could undermine development of a unified European diversification strategy. A key enhancement of European-Russian energy ties was the construction of the Nord Stream pipeline, which directly connects Russia and Germany, Russia's largest importer. Russia has also announced the Turkish Stream pipeline, across the Black Sea, connecting Russia to Turkey at its border with Europe. The stated goal of Turkish Stream is to supply natural gas to Europe, not Turkey. 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 in 2012 and the proposal for Turkish 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 energy 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. Gazprom and a consortium of European companies, including E.ON of Germany, Shell, OMV of Austria, BASF/Wintershall of Germany, and Engie of France, have proposed an expansion of Nord Stream.

Despite its 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:

- North Africa's large gas supplies could pose a credible partial alternative to Russian natural gas supplies. However, political upheaval has heightened uncertainty about the viability of needed investments and the reliability of supplies. Both Libya and Egypt have large natural gas reserves, but production and exports have been hampered by domestic policies and unrest, and while Egypt has just made a new large natural gas discovery, it began importing LNG in 2015 to meet domestic needs.[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 must 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 caused 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 2014, LNG comprised almost 12% of the EU's natural gas imports and 11% 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, e.g., Lithuania, which opened its LNG import terminal at the end of 2014. In addition to LNG

[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] Ehab Farouk, "Egypt to Begin LNG Imports as Floating Terminal Arrives," Reuters, April 2, 2015.

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

import terminals, the EU could benefit from strategically located 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] The United States is to begin exporting liquefied natural gas (LNG) from the lower-48 states at the end of 2015. The Sabine Pass Liquefaction project, which is located in Cameron Parish, LA, and owned by Houston-based Cheniere Energy, is scheduled to begin operations in December 2015. Contracts for initial production have been signed for capacity at the terminal with BG Group (based in the United Kingdom but now owned by Royal Dutch Shell), Gas Natural Fenoso (Spain), KOGAS (South Korea), and GAIL (India), with future capacity contracted with Total (France) and Centrica (United Kingdom). Although contracts have been signed with European companies, there is a likelihood that most of those exports will head to Asia, which tends to pay the highest prices for LNG. Additionally, U.S. LNG contracts do not include an oil-indexed formula, which could pressure 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 encouraging EU market reforms.

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 and opposed the use of energy as a political weapon.[6]

The progress of the TANAP project along with the selection of TAP has improved the chances of Caspian natural gas flowing to Europe in significant quantities. Both TAP and Nabucco West were designed to 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 Southern Corridor that provides gas to the most vulnerable countries in Europe and that includes concrete, written

[4] For additional information see CRS Report R42074, *U.S. Natural Gas Exports: New Opportunities, Uncertain Outcomes*, by Michael Ratner et al.

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

[6] Matthew Lee, "Kerry: Energy Should Not Be Used as a Weapon," *Associated Press*, April 2, 2014, http://www.pbs.org/newshour/rundown/kerry-energy-used-weapon/.

guarantees that the pipeline will be expanded as more gas becomes available."[7] The three projects mentioned above are all viewed as scalable as supply and demand changes. 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.

Although U.S. and EU officials have welcomed TAP as an alternative to Russian natural gas, some analysts continue to express concern about Russian influence. Observers note, for example, that Russian companies have shown interest in Greece's natural gas sector and that Italy and Russia historically have close ties on energy issues. In June 2013, Greek officials reportedly were surprised to learn that Gazprom would not submit a bid to purchase Greece's state-owned natural gas supplier, DEPA. The proposed sale, potentially worth above €900 million ($1.17 billion), was a priority for then-Prime Minister Antonis Samaras, who had negotiated directly with Gazprom CEO Alexey Miller. Some speculate that Gazprom's unexpected decision not to go through with the deal could have been the result of opposition from the European Commission.[8] Regardless of the outcome of negotiations with Russia, the TAP project, which former Prime Minister Samaras claimed will bring €1.5 billion (about $1.9 billion) in direct investment and at least 2,000 jobs to Greece over the next several years, remains a cornerstone of Greek economic development plans.[9]

The Arab Spring brought regime change and turmoil 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 stability and the policies of the evolving governments. Libya is far from being settled, while Egypt announced its first major natural gas discovery in years. 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 to 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."[10] Some Members of Congress have also expressed interest in deeper trade and investment ties with Arab Spring countries.[11] 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.[12] Aside from security, market competitiveness may limit the potential for such investments. In the past, international energy companies seeking to invest in North African

[7] 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.

[8] See, for example, Helena Smith, "Greek Gas Supplier Selloff Fails to Draw Gazprom Bid," *The Guardian*, June 10, 2013, online edition.

[9] "PM Hails Choice of TAP As 'Putting Greece on Pipeline Map,'" *ekathimerini.com*, June 28, 2013, online edition.

[10] 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.

[11] See, for example, 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.

[12] For additional 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.

markets have faced what they have considered non-competitive pricing offers from local governments.

Europe's Energy Dependence

Ongoing Russian aggression in Ukraine, including episodic cutoffs of natural gas supplies to Ukraine, has heightened attention on Europe's dependence on Russian energy resources. Many analysts assert that this dependence has been and will continue to be a key factor in constraining Europe's policy responses to Russia's actions. Some observers note, for example, that the EU has not imposed sanctions against Russia's natural gas companies.[13] As the crisis in Ukraine continues, European leaders have renewed their focus on long-standing efforts to diversify energy supplies and to enhance pipeline and electricity interconnections within the EU.

Collectively, EU member states are the world's largest energy importer, importing about 53% of their energy needs—including approximately 88% of their oil and 66% of their natural gas. Given declining domestic fossil fuel production, Europe's dependence on energy imports is expected to increase over the foreseeable future.[14] Russia is Europe's main energy supplier. In 2014, about 40% of the EU's natural gas imports and almost 30% of its oil imports came from Russia. Other key energy suppliers to the EU include non-EU member Norway (35% of natural gas imports and 12% of oil imports), Algeria (11% of natural gas imports), and Saudi Arabia (8% of oil imports).[15] See **Figure 1** for more detail on natural gas imports.

Europe's dependence on natural gas imports, especially from Russia, is a particular concern and a focal point of diversification efforts. Unlike oil imports, 90% of which arrive in Europe by sea, the vast majority of natural gas imports are transported via pipeline. This significantly limits European countries' flexibility to change suppliers or supply routes. In addition, EU member states may increasingly rely on natural gas, particularly to reach ambitious targets to reduce carbon dioxide and greenhouse gas emissions. Natural gas comprises about 23% of the EU's primary energy consumption, a number that is expected to grow to almost 30% by 2030. Gas imports from outside the EU currently account for almost 70% of gas consumed in the EU. Analysts note that policy decisions, such as a German decision to 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.

The extent of individual EU member states' dependence on Russian energy resources varies greatly. (See **Figure 2**.) Seven member states depend on Russia for all of their gas imports; three of those rely on natural gas for at least a quarter of their total energy needs. Other states, such as Germany and Italy, receive almost 40% of their gas imports from Russia. At the same time, however, some EU members do not rely on Russian gas at all, and other EU member states are far less dependent on natural gas, in general.

Russian involvement in the European energy sector goes beyond its role as an energy supplier. Russian energy companies and their subsidiaries have significant ownership stakes in European energy infrastructure, including pipelines, distribution, and storage facilities. Given complicated

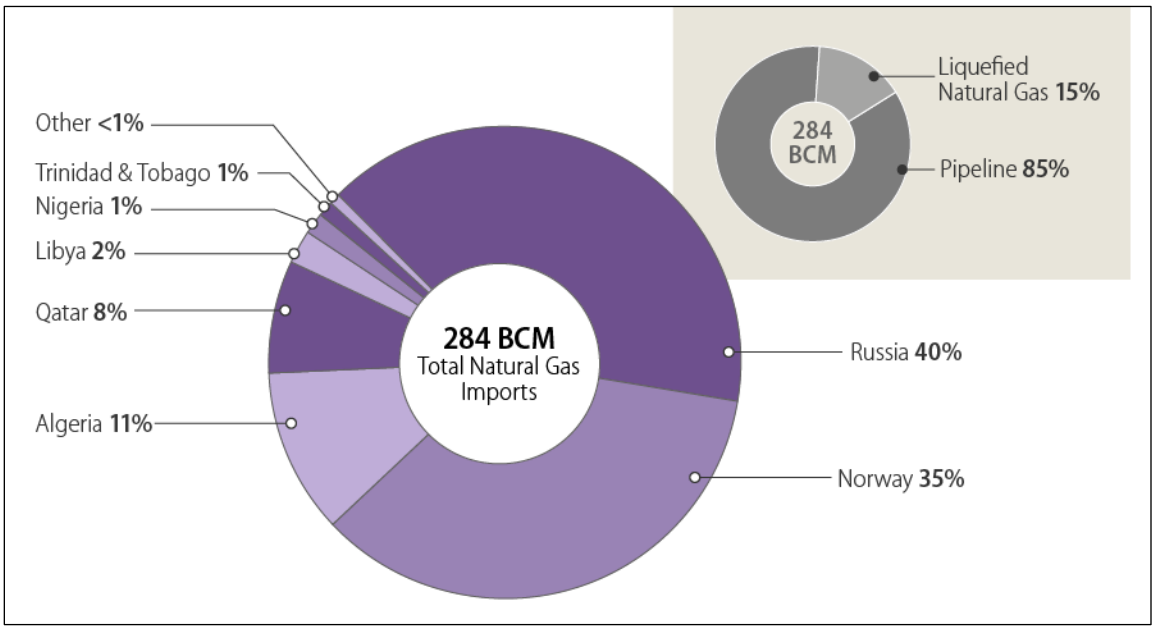
[13] European Union, *Consolidated List of Persons, Groups and Entities Subject to EU Financial Sanctions*, August 10, 2015, http://eeas.europa.eu/cfsp/sanctions/consol-list/index_en.htm.

[14] Between 1995 and 2012, natural gas production in the EU decreased by 30%, oil production by 56%, and production of solid fuels such as coal by 40%. European Commission Memo, *Questions and Answers on Security of Energy Supply in the EU*, May 28, 2014.

[15] Data in this paragraph from: European Commission, https://ec.europa.eu/energy/en/statistics/eu-crude-oil-imports and Cedigaz Statistical Database, http://www.cedigaz.org.

ownership structures and subsidiary arrangements, the extent of Russian involvement is difficult to quantify, however most analysts agree that Russian efforts to increase investments in European energy infrastructure have been quite successful. According to a 2014 study commissioned by members of the European Parliament, state-controlled Russian energy company Gazprom controls large and even majority shares of energy trading, distribution, pipeline, and storage facilities in many Central and Eastern European countries, and has significant stakes in facilities in Western European countries, including Germany, Austria, and the UK.[16]

Figure 1. 2014 EU Natural Gas Imports



Source: Cedigaz Statistical Database, http://www.cedigaz.org.

Notes: The percentages do not include trade from one EU country to another. Units are billion cubic meters (BCM).

European Response: Toward a European Energy Union?

In Europe, energy policy has traditionally been a strongly guarded competence of national governments, with individual EU member states making their own decisions on national energy mix, energy suppliers, and supply contracts. Accordingly, energy import levels and reliance on energy sources vary significantly by country.[17] (See **Table 1**.) In a reflection of these national differences, the EU has generally 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, over the past decade EU member states have begun to increase cooperation toward a unified EU energy policy.

In March 2015, EU member state governments endorsed key elements of a European Commission proposal for a so-called European Energy Union. The European Parliament followed

[16] See Deutsches Institut für Wirtschaftsforschung, *European Natural Gas Infrastructure: The Role of Gazprom in European Natural Gas Supplies*, Spring 2014.

[17] For example, while some member states, such as France, rely greatly on nuclear energy, others, such as Germany, have committed to phasing out nuclear energy. France has also prohibited hydraulic fracturing for shale gas production, while Poland has aggressively tried to develop its shale gas resources.

suit in mid-June, voting in favor of most aspects of the Commission proposal. The proposed energy union focuses on five core dimensions:

- Energy security and solidarity;
- An integrated European energy market;
- Energy efficiency;
- "Decarbonizing" the economy; and
- Research, innovation, and competitiveness.

Some analysts are hopeful that the proposed energy union is another step toward bolstering European energy security through increased cooperation. Others remain skeptical, however. They point out that many of the policies proposed in the new energy strategy have been proposed and endorsed at various times over the past 15 years, but have never been fully implemented. A top European Commission priority is to fully implement existing EU energy legislation. Critics question whether member states will demonstrate the political will to realize past commitments, let alone forge new levels of cooperation.

Supply Diversification—Small Steps Away from Russia

The EU has been particularly challenged to reduce its dependence on Russian resources. Analysts agree that Europe has few if any alternatives to replace gas flows from Russia in the short-term. Over the medium- to long-term, Europe could accelerate ongoing efforts to further develop pipelines from the Caspian region that bypass Russia, as well as explore the possibility of additional energy sources in Europe such as in the eastern Mediterranean. European countries could seek to boost LNG imports from North Africa, the Persian Gulf, or even the United States. EU member states could also enhance efforts to develop new domestic energy sources, such as shale gas and renewable energy.

Many analysts believe that, regardless of the aforementioned efforts, Russia will continue to exercise significant influence over Europe's energy security. They note, for example, that 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. Further, bilateral deals with Russia have not been limited to the major energy consumers. Bulgaria, Romania, Hungary, Greece, and others have also entered into long-term energy agreements with Gazprom over the past several years. For Germany and several others, Russia's role as a dominant energy supplier has, at least until recently, increased the importance of fostering good relations with Moscow.

On the other hand, as Europe's relations with Russia continue to sour, European countries have also become more inclined to question Russia's reliability and have increasingly pressured one another to curb energy ties with Moscow. Mounting tensions were evident in European responses to Russia's abrupt announcement in December 2014 that it was canceling its proposed South Stream gas pipeline. Those EU members that had committed to the project were dismayed by the loss of a key anticipated supply source and by the lack of prior communication from Russia on the cancellation. Opponents of the project were encouraged that Moscow was apparently bowing to European pressure to reduce Gazprom's control over supply and distribution networks. Prior to the project's cancellation, EU officials had threatened to block construction of the pipeline unless Gazprom opened up at least half of the pipeline's capacity to other suppliers. South Stream would have run across the Black Sea through Bulgaria, Serbia, and Hungary to Austria.

Table 1. EU Natural Gas Data, 2014

Units = 1 billion cubic meters (BCM)

	Natural Gas Consumption	Natural Gas Production	Natural Gas Imports[a]
Austria	9.04	1.24	7.80
Belgium	16.54	0.00	29.79
Bulgaria	2.75	0.15	2.60
Croatia	2.40	1.36	1.04
Cyprus	0.00	0.00	0.00
Czech Republic	8.19	0.24	7.95
Denmark	3.15	4.61	0.63
Estonia	0.38	0.00	0.38
Finland	2.91	0.00	2.91
France	39.44	0.01	44.24
Germany	80.70	9.15	92.55
Greece	2.77	0.00	2.77
Hungary	8.81	1.71	7.10
Ireland	4.86	0.37	4.49
Italy	61.66	6.99	54.91
Latvia	0.94	0.00	0.94
Lithuania	2.49	0.00	2.49
Luxembourg	0.90	0.00	0.90
Malta	0.00	0.00	0.00
Netherlands	35.30	69.58	17.24
Poland	14.90	4.15	12.00
Portugal	4.14	0.00	4.44
Romania	11.00	10.50	0.50
Slovakia	4.22	0.10	4.12
Slovenia	0.40	0.00	0.40
Spain	27.69	0.04	32.56
Sweden	1.00	0.00	1.00
United Kingdom	67.72	34.85	43.51
TOTAL	**414.30**	**145.05**	**379.26**

Sources: Cedigaz, Statistical Database, http://www.cedigaz.org.

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.

Integrating Europe's Internal Energy Market

A key component of the EU's energy strategy has been to liberalize and better integrate the European energy market. The European Commission and a range of analysts have long contended that strong state control over national energy sectors has prevented development of a more competitive European energy market, leaving some member states more vulnerable to manipulation by dominant energy suppliers. Until recently, analysts questioned whether the EU would be willing to pressure Russia and Gazprom to adopt EU principles of competition. However, over the past several years, member states have begun to demonstrate a clearer commitment to implementing market regulations that would reduce Russian influence over the energy sector.

In late 2014 the European Commission formally charged Gazprom with violating EU antitrust law by manipulating energy prices and deliberately limiting supplies to some customers. Gazprom submitted its proposal to the EU for settling the claims against it in September 2015. Gazprom could face financial penalties of up to $9 billion and be forced to restructure its supply contracts, according to the EU case against the company. In addition, other EU energy directives could force Gazprom to sell some of its significant shares in European pipelines. The EU's so-called Third Energy Package requires energy producers to limit their stakes in distribution networks, or manage them separately. EU member states had previously committed to fully implementing the Energy Package, including the break-up of production and distribution cartels, by the end of 2014. However, that target date was not met, and some analysts still question how committed all EU member states are to continue to pressure their primary energy supplier.

Another key element of the EU's market liberalization efforts is enhancing the inter-connectedness of European gas pipelines and electricity grids. In recent years, the EU has prioritized developing pipeline and electric grid interconnections in order to allow European countries to share energy resources, particularly in the event of supply reductions that adversely affect some member states. Observers note, however, that while some progress has been made, efforts are far from complete, as evidenced by the difficulty in transporting Norwegian gas and LNG imports to Southern and Eastern Europe. In its proposed Energy Security strategy, the European Commission calls on member states to adopt a goal of linking up 15% of existing EU electricity capacity by 2030, in addition to meeting a previously adopted target of 10% by 2020.

Russia's Role[18]

The Russian natural gas industry is one of the most important in the global energy market. As of 2014, Russia had the largest natural gas reserves in the world, about 25% of the world's total according to data from research firm Cedigaz. The country 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).

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

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, the United Arab Emirates, and Venezuela—control 38% of world production and 40% of global trade.[19] 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, and the United States (the world's leading natural gas producer).

As noted, Russia is currently the dominant supplier of natural gas to Europe, accounting for about 27% of the EU's natural gas supplies in 2014 according to Eurogas, or 47% of pipeline imports (excluding LNG) according to Cedigaz data.[20] (See **Figure 2**.) This dependency does not go only in one direction, however. The EU is also the most important market for Russian natural gas exports (63% of the total), a calculation Moscow likely takes into account in its broader relationship with EU countries.

In addition to the EU, Russia exports significant volumes of gas via pipeline to the Commonwealth of Independent States (CIS),[21] some of which Russia has accused of being unreliable counterparties.[22] Russia has also been attacked as an allegedly "unreliable partner" in the gas trade by some of these same countries.[23] The remainder of Russian pipeline exports goes to Turkey and other non-EU countries in Europe. Russia's LNG goes exclusively to East Asia (mostly Japan).[24]

[19] Data compiled by CRS from Cedigaz dataset published September 2014.

[20] *Eurogas Statistical Report 2014*, Eurogas, December 2014, http://www.eurogas.org/uploads/media/Eurogas_Statistical_Report_2014.pdf.

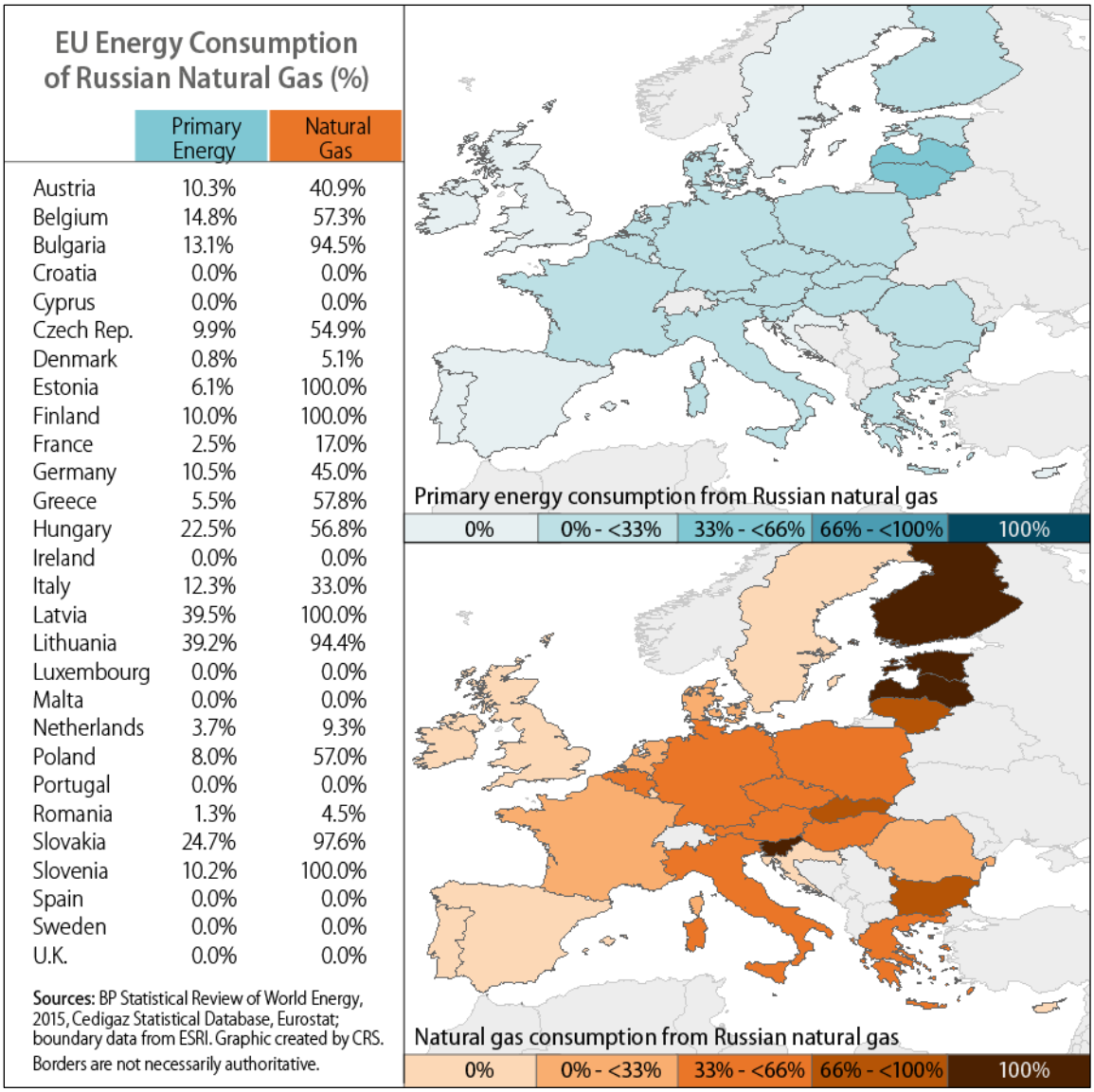
[21] The Commonwealth of Independent States (CIS) includes Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, and Uzbekistan with Turkmenistan and Ukraine having unofficial status. Georgia withdrew from the CIS in 2009.

[22] "Cold Self-Interest," *Economist*, October 31, 2014, http://www.economist.com/blogs/easternapproaches/2014/10/ukraine-russia-gas-deal.

[23] "Turkmenistan Blasts Russia as "Unreliable" Gas Partner," Chris Rickleton, *Eurasianet*, February 17, 2015, http://www.eurasianet.org/node/72121.

[24] 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, 2014



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 50% 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, which has very close links with top Russian leaders. Current Gazprom CEO Alexey Miller served under Vladimir Putin in the Saint Petersburg city government in the 1990s.

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 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. Although proposals to strip away subsidies have been floated in recent years, they appear to be going nowhere. The late 2014 drop in energy prices, coupled with

Russia's economic woes and currency collapse, have only increased demands for state subsidies. Russia's sovereign wealth fund was tapped in December 2014 to provide a $700 million bailout for Gazprom's financial arm,[25] and as of March 2015 Gazprom had requested an additional $3.2 billion.[26]

Despite the problems currently facing the gas industry in Russia, 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 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."[27]

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. More than half of its 2014 exports are contracted with European companies through 2030 (see **Figure 3**). Russia opened its first LNG export facility in 2009 on its east coast, and already exports small amounts to Japan, South Korea, and Taiwan.

Long-standing Russian hopes of providing large amounts of pipeline gas to China appeared to take a step forward with an agreement for Russia to provide 37 BCM per year, over the course of 30 years.[28] In November 2014, the two sides signed a framework deal for a second pipeline that would supply an additional 31 BCM per year. The implementation of the deals may be affected by the sharp drop in oil prices on which the gas prices will be based, however.

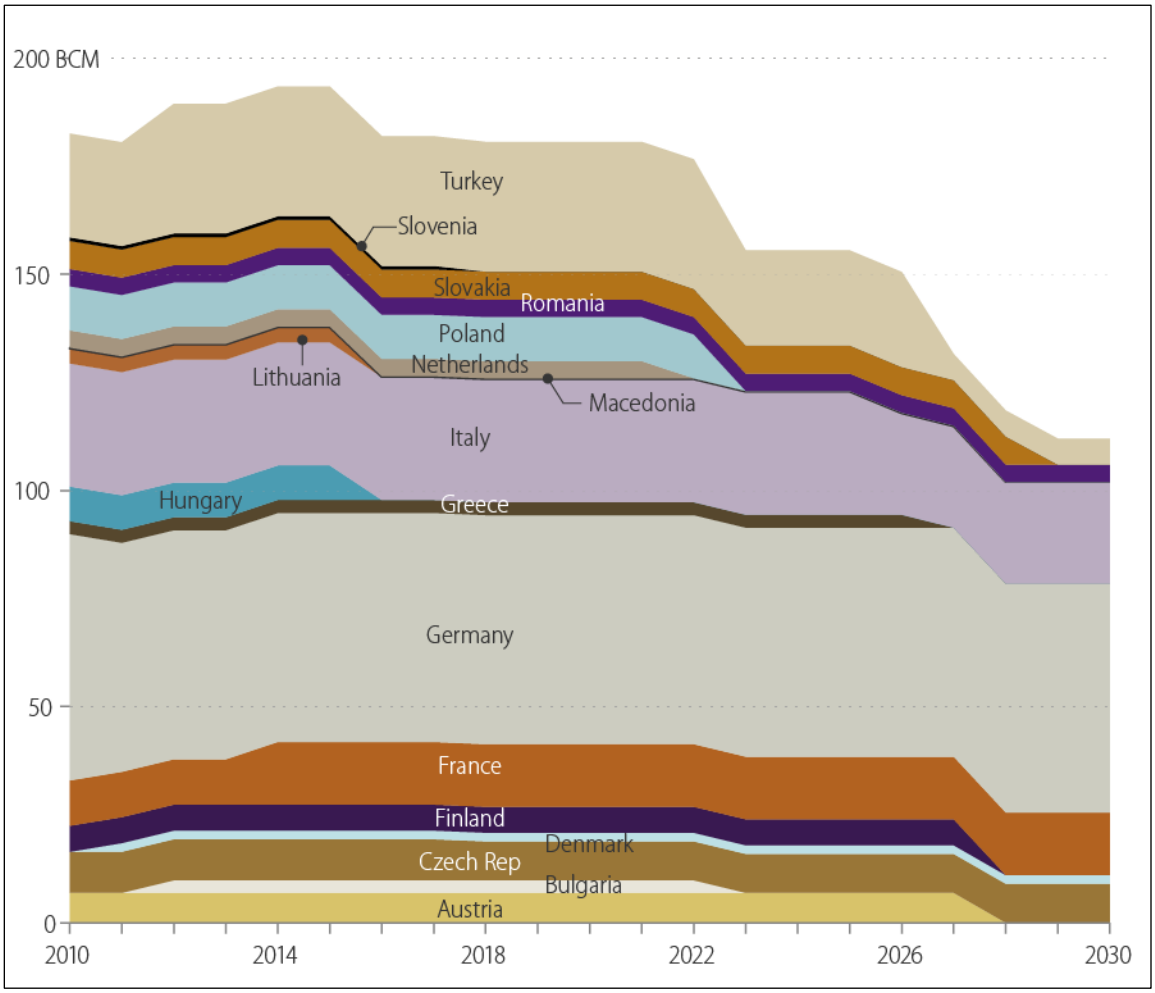
[25] James Marson, "Russia Adds Gazprombank to Its Bank Bailouts," *Wall Street Journal*, December 31, 2014, http://www.wsj.com/articles/russia-adds-gazprombank-to-its-bank-bailouts-1420050602.

[26] Andrew Kramer, "Russia's Well for Corporate Bailouts Appears to Be Running Dry," *New York Times*, March 9, 2015, http://www.nytimes.com/2015/03/10/business/dealbook/in-russia-the-well-for-corporate-bailouts-might-run-dry.html.

[27] 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.

[28] Nadezhda Sladkova, Vitaly Sokolov, and Dawn Lee, "Russia, China Sign Strategic Gas Supply Deal," *Oil Daily*, May 22, 2014, online.

Figure 3. Russian Contract Volumes for EU and Other European Countries
2010-2030



Source: Cedigaz, Long-Term Gas and LNG Supply Database, Pipelines in Europe, updated June 2014, http://www.cedigaz.org.

Notes: Units = billion cubic meters (BCM)

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. Additionally, 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, Ukraine, and Europe's Search for Alternatives

For the past decade, Europe's gas supplies have to some extent been held hostage to problems in relations between Russia and Ukraine. The election of a pro-Western government in Ukraine in 2005 led Moscow to take a harder line with Kyiv on many issues, including gas supply, debts, and pricing. Disputes on these issues led to brief cutoffs of gas supplies to Europe in 2006 and 2009,

as Russia cut off supplies to Ukraine and Ukraine responded by taking gas from the pipelines that Russia had intended to go to Europe via Ukraine.

Russia and some Western European countries responded to these incidents by planning new pipeline projects to bypass Ukraine and Belarus (which plays a considerably smaller role in gas transit to Europe and has better relations with Moscow). One result of these efforts is the Nord Stream pipeline system, which transports natural gas directly from Russia to Germany under the Baltic Sea. It currently has a capacity of almost 57 BCM per year, as compared to the Ukrainian pipeline system's 110-130 BCM per year.

Before Nord Stream opened in 2011, as much as 80% of Europe's gas imports from Russia transited Ukraine. Currently, Ukraine's share of the gas transit is only about 50%. In June 2015, Gazprom reached agreement with Anglo-Dutch Shell, Germany's E.ON and BASF/Wintershall, France's Engie, and Austria's OMV to build a third and fourth pipeline as part of Nord Stream by 2020. If built, the pipelines would add 55 BCM a year in transit capacity to the system. The announcement was strongly criticized by Ukraine, Slovakia, and Poland, whose own gas transit infrastructure risks being bypassed by the deal.[29]

South Stream was another pipeline project touted by Moscow to circumvent Ukraine. It was to run under the Black Sea to Bulgaria and then on to other European countries. Russia broke ground on South Stream in December 2012, but the project was scrapped by Moscow in late 2014.

Russia's current pipeline project to replace South Stream is Turkish Stream, which is intended to provide gas to Europe through Turkey and Greece.[30] In early 2015, Gazprom announced that all gas currently flowing through Ukraine would be diverted to Turkish Stream after its completion, currently scheduled for 2019.[31] However, Turkish Stream's prospects are also unclear, due to complicated political and financial dynamics that similarly stymied South Stream.[32] Russian military action in Syria and reported incursions into Turkish airspace as of early October 2015 could exacerbate these complications.[33]

After a popular revolt against the regime of Viktor Yanukovych in Ukraine and the victory of pro-Western forces in February 2014, Russia invaded and annexed Ukraine's Crimean peninsula and seized parts of eastern Ukraine. Given the experience of 2006 and 2009, one might have expected another European gas crisis. However, this has not yet occurred. Russia cut off gas supplies to Ukraine in June 2014, due to pricing and payment disputes. Nonetheless, Ukraine has continued to allow Russian supplies to transit its territory. One reason for this may be Europe's diversification efforts. Another is Ukraine's desire to not alienate European countries whose help Kyiv needs to stabilize its economy and negotiate an end to Russia's aggression against Ukraine.

In October 2014, the EU brokered an agreement between Gazprom and Ukraine that permitted the resumption of supplies to Ukraine through March 2015. This deal was subsequently extended

[29] Denis Pinchuk, "Gazprom Mothballs Extension of Nord Stream Pipeline," *Reuters*, January 28, 2015, http://www.reuters.com/article/2015/01/28/russia-gazprom-nordstream-idUSL6N0V71HO20150128.

[30] "A Twist in the Pipeline," *Economist*, April 14, 2015, http://www.economist.com/news/europe/21647939-hungary-and-greece-are-joining-turkey-new-route-russian-gas-twist-pipeline.

[31] Elena Holodny, "Russia Just Made a Bold Move to Keep Its Gas Leverage on Europe," *Business Insider*, January 15, 2015, http://www.businessinsider.com/russia-turkey-black-sea-pipeline-2015-1; "Speculation Rife over Russia's Turkish Stream Loan to Greece," *EurActiv*, April 20, 2015, http://www.euractiv.com/sections/energy/speculation-rife-over-russias-turkish-stream-loan-greece-313910.

[32] See, e.g., Barin Kayaoglu, "Turkey Treads Carefully on New Gas Pipeline with Russia," *Al-Monitor Turkey Pulse*, August 12, 2015.

[33] Daren Butler, "Turkey's Erdogan Warns Russia on Nuclear Project, Natural Gas: Papers," *Reuters*, October 8, 2015.

for three additional months. In July 2015, Russia cut off natural gas supplies to Ukraine again after the two sides failed to agree on prices. Ukrainian officials acknowledge that while Ukraine has sufficient gas reserves for now (in part due to imports from Slovakia), it will need Russian gas this fall and winter both for its own needs and to maintain uninterrupted supplies to Europe. With the EU's help, Russia and Ukraine agreed in September 2015 on a gas deal that will run through March 2016

The conflict between Russia and Ukraine has caused both sides to declare that they will end their dependence on the other party in the gas sector. However, this will be easier said than done, and in any case cannot be done quickly, perhaps setting the scene for years of additional uncertainty for Europe over its gas supplies from Russia. As noted above, Gazprom plans to end gas transit via Ukraine after 2019, but it is unclear whether this goal is realistic. Likewise Ukraine is seeking to achieve energy independence through increased domestic gas production, diversification, and conservation within 10 years.

Other 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; and 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" out of the GECF.

Some observers have suggested that Russia attempted to influence Azerbaijan and the Shah Deniz consortium's selection at the end of June 2013 of the Trans-Adriatic Pipeline (TAP) over the competing Nabucco West pipeline, although Russia would likely have preferred neither project be built. Nabucco's planned route and terminus in Austria were partly similar to those of Russia's South Stream pipeline, so it was viewed as competing for the same markets (although the volumes of the Nabucco project would have been smaller than South Stream).

Southern Corridor: Issues and Background[34]

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. Although the Trans-Anatolia Pipeline (TANAP), with a capacity of 16 BCM, and TAP, with a capacity of 10 BCM, are significant steps in achieving this goal, the initial volumes are not great enough to significantly alter Europe's dependence on Russian natural gas. As currently envisioned, an initial pipeline network would transport less than the capacity of the originally proposed Nabucco pipeline—but European policymakers hope that TANAP will be the first of a series of expansion projects.[35]

In 2007, then-Prime Minister Kostas Karamanlis of Greece and then-Prime Minister (now President) Recep Tayyip Erdogan of Turkey inaugurated a natural gas pipeline connecting the two

[34] 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 to congressional clients upon request). 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.

[35] Qishloq Ovozi, "The European Union, the Southern Corridor, and Turkmen Gas," *Radio Free Europe/Radio Liberty*, April 23, 2015, http://www.rferl.org/content/energy-pipelines-turkmenistan-former-soviet-europe/26974648.html.

countries. Since some Azerbaijani natural gas reaches Greece, the pipeline represented the first Caspian region natural gas supplies to reach the EU.

Alternatives have also been raised that would bypass Turkey. An 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 use of LNG, as the distance across the Black Sea is relatively short—the industry norm for economic LNG transport is 1,500 miles or more.

Although the AGRI project has lain dormant for years, regional tensions spurred its revival in late 2014, at a meeting of key stakeholders in Romania.[36] In its currently planned form, the project is expected to cost about $1.3 billion to $4.9 billion, and is expected to transport between 2 BCM and 8 BCM of LNG annually from Azerbaijan to the EU.[37]

The Azerbaijan-Turkey relationship experienced deep tensions in the late 2000s over Turkey's increasingly friendly relations with Armenia—at one point, Azerbaijan's President Ilham Aliyev threatened to cut off Turkey's access to Azerbaijani gas flows.[38] However, since then there has been a rapprochement, with both nations supporting increased development of TANAP and the two major Shah Deniz gasfield projects currently in operation. TANAP's first stage, with a capacity of 16 BCM per year, is planned to be completed in 2018.

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 (TCP) to Azerbaijan, but Turkmenistan failed to commit to the pipeline following objections from Iran and Russia. Since the 1990s, attempts to launch a trans-Caspian pipeline construction project have been stymied by maritime disputes and legal hurdles imposed by Russia and Iran. Such blockades have proven difficult to overcome, but in the wake of recent summits, participating officials have been quoted as stating that these disputes are "more than 80 percent" resolved.[39]

In mid-2015, leaders in Turkmenistan, Azerbaijan, and Turkey announced a trilateral mechanism on energy issues, which would appear to open the doors to potential practical discussion of a TCP.[40] The United States and EU have for several years supported the idea of such a project.

[36] "Azerbaijan to Revive LNG Export Project to EU," *Natural Gas Europe*, December 9, 2014, http://www.naturalgaseurope.com/azerbaijan-revive-lng-export-project-eu.

[37] Original cost estimate is €1.2 to €4.5 billion, and original flow estimate is 2 to 8 BCM.

[38] Emrullah Uslu, "Ankara-Yerevan Rapprochement Strains Turkey's Relations With Azerbaijan," *Jamestown Foundation*, April 9, 2009, http://www.jamestown.org/programs/edm/single/?tx_ttnews%5Btt_news%5D=34835&cHash=be5de68ed6#.VUANvCFVhHw.

[39] "Caspian Sea's Economic Issues Resolved, Agreement Nears," *Turkish Weekly*, March 6, 2015, http://www.turkishweekly.net/news/181196/caspian-sea-39-s-economic-issues-resolved-agreement-nears.html.

[40] Zaur Shiriyev, "Turkmenistan, Turkey, and Azerbaijan: Potential for Trilateral Energy Strategy?" *Eurasia Review*, April 6, 2015, http://www.eurasiareview.com/06042015-turkmenistan-turkey-and-azerbaijan-potential-for-trilateral-energy-strategy-analysis/.

Figure 4. Select European Natural Gas Infrastructure

Source: Compiled by the Library of Congress Cartography Section.

Potential Sources of Alternative Supplies[41]

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 4**) offer possible alternatives to Russian supplies. As noted above, 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 could provide the EU with other alternative suppliers even though their ability to use LNG is currently constrained by a lack of infrastructure.

The Caspian Region and Central Asia: The Focus of U.S. Policy[42]

The Caspian region (see **Figure 5**) 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 approximately 14,700 BCM, among the largest in the world (see **Figure 6**). 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 Russia, Iran, or the Caspian Sea, where the littoral states continue to argue over the Caspian Sea's legal status.

[41] U.S. Energy Information Administration, *Technically Re coverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States*, Washington, DC, June 13, 2013, 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. Estimated global natural gas reserves have increased from about 119 trillion cubic meters (TCM) in 1994 to 187 TCM in 2014 with the advent of shale gas, and future reserves are potentially even larger. The U.S. Energy Information Administration (EIA) estimates even higher technically recoverable shale gas resources, at 204 TCM in their 2013 report. Industry data has estimated 2014 consumption worldwide at 3.4 TCM.

[42] For additional information on Central Asia see CRS Report RL33458, *Central Asia: Regional Developments and Implications for U.S. Interests*, by Jim Nichol (out of print; available from the author of this report to congressional clients upon request).

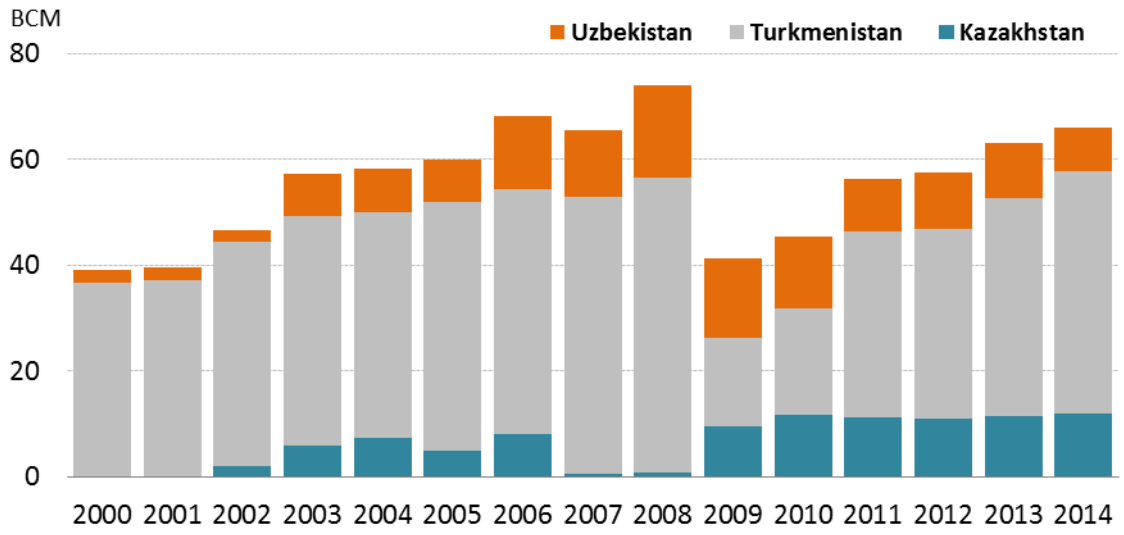
Figure 5. The Caspian Region

Source: Compiled by the Library of Congress Cartography Section.

East Asia represents an increasingly important export market for Central Asian natural gas. The 3-line Central Asia-China Pipeline runs through Turkmenistan, Kazakhstan, and Uzbekistan, and with the possible completion of a fourth line through Tajikistan, is expected to transport 85 BCM per year.[43] (See **Figure 6**.) A separate pipeline from Turkmenistan to China already exists.

Figure 6. Central Asian Natural Gas Exports

2000-2014



Source: Cedigaz Statistical Database, http://www.cedigaz.org.

Notes: The decline between 2008 and 2009 is attributed to the financial crisis. Units = billion cubic meters (BCM).

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.[44] If enough capacity is constructed to China and other parts of Asia, future supplies from Central Asia to Europe may be moot, which would benefit Russia.

Table 2. Key Central Asian Natural Gas Data, 2014

Units = billion cubic meters (BCM)

	Reserves	Production	Exports to EU
Azerbaijan	1,291	18	0[a]
Kazakhstan	1,918	20	0
Turkmenistan	9,904	80	0

[43] "Flow of Natural Gas Through Central Asia," China National Petroleum Corporation, 2015, http://www.cnpc.com.cn/en/FlowofnaturalgasfromCentralAsia/FlowofnaturalgasfromCentralAsia2.shtml.

[44] 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.

	Reserves	Production	Exports to EU
Uzbekistan	1,608	59	0
TOTAL	14,721	177	0

Source: Cedigaz Statistical Database, http://www.cedigaz.org.

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?[45]

U.S. Administrations have stated that exports from Azerbaijan could boost energy security for European consumers that currently rely heavily on Russia. According to Richard Morningstar, who served as both U.S. Special Envoy for Eurasian Energy and U.S. Ambassador to Azerbaijan, Azerbaijani natural gas "is necessary to the development of the Southern Corridor."[46] As noted previously, Azerbaijan is to supply all the natural gas for the TANAP pipeline, as a producer and, if a TCP is built, a transit state. It is considered likely that the price of the natural gas will be predominantly linked to oil prices and may not give European consumers a discount compared to other sources. It is also important to note that Azerbaijan is to supply Turkey with an additional 6 BCM of natural gas to help Turkey meet its growing natural gas demand.

The natural gas to Europe is to come from phase 2 development of Azerbaijan's Shah Deniz field 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). U.S. legislation imposing sanctions on Iran provides waivers for the Shah Deniz gas project, in which Iran's Naftiran Intertrade Company (NICO) holds a passive 10% share. NICO is to also have a 10% stake in the South Caucasus Pipeline expansion that is to connect to TANAP.[47]

At the end of 2005, Azerbaijan began sending about 200 million cubic meters (MCM) of natural gas per year through a section of Soviet-era pipeline to the Iranian border at Astara. In January 2011, Azerbaijan signed a five-year accord with Iran to supply 1 BCM of natural gas through the pipeline in 2011, with possibly increasing amounts thereafter. This gas was to be used in northern Iran, and in exchange, Iran agreed to provide some gas to the Azerbaijani exclave of Naxçivan. However, in practice, pipeline exports may be less than the countries originally had agreed upon. According to data from research firm Cedigaz, Azerbaijan only exported 37 MCM to Iran in 2013 and 14 MCM in 2014.

Kazakhstan: Natural Gas Is Second to Oil[48]

Most natural gas production in Kazakhstan has been associated with the development of oil fields, and a significant portion of extracted natural gas is reinjected into underground reservoirs

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

[46] Ambassador Richard Morningstar, Special Envoy for Eurasian Energy, *Speech to Plenary Session of Caspian Oil and Gas Conference*, Embassy of the United States of America to Azerbaijan, June 8, 2011, http://photos.state.gov/libraries/azerbaijan/366196/Press%20Releases/MorningstarCOG%20speech-ENG.pdf.

[47] For additional information on U.S. sanctions towards Iran, see CRS Report RS20871, *Iran Sanctions*, by Kenneth Katzman.

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

in order to facilitate oil extraction. This leads to a relatively low percentage of Kazakhstan's gas being ultimately sold in the regional market. Natural gas is mostly produced in areas near the Caspian Sea coast, with 46% of Kazakhstan's reserves located in the single field of Karachaganak.[49] According to industry association Cedigaz, Kazakhstan exported about 12 BCM of natural gas in 2014, up slightly from 2013.

Kazakhstan has for many years expressed its intentions to increase natural gas exports to both Russia and China. 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 running through Kazakhstan along Turkmenistan's Caspian coast.[50] However, this pipeline segment has been long-delayed, and appears to have been shelved indefinitely.[51]

At the end of October 2008, China and Kazakhstan signed a framework agreement on constructing a natural gas pipeline from Beyneu, just east of the Caspian Sea, southeastward to Shymkent, where it will connect with the Central Asia-China Pipeline. The first segment of the Beyneu-Shymkent pipeline, running 702 miles from Bozoi to the Uzbek border near Tashkent, was completed in September 2013, and construction of the second phase of the pipeline was still underway as of late 2015. In August 2015, state monopoly KazTransGas agreed to a $2.5 billion loan from the Bank of China and China Development Bank to finish pipeline construction.[52] This new link to the Central Asia-China Pipeline is projected to supply over 10 BCM from the Caspian coast to inland Kazakhstan and over 5.6 BCM to the Kazakh-Uzbek border for export to Central Asia and China.[53] Kazakhstan's government has also expressed strong interest in participating in the future TAPI pipeline from Turkmenistan to India.[54]

Some observers have suggested that Kazakhstan's joint participation in region-wide energy sector projects is due in part to its gas sector's aging infrastructure and inefficient management practices.[55] According to Cedigaz, Kazakhstan's natural gas sector sees a much higher ratio of waste than its gas-producing neighbors.[56] In late 2014, due to concerns over halted production at the Kashagan oilfield and the impact of international sanctions on the Russian economy, Kazakhstan's government began to combine several ministries to promote greater coordination within its energy sector and maintain growth. As of August 2014, a new ministry had been formed

[49] Columbia Center on Sustainable Investment, "Kazakhstan Associated Gas Utilization Study," December 2014, http://ccsi.columbia.edu/files/2014/03/Kazakhstan-APG-Utilitzation-Study-December-2014-CCSI.pdf.

[50] Isabel Gorst, "Russia Seals Caspian Gas Pipeline Deal," *Financial Times*, December 20, 2007, http://www.ft.com/intl/cms/s/0/674201a6-aefe-11dc-880f-0000779fd2ac.html.

[51] Gazprom, "Central Asia-Center," 2014, http://www.gazprom.com/about/production/projects/pipelines/central-asia/.

[52] Dmitry Solovyou, "Kazakh Gas Pipeline Operator Gets $2.5 Billion Loan from Chinese Banks," *Reuters*, August 19, 2015, http://www.reuters.com/article/2015/08/19/kaztransgas-loan-idUSL5N10U36D20150819#miQ93IXqxqwGXsmU.97.

[53] Beineu-Shymkent Pipeline, "About the Company," 2013, http://bsgp.kz/eng/sections/about_us.

[54] Daniel Graeber, United Press International, "Kazakhstan Keen on TAPI Gas Pipeline," December 3, 2014, http://www.upi.com/Business_News/Energy-Resources/2014/12/03/Kazakhstan-keen-on-TAPI-gas-pipeline/1741417604335/.

[55] Antonio Gómez, César Dopazo, Norberto Fueyo, "The Causes of the High Energy Intensity of the Kazakh Economy: A Characterization of Its Energy System," *Energy*, May 28, 2014, http://elrond.cps.unizar.es/dopazo/sites/default/files/pdf/Refereed%20Journals%20CD/89Energy.pdf.

[56] See graph of "Recorded waste," comprising flaring, venting, and shrinkage in billion cubic meters (bcm), divided by gross production in bcm. Note that the waste measured in the graph does not include Cedigaz's estimates of reinjection, which made up about one-third of Kazakhstan's gross production in 2013.

from the previously existing Oil and Gas Ministry, the Industry and New Technologies Ministry, and the Environmental Protection Ministry.[57]

Turkmenistan: Top Regional Natural Gas Producer[58]

As shown in **Table 2**, Turkmenistan is considered to hold the largest proved reserves of natural gas in Central Asia. A significant quantity of Turkmenistan's gas production already flows to Europe via Russia. However, Turkmenistan's drive for alternative export routes has pitted it against other Caspian countries. In the wake of the Ukraine crisis and renewed sense of unease over its energy dependence on Russia, the EU also has an incentive to encourage alternate routes for Turkmen gas.

Since September 2011, the EU, Azerbaijan, and Turkmenistan have been engaged in talks on building a Trans-Caspian Pipeline to provide gas to Europe via Turkey. Plans have faltered in recent years; a 2016 meeting in Kazakhstan may provide the regional consensus needed to move the project forward. In the past, Russia and Iran have strongly opposed the building of trans-Caspian pipelines, claiming that their opposition stems from concern over environmental impacts.[59]

Although negotiations over Caspian access rights have stretched on since the end of the Soviet Union, recent signs suggest that the five coastal countries' long-standing disagreements may finally be nearing resolution. At a September 2014 summit in Astrakhan, Russia, all five coastal countries agreed not to allow foreign military forces access to the Caspian.[60] In March 2015 in Baku, Azerbaijan, they reached agreement on surface rights in the Caspian.[61] Azerbaijan's deputy foreign minister Khalaf Khalafov said after the meeting that a final agreement was "more than 80 percent" complete, and predicted that all outstanding issues would likely be resolved at the 2016 Caspian Summit in Astana, Kazakhstan.[62]

Russia was at one point a major importer of Turkmenistan's gas. However, several factors have led to a decrease in Russian gas imports: the global recession's effect on EU demand, a major 2009 pipeline explosion, and an argument over pricing in 2010.[63] The 2009 explosion in particular led to displeasure on both sides, as Turkmenistan blamed the explosion on Gazprom's alleged mismanagement and sought to attract media attention to the issue in the hopes of getting Russia to foot the bill for repairs.[64]

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[57] Dmitry Solovyov, "Kazakhstan Creates Giant Energy Ministry as Economy Falters," *Reuters*, August 6, 2014: http://www.reuters.com/article/2014/08/06/oil-kazakhstan-idUSL6N0QC2AB20140806.

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

[59] Aygun Badalova, "Will Trans-Caspian Pipeline Project Move Forward?" *Trend*, September 30, 2014, http://en.trend.az/business/energy/2317431.html.

[60] Jacopo Dettoni, "Russia and Iran Lock NATO Out of Caspian Sea," *The Diplomat*, October 1, 2014, http://thediplomat.com/2014/10/russia-and-iran-lock-nato-out-of-caspian-sea/.

[61] Ovunc Kutlu, "Caspian Sea's Surface Rights Resolved, Agreement Nears," *AA Energy News Terminal*, March 5, 2015: http://aaenergyterminal.com/newsRegion.php?newsid=4706198.

[62] John C.K. Daly, "Turkmenistan Opens Up to International Oil Companies," *Silk Road Reporters*, March 15, 2015, http://www.silkroadreporters.com/2015/03/15/turkmenistan-opens-up-to-international-oil-companies/.

[63] Vladimir Soldatkin, "Russia, Turkmenistan Extend Caspian Gas Link Freeze-Paper," *Reuters*, October 23, 2010, http://uk.reuters.com/article/2010/10/23/russia-turkmenistan-pipeline-idUKLDE69M02I20101023; Lyubov Pronina, "Turkmenistan May Seek Damages After Gas Pipeline Explosion," *Bloomberg*, April 13, 2009, http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aiRn.kxtjkxI.

[64] David Trilling, "Turkmenistan: Pipeline Spat with the Kremlin Turns into a Political Test of Strength,"

The rise of Chinese demand has also been a key factor in diverting Turkmen hydrocarbons from Russia, and the vast bulk of gas now flows to China via the Central Asia-China Pipeline. Turkmenistan has played a critical role in helping China to meet rapidly increasing energy demand while minimizing greenhouse gas emissions. Some analysts have suggested Turkmenistan is moving towards a "one-country policy" in its energy sector, raising the possibility of Chinese monopsony over local gas output.[65]

Between 1997 and 2010, Turkmenistan and Iran opened two cross-border pipelines, increasing Turkmenistan's export capacity to the point that for a brief period during 2009, Iran was its main gas customer. However, it appears that this long-running bilateral trade relationship may be about to end. In August 2014, the Oil Minister of Iran declared that his country no longer had any market-driven need for Turkmen gas, and was importing it mainly due to political concerns.[66]

Turkmen President Berdimuhamedov has also revived his predecessor's proposal to build a natural gas pipeline through Afghanistan to Pakistan and India (TAPI). The project is still being development and has not begun construction.

Uzbekistan: A Sleeping Natural Gas Giant?[67]

Uzbekistan mostly uses its natural gas production domestically and is self-sufficient. It has, however, used its network of Soviet-era pipelines to export some natural gas to some of its former Soviet neighbors (Russia, Kazakhstan, and Kyrgyzstan in 2013).[68] Uzbekistan appears to have sufficient gas reserves to become a potential supplier of some gas to Europe if its infrastructure is developed with western exports in mind.

Although Uzbekistan has welcomed foreign direct investment in its energy sector in recent years, firms have expressed increasing wariness about the country's political situation. In 2013, British-Canadian company Tethys Petroleum's in-country director was arrested and imprisoned, and the firm itself faces charges of corruption and theft. Since 2011, Tethys and two other major multinational energy firms have chosen to cease operations in Uzbekistan.[69]

Russian firms Gazprom and Lukoil have historically been the major foreign investors in Uzbek natural gas development and production, but the state-owned China National Petroleum Corporation (CNPC) plays an increasingly important role as well. In 2007, Uzbekistan and China signed an agreement on building a 326-mile section of the Central Asia-China Pipeline, which came into operation in mid-2008.[70] In June 2012, Uzbekistan agreed to supply China with 10 BCM of natural gas per year through the pipeline.[71] Uzbekistan's National Information Agency

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Eurasianet.org, April 14, 2009, http://www.eurasianet.org/departments/insightb/articles/eav041509.shtml.

[65] Chris Rickleton, "Is Turkmenistan's Gas Flowing Toward a One-Country Policy?" *Eurasianet.org*, August 18, 2014, http://www.eurasianet.org/node/69591.

[66] Bruce Pannier and Toymyrat Bugayev, "Is Turkmenistan Losing Iran as a Gas Customer?" *Radio Free Europe/Radio Liberty*, August 14, 2014, http://www.rferl.org/content/qishloq-ovozi-turkmenistan-iran-gas/26530894.html.

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

[68] Cedigaz, "Trends and Figures in 2013."

[69] Alexander Kim, "Political Scandal in Uzbekistan Harms Investment Climate," *Jamestown Foundation*, February 3, 2014, http://www.jamestown.org/single/?tx_ttnews%5Btt_news%5D=41908&no_cache=1#.VCst4PldVIE.

[70] "Asia Trans Gas Will Begin in 2014 Constructing the Central Asia Gas Pipeline's 4th Thread," *Oilnews KZ*, September 10, 2013, http://oilnews.kz/en/home/news/news-of-fuel-and-energy-complex-abroad/asia-trans-gas-will-begin-in-2014-constructing-the-central-asia-gas-pipeline%E2%80%99s-4th-thread/.

[71] "Uzbekistan to Start Exporting Gas to China in August," *Kyiv Post*, September 13, 2012, http://www.kyivpost.com/

reported in September 2012 that shipments had begun, but they were well below the target amount throughout 2013. According to industry group Cedigaz, Uzbek exports to China reached only a little over 400 MCM for the entire year.[72]

In an effort to expand beyond existing gas fields, a consortium composed of Uzbekneftegaz, Lukoil, the Korea National Oil Corporation, and CNPC is exploring for natural gas in the Aral Sea region.[73]

North Africa: Opportunities Amid Uncertainty

To date, U.S. energy strategy towards Europe has not focused on North Africa as a counterbalance 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 two existing suppliers to Europe in the region—Algeria and Libya—already have natural gas infrastructure to Europe by both pipeline and LNG (see **Table 3**) and hold tremendous natural gas resources and reserves that could be further developed. Egypt, a historic natural gas supplier to Europe, did not export any natural gas in 2014 because of its internal issues. Algerian and Libyan natural gas exports accounted for about 34% of what Russia supplied to the EU in 2014, most of which came from Algeria. Difficult business environments and domestic demand, prompted by subsidies for natural gas consumption, have limited development of each country's natural gas resources. Burgeoning security concerns linked to instability and terrorism emanating from northern Mali, and conflict across Libya, may constrain new and existing exploitation of energy resources in the region.

Table 3. Key North African Natural Gas Data, 2014

Units = billion cubic meters (BCM)

	Reserves	Production	Exports to EU
Algeria	4,504	83	32
Egypt	2,168	49	0
Libya	1,505	13	7
TOTAL	**8,177**	**145**	**39**

Source: Cedigaz Statistical Database, http://www.cedigaz.org.

Algeria: Security Concerns Threaten Resource Development[74]

The four-day hostage crisis that began when terrorists seized a natural gas compound with foreign (including U.S.) workers in southeastern Algeria on January 16, 2013, highlights security 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.

content/russia-and-former-soviet-union/uzbekistan-to-start-exporting-gas-to-china-in-august-312876.html.

[72] Cedigaz, "Trends and Figures in 2013."

[73] Demir Azizov, "LUKOIL Increases Investments in Hydrocarbon Exploration and Production in Uzbekistan," *Trend*, September 5, 2014, http://en.trend.az/business/energy/2308802.html.

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

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. Limited unrest linked to security force confrontations with anti-hydraulic fracturing activists has emerged in the wake of the Algerian government's December 2014 announcement that extraction using the new method would begin in some areas after pilot projects concluded.[75]

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.[76] 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.[77] Still, according to the State Department, "the 49/51 rule remains controversial but foreign investors have adapted."[78]

Algerian natural gas production and exports had been declining since 2005, when it produced over 88 BCM and exported more than 65 BCM. In 2014, Algeria produced 83 BCM—its first increase in three years—and exported 41 BCM, with 30 BCM going to the EU. In 2005, Algeria's energy minister announced ambitious plans to increase production and export, with a goal of reaching 110 BCM of production and 100 BCM 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, submarine pipeline runs directly from Algeria's Beni Saf port to Spain's Perdigal Beach. The initial capacity of the line is approximately 8 BCM 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 12 BCM Maghreb-Europe pipeline to Spain and the 6.5 BCM Trans-Mediterranean pipeline to Italy. Algeria has also announced plans to expand its LNG export capacity.

[75] Carlotta Gall, "Algeria: Violence Erupts at Protest Over Shale Gas Drilling Project," March 1, 2015.

[76] 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.

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

[78] State Department, "2013 Investment Climate Statement—Algeria," February 2013.

Egypt: New Natural Gas Discovery Bodes Well[79]

In August 2015, Italy's ENI announced that it had discovered a massive natural gas field (commonly referred to as a superfield or supergiant) off Egypt's coast, which may hold as much as 850 BCM of natural gas.[80] The discovery (named the Zohr Field) may mean that Egypt would have enough natural gas not only to cover domestic consumption for decades, but also allow it to resume and grow its exports. Egyptian natural gas exports of both pipeline gas and LNG were halted in 2015.

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. The Egyptian authorities have struggled to protect infrastructure in the demilitarized Sinai Peninsula.

Before the discovery of the Zohr Field by ENI, Egypt's production had been in decline, while demand has grown, forcing Egypt to import natural gas. Until the ENI discovery, Egypt was projected to need to import increasing volumes of natural gas.

Libya: Untapped Potential amid Ongoing Unrest[81]

The September 11, 2012, terrorist attacks on U.S. facilities in Benghazi and ongoing unrest that has seen national energy infrastructure held hostage by armed groups underscore security and stability issues in the country. Nevertheless, Libya may have the greatest potential to increase natural gas exports to Europe when it stabilizes, which may not happen for a long time. The 2011 civil war and subsequent unrest have intermittently halted natural gas production at several key locations, but some production is ongoing and holds potential for consistent resumption and expansion if political conditions stabilize.

Libya has one natural gas pipeline to Europe, Greenstream, which was closed during the 2011 unrest, as well as an LNG export terminal. Italy received all of Libya's natural gas exports in 2014, while Libya provided approximately 12% of Italy's natural gas imports. Libya did not export any LNG in 2014.

Libya's natural gas production dropped almost 90% in 2011 and remains below capacity. Barring further production over time, domestic consumption, particularly for electric power generation, could reduce Libya's exports of natural gas, which have been stable over the past decade according to EIA.[82]

Liquefied Natural Gas Imports

One of the most important developments for Europe has been the growing availability of natural gas in LNG. LNG represents almost 25% of European natural gas imports, up from 15% in 2010. Spain leads Europe in LNG imports, followed by the United Kingdom and France. However, the

[79] For additional information on current events in Egypt see CRS Report RL33003, *Egypt: Background and U.S. Relations*, by Jeremy M. Sharp.

[80] Christopher Adams, "Eni Discovers 'Supergiant' Gasfield near Egypt," *Financial Times*, August 29, 2015.

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

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

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, and Qatar. Qatar is the largest supplier of LNG to Europe, and also owns multiple LNG import terminals in Europe. Lithuania opened its LNG import facility at the end of 2014, which is considered a milestone for the country. Poland may start operations of its LNG import terminal at the end of 2015.

Table 4. EU LNG Import Capacity, 2014

	Number of Facilities	Capacity (BCM)
Belgium	1	9.0
France	3	21.7
Greece	1	5.0
Italy	3	14.7
Lithuania	1	4.0
Netherlands	1	12.0
Portugal	1	7.9
Spain	7	68.9
Sweden	2	0.8
United Kingdom	4	52.3
	24	196.3

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

Note: Capacity unit is billion cubic meters (BCM).

U.S. LNG Exports: The Gas Is to Start Flowing

The United States is to begin exporting liquefied natural gas (LNG) from the lower-48 states at the end of 2015. The Sabine Pass Liquefaction project, which is located in Cameron Parish, LA, and owned by Houston-based Cheniere Energy, is scheduled to begin operations in December 2015. Contracts for initial production have been signed for capacity at the terminal with BG Group (based in the United Kingdom but now owned by Royal Dutch Shell), Gas Natural Fenoso (Spain), KOGAS (South Korea), and GAIL (India), with future capacity contracted with Total (France) and Centrica (United Kingdom). Although contracts have been signed with European companies, there is a high likelihood that most of those exports will head to Asia, which tends to pay the highest prices for LNG.

As of August 2015, the Department of Energy (DOE) has granted final approval for the export of 103 BCM per year to countries with which the United States does not have a free trade agreement.[83] The non-FTA permit is important because South Korea is the only major importer of LNG that has an FTA with the United States. However, if the Transatlantic Trade and Investment Partnership and/or the Trans-Pacific Partnership negotiations conclude in an agreement, the signatory countries would likely be viewed as FTA countries for the purposes of U.S. natural gas exports. Contracts for the other projects that have received final DOE approval for the export of LNG to non-FTA countries include companies from France, Italy, Spain, and the United Kingdom in Europe and Australia, India, Indonesia, Japan, and South Korea in the Asia region. DOE has

[83] For reference, the United States produced approximately 723 BCM in 2014.

issued conditional approvals for 42 BCM and there are pending applications for 318 BCM to non-FTA countries.

Any volumes of LNG from the United States would benefit other markets by offering a new supplier to consuming countries. 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, most countries in those regions have not yet constructed LNG import terminals that would be needed. Lithuania opened the first LNG receiving facility in these regions in 2014, and Poland is scheduled to bring its LNG import terminal into operation later in 2015.

More Distant Alternatives

Eastern Mediterranean: A Recent Development

Natural gas discoveries in the eastern Mediterranean by Israel and Cyprus may open a new source of European natural gas. However, regulatory issues in the case of Israel and resource issues in the case of Cyprus may limit or curtail exports, particularly expensive LNG exports. The large natural gas discovery in Egypt by the Italian firm ENI may pose a more likely source of future supply to Europe as that country could resume exports more quickly than other countries could build more capacity. 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.[84]

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 U.S. 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 14 trillion cubic meters, more than 35 years of supply at current consumption levels.[85] 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

[84] For additional information on energy issues in Lebanon see CRS Report R42816, *Lebanon: Background and U.S. Policy*, by Christopher M. Blanchard, and for Turkey see CRS Report R41368, *Turkey: Background and U.S. Relations*, by Jim Zanotti.

[85] 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/.

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 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 major financial interests in maintaining Russian supplies and do not see a problem in depending so much on Russia. 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 could be how to balance these views with those of member states that are highly dependent on Russian energy and are concerned by the 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 pipelines 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, the ongoing turmoil in Libya and the evolving government in Egypt are key factors for natural gas development. 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 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 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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