



Independent Statistics & Analysis
U.S. Energy Information
Administration

Natural Gas Exports from Iran

A report required by section 505 (a) of the Iran
Threat Reduction and Syria Human Rights Act of
2012

October 2012



This report was prepared by the U.S. Energy Information Administration (EIA), the statistical and analytical agency within the U.S. Department of Energy. By law, EIA's data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government. The views in this report therefore should not be construed as representing those of the Department of Energy or other Federal agencies.

Contents

Summary	1
Background	2
Iran’s Natural Gas Sector: Production, Consumption, and Trade	2
Imports from Turkmenistan.....	5
Possible Alternatives to Imports of Iranian Gas.....	5
Turkey	6
Armenia and Azerbaijan	9
Global Impacts of Reduction in Iranian Natural Gas Exports.....	9

Summary

Iran is a relatively minor and strictly regional exporter of natural gas via pipelines to three neighboring countries – Turkey, Armenia, and Azerbaijan. Iran supplies less than 1 percent of global natural gas exports and has no current capability to export to global markets via liquefied natural gas (LNG) export terminals. Such capability is years away.

Turkey receives more than 90 percent of Iran's natural gas exports under a long-term contract. Armenia and Azerbaijan have swap arrangements with Iran that account for 6 percent and 3 percent of Iran's natural gas exports, respectively. Armenia exports electricity to Iran to compensate for the natural gas volumes it receives. Azerbaijan repays Iran for the natural gas sent to its Nakhchivan exclave by exporting similar volumes to northeastern Iran.

EIA estimates that the average revenues from Iran's natural gas exports during the period July 2011-June 2012 were approximately \$10.5 million per day, or about 5 percent of the estimated \$231 million per day in revenues from crude oil and condensates exports over the same period. In 2010, natural gas exports accounted for less than 4 percent of Iran's total export earnings while crude oil and condensates accounted for over 78 percent.

Iran imports more natural gas than it exports. Iran's imports from Turkmenistan alone exceeded its exports during the July 2011-June 2012 period. Iran, which also imports from Azerbaijan and injects natural gas to support oil production, has some ability to divert export volumes to domestic uses.

Restrictions on the imports of Iranian natural gas could reduce the bargaining power of all three importing countries with other suppliers. Impacts on the physical availability of natural gas are likely to vary. Under current and foreseeable market conditions, Turkey cannot make up for all volumes currently imported from Iran from other sources. Excess capacity on import pipelines from Russia and Azerbaijan and at its two LNG terminals has declined as overall natural gas demand has increased, and it cannot serve all areas currently receiving Iranian natural gas. Shortfalls are especially likely to occur during the winter, when demand peaks.

The Azerbaijani exclave of Nakhchivan is wholly dependent on Iranian natural gas. It faces significant challenges due to ongoing tensions between Armenia and Azerbaijan and the general disrepair of the regional natural gas infrastructure. It may be unable to replace volumes from Iran regardless of the season.

Armenia, which uses only small volumes of Iranian natural gas, could likely replace a substantial portion or all of those volumes with increased supplies from Russia via Georgia.

The disruption of Iranian natural gas exports would not be expected to have a significant effect on global natural gas markets, which differ significantly from oil markets due to the inflexible and expensive infrastructure for international trade through pipeline or LNG shipments. Most pipelines operate under long-term fixed-price contracts, effectively limiting the global spill-over from supply disruptions due to captive-market effects. Changes in the utilization of Turkey's two LNG import terminals, which have limited excess capacity, are unlikely to affect global LNG markets.

Background

This assessment of the natural gas sector in Iran, with a focus on Iran's natural gas exports, was prepared pursuant to section 505 (a) of the Iran Threat Reduction and Syria Human Rights Act of 2012 (Public Law No: 112-158). As requested, it includes: (1) an assessment of exports of natural gas from Iran; (2) an identification of the countries that purchase the most natural gas from Iran; (3) an assessment of alternative supplies of natural gas available to those countries; (4) an assessment of the impact a reduction in exports of natural gas from Iran would have on global natural gas supplies and the price of natural gas, especially in countries identified under number (2); and (5) such other information as the Administrator considers appropriate.

This report provides information to be used in preparation of a subsequent report called for under section 505 (b) of the same legislation.

Iran's Natural Gas Sector: Production, Consumption, and Trade

Over the last two decades, Iran's dry natural gas production has rapidly increased, rising from 0.9 trillion cubic feet (Tcf) in 1991 to 5.4 Tcf in 2011, and accounts for around 5 percent of the world's natural gas production.¹ Domestic consumption, also estimated at 5.4 Tcf in 2011, has kept pace. During 2009, Iran's imports of 216 billion cubic feet (Bcf) and exports of 209 Bcf were roughly balanced, but available data for July 2011 through June 2012 suggest that Iran's net imports of natural gas have increased, totaling 84 Bcf over that period.

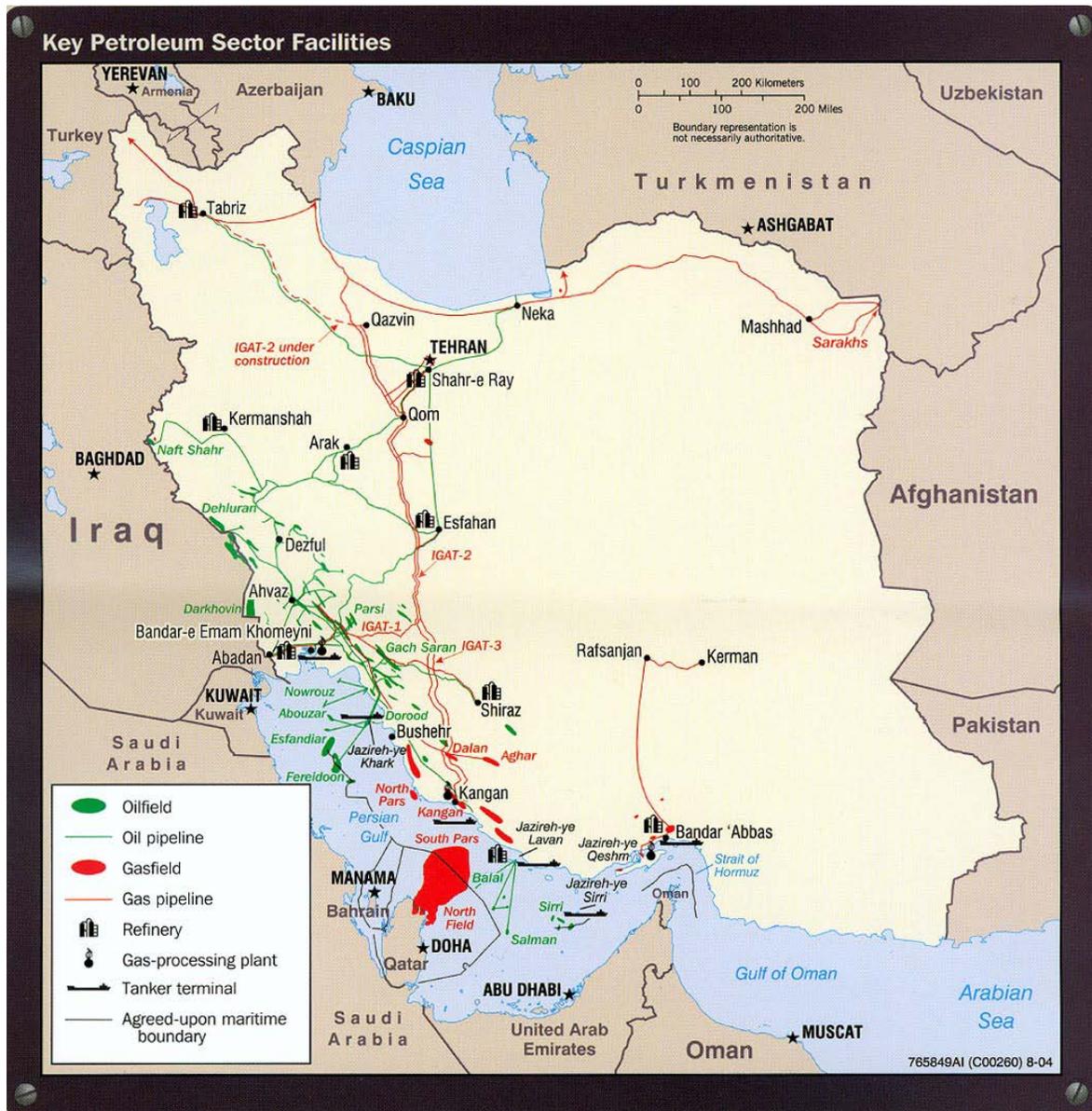
Iran's natural gas consumption is expected to grow around 7 percent annually for the next decade, according to the FACTS Global Energy *Iran Oil and Gas Annual Report 2011*. Domestically produced natural gas is central to Iran's plans to increase crude oil production through enhanced oil recovery techniques. In 2011, Iran reinjected more than 1 Tcf of domestically produced natural gas in its oil fields to help boost production. It is expected that natural gas used for reinjection, which is not included in either the production or consumption estimates presented above, will increase in the coming years.

Iran's estimated proven natural gas reserves stood at 1,168 Tcf as of January 2012, according to the *Oil and Gas Journal*, second only to Russia. Over 85 percent of Iranian natural gas reserves are located in non-associated fields and have not yet been developed. Major natural gas fields include South and North Pars, Kish, and Kangan-Nar. Iran's most significant natural gas project is the offshore South Pars field (shown in Figure 1), which holds about 47 percent of its total natural gas reserves and accounts for about 35 percent of its total natural gas production.² The field is being developed in 24 phases, of which ten were online as of February 2012.

¹ The data used in this section comes from Cedigaz, FACTS Global Energy, and EIA estimates unless otherwise noted.

² Middle East Economic Survey and FACTS Iran Oil and Gas Annual Report 2010.

Figure 1: Iran Major Oil and Natural Gas Infrastructure



Source: The University of Texas, Austin, Perry-Castañeda Library Map Collection

The state-owned National Iranian Gas Company (NIGC) is responsible for natural gas infrastructure, transportation, and distribution. The National Iranian Gas Export Company (NIGEC) was created in 2003 to manage and to supervise all international natural gas pipeline and LNG projects. Until May 2010, NIGEC was under the control of the National Iranian Oil Company, but the Petroleum Ministry transferred NIGEC, incorporating it under NIGC in an attempt to target responsibility for new natural gas projects.

Although Iran is the world’s fourth-largest producer of natural gas, its role in international trade in natural gas is far less significant. Iran, like the United States, is both an importer and exporter of natural gas. Iran exports natural gas to Turkey, Armenia, and Azerbaijan, but it also receives pipeline imports

from Turkmenistan and Azerbaijan (see Table 1). Since 2000, Iran's imports have exceeded its exports in all but one year (2010). In both 2010 and 2011, Iran accounted for less than 1 percent of global dry natural gas imports and exports.

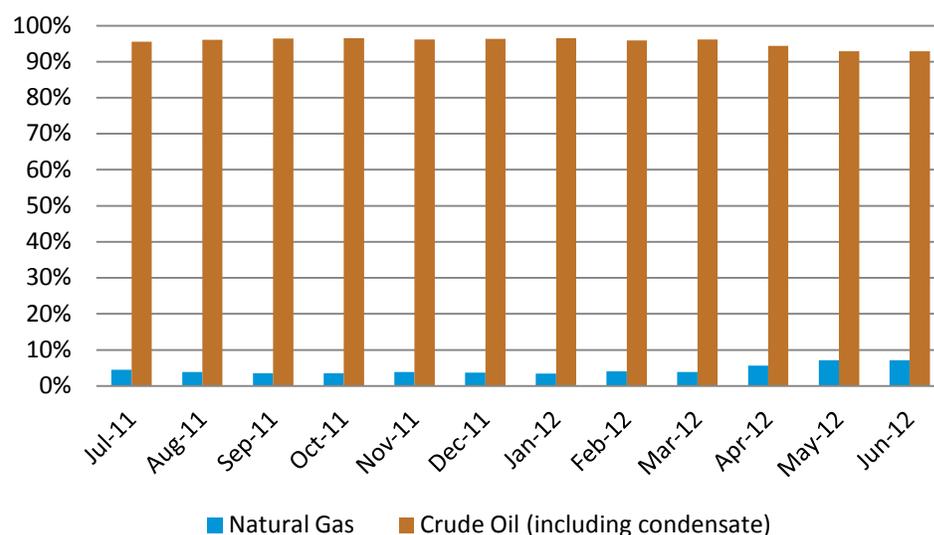
Table 1. Average Iranian Imports and Exports of Natural Gas, July 2011-June 2012

million cubic feet per day	Imports from Iran	Exports to Iran
Armenia	51	..
Azerbaijan	26	32
Turkey	733	..
Turkmenistan	..	1008

Source: FACTS Global Energy Iran Oil and Gas Monthly Reports

EIA estimates that between July 2011 and June 2012, Iran's exports of natural gas averaged about 810 million cubic feet (MMcf) per day. Iran's average monthly revenues during that time period were approximately \$320 million, or approximately \$10.5 million per day, which is about 5 percent of the estimated \$231 million per day in revenues from crude oil and condensates exports over the same period (see Figure 2).³ In 2010, natural gas exports accounted for less than 4 percent of Iran's overall export earnings while crude oil and condensates accounted for over 78 percent.⁴

Figure 2. Share of Iranian Energy Export Revenues, by Energy Type



Source: U.S. Energy Information Administration based on FACTS Global Energy, IHS Global Insight, Lloyd's APEX

³ The estimates for natural gas were based on monthly export data published by FACTS Global Energy and price data published by IHS. The revenue estimates only account for volumes sent to Turkey because that contract is the only monetized agreement in place; Iran's other natural gas exports are executed through swaps for imported natural gas and electricity. Oil and condensate revenues were estimated using weighted-average prices and export figures from FACTS Global Energy.

⁴ Based on International Monetary Fund data for 2010 and EIA estimates.

Imports from Turkmenistan

Although Iran accounts for less than 1 percent of global natural gas trade, it is a significant market for exports from Turkmenistan, receiving just under 30 percent of all Turkmen natural gas exports in 2011, according to Cedigaz. Since its completion in late 2010, the Dauletabad-Hasheminejad pipeline—which delivers gas from Turkmenistan to Iran—boosted Iran’s import capacity to more than 1 Bcf per day of Turkmen gas. Between July 2011 and June 2012, Iran’s imports from Azerbaijan and Turkmenistan have averaged just over 1 Bcf per day. Imports of Turkmen natural gas are essential to Iran’s ability to meet both seasonal peak demand and industrial demand in northern Iran. It is possible that imports from Turkmenistan may grow in the coming years. Turkmen export volumes to Iran exceed Iranian export volumes to Turkey, and analysis suggests that Iran has flexibility to substitute some of the volumes intended for export for those it currently receives from Turkmenistan. In the event that Iran redistributes natural gas volumes intended for export to its domestic consumers—thereby reducing the need for imports—Turkmenistan could suffer a significant loss of revenue.

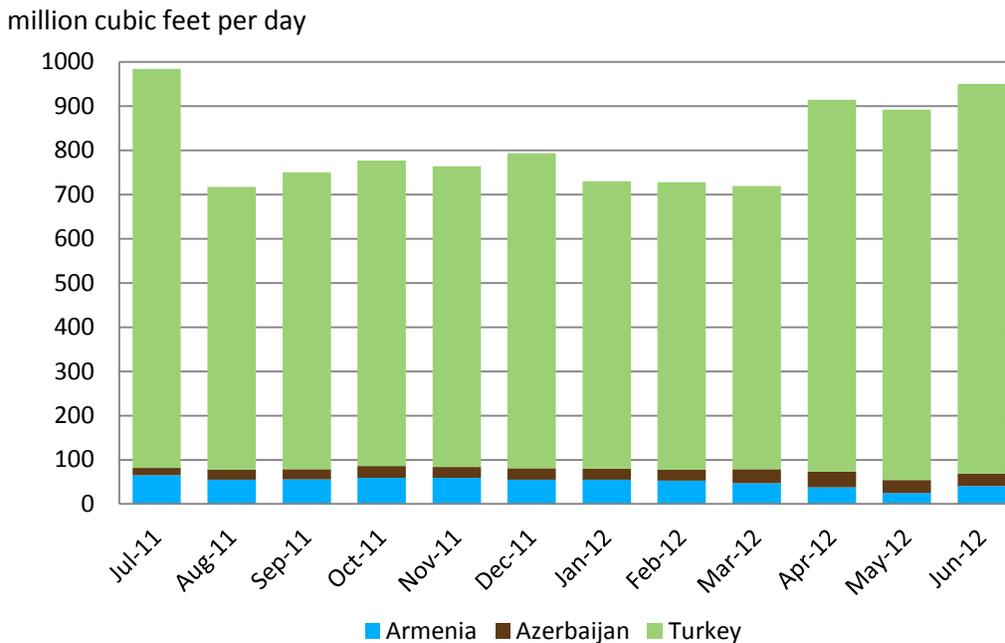
It is difficult to ascertain the exact price Iran pays for its natural gas imports from Turkmenistan, but analysis published by PFC Energy indicates that Iran paid between \$9 and \$10 per MMBtu in the first half of 2009. The contractual terms were changed in the second half of 2009 and Iran now pays an oil-linked price for its imports.

As Iranian natural gas demand continues to increase, the potential for shortfalls in natural gas supply grows. Although Iran may have the ability to displace some import volumes with domestically produced natural gas—likely resulting in lowering import costs and providing a partial offset to losses in export revenues—it faces challenges in developing its own natural gas deposits.

Iran's future natural gas exports likely will be limited due to rising domestic demand, even if future expansion and production from the massive South Pars project and other development projects occur. More importantly, sanctions imposed on the Iranian oil and natural gas industry severely hamper the country’s development of its resources. As a result of the sanctions, a number of companies have withdrawn from Iran and foreign investment in natural gas exploration and production has virtually disappeared over the last few years. Iran is also facing significant difficulty in purchasing necessary equipment and technologies to develop its own energy resources as a result of sanctions.

Possible Alternatives to Imports of Iranian Gas

Iran currently exports natural gas via pipeline to Turkey, Armenia, and Azerbaijan (see Figure 3). EIA estimates the average monthly volume of natural gas exported by Iran to Turkey, Armenia, and Azerbaijan to be approximately 810 MMcf per day, with more than 90 percent sent to Turkey under the terms of an ongoing 25-year contract. Armenia and Azerbaijan account for just 6 percent and 3 percent of Iran’s natural gas exports, respectively.

Figure 3. Iran's Natural Gas Exports by Destination, July 2011-June 2012

Source: U.S. Energy Information Administration based on FACTS Global Energy

Turkey

Turkey's imports of Iranian natural gas via the Tabriz-Dogubayazit pipeline averaged nearly 733 MMcf per day during the 12-month period ending in June 2012, according to FACTS Global Energy's *Iran Oil and Gas Monthly Reports*. Of those imports, the vast majority are incorporated into the Turkish central pipeline network and further distributed as necessary. Cedigaz data indicate that Turkey receives approximately 20 percent of its natural gas imports from Iran, making it Turkey's second largest source of natural gas imports after Russia, which had a 57 percent share of Turkey's natural gas imports in 2011. Turkey also imports pipeline volumes from Azerbaijan and LNG from five countries.⁵

One possible alternative to Iranian imports is the Blue Stream pipeline, which already sends Russian natural gas across the Black Sea to Turkey. The Blue Stream pipeline is capable of increasing volumes to make up for shortages caused by disruptions in the Tabriz-Dogubayazit pipeline, and has done so in the past according to numerous trade publications. Gazprom—which operates the Blue Stream pipeline—regularly boosts volumes to prove that Blue Stream can handle increased throughput. However, with the growth in Turkey's natural gas demand, EIA estimates the excess capacity of the Blue Stream pipeline on an annual average basis declined to about 200 MMcf per day in 2011, well below excess capacity of 600 to 700 MMcf per day on an annual basis of a few years ago. Other alternatives to Iranian gas include the Baku-Tbilisi-Erzurum pipeline from Azerbaijan (around 200 MMcf per day of excess capacity on an annual basis) and the Bulgaria-Turkey pipeline (around 200 MMcf per day excess capacity on an annual basis) supplied by Russia. Turkey could also increase imports of LNG to its terminals in

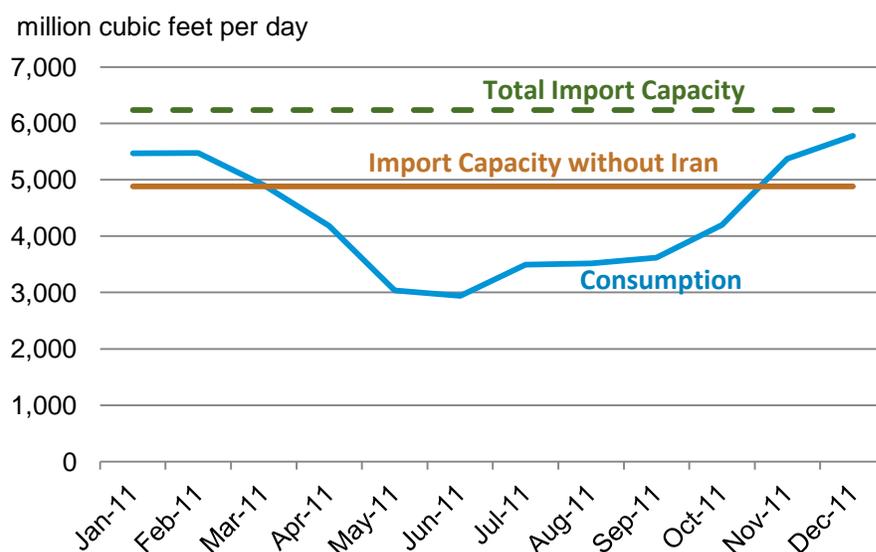
⁵ Algeria, Nigeria, Qatar, Egypt, and Norway.

Izmir and Tekirdag, which have a combined excess capacity of approximately 500 to 600 MMcf per day on an annual basis.

However, excess capacity on alternative pipelines and at the LNG import terminals is much lower during peak demand months. Turkey's natural gas demand is highly seasonal, with heating season months (November through February) exhibiting natural gas demand that is significantly higher than other months.⁶ In January 2011, Turkish consumption averaged 5,470 MMcf per day, with similar volumes consumed in February (5,476 MMcf per day), November (5,375 MMcf per day), and December (5,778 MMcf per day). By contrast, average consumption for May, June, and July 2011 was approximately 3,160 MMcf per day (see Figure 4).

Given Turkey's low capacity for natural gas storage to meet its seasonal demand swings, it relies primarily on increased imports to meet the increases in demand. If Turkey had been unable to access natural gas from Iran during 2011, it would have faced supply shortages in January, February, November, and December, even assuming that it could have fully utilized the capacity of pipelines providing volumes from other sources. Technical problems during the last two winters already hindered Iran's ability to meet its obligations to Turkey, forcing some large natural gas consumers to use alternative sources of energy. Since imports from Russia and Azerbaijan already increase during the winter months due to increased seasonal demand in Turkey, there is less excess capacity available to replace Iranian volumes.⁷ These seasonal effects in combination with Turkey's 2011 natural gas demand growth suggest that Turkey would be unable to fully offset the complete loss of Iranian natural gas using its existing import capacity.

Figure 4. Turkish Natural Gas Import Capacity and Consumption, 2011



Source: PFC Energy and EIA estimates

⁶ All consumption figures in this paragraph are from PFC Energy.

⁷ PFC Energy, Turkey GLNG Report, September 2012.

Following strong annual growth in natural gas demand in 2011—and 2012 forecasts that indicate this trend will continue⁸—Turkey faces a significant supply challenge if natural gas imports from Iran are restricted. Shortfalls caused by a cutoff of natural gas imports from Iran could be especially problematic for industrial and residential consumers when demand peaks during the winter months. There is at least one power plant in eastern Turkey that may be unable to access any alternative natural gas supplies regardless of the season.

In the past, Iranian natural gas exports to Turkey have been interrupted during times of spiking domestic demand in Iran, particularly when colder-than-normal winter weather occurs.⁹ When Iranian domestic demand surges, Iran either decreases or stops exports to Turkey for short periods. Generally, Turkey has replaced missing Iranian volumes by either increasing its imports from Russia temporarily, purchasing spot LNG cargoes, or by limiting the amount of natural gas it re-exports to Greece. Previous shutdowns have usually been resolved fairly quickly.

Even assuming that some terminal capacity to receive additional LNG shipments is available, it could be both challenging and expensive for Turkey to acquire additional LNG supplies. In particular, it may be difficult for Turkey to transport the natural gas from additional LNG cargoes to Turkey's major demand centers. Any additional cargoes would likely be purchased on the spot market, increasing the replacement costs for Iranian volumes. Spot market prices for LNG continue to reflect high Japanese demand for LNG as a fuel for power generation to replace virtually all of that country's nuclear generation, which was idled in the aftermath of the disaster at the Fukushima nuclear power plant due to the March 2011 earthquake and tsunami.

EIA estimates that Turkey paid approximately \$505 per thousand cubic meters (approximately \$14 per MMBtu) for Iranian natural gas during the 12-month period ending in June 2012. Iranian exports to Turkey are priced according to an oil-linked formula under a 25-year take-or-pay agreement, which is due to expire in 2027.¹⁰ Trade reports and EIA estimates indicate that contracted volumes of Russian natural gas are priced lower than those originating in Iran, likely by more than \$100 per thousand cubic meters (approximately \$2.77 per MMBtu).¹¹ To the extent Turkey could replace some Iranian natural gas with Russia's pipeline volumes, any such arrangement would be made at Gazprom's discretion. Increasing its reliance on Russian natural gas would also affect Turkey's bargaining position and may lead to higher prices.

Clearly, Turkey would be placed in a very difficult position in the event that it is unable to continue importing Iranian natural gas. While Turkey has successfully found short-term alternatives to Iranian natural gas in the past, a prolonged period without access to Iranian volumes—particularly during the winter—could have a major disruptive effect on industry, residential heating, and electricity generation. In addition to the adverse effects of physical storage, under the terms of its contract with Iran, Turkey is

⁸ According to the *Natural Gas Market 2011 Sector Report*, produced by the Republic of Turkey's Energy Market Regulatory Authority.

⁹ Based on information from IHS Global Insight and news reports.

¹⁰ According to the IHS EDIN Gas Contract Database.

¹¹ These estimates are based on information provided by PFC Energy, IHS Global Insight, and news reports.

obligated to pay for its contracted volumes whether it receives them or not.¹² Finally, losing a key supplier like Iran could limit Turkey's bargaining power with other suppliers, notably Russia.

Armenia and Azerbaijan

Armenia used the majority of the approximately 51 MMcf per day of Iranian natural gas it imported from July 2011- June 2012 to produce electricity at the Hrazden power plant. In return, excess base load electricity generated from the Armenian Nuclear Power Plant (ANPP) is exported to Iran.¹³ Per the terms of their agreement, Armenia supplies 3 kilowatthours of electricity for every cubic meter (35.3 cubic feet) of natural gas it receives from Iran. Initially, Armenia was to receive 106 MMcf of natural gas per day from Iran, with volumes slated to increase to 220 MMcf per day by 2019 as part of the ongoing 20-year contract agreed to in May 2004; however, reported volumes have thus far failed to reach these targets. According to Cedigaz, Armenia receives 23 percent of its natural gas imports from Iran, with the remaining 77 percent provided by Russia. Iranian volumes are important to Armenia, but Russia was able to meet all of Armenia's natural gas demand by itself as recently as 2008. That year Armenian total natural gas imports were higher than they were in 2011, when both Russia and Iran exported natural gas to the country.

Armenia has fewer alternatives to Iranian natural gas available than Turkey does, but—given the small volumes and the nature of its existing contract—the consequences of Iranian supply reductions are unlikely to be as severe as in Turkey. Should Armenia move to reduce imports from Iran, Russia may be able to increase supplies via Georgia to make up the difference. The loss of supply from Iran could also reduce its bargaining power in negotiations over base or incremental natural gas supplies from Russia. Like Turkey, Armenia will face a greater challenge meeting demand during the winter months when demand for natural gas is at its highest.

Turning to Azerbaijan, Iran's exports to the isolated Azerbaijani exclave of Nakhchivan via the Salmas-Nakhchivan pipeline averaged just over 26 MMcf per day from July 2011-June 2012. In exchange, Azerbaijan exports natural gas to Iran's northern provinces via the Astara-Kazi-Magomed pipeline. Nakhchivan is in an extremely difficult position, as natural gas volumes from mainland Azerbaijan—or anywhere else—are currently unavailable.¹⁴ This is due to the ongoing Nagorno-Karabakh conflict between Armenia and Azerbaijan, and the general disrepair of the energy infrastructure in the region. Without cooperation from the Armenian government, Nakhchivan lacks access to alternative supplies that could replace Iranian volumes in the short term.

Global Impacts of Reduction in Iranian Natural Gas Exports

The potential global impacts of restricting Iranian gas exports are limited. Beyond countries directly connected to Iran by pipeline, the two countries most likely to be affected are Greece and Russia. When Turkey has experienced gas shortages in the past, it has reduced re-exports of Azerbaijani gas to Greece (less than 100 MMcf per day). Greece could replace some or all of any shortfall in imports from Turkey

¹² According to PFC Energy, IHS Global Insight, and various news reports.

¹³ Information on the terms of the Iran-Armenia agreement comes from IHS Global Insight, IHS EDIN, PFC Energy, the Caucasus Analytical Digest, and EIA estimates.

¹⁴ Based on information provided by Eastern Bloc Energy.

with additional Russian pipeline volumes. The loss of natural gas volumes via Turkey could affect Greece's bargaining power with Russia, and any arrangement would be made at Gazprom's discretion.

From a longer-term perspective, Russia would likely benefit from a reduction of natural gas exports by Iran, as it appears to have the productive capacity—if not the pipeline capacity—to make up for natural gas shortfalls in Turkey, Armenia, and Greece. Russian natural gas deliveries to Europe have declined in recent years due to decreased European demand for natural gas since the 2008 economic recession. Russian exports of natural gas to European Union-27 countries were around 14 percent lower in 2010 than in 2008 according to Eurostat data.

Unlike oil markets, natural gas markets are regional rather than global in nature, often with very limited connections between markets. The greatest potential for there to be any effects beyond Turkey, Armenia, Azerbaijan, Greece, or Turkmenistan is if Turkey or Greece increased their spot LNG purchases to replace shortfalls in pipeline gas from Iran or Turkey, respectively. Doing so could put additional upward pressure on prices in LNG spot markets, though it remains unclear to what degree. Most countries and companies that rely on LNG purchase the bulk of their supplies under long-term contracts, and any volumes purchased in the spot market are often rolled in with larger volumes of contract purchases and thus only slightly affect average prices paid.