



Independent Statistics & Analysis

U.S. Energy Information  
Administration

## Country Analysis Brief: Iran

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### Overview

*Iran holds the world's fourth-largest proved crude oil reserves and the world's second-largest natural gas reserves. Despite the country's abundant reserves, Iran's oil production has substantially declined over the past few years, and natural gas production growth has slowed. International sanctions have profoundly affected Iran's energy sector. Sanctions have prompted a number of cancellations or delays of upstream projects, resulting in declining oil production capacity.*

Iran holds some of the world's largest deposits of proved oil and natural gas reserves, ranking as the world's fourth- and second-largest reserve holder of oil and natural gas, respectively. Iran also ranks among the world's top 10 oil producers and top 5 natural gas producers. Iran produced 3.2 million barrels per day (bbl/d) of petroleum and other liquids in 2013 and more than 5.6 trillion cubic feet (Tcf) of dry natural gas in 2012.

The [Strait of Hormuz](#), on the southeastern coast of Iran, is an important route for oil exports from Iran and other Persian Gulf countries. At its narrowest point, the Strait of Hormuz is 21 miles wide, yet an estimated 17 million bbl/d of crude oil and oil products flowed through it in 2013 (roughly one-third of all seaborne traded oil and almost 20% of total oil produced globally). Liquefied natural gas (LNG) volumes also flow through the Strait of Hormuz. Approximately 3.9 Tcf of LNG was transported via the Strait of Hormuz in 2013, almost all of which was from [Qatar](#), accounting for about one-third of global LNG trade.



Source: U.S. Energy Information Administration  
Representation of international boundaries and names is not necessarily authoritative

### Effects of recent sanctions

Iran's oil production has declined substantially over the past few years, and natural gas production growth has slowed, despite the country's abundant reserves. International sanctions have stymied progress across Iran's energy sector, especially affecting upstream investment in both oil and natural gas projects. The sanctions have prompted a number of cancellations and delays of upstream projects, resulting in declining oil production capacity. The United States and the European Union (EU) enacted measures at the end of 2011 and during the summer of 2012 that have affected the Iranian energy sector more profoundly than any previously enacted sanctions. The sanctions impeded Iran's ability to sell oil, resulting in a 1.0-million bbl/d drop in crude oil and condensate exports in 2012 compared with the previous year.

According to the International Monetary Fund (IMF), Iran's oil and natural gas export revenue was \$118 billion in the 2011/2012 fiscal year (ending March 20, 2012). In the 2012/2013 fiscal year, oil and natural gas export revenue dropped by 47% to \$63 billion. The IMF estimates that Iran's oil and natural gas export revenue fell again in the 2013/2014 fiscal year by 11% to \$56 billion. The revenue loss is attributed to the precipitous decline in the volume of oil exports from

2011 to 2013. Iran's natural gas exports actually increased slightly over the past few years. However, Iran exports a small volume of natural gas, as most of its production is domestically consumed.

Nonetheless, international sanctions have also affected Iran's natural gas sector. Iran's natural gas sector has been expanding, but production growth has been lower than expected as a result of the lack of foreign investment and technology. The South Pars natural gas field is the largest hydrocarbon upstream project currently being developed in Iran and continues to encounter delays. South Pars, located offshore in the Persian Gulf, holds roughly 40% of Iran's proved natural gas reserves. It is currently being developed mostly by Iranian companies as most international companies have pulled out. The field's development entails 24 phases, of which phases 1-10 are completed, and phase 12 started production in February 2014.

On November 24, 2013, a Joint Plan of Action (JPOA) was established between Iran and the five permanent members of the United Nations Security Council (the United States, [United Kingdom](#), France, [Russia](#), and [China](#)) plus Germany (P5+1). Implementation of the JPOA started in January 2014. Under the JPOA, Iran agreed to scale back or freeze some of its nuclear activities during the six months of negotiations in exchange for some sanctions relief. The period of negotiations was recently extended for another four months to November 24. The JPOA aims to reach a long-term comprehensive plan that ensures that Iran's nuclear program is peaceful, which may lead to the lifting of international sanctions.

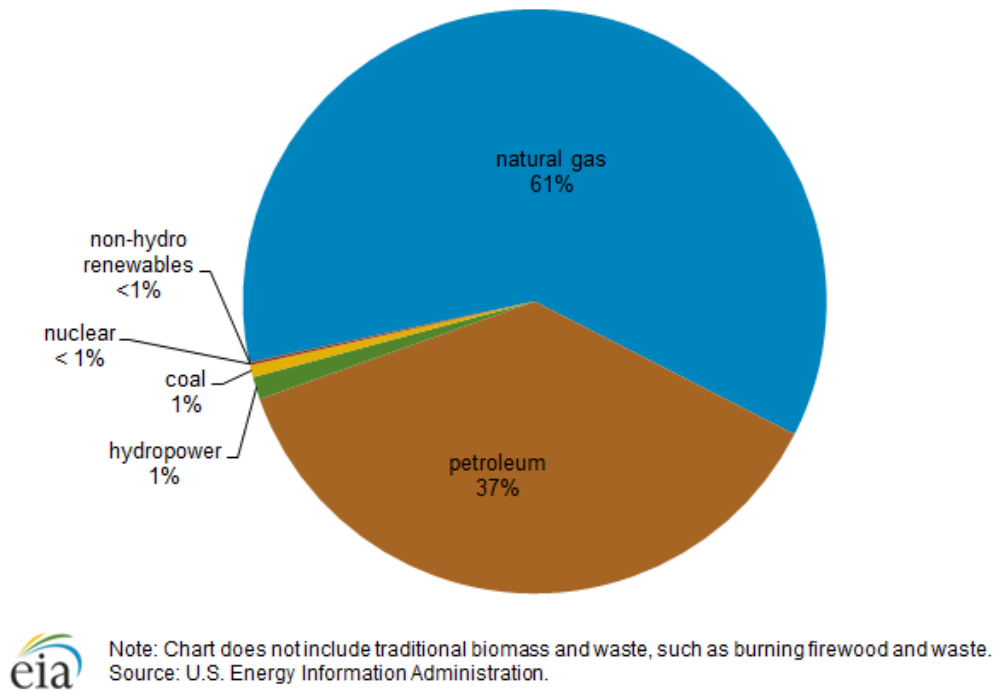
The JPOA does not directly allow for additional Iranian oil sales, although it does suspend sanctions on associated insurance and transportation services. However, Iran and the countries that are continuing to import Iranian oil have increasingly been able to find alternatives to European Protection and Indemnity Clubs (P&I) coverage from EU companies.

Iran's crude oil and condensate exports increased in late 2013 and have maintained a level above the 2013 average. From January to May 2014, Iran's crude oil and condensate exports averaged 1.4 million bbl/d, roughly 300,000 bbl/d higher than the 2013 average, according to the International Energy Agency (IEA). Exports to China and [India](#) account for almost all of the increase.

## **Total primary energy consumption**

Iran consumed 9.6 quadrillion British thermal units (Btu) of energy in 2012. Natural gas and oil accounted for almost all (98%) of Iran's total primary energy consumption in 2012, with marginal contributions from coal, hydropower, nuclear, and non-hydro renewables. Iran's primary energy consumption has grown by more than 50% over the past 10 years. In order to curtail wasteful energy use and to limit domestic demand growth, Iran has embarked on an energy subsidy reform to raise the prices of domestic petroleum, natural gas, and electricity. The first phase of the reform was enacted in late 2010, and phase two was initiated in early 2014.

Iran's total primary energy consumption, share by fuel, 2012



## Management of oil and natural gas sectors

*The state-owned National Iranian Oil Company (NIOC) is responsible for all upstream oil and natural gas projects. The Iranian constitution prohibits foreign or private ownership of natural resources. However, international oil companies (IOC) can participate in the exploration and development phases through buyback contracts.*

The energy sector is overseen by the Supreme Energy Council, which was established in July 2001 and is chaired by the president of Iran. The council is composed of the Ministers of Petroleum, Economy, Trade, Agriculture, and Mines and Industry, among others. Under the supervision of the Ministry of Petroleum, state-owned companies dominate the activities in the oil and natural gas upstream and downstream sectors, along with Iran's petrochemical industry. The three key state-owned enterprises are the National Iranian Oil Company (NIOC), the National Iranian Gas Company (NIGC), and the National Petrochemical Company (NPC).

**Table 1. Iran's state-owned energy companies**

<b>Company</b>	<b>Objective</b>
National Iranian Oil Company (NIOC)	NIOC controls oil and natural gas upstream activities through several subsidiaries. Some of the NIOC's subsidiaries produce most of the oil and gas in the country (see Table 2).
National Iranian Gas Company (NIGC)	NIGC is in charge of Iran's natural gas downstream activities, including gas processing plants, pipelines, and city natural gas networks. The company's objective is to process, deliver, and distribute gas for domestic use. NIGC operates through several subsidiaries, including: Iran Gas Engineering and Development Company (IGEDC), Iran Gas Transmission Company (IGTC), Iran Gas Storage Company (IGSC), and Iran Gas Distribution Company (IGDC). NIGC holds a trading company that sells natural gas plant liquids called the Iran Gas Commercial Company (IGCC). Another subsidiary, the National Iranian Gas Exports Company (NIGEC), is in charge of new pipeline and liquefied natural gas (LNG) projects.
National Iranian Petrochemical Company (NPC)	NPC operates several petrochemical complexes through its subsidiaries. In 2011-12, NPC accounted for almost 90% of Iran's total petrochemical production of 46-47 million tons and almost the same share of Iran's petrochemical exports of 18-19 million tons. NPC exports petrochemicals through its wholly-owned subsidiary Iran Petrochemical Commercial Company (IPCC).

Source: U.S. Energy Information Administration, Facts Global Energy, and Arab Oil and Gas Journal.

The state-owned NIOC, under the supervision of the Ministry of Petroleum, is responsible for all upstream oil and natural gas projects, encompassing both production and export infrastructure in the oil sector. The National Iranian South Oil Company (NISOC), a subsidiary of NIOC, accounts for 80% of oil production covering the provinces of Khuzestan, Bushehr, Fars, and Kohkiluyeh and Boyer Ahmad. Nominally, NIOC also controls the refining and domestic distribution networks, by way of its subsidiary, the National Iranian Oil Refining and Distribution Company (NIORDC).

**Table 2. Subsidiaries of the National Iranian Oil Company (NIOC)**

<b>NIOC Subsidiary</b>	<b>Main Objectives</b>
National Iranian South Oil Company (NISOC)	Controls oil and gas upstream activities in the south and southwest of the country. It produces approximately 80% of all crude oil produced in Iran.
Iranian Central Oil Fields Company (ICOFC)	Oversees oil and gas production in the south and central areas of Iran and is the largest natural gas producer in Iran.
Iranian Offshore Oil Company (IOOC)	Controls all upstream activities in offshore fields, including Salman, Sirri, Doroud, and Balal.
Khazar Exploration and Production Company (KEPCO)	In charge of exploration and production in the Caspian Sea region and has recently undertaken drilling at the Sardare Jangal offshore gas discovery.
Pars Oil and Gas Company (POGC)	Its objective is the development of the South and North Pars gas fields, as well as the Golshan and Ferdowsi fields.
Pars Special Economic Energy Zone (PSEEZ)	Established in 1998 to promote the use of South Pars oil and gas resources.
Karoon Oil and Gas Production Company (KOGPC)	Operates in Khouzestan and delivers natural gas to the National Iranian Gas Company (NIGC).
Petroleum Engineering and Development Company (PEDEC)	Responsible for carrying out all engineering and development projects conducted by NIOC.
National Iranian Drilling Company (NIDC)	Conducts most of the onshore and offshore drilling in Iran and handles related technical services and well control operations.
Iranian Drilling Services Company (IDSC)	Provides wellhead and well work services.
North Drilling Company (NDC)	Established to develop internal expertise needed for complex oil and gas drilling.
Kala Naft Company	Manufactures equipment for the oil, gas, and petrochemical sectors and is tasked with distributing equipment to operational centers.
Naftiran Intertrade Company (NICO) Sarl	Invests in and finances Iran's oil, gas, and petrochemical trade.
Iranian Oil Terminals Company (IOTC)	Accepts deliveries and stores crude oil, petroleum products, and condensates for exports.
National Iranian Tanker Company (NITC)	Delivers crude oil and petroleum products.
National Iranian Oil Refining and Distribution Company (NIORDC)	Oversees the subsidiaries that control the refining sector, pipelines, telecommunications, and oil products distribution. Engaged in exports of petroleum products.
Iranian Fuel Conservation Organization (IFCO)	Established in 2000 with the objective of optimizing energy consumption, protecting the environment, and increasing energy efficiency.

Source: U.S. Energy Information Administration, Facts Global Energy, Arab Oil and Gas Journal, and National Iranian Oil Company.

## Foreign investment

*Iran is planning to change the oil contract model to allow IOCs to participate in all phases of an upstream project, including production. However, international sanctions continue to affect foreign investment in Iran's energy sector, limiting the technology and expertise needed to expand the capacity at oil and natural gas fields and reverse production declines.*

The Iranian constitution prohibits foreign or private ownership of natural resources, and all production-sharing agreements (PSAs) are prohibited under Iranian law. The government permits buyback contracts that allow IOCs to enter into exploration and development contracts through an Iranian subsidiary. The buyback contract is similar to a service contract and requires the contractor (or IOC) to invest its own capital and expertise for development of oil and natural gas fields. After the field is developed and production has started, the project's operatorship reverts back to the NIOC or the relevant subsidiary. The IOC does not get equity rights to the oil and gas fields. The NIOC uses oil and gas sales revenue to pay the IOC back for the capital costs. The annual repayment rates to the IOC are based on a predetermined percentage of the field's production and rate of return, according to a report by Clyde and Company. According to FACTS Global Energy (FGE), the rate of return on buyback contracts varies between 12% and 17% with a payback period of about five to seven years.

Iran recently announced a new oil contract model called the Iranian (or Integrated) Petroleum Contract (IPC), although it is not yet finalized and is subject to change. The purpose of the new framework is to attract foreign investment with a contract that contains terms similar to a PSA. Some of the main criticisms of the buyback contracts include lack of flexibility of cost recovery and in some cases, the NIOC's limited expertise to reverse field decline rates in comparison to the IOC that developed the field.

Under the current draft IPC, IOCs can establish a joint venture agreement with the NIOC or a relevant subsidiary to manage oil and natural gas exploration, development, and production projects. IOCs will help manage the projects, but they will not have ownership of the reserves. IOCs will be paid a share of the project's revenue in installments once production starts. The payment terms can be adjusted as the project progresses, according to the Middle East Economic Survey (MEES).

IPCs will cover a longer time period of between 20 to 25 years, which is double the amount of time under the buyback contract. The IPC will encompass the exploration, development, and production phases, along with the possibility to extend into enhanced oil recovery (EOR) phases. This proposed contract model is different from the current buyback contracts, which only cover the exploration and development phases. This modification aims to rectify issues with field decline rates by including the IOC in the production and recovery phases, while optimizing technology and knowledge transfers. To help facilitate knowledge and technology transfers, the IPC will require IOCs to fulfill Iran's local content requirement, which will be 51% of the contract.

International sanctions have affected Iran's energy sector by limiting the foreign investment, technology, and expertise needed to expand the capacity at oil and natural gas fields and to reverse declines at mature oil fields. Iran has mainly had to depend on local companies to develop oil fields. Chinese and Russian companies are the only IOCs currently directly or indirectly involved with developing oil fields, according to FGE.

Foreign investment played a role in restoring oil production in the latter part of the 1990s and first part of the 2000s, according to IHS Cera. But in 2007, international sanctions led to the near halt of most international investment as many IOCs stalled investments. From 2009-10, Iran forced out most of the companies from western countries, Malaysia and Japan because of non-delivery of projects, making way for Chinese and Russian companies, according to IHS Cera.

Nonetheless, international sanctions have also led Chinese companies to stall or slow investments. In 2013, Iran cancelled CNPC's contract to develop Phase 11 of the South Pars natural gas field, and in 2014, Iran cancelled its \$2.5 billion contract with CNPC to develop the South Azadegan field, both because of persistent project delays. CNPC is still involved in the development of the North Azadegan field, although Iran has also noted dissatisfaction with the project's progression.

As a result of the poor investment climate and international political pressure, some IOCs, including Repsol, Shell, and Total, divested from Iran's natural gas sector. In response, Iran has looked toward eastern firms, such as state-owned Indian Oil Corp., China's Sinopec, and Russia's Gazprom, to take a greater role in Iranian natural gas upstream development. Activity from these sources has also been on the decline because of sanctions imposed on technology and financial transactions.

## Oil sector

### Reserves

*Iran holds nearly 10% of the world's crude oil reserves and 13% of OPEC reserves. About 70% of Iran's crude oil reserves are located onshore, with the remainder mostly located offshore in the Persian Gulf. Iran also holds proved reserves in the Caspian Sea, although exploration has been at a standstill.*

According to the *Oil & Gas Journal*, as of January 2014, Iran has an estimated 157 billion barrels of proved crude oil reserves, representing nearly 10% of the world's crude oil reserves and 13% of reserves held by the Organization of the Petroleum Exporting Countries (OPEC). Most of Iran's reserves were discovered decades ago. According to a report by Clyde & Company, roughly 80% of Iran's reserves were discovered before 1965.



## Iran's major oil infrastructure



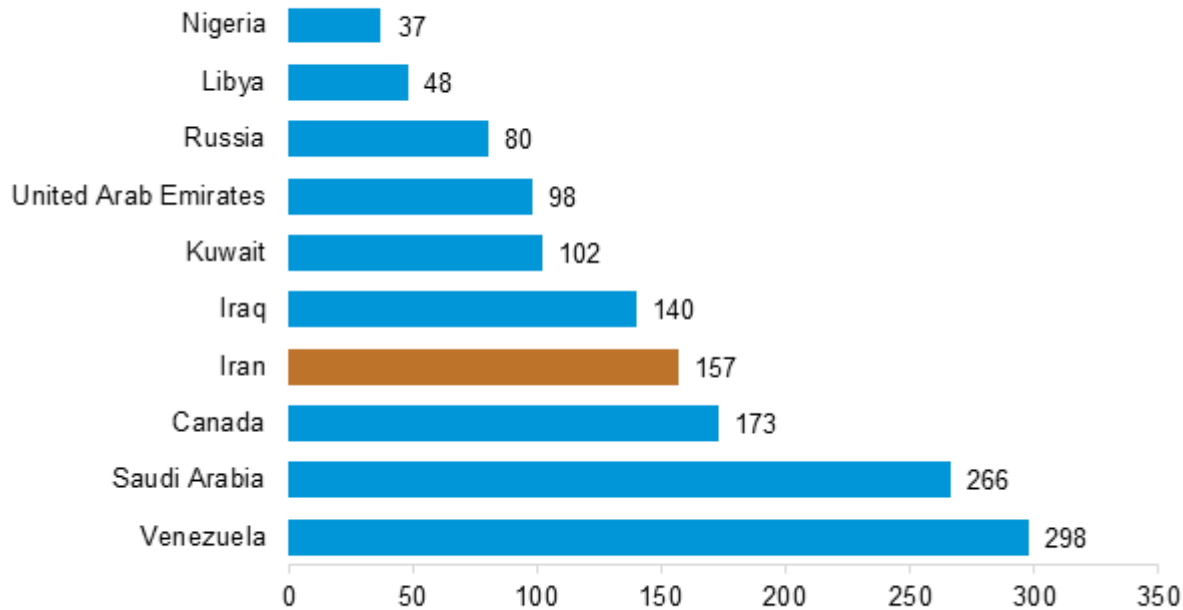
Source: U.S. Energy Information Administration, IHS EDIN

According to FGE, approximately 70% of Iran's crude oil reserves are located onshore and the remainder offshore, mostly in the Persian Gulf. Roughly 85% of Iran's onshore reserves are located in the Luristan-Khuzestan basin in the southwest near the Iraqi border, according to the *Arab Oil and Gas Journal*.

Iran also has proved and probable oil reserves of approximately 500 million barrels mostly offshore in the [Caspian Sea](#), but exploration and development of these reserves have been at a standstill because of territorial disputes with neighboring [Azerbaijan](#) and Turkmenistan. Iran also shares a number of both onshore and offshore fields with neighboring countries, including [Iraq](#), [Qatar](#), [Kuwait](#), and [Saudi Arabia](#).

## Largest proved reserve holders of crude oil, January 2014

billion barrels



Source: Oil & Gas Journal

## Exploration and production

*Iran's crude oil production fell dramatically in 2012, following the implementation of sanctions in late-2011 and mid-2012. Iran dropped from being the second-largest crude oil producer in OPEC to the fourth in 2013, after Saudi Arabia, Iraq, and narrowly behind the United Arab Emirates (UAE). Iran's production increased in 2014, increasing Iran's rank to the third-largest crude oil producer in OPEC during the first half of 2014.*

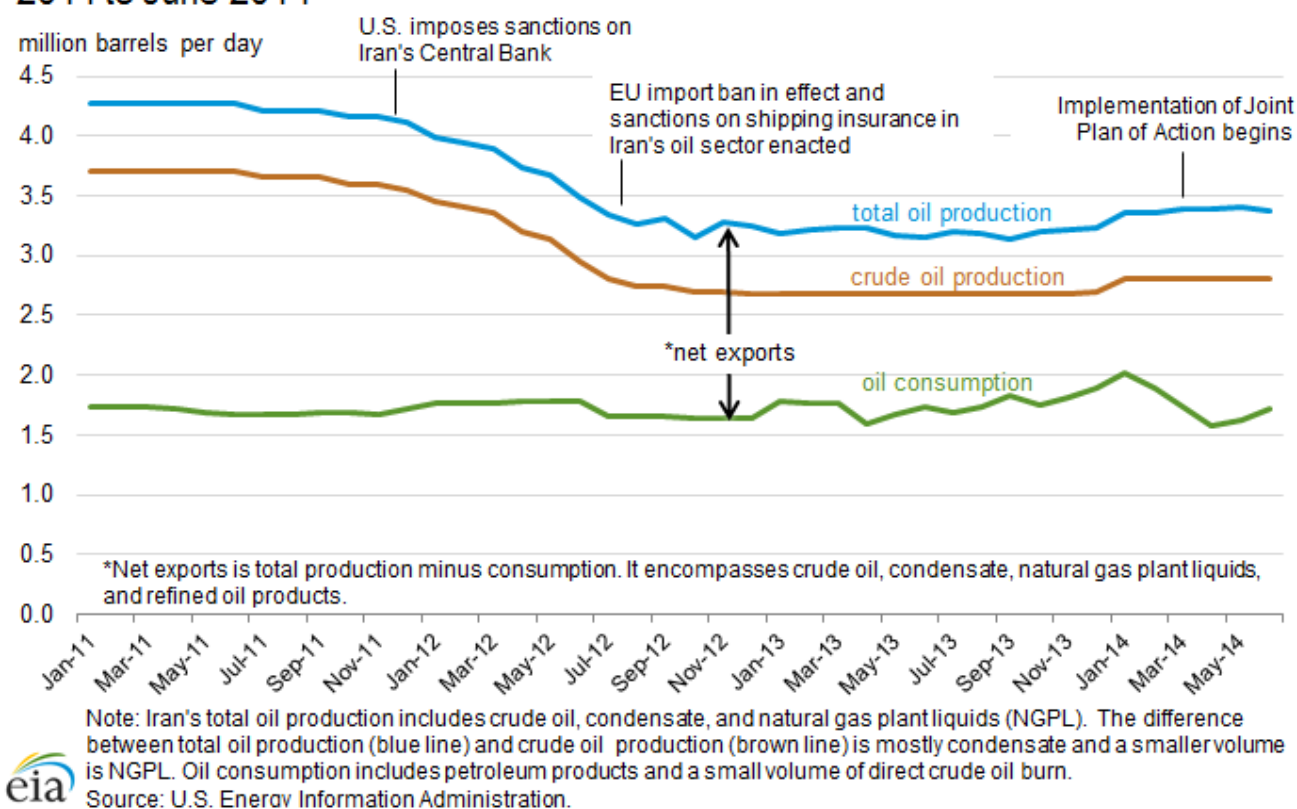
Iran is one of the founding members of the Organization of the Petroleum Exporting Countries (OPEC), which was established in 1960. Since the 1970s, Iran's oil production has varied greatly. Iran averaged production of over 5.5 million bbl/d of oil in 1976 and 1977, with production topping 6.0 million bbl/d for much of the period. Since the 1979 revolution, however, a combination of war, limited investment, sanctions, and a high rate of natural decline of Iran's mature oil fields has prevented a return to such production levels.

In recent years, a series of sanctions targeting the oil sector have resulted in cancellations of new projects by a number of foreign companies, while also affecting existing projects. Following the implementation of sanctions in late-2011 and mid-2012, Iranian production dropped dramatically. Although Iran had been subject to four earlier rounds of United Nations sanctions,

the much tougher measures imposed by the United States and the EU have severely hampered Iran's ability to export its oil, which affected Iran's oil production.

The U.S. and EU measures targeted Iran's petroleum exports and imports, prohibited large-scale investment in the country's oil and gas sector, and cut off Iran's access to European and U.S. sources for financial transactions. Further sanctions were implemented against institutions targeting the Central Bank of Iran, while the EU imposed an embargo on Iranian oil and banned European Protection and Indemnity Clubs (P&I Clubs) from providing Iranian oil tankers with insurance and reinsurance.

### Iranian petroleum and other liquids production and consumption, January 2011 to June 2014



In 2013, Iran produced approximately 3.2 million bbl/d of petroleum and other liquids (total oil), of which roughly 2.7 million bbl/d was crude oil, 0.4 million bbl/d was condensate, and 0.1 million bbl/d was natural gas plant liquids (NGPL). Iran's total oil production level in 2013 was 1.0 million bbl/d (almost 25%) lower than the production level of 4.2 million bbl/d in 2011. The drop in production is mainly attributed to the sanctions. Iran faces continued depletion of its production capacity, as its fields have relatively high natural decline rates of 8% to 11%, coupled with an already low recovery rate of 20% to 25%, according to FGE and the *Arab Oil and Gas Journal*. Sanctions and unfavorable contractual terms have impeded the necessary investment to halt this decline. Moreover, sanctions enacted in late 2011 and throughout 2012 have accelerated Iran's production capacity declines.

For the first half of 2014, the U.S. Energy Information Administration (EIA) estimates that Iran's total oil production increased by an average of almost 200,000 bbl/d, compared with the annual average in 2013. Preliminary export data for 2014 show a corresponding increase in Iran's exports.

### **Crude streams and oil fields**

Iran's crude oil is generally medium in sulfur content and in the 28° to 36° API gravity range. Two crude streams, Iran Heavy and Iran Light, account for more than 80% of the country's crude oil production capacity. Other crude streams include Froozan, Soroush/Norouz, Doroud, Sirri, and the Lavan Blend. Iran's largest producing oil fields are the onshore Ahwaz-Asmari, Marun, and Gachsaran fields, all of which are located in Khuzestan Province. Iran's largest offshore field is Abuzar field, with a production capacity of 175,000 bbl/d.

The Iran Heavy crude stream accounts for approximately 45% of the country's total crude oil production, according to FGE. The stream is mainly sourced from a few onshore fields in southern Iran, some of which are multilayered and also feed the Iran Light stream. Gachsaran and Marun are two of the largest fields that contribute to Iran Heavy. Other fields include Rag-e-Safid, Ahwaz, Bangestan, Mansouri, and Bibi Hakimeh.

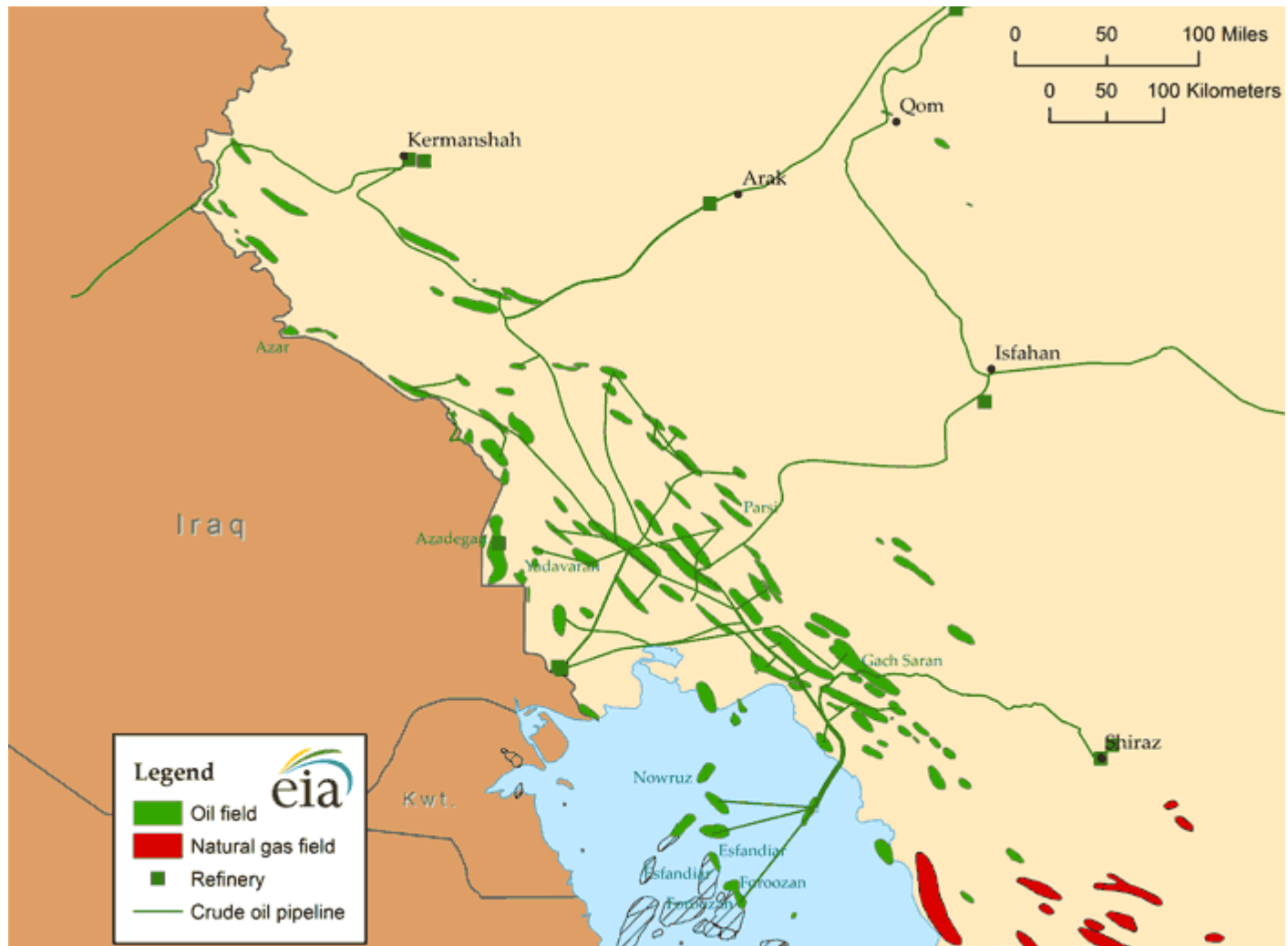
The Iran Light crude stream is the other key grade and is sourced from several onshore fields in the Khuzestan region. However, two-thirds of this grade comes from three fields: Ahwaz-Asmari, Karani, and Agha Jari. Many of the fields that produce Iran Light have been producing for decades and are declining rapidly. NIOC has been working on offsetting these declines through the use of EOR techniques, mainly by reinjecting associated gas into oil wells to improve oil recovery rates.

### **Non-crude liquids production**

For the first half of 2014, Iran produced about 600,000 bbl/d of non-crude liquids (condensate and natural gas plant liquids). Iran's non-crude oil production mostly comes from the South Pars natural gas field, with smaller volumes produced at Nar and Kangan, and at other fields.

In mid-2011, Iran started a 1,000-bbl/d pilot gas-to-liquids plant, according to the *Arab Oil and Gas Journal*. The country planned to build a 10,000-bbl/d commercial plant fueled by the South Pars natural gas field. However, the status of the plant's development is unclear.

## Iran's largest oil fields



Source: U.S. Energy Information Administration, IHS EDIN

## Upstream projects

Iran has not had a new oil field enter into production since 2007. There were a number of new exploration and development blocks announced over the past several years that could provide Iran with an increase in its crude oil production capacity, but sanctions have negatively affected the Iranian oil industry. Virtually all western companies have halted their activities in Iran, although there are some Chinese and Russian companies that are still participating. The sanctions and lack of international involvement have particularly affected upstream projects, as the lack of expertise, technology, and investment has resulted in delays and, in some cases, cancellations of projects. Nonetheless, development of a few projects continues, albeit at a slower pace than planned.

The Azadegan field was Iran's biggest oil find in 30 years when announced in 1999. It contains 6 to 7 billion barrels of recoverable crude oil reserves, but its geologic complexity makes extraction difficult. The field is divided into two portions: North and South Azadegan. China National Petroleum Corporation (CNPC) is developing North Azadegan in a two-phase development, with ultimate total production estimated at 150,000 bbl/d (75,000 bbl/d for each phase). Latest estimates from FGE indicate that the first phase will be onstream by 2015/2016, costing \$1.8 billion.

In 2004, a consortium of NIOC (25%) and Japan's INPEX (75%) signed an agreement to develop the South Azadegan field. However, INPEX has since halted its activities in South Azadegan. In 2009, CNPC signed a memorandum of understanding (MOU) with the NIOC to obtain a \$2.5 billion contract to develop the South Azadegan field and was awarded the contract in 2011. The project targeted peak output is 260,000 bbl/d in two phases (150,000 bbl/d in the first phase and 110,000 bbl/d in the second phase). However, in 2014, the NIOC announced that it was cancelling its contract with CNPC to develop the South Azadegan field because of persistent project delays. In February 2014, Iran said that CNPC drilled only 7 of the 185 wells it had planned at the field, according to MEES. The South Azadegan field came online in 2007 and produced 50,000 bbl/d in 2013, virtually unchanged from its production level in 2009.

Yadavaran is the other promising upstream development project, with 3.2 billion barrels of recoverable oil reserves and 2.7 Tcf of recoverable gas reserves. China Petroleum & Chemical Corporation (Sinopec) signed a buyback contract at the end of 2007 to invest \$2.2 billion to develop Yadavaran. Yadavaran produced 25,000 bbl/d in 2013. Production is expected to increase to 85,000 bbl/d by mid-2015. A second phase in the field's development is projected to boost production by 50,000 bbl/d to 100,000 bbl/d in 2018. NIOC is also planning a third phase to boost output to 300,000 bbl/d. NIOC originally planned to have Yadavaran's first phase completed by 2012.

**Table 3. Status of selected new upstream oil projects in Iran**

Project	Recoverable Reserves (billion barrels)	Developer	Status
South Azadegan	6.0 to 7.0	NIOC recently cancelled its contract with CNPC. The National Iranian Drilling Company will drill wells.	South Azadegan came online in 2007. It produced 50,000 bbl/d in 2013. Phase I targets 150,000 bbl/d and Phase II targets 110,000 bbl/d.
North Azadegan		CNPC	Phase I is underway and expected to be completed by 2015-16 (75,000 bbl/d). Phase II expected to be completed by 2020 (75,000 bbl/d).
Yadavaran	3.2	Sinopec	Yadavaran produced 25,000 bbl/d in 2013 and it is expected to increase to 85,000 bbl/d in 2015. Phase II is expected to add 50,000 to 100,000 bbl/d in 2018. (NIOC) Phase III is expected to add more than 100,000 bbl/d after 2020.
Yaran	1.1 (oil in place <sup>1</sup> )	PEDEC (South Yaran) and local company Persian Energy (North Yaran)	North Yaran is expected to produce 30,000 bbl/d in 2015 and South Yaran 50,000-60,000 bbl/d in 2018.
Azar	NA	Iranian consortium	Shared oil field straddling Iran and Iraq. The field is called Badra on the Iraqi side and is operated by Gazprom Neft. Azar drilling set to resume next year. Initial target production is 30,000 bbl/d at Azar, with plans to increase to 65,000 bbl/d.
South Pars (oil layer)	1.3	PEDCO	Installation of a floating production, storage, and offloading unit needs to occur before production can commence. Initial capacity is expected to be 35,000 bbl/d.
Zagheh	3 (oil in place)	Iran is looking for a new developer.	In 2014, Iran cancelled the MOU <sup>2</sup> signed with Tatneft Iran Oil. Its production potential is estimated at 55,000 bbl/d of heavy crude.
Bushgan, Kuh-e-Kaki, Kuh-e-Mond	1.1 (oil in place)	Iran is looking for a new developer.	In 2014, Iran cancelled the MOU signed with joint Iranian-Russian and Iranian-Ukrainian companies (Gazprom Pars Kish International). The total production potential is estimated at 22,000 bbl/d.

<sup>1</sup> Oil in place is defined as the amount of oil estimated to exist in naturally occurring reservoirs. A portion of this oil is typically not technically and/or economically recoverable.

<sup>2</sup> MOU stands for memorandum of understanding.

Source: U.S. Energy Information Administration based on FACTs Global Energy (FGE), Arab Oil & Gas Journal, Middle East Economic Survey (MEES), National Iranian Oil Company (NIOC), Bloomberg, Fars News, and United Press International (UPI).

## Crude oil and condensate exports

*Iran's exports of crude oil and condensate dropped from 2.5 million bbl/d in 2011 to 1.1 million bbl/d in 2013 because the United States and the European Union tightened sanctions that targeted Iran's oil exports. The largest buyers of Iranian crude and condensate are China, India, Japan, South Korea, and Turkey.*

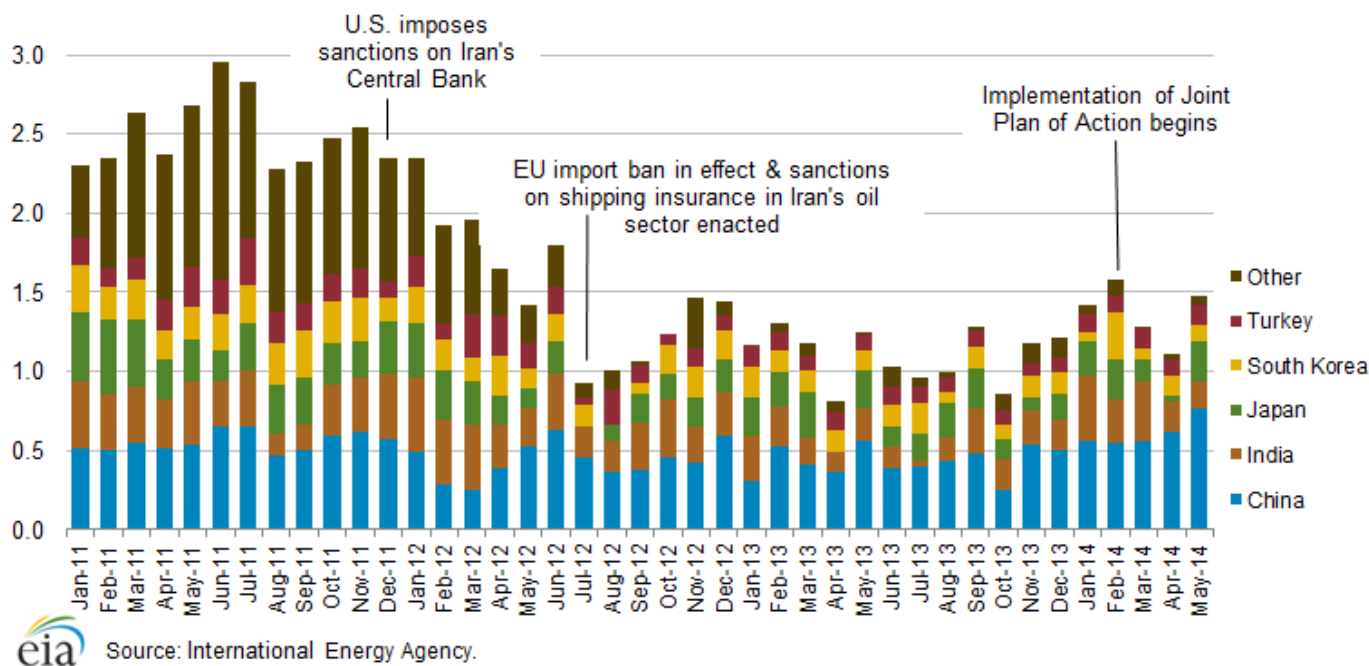
According to data from the International Energy Agency (IEA), Iran's crude oil and condensate exports averaged 1.1 million bbl/d in 2013, 1.4 million bbl/d less than the volume exported in 2011. Iran's ability to sell oil was substantially impeded by new sanctions imposed by the United States and the EU, which went into effect in summer 2012.

Iran's exports increased in the beginning of 2014. From January to May 2014, Iran's exports averaged 1.4 million bbl/d, 300,000 bbl/d higher than the 2013 annual average, according to the IEA. China and India accounted for nearly all of that increase.

### Monthly Iranian exports of crude oil and condensate

million barrels per day

3.5



### Effects of 2011-12 sanctions

According to the IEA, Iranian crude oil and condensate exports declined by 1 million bbl/d in 2012 compared with the previous year. The decline is attributed to new sanctions imposed by the United States and the EU at the end of 2011 and during the summer of 2012. Iran's ability to sell crude oil was particularly affected by the EU ban on all Iranian petroleum imports as well as the imposition of insurance and reinsurance bans by European P&I Clubs effective July 1, 2012.



European insurers underwrite the majority of insurance policies for the global tanker fleet. The insurance ban particularly affected Iranian oil exports as lack of adequate insurance impeded the sales of Iranian crude to all of its customers, including those in Asia. Iranian exports dropped to less than 1.0 million bbl/d in July 2012 as Japanese, Chinese, Korean, and Indian buyers scrambled to find insurance alternatives. Adding to the insurance difficulties was continued pressure imposed by the U.S. sanctions on Iranian oil customers to decrease their purchases.

Iran and the countries that are continuing to import Iranian oil have since been able to find alternatives to P&I coverage from EU companies. By the last quarter of 2012, Iranian exports recovered somewhat as [Japan](#), [South Korea](#), and [India](#) began to issue sovereign guarantees for vessels carrying Iranian crude oil and condensate. [China](#) and India began to accept Iranian Kish P&I Club guarantee on the vessels that shipped oil to its refineries. Nonetheless, Iranian exports have failed to reach export levels prior to the latest sanctions.

In 2012, sanctions were not the only driver of export decreases. For example, commercial interests contributed to the decrease in China's imports, as Chinese buyers were engaged in a contractual dispute with Iran in the first quarter of 2012. China is Iran's largest trading partner and its biggest oil importer, according to the World Bank. Chinese refiners significantly decreased their purchases of Iranian crude and condensate as a result of a dispute over the terms of annual purchase contracts. Although eventually Unipet (the trading arm of China's largest refiner Sinopec Corporation) signed a supply contract with NIOC for volumes comparable to those imported in 2011, the contract did not allow NIOC to make up for the oil sales that did not get delivered to China in the first quarter of that year.

### **Petroleum product exports**

In addition to crude oil and condensate, Iran also exports petroleum products. According to FGE, Iran exported about 240,000 bbl/d of petroleum products in 2013, most of which was fuel oil and LPG sent to Asian markets. Iran's petroleum product exports declined by roughly 40% in 2013 compared with the 2011 level. According to FGE, U.S. and EU sanctions affected Iran's ability to sell petroleum products as well.

### **Oil terminals**

The Kharg, Lavan, and Sirri Islands, located in the Persian Gulf, handle almost all of Iran's crude oil exports. Iran also has two small crude oil terminals at Cyrus and Bahregansar, one terminal along the Caspian Sea, and other terminals that handle mostly refined product exports and imports. Condensate from the South Pars natural gas field is exported from the Assaluyeh terminal.

**Kharg Island** is the largest and main export terminal in Iran. Roughly 90% of Iran's exports are sent via Kharg. Kharg's loading system has a capacity of 5.0 million bbl/d. The terminal processes all onshore production (the Iranian Heavy and Iranian Light Blends) and offshore production from the Froozan field (the Froozan Blend). The Kharg terminal includes the main T-jetty, the Sea Island that is located on the west side of Kharg, and the Dariush terminal to the

south. Kharg Island relies on storage to ensure even operations, and its current storage capacity is expected to increase to 28 million barrels of oil in 2014.

**Lavan Island** mostly handles exports of the Lavan Blend sourced from offshore fields. Lavan is Iran's highest-quality export grade and one of Iran's smallest streams. Lavan's production averaged less than 100,000 bbl/d in 2013, but the Lavan facilities have the capacity to process 200,000 bbl/d of crude oil. Lavan has a two-berth jetty, which can accommodate vessels up to 250,000 deadweight tons. Lavan's storage capacity is 5.5 million barrels.

**Sirri Island** serves as a loading port for the Sirri Blend that is produced in the offshore fields of the same name. The Sirri terminal includes a loading platform equipped with four loading arms that can load tankers from 80,000 to 330,000 deadweight tons. Its storage capacity is 4.5 million barrels.

The small offshore loading terminal at **Cyrus** can handle tankers up to 70,000 deadweight tons. Crude is stored on a barge moored nearby, according to *Arab Oil and Gas Journal*. The **Bahregansar** field in the northern Persian Gulf has its own loading terminal. It features one single buoy mooring that can load tankers up to 250,000 deadweight tons.

**Neka** is Iran's Caspian Sea port and was built to receive crude oil imports from Caspian region producers that are delivered under swap agreements. The port was built in 2003 and has a storage capacity of 1 million barrels and can handle up to 100,000 bbl/d of crude oil, according to FGE. Neka has not been operational since 2011. The terminal was previously used to facilitate swap agreements with [Azerbaijan](#), [Kazakhstan](#), and [Turkmenistan](#). Under these agreements, Iran received crude oil at its Caspian Sea port of Neka, which was processed in the Tehran and Tabriz refineries. In return, Iran exported the same amount of crude oil through its Persian Gulf ports.

The export terminals **Bandar Mahshahr** and **Abadan** (also known as Bandar Imam Khomeini), are near the Abadan refinery and are used to export refined product from the Abadan refinery. **Bandar Abbas**, located near the northern end of the Strait of Hormuz, is Iran's main fuel oil export terminal.

## Consumption and downstream

*Iran is the second-largest oil-consuming country in the Middle East, second to Saudi Arabia. Over the past few years, Iran has expanded its domestic refining capacity to meet growing domestic demand, particularly for gasoline. Almost all of Iran's domestic oil consumption was of locally produced products.*

Iran is the second-largest oil-consuming country in the Middle East, second to Saudi Arabia. Iranian domestic oil consumption is mainly diesel, gasoline, and fuel oil. Total oil consumption averaged approximately 1.75 million bbl/d in 2013, almost 3% higher than the year before. In the past, Iran had limited domestic oil refining capacity and was heavily dependent on imports of refined products, especially gasoline, to meet domestic demand. In response to international sanctions and the resulting difficulty in purchasing refined products, Iran expanded its domestic

refining capacity. As of September 2013, Iran's total crude oil distillation capacity was nearly 2.0 million bbl/d, about 140,000 bbl/d more than the previous year, according to FGE. Most of that increase came from expansion projects that were recently completed at the Arak and Lavan refineries. Iran also extracts petroleum products at natural gas processing plants (naphtha and liquefied petroleum gas). A small amount of crude oil, approximately 4,000 bbl/d, is directly burned for power generation.

Almost all of Iran's product consumption was locally produced. In 2013, FGE estimates that Iran imported almost 17,000 bbl/d of petroleum products, of which roughly 85% was gasoline. Over the past several years, Iran's gasoline import dependence has decreased significantly as a result of increased domestic refining capacity and subsidy cuts. Iran plans to increase gasoline production capacity at the Isfahan and Bandar Abbas refineries by the end of 2014. Despite refinery expansions, FGE expects Iran's gasoline imports to increase over the medium and long term because of increased gasoline demand and the government's plan to reduce gasoline production at petrochemical plants. However, gasoline demand is expected to decrease in the short term because of higher prices as a result of subsidy cuts.

## Rationing and subsidies

Iran's energy prices are heavily subsidized, particularly gasoline prices. At the end of 2010, the government initiated the first phase of the subsidy reform, decreasing the subsidies on energy prices to discourage waste. Phase II of the subsidy reform was initiated in early 2014. According to FGE, gasoline prices have risen by 43% to 75%. As a result, gasoline consumption is expected to decline in the near term, at least in 2014. The subsidy reform also includes phasing out subsidies for natural gas.

**Table 4: Oil Refineries in Iran**

Refinery	Crude Distillation Capacity (thousand bbl/d)
Abadan	360
Isfahan	370
Bandar Abbas	345
Tehran	250
Arak	250
Borzuyeh	120
Tabriz	110
Shiraz	50
Kermanshah	25
Lavan Island	50
BooAli Sina	34
Booshehr	10
Aras	5
<b>Total</b>	<b>1,979</b>

Source: Facts Global Energy, 2013

# Natural gas sector

## Reserves

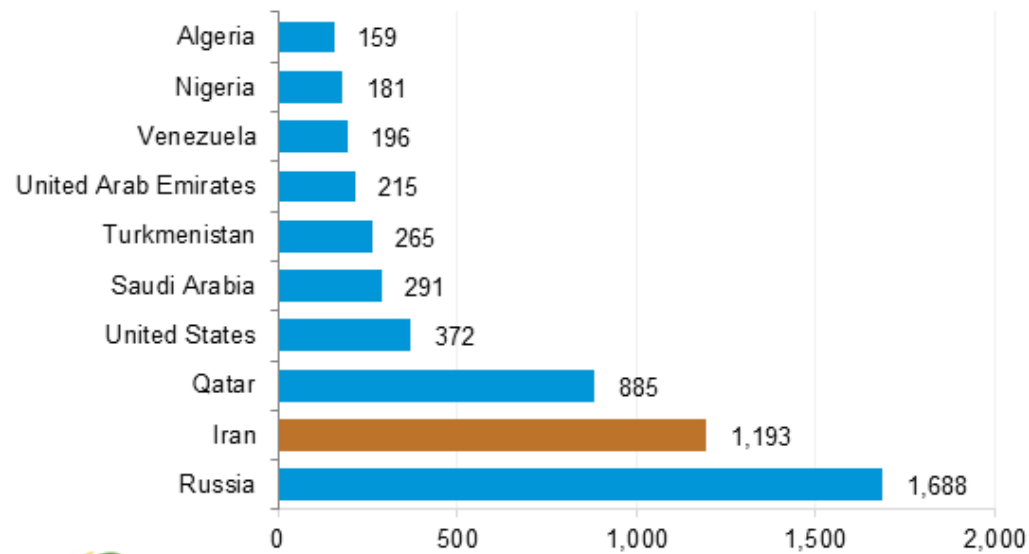
*Iran is the second-largest proved natural gas reserve holder in the world, behind Russia. Iran holds 17% of the world's proved natural gas reserves and more than one-third of OPEC's reserves. Iran's largest natural gas field, South Pars, is estimated to hold roughly 40% of Iran's gas reserves. However, the vast majority of Iran's gas reserves are undeveloped.*

According to *Oil & Gas Journal*, as of January 2014, Iran's estimated proved natural gas reserves were 1,193 Tcf, second only to Russia. Iran holds 17% of the world's proved natural gas reserves and more than one-third of OPEC's reserves. Iran has a high success rate of natural gas exploration, in terms of wildcat drilling, which is estimated at 79% compared to the world average success rate of 30% to 35%, according to FGE.

Iran's largest gas field is South Pars, a non-associated gas field located offshore in the middle of the Persian Gulf. South Pars is a portion of a larger gas structure that straddles the territorial water borders of Iran and Qatar. It is called the North field in Qatar. South Pars reserves account for roughly 40% of Iran's total gas reserves, and the field is also estimated to hold 17 million barrels of condensate in place. Other major gas fields in Iran include: Kish, North Pars, Tabnak, Forouz, and Kangan. These fields and others also hold large amounts of condensate reserves. Iran is also estimated to hold 2 Tcf of proved and probable natural gas reserves onshore and offshore in the Caspian basin.

## Largest proved reserve holders of natural gas, January 2014

trillion cubic feet



Source: *Oil & Gas Journal*

### Iran's natural gas infrastructure



Source: U.S. Energy Information Administration, IHS EDIN

## Exploration

*Although finding new natural gas reserves is not a high priority because much of Iran's current reserves are undeveloped, there have been significant gas discoveries in recent years.*

Iran's natural gas resources are abundant, and although exploration for new resources is not a priority for the Iranian government, a number of new finds have been announced recently. In 2011, four sizeable new discoveries were announced: Khayyam (onshore), Forouz B (offshore in Persian Gulf), Madar (offshore in the Persian Gulf), and Sardare Jangal fields (offshore in Caspian Sea).

The discovery of the Khayyam field, located near the city of Assaluyeh, was announced in January 2011. According to *Arab Oil and Gas Journal*, the field contains 9.2 Tcf of natural gas

in place, of which at least 7.3 Tcf is believed to be recoverable, along with approximately 220 million barrels of condensate reserves. The Forouz B field was discovered in the Persian Gulf, close to Lavan Island, and holds an estimated 29 Tcf of gas in place. The Madar field, close to Assaluyeh, is thought to hold about 17.5 Tcf of natural gas in place and 653 million barrels of recoverable condensate reserves.

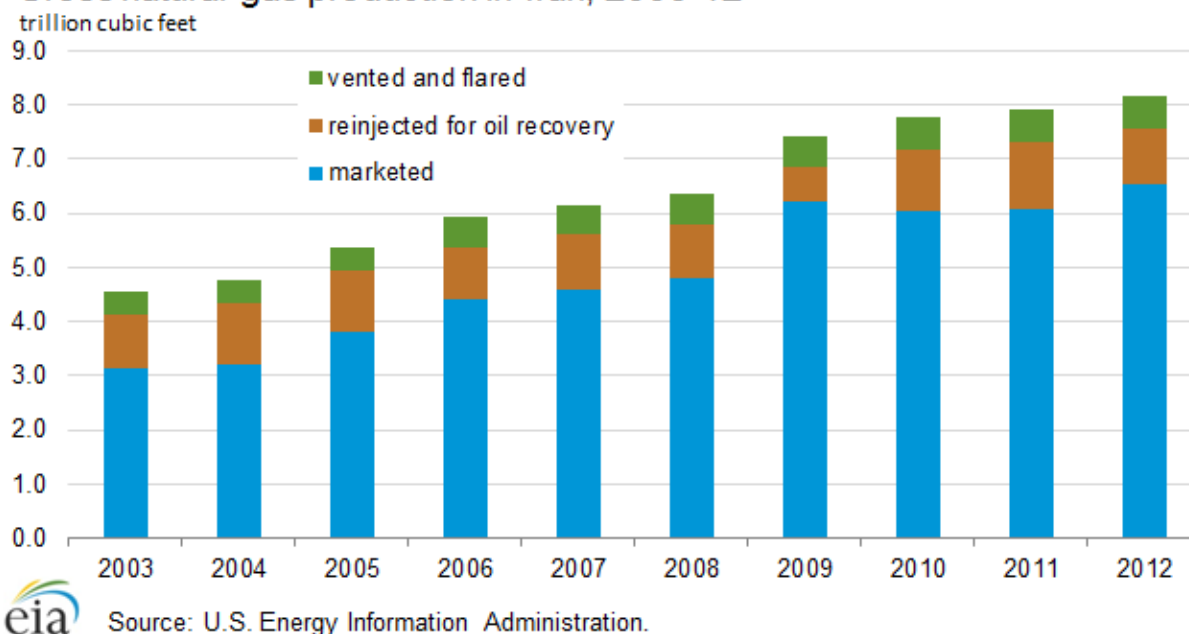
In December 2011, Khazar Oil Company (a NIOC subsidiary) discovered the giant Sardare Jangal field approximately 150 miles offshore in the Caspian Sea. Based on initial assessments, the field is estimated to hold 50 Tcf of natural gas in place. Given the field's position in the Caspian Sea, it is possible that Iran shares the field with Azerbaijan. However, the lack of a border delineation agreement among littoral states could complicate the development of this field.

## Production

*Iran is the world's third-largest dry natural gas producer, after the United States and Russia, and accounted for nearly 5% of the world's dry natural gas production in 2012. Despite repeated delays in field development and the effects of sanctions, Iran's natural gas production is expected to increase in the coming years. In 2012, almost 40% of Iran's gross natural gas production came from the South Pars field.*

Gross natural gas production totaled almost 8.2 Tcf in 2012, increasing 3% from the previous year. Of the 8.2 Tcf produced, most of it was [marketed](#) (6.54 Tcf), and the remainder was reinjected into oil wells to enhance oil recovery (1 Tcf) and vented and flared (0.62 Tcf). Reinjecting natural gas plays a critical role in oil recovery at Iran's fields. As a result, natural gas reinjection is expected to increase in the coming years. Some estimates indicate that NIOC will require 7 to 8 billion cubic feet per day (Bcf/d) of natural gas for reinjection into its oil fields in the next decade, according to FGE. Iran also flares (burns off) a substantial portion of its gross production. According to Cedigaz, Iran flared the second-largest amount of natural gas in the world in 2012, after Russia. Gas is flared because of the lack of infrastructure to capture and transport gas associated with oil production.

## Gross natural gas production in Iran, 2003-12



Dry natural gas production is a subset of marketed production. Marketed production includes dry natural gas, liquid hydrocarbons, and natural gas used in field and processing plant operations. In 2012, 69% of the gross natural gas production was marketed as dry gas. Iran's dry natural gas production has rapidly increased to more than 5.6 Tcf in 2012, almost double the amount produced 10 years ago. Iran is the world's third-largest dry natural gas producer, after the United States and Russia, and accounted for nearly 5% of the world's dry natural gas production in 2012. The vast majority of Iran's production is consumed domestically. Domestic consumption has increased alongside production and totaled 5.5 Tcf in 2012.

The South Pars field accounted for almost 40% of Iran's gross natural gas production, with sizeable production also coming from the Nar, Kangan and Tabnak fields. Nearly 80% of gross production came from non-associated gas fields, with the remainder of gross natural gas produced being associated with oil. Associated natural gas production originates mainly from the Khuzestan, Ilam, and Kermanshah provinces, along with offshore oil fields.

Much like in the oil sector, the natural gas sector has been hampered by international sanctions. Although sanctions targeting the Iranian natural gas exports were only recently enacted by the EU, lack of foreign investment and sufficient financing has resulted in slow growth in Iran's natural gas production. According to some analysts, Iran should have become one of world's leading natural gas producers and exporters given its large resource base. Development of its fields has been hampered by a combination of financing, technical, and contractual issues.

Nonetheless, Iran's natural gas production has grown, and output is likely to continue to increase in the coming years. FGE projects that Iran's gross natural gas production will increase to 10.6 Tcf in 2020, but that growth will depend on the pace of development of the South Pars field.



## Iran's major natural gas fields



Source: U.S. Energy Information Administration, IHS EDIN

## South Pars Gas Field

*Natural gas production from South Pars is critical to meet increasing domestic consumption and Iran's current and to meet future export obligations.*

The most significant energy development project in Iran, the South Pars field, accounted for nearly 40% of Iran's gross natural gas production in 2012 and holds 40% of Iran's total proved natural gas reserves. Discovered in 1990 and located 62 miles offshore in the Persian Gulf, South Pars has a 24-phase development scheme. The total cost is expected to exceed \$100 billion, which excludes downstream facilities, according to *Arab Oil and Gas Journal*.

The entire project is managed by [Pars Oil & Gas Company](#) (POGC), a subsidiary of NIOC. Each of the 24 phases has a combination of natural gas with condensate and/or NGPL production. Production from phases 1 to 10 was originally designed to be allocated for the domestic market for consumption and reinjection. Production from the remaining phases is planned for export via

pipelines and as liquefied natural gas (LNG) and/or used for proposed gas-to-liquids (GTL) projects.

Currently, phases 1 to 10 and phase 12 are producing natural gas. Phase 12 is the most recent to come online in February 2014, although it is not expected to reach its full capacity of 3 Bcf/d of natural gas and 120,000 bbl/d of condensate until 2016-17. Phases 15 and 16 are the next phases planned to come online in 2015, eventually reaching full capacity of 2 Bcf/d of natural gas and 80,000 bbl/d of condensate a year following its start.

**Table 5: South Pars Natural Gas Field Development**

Phase	Natural Gas Capacity (Bcf/d)	Condensate Capacity (bbl/d)	Participating Companies	Start Year or Expected Start Date
1	1	40,000	PetroPars, Petronas	2004
2	2	80,000	Total, Petronas, Gazprom	2002
3				
4	2	80,000	ENI, PetroPars, Naftiran	2004
5				
6	3.9	156,000	Statoil, PetroPars	2009
7				
8				
9	2	80,000	PetroPars	2011
10				
11	2	80,000	PetroPars	2020+
12	3	120,000	POGC, NIOC, PDVSA	2014
13	2	80,000	Mapna, Sadra, Pedro Pidar	2020+
14	2	77,000	IDRO, IOCC, NIDC	2017
15	2	80,000	POGC, ISOICO	2015
16				
17	2	80,000	PetroPars, OIEC, IOEC	2016
18				
19	2	77,000	PetroPars, IOEC	2018
20	2	75,000	OIEC	2017
21				
22	2	77,000	Petro Sina Arian, Sadra	2016
23				
24				
<b>Total</b>	<b>30</b>	<b>1,182,000</b>		

Note: POGC: Pars Oil and Gas Company; PDVSA: Petroleos de Venezuela S.A.; IDRO: Industrial Development and Renovation Organization of Iran; NIDC: National Iranian Drilling Company; ISOICO: Iran Shipbuilding and Offshore Industries Complex Company; OIEC: Oil Industries Engineering Construction Company; IOEC: Iranian Offshore Engineering and Construction Company.

Note: Total, ENI, and Statoil are currently not participating in South Pars.

Source: Arab Oil and Gas Directory, FACTS Global Energy, and U.S. Energy Information Administration.

## Other field developments

**The Kish field**, which was originally thought to hold approximately 48 Tcf of natural gas reserves, was reassessed in mid-2011 to 70 Tcf. According to FGE, Kish may be one of Iran's more lucrative natural gas prospects because of its reserves and location. PEDEC put in place a six-phase plan to develop Kish, which could produce more than 4 Bcf per day of natural gas. Because of repeated contractual disagreements among companies involved in the development of this field, as well as the infrastructure required (which includes the construction of a natural gas processing plant, gas pipelines, and a new power plant), the first phase of this field is unlikely to come online before 2020.

**The North Pars field** has approximately 50 Tcf recoverable reserves of sour gas. China National Offshore Oil Corporation (CNOOC) signed an agreement with NIOC to develop North Pars. However, Iran cancelled the contract with CNOOC after CNOOC paused its activities as a result of U.S. sanctions. According to FGE, this project is not likely to come online before 2020.

**The Lavan field's** estimated recoverable reserves are approximately 6.6 Tcf, with 62 million barrels of condensate reserves. The first phase of the project, expected to be completed by 2015-2016, will produce 750 million cubic feet per day (MMcf/d) of natural gas and 11,000 bbl/d of condensate.

**The Forouz B field's** recoverable reserves are estimated at 25 Tcf. Production from this field is expected to be used for electricity generation for export to [Iraq](#), [Turkey](#), Pakistan, and [Oman](#). The first gas from Forouz B is expected in 2017-18.

**The Golshan and Ferdowsi fields** hold 39 Tcf and 11 Tcf of recoverable natural gas reserves, respectively. Contracts for the development of these fields were awarded but subsequently cancelled. There are currently no development plans. NIOC plans to award these fields to Iranian firms sometime during 2014. First production is not expected until after 2020.

## Consumption

In 2012, Iran consumed an estimated 5.5 Tcf of dry natural gas, an increase of 2% compared with the previous year. The residential and commercial sector accounted for the largest share of dry natural gas consumption (34%), followed by electric power (28%), industrial (25%), transportation (5%), and other sectors (8%), according to FGE. While Iran's domestic natural gas consumption has been growing in those sectors, domestically-produced natural gas is also central to Iran's plans to increase crude oil production through EOR techniques. In 2012, Iran reinjected more than 1.0 Tcf of natural gas in its oil fields to help boost oil production. In addition to domestic consumption and reinjection for oil recovery, Iran also must dedicate a portion of its natural gas production to fulfill contractual export commitments.

Iran has experienced seasonal natural gas supply shortages in the winter months mostly because of the delay of the South Pars projects. Also, Iran's natural gas imports declined by roughly 50% in 2012 over the previous year, reflecting substantially fewer volumes imported from

Turkmenistan because U.S. and EU sanctions interfered with financial transactions. As a result of the 2013 natural gas supply shortage, power plants were switched to use fuel oil and diesel. Also, natural gas supply, used to fuel compressed natural gas (CNG) stations for transportation and production at petrochemical plants, was disrupted this past winter. Iran is expected to continue to experience seasonal natural gas supply shortages in the next few years, although this largely depends on whether any new South Pars phases come online. Iran is planning to expand its underground natural gas storage capacity to ensure that enough natural gas is available during peak demand periods in the future.

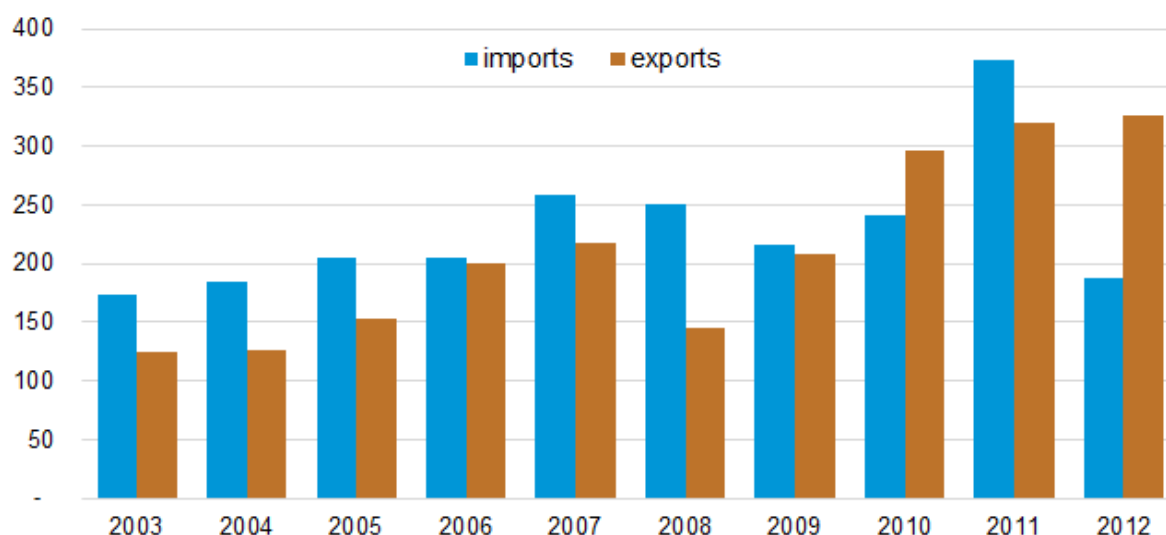
## Imports and exports

*Iran trades marginal amounts of natural gas regionally via pipelines. In 2012, more than 90% of Iran's imports came from Turkmenistan and roughly 90% of Iran's exports went to Turkey. Iran does not have the infrastructure in place to export or import liquefied natural gas (LNG).*

Iran accounted for less than 1% of global natural gas trade in 2012. In 2012, Iran exported 326 Bcf and imported 188 Bcf of dry natural gas, both via pipelines. Iran relies on imports particularly during winter months when residential space-heating demand peaks during colder weather. Iran does not have the infrastructure in place to export or import liquefied natural gas (LNG). The NIOC started construction projects in the past to build an LNG export plant, but most of the work has been halted, mainly because of the lack of technology and foreign investment, stemming from international sanctions.

### Iran's dry natural gas imports and exports, 2003-12

billion cubic feet



Source: U.S. Energy Information Administration.

Iran's natural gas imports declined by roughly 50% in 2012 compared with the previous year, reflecting substantially fewer volumes imported from Turkmenistan. According to FGE, the U.S. and EU sanctions interfered with financial transactions between Turkmenistan and Iran in 2012 and 2013, resulting in the decline of Turkmen gas imports. In 2011, Iran received almost 30% of Turkmenistan's gas exports, but the share dropped to under 15% in 2012. Nonetheless, more than 90% of Iran's natural gas imports still came from Turkmenistan in 2012, and the remainder was from Azerbaijan. Imports of Turkmen natural gas are essential to Iran's ability to meet both seasonal peak demand and industrial demand in northern Iran.

Iran exports natural gas to Turkey, Armenia, and Azerbaijan. Almost 90% of Iranian exports went to Turkey in 2012, and the remainder went to Azerbaijan and Armenia. Armenia uses the majority of imported Iranian natural gas 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. Iran's exports natural gas to the isolated Azerbaijani enclave of Nakhchivan via the Salmas-Nakhchivan pipeline. In exchange, Azerbaijan exports natural gas to Iran's northern provinces via the Astara-Kazi-Magomed pipeline.

In a report titled [\*Natural Gas Exports from Iran\*](#), EIA estimated that the average revenues from Iran's natural gas exports during the period July 2011 to June 2012 were approximately \$10.5 million per day, or about 5% 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% of Iran's total export earnings, while crude oil and condensates accounted for more than 78%.

### **Liquefied natural gas (LNG)**

Although Iran's aspirations to build a liquefaction facility date back to the 1970s, the country has yet to build one. Despite ambitious plans, Iran has had to cancel or delay LNG projects because of U.S. and EU sanctions that made it impossible to obtain financing and to purchase necessary technology. Given the political constraints, Iran's LNG projects are years away.

### **Proposed regional pipelines**

**Iran-Iraq Pipeline:** Iraq signed an agreement with Iran in June 2013 to receive natural gas to fuel Iraqi power plants in Baghdad and Diyala. The initial contract covered 880 MMcf/d over 5 years, but this was later increased to 1.4 Bcf/d over 10 years. The pipeline is under construction and it has experienced delays, some of which have been security-related issues including an attack on Iranian engineers. According to FGE, Iran's plans to export 176 MMscf/d of gas to Iraq have been postponed to 2015.

**Iran-Oman Pipeline:** Iran and Oman signed an MOU for Iran to supply 1 Bcf/d of natural gas via pipeline to Oman over 25 years. According to IHS, the pipeline is expected to be completed in 2018-19. However, the project may be delayed because of pricing disagreements. According to FGE, Iran expects gas prices of \$11-14/MMBtu, while Oman is looking to pay \$6-7/MMBtu.

**Iran-Pakistan Pipeline:** Although the Iran-Pakistan Pipeline has experienced considerable financing difficulties, both countries seem committed to complete the project. In 2012, Pakistan completed tenders for engineering, procurement, construction, and commissioning, and Iran agreed to supply Pakistan with \$500 million to finance the line on the Pakistani side. The initial agreement called for the delivery of 750 MMcf/d of natural gas over 25 year, but this was later increased to roughly 1 Bcf/d, according to *Arab Oil and Gas Journal*. Although contractor targets indicate pipeline completion in late 2014, industry sources do not expect the pipeline to be operational before 2018.

**Iran-UAE Gas Contract:** The Iran-UAE gas contract outlined an agreement to transport natural gas from the Salman field to Sharjah in UAE. Contract negotiations were not concluded because of a pricing and volume dispute, and the contract was referred to international arbitration.

## Electricity sector

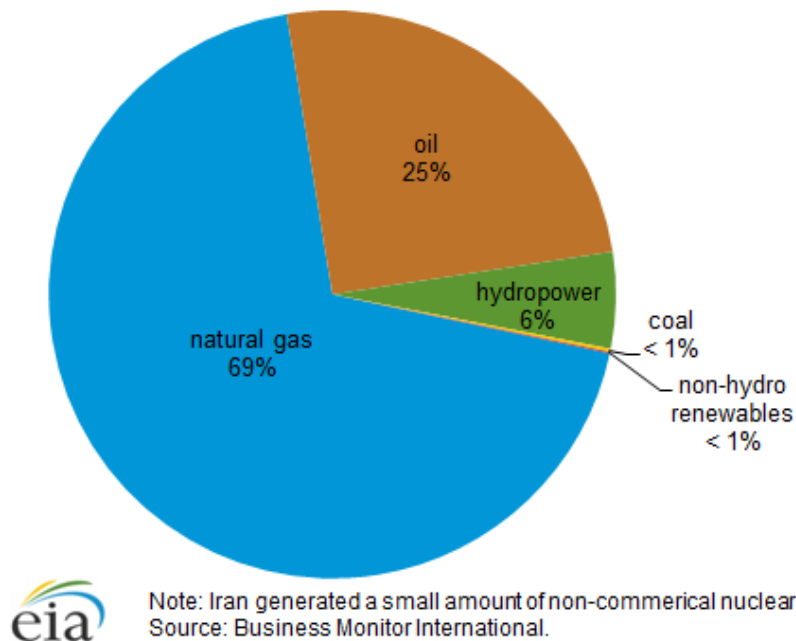
*Iran's increasing domestic demand for electricity has created supply shortfalls during times of peak energy demand. Iran recently increased electricity prices, which is a component of its energy subsidy reform, in hopes to limit demand growth. Natural gas is the country's primary fuel source to generate electricity, accounting for almost 70% of total generation in 2012.*

In 2012, Iran generated approximately 221 billion kilowatthours (Bkwh) of electricity, of which almost 95% was from fossil-fuel sources, according to Business Monitor International (BMI). Natural gas is the largest source of fuel for electricity generation in Iran, accounting for almost 70% of total generation. Oil, hydropower, coal, and non-hydro renewables made up the remaining fuel sources used to generate electricity in Iran, with marginal generation from a nuclear power plant that came online in 2011 but did not start commercial production until 2013.

Iran has experienced seasonal natural gas supply shortages in the winter months mostly because of the delay of the South Pars projects. Several natural gas-fired power plants were switched to use fuel oil and diesel during the past winter because of the natural gas supply shortage. Iran is planning to expand its underground natural gas storage capacity to ensure that enough natural gas is available during peak demand periods to avoid electricity supply shortfalls in the future.

As a part of Iran's energy subsidy reform, the Iranian government announced in early 2014 that electricity prices would increase by 25% as subsidies are scaled back. The government hopes that the price increase will ease consumption growth and pressure on its generation system, particularly during peak demand times. Nonetheless, Iran's electricity consumption is expected to continue to grow, and be met by new generation from natural gas, non-hydro renewable resources, and nuclear power.

### Electricity generation by fuel in Iran, 2012



Iran's first nuclear power plant at Bushehr became operational in 2011 after many years of delay. Construction at the power plant originally began in the mid-1970s, but was repeatedly delayed by the Iranian Revolution, the Iran-Iraq war, and more recently by problems associated with the Russian consortium that was awarded the construction contract. The Iranian government took control over the management of the plant in late 2013, around the same time the nuclear power plant began commercially producing power at its full capacity of 1,000 megawatts (MW), according to BMI. Two additional units are planned at Bushehr, each with a planned capacity of 1,000 MW, according to the World Nuclear Association.

Iran's government plans to construct additional nuclear power plants, the next of which is likely to be a station near Darkhovin with a generation capacity of 360 MW, although initial plans included capacity of more than 1,000 MW. However, sanctions imposed on Iran's controversial nuclear program may prevent the development of not only this nuclear power plant, but also adversely affect fossil-fueled generation and hydroelectric projects as a result of a lack of financing and necessary technology.

The Iranian government also plans to expand power generation from fossil-fuel sources with a number of new projects being developed as independent power projects, including a station near Assaluyeh (natural gas-fired), one in the East Azerbaijan province (gas-fired combined-cycle), and another at Parehsar on the Caspian Sea coast.

Increasing its generation capacity will help ensure that Iran can meet its increasing domestic power demand and continue to export electric power to neighboring countries. Iran exports

electric power to Armenia, Pakistan, Turkey, Iraq, and Afghanistan. Azerbaijan and Armenia supply electricity to Iran under a swap agreement.

## Notes

- Data presented in the text are the most recent available as of July 21, 2014.
- Data are EIA estimates unless otherwise noted.

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