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Iran

BACKGROUND REFERENCE: IRAN

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Overview

Iran holds some of the world's largest proved crude oil reserves and natural gas reserves. Despite Iran's abundant reserves, crude oil production stagnated and even declined between 2012 and 2016 as a result of nuclear-related international sanctions that targeted Iran's oil exports and limited investment in Iran's energy sector. At the end of 2011, in response to Iran's nuclear activities, the United States and the European Union (EU) imposed sanctions, which took effect in mid-2012. These sanctions targeted Iran's energy sector and impeded Iran's ability to sell oil, resulting in a nearly 1.0 million barrel-per-day (b/d) drop in crude oil and condensate exports in 2012 compared with the previous year.[1]

After the oil sector and banking sanctions eased, as outlined in the Joint Comprehensive Plan of Action (JCPOA) in January 2016, Iran's crude oil and condensate production and exports rose to pre-2012 levels. However, Iran's crude oil exports and production again declined following the May 2018 announcement that the United States would withdraw from the JCPOA. The United States reinstated sanctions against purchasers of Iran's oil in November 2018, but eight countries that are large importers of Iran's oil received six-month exemptions. In May 2019, these waivers expired, and Iran's crude oil and condensate exports fell below 500,000 b/d for the remainder of 2019 and most of 2020.

According to the International Monetary Fund (IMF), Iran's oil and natural gas export revenue was \$26.9 billion in FY 2015–2016, decreasing more than 50% from \$55.4 billion in FY 2014–2015. The sudden drop followed continued depressed export volumes and lower crude oil prices combined, which resulted in low total export revenue. In FY 2017–2018, oil and natural gas export revenue rose to about \$63.7 billion, and crude oil export volumes also rose after JCPOA was implemented.[2] Most of the export revenues came from crude oil and condensate exports because Iran exported a relatively small volume of natural gas.

Development of Iran's natural gas resources continued and picked up pace following the JCPOA. However, production growth was slower than expected because sanctions targeting Iran's nuclear activities between 2012 and 2016 also affected investments in natural gas development. Iran's natural gas activities are centered on the South Pars natural gas field, located offshore in the Persian Gulf, which holds about 40% of Iran's proved natural gas reserves.[3] Local companies in Iran are the main developers of the field.

In addition to its relatively large energy resources, Iran plays a significant role in fossil fuel transit geographically (Figure 1). The [Strait of Hormuz](#), off 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 20.7 million b/d of crude oil and refined products flowed through it in 2018 (about one-third of all seaborne-traded oil and more than 20% of total oil consumed globally).[4] Liquefied natural gas (LNG) volumes also flow through the Strait of Hormuz. Approximately 4.1 trillion cubic feet (Tcf) of LNG moved from Qatar through the Strait of Hormuz in 2018, accounting for more than 25% of global LNG trade.

Figure 1. Map of Iran



Source: U.S. Central Intelligence Agency

Total primary energy consumption

Despite periodic economic depression, total use of energy in Iran has grown rapidly between 2009 and 2019, increasing by about 40% over that time period.[5] To better control domestic demand growth for energy and reduce the budgetary exposure to high subsidy costs, Iran's government implemented energy subsidy reforms, which resulted in increasing domestic prices for domestic petroleum, natural gas, and electricity between 2010 and 2014.

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. Iran's constitution prohibits foreign or private ownership of natural resources. However, international oil companies (IOCs) can participate in the exploration and development phases through Iran's petroleum contract, a relatively new model for its upstream oil and natural gas fiscal regime, implemented in 2016.

The Supreme Energy Council, established in July 2001 and chaired by the president of Iran, oversees the energy sector. The Council includes 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, in addition to Iran's petrochemical industry. The four key state-owned enterprises are NIOC, the National Iranian Gas Company (NIGC), National Oil Refining and Distribution Company (NIORDC), and the National Petrochemical Company (NPC).

Table 1. Iran's state-owned energy companies

Company	Responsibility
National Iranian Oil Company (NIOC)	NIOC controls oil and natural gas upstream activities through its 11 subsidiaries.
National Iranian Gas Company (NIGC)	NIGC controls natural gas downstream activities. The company processes, delivers, and distributes natural gas for domestic use. NIGC operates through several subsidiaries.
National Iranian Oil Refining and Distribution Company (NIORDC)	NIORDC is responsible for all refining and distribution activities related to crude oil and petroleum products, including construction of refining and storage facilities and oil pipelines and operations of gasoline stations. NIORDC conducts these operations through its four major subsidiaries.
National Petrochemical Company (NPC)	NPC manages Iran's petrochemical industry, including operations of several petrochemical complexes, through its subsidiaries.

Source: U.S. Energy Information Administration, Facts Global Energy, Arab Oil & Gas Directory, and NIOC

Foreign investment

To attract much-needed foreign investment and technology in its oil and natural gas sector, Iran's government implemented a petroleum contract that allows IOCs to participate in all phases of upstream projects. This fiscal regime took effect in 2016 and offers more attractive terms than the previously available buyback contracts.

Iran's constitution prohibits foreign or private ownership of natural resources, and before late 2016, the government only permitted buyback contracts, which allowed IOCs to enter exploration and development contracts through an Iranian subsidiary. A buyback contract is similar to a service contract and requires the contractor (or an IOC) to invest its own capital and expertise to develop oil and natural gas fields.

After the field was developed and production started, the project's operatorship reverted to NIOC or to the relevant subsidiary. The IOC did not get equity rights to the oil and natural gas fields. NIOC used revenue from the sale of oil and natural gas to pay back the capital costs to the IOC. The annual repayment rates to the IOC were based on a predetermined percentage of the field's production and rate of return. According to Facts Global Energy (FGE), the rate of return on buyback contracts ranged between 12% and 17%, and the payback period was between five and seven years.[6]

In late 2016, Iran implemented the new oil contract model called the Iranian (or Integrated) Petroleum Contract (IPC). The goal of the IPC is to attract more foreign investment and technology to spur development of upstream oil and natural gas projects. The IPC terms combine terms from buyback contracts and production sharing agreements (PSA). The IPC encompasses exploration, development, and production phases, along with the possibility to extend into EOR phases. The contract term is set at a maximum of 20 years, with the possibility to extend the term by 5 years for EOR projects. The IPC retains the previous local content requirement of 51% of the value of work, and the foreign investor must submit plans for knowledge and technology development transfer as part of its annual operational financial plan.[7]

International sanctions have limited the foreign investment, technology, and expertise needed to expand capacity at oil and natural gas fields and to reverse declines at mature oil fields. Iran has depended mainly on local companies to develop oil and natural gas fields since 2018. Although the IPC may reverse this trend, Iran has had limited success in attracting IOCs to its oil and natural gas upstream sector.

By 2020, Iran had signed six IPC contracts, although all of the recent contracts were with domestic firms.[8] Iran finalized two IPC contracts with foreign firms before sanctions on Iran were re-imposed, but these companies withdrew from the projects to avoid sanctions. The first project was the July 2017 agreement with French company Total and China National Petroleum Corporation (CNPC) to develop Phase 11 of the South Pars field. The development was not slated to produce any crude oil but was expected to produce about 80,000 b/d of condensate.[9] Russian state-controlled Zarubezhneft signed an oil development contract under the IPC, reportedly with Rosneft, Lukoil, Gazprom Neft, and Tatneft, who were all considering upstream agreements with Iran. Zarubezhneft, NIOC, and Dana Energy signed the latest agreement in mid-March 2018 to develop the West Paydar and Abadan onshore fields near Iraq. The 10-year contract called for improved recovery rates and increased production from the fields to 48,000 b/d.[10]

Petroleum and other liquids

Reserves

Most of Iran's crude oil reserves are located onshore (about 86%) in the Khuzestan Basin (located on the southwest border of Iraq), which contains about 80% of total onshore reserves. Offshore reserves are mainly located in the Persian Gulf. Condensate reserves are split more evenly between onshore and offshore deposits.[11] Iran also has 0.5 billion barrels of proved and probable reserves in the Caspian Sea, but to date, very limited upstream activity has occurred in Iran's portion of the Caspian Sea.[12] Iran also shares a number of onshore and offshore fields with neighboring countries, including Iraq, Qatar, Kuwait, the United Arab Emirates (UAE), and Saudi Arabia.

Exploration and production

Iran is one of the founding members of OPEC, which was established in 1960. Since the 1970s, Iran's oil production has varied greatly. Iran's oil production averaged more than 5.0 million b/d between 1972 and 1978, and production topped 6.0 million b/d in 1974. Since the 1979 revolution, however, a combination of war, limited investment, sanctions, and a high rate of natural decline in production at Iran's mature oil fields has prevented a return to those production levels.

Sanctions imposed in late 2011 and mid-2012 related to Iran's nuclear activities led to a large and unexpected decrease in Iran's oil production in 2013, and crude oil output fell to 2.7 million b/d. These sanctions targeted Iran's petroleum exports and imports, prohibited large-scale investment in the country's oil and natural gas sector, and cut off Iran's access to European and U.S. sources for financial transactions. Further sanctions targeting the Central Bank of Iran were implemented against institutions doing business with the bank, while the EU imposed an embargo on Iran's oil and banned European Protection and Indemnity Clubs (P&I Clubs) from providing Iran's oil tankers with insurance and reinsurance. Before the 2012 sanctions, Iran was the second-largest producer in OPEC after Saudi Arabia.

Following JCPOA's start in January 2016 and Iran's renewed ability to export oil to Europe, Iran's exports immediately rose, and as a result, Iran's crude oil production once again exceeded pre-2012 levels. In 2017, Iran produced 4.8 million b/d of petroleum and other liquids, and more than 3.8 million b/d was crude oil and the remainder was condensate and hydrocarbon gas liquids (HGLs). Iran's total liquids production rose between 2015 and 2017 by 1.2 million b/d, supported by continued increases in exports.

After the United States withdrew from the JCPOA in 2018, Iran's crude oil production substantially declined. The United States' and Iran's governments reportedly began discussions in early 2021 that may result in the return to the agreement. If oil sanctions are lifted on oil exports, Iran's crude oil production could increase to its capacity of 3.8 million b/d within about 18 months.

Crude oil streams and oil fields

Most of Iran's crude oil production comes from the country's southwestern onshore fields, where Iran Heavy and Iran Light grades are produced. This area accounted for about 88% of Iran's total crude oil production capacity in 2019.[13] Iran Heavy is a medium-heavy, high-sulfur crude oil (29.6° API, 2.24% sulfur) and is sourced from some of Iran's largest oil fields, including the Gachasaran, Marun, Ahwaz, and Bangestan. Iran Light is similar in quality to Arab Light, with 33.6° API and 1.46% sulfur content. Iran Light is produced at several onshore fields in the Khuzestan province, but two-thirds of the Iran Light volume comes from three fields—Ahwaz, Karanj, and Aghajari.[14] All of these fields are decades old and have large decline rates. Sustaining production capacity will require EOR techniques, including the injection of natural gas into oil reservoirs to boost recovery rates.

In addition to its Heavy and Light grades, Iran also produces Azadegan, Doroud, Foroozan, Lavan Blend, Soroush/Nowruz, and Sirri. Azadegan is a relatively new stream, with production totaling about 0.2 million b/d in 2020 (down from 0.3 million b/d in 2017), from the Azadegan oil field (called Majnoon on the Iraqi side). Azadegan's plateau production will likely reach nearly 0.7 million b/d.[15]

While Iran developed the giant South Pars natural gas field, it also increased condensate output, which averaged 0.7 million b/d between 2018 and 2020. Condensate production of 0.7 million b/d is below Iran's production capacity of nearly 0.9 million b/d because of limiting export sanctions and lack of storage. However, Iran has managed to increase its condensate production capacity by developing South Pars, despite sanctions. We assess that Iran could produce more than 0.8 million b/d of condensate within one year without sanctions or other limiting factors.

Upstream Projects

Iran's medium-term plans to expand production capacity and crude oil output are ambitious and depend on the available international funding, expertise, and technology. The lack of foreign investment during the past few years as a result of sanctions prompted Iran to turn to local companies to develop its oil projects. However, local firms are limited in the capital and technology they need to maintain production at mature fields. The plans are focused on developing the West Karun oil fields located in the southwestern region, including Azadegan, Yadavaran, and Yaran. These fields straddle fields in neighboring Iraq. In addition, Iran plans to maintain and increase production capacity at fields with high-decline rates.

According to Iran's petroleum ministry, production from the West Karun fields was about 400,000 b/d in 2020, and target output is 1.2 million b/d.[16] In July 2020, Iran awarded contracts to local firms to raise output in the South Azadegan and Yaran fields. PetroPars, a subsidiary of NIOC, won a contract to double the production of South Azadegan from 140,000 b/d to 320,000 b/d by 2023.[17] Iran awarded local firm Persia Oil a contract to increase production from the North and South Yaran fields by 11,000 b/d over 10 years, from about 50,000 b/d in mid-2020.[18] Yadavaran is producing about 110,000 b/d of crude oil, which already surpassed its Phase 1 capacity of 85,000 b/d. A second phase will likely bring production capacity up to 180,000 b/d.[19]

To improve recovery rates at a number of mature fields, NIOC signed 28 contracts with several local companies in three phases between 2019 and 2021. These contracts are meant to bolster crude oil production from onshore and offshore fields by about 350,000 b/d.[20]

Exports

Iran's exports of crude oil and condensate increased sharply in 2016. However, Iran's exports have fallen at a faster rate than its production since the United States announced in May 2018 its withdrawal from the JCPOA. In 2017 (and before sanctions were imposed), buyers of Iran's crude oil and condensates were China (25%), India (17%), Turkey (9%), South Korea (13%), and Europe (20%). South Korea began to import much condensate from Iran to fuel its new condensate refineries.

Before the 2011 and 2012 sanctions, European refiners had been purchasing and processing Iran's crude oil, but they stopped their imports in early 2012. In 2016 and 2017, some European countries—Croatia, France, Greece, Italy, Malta, Netherlands, Poland, and Spain—resumed their purchases of Iran's oil after the JCPOA was implemented. The United States has not imported crude oil and condensate from Iran in several decades.

In addition to crude oil and condensate, Iran also exports petroleum products. According to FGE, Iran had a supply surplus of all petroleum products starting in 2019. Most of the petroleum product exports went to Asia, neighboring countries, and Syria.[21]

Oil terminals

The terminals at 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. Iran exports condensate from the South Pars natural gas field through the Assaluyeh terminal.

Kharg Island, the largest export terminal in Iran, is located in the northeastern part of the Persian Gulf. Most of Iran's crude oil exports are sent through Kharg, which includes a main terminal and a four-berth sea island (three of which are operational). The terminal processes all onshore production (the Iran Heavy and Iran Light Blends) and offshore production from the Foroozan field (the Foroozan Blend). NIOC has reportedly upgraded the terminal to handle a maximum loading capacity of 7 million b/d.[22]

Lavan Island mostly handles exports of the Lavan Blend, sourced from offshore fields. Lavan is Iran's highest-quality export grade (35.4° API, 1.67% sulfur) and one of Iran's smallest streams, at a production volume of about 115,000 b/d in 2018. Lavan's storage capacity is 5.5 million barrels and has a loading capacity of 200,000 b/d.[23]

Sirri Island serves as a loading port for the medium-gravity, high-sulfur Sirri Blend produced in the offshore fields. Its storage capacity is 4.5 million barrels.[24]

Neka is Iran's Caspian Sea port, which was built in 2003 to receive crude oil imports from the Caspian-region producers under swap agreements. The port's loading capacity is about 150,000 b/d. The terminal facilitates swap agreements with [Azerbaijan](#), [Kazakhstan](#), and [Turkmenistan](#). Under these agreements, Iran receives crude oil that is processed in the Tehran and Tabriz refineries at its Caspian Sea port of Neka. In return, Iran exports the same amount of crude oil from Kharg Island. The terminal operations stopped when sanctions on Iran began in 2018.[25]

Assaluyeh terminal is where Iran's South Pars condensate is loaded for exports, mainly to China, India, Japan, South Korea, and UAE. In addition to condensate, the port also loads liquefied petroleum gas (LPG), sulfur, and petrochemical products.[26]

Qeshm oil terminal, located on Qeshm Island near the Strait of Hormuz, began operations in mid-2020 with 3.2 million barrels of storage capacity for either crude oil, condensates, or oil products. A second phase is slated to add another 3.2 million barrels of storage capacity in late 2021.[27]

Jask oil terminal and the accompanying 620-mile Goreh-Jask pipeline project, which will transport crude oil from Goreh, Iran, to the terminal, are under construction. This oil terminal will be Iran's first oil export facility east of the Strait of Hormuz, allowing the country to bypass any disruption that may occur within the Persian Gulf. Ultimately, Iran plans to install a total loading capacity of 2 million b/d and storage capacity of 20 million barrels at the project. Initially, at least 2 million barrels of storage capacity and 1 million b/d of loading capacity will be available at the terminal, and the Goreh-Jask oil pipeline is scheduled to come online by 2022.[28]

The export terminals **Bandar Mahshahr** and **Abadan** (also known as Bandar Imam Khomeini), near the Abadan refinery, 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

Iran has the second-largest oil-consuming economy in the Middle East after Saudi Arabia. Domestic petroleum products used in Iran are mainly diesel, gasoline, and fuel oil. Starting in 2019, Iran's oil product consumption was completely met with domestically refined product. Historically, Iran's consumers relied on imported gasoline because of limited refining capacity to meet domestic needs. However, following upgrades to existing refineries and the start of the third phase of the Persian Gulf Star refinery at the beginning of 2019, Iran's gasoline production grew significantly, which allowed export of gasoline that year.[29]

Refining sector

In the past, Iran had limited domestic oil refining capacity, and domestic demand relied on imports of refined products, especially gasoline. In response to international sanctions and the resulting difficulty in purchasing refined products, Iran's domestic refining capacity expanded. As of 2020, total crude oil distillation and condensate splitter capacity in Iran was more than 2.4 million b/d. The Persian Gulf Star condensate refinery, which processes condensates from Iran's South Pars natural gas field, came online in phases, starting in 2017 and continuing through 2019, with an initial design capacity of 360,000 b/d. More processing capacity to produce lighter petroleum products such as gasoline allowed Iran to substantially increase its gasoline output and become self-sufficient in all petroleum products by 2019. In early 2020, NIORDC, the state oil refiner, raised the capacity of Persian Gulf Star to 420,000 b/d, and it has plans to increase capacity by another 60,000 b/d to process more condensates from the South Pars field.[30]

Although Iran does not expect to add any significant crude oil distillation capacity in the next several years, it has plans to upgrade existing refineries that would produce lighter products such as diesel and gasoline and reduce output of fuel oil. However, some of these projects are currently on hold as a result of U.S. sanctions.[31]

Table 2. Oil refineries in Iran, 2020

Refinery	Nameplate crude oil distillation capacity (thousand b/d)
Abadan	360
Isfahan	360
Bandar Abbas	330

Source: Created by the U.S. Energy Information Administration, based on data from Facts Global Energy, December 2020, and *Middle East Economic Survey*

Refinery	Nameplate crude oil distillation capacity (thousand b/d)
Tehran	250
Arak	250
Borzuyeh	120
Persian Gulf Star	420
Tabriz	110
Shiraz	60
Lavan	60
BooAli Sina	40
Kermanshah	22
Aras 2	10
Bushehr	10
Aras 1	5
Yazd	3
Total	2,410

Source: Created by the U.S. Energy Information Administration, based on data from Facts Global Energy, December 2020, and *Middle East Economic Survey*

Pipelines

An extensive domestic oil pipeline network exists in Iran, including 20 crude oil and product pipelines ranging in length from 93 miles to 525 miles. The longest pipeline in Iran is the product line that runs between Rey and Mashahad. The longest crude oil pipeline transports oil between Ahavaz and Rey and supplies feedstock to the Tehran, Arak, and Tabriz refineries. In addition, a new 36-inch condensate pipeline (Assaluyeh-Bandar Abbas) ships feedstock from Assaluyeh to the Persian Gulf Star refinery.[32]

Iran's future plans include construction of four additional petroleum product pipelines, including a new line that will transport gasoline throughout Iran from the Persian Gulf Star refinery.

Natural gas

Reserves

Iran has a high success rate of natural gas exploration, which is estimated at 80% compared with the world average success rate of 30% to 35%, according to FGE.[33] In late 2019, NIOC discovered Eram, a large independent onshore natural gas field with 12 trillion cubic feet of recoverable reserves.[34] However, because of its vast amounts of undeveloped known reserves, Iran prioritizes developing those that are adjacent to currently producing fields.

Iran is the second-largest holder of natural gas reserves in the world, and most reserves are located in the offshore southwestern region.[35] The largest natural gas field (by reserves) in Iran is South Pars, a non-associated natural gas field located offshore in the Persian Gulf. South Pars is part of a larger natural gas structure that straddles the territorial water of Iran and Qatar called the North Field in Qatar. South Pars reserves account for almost 40% of Iran's total natural gas reserves. Other major natural gas fields in Iran include Kish, North Pars, Sardar-e-Jangal, Forouz-B, Aghar, Golshan, and Kangan. These fields and others also hold large amounts of condensate reserves. About 81% of Iran's natural gas reserves are nonassociated.[36]

Production

Iran is one of the world's largest dry natural gas producers. Iran's natural gas prospects have improved since production began in the South Pars field in 2003, and one additional phase is expected to come online by 2024.

Iran's use of natural gas in EOR increased 27% between 2007 and 2017. As natural gas production increases, the use of natural gas for EOR will likely continue to rise. After 2017, natural gas reinjection declined substantially because of strict U.S. sanctions on Iran's oil exports and the subsequent fall in oil production.[37] Use of EOR in the future will be key to stemming declines in Iran's existing oil fields, which have relatively high natural decline rates. Natural gas is flared when no infrastructure exists to capture, transport, and process gas associated with oil production. Iran was the fourth-largest source country of flared natural gas in 2019 behind Russia, Iraq, and the United States.[38]

South Pars is Iran's largest field by production volume; approximately 66% of Iran's production originated from this field in 2019. In addition to South Pars, other major sources of Iran's natural gas production include the Tabnak, Nar, Kangan, Khangiran, Homa, and Shanoul fields.[39]

South Pars Natural Gas Field

Natural gas production from South Pars is critical for meeting increasing domestic consumption and Iran's plans and obligations for exports. The development plan includes 24 phases. Because NIOC has commissioned several South Pars phases since 2014, Iran's natural gas production has increased significantly.

Discovered in 1990 and located 62 miles offshore in the Persian Gulf, South Pars has a 24-phase development plan, with 23 phases already operational, although not all of these phases have reached maximum production capacity. Currently, Phase 11 is under development, and four phases began operations in 2019. Each of the 24 phases has a combination of natural gas with condensate and/or HGLs. Pars Oil and Gas Company (POGC), a subsidiary of NIOC, manages the project.[40] According to FGE, development of the South Pars natural gas field has so far required \$80 billion in investment, and an additional \$20 billion is needed to complete the remaining phase and sustain production from several other phases.[41]

After the U.S. re-imposed sanctions, China's CNPC and France's Total withdrew from South Pars Phase 11 development. As a result, in 2020, local companies led by PetroPars, resumed work to develop the block. The first stage of development involves installing all of the offshore equipment and drilling 30 wells. Field drilling began in late 2020, and production could begin as early as 2023. To maintain production capacity for 20 years, Iran will need to set up offshore compression stations to maintain natural gas flow. However, this stage is on hold for now.[42]

Table 3. South Pars natural gas field development

Phase	Natural gas capacity (Bcf/d)	Condensate capacity (b/d)	Start-up year
1	1	40,000	2004
2	2	80,000	2003
3			
4	2	80,000	2005
5			
6			
7	3	120,000	2008
8			
9	2	80,000	2009
10			
11	2	80,000	2023
12	3	120,000	2014
13	2	75,000	2019
14	2	75,000	2018
15	2	75,000	2015
16			
17	2	75,000	2016
18			
19	2	75,000	2017
20	2	75,000	2017
21			
22			
23	2	77,000	2019
24			
Total	29	1,125,000	

Source: Table created by the U.S. Energy Information Administration, based on data from Facts Global Energy, December 2019 and December 2020

Note: billion cubic feet per day=Bcf/d; barrels per day=b/d.

Iran has identified several undeveloped natural gas fields, such as Farzad A and B, Balal, and Kish, although sanctions have slowed any efforts to advance these projects.

Imports and exports

Natural gas pipeline exports from Iran accounted for about 2% of global trade in 2019.[43] Iran trades relatively small volumes of natural gas regionally via pipelines, although since 2017, exports have risen substantially. In 2020, all of Iran's imports came from Azerbaijan, and about 97% of Iran's exports went to Iraq and Turkey.[44]

Iran's natural gas exports to Iraq started in June 2017 to fuel electric power plants near Baghdad. In July 2018, natural gas from Iran to Basrah began through a second export pipeline. Iraq's power plants will likely continue to depend on natural gas from Iran to help meet growing electricity consumption needs until natural gas production in Iraq increases sufficiently to meet domestic demand.

Iran and Armenia trade small volumes of natural gas and electric power through a 20-year swap contract that began in 2004.[45] Azerbaijan and Iran have been trading natural gas under a natural gas swap contract since 2004. Iran exports natural gas to Azerbaijan's Nakhchivan province, and in return, Azerbaijan exports natural gas via pipeline connections to Iran's northwestern city of Astara.

Iran's imports of natural gas from Turkmenistan began in 1997 in response to a lack of domestic infrastructure that would deliver natural gas from southern Iran to the major consuming centers in the north. Turkmenistan's natural gas volumes filled this critical gap for years, especially during winter months. Iran's imports of Turkmenistan's natural gas peaked in 2015 at about 330 Bcf, but they gradually declined and ultimately stopped in 2019. The decrease is partly the result of contractual disputes between Iran and Turkmenistan, which have at times resulted in a complete stop of natural gas trade between the two countries. In January 2017, Turkmenistan halted natural gas exports to Iran over a reported nonpayment for deliveries. In response, Iran built a pipeline between the city of Damghan and Neka in the north, reducing the need for Turkmenistan's natural gas.[46]

No infrastructure exists in Iran to export or import LNG, despite Iran's aspirations, dating back to the 1970s, to build a liquefaction facility. In past years, NIOC started construction projects to build an LNG export plant, but most of the work has stopped. The lack of technology and foreign investment, stemming from decades-old international sanctions, made obtaining foreign financing and purchasing necessary technology difficult. NIOC has spent over \$2 billion on developing the Iran LNG project in Tombak, near the city of Assaluyeh. This facility has a design capacity of 520 Bcf per year, but sanctions have prevented continued work on this project. NIOC is offering shares in the ownership for foreign assistance to finish the project. In addition to these large-scale LNG projects, plans existed to construct small- and medium-sized LNG plants in 2017. However, development has not moved forward because the companies involved cannot agree on the contract terms and natural gas prices.[47]

Proposed regional pipelines

Iran's potential to become an important natural gas supplier is significant, and some agreements exist with neighboring countries to export natural gas via planned regional pipelines. However, several challenges related to Iran's natural gas sector remain that may complicate the expected volumes from these projects. Some of these challenges include:

- Iran's domestic growth in natural gas demand
- Iran's reliance on reinjecting domestic natural gas to augment oil recovery
- International sanctions that have hindered Iran's access to technology and foreign investment
- Disagreements between Iran and potential buyers over natural gas prices

In addition, competition from other supply sources such as LNG or new domestic natural gas production present major obstacles for some of these projects.

Iran-Oman Pipeline: In March 2014, Iran and Oman agreed to form a joint venture that would deliver more than 365 Bcf per year of Iran's natural gas to Oman. Some of Iran's natural gas volumes were planned to be exported as LNG from Oman. However, Oman's development of its domestic natural gas resources, including tight gas development projects, has removed some of the need to import natural gas from Iran. The project would require a new pipeline (half of which would be at subsea levels), and little progress has been made so far on its construction.

Iran-Pakistan Pipeline: Construction of one leg on Iran's side of the pipeline is complete, but construction on Pakistan's side has been repeatedly delayed and has yet to start. In 2009, when the agreement was signed, Pakistan agreed to import 274 Bcf per year of natural gas, and the trade was supposed to commence in December 2014. Given the lack of progress on Pakistan's side and increasing LNG imports into Pakistan, this project is not likely to materialize.[48]

Iran-UAE Gas Contract: Although Iran's natural gas pipeline system is connected to the UAE, Iran has so far refused to sell its natural gas to UAE. Iran and UAE's Crescent Petroleum had signed an agreement to trade natural gas on a 20-year term with Iran shipping natural gas produced at the Salman field to the city of Sharjah. However, after repeated cancellations, the contract was referred for international arbitration. The court ruled that the contract was valid and that Crescent Petroleum had a right to terminate the contract and receive compensation from NIOC. The parties are waiting on a final court decision on whether NIOC is liable for damages for the full period of the agreement.[49]

Electricity

Natural gas is Iran's primary fuel source for electricity generation. Nuclear and renewables (mostly hydropower) make up the remaining fuel sources used to generate electricity in Iran.

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Iran's ambitious plans also extend to nuclear electric power generation. The government plans to construct two additional units to the Bushehr facility, Iran's only nuclear power plant, which became fully operational in late 2013. Currently, Bushehr has 915 megawatts (MW) of net capacity.[51] One of these units is under construction and expected to begin operations in 2024 at the earliest, and the third Bushehr reactor is scheduled to begin operations in 2026. Combined, these units will add 1,948 MW to Iran's current net nuclear-powered capacity.[52]

Construction at the Bushehr power plant originally began in the mid-1970s, but the project was repeatedly delayed by the Iranian Revolution, the Iran-Iraq war, and then by problems associated with the Russian consortium that was awarded the construction contract. Iran's government took control of the plant's management in late 2013, about the same time the nuclear power plant began producing commercial power.

Iran's government also plans to add 5 gigawatts (GW) of new non-hydropower renewable capacity by 2022. According to Fitch Solutions, Iran has adopted a feed-in tariff to offer a fixed rate for renewable projects to promote these types of projects.[53] Although non-hydropower renewable capacity has increased gradually over the past few years to nearly 1 GW by 2021, it remains well below the 5 GW target because many projects have been shelved as a result of U.S. sanctions and a lack of investment.[54]

Notes

- In response to stakeholder feedback, the U.S. Energy Information Administration has revised the format of the *Country Analysis Briefs*. As of December 2018, updated briefs are available in two complementary formats: the Country Analysis Executive Summary provides an overview of recent developments in a country's energy sector and the Background Reference provides historical context. Archived versions will remain available in the original format.
- Data presented in the text are the most recent available as of April 30, 2021.
- Data are EIA estimates unless otherwise noted.

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