Independent Statistics & Analysis
U.S. Energy Information Administration

Background Reference: Iraq

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Overview

Iraq's economy depends heavily on oil revenues. Iraq is one of the largest crude oil producers in the Organization of the Petroleum Exporting Countries (OPEC), and as such, Iraq also is one of the world's largest holders of proved crude oil reserves. Most of Iraq's major known fields are either producing or are in development, and all of them are located onshore. The largest fields in the south have relatively low extraction costs as a result of

- Uncomplicated geology
- Several supergiant fields
- Fields located in relatively unpopulated areas with flat terrain
- Close proximity to coastal ports

Iraq's production growth during the past decade has slowed as a result of infrastructure bottlenecks in the south, supply disruptions in the north, and delays in awarding contracts. Nonetheless, crude oil production grew to 4.7 million barrels per day (b/d) in 2019 before it declined in response to lower global demand in 2020.

Kurdistan Regional Government and Baghdad

The Kurdistan Regional Government (KRG), the official ruling body of the semi-autonomous region in northern Iraq that is predominantly Kurdish, has been involved in disputes with national authorities related to sovereignty.

Northern Iraq crude oil production and exports have contributed to ongoing disputes between the central Iraqi government in Baghdad and the KRG. Before 2014, the central Iraqi government and its Ministry of Oil controlled and administered most of the crude oil production in the north, mainly at the Kirkuk field (Avana and Baba Domes) and the Bai Hassan field. However, northern production lacked access to export markets after the Iraq-Turkey pipeline was severely damaged by militants and became inoperable in March 2014. The Baiji refinery (Iraq's largest at the time) also closed in June 2014 after being attacked by Islamic State (IS) militants.

Following U.S.-led airstrikes against the IS in August 2014, the Kurdish Peshmerga took over the oil fields in northern Iraq, and subsequently, the KRG resumed operations at the Avana Dome and Bai Hassan. The KRG-administered oil in northern Iraq is exported through the KRG-built independent pipeline, which connects the Kirkuk area and other northern fields and Turkey's Ceyhan port. Following the independence referendum in late 2017, the central government of Iraq retook the Avana Dome and Bai Hassan fields.

KRG and the central Iraqi government attempted to cooperate on crude oil sales in northern Iraq, but they faced a number of challenges. KRG and the federal government of Iraq agreed to an oil transfer and payment scheme, and the KRG began transferring some of the crude oil at Turkey's Ceyhan terminal to Iraq's State Organization for Marketing for Oil (SOMO) in late 2014. The agreement gave Baghdad control over Iraq's northern crude oil exports, and in exchange, the KRG received payments from Baghdad equal to 17% of Iraq's federal budget. This arrangement lasted until August 2015, when the KRG stopped oil transfers to SOMO. Transfers to SOMO resumed in August 2016, and this arrangement lasted until June 2017.

Even before the independence referendum in September 2017 and the takeover of certain Kirkuk-area oil fields by the central government of Iraq, the KRG had experienced budgetary constraints that caused payment delays to international oil companies (IOCs). After the KRG lost control of nearly half of the production from the Kirkuk-area oil fields after the referendum, its budgetary problems have become even more problematic.

Iraq's Ministry of Oil has prioritized repairing parts of the pipeline that connect the northern field to the Baiji refinery. IS damaged this pipeline in 2014, and it was inoperable until June 2018. As of July 2018, the restored pipeline had a capacity of 40,000 b/d and transports Kirkuk oil to the Baiji and Daura refineries. [1]

Future transportation expansion plans include construction of a new pipeline between Kirkuk and Kermanshah in Iran.

Petroleum and other liquids

According to the *Oil & Gas Journal* (OGJ), Iraq is one of the top holders of proved oil reserves in the world. [2] Iraq has five supergiant fields (defined as holding more than 5 billion barrels of oil reserves) in the south. These supergiant fields account for almost 50% of Iraq's total estimated reserves. An estimated 20% of oil resources are located in northern Iraq, including the areas of Kirkuk, Irbil, and Mosul. [3]

Iraq's crude oil output has increased since 2003 despite infrastructure bottlenecks, supply disruptions in the north, and contractual delays. Future growth remains uncertain, however, because of reduced foreign investment in the oil sector, which resulted from lower crude oil prices between 2015 and 2017 and again in 2020.

Although Iraq's production growth has slowed since the record-high annual growth of nearly 700,000 b/d in 2015, crude oil output increased by an average growth rate of nearly 170,000 b/d between 2015 and 2019 despite significant budget constraints, which resulted in lower spending plans and lower payments to IOCs.

Oil sector management

The Ministry of Oil in Baghdad oversees all oil and natural gas development and production in Iraq, except for the Kurdish territory, through its operating entities: the North Oil Company (NOC) and the Midland Oil Company (MDOC) in the north and central regions and the South Oil Company (SOC) and the Missan Oil Company (MOC) in the southern regions. In the Iraqi Kurdistan region, the KRG, through its Ministry of Natural Resources, oversees oil and natural gas development and production. IOCs are very active in Iraq, including in the Iraqi Kurdistan region. IOCs operate under technical service contracts (TSCs) in Iraq, which the Ministry of Oil in Baghdad signs. IOCs in the Iraqi Kurdistan region operate under production-sharing agreements (PSAs).

Crude oil exports and infrastructure constraints

Southern exports

Iraq substantially expanded onshore pumping and storage infrastructure in the south between 2015 and 2018. Iraq's Basra and Khor al-Amaya ports operate well below capacity following years of armed conflict and insufficient maintenance. Although capacity expansions since 2015 have alleviated some of the constraints, Iraq will need further crude oil export capacity expansions for additional crude oil production increases.

Capacity expansions include the addition of five single-point moorings (SPMs) near the Basra and Khor al-Amaya ports. The SPMs have a combined nameplate (design) loading capacity of 4.6 million b/d, although actual loadings are typically much less as a result of a lack of sufficient onshore pumping stations. The SPMs have added much needed shipping capacity to the southern export outlets.

Storage capacity at the southern ports remains limited. SOMO storage capacity in the south as of March 2021 was about 10 million barrels, which is insufficient if the Iraqi government plans to increase oil output and exports through the southern ports. Plans are in place to increase southern storage capacity by almost 9 million barrels, but this project has encountered delays.[4]

Common Seawater Supply Project

Meaningful crude oil production increases will also require substantial increases in natural gas and water injection to maintain enough reservoir pressure to increase recovery rates and boost oil production. Associated natural gas production in Iraq could be used for reinjection, but much of the natural gas is currently flared and is slated for future power generation projects.

Future production targets rely primarily on water injection. Iraq's South Oil Company (SOC) is undertaking the Common Seawater Supply Project (CSSP), which will treat seawater from the Persian Gulf and then transport it via pipelines to oil production facilities. The CSSP will likely supply 5 million b/d of water, possibly expanding to 7.5 million b/d.[5] The water will be sent to the key southern Basra fields and the Nasiriya and Halfaya oil fields.[6] Generally, Iraq's major southern oil fields require between 1.3 barrels and 1.5 barrels of water injection to produce 1 barrel of oil.[7] The CSSP is key to Iraq's plans to expand crude oil production. The anticipated project start year has been pushed back several times as a result of management changes, administrative delays, contract negotiation disagreements, and financial hurdles. Once the project work begins, CSSP will take at least three years to complete.[8]

Northern exports

Most of Iraq's major crude oil pipelines are located in the north and are currently not operable (Table 1). The pipelines have suffered substantial damage over the years, and rehabilitation would take years and large investments. The Iraqi portion of the Iraq-Turkey (IT) pipeline stopped operating in March 2014 following several attacks by militants. Iraq's government intends to build a pipeline parallel to the original one although this project is still under discussion.[9]

Currently, only two major export-oriented pipelines in northern Iraq are operable— KRG's main pipeline and the DNO/Tawke pipeline, both built by the KRG and its international partners and both linked to the Turkey pipeline to the Ceyhan port. Several smaller pipelines carry crude oil from other fields to KRG's main pipeline.

Figure 1. Map of Iraq

Source: U.S. Central Intelligence Agency

Table 1. Status of main pipelines used to export crude oil produced in Iraq (including Kurdistan Regional Government [KRG] area)

Name/description	Pipeline direction	Location	Nameplate capacity (000' b/d)	Status	Notes
Turkey section of Iraq to Turkey (IT) pipeline	Fishkhabur (Iraqi-Turkey border) to Ceyhan port (Turkey)	southern Turkey	1,500	operating	The pipeline transports oil produced in northern Iraq to the Turkish port of Ceyhan. It is connected to KRG's main pipeline. The pipeline consists of two parallel lines.
KRG's independent pipeline to Turkey pipeline	Khurmala Dome to Fishkhabur	northern Iraq	1,000	operating	This pipeline carries crude oil produced at the Khurmala Dome and crude oil sent there from nearby fields, including Taq Taq.
DNO-KRG to Turkey pipeline	Tawke field to Fishkhabur	northern Iraq	200	operating	The pipeline transports oil produced at the Tawke field, operated by DNO, to Fishkhabur. From there, it connects to the Turkey pipeline for export at the Ceyhan. DNO and its partners are expanding the pipeline's capacity.
Iraq section of Iraq to Turkey (IT) pipeline	Kirkuk to Fishkhabur	northern Iraq	600	not operating	The pipeline was the target of militant attacks and stopped operating in March 2014. The pipeline's effective capacity was significantly lower than its nameplate capacity before its closure. Crude oil exports from the pipeline averaged 260,000 b/d in 2013.
Kirkuk-Banias/Tripoli Pipeline	Kirkuk to Banias (Syria) and to Tripoli (Lebanon)	northern Iraq	700	not operating	One section of the pipeline links to Syria, and a branch goes to Lebanon. The pipeline was closed in the 1980s and opened in 2000. It was closed again in 2003 after it was damaged.
Strategic pipeline	Kirkuk to Persian Gulf	northern Iraq to southern Iraq	800	partially operating	This pipeline is reversible and transports northern Kirkuk crude oil to the southern Basra Port and vice versa. The pipeline section from Basra to Karbala is operating with a capacity of 40,000 b/d and transports crude oil to Baghdad refineries.
Iraq pipeline to Saudi Arabia (IPSA)	southern Iraq to port of Mu'ajjiz in Saudi Arabia	southern Iraq & Saudi Arabia	1,650	Iraq portion is not operating	The portion that runs through Saudi Arabia was converted to transport natural gas to power plants (see Saudi Arabia Country Analysis Brief).

Sources: U.S. Energy Information Administration, Arab Oil & Gas Directory, Genel Energy, BOTAS (Petroleum Pipeline Corporation), Reuters

Crude oil grades

Iraq exports four grades of crude oil: Basra Heavy, Basra Medium, Basra Light, and Kirkuk. Iraq introduced the Basra medium grade in January 2021 as a result of Iraq's rising production from heavier

crude oil fields that compromised the grade of Iraq's light crude oil. SOMO markets the Basra Medium grade as a medium, sour crude oil (27.9° API, 3.0% sulfur).[10]

Basra Light is sourced from the southern fields, mainly from the Rumaila, West Qurna, Zubair, and Majnoon fields. Basra Light is a light, sour crude oil (31.4° API, 2.74% sulfur). When the West Qurna 2 and Halfaya fields came online, Basra Light became heavier, and as a result, Iraq launched the Basra Heavy grade in 2015.[11]

Basra Heavy is a heavy, sour (24° API, 4% sulfur) crude oil grade, which is mainly sourced from Iraq's Missan province (Halfaya field and Missan cluster), the West Qurna 2 field, and the Gharraf field. Exports of the Basra heavy grade began in mid-2015, with most of the volumes headed to Asia, although exports of the grade to the United States and Europe have grown over time.[12]

The Kirkuk grade, which was traditionally exported through the Ceyhan terminal in Turkey is a 34.2° API, 2.24% sulfur crude oil grade. The Kirkuk blend is primarily produced in the Kirkuk area fields, but other northern fields have contributed to the grade.[13]

Liquid fuels consumption and refining

Most of Iraq's petroleum consumption needs are met by its domestic refineries; however, Iraq relies on imports of some petroleum products, including diesel, gasoline, and small volumes of kerosene.

Total nameplate (design) refinery capacity in Iraq was nearly 1.2 million b/d as of February 2021 (Table 2); however, effective capacity is about 900,000 b/d. The difference between design and effective capacity in the northern refineries is mainly attributable to Iraq's war against IS in 2014–15, when facilities were destroyed or severely damaged. Some of the capacity was restored since 2015, such as part of the Baiji refinery. The Iraqi government plans to reduce petroleum product imports by rehabilitating the refining sector and building new refineries, but the government has struggled in its efforts to attract the foreign investment needed in the downstream sector.

Iraq's refineries produce more heavy fuel oil than is needed domestically and not enough gasoline and diesel to meet demand. Several new refineries are planned, along with capacity expansion at a number of existing refineries to alleviate domestic product shortages, reduce government import costs, and eventually increase exports of refined products. The South Refineries Company is expanding its Basra refinery by 70,000 b/d in 2021. Iraq's oil ministry expects the new 150,000 b/d Karbala refinery to come online starting in 2022.[14]

Table 2. Existing oil refineries in Iraq, 2021

Refinery	Nameplate (design) capacity ('000 b/d)	Effective capacity ('000 b/d)	Notes
North Refineries Company			
Baiji	310	140	The Baiji refinery was severely damaged by an IS attack in June 2014. Effective capacity was 230,000 b/d before the June 2014 attack. Two crude oil distillation units were repaired, and each began operations in September 2018 and January 2021, respectively. Plans include installing a third crude oil distillation unit that would increase effective capacity by an additional 140,000 b/d.
Kirkuk	56	56	
Sininya	30	20	
Hadeetha	16	10	
Qayara	20	14	Qayara was severely damaged by IS. Effective capacity was about 10,000 b/d in the fall of 2016. After repair work, the refinery came back online in 2017 with capacity of about 14,000 b/d.
Kasak	10	10	
Total north	**442**	**250**	
Midland Refineries Company			
Daura	210	140	
Najaf	30	30	
Samawah	30	30	
Diwaniya	20	20	
Total midland	**290**	**220**	
South Refineries Company			
Basra/Shuaiba	210	210	Planned expansion will add 70,000 b/d of capacity.
Missan	40	40	
Nassiriya/Dhi Qar	30	30	
Total south	**280**	**280**	
KAR Group (Iraq Kurdistan)			
Kalak (near Erbil)	110	110	
Qaiwan Group (Iraq Kurdistan)			
Bazian (near Sulaimanya)	40	40	
DNO (Norway)			
Tawke	6	6	
Total Iraqi Kurdistan Region	**156**	**156**	
Total Iraq	**1,168**	**906**	

Source: U.S. Energy Information Administration based on information from the North Refineries Company and the South Refineries Company, Qaiwan Group, Iraq Oil Report, Middle East Economic Survey, and Energy Intelligence Group.

Natural gas

Because of insufficient infrastructure to gather, process, transport, and store natural gas for consumption, export, or both, Iraq flares relatively large volumes of its natural gas production. To reduce flaring, Iraq's state-owned South Gas Company (51%) signed an agreement with Royal Dutch Shell (44%) and Mitsubishi (5%) in 2011 to create a new joint venture—Basra Gas Company—to capture flared gas at three large southern oil fields—Rumaila, West Qurna 1, and Zubair. The 25-year venture, which is estimated to cost US $17 billion, entails upgrading current facilities and building new facilities and processing plants.

In the long term, the joint venture may construct a liquefied natural gas (LNG) exporting facility—the Basra Gas LNG Project. Under the agreement, processed natural gas would first be available to the South Gas Company for power generation. Any natural gas not bought for use by Iraq's power plants could be exported via the LNG plant. This agreement is also critical for the new oil development projects, which would use some of the natural gas for reinjection.

Iraq began importing natural gas from Iran in June 2017 to fuel electric power plants near Baghdad, including stations in Al-Besmaya, Al-Quds, Al-Mansuriyah, and Al-Sadr.

Electricity

Iraq generates electric power from liquid fuels, natural gas, and hydroelectric resources. In addition, it also relies on electricity imports from Iran to meet domestic demand. Although Iraq's generation capacity has increased during the past few years, it is not sufficient to meet its power needs. Much like its Gulf neighbors, Iraq faces a sharply rising demand for power. Parts of Iraq continue to experience power blackouts and managed shutdowns of the power distribution system, particularly during the summer, despite increased natural gas-fired generation and increases in electricity imports from Iran. [15] Iraq's households and businesses must rely on expensive off-grid, private, diesel-fueled generators to address the shortfall. In addition, Iraq's distribution system has deteriorated because of poor design, lack of maintenance, and electricity theft, which has resulted in large distribution losses, low voltage levels, and frequent disconnections. [16]

Iraq also gets hydroelectric power from the Mosul dam, located on the Tigris River north of Mosul city. IS briefly took control of the dam in August 2014 following the start of the group's occupation of Mosul, but KRG's Peshmerga forces and the Iraqi army regained control of the dam shortly after. The Mosul dam is reportedly at risk of collapse because of its initial poor construction.

Iraq lacks sufficient natural gas, and at times, water, to fuel its power plants. Iraq's electricity expansion plan expects its electricity will be fueled primarily by natural gas-powered turbines. Most current natural gas production in Iraq is flared, and pipelines will need to be built to bring natural gas, which would otherwise be flared, to future power plants.

Iraq's oil and natural gas industry is the country's largest industrial customer of electricity in Iraq. Large-scale increases in oil production would require commensurate increases in electric power generation.

However, Iraq has struggled to keep up with the demand for electricity, with shortages common across the country. Significant upgrades to the electricity sector would be needed to supply additional power. Delays in meeting projected targets may mean insufficient power supply to meet the projected demands of the oil sector.

The Iraqi government heavily subsidizes electricity at an estimated $11 billion. Most end users in Iraq do not pay for the electricity delivered, leaving the government to carry nearly all of the cost.[17] The government has attempted to implement reforms and to institute bill collections, but these changes have proven deeply unpopular with the population, especially in the poorer areas.

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 February 2021.
- Data are EIA estimates unless otherwise noted.

Endnotes

[1] FGE, *Middle East Oil Monthly* (June 21, 2018)
[2] *Oil & Gas Journal*, Worldwide Look at Reserves and Production, (January 1, 2021).
[3] Rystad Energy, UCube Browser, accessed July 2018.
[4] FGE *Middle East Oil Monthly*, June 2019, page 10; *Middle East Economic Survey*, "Iraq Oil Export Revenues Surge with First Basra Medium," (February 5, 2021).
[5] Reuters, "Iraq picks Hyundai E&C for $2.4 billion seawater injection project: state oil company director," June 2, 2019.
[6] *Middle East Economic Survey*, "Exxon Walks Away From Iraq Seawater Project," June 22, 2018, page 2; Oxford Energy Institute, "Iraqi Oil: industry evolution and short and medium-term prospects," October 2018, page 16.
[7] Oxford Energy Institute, "The Soleimani Effect: A Game-Changer for Iraqi Crude Dynamics?" January 2020, page 7.
[8] *Middle East Economic Survey*, "Exxon Walks Away From Iraq Seawater Project," June 22, 2018, page 2; *Middle East Economic Survey*, "Iraq's 7 mn b/d Output Target Delayed to 2027," October 23, 2020; page 4.
[9] Iraq Oil Report, "Iraqi Oil Minister takes hardline stance as Turkey arbitration decision looms," January 28, 2021; International Energy Agency, Iraq's Energy Sector: A Roadmap to a Brighter Future, April 2019, page 29.
[10] *Middle East Economic Survey*, "Iraq Details New Export Grades," (November 20, 2020), page 14.
[11] Ibid
[12] Ibid
[13] Energy Intelligence, World Crude Oil Data, Iraq Country Profile (accessed July 2018).
[14] *Middle East Economic Survey*, "Iraq: 80,000 b/d Refining Boost," (February 12, 2021), page 16.
[15] *Middle East Economic Survey*, "Iraq Adds Upgrades to Gas-Fired Plans, Keeping Pressure on Rising Supplies," (December 8, 2017).
[16] International Energy Agency, *World Energy Outlook Special Report: Iraq Energy Outlook*, (October 2012), page 92.
[17] *Iraqi Oil Report*, "Iraq pushes electricity reform, prompting protests," (January 18, 2018).