

Country Analysis Brief: Iraq

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Overview

Iraq has the fifth largest proved crude oil reserves in the world, and it is the second-largest crude oil producer in OPEC.

Iraq was the second-largest crude oil producer in the Organization of the Petroleum Exporting Countries (OPEC) in 2014, and it holds the world's fifth largest proved crude oil reserves after [Venezuela](#), [Saudi Arabia](#), [Canada](#), and [Iran](#). Most of Iraq's major known fields are producing or in development, though much of its known hydrocarbon resources have not been fully exploited. All of Iraq's known oil fields are onshore and the largest fields in the south have relatively low extraction costs owing to uncomplicated geology, multiple supergiant fields, fields that are typically located in relatively unpopulated areas with flat terrain, and the close proximity to coastal ports.¹

Iraq is re-developing its oil and natural gas reserves after years of sanctions and wars. Iraq's crude oil production grew by 950,000 barrels per day (bbl/d) over the past five years, increasing from almost 2.4 million bbl/d in 2010 to almost 3.4 million bbl/d in 2014. These production estimates include oil produced in the Iraqi Kurdistan Region, the semiautonomous northeast region in Iraq governed by the Kurdistan Regional Government (KRG). Despite this growth, Iraq's production has actually grown at a slower rate than Iraq had expected because of infrastructure bottlenecks in the south, supply disruptions in the north, and delays in awarding contracts.

The Iraqi government has set ambitious oil production targets. The government is currently renegotiating field production targets set in Technical Service Contracts (TSCs) previously signed with international oil companies (IOCs). Based on some of the target revisions that have already been announced, the Energy Intelligence Group estimates that Iraq is now aiming for crude oil output of 9.0 million bbl/d by 2020.² Key challenges the Iraqi government faces to achieve this target include expanding southern export infrastructure and storage capacity, building a large common water supply and re-injection system in the south, passing a hydrocarbon law, a slow administrative process of doing business, and less favorable contract terms to attract IOCs to invest in new projects. Also, political instability, sectarian violence, and the threat of the Islamic State of Iraq and the Levant (ISIL) spreading to other areas of Iraq pose significant uncertainty for Iraq's future.

Iraq petroleum infrastructure



Petroleum and other liquids

Iraq holds about 18% of proved crude oil reserves in the Middle East and almost 9% of total global reserves. Despite having large reserves, increases in oil production have fallen behind ambitious targets because of infrastructure constraints and political disputes.

Reserves

According to the *Oil & Gas Journal*, Iraq held 144 billion barrels of proved crude oil reserves as of January 1, 2015, representing almost 18% of proved reserves in the Middle East and almost 9% of global reserves, ranking fifth in the world.³ Iraq's resources are not evenly divided across sectarian-demographic lines. Most known oil and natural gas resources are concentrated in the Shiite areas of the south and the ethnically Kurdish region in the north, with few known resources in control of the Sunni minority in central/western Iraq.

Iraq has five super-giant fields (defined as holding more than 5 billion barrels of oil reserves) in the south that account for about 60% of the country's total proved oil reserves.⁴ An estimated 17% of oil reserves are in the north of Iraq, near Kirkuk, Mosul, and Khanaqin.⁵ Control over rights to reserves is a source of controversy between the ethnic Kurds and other groups in the area. The International Energy Agency (IEA) estimated that the Iraqi Kurdistan Region contained 4 billion barrels of proved reserves.⁶ KRG's estimate is much higher because it is a resource estimate that includes unproved resources. The KRG recently increased its oil resource estimate from 45 billion barrels to 60 billion barrels,⁷ although this has not been independently verified and this number likely includes at least some resources in disputed areas—especially Kirkuk.

Sector management

The Ministry of Oil in Baghdad oversees oil and natural gas development and production in all but 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 southern regions. In the Iraqi Kurdistan Region, the KRG, with its Ministry of Natural Resources, oversees oil and gas development and production. International oil companies (IOCs) are very active in Iraq, including the Iraqi Kurdistan Region. IOCs operate under technical service contracts (TSCs) in Iraq, which are signed with the Ministry of Oil in Baghdad, and under production-sharing agreements (PSAs) in the Iraqi Kurdistan Region signed with the KRG. Over the years, KRG's push to sign PSAs with IOCs has escalated tensions with Baghdad, making the situation uncomfortable for some IOCs who have been pressured on different occasions to reduce their investments in Kurdistan.⁸

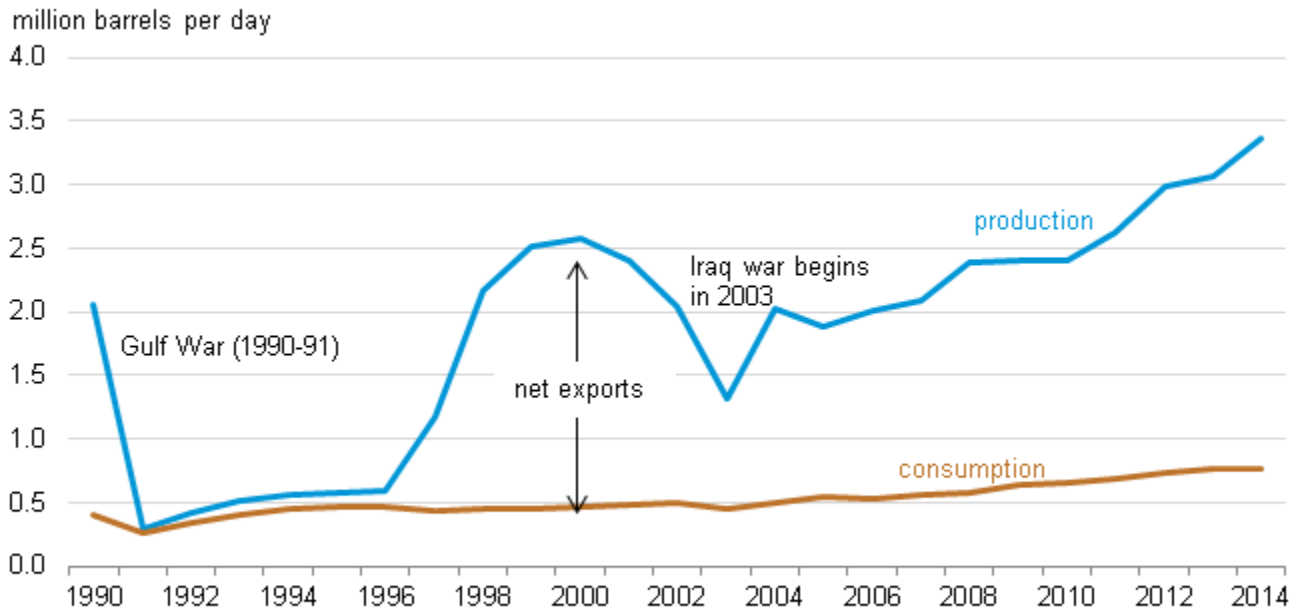
Production

Iraq's crude oil production increased by more than 300,000 bbl/d in 2014, compared with the previous year, averaging almost 3.4 million bbl/d in 2014. Supply disruptions in the north escalated in 2014 after the Iraq-Turkey (IT) pipeline flows were completely halted in March. The ISIL offensive caused more northern production to shut down in June. However, increased output at fields in southern Iraq and in the Iraqi Kurdistan Region more than offset disrupted volumes. Iraq also produces about 30,000 bbl/d of non-crude liquids. The production growth in 2014 was a significant improvement from 2013 when year-over-year production grew by only 70,000 bbl/d. Poor oil production growth in 2013 is attributed to infrastructure bottlenecks in the south and an increase in supply disruptions to northern fields because of frequent attacks on the IT pipeline.

Production in the northern region controlled by the KRG in the past has tended to fluctuate because of disputes with the central Iraqi government, but recently it has steadily increased. The U.S. Energy Information Administration (EIA) estimates KRG's crude oil production averaged 350,000 bbl/d during the second half of 2014. Increased pipeline capacity has allowed the KRG to increase output at its fields, while exporting it through the Turkish port of Ceyhan. KRG's Ministry of Natural Resources reported that oil flows through the Kurdish crude pipeline to Turkey, which started in May 2014, reached as high as 300,000 bbl/d in November 2014,⁹ but

pipeline flows fluctuated in 2014 typically averaging below that level. The KRG also trucks between 50,000 and 100,000 bbl/d of crude and condensate to the Turkish ports of Mersin, Dortyol, and Toros, and to Iran.¹⁰

Figure 1. Iraq's total petroleum and other liquids production and consumption




 Source: U.S. Energy Information Administration

Table 1. Iraq's oil fields, ports, pipelines, and refineries¹

location	main oil fields	lead foreign partner	production capacity (000 bbl/d) ²	export outlet	refinery effective capacity (000 bbl/d)
southern fields	Rumaila	BP, CNPC	1,430	Basrah port (including 3 single point mooring systems) and Khor al-Amaya port	Basra (135), smaller refineries
	West Qurna-1	ExxonMobil, Petrochina, Shell	550		
	West Qurna-2	Lukoil	220		
	Zubair	Eni, Occidental	360		
	Majnoon	Shell, Petronas	200		
	Garraf	Petronas, Japex	100		
	Missan fields (Fakka, Abu Gharb, Bazergan)	CNOOC	135		
	Halfaya	CNPC, Total, Petronas	110		
	Other fields		215		
	Total southern capacity		3,320		
central fields	Ahdab	CNPC	140	connected to southern export infrastructure	Daura (140), smaller refineries
	Badra	Gazprom Neft, Kogas, Petronas	15		
	Other fields		25		
	Total central capacity		180		
northern fields	Kirkuk (Avana & Baba)	NA	220	Iraq (Kirkuk) to Turkey (Ceyhan) pipeline (Flows stopped in March 2014 and the pipeline is currently unusable.)	Baiji (230), Daura (140), Kirkuk refinery (30), smaller refineries
	Bai Hasan	NA	185		
	Jambur	NA	40		
	Khabbaz	NA	30		
	Other fields	NA	50		
	Total northern capacity		525		
northern fields (Kurdistan Regional Government - KRG)	Khurmala Dome (northern tip of Kirkuk)		110	KRG pipelines that connect to Turkey (Ceyhan) pipeline; some oil trucked to ports in Turkey (Mersin, Dortyol, & Toros) and to Iran	Kalak, Bazian, and small refineries (total 150)
	Tawke	DNO, Genel Energy	130		
	Taq Taq	Genel Energy, Sinopec	130		
	Shaikan	Gulf Keystone	21		
	Other fields		36		
	Total KRG capacity		427		
Total Iraq (Baghdad) capacity			4,025		
Total Iraq capacity			4,452		

¹ This is the latest information available prior to the June 2014 attack by the Islamic State of Iraq and the Levant.

² Iraq's actual production level is much lower than capacity as most oil fields are producing below capacity because of infrastructure constraints. Also, a portion of northern production is not being produced commercially and is considered a supply disruption.

CNPC is China National Petroleum Corporation; CNOOC is China National Offshore Oil Corporation; Sinopec is China Petroleum & Chemical Corporation.

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

Impact of ISIL on Iraq's oil sector in 2014

The Islamic State of Iraq and the Levant (ISIL) launched an attack in Iraq in early June 2014, taking over Mosul, one of the largest cities in the north, and subsequently other nearby towns. ISIL affected northern Iraqi (not including the Iraqi Kurdistan Region) production and refinery operations, but it did not affect southern production and exports, which accounted for about 95% of Iraq's total crude oil exports in 2014.¹¹ ISIL did not significantly affect current production in the Iraqi Kurdistan Region in northern Iraq, although fighting came very close to fields produced under the KRG—the Khurmala Dome and Shaikan. Some oil companies were forced to abandon exploration projects, which could delay future development.

ISIL initially took over some smaller northern Iraqi oil fields, including Ajeel, Hamrin, Qayara, Balad, Ain Zalah, Batma, and Najma, but ISIL later lost control of some of those fields following the U.S.-led air strikes that began in early August 2014.¹² The Ajeel field, with a capacity of 28,000 bbl/d, was one of ISIL's main sources of Iraq's production, but it was bombed in August 2014, causing significant damage to the field's control room.¹³ After the bombing, an Iraqi official reported that ISIL's production in Iraq was not more than 15,000 bbl/d.¹⁴ ISIL continues to sell oil on the black market, most of which is making its way to small refineries in northern Iraq and some to Turkey. As a result, the KRG and Turkey have both pursued measures to restrict oil smuggling. ISIL has also stolen oil from storage tanks, pipelines, and pumping stations, estimated to be as high as 3.0 million barrels.¹⁵

During the second half of June, ISIL attacked Baiji, Iraq's largest oil refinery, causing the refinery to halt operations. At the time this report was published, the Iraqi government regained control of Baiji, though the refinery is still not operational. The closure of the Baiji refinery caused a near halt to commercial production in northern Iraq (not including the Iraqi Kurdistan Region). The Iraq portion of the Iraq (Kirkuk) to Turkey (Ceyhan) pipeline (IT pipeline) had already been severely damaged after being sabotaged by militants, and it has not operated since March 2014 (see Table 2). Therefore, with the closure of both the Baiji refinery and the Iraq portion of the IT pipeline, northern Iraqi oil production (the Kirkuk and Bai Hassan fields) lacked a significant commercial outlet for several months.

After skirmishes between ISIL and KRG forces around the Kirkuk and Bai Hassan fields, the KRG took over operations at the Avana Dome, a part of the Kirkuk field, and Bai Hassan in July 2014. Shortly after, KRG restarted commercial production at those fields, which allowed the KRG to increase oil flows through its newly built pipeline that connects to Ceyhan (see Table 2). Meanwhile, Iraq's Northern Oil Company continued to produce about 120,000 bbl/d from the Kirkuk's Baba Dome, of which 30,000 bbl/d was sent to the Kirkuk refinery.¹⁶ The remainder of the oil production was reinjected into oil fields associated with natural gas to keep natural gas production flowing for power generation.

A December 2014 deal reached between Baghdad and the KRG has allowed Kirkuk crude to be transported via the KRG pipeline to Ceyhan, providing Baghdad with a commercial outlet for its northern production (see section on Issues between the Kurdistan Regional Government and Baghdad). Fighting around Kirkuk city continues to take place, making nearby fields vulnerable to supply disruptions.

Field development plans

Iraq is undertaking an ambitious program to develop its oil fields and to increase its oil production. The Iraqi Ministry of Oil signed a dozen long-term technical service contracts after two licensing rounds between 2008 and 2009 with IOCs to develop or re-develop several giant oil fields, most of which were already producing.

Iraq and the IOCs had set ambitious initial production plateau targets for the dozen oil fields, totaling more than 12 million bbl/d to be completed by 2017. However, these contracts are being re-negotiated to more modest levels. Based on some of the target revisions that have already been announced, the Energy Intelligence Group estimates that Iraq is now aiming for crude oil output of 9.0 million bbl/d by 2020.¹⁷ However, even these revised targets may be overly optimistic, given the ongoing delays to develop Iraq's energy infrastructure.

From 2010-12, Iraq held a third bidding round for natural gas fields and a fourth round (with few bids submitted) for fields that contain predominantly crude oil. The Iraqi government plans to launch a licensing round for the Nasiriya oil field in Thi-Qar province, together with the construction and operation of a new 300,000-bbl/d refinery.¹⁸

In northern Iraq, the Kirkuk field has experienced precipitous capacity declines over the past decade. Kirkuk's current capacity is about 220,000 bbl/d, which is much lower than its peak production rate of more than 800,000 bbl/d.¹⁹ In 2013, Iraq's Ministry of Oil and BP signed a \$100 million contract for BP to provide consulting services on Kirkuk's reservoirs, and the two resumed talks over the development of the Kirkuk field in late 2014. Militant activity and the poor security environment near Kirkuk in recent years has impeded the field's revival.

In the Iraqi Kurdistan Region, the KRG has also set ambitious production targets, with plans to produce 1.0 million bbl/d by the end of 2015 or early 2016.²⁰ The KRG will have to expand its pipeline capacity to accomplish its production goals because its current pipeline capacity cannot support production at this level. Project delays caused by the ISIL offensive and past non-payment of IOCs for work performed also make it unlikely this goal will be achieved.

Infrastructure constraints

Southern exports

Iraq faces many challenges in meeting the planned timetable for oil production. One of the major obstacles is the inadequate storage, pumping, and pipeline capacity (or midstream infrastructure) in the south to facilitate larger export volumes. Iraq has expanded the capacity of southern export facilities in recent years by adding on three single point moorings (SPMs) near the Basra and Khor al-Amaya ports. However, export capacity has expanded at a faster rate than midstream infrastructure capacity, which has severely constrained Iraq's southern export capabilities and the ability of oil companies to meet their production goals.

Iraq does not have more than seven days of storage capacity.²¹ As a result, when poor weather conditions hit the Persian Gulf or if any event causes Iraq's exports to halt, production at the oil fields would also have to be halted soon after because of the insufficient storage capacity. Hence,

the lack of midstream infrastructure makes Iraq more vulnerable to potential production disruptions because it lacks the ability to mitigate them.

Iraq also plans to continue to increase its export capacity to meet ambitious production targets. Three SPMs buoyed off the Basra port are currently operational, and two more are planned to come online. The SPMs have a nameplate (design) capacity of 900,000 bbl/d each but have been operating below that amount. The SPMs have added much needed shipping capacity to the south, as the Basra and Khor al-Amaya ports are operating well below capacity after enduring three wars and poor maintenance.²²

Common seawater supply project

Production increases of the scale planned will also require substantial increases in natural gas and/or water injection to increase recovery rates, maintain oil reservoir pressure, and boost oil production. Iraq has associated natural gas that could be used for reinjection, but much of it is currently being flared. According to a report issued by the U.S. National Oceanic and Atmospheric Administration (NOAA), Iraq was the fourth-largest natural gas-flaring country in 2011.²³ Iraq is working with its international partners to reduce gas flaring. The gas will be prioritized first for electricity generation.

Iraq plans to rely on water injection to reach future production plateau targets. The country plans to use seawater, as opposed to freshwater, which is scarcer in the Middle East. For this reason, Iraq's South Oil Company is undertaking the Common Seawater Supply Project (CSSP), which entails treating seawater from the Persian Gulf and then transporting it via pipelines to oil production facilities. The companies hope the CSSP will supply between 10 million bbl/d and 12 million bbl/d of water by 2020 to at least five southern Basra fields and one in the Missan province, but the amount may change depending on the renegotiated production targets. The project will come online in at least two phases, with the first phase bringing online around half of the total water supply. Trade press reports indicate that the project will not come online before 2018 at the earliest.²⁴ The anticipated project start date has been pushed back a few times. The initial project lead was ExxonMobil, but the company dropped out of that position in late 2011 after announcing investments in the KRG, which contributed to schedule delays. The engineering company CH2M Hill was subsequently awarded the position as project consultant in December 2012.

Electricity

Iraq's oil and gas industry is the largest industrial customer of electricity in Iraq. Large-scale increases in oil production would also require large 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. Although more than 20 gigawatts (GW) of new generating capacity is planned by 2017, delays in meeting projected targets may mean insufficient power supply to meet the projected demands of the oil sector.

Northern exports

Most of Iraq's major crude oil pipelines are located in the north and are currently not operable. They have suffered substantial damage because of conflict and war, and rehabilitation would take years and a large investment. The Iraq portion of the Iraq to Turkey (IT) pipeline stopped operating in March 2014 after suffering several attacks by militants in the area. At the time this report was published, a significant portion of the pipeline was in ISIL-controlled territory. Given the extreme unstable environment along the pipeline and the extent of the pipeline's damage, it is unlikely that it will resume operations in the foreseeable future.

Currently, the only working major pipelines in northern Iraq are two pipelines built by the KRG and its international partners: KRG's main pipeline and the DNO/Tawke pipeline, which both link to the Turkey pipeline to the Ceyhan port. There are also several smaller pipelines that carry crude oil from other fields to KRG's main pipeline. The KRG is working to expand pipeline capacity to support its ambitious plan to increase production to 1.0 million bbl/d in 2015 or early 2016. The KRG and Iraq (Baghdad) agreed in December 2014 to cooperate on northern exports, allowing Kirkuk crude that was formerly transported through the IT pipeline to now go through KRG's independent pipeline (see section on Issues between the Kurdistan Regional Government and Baghdad).

Table 2. Status of main pipelines used to export crude oil produced in Iraq (including KRG area)

name/description	pipeline direction	location	nameplate capacity (000' bbl/d)	status	notes
Turkey (Ceyhan) pipeline	Fishkhabur (Iraqi-Turkey border) to Ceyhan port (Turkey)	southern Turkey	1,500	40-inch line is operating	Two parallel lines (a 40-inch and 46-inch) that transport oil produced in northern Iraq to the Ceyhan port. The 46-inch line is operational, but it was not operating, as of late 2014. The 40-inch line has a usable capacity of 500,000 bbl/d and is connected to the two KRG pipelines (see below). The pipeline's flow is likely to expand as infrastructure in Iraq is completed.
KRG's main pipeline that connects to Turkey pipeline	Khurmala Dome to Fishkhabur	northern Iraq	300	operating	It carries crude produced at the Khurmala Dome and also crude sent there from nearby fields, including Taq Taq. The KRG is working to increase the pipeline capacity.
DNO-KRG connection to Turkey pipeline	Tawke field to Fishkhabur	northern Iraq	100	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 port. DNO and its partners are expanding the pipeline's capacity.
Iraq (Baghdad) section of Iraq to Turkey 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 prior to its closure. Crude exports from the pipeline averaged 260,000 bbl/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 to 2000. It was closed again in 2003 after it was damaged.

Strategic Pipeline	Kirkuk to Persian Gulf	north to south (Iraq)	800	not operating	This is a reversible pipeline meant to transport northern Kirkuk crude to the southern Basra Port and vice versa. The pipeline section from Basra to Karbala is operating and sending crude 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 CAB).

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

Oil consumption and refining

In 2014, Iraq consumed 760,000 bbl/d of petroleum and other liquids. Iraq's oil consumption, which has increased by two-thirds since 2003, slightly declined in 2014 mostly because of the attacks in Iraq by ISIL that led to the shutdown of Iraq's largest refinery and fuel shortages in northern Iraq. Most of Iraq's petroleum consumption derives from its domestic oil refineries, which are fueled by domestically produced oil. Iraq also imported roughly 100,000 bbl/d of petroleum products in 2013 and 2014. Iraq burns crude oil for power generation, averaging about 70,000 bbl/d in 2013 and 2014.²⁵

Total nameplate refinery capacity in Iraq is estimated at almost 1.1 million bbl/d, although estimates vary because effective capacity (what is actually available to use) has fallen below nameplate capacity in many cases. Before the June 2014 ISIL attack on the Baiji refinery, effective refining capacity in Iraq (including the Iraqi Kurdistan Region) was almost 800,000 bbl/d. But with the Baiji refinery not being operational, Iraq's total effective capacity is now estimated below 600,000 bbl/d.

Iraqi refineries produce more heavy fuel oil than is needed domestically and not enough of other refined products, such as gasoline. Iraq plans to build four new refineries and expand capacity at some existing refineries to alleviate domestic product shortages and to eventually export refined products. The planned new refineries and capacity expansions would add 800,000 bbl/d of refining capacity.²⁶ Most of these projects will probably come online sometime after 2018. The KAR Group, a private company that operates the largest refinery in the Iraqi Kurdistan Region, is planning to build a new refinery in the Ninewa province with a planned design capacity of 60,000 bbl/d.²⁷

Iraqi refineries produce too much heavy fuel oil relative to domestic needs, and not enough other refined products such as gasoline. To alleviate product shortages, Iraq set a goal of increasing refining capacity to 1.5 million bbl/d. Iraq has plans for four new refineries as well as plans for expanding the existing Daura and Basrah refineries.

Table 3. Existing oil refineries in Iraq (2014)

refinery	nameplate capacity (^{'000} bbl/d)	notes
North Refineries Company		
Baiji	310	effective capacity is 230,000 bbl/d ¹
Kirkuk	30	
Sininya	30	
Hadeetha	16	
Qayara	16	
Kasak	10	
Total north	412	
Midland Refineries Company		
Daura	210	effective capacity is 140,000 bbl/d
Najaf	30	
Samawah	30	
Diwaniya	20	
Total midland	290	
South Refineries Company		
Basrah	210	effective capacity is 135,000 bbl/d
Missan	30	
Nassiriya	30	
Total south	270	
KAR Group (Iraq Kurdistan)		
Kalak (near Erbil)	80	effective capacity is 80,000 bbl/d; plans to add 95,000 bbl/d of processing capacity by 2018
Qaiwan Group (Iraq Kurdistan)		
Bazian (near Sulaimanya)	34	effective capacity is 20,000 bbl/d; plans to add 66,000 bbl/d of processing capacity by 2018
Total Iraqi Kurdistan	114	
Total Iraq	1,086	

¹This is Baiji's effective capacity prior to the June 2014 attack on the refinery by the Islamic State of Iraq and the Levant.

Source: U.S. Energy Information Administration based on information from the Arab Oil & Gas Directory, Northern and South Refineries Companies, Iraq Oil Report, and Energy Intelligence Group.

Issues between the Kurdistan Regional Government and Baghdad

The Kurdistan Regional Government (KRG), the official ruling body of the semiautonomous region in northern Iraq that is predominantly Kurdish, has been involved in disputes with national authorities related to sovereignty. The plan by Iraq's North Oil Company to boost production at the Kirkuk field in northern Iraq at the edge of the KRG region has been met with objections by the KRG, which insists that development plans at this field require KRG cooperation and approval.

More generally, the Iraqi Ministry of Oil insists that all hydrocarbon contracts must be signed with the national government, and that all oil produced in the KRG region be marketed and shipped via State Oil Marketing Organization (SOMO), Iraq's oil exporting arm. However, the KRG passed its own hydrocarbons law in 2007 in the absence of a national Iraqi law governing investment in hydrocarbons. In late 2011, the KRG challenged the authority of the national government when it signed oil production-sharing agreements with ExxonMobil to develop blocks in northern Iraq, some of which are in disputed border areas. The KRG has since signed additional contracts with majors such as Chevron, Gazprom, and Total. ExxonMobil withdrew from some of its projects in Iraq, notably the Common Seawater Supply Project, and the company had been asked by the Iraqi government to choose between its involvement in the West Qurna 1 oilfield and its projects in the KRG. Turkish Petroleum Corporation (TPAO) had also been asked to withdraw from its involvement in the Block 9 concession that was awarded during the fourth bidding round because of disputes regarding Turkey's involvement in KRG energy projects.

Past agreements to export oil independently and via Iraqi state owned infrastructure from Iraqi Kurdistan have fallen apart due to payment disagreements, security problems, and delays building infrastructure required to transport the amounts of oil promised.

Oil exports directly from the KRG have been another contentious issue. The KRG has been exporting crude oil and condensate to Turkey and Iran by truck. In May 2014, the KRG started exporting crude oil via a newly built independent pipeline to Turkey's Ceyhan port.

Recent developments

In December 2014, Iraq (Baghdad) and the KRG reached a preliminary deal on oil exports and revenues. The two sides agreed that: (1) the KRG would give 250,000 bbl/d of the crude oil produced in its territory to Iraq's State Oil Marketing Organization (SOMO) at the Ceyhan terminal to market the crude, (2) Iraq (Baghdad) would export 300,000 bbl/d of Kirkuk crude through KRG's pipeline to Ceyhan, and (3) Iraq (Baghdad) will resume federal payments to the KRG that will amount to a 17% share of Iraq's federal budget and pay KRG's Peshmerga military forces \$1 billion. The deal allows SOMO to reclaim marketing control over much of Iraq's northern crude exports. The deal is not entirely clear whether the KRG will be able to market crude oil in the event that it sends more than 250,000 bbl/d of its own crude through its pipeline. Although the deal is a pivotal step forward that could lead to a significant increase in Iraq's

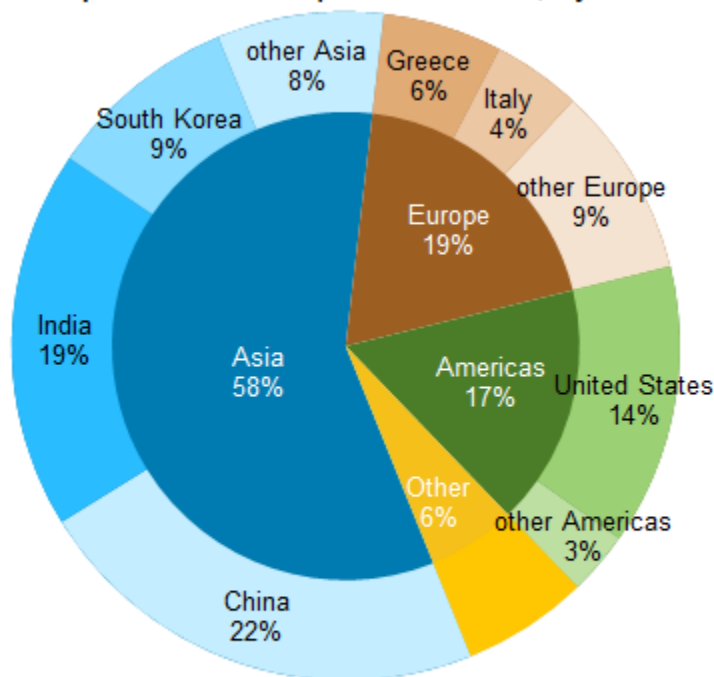
northern production and exports, several issues between Iraq (Baghdad) and KRG remain unresolved. The KRG infrastructure is probably not yet capable of transporting the promised volumes, and it is not clear how the two sides are accounting the oil produced by the Avana Dome section of Kirkuk and the Bai Hassan field now operated by the KRG.

Crude oil exports

China was the largest importer of Iraq's crude oil, followed by India and the United States in 2014. About 95% of Iraq's crude oil exports came from the country's southern export terminals along the Persian Gulf in 2014, which export Iraq's Basra crude grade.

Total Iraqi crude oil exports averaged 2.6 million bbl/d in 2014, 0.2 million bbl/d higher than the previous year, based on Lloyd's List Intelligence (APEX tanker data). Asia (led by China, India, and South Korea) is the main destination for Iraq's crude oil, importing 58% of the total in 2014. The United States is the third-largest importer of Iraq's crude, although the volume has fallen over the past decade. The United States imported an average of 355,000 bbl/d of crude from Iraq in 2014, 30% lower than the volume received 10 years before in 2005. The growth in U.S. oil production has resulted in a sizable decline in U.S. imports of crude grades of similar quality.

Figure 2. Iraq's crude oil exports in 2014, by destination



Note: Total exports are 2.6 million bbl/d. Exports only include oil transported via pipeline to a seaport, not crude trucked to a seaport.
 Source: U.S. Energy Information Administration based on Lloyd's List Intelligence (APEX tanker data)

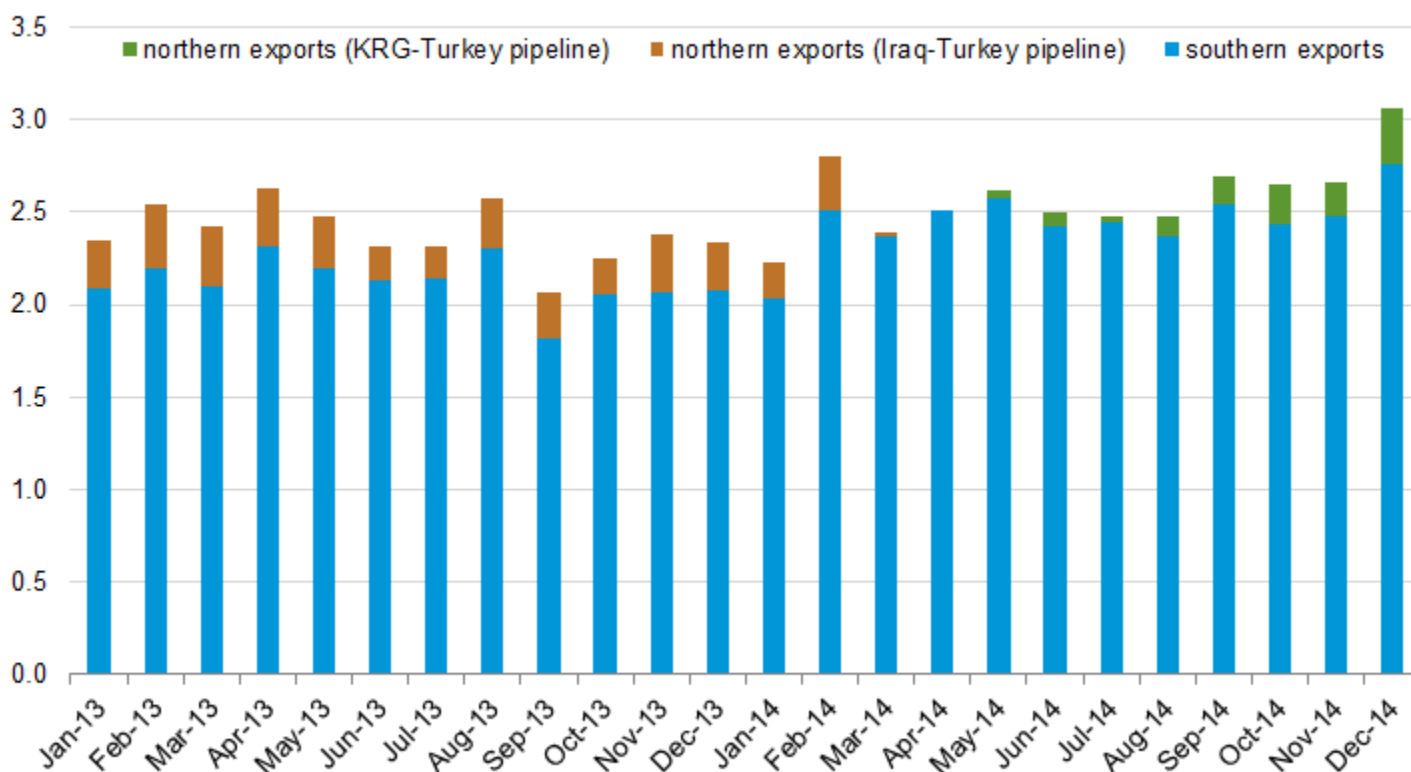
In 2014, about 95% of Iraq's exports came from its southern export terminals in the Persian Gulf, which exports the Basra crude grade. The share of southern exports increased in 2014 compared with 2013 when it was slightly below 90%. Northern exports in Iraq fell substantially after the Iraq-Turkey pipeline went out of service in March 2014. Northern seaborne exports from the Turkish Ceyhan port via the Iraq-Turkey pipeline averaged 260,000 bbl/d in 2013.

The KRG started to export crude via its independent pipeline for the first time in May 2014 (see Table 2). The pipeline flows have reached more than 300,000 bbl/d, but this flow level has not been maintained on a sustained basis.²⁸ Tanker liftings of crude that had been transported through the Iraqi Kurdistan Region pipeline to the Ceyhan port averaged more than 200,000 bbl/d in fourth quarter 2014, based on Lloyd's List Intelligence (APEX tanker data).

The crude export estimates in the charts only include oil transported via pipeline to a seaport. The estimates do not include crude oil transported by truck. Iraq previously exported about 10,000 bbl/d of crude to Jordan by truck, but due to insecurity in the Anbar province, those exports were halted in early 2014.²⁹ The KRG trucks about 50,000 to 100,000 bbl/d of crude and condensate to the Turkish ports of Mersin, Dortyol, and Toros, and to Iran.³⁰

Figure 3. Iraq's monthly crude oil exports, by location, 2013-14

million barrels per day



Note: Exports only include oil transported via pipeline to a seaport, not crude trucked to a seaport.
Sources: Iraqi Ministry of Oil, Lloyd's List Intelligence (APEX tanker database)

Natural gas

More than half of Iraq's gross natural gas production is vented and flared, and Iraq was ranked the fourth-largest natural gas-flaring country in the world in 2011. Iraq is taking steps to reduce flaring and instead use its natural gas resources more for power generation and for reinjection into wells to increase oil recovery.

Reserves

Iraq's proved natural gas reserves as of January 1, 2015 were the 12th largest in the world at almost 112 trillion cubic feet (Tcf), according to the *Oil & Gas Journal*.³¹ About three-fourths of Iraq's natural gas reserves are associated with oil, most of which lie in the supergiant fields in the south.³²

Production and consumption

Iraqi gross natural gas production was 724 billion cubic feet (Bcf) in 2012, of which 423 Bcf (58%) was vented and flared. In 2011, Iraq was ranked as the fourth-largest natural gas-flaring country in the world.³³ Natural gas is flared because of a lack of sufficient pipelines and other infrastructure to transport it for consumption and export. Natural gas that is not flared is mostly used for reinjection into oil wells to increase oil recovery rates. Iraq commercially consumed 23 Bcf of dry natural gas in 2012, which was used primarily in the electricity sector.

To reduce flaring, Iraq's state-owned South Gas Company signed an agreement with Royal Dutch Shell and Mitsubishi to create a new joint venture, Basrah 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 \$17 billion, entails upgrading current facilities and building new facilities and processing plants to increase gas processing capacity to 2 Bcf per day.³⁴ The joint venture is considering the construction of a liquefied natural gas (LNG) exporting facility, the Basra Gas LNG Project. Under the agreement, processed gas would go first to the South Gas Company for power generation. Any gas not bought for use by Iraqi power plants could be exported via the LNG plant. The implementation of this agreement is also necessary for the new oil development projects, which would use some of the natural gas for reinjection.

Iraq held its third bidding round in late 2010, for three nonassociated natural gas fields (Akkas, al-Mansuriyah, and Siba), with combined gas resources of more than 11 Tcf.³⁵ The Akkas field is located in the volatile western part of the country, and operations have been disrupted in the past because of attacks. In June 2014, the ISIL offensive in northern Iraq disrupted operations at both the Akkas and al-Mansuriyah fields.

Export/pipeline ambitions

Plans to export natural gas remain controversial because natural gas is needed as fuel for Iraq's electric power plants. The current shortage of adequate gas has resulted in idle and suboptimal electricity generation in Iraq.

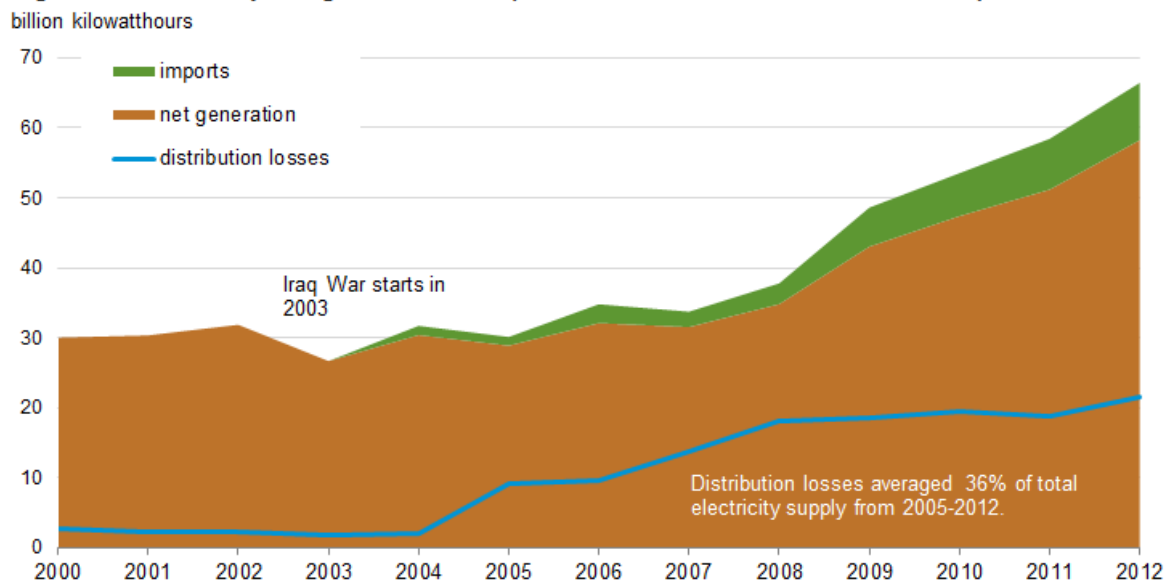
Prior to the 1990-91 Gulf War, Iraq exported natural gas to Kuwait. The gas came from the Rumaila field through a 105-mile, 400 million cubic feet per day pipeline to Kuwait's central processing center at Ahmadi.³⁶ The Ministry of Oil has discussed reviving the mothballed pipeline, but no firm plans have been made to do this. The Iraqi government has also considered proposals to build a transcontinental pipeline to export natural gas to Europe via nearby countries, but there are no firm plans.

Electricity

After years of power shortages, Iraqi efforts to increase generating capacity are moving forward. Iraq plans to more than double its generating capacity by 2017.

Iraq's electricity supply totaled 66 billion kilowatthours (kWh) in 2012, of which 58 billion kWh was generated from domestic power plants and 8 billion kWh was imported from Iran and Turkey. Electricity net generation in Iraq grew by an annual average of 13% from 2008 to 2012, recovering from the 2003 dip in electricity generation with the start of the Iraq war. Although generation in Iraq has increased, distribution losses have also increased. From 2005 to 2012, distribution losses averaged 36% of total electricity supply. Iraq's distribution system, outside the Iraqi Kurdistan Region, has deteriorated because of poor design, lack of maintenance, and electricity theft, resulting in large distribution losses, low voltage levels, and frequent disconnections.³⁷

Figure 4. Electricity net generation, imports, and distribution losses in Iraq



eia Source: U.S. Energy Information Administration

Iraq has struggled to meet its power needs during the Iraq war and for the postwar period. Like many developing countries in the Middle East and North Africa, Iraq faces a sharply rising demand for power. From 2003 to 2011, power outages lasting 16 to 22 hours per day were common. Although many parts of Iraq, outside the Iraqi Kurdistan Region, still suffer from power blackouts and load shedding particularly during the summer, the problem has been reduced somewhat as both on-grid and off-grid generation capacity has increased, along with electricity imports from Iran and from Turkish electricity barges (floating power plants) in the Persian Gulf.³⁸

Peak summer demand has typically exceeded actual generation by almost 50%, causing power shortages that have sparked protests, particularly in southern Iraq.³⁹ Iraqi households and businesses must rely on expensive off-grid, private diesel-fueled generators to rectify the shortfall, with those in Baghdad alone providing an additional 1 gigawatt (GW) of capacity.⁴⁰ A study of Iraq's electricity sector shows that about \$40 billion in revenue is lost each year because the country lacks the electricity supply needed to stimulate more business activity from various economic sectors, including agriculture, commerce, and tourism.⁴¹

Iraq has made significant strides to increase its generation capacity over the past few years. At the end of 2013, the Middle East Economic Survey estimated that Iraq's (Baghdad) electricity generation capacity reached 9.77 GW,⁴² an increase from 7 GW in 2012.⁴³ Most recent electricity projects in Iraq have focused on installing turbines that were purchased in 2008 but sat in storage for a few years. In 2008, Iraq purchased 74 turbines, with a total capacity of 10.2 GW, but no progress in installation was made until recently because of budgetary, contracting, and political difficulties. Iraq's Ministry of Electricity has also allowed foreign oil companies to construct small electricity plants to power their oil and natural gas operations.

Electricity generation in the Iraqi Kurdistan Region has typically been much more reliable, and power outages there have not been a problem. KRG is also embarking on an ambitious electricity expansion plan, aiming to double its power generation capacity from its current 4 GW to 8.6 GW by the end of 2016.⁴⁴

Development plans

Iraq's Ministry of Electricity's master plan set a target to install 24.4 GW of new generating capacity between 2012 and 2017. The plan is similar to Iraq's Integrated National Energy Strategy (INES), released in 2013. INES proposes to increase generation capacity in Iraq (outside of the Iraqi Kurdistan Region) by 22 GW in 2016 from 7 GW in 2012 by adding steam and gas turbines that are also capable of running on fuel oil in case of natural gas shortages. The additional 22 GW in 2016 is the estimated amount needed to meet summer peak demand while allowing for a 15% reserve margin.⁴⁵ Iraq plans to spend at least \$27 billion by 2017 on developing its electricity sector, with about half of the money to be spent on upgrading the transmission and distribution systems. Iraq hopes to stop importing electricity by the end of 2016 if these expansions are made.

One major bottleneck that Iraq faces in achieving its goals is the delayed enhancements to the natural gas infrastructure that are needed to support the electricity expansion. The electricity

expansion plan is expected to be fueled primarily by natural gas-powered turbines. Most current Iraqi natural gas production is flared, and pipelines will need to be built to bring natural gas, which would otherwise be flared, to future power plants. The delayed start-up of the Basrah Gas Company project and delayed development of oil fields have contributed to electricity expansion plans falling behind schedule.

INES aims to increase Iraq's generation capacity to 42 GW by 2030, of which 80% will be fueled by natural gas, an increase from 25% in 2012. In the short term, Iraq plans to use only renewable energy, such as wind and solar, at remote off-grid locations. But in the medium and long term, renewable energy is projected to reach more than 2 GW, making up more than 4% of total planned generation capacity. Iraq does not plan to bring online additional hydropower plants because of water shortages. The country's hydropower generation capacity was 2.5 GW in 2012, which has been unchanged since 2008, according to EIA estimates.

Iraq will need to enact regulatory and tariff reforms and to re-examine its current heavy electricity subsidies in order to prevent future demand growth from out-stripping the expansion in generating capacity. New laws for the electric sector have been proposed, but they are waiting for cabinet approval.

Notes

- Data presented in the text are the most recent available as of January 30, 2015.
- Data are EIA estimates unless otherwise noted.

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Figure 3. Iraq's crude oil exports, by location, 2013-14. Southern exports and northern exports (Iraq-Turkey pipeline): Iraqi Ministry of Oil, [Crude Oil Exports](#). Northern exports (KRG-Turkey pipeline): Lloyd's List Intelligence (APEX tanker data).