U.S. Energy Information Administration

Yemen

Last Updated: September 25, 2014 (Notes)

full report

Update: July 6, 2017

Since the publication of the Yemen Country Analysis Brief in September 2014 below, the situation in Yemen has deteriorated significantly. In September 2014, the Shia Houthi rebel group seized the Yemeni capital of Sanaa. In January 2015, the Houthis captured the presidential palace and other strategic buildings, forcing President Hadi and his ministers to resign and to dissolve parliament. In March 2015, a coalition led by Saudi Arabia began airstrikes on Houthi targets.

As Houthi control spread across the country and the political situation became more precarious, the energy sector was drastically affected. Foreign firms operating in Yemen were forced to abandon operations and evacuate staff. Nearly all production in Yemeni oil and natural gas fields has been shut in; petroleum and other liquids production has declined from an average of 147,000 barrels per day (b/d) in 2014 to approximately 16,000 b/d in 2016. Natural gas production has fallen from 328 billion cubic feet (Bcf) in 2014 to 25 Bcf in 2016, according to BP estimates.[1]

Pipelines and port facilities also have been attacked and disrupted repeatedly. The Aden refinery was shut down when *force majeure* was declared in April 2015 and sustained further damage from attacks by Houthi forces in July of that year. The area has since been retaken by the Yemeni government, although the refinery is still struggling to restart refining operations. Yemen's only liquefied natural gas (LNG) plant has been shut down since April 2015 when Total, the largest stakeholder at the Balhaf facility, evacuated the country.[2]

As of August 2016, Yemen resumed limited crude oil exports. Yemen also recently reopened the Ash Shihr export terminal, which in August 2016 shipped out its first cargo since the conflict stalled operations.[3] Based on APEX crude oil loadings data that show crude oil liftings, Yemen shipped an average of about 15,000 b/d for the period August 2016-December 2016. Average loadings January 2017- May of 2017 were roughly 39,000 b/d.[4]

In May 2017, the government of Yemen reportedly issued a tender for 75,000 b/d of Shabwa blend crude for June 2017 delivery. Before the Shabwa basin was shut down in April 2015, Block 5 produced slightly more than 26,000 b/d while Block 4 produced approximately 400 b/d. Although exact production amounts are unknown, the tender demonstrates a desire to restart crude production in the Shabwa basin, the second-largest producing region in Yemen.[5] In the summer of 2016, partial production from Blocks 14 and 10 in the Masila basin was restored, producing approximately 50,000 b/d under state operator PetroMasila.[6] The Masila basin holds more than 80% of the country's reserves.

The report below represents the energy situation in Yemen before the Houthi capture of Sanaa and conflict in the rest of Yemen. Lack of data and the halting of nearly all energy sector activity in Yemen do not allow for a full update of the Yemen Country Analysis Brief.

Overview

Although Yemen is not a major hydrocarbon producer relative to several other countries in the Middle East, the country has sufficient oil and natural gas resources for both domestic demand and exports. However, Yemen's difficult security environment hinders the production and transport of those resources.

Yemen's energy sector is in a state of flux. Declining oil production and frequent attacks on Yemen's energy infrastructure have offset positive developments in the country's natural gas sector since 2009. Yemen's difficult security environment complicates the exploration, production, and transport of energy resources in the country, and could undermine the country's emerging liquefied natural gas (LNG) export sector.

Yemen is not a major energy producer or exporter compared with other countries in the Middle East. However, the country's location at the Bab el-Mandab, a key chokepoint in international shipping, makes Yemen important in terms of international energy trade. More than 3.8 million barrels of oil per day (b/d) passed through Bab el-Mandab in 2013.* Closure of the two-mile strait would force tankers to sail around the southern tip of Africa to reach European, North American, and South American markets.

Yemen's government depends on the country's hydrocarbons sector. Even with the earnings from natural gas exports, the International Monetary Fund (IMF) estimates that Yemen needs an oil export price of approximately $215 per barrel to balance its budget. IMF figures also show that 63% of government revenues came from the hydrocarbons sector between 2010-12, and that hydrocarbons accounted for 89% of total export revenues. Yemen, as a member of the Extractive Industries Transparency Initiative (EITI), reported in July 2013 that government revenues from the oil and natural gas sector in 2011 were more than $5 billion.

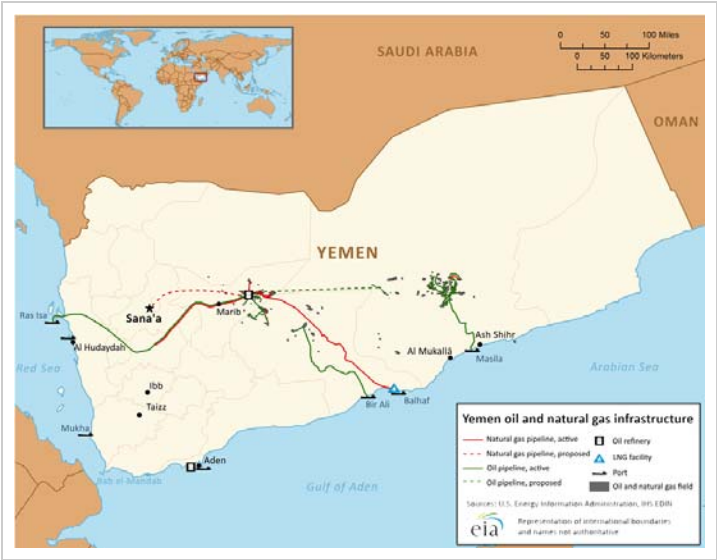
Oil production in Yemen declined steadily after peaking in 2001, but beginning in 2009, the country began producing commercial quantities of natural gas for domestic use and for exports as LNG. This development could help the country stabilize its economy even without an extremely high oil export price. However, replacing oil export revenues with LNG export revenues does not reduce the country's dependence on its hydrocarbons sector.

**An update to this number and other data provided in the World Oil Transit Chokepoints will be available July 2017.*

Oil

Yemen's oil production has decreased significantly since peaking in 2001 because of natural decline in the country's aging fields and frequent attacks on its oil infrastructure.

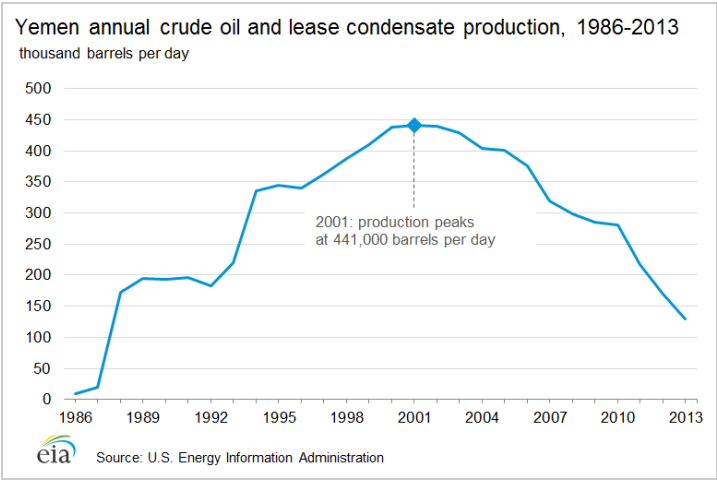
According to the *Oil & Gas Journal*, Yemen had proved reserves of oil totaling 3 billion barrels as of January 2014. Yemen has two primary crude streams, the light and sweet Marib stream and the medium-gravity and more sulfur-rich Masila stream. According to the government, the southeast Masila Basin holds more than 80% of the country's total reserves.



The combination of declining production in its mature fields and frequent attacks on its energy infrastructure has left Yemen's oil sector in poor shape. In 2013, there were at least 10 attacks on Yemen's oil and natural gas pipeline system, and some industry sources estimate closer to 24 attacks. In 2012, there were more than 15 attacks, and oil exports were completely offline for most of the first half of the year.

Securing the country's pipelines and other critical energy infrastructure is a stated goal of Yemen's current President, but the efforts have not been entirely successful to date. The security situation has led several smaller international oil companies to suspend operations.

The country continues to hold bidding rounds for exploration blocks that may hold additional oil resources in both offshore and onshore areas. There are contradicting reports of Yemen's additional oil resources. Even if additional resources exist in the country, the current security environment restricts the ability of companies to produce and transport oil.



Exploration and production

Yemen's oil production declined after 2001 as a result of the country's maturing fields, and attacks on the country's oil infrastructure since 2011 have led to significant short-term disruptions.

Yemen began producing crude oil in 1986 at very low levels and gradually increased production throughout 1987. The country's first significant production came in 1988, when it produced 173,000 barrels per day (b/d). Yemen's average monthly crude oil production declined after 2001, when production peaked at more than 440,000 b/d. Yemen had plans to boost production to 500,000 b/d, but declining production at its maturing fields, limited

exploration, and frequent attacks on the country's energy infrastructure make that goal infeasible. The U.S. Energy Information Administration estimates that Yemen's crude oil production was about 100,000 b/d in March 2014.

Most of Yemen's production is from the Marib-Jawf area in central Yemen and near the Masila area in the east, with production coming from just 13 of the country's 105 exploration blocks. Since 2001, the country's most productive field has been the Tawila field, which averaged nearly 90,000 b/d in 2003 but has since declined along with many of the country's other large fields.

Natural decline rates at many of Yemen's major fields—including Tawila—account for the country's generally falling production, but the frequent attacks on the country's energy infrastructure since 2011 have caused much sharper declines in recent years. Other factors contributing to lower production include strikes—Norway's DNO had to cease all production in June 2014 because staff protested that the company failed to fulfill its obligations.

Sector organization

Yemen's Ministry of Oil and Minerals oversees the country's oil and natural gas sectors. The ministry sets oil and gas policies and manages relations with foreign operators, but any contracts with foreign companies also require parliamentary approval. The national oil company, Yemen General Corporation for Oil, Gas, and Mineral Resources, guides a number of state-owned subsidiaries that handle most day-to-day operations and deals with energy sector revenues.

Selected subsidiaries of the Yemen General Corporation for Oil, Gas, and Minerals

Group	Function
Aden Refinery Company	Oversees operations at the Aden refinery, including transport to international destinations
Petroleum Exploration and Production Authority	Manages petroleum exploration and production; oversees licensing rounds and contracts with foreign investors
Safer E&P Operations company	Upstream operator; second largest producer in Yemen
Yemen Gas Company	Responsible for sales, marketing, and supply of liquefied petroleum gases domestically
Yemen Investments Company for Oil and Minerals	Upstream operator; focused on Jannah and West Ayad areas
Yemen Petroleum Products Distribution company	Markets and distributes petroleum products in the local market
Yemen Refining Company	Oversees domestic refining operations

Sources: Yemen Ministry of Oil and Minerals, Yemen General Corporation for Oil, Gas, and Minerals, company websites

Foreign operators account for most of the oil production in Yemen. Major international oil companies in Yemen include Total (which operates the Yemen LNG facility in addition to being active in several exploration blocks), Occidental Petroleum Corporation, and Nexen, a subsidiary of the China National Offshore Oil Corporation.

Yemen relies heavily on production-sharing agreements (PSAs) with foreign companies, which usually include 20-year concessions for production activities. In 2013, Yemen's government announced plans to transfer any expiring exploration licenses to state-owned companies. Production royalties paid to Yemen's government range between 3% and 10%.

Exports, imports, and consumption

Attacks on Yemen's key oil infrastructure continue to curtail both domestic petroleum consumption and exports.

With the continued decline in oil production since the early 2000s, Yemen has struggled to keep its export sector at normal operating levels. The pipeline, which runs from the Marib region in the center of the country to the export terminal at Ras Isa, is critical to Yemen's export operations. As such, it is one of the most frequent targets of sabotage.

Yemen does not have any overland pipeline connections to its neighbors, so all of the country's petroleum exports depart via tanker vessels. In recent years, more than three-fourths of their petroleum exports went to destinations in Asia. In 2013, Yemen exported just 124,000 b/d of crude oil, according to data from Lloyd's List Intelligence tanker tracking service. Exports are down from more than 350,000 b/d 10 years earlier. In addition to crude oil exports, Yemen exports limited amounts of refined petroleum products, averaging just 16,000 b/d of refined product exports in 2013, according to data from Global Trade Information Services' Global Trade Atlas.

Yemen regularly imports petroleum products, particularly distillate fuel oil and residual fuel oil. Between 2000 and 2013, Yemen's imports of all petroleum products grew from just 2,000 b/d to 78,000 b/d, based on data from FACTS Global Energy. The possibility of continuing attacks on its energy infrastructure and further production declines means Yemen's reliance on imported petroleum products will likely increase in the short term.

Yemen's oil consumption has been trending steadily upward, reaching 144,000 b/d in 2013. The country has two operating refineries with a total capacity of 140,000 b/d. While these refineries produce some of the petroleum products Yemen needs, the refineries do not operate at full capacity, and the country imports additional petroleum products to help meet internal demand. The Aden Refinery is the largest in the country, accounting for almost all of Yemen's total refining capacity of 140,000 b/d.

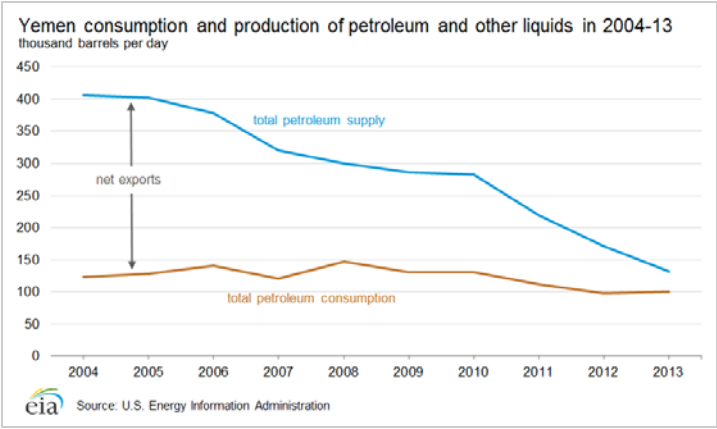
Yemen refinery capacities as of January 1, 2014

Operator	Refinery name	Capacity (b/d)
Aden Refining Company	Aden Refinery	130,000
Yemen Oil Company	Ma'arib Refinery	10,000
Total		**140,000**

Source: Oil & Gas Journal

Natural gas

Until recently, Yemen reinjected most of its natural gas production to aid in oil recovery. However, since 2009 the country has been an LNG exporter, and the government aims to increase the use of



natural gas in many sectors, including in electricity generation.

As of January 2014, Yemen held 16.9 trillion cubic feet (Tcf) of proved natural gas reserves according to the *Oil & Gas Journal*. One of the larger natural gas deposits in Yemen is in the hydrocarbon-rich Marib-Jawf area, where there may be 18 Tcf in recoverable volumes of natural gas, according to Yemen's government.

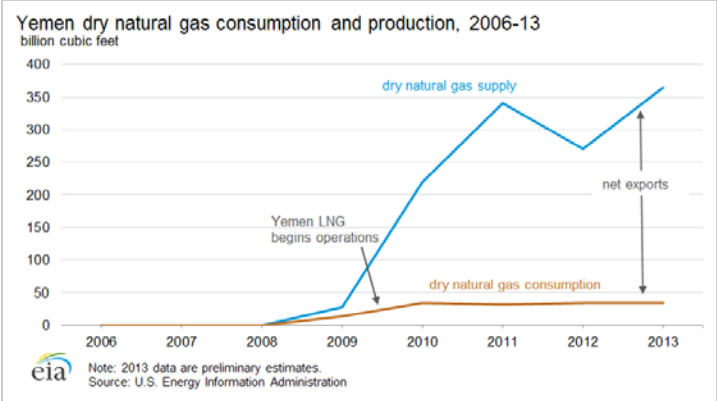
Until 2009, Yemen reinjected nearly all of the natural gas it produced to aid in oil extraction. In 2009, the Yemen LNG facility opened, and the country began to divert dry natural gas away from the oil fields and toward domestic and international consumers. Yemen's domestic market began consuming small amounts of natural gas in 2009, and there are plans to increase the use of natural gas in many sectors—particularly in power generation—to make up for diminishing petroleum supplies.

Exploration and production

Because Yemen's natural gas was historically reinjected into oil fields to aid oil recovery, there was rarely any exploration specifically targeting natural gas. After the opening of the Yemen LNG facility in 2009, the economic incentives for discovering and producing natural gas changed.

Yemen began producing natural gas in the early 1990s, however, from 1993 until 2009—when the Yemen LNG facility came online—Yemen reinjected virtually all (98%) of the natural gas produced inside the country. With the opening of the country's only LNG facility in November of 2009, Yemen began producing commercial quantities of dry natural gas for the first time in its history. In 2013, Yemen produced 365 billion cubic feet (Bcf) of dry natural gas, up from just 28 Bcf in 2009 when the production of dry natural gas began.

With the continued build-out of infrastructure to feed Yemen LNG, the possibility of diverting natural gas used in oil recovery to domestic consumers—such as the power sector—becomes more feasible. Further, exploration in Yemen's onshore and offshore blocks may yield additional recoverable quantities of natural gas, although, like oil exploration, the security environment in the country will play a big role in determining the interest of international investors.



Exports, imports, and consumption

The startup of the Yemen LNG facility in 2009 gave Yemen the ability to export natural gas for the first time.

Yemen has never been a natural gas importer, and until 2009, never consumed natural gas domestically. Since 2009, Yemen's natural gas consumption has grown, but not nearly as fast as its natural gas exports. Yemen's consumption of natural gas remains limited, peaking at just 34 Bcf in 2010. In contrast, Yemen exported about 330 Bcf of LNG in 2013, representing more than 90% of its total dry natural gas production that year. According to IHS Global Insight, Yemen LNG provided approximately 3% of 2013 global LNG volumes.

French company Total operates the 6.7 million ton per year (322 Bcf) Yemen LNG facility, and most of the exported LNG is under contract to GDF Suez, Total, or Korean Gas (KOGAS). The volumes purchased by GDF Suez and Total are non-dedicated—meaning that they can go to any willing buyer—while the volumes contracted to KOGAS all go to South Korea.

In late 2012, Yemen LNG began renegotiating its contracts with GDF Suez and Total, claiming that the prices it received for LNG were too far below prices elsewhere in the international market. As of July 2014, these companies have not agreed on a new price. However, in 2013, KOGAS agreed to increase its contract price. Yemen LNG is also in discussions with Turkey's Petroleum Pipeline Corporation (BOTAS) on a deal that could send up to 35 Bcf of LNG per year to Turkey.

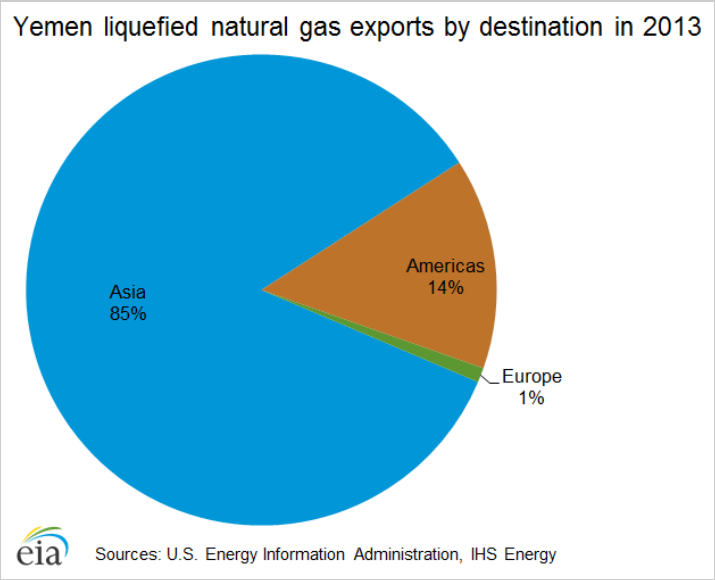
Yemen LNG shareholders

Group	Share (percent)
Total (France)	39.62
Hunt Oil Company (United States)	17.22
Yemen Gas Company	16.73
SK Corporation (South Korea)	9.55
KOGAS (South Korea)	6.00
Hyundai Company (South Korea)	5.88
General Social Security and Pension Corporation (Yemen)	5.00

Source: Yemen Ministry of Oil and Minerals

Like its oil infrastructure, Yemen's natural gas infrastructure—particularly pipelines—is the target of persistent attacks. In 2012, Yemen LNG was offline for more than six months as the

result of numerous attacks on the country's natural gas system, leading to several lost cargos. In 2013, there were several more attacks but no associated production or export declines. However, militants did force a shutdown of the 450 megawatt gas-fired power plant supplying Yemen's western regions in September 2013, contributing to electricity shortages throughout the country.



Electricity

The majority of Yemen's population does not have access to electricity, although the country plans to build several new generating facilities over the coming years.

Yemen's electricity infrastructure is outdated and insufficient to meet the country's needs. Data from the World Bank indicated that, as recently as 2010, only 40%of Yemen's population had access to electricity. Even for grid-connected consumers, blackouts are frequent as a result of persistent attacks on the country's energy infrastructure.

Petroleum, including distillate and residual fuel oil, fuels much of Yemen's electricity generation, although natural gas is capturing a growing market share as the country develops its natural gas resources.

Yemen's generating capacity as of 2012 was just 1.5 million kilowatts (1.5 gigawatts) according to Yemen's Ministry of Electricity, one of the lowest in the Middle East region. According to the Middle East Economic Survey (MEES), capacity in 2013 was only 850 megawatts, or only enough to meet 41% of the country's electricity demand.

Likewise, in 2012 Yemen's total net generation (6.2 billion kilowatthours) were among the lowest in the Middle East, despite the country having the fourth-largest population in the region. Many of Yemen's electric plants are now able to use natural gas as fuel, which has helped the country move away from burning petroleum to generate electricity.

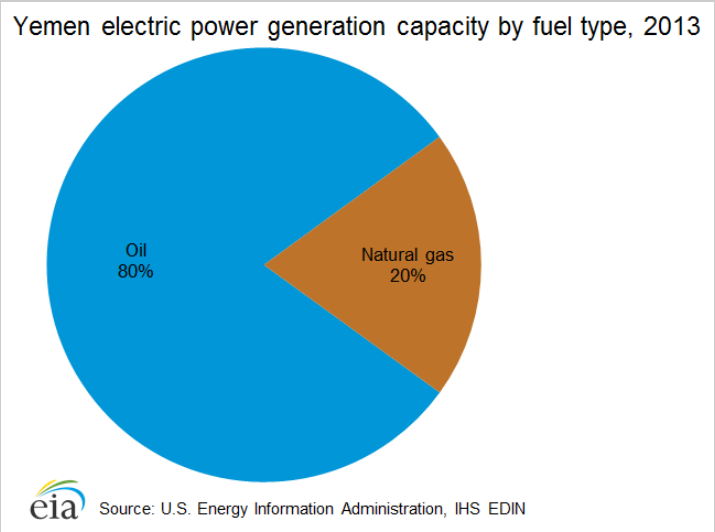
Over the past several years, Yemen worked to integrate its electric grid with neighboring Saudi Arabia's. In 2007, the two countries established a grid interconnection, and there is a $400 million interconnection expansion program that should allow for transfers of between

500 megawatts and 1,000 megawatts between the two countries.

In August of 2013, Yemen began construction on a new 400 megawatt gas-fired generating facility, and the facility is set to begin operating in late 2014. Additionally, in September 2012, Yemen reached an agreement with the China National Corporation of Overseas Economic Cooperation on the construction of three natural gas-fueled power plants. Each will have more than 400 megawatts of generating capacity. Further, the government of Turkey agreed to help Yemen construct a 163 megawatt electric plant capable of burning both petroleum and natural gas in late 2012.

In November 2013, the government announced that it reached a deal with China to build a series of power plants with a combined capacity of 5 gigawatts, including both coal-fired and natural gas-fired plants.

Yemen's government also plans to develop a renewable energy sector in its 2009 National Strategy for Renewable Energy and Energy Efficiency. Yemen began pilot projects for solar and geothermal generation projects in 2003 and 2006, respectively. Progress has been slow because of a lack of financial backing and because of the security environment in the country.



Notes

- Data presented in the text are the most recent available as of September 25, 2014.
- Data are EIA estimates unless otherwise noted.

Endnotes

[1]BP Statistical Review of World Energy 2017.
[2]Middle East Economic Survey, "Total: Adco Boosts Oil Output But Gas Lower On Yemen conflict," March 25, 2016.
[3]The National, "Yemen resumes oil shipments, the first since start of civil war, "August 11, 2106
[4]APEX data report, generated June 19, 2017.
[5]Argus Media, "Yemen eyes Shabwa crude restart," May 15, 2017.
[6]Energy Intelligence International Oil Daily, "Yemen Revives Oil Heartland on Front line of War," May 3, 2017.