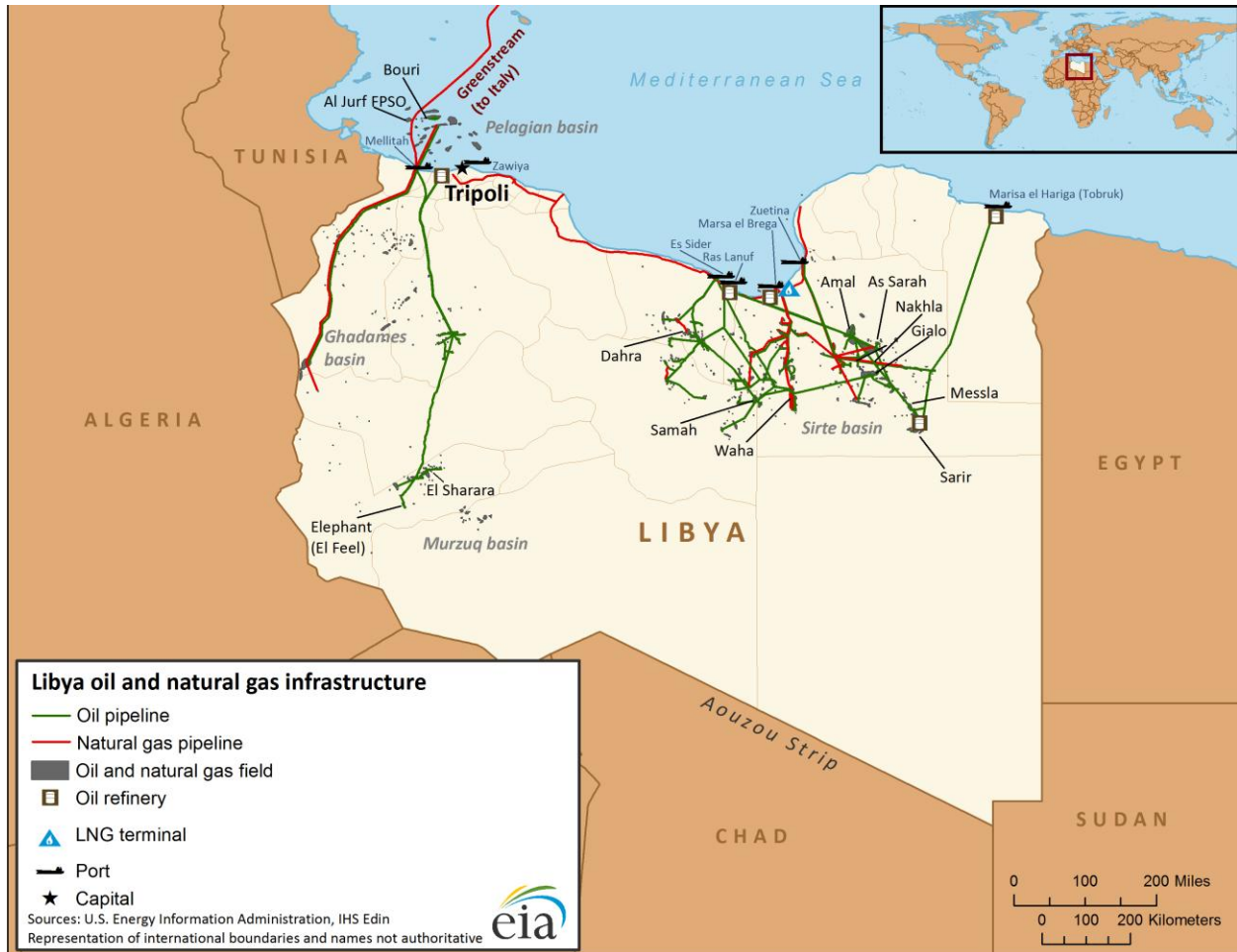


Overview

Libya is a member of the Organization of the Petroleum Exporting Countries, the holder of Africa's largest proved oil reserves, and an important contributor to the global supply of light, sweet crude oil.

Libya joined the Organization of the Petroleum Exporting Countries (OPEC) in 1962, a year after it began to produce oil. Libya now holds the largest amount of proved crude oil reserves in Africa, the fourth largest amount of proved natural gas reserves on the continent, and it is an important contributor to the global supply of light, sweet (low sulfur) crude oil, which Libya mostly exports to European markets.



Libya's hydrocarbon production and exports have been substantially affected by civil unrest over the past few years. The civil war in 2011 resulted in the fall of Col. Mu'ammarr al-Qadhafi's regime and the gradual consolidation of control over most parts of the country by the Transitional National Council (TNC) and affiliated rebel militias. Libya's hydrocarbon exports suffered a near-total disruption during the civil war, and the minimal and sporadic production that did occur was mostly consumed domestically. In response to the loss of Libya's oil supplies in the summer of 2011 the International Energy Agency (IEA) coordinated a release of 60 million barrels of oil from the emergency stocks of its member countries through the Libya Collective Action – the first such release since Hurricane Katrina in 2005.

Libya's oil production recovered in 2012, but it still remained lower than levels prior to the civil war. After the civil war ended, labor-related protests occurred sporadically at various oil fields and installations. Protests at oil fields escalated in June 2013, affecting output at some of Libya's major oil fields. In July

and August, protests at key oil loading ports in the central and eastern regions, by workers and guards that were hired to protect the facilities, crippled the oil sector and led to the near-halt in production from the oil fields linked to ports after most storage tanks became full. Production at two major oil fields in the west were shut down in late August after the Zintan militia closed pipelines linking the fields to loading ports but output in the west resumed in mid-September.

Libya's economy is heavily dependent on hydrocarbons. According to the International Monetary Fund (IMF), oil and natural gas account for nearly 96% of total government revenue and 98% of export revenue in 2012. Roughly 79% of Libya's export revenue comes from crude oil exports, which brought in around \$4 billion per month of net revenues in 2012. EIA's [OPEC Revenues Fact Sheet](#) has net oil export revenues also at \$4 billion per month from January to June 2013. During the 2011 civil war, the drop in oil and natural gas production led to an economic collapse, and real GDP contracted by 62% for the year.

Total Primary Energy Consumption

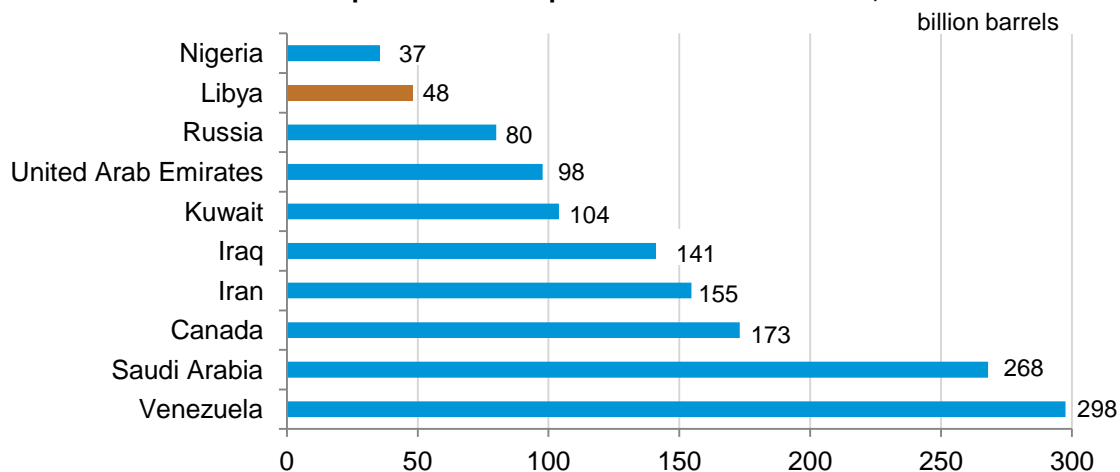
EIA estimates that Libya consumed almost 0.9 quadrillion British thermal units (Btu) of energy in 2010, of which about 70% was from oil, 29% from natural gas, and 1% from renewable energy sources. Although Libya's use of renewable resources is marginal, the Renewable Energy Authority of Libya is working to harness the country's solar and wind potential. The organization initially set a target in 2009 to source 10% of Libya's energy supply from renewable energy resources by 2020, but the target date was recently pushed back to 2030. Despite efforts to diversify Libya's energy mix, the 2011 civil war, the current unrest, and the lack of investment have presented considerable obstacles to achieving such a goal.

Oil

Libya is believed to hold large amounts of untapped hydrocarbon resources as it shares similar hydrocarbon-bearing geological structures with its neighboring countries although most of the country remains unexplored.

According to *Oil and Gas Journal* (OGJ), Libya had proved crude oil reserves of 48 billion barrels as of January 2013— the largest endowment in Africa, accounting for 38% for the continent's total, and the ninth largest amount globally. About 80% of Libya's reserves are located in the Sirte basin, which also accounts for a vast majority of the country's oil output. Libya has six large sedimentary basins— Sirte, Murzuk, Ghadames, Cyrenaica, Kufra, and the offshore, which the government believes has substantial undiscovered potential. Libya could significantly increase its reserves because a majority of the country remains unexplored and it shares similar hydrocarbon-bearing geological structures as its neighboring countries, Egypt, Algeria, and Tunisia, according to IHS CERA.

The world's top 10 holders of proven crude oil reserves, 2013



Source: Oil & Gas Journal

Exploration and Development

The country's National Oil Corporation (NOC) has emphasized the need to apply enhanced oil recovery techniques to increase crude oil production at maturing oil fields. Before the 2011 civil war, the NOC claimed that capacity additions of around 775,000 bbl/d were possible from existing oil fields.

Prior to the 2013 oil sector crisis, the Libyan government had made several announcements to increase crude oil production capacity to 1.7 million bbl/d by the end of 2013 and 2 million bbl/d in the next few years, according to the Middle East Economic Survey (MEES). In the past, Libya's National Oil Corporation (NOC) emphasized investing in enhanced oil recovery (EOR) methods to counter depletion of reserves and expand production capacity at existing fields. In 2009, the NOC announced a development program that entailed the development and rehabilitation of 24 oil and natural gas fields. The NOC's development program identified several oil-producing fields where capacity could be expanded. The largest capacity additions were planned for the Waha (Oasis) fields, the Nafoura/Augila complex, and the El Feel (Elephant) field. The program aimed to boost total capacity by 775,000 bbl/d from existing fields. According to MEES, Libyan officials have continued to encourage foreign companies to invest in EOR techniques to avoid a drop in production, but oil companies have said, given the capital-intensive nature of EOR projects, that a stable political situation and sound regulatory framework are requisite, conditions currently absent in Libya.

According to the Arab Oil and Gas Journal, reserve recovery rates in Libya are very low by international standards because of sanctions imposed by the United States and the United Nations (UN) that prevented the import of certain oil production equipment and new technology from the 1980s to 2004. During the time of the sanctions, oil output at several fields dramatically declined in the absence of EOR and foreign investment, according to IHS CERA. After the sanctions ended, many foreign companies returned to reclaim rights to their assets, including U.S. companies Occidental Petroleum and consortium partners in the Waha (Oasis) Oil Company (ConocoPhillips, Marathon, and Hess). In 2012, Waha, announced a field development plan to increase capacity at their fields to a total of 500,000 bbl/d. However, as of early October 2013, Waha's production, which is typically around 330,000 bbl/d of crude oil, has been almost completely halted as a result of protests at the Es Sider port.

Management of Hydrocarbon Industry

Prior to Qadhafi's ouster, Libya's oil industry was run by the state-owned NOC. The NOC was responsible for implementing Exploration and Production Sharing Agreements (EPSA) with international oil companies (IOCs), as well as its own field development and downstream activities. Its subsidiaries include the Sirte Oil Company and the Arabian Gulf Oil Company (Agoco), the profile of which was elevated by its relatively independent action during and after the conflict between Qadhafi and the opposition. After Qadhafi's removal, the NOC and the Energy Ministry, with a new leadership, became the main decision makers in the oil and natural gas sectors, according to IHS CERA.

Even before the 2011 civil war, policy makers in Libya had been debating the content for a new hydrocarbon law. The last hydrocarbon law passed in 1955 was outdated, giving little guidance to natural gas development, EOR projects, and other ventures, according to IHS CERA. The proposed new law aims to establish a unified national law that encompasses all aspects of the hydrocarbon sector. There has recently been a series of regulatory reviews pertaining to the structure and management of the hydrocarbon industry. The focus is on expanding the downstream sector, subsidy reform, restructuring and the relocation of the NOC, and potential changes to upstream contracts and the terms included.

The organization of Libya's hydrocarbon sector could change considerably depending upon the outcomes of political processes that have yet to run their course completely. The most significant unanswered questions pertain to the balance of power between the national government and regional actors, especially in the wake of agitation for greater autonomy in the oil-rich region of Cyrenaica. There has

been a push in Cyrenaica to host the upstream duties of the NOC. Regional interests may complicate efforts to agree on a unified national law.

IOCs mainly from the United States and Europe participate in Libya's hydrocarbon sector. IOC involvement in Libya experienced a resurgence in the mid-2000s as various rounds of sanctions were lifted by the United States and the UN. Companies were lured by the country's bountiful resources, which outweighed regulatory uncertainties and the fact that contractual terms of the EPSA-IV (2005) licensing round were unfavorable to foreign investors. Now, IOCs are confronted with new types and unexpected degrees of political and security risks in Libya.

In the short term, IOC involvement in Libya will depend on resolution of the aforementioned political issues, operational security, and new regulatory legislation that is enacted in the future. After Qadhafi's removal, Libyan officials have often attempted to reassure IOCs that they would honor the sanctity of existing contracts, while also reserving the right to review and revise those contracts that were secured through corrupt practices.

Oil Production

Libya's oil production was disrupted for most of 2011 because of the civil war, but it began to recover relatively rapidly following the cessation of most hostilities by the autumn of that year. The country's oil sector was crippled again in mid-2013 as protests led to the closure of loading ports, oil fields, pipelines, and a sharp deterioration of the security environment at oil installations.

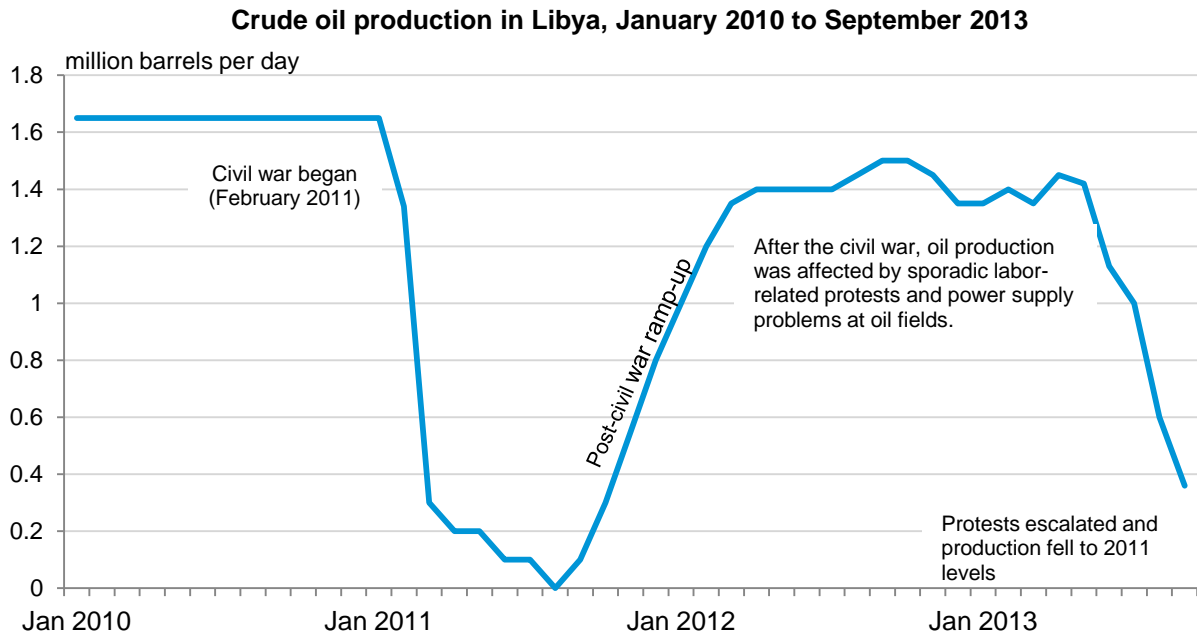
In 2012, Libya produced 1.37 million bbl/d of crude oil, up from an average of 500,000 bbl/d in 2011. Prior to the onset of hostilities in 2011, Libya had been producing an estimated 1.65 million bbl/d of mostly high-quality light, sweet crude oil. Libya's production had increased for most of the previous decade, from 1.4 million bbl/d in 2000 to 1.74 million bbl/d in 2008, but production remained well below peak levels of more than 3 million bbl/d achieved in the late 1960s. Oil production in Libya from the 1970s into the 2000s had been affected early on by the partial nationalization of the industry and later by sanctions imposed by the United States and the UN that impeded the investment and equipment needed to sustain oil production at higher levels.

EIA estimates that Libya's current effective production capacity is slightly below 1.6 million bbl/d. Effective production capacity is defined as the amount of production that could come back to markets within a year. It takes into account permanent or prolonged production loss due to the degradation of shut-in oil fields and damages to operational components that would take longer than a year to repair, which is dependent on the financial, security, and political situation. Some of Libya's production was compromised from the prolonged closure of oil fields during the 2011 conflict, but a vast majority of production was restored and restarted quicker than most industry analysts expected.

Libya is currently going through another crisis that has crippled its oil sector. What began as labor-related protests for higher salaries and better work conditions has evolved into more politicized issues such as regional autonomy and allegations of corruption. During July and August 2013, protests at major oil loading ports in the central and eastern regions of Libya forced the complete or partial shut-in of oil fields linked to the ports. As a result of protests at ports and at some oil fields, crude oil production fell to 1.0 million bbl/d in July and 600,000 bbl/d in August, although the production level at the end of August was far lower. At the end of August, members of the Zintan militia blocked pipelines that connect the El Sharara and El Feel (Elephant) fields to the Zawiya and Mellitah export terminals, respectively, forcing the shutdown of those fields. Production dropped to around 200,000 bbl/d during this time period and continued at this level into September. In mid-September production at the western oil fields restarted and boosted Libya's total output, albeit it remained less than half of its effective capacity.

Libya also produces an estimated 120,000 to 140,000 bbl/d of non-crude liquids, which include condensate and natural gas liquids. These non-crude liquids mainly come from the Mellitah gas

processing plant, a gas processing plant at the Intisar complex, and a natural gas liquids plant in Marsa al-Brega.



Source: U.S. Energy Information Administration, Short-Term Energy Outlook

Libya's oil ports, fields, refineries, and operators

Load Ports	Region	Main Fields	Refinery	Field Operator	Lead Foreign Partners
Es Sider (Sidra)	central-east	Waha, Samah, Dahra, and Gialo		Waha Oil Company	ConocoPhillips, Marathon, Hess
		Mabruk (Mabrouk)		Mabruk	Total
Ras Lanuf	central-east	Nafoura		Agoco	none
		As Sarah/Jakhira b(C96), Nakhla (C97) ¹ Amal, Naga, Farigh		Wintershall Harouje	Wintershall, Gazprom Suncor (PetroCanada)
Marsa al-Hariga (Tobruk) ²	east	Sarir, Messla, Beda, Magrid, Hamada ³	Ras Lanuf; Tobruk; Sarir	Agoco	none
Zueitina	central-east	Abu Attifel, NC-125 Nakhla (C97) ¹		Mellitah Wintershall	Eni Wintershall, Gazprom
		Intisar Complex and NC74 ⁴		Zueitina Oil Company ⁵	Occidental, OMV
Marsa al-Brega	central-east	Brega (Nafoura/Augila complex)		Agoco	none
		Nasser (Zelten), Raguba, Lehib (Dor Marada) ⁶	Marsa al-Brega	Sirte Oil	none
Mellitah	west	El Feel (Elephant), oil and condensate from Wafa and Bahr Essalam gas fields		Mellitah	Eni
Zawiya or Zawia (Tripoli)	west	El Sharara (NC-115) and NC-186 fields	Zawiya	Akakus	Repsol, Total, OMV
Bouri ⁷	west	Bouri (offshore)		Mellitah	Eni
Farwah (Al-Jurf) ⁷	west	Al-Jurf (offshore)		Mabruk	Total

¹Oil from Nakhla (C97) is mixed with oil from Eni's Abu Attifel field.

²Most of the production from Agoco fields can be sent to Ras Lanuf and Marsa al Hariga (Tobruk).

³Oil from the Hamada field, which is located in the West, is sent to Zawiya. It is typically used domestically.

⁴Oil produced at NC74 is sent to Ras Lanuf.

⁵The Zueitina grade can also be sent to the Ras Lanuf terminal.

⁶Output from Lehib is mixed with output from one of Harouje's fields and sent to Ras Lanuf.

⁷Bouri and Farwah (Al-Jurf) are offshore loading platforms of Mellitah.

Sources: U.S. Energy Information Administration based on data from Energy Intelligence, Middle East Economic Survey (MEES), company websites, Oil & Gas Journal, and APEX Tanker Data.

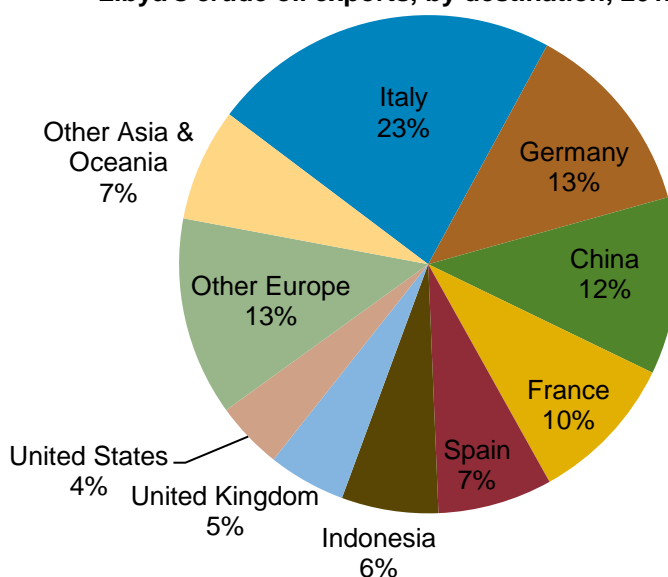
Crude Oil Exports

Libya typically exports most of its crude oil to European countries, with Italy being the leading recipient. The United States resumed importing crude oil from Libya in 2004 after sanctions were removed, though the amount it typically imports is small.

During the 2011 civil war, crude oil exports plummeted to average below 400,000 bbl/d for the year, based on trade data from Global Trade Atlas and APEX Tanker Data. Crude oil exports recovered in 2012 to average roughly 1.25 million bbl/d. For the first half of 2013, crude oil exports averaged around 1.1 million bbl/d, but when production outages escalated, crude oil exports fell to 830,000 bbl/d in July and 445,000 bbl/d in August.

Typically, the vast majority of Libya's crude oil is sold to European countries. In 2012, roughly 71% of Libya's crude exports were sent to Europe; the leading single recipients were Italy, Germany, China, France, and Spain. The United States restarted oil imports from Libya in 2004, after sanctions were lifted. The United States imported 56,000 bbl/d of crude oil from Libya in 2012, which was only about 0.6% of total U.S. imports during that year.

Libya's crude oil exports, by destination, 2012



Source: Global Trade Atlas and APEX Tanker Data

Oil Consumption and Refining

Libya consumed an average of 170,000 bbl/d of petroleum in 2012, lower than its peak of 280,000 bbl/d in 2010. Almost all of Libya's domestic oil consumption is from domestic refineries. The country also typically exports a smaller portion of its refined products to global markets. According to OGJ, Libya has five domestic refineries with a combined crude oil distillation capacity of 378,000 bbl/d. Libya's NOC recently announced plans to sizably expand the downstream sector with planned investments of \$60 billion. The plan includes upgrading current refineries, which the NOC expects to finance, and building new small refineries and petrochemical complexes, which it expects private companies to fund, according to MEES. Below is a description of Libya's existing refineries.

Ras Lanuf is the country's largest refinery with a capacity of 220,000 bbl/d and is located on the Gulf of Sirte in the central-eastern region. The refinery is typically fueled by output the Sarir and Messla fields operated by Agoco. The current operator is the Libyan Emirati Refining Company (LERCO), a joint venture between the NOC and Trasta Energy, which is owned by the Dubai-based Al-Ghurair business

conglomerate. The refinery was completed in 1984. The current operator has in the past expressed an intention to increase and upgrade the refinery's capacity.

Zawiya is Libya's second-largest refinery with a capacity of 120,000 bbl/d, and it is the largest one near the capital of Tripoli. It is operated by Zawiya Oil Refining Co., a subsidiary of NOC. The refinery is typically fueled by production from oil fields located in the southwest part of the country. The NOC plans to upgrade the refinery's capacity to 380,000 bbl/d.

Tobruk (Marsa al-Hariga) is located in the east and typically runs on crude oil produced at fields operated by Agoco. The refinery has a capacity of 20,000 bbl/d and is operated by an affiliate of Agoco.

Sarir is also operated by an affiliate of Agoco and is reported to be processing crude pumped from the field of the same name. It has a capacity of 10,000 bbl/d.

Marsa al-Brega is the oldest refinery in Libya, with a capacity of 8,000 bbl/d. It is operated by Sirte Oil Company.

Libya's refining sector was affected by UN sanctions, specifically UN Resolution 883 of November 11, 1993, which banned Libya from importing refinery equipment. Libya is seeking a comprehensive upgrade to its entire refining system, with a particular aim of increasing output of gasoline and other light products.

Overseas Investment

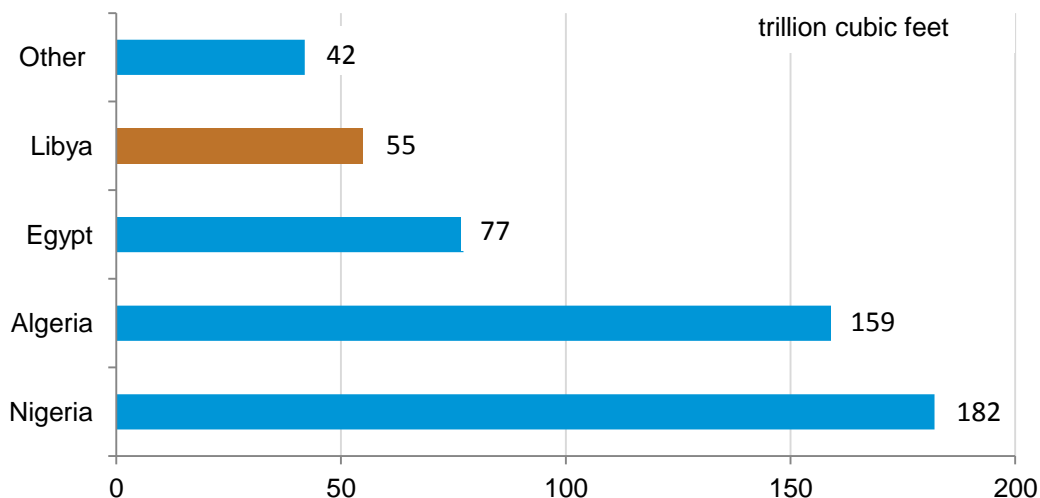
Libya also has refinery operations in Europe through its overseas oil retail arm, Tamoil. According to Tamoil, it has refineries in Germany and Switzerland, as well as distribution networks in those countries, plus Italy, Netherlands, and Spain.

Natural Gas

As with its oil sector, Libya's natural gas industry recovered in 2012, but production still remained below pre-war levels. Libya's rank as a producer and reserve holder is less significant for natural gas than it is for oil. Most of its natural gas production is exported to Italy via pipeline.

As of January 1, 2013, OGJ estimated that Libya's proved natural gas reserves were 54.6 trillion cubic feet, making it the fourth largest natural gas reserve holder in Africa. Prior to the transformative events of 2011, new discoveries and investments in natural gas exploration had been expected to raise Libya's proved reserves in the near term.

Natural gas proved reserves in Africa, 2013



Source: Oil & Gas Journal

Sector Organization

Many of the same entities involved in oversight and operations of the oil industry exercise similar functions for natural gas. Likewise, some of the same questions and uncertainties about the future are equally applicable to both sectors. Libya's natural gas sector is mostly state-run, by the NOC and its Sirte Oil Company subsidiary. IOCs are less involved in natural gas production than they are in oil production, although Eni is a notable exception due to its stake in the large Western Libya Gas Project.

Exploration and Production

Libya's natural gas production and exports increased considerably after 2003 with the development of the Western Libya Gas Project and the opening of the Greenstream pipeline to Italy. Flows through the Greenstream pipeline were disrupted during most of the 2011 civil war.

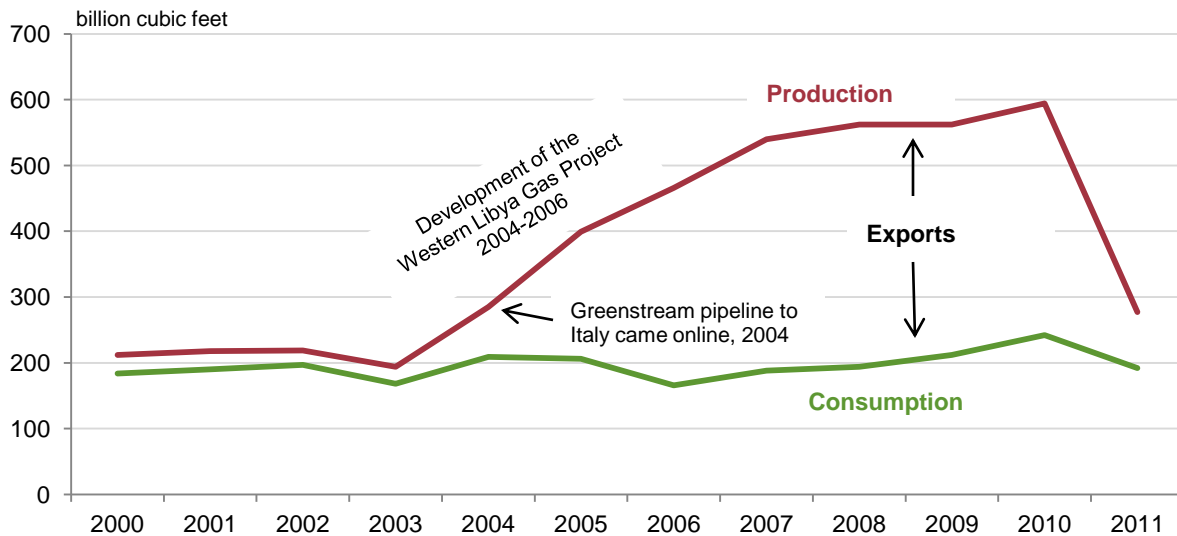
Libya's dry natural gas production grew substantially from 194 billion cubic feet (Bcf) in 2003 to 594 Bcf in 2010. The Western Libya Gas Project (WLGP), which is operated by Eni and NOC through the Mellitah Oil & Gas joint venture, accounted for most of Libya's natural gas production growth after 2003. The WLGP includes the onshore Wafa and offshore Bahr Essalam fields. The vast majority of the gas produced from WLGP is exported via the Greenstream pipeline. Most other natural gas output is produced by the NOC and its Sirte Oil Company subsidiary in the onshore Sirte Basin.

As with oil, Libya's natural gas production was almost entirely shut in for sustained periods in 2011. Dry natural gas production averaged 277 Bcf in 2011, more than a 50% drop from the previous year. Natural gas production has since recovered to average 431 Bcf in 2012, according to the BP 2013 Statistical Review. Natural gas production has been affected by the mid-2013 protests, but the extent of the impact on natural gas output is unclear.

The NOC has announced plans to increase the country's natural gas production from offshore and onshore fields. New or expanded projects to support this goal include associated oil and gas fields in various stages of development, most notably Faregh, operated by Waha in the Sirte Basin, and Mellitah's offshore Bouri field. The NOC also says it intends to utilize natural gas that is currently being flared. Increased marketed natural gas production would most likely result in a greater use of natural gas in the power sector and thus free up more oil for export. However, like all prospective oil and gas plans in Libya,

greater development of the natural gas sector is contingent upon support and certainty of political institutions and the security environment.

Libya's dry natural gas production, consumption, and exports, 2000-2011



Source: U.S. Energy Information Administration

Consumption and Exports

In 1971, Libya was the third country in the world, after Algeria and the United States (Alaska), to begin exporting liquefied natural gas (LNG). Typically, the country exports a small amount of LNG to Spain. However, the LNG plant was damaged during the 2011 civil war, and Libya has not exported LNG since early 2011.

In 2011, Libya consumed about 190 Bcf of dry natural gas, down from 242 Bcf in 2010. Prior to the 2011 conflict, typically 35% to 40% of dry natural gas supply was consumed domestically, and the remainder was exported to Italy and Spain. In 2011, dry natural gas exports fell to 85 Bcf from its peak of 242 Bcf in 2010. In 2012, Libya's exports recovered to 228 Bcf, all of which were sent via the Greenstream pipeline to Italy, according to the BP 2013 Statistical Review. Prior to 2012, Libya also exported small volumes in the form of liquefied natural gas (LNG) mainly to Spain.

Greenstream

Libya's capacity to export natural gas increased dramatically after October 2004, when the 370-mile Greenstream pipeline came online. The pipeline starts in Mellitah, where natural gas piped from the onshore Wafa and offshore Bahr Es Salam fields is treated for export. It runs underwater to Gela, on the island of Sicily, and the natural gas flows onward to the Italian mainland. The Greenstream pipeline is operated by Eni in partnership with NOC. According to PFC Energy, total capacity is 11 billion cubic meters (388 billion cubic feet) per year since the most recent capacity expansion.

Natural gas exports via Greenstream were completely suspended for nearly eight months from March 2011 to mid-October 2011 due to the civil war. Exports partially recovered to 228 Bcf in 2012, albeit lower than the 2010 level of 332 Bcf, according to the BP 2013 Statistical Review.

Liquefied Natural Gas (LNG)

In 1971, Libya became the third country in the world (after Algeria in 1964 and the United States in 1969) to export LNG. Since then, Libya's LNG exports have remained low, largely because of technical limitations.

Libya's sole LNG plant, built in the late 1960s at Marsa al-Brega, is owned by the NOC and operated by Sirte Oil Company. However, it went offline in February 2011 as a result of damage sustained during the civil war and has not exported LNG since early 2011. According to PFC Energy, its nameplate design capacity is 3.2 million tons (154 Bcf) per year, but exports have averaged less than one-third of that level since operations began. One reason for the low output is that the plant lacks the requisite technology to separate some natural gas liquids from the LNG stream, which also limits the number of receiving terminals that are able to process it. Libya's LNG had been exported to Spain, but only on a spot basis in more recent years due to a failure to meet the levels stipulated by earlier long-term contracts.

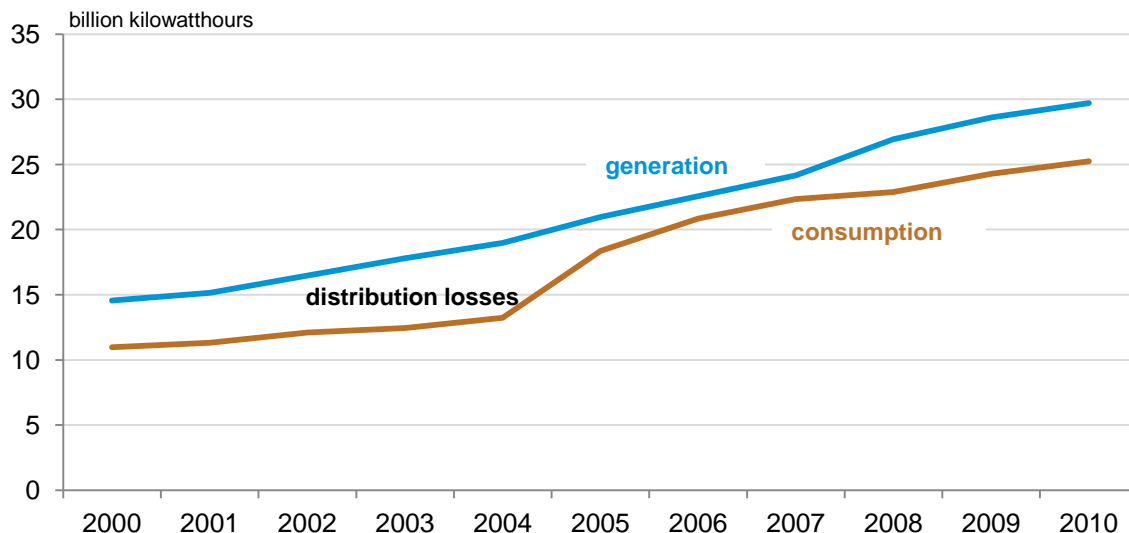
Electricity

Electricity generation has more than doubled from 2000 to 2010. Growing power demand, which was greater than gains in installed generation capacity, have led to electricity shortfalls. Libya's oil sector has also been affected by power supply issues, which has compromised production at some of the country's largest oil fields.

According to the latest 2010 World Bank estimate, 99.8% of people in Libya had access to electricity, which is the highest among African countries. Despite the high electrification rate, the country suffers from power outages due to electricity shortfalls, which occurred even before the 2011 civil war, according to IHS CERA. In addition to end users being affected by outages, power shortfalls have also affected production at some of Libya's largest oil fields, including fields controlled by Agoco and Mellitah.

Electricity generation has more than doubled from 2000 to 2010, reflecting high economic growth and greater investment in the oil and natural gas sectors, particularly after sanctions affecting foreign investment in the hydrocarbon sectors were deposed. Installed electricity generation capacity has not grown as quickly as power demand, which has led to regular power shortfalls. As of 2010, Libya had a total electricity installed capacity of 6.8 gigawatts, made up of power plants that are either fueled by oil or natural gas. Before the 2011 civil war, several power plants were converted from oil to natural gas to lower costs, but most of the country's power plants are still fueled by oil, according to IHS CERA.

Electricity net generation and consumption in Libya, 2000-2010



Source: U.S. Energy Information Administration

Notes

- Data presented in the text are the most recent available as of October 10, 2013.
- Data are EIA estimates unless otherwise noted.

Sources

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