



Background Reference: Norway

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Overview

Norway is Europe's largest petroleum liquids producer and one of the world's top natural gas exporters.

Norway is the largest holder of crude oil and natural gas reserves in Europe, and provides much of the petroleum liquids and natural gas consumed on the continent. Norway's petroleum and other liquids production peaked in 2001 at 3.4 million barrels per day (b/d) and declined to 1.8 million b/d in 2013 before stabilizing at about 2.0 million b/d beginning in 2015. Natural gas production, on the other hand, has increased almost every year since 1993.

Figure 1. Map of Norway



Source: Central Intelligence Agency, The World Factbook

Petroleum and other liquids

Norway is the largest oil producer and exporter in Western Europe.

Norway has the largest oil reserves in Western Europe.¹ All of Norway's oil reserves are located offshore on the Norwegian continental shelf (NCS), which is divided into three sections: the North Sea, the Norwegian Sea, and the Barents Sea. The bulk of Norway's oil production occurs in the North Sea.

An historic agreement between Norway and Russia that defined their maritime boundaries in the Barents Sea and the Arctic Sea and resolved their 40-year old boundary dispute was fully ratified by both governments in early 2011 and went into effect in July 2011. As a result of the agreement, Norway gained access to about 34,000 square miles of continental shelf. The agreement required the two countries to jointly develop oil and natural gas deposits that cross over their boundary.

Sector organization

Norway's Ministry of Petroleum and Energy (MPE) is responsible for overseeing the country's energy resources. The Norwegian Petroleum Directorate (NPD) reports to the MPE as an advisor, administers exploration and production activities on the NCS, and collects and analyzes data. State-owned Petoro manages the commercial aspects of the government's financial interests in petroleum operations and associated activities. Petoro acts as the licensee for production licenses and companies.

The largest energy company operating in Norway is Equinor ASA, which was renamed from Statoil ASA in 2018. The company was created by the merger of Statoil and Norsk Hydro in October 2007. Norway's government is the company's largest shareholder, owning a majority stake of the company. In addition to its operations in Norway, Equinor is a major international company, and it has interests in more than 30 countries.

Several international oil companies have a sizable presence in Norway. The Norwegian government's subsidy of oil and natural gas exploration, introduced in 2005, refunds 78% of the exploration costs to the companies. In addition, the Norwegian government reduced taxes on onshore oil activities and on liquefied natural gas (LNG) shipped overseas, which has attracted additional international investment.

Exploration and production

Norway's petroleum production has been gradually declining since 2001 as oil fields have matured, although production stabilized in 2014–2016. Norway's largest producing crude and condensate fields are mainly located in the Norwegian portion of the North Sea, where most of Norway's current production occurs. New exploration and production activity is taking place further north in the Norwegian Sea and the Barents Sea, where small volumes of liquids and natural gas are currently being produced.

Overall investment in the oil and natural gas industry declined in response to lower oil prices after 2013.

North Sea

Norway has been producing oil from the North Sea since 1971, and the North Sea still accounts for most of Norway's production. Although most of the country's North Sea fields are in decline, several significant discoveries in the North Sea have been made in recent years. The Norwegian Parliament

approved joint development and operating plans in June 2012 for Lundin's Edvard Grieg oil and natural gas field and Det Norske's Ivar Aasen Field (formerly called Draupne). Estimated to hold 206 million barrels of oil equivalent, Edvard Grieg began production in November 2015 and is expected to continue producing 100,000 b/d of oil equivalent at peak production. The nearby Ivar Aasen field, estimated to hold 183 million barrels of oil equivalent, is connected to Edvard Grieg, and began producing oil in late 2016.²

The Johan Sverdrup oil field was the largest oil discovery in the world in 2011. Its reserves were estimated at between 2.1 and 3.1 billion barrels of recoverable oil equivalent resources. This field is located 96 miles west of Stavanger in the North Sea. Johan Sverdrup was initially believed to be two fields that were four miles apart: Avaldnes, discovered by Lundin in 2010, and Aldous, discovered by Equinor in 2011. Further exploration activities revealed they constitute one giant field, renamed Johan Sverdrup in 2012, when the field partners signed a cooperation agreement that named Equinor as the operator. Partners also include Petoro, Det Norske, and Maersk. The field is expected to be a new stand-alone processing and transport hub. Phase 1 production of the field is scheduled to start in late 2019 and is expected to have peak production of 440,000 b/d. With Phase 2 production, which is estimated to begin by 2022, overall peak field production is estimated to reach 660,000 b/d, accounting for 25% of the forecasted production from the Norwegian continental shelf.³

Barents Sea

Goliat was the first oil field to be developed in the Barents Sea. Discovered in 2000, Goliat's recoverable oil reserves are estimated at 179 million barrels. Eni owns 65% of the field and is the operator; Equinor owns the remaining 35%. Eni is developing the field with a cylindrical floating production, storage, and offloading (FPSO) platform that is designed to deflect ice and withstand extreme weather conditions. The FPSO was built in South Korea, shipped to Hammerfest, Norway, and in May 2015 it was towed to its destination at the Goliat field, offshore Norway. Production at Goliat began in March 2016 and is expected to ramp up to a peak of 93,000 b/d of oil before declining to about 30,000 b/d and eventually declining further to about 9,000 b/d. Goliat has estimated recoverable natural gas reserves of 283 billion cubic feet (Bcf). Produced natural gas is reinjected into the formation to improve oil recovery.⁴

Johan Castberg is another recent discovery in Norway's Barents Sea, encompassing three finds made in 2011, 2012, and 2014. Johan Castberg is estimated to hold between 400 and 650 million barrels of oil. Equinor, the operator for the field, was expected to decide on a development plan for the field in 2015.⁵ However, because of its remote Arctic location, development of this field will be relatively expensive, which delayed the final investment decision during the period of low oil prices. Equinor submitted a plan for development and operation of the field in December 2017, and its first oil production is scheduled for 2022.⁶

Oil exports

Most of Norway's crude oil exports go to other European countries. The top importers include the United Kingdom and the Netherlands.

Pipelines

Norway has an extensive network of subsea oil pipelines that transport crude oil and condensate to processing terminals on Norway's coast.⁷ Many smaller pipelines connect North Sea fields to one of the major pipelines. Shuttle tankers bring the remaining offshore oil production onshore.

ConocoPhillips operates the 830,000 b/d capacity subsea Norpipe, which connects Norwegian oil fields in the Ekofisk system (as well as associated fields in both Norwegian and [United Kingdom](#) waters) to the oil terminal and refinery complex at Teesside, England.⁸

Brent benchmark crude

A benchmark crude is a specific crude oil that is widely and actively bought and sold. Other types of crude oil can be compared to the benchmark to determine a price by an agreed-upon differential. Brent, the most widely used global crude oil benchmark, was originally based on the output of the Brent field, a single field in the United Kingdom's sector of the North Sea. However, as production from the Brent field declined, other fields and blends were added to the benchmark and it is now composed of five crude oil blends.

The Brent benchmark Forties and Oseberg blends were added in 2002, and Ekofisk was added in 2007. Since then, the Dated Brent crude oil price assessment has been referred to as Brent BFOE, and the acronym that represents the four crude oil grades was included in the assessment. To offset decreasing production, the Troll blend was added on January 1, 2018, although the BFOE name remained unchanged.

Similar to Brent, the Forties blend is produced offshore in the waters of the United Kingdom. The Ekofisk, Oseberg, and Troll blends are mainly produced offshore in the waters of Norway. North Sea Brent crude oil loadings average almost 1.2 million b/d, and the three Norwegian crude oil streams account for about 55% of the total.

Although the benchmark itself accounts for only a small portion of total world crude oil production, it remains a key indicator for world crude oil pricing.

Refining

Norway has two major refining facilities: the 120,000-b/d refinery at Slagentangen, operated by ExxonMobil,⁹ and the almost 240,000-b/d Mongstad plant, operated by Equinor.¹⁰ Most of the output from both refineries is exported, and Norway is an important supplier of gasoline and diesel fuel to the European Union (EU). Equinor dominates the retail products market in Norway, and the company has also expanded into other European markets.

Natural gas

Norway is one of the world's largest producers and exporters of natural gas.

Despite maturing major natural gas fields in the North Sea, Norway has shown increases nearly every year in total natural gas production since 1993 by continuing to develop new fields.

Sector organization

As is the case in the oil sector, Equinor dominates natural gas production in Norway. A number of international oil and natural gas companies, including ExxonMobil, ConocoPhillips, Total, Shell, and Eni, have a sizable presence in the natural gas and oil sectors in partnership with Equinor.

State-owned Gassco is the operator for Norway's natural gas pipeline network, including the network of international pipelines and receiving terminals that exports Norway's natural gas to the United Kingdom and continental Europe. Gassled, a joint venture between the Norwegian government (46% ownership) and Equinor (5% ownership), owns the pipelines. Two Canadian pension funds, other institutional investors, and private companies own the remaining 49%.

Exports

Norway exports nearly all of its natural gas production.

International natural gas pipelines

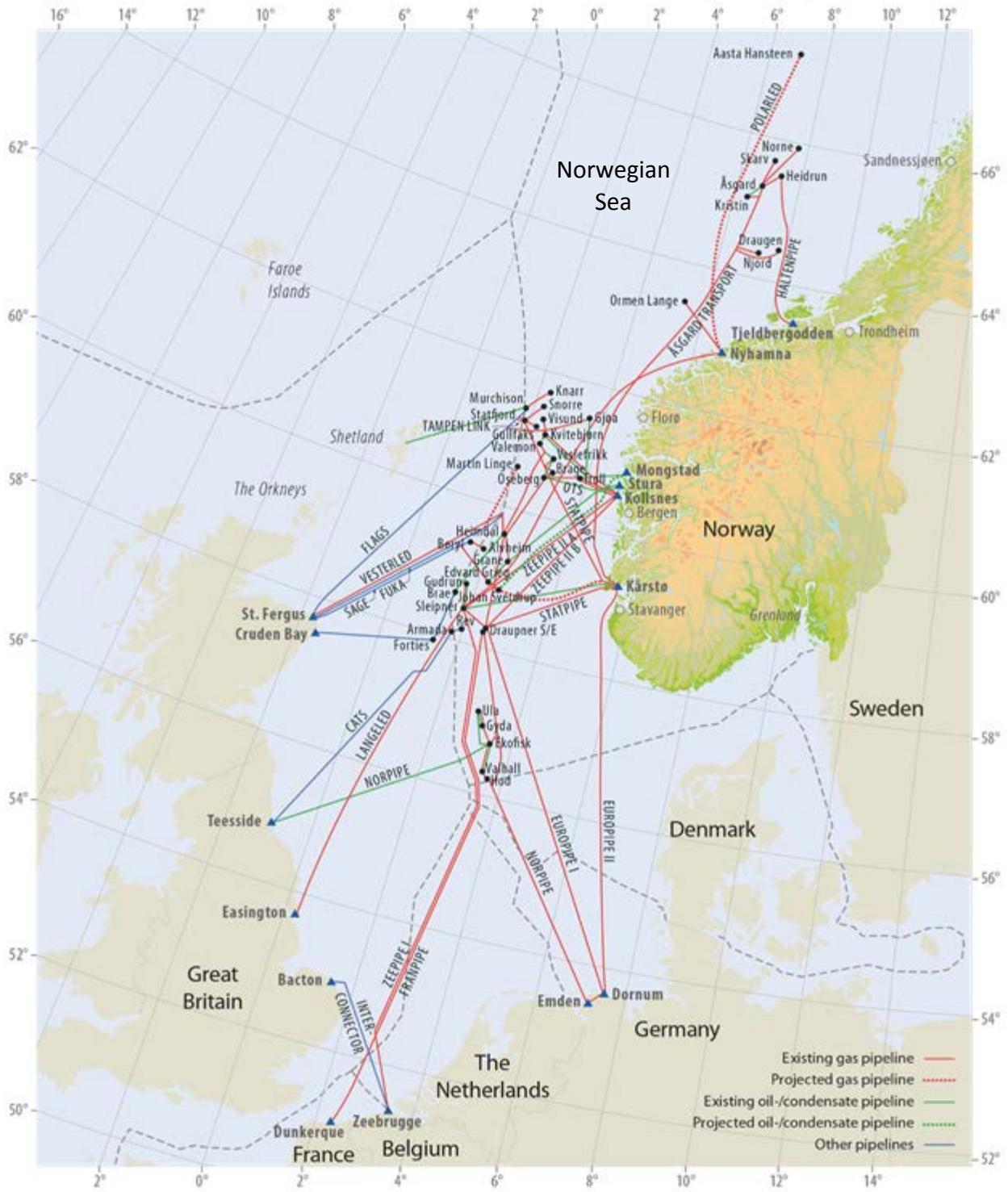
Norway operates several important natural gas pipelines (Table 1)¹¹ that connect directly with other European countries, including [France](#), the United Kingdom, Belgium, and [Germany](#). Gassco operates these pipelines. Some pipelines run directly from Norway's major North Sea fields to processing facilities in the receiving country. Other pipelines connect Norway's onshore processing facilities to European markets (Figure 2).

Table 1. Norway's natural gas export pipelines

Facility	Status	Capacity (trillion cubic feet per year)	Total length (miles)	Origin	Destination	Details
Norpipe	operating	0.6	280	Ekofisk area	Emden, Germany	started operation in 1977
Zeepipe I	operating	0.5	500	Sleipner platform	Zeebrugge, Belgium	started operation in 1993
Europipe I	operating	0.6	390	Draupner platform	Dornum, Germany	started operation in 1995
Zeepipe IIA and IIB	operating	1.8	190	Kollsnes gas plant	Sleipner platform (IIA) and Draupner platform (IIB)	started operation in 1996 (IIA) and 1997 (IIB)
Franpipe	operating	0.7	520	Draupner platform	Dunkirk, France	started operation in 1998
Europipe II	operating	0.8	410	Kårstø gas plant	Dornum, Germany	started operation in 1999
Vesterled	operating	0.5	220	Heimdal field	St. Fergus, Scotland	started operation in 2001
Langeled	operating	0.9	720	Nyhamna gas plant	Easington, England	started operation in 2007, connects to the Sleipner platform
Tampen, Gjøa, and Knarr	operating	0.6	14 (Tampen), 80 (Gjøa), and 65 (Knarr)	Statfjord, Gjøa, and Knarr fields	connects to the FLAGS pipeline to St. Fergus, Scotland	started operation in 2007 (Tampen, 2010 (Gjøa), and 2015 (Knarr))
Utsirahøyden	Operating	0.1	58	Edvard Grieg field	Connects to the SAGE pipeline to St. Fergus, Scotland	started operation in 2015

Sources: U.S. Energy Information Administration based on Equinor and Gassco.

Figure 2. Domestic and international Norwegian pipelines



Source: [The Norwegian Petroleum Directorate](http://www.petroleumdirektoratet.no)

Liquefied natural gas

Norway's first large-scale LNG liquefaction facility opened in 2007. Equinor operates the LNG export terminal and liquefaction facility at Melkøya, Norway, near Hammerfest. The facility draws natural gas from the Snøhvit natural gas field, Norway's first natural gas development in the Barents Sea. The Melkøya facility, the first large-scale LNG export terminal in Europe, has a design capacity of 4.2 million metric tons per year (mt/y) of LNG.

Norway has been at the forefront of a growing small-scale LNG industry in the Nordic countries. Norway has several small-scale LNG facilities, including three small-scale liquefaction plants with a combined capacity to produce 0.44 mt/y of LNG. Small tanker ships and tanker trucks distribute LNG to ports and inland facilities in Norway, Sweden, and Denmark. Finland's first small-scale LNG receiving terminal started commercial operations in September 2016. Industrial consumers mainly use LNG, and it is increasingly being used as marine fuel.

Hydrocarbon gas liquids

Hydrocarbon gas liquids include both natural gas liquids (such as ethane, propane, and butanes) and olefins produced by natural gas processing plants, fractionators, crude oil refineries, and condensate splitters. Norway's growing natural gas production has resulted in increasing yields of natural gas plant liquids (NGPL), making Norway Europe's leading producer of NGPL. As natural gas production has grown in Norway, the quantities of recovered NGPL have also increased significantly.¹² Most NGPL are produced at the Kårstø processing plant, north of Stavanger, Norway, which can process more than 3.1 Bcf per day of wet natural gas and unprocessed condensate. The plant receives NGPL from a number of fields on the Norwegian continental shelf, including Åsgard, Sleipner, and Mikkel.¹³

The significant NGPL output of the natural gas processing and fractionation capacity in Norway, particularly at Kårstø, has resulted in the port of Kårstø becoming Europe's largest liquefied petroleum gas (LPG, comprising propane and butanes that are generally shipped separately) export facility and one of the largest and most modern such terminals in the world. Propane and butane originating at the port move by tanker to destinations around the world.¹⁴ However, while Norway's LPG exports continue to rise, ethane output has gradually declined.

Historically, ethane produced at Kårstø was shipped by barge to petrochemical crackers at Rafnes, Norway, and Stenungsund, Sweden. Diminishing ethane output, however, was no longer sufficient for Ineos at Rafnes and Borealis at Stenungsund to operate their plants at full capacity. In March 2015, Ineos began importing ethane from the United States to the Rafnes plant, where it is used to produce ethylene. Although the shipments of U.S. ethane to Norway have resulted in the energy exporter becoming a significant importer of ethane—at an average rate of approximately 25,000 b/d—the additional supplies to Rafnes have also allowed the Kårstø terminal to diversify its export destinations. Starting in mid-2017, Norway began exporting ethane to Total's Antwerp petrochemical cracker in the Netherlands, at an annualized rate of nearly 10,000 b/d.¹⁵

Electricity

Nearly all of the electricity produced in Norway comes from hydropower.

Most electricity in Norway is generated from hydropower. The remaining electricity is generated from fossil fuels and other renewables, including wind and biomass. The largest renewable energy power generator in Europe is Statkraft, which is owned by the Norwegian state and is a major supplier of hydropower. Norway's electric grid is owned and operated by Statnett. Statnett is responsible for ensuring the reliability and efficiency of the electric grid and for balancing electricity supply and demand. The company is also owned by the Norwegian state, and its revenues from operating the grid are regulated by the Norwegian Water Resources and Energy Directorate under the Ministry of Petroleum and Energy.

In the late 1990s, Norway, Sweden, Finland, and Denmark integrated their electricity markets into a single market for the Nordic region. In 2008, a 0.7 gigawatt capacity subsea power cable allowing electricity trade between Norway and the Netherlands began operating. In addition, subsea power cables that connect Norway to Germany and to the United Kingdom are currently under construction. They are expected to be completed by 2019 and 2021, respectively, and both will have transmission capacities of 1.4 gigawatts.¹⁶ Norway also has a small interconnection with Russia in the far northern part of the country.

In June 2012, government officials from Norway, Germany, and the United Kingdom confirmed their plans for subsea electric power connections between their countries to strengthen the northern European electricity grid and to increase supply security. Statnett will work with the United Kingdom's National Grid to construct the Norway-United Kingdom cable connection, expected to be completed in 2021. Statnett will also cooperate with Germany to build the Norway-Germany cable, expected to be completed in 2019.¹⁷

Notes

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

Endnotes

¹ *Oil & Gas Journal*, "Worldwide Look at Reserves and Production," (December 4, 2017) p. 20.

² Lundin Petroleum, [Operations—Norway](#), accessed August 7, 2018.

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- ³ Equinor, [Johan Sverdrup](#), accessed August 7, 2018 and Lundin Petroleum, [Operations—Johan Sverdrup](#), accessed August 7, 2018.
- ⁴ Eni Norge, [Goliat Facts](#), accessed August 7, 2018.
- ⁵ Norwegian Petroleum Directorate, Fact Pages, [Johan Castberg](#), accessed August 7, 2018.
- ⁶ Equinor, “[New timeline for Johan Castberg and Snorre 2040](#),” (March 6, 2015) and “[Johan Castberg PDO approved](#),” (June 12, 2018).
- ⁷ Norwegian Petroleum Directorate, [Oil and Condensate Pipelines on the Norwegian Continental Shelf](#), (updated March 10, 2016).
- ⁸ ConocoPhillips, Norway, [The Pipelines](#), accessed August 8, 2018.
- ⁹ ExxonMobil, Norway, [Refining and supply](#), accessed August 8, 2018.
- ¹⁰ Equinor, [Terminals and Refineries](#), accessed August 8, 2018.
- ¹¹ Statoil, [Norway’s Gas Transport System](#), accessed August 13, 2018; Gassco, [Pipelines and Platforms](#), accessed August 13, 2018; and Norwegian Petroleum, [The oil and gas pipeline system](#), accessed August 15, 2018.
- ¹² Norwegian Petroleum Directorate, [Facts—Production](#), Annual Production, 1971–2018, accessed August 10, 2018.
- ¹³ Equinor, [Kårstø Processing Plant](#), accessed August 13, 2018.
- ¹⁴ Ibid.
- ¹⁵ Total, [First phase of the Antwerp platform upgrade starts up with ethane-based petrochemical production](#), accessed September 7, 2018.
- ¹⁶ Statnett, [Brief History](#), [Cable to the UK](#), and [NORD.LINK](#), accessed August 13, 2018.
- ¹⁷ Statnett, [Cable to the UK](#) and [NORD.LINK](#), accessed August 7, 2018