



2014 Minerals Yearbook

DENMARK, THE FAROE ISLANDS, AND GREENLAND

THE MINERAL INDUSTRIES OF DENMARK, THE FAROE ISLANDS, AND GREENLAND

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DENMARK

The Kingdom of Denmark, which is a constitutional monarchy, includes Denmark and the self-governing areas of the Faroe Islands and Greenland. The ice-free land-mass area of Greenland is almost 10 times larger than Denmark, and Denmark is 30 times larger than the Faroe Islands. The population density of Denmark is about 131 persons per square kilometer (km²), which is relatively high compared with other European countries. On January 1, 2015, Denmark's population was 5,659,715, and its population growth rate was 0.38% in 2014. The population growth that Denmark experienced was owing to an annual birth rate of 1.6%, and to a high rate of immigration into the country (Statistics Denmark, 2015, p. 2–4).

Denmark's mineral resources are limited and composed mainly of industrial minerals and mineral fuels; the country's production of these minerals is not significant. Denmark is a member of the European Union (EU) and is located at the junction of the Baltic Sea, the North Sea, and the Skagerrak Strait (U.S. Department of State, 2014).

Trade has always been important for Denmark, but during the past few years, it has become even more relevant, as imports and exports increased as a percentage of the gross domestic product (GDP)—from less than 40% in 1997 to more than 50% in 2014, when imports increased by 3.8% and exports increased by 2.6% compared with those of 2013. Trade in services has increased over time and has almost tripled since 1994; trade in goods doubled during the same period of time, however, and remains the major component of foreign trade. In 2014, Denmark's most important trading partners were Germany, Sweden, and the United Kingdom, which accounted for 14.6%, 10.9%, and 7.1%, respectively, of Denmark's exports and supplied 16.4%, 11.2%, and 6.7%, respectively, of its imports. Denmark's most important trading partners outside of the EU were the United States (9% of exports and 6.5% of imports) and Norway (7.2% of exports) (Statistics Denmark, 2015).

Production

In 2014, Denmark's production of sand and gravel increased by 59.4%. Other commodities for which production increased significantly were bentonite, 17.8%; secondary aluminum, 2.7%; cement, 2.5%; and crushed stone, 2.5%. Commodities for which production decreased significantly were moler, 7.3%, and crude petroleum, 5.7%. Denmark lacked economically exploitable metallic mineral resources, and its mineral production consisted mainly of industrial minerals, crude petroleum, natural gas, and refinery products. Denmark was the world's only commercial producer of moler, which is a natural mixture of diatomite and smectite clay, and is known generically as moclay. The range

of uses for this mineral is wide, including filtration systems, insulation bricks, and cat litter (tables 1, 2; Damolin A/S, 2014).

Structure of the Mineral Industry

Private ownership, exploration, development, and production of minerals were allowed under Danish law. The permitting procedures for mineral production were developed and administered at the county level. Denmark's regulations concerning the mineral industry were comparable with those of other EU countries, and Denmark's mineral industry was mostly privately owned. One of the principal exceptions was Nordsøfonden, which was Denmark's state-owned oil and gas company. Since 2005, Nordsøfonden had owned a 20% interest in all new licenses in the oil and gas sector. The company was also a nonoperating partner in the Dansk Undergrunds Consortium (DUC) and held a 20% interest in the DUC's concession area. Table 2 is a list of the country's major mineral industry facilities, their capacities, and their locations (table 2; Nordsøfonden, 2014).

Commodity Review

Industrial Minerals

Cement.—Aalborg Portland A/S (Aalborg) (a subsidiary of Cementir Holdings S.p.A. of Italy) was the main producer of gray and white cement in Denmark. Aalborg operated seven kilns at its plant in Rørdal, which had a combined capacity of 2.1 million metric tons per year of gray cement and 850,000 metric tons per year (t/yr) of white cement. The gray cement was sold mainly on the domestic market, whereas the white cement was marketed on the international market. Aalborg also produced ready-mix concrete.

In 2014, Aalborg invested \$7.47 million¹ in a facility to increase its use of fuel produced from industrial waste. The company stated that the investment reduced its use of fossil fuels and that, in 2014, 33% of the fuel supplied to furnace 87 was produced from industrial waste. Aalborg sought to replace 45% of the furnace's fuel with industrial waste by 2015. Since 2010, the company had reduced the plant's consumption of electricity and fuel and saved 222 million kilowatthours (Cementir Holdings S.p.A., 2014; Aalborg Portland A/S, 2015).

Salt.—Akzo Nobel A/S's production of salt at Mariager was based on vacuum salt technology. The main material was a raw brine produced by solution mining in multieffect evaporation

¹Where necessary, values have been converted from Danish kroner (DKK) to U.S. dollars (US\$) at an annual average rate of DKK5.619=US\$1.00 for 2014. All values are nominal, at current prices, unless otherwise stated.

plants located at Hvornum. The salt produced was suitable for the electrolytic production of caustic lye, chlorine, and sodium chlorate. Akzo Nobel originally had a 50-year license to extract salt, which was scheduled to expire in 2013, and in 2009, the company negotiated a new 30-year license (Akzo Nobel A/S, 2014).

Mineral Fuels

Petroleum and Natural Gas.—On October 20, the seventh licensing round for submitting applications for new oil and gas exploration ended. The Danish Energy Agency received 25 applications from 15 oil companies; several had not previously held licenses in Denmark. The 15 companies were A.P. Møller-Mærsk A/S, Ardent Oil Ltd., Dana Petroleum Denmark B.V., Danoil Exploration A/S, DONG E&P A/S, Dyas B.V., Edison International S.p.A., Hansa Hydrocarbons Ltd., Hess Denmark ApS, Mærsk Olie & Gas A/S, Noreco Oil Denmark A/S, PA Resources UK Ltd., RWE Dea AG, Shell Olie & Gasudvinding B.V. of the Netherlands, and Wintershall Noordzee B.V. Denmark's state-owned oil and gas company, Nordsøfonden, had a 20% interest in all new licenses. The areas that were offered for licensing included unlicensed areas in the Central Graben section of the North Sea, where the majority of Denmark's gas and oil fields have been discovered, and areas further to the east, where oil discoveries were made in the previous licensing round. The Danish Energy Agency intended to continue holding licensing rounds yearly and expected to initiate the next licensing round in mid-2015 (Danish Energy Agency, 2014a, b).

Outlook

Denmark will likely continue to issue licenses for future natural gas and petroleum exploration, as Danish crude petroleum and gas production continue to decline. The development of mineral deposits in Greenland will affect how the Government of Denmark subsidizes the autonomous region, and the benefits that are gained from such development remain unclear.

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FAROE ISLANDS

The Faroe Islands, which is a self-governing overseas administrative division of Denmark, had no significant identified mineral resources, although a small amount of crushed stone was thought to be produced for domestic consumption. The Faroese economy depended mainly on fishing and salmon farming and was aided by an annual subsidy from Denmark of about 3% of the Faroe Island's GDP. The main involvement of the Faroe Islands in the international mineral industry was as a market for imported materials, principally cement, fertilizer materials, and fuels.

Commodity Review

Mineral Fuels

Petroleum.—In June 2014, Statoil ASA (Statoil) of Norway reported that the drilling of the Brugdan II reentry well in its license 006, which was located 130 kilometers (km) offshore of the Faroe Islands, had concluded. The company planned to plug and abandon the well, as it was determined to be dry. The well had been drilled using the West Hercules semisubmersible rig in a water depth of 450 meters. This was the second exploration well that Statoil had drilled in the 579-km² license 006 area that had proved to be dry.

To establish a leading position in frontier areas, Statoil operated four licenses in the Faroe Islands and as part of the company's exploration strategy of early field exploration. Statoil held a 35% interest in license 006, and Exxon Mobil Corp. of the United States held a 49% interest; OMV Aktiengesellschaft of Austria, 15%; and Atlantic Petroleum P/F, 1%. Statoil planned to move the West Hercules semisubmersible rig to its license 008 in the Faroe Islands where the company planned to drill the Sula/Stelkur well (Statoil ASA, 2014).

Outlook

The exploration for crude oil will continue to be the most important activity in the mineral resource industry in the Faroe Islands for the foreseeable future. Several companies will likely continue to be engaged in geophysical exploration and exploration well drilling. Future discoveries in the Faroe Islands could make the eventual production of petroleum possible.

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GREENLAND

Greenland (officially known as Kalaallit Nunaat) is a self-governing overseas administrative division of the Kingdom of Denmark. Greenland's government is based in the capital city of Nuuk. It has an ice-free area of 410,449 km² and a coastline of 44,087 km², making it the largest island in the world.

Greenland receives an annual grant and subsidies from Denmark of about \$648 million, and it uses the Danish kroner as its official currency. Greenland's population in 2014 was 55,984, with 16,992 people living in Nuuk. The country's population rate of growth was -0.5%. Greenland's economy depended mostly on fisheries and, in 2014, its most important exports were provisions and livestock. Only 2% of exports were derived from mining, mainly gold and olivine (Government of Greenland, 2014; Statistics Greenland, 2015, p. 3–7).

In 2014, a total of 28 new mineral licenses were granted, 8 were renewed, and 8 were terminated. Of the new licenses, 15 were exploration licenses (Bureau of Minerals and Petroleum, 2013, p. 5–6; Bureau of Minerals and Petroleum, 2015, p. 9).

Greenland had six rare-earth projects, of which the most important were two that were located in the Ilimaussaq complex—the Kvanefjeld project and the Kringlerne project. The others were the Milneland, the Motzfeldt, the Sarfartoc, and the Tiquusaaq projects. As of yearend 2014, only feasibility studies had been produced, and mining activity remained insignificant (Goldletter International, 2014, p. 10–12; Greenland Minerals and Energy Ltd., 2014; Statistics Greenland, 2015, p. 16).

Commodity Review

Metals

Iron and Steel.—At a meeting on December 21, 2014, the government approved the indirect transfer of London Mining Greenland A/S to General Nice Development Ltd. of China. The government of Greenland reported that the company planned to develop an iron ore mine at Isukasia in western Greenland for which London Mining Greenland held the license. General Nice Development was a Hong Kong-based company with its main operational center at Tianjin City in mainland China. The government clarified that an indirect transfer of the license meant that the structure and name of London Mining Greenland A/S would remain the same, but that General Nice Development would be the owner. The government reported that London Mining Greenland would keep headquarters in Nuuk and continue to employ the current staff. The mine was projected to take about 3.5 years to construct and would be operational for an estimated 15 years. The project would include an approximately 105-km road, a harbor, a residential area, a workshop, fuel and explosives depots, and related infrastructure, which could include an airstrip (Government of Greenland, 2015).

Industrial Minerals

Gemstones.—The Ministry of Mineral Resources of Greenland reported that construction of infrastructure was

underway for the development and exploitation of the True North Gems Inc. (TNG) Aappaluttoq ruby and pink sapphire deposit in Fiskeaesst in southwestern Greenland, which is located approximately 160 km southwest of Nuuk. The Ministry stated that gem- and near-gem-quality rubies and pink sapphires occur along the metasomatic contact between the Fiskeaesst anorthosite and amphibolite, which extends for more than 200 km. More than 65 kilograms (kg) of gemstones and more than 129 kg of near-gem-quality rubies and pink sapphires had been recovered from 48 metric tons of processed material. TNG had been exploring the area since 2004 and was granted an exploitation license for the Aappaluttoq project in March 2014. The company updated its prefeasibility study, which stated that the resources of the deposit were 77,160 t at an inferred grade of 1,417 carats per metric ton and a (lower) cutoff size of 1.7 millimeters; the expected mine life was 9 years. According to the government of Greenland, production from the deposit would introduce significant quantities of Greenland's colored gemstones to the international market (Bureau of Minerals and Petroleum, 2015, p. 1–2).

Rare Earths.—Greenland issued several exploration licenses for rare-earth elements (REEs) since it changed its policy on exploitation of radioactive minerals in October 2013. The largest identified REE deposits were the Kvanefjeld and the Kringlerne deposits, which were owned by Greenland Minerals and Energy (GMEL) of Australia and Tanbreez Mining Greenland ALS (Tanbreez), respectively. The Kvanefjeld project is located in the northern Ilimaussaq complex on the southwestern tip of Greenland. The Kringlerne deposit is located in southern Greenland between the cities of Narsaq and Qaqortoq, and is also known simply as the Tanbreez project. GMEL continued its investigation of the Kvanefjeld deposit and reported it to be a significant REE deposit with substantial uranium and zinc resources. The company reported that the deposit was second in size only to the Bayan Obo REE deposit in China. The main focus of GMEL's investigation was to develop an effective method of beneficiating the multiple-element ores (Goldletter International, 2014, p. 10; Greenland Minerals and Energy Ltd., 2014).

In September 2013, Tanbreez applied for an exploration license for the Killavaat Alannguat multiple-element deposit in southern Greenland and, as of December 2014, negotiations were ongoing. The deposit was calculated to contain more than 3 billion metric tons of eudialyte-bearing resources. The company planned to produce eudialyte concentrate and feldspar from an estimated 500,000 t/yr of ore. From the eudialyte, the company planned to extract tantalum, niobium, REEs, and zirconium. This project would include the construction of an open pit mine, a processing plant for magnetic separation, a port and helipad, a camp, a tailings deposit, and connecting infrastructure for the complex. The company expected to employ up to 135 people during construction and about 90 during production. The public hearing process began in the fall of 2013 and, as of yearend 2014, negotiations with the government of Greenland were ongoing (Bureau of Minerals and Petroleum, 2013, p. 2; 2015, p. 3).

Outlook

Since Greenland changed its legislation to permit the exploitation of radioactive minerals, several companies have begun exploration. The conditions of extraction and the size of the investment necessary for this type of enterprise, however, mean that only well-developed and well-funded projects are likely to be realized. More areas for exploration in Greenland are expected to open up if the ice sheet recedes, especially for crude oil and gas in the Arctic Sea. The country's political autonomy and the likelihood that the government of Greenland will continue to see the new sources of revenue as instrumental in achieving economic autonomy from Denmark are reasons to expect the continued development of the mineral industry in Greenland for the foreseeable future.

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TABLE 1
DENMARK: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2010	2011	2012	2013	2014
Aluminum, metal, secondary	29,200 ^r	31,300 ^r	26,700 ^r	25,700 ^r	26,400
Cement, gray and white ³ thousand metric tons	1,540	1,820	1,820	1,830	1,876
Chalk, calcium carbonate thousand cubic meters	2,700	2,600	2,600	2,571 ^r	2,610
Clays: ³					
Bentonite	23,832	38,300	30,330	56,355	66,388
Moler, extracted thousand cubic meters	199 ^r	201 ^r	177 ^r	205 ^r	190 ^r
Gas, natural, dry million cubic meters	8,211 ^r	7,079 ^r	5,804 ^r	4,842 ^r	4,800 ^e
Gold ⁴ kilograms	--	103	307	100	--
Petroleum:					
Crude thousand 42-gallon barrels	89,425 ^r	80,665 ^r	73,730 ^r	63,875 ^r	60,225
Refinery products:					
Liquefied petroleum gas do.	1,752	1,533	1,862	1,278 ^r	1,200 ^e
Gasoline do.	15,330	15,768	17,046	18,980 ^r	19,000 ^e
Jet fuel do.	3,416	2,154	1,752	1,168 ^r	1,200 ^e
Distillate fuel oil do.	22,703	21,280	25,331	31,025 ^r	31,000 ^e
Residual fuel oil do.	7,665	7,373	8,432	9,855 ^r	9,800 ^e
Total do.	50,866	48,108	54,423	62,306 ^r	62,200
Salt, all forms	601,046	600,000	600,000	600,000	600,000
Sand and gravel thousand metric tons	17,901	19,966	18,981	17,762	28,306
Stone, crushed do.	640	542	500	512	525
Sulfur, recovered	3,246	3,045	3,400	3,599	3,600 ^e

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. do. Ditto. -- Zero.

¹Table includes data available through July 29, 2015.

²In addition to the commodities listed, kaolin, lime, naphtha, and peat were thought to be produced, but available information was inadequate to make reliable estimates of output.

³Volume based on reported sales.

⁴Reported figure.

TABLE 2
DENMARK AND GREENLAND: STRUCTURE OF THE MINERAL INDUSTRIES IN 2014

(Thousand metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
DENMARK				
Cement:		Aalborg Portland A/S (Cementir Holding S.p.A.)		2,100
Gray		do.	Plant at Rordal	2,700
White		do.	do.	850
Chalk (calcium carbonate)	thousand cubic meters	Faxe Kalkbrud A/S (Lhuist group S.A.)	Quarries at Stevns and Sigerslev	280
Diatomite (moler)	do.	Damolin A/S	Quarries on Mors and Fur Islands	250
Lime		A/S Faxe Kalkbrud (Lhuist group S.A.)	Plant at Stubberup, near Fakse, on Zealand Island	200
Natural gas	million cubic meters	Maersk Olie og Gas A/S	Roar and Tyra gasfields, Danish North Sea	5,000
Petroleum:				
Crude	barrels per day	Dansk Undergrunds Consortium (DUC) ¹ (A.P. Møller-Mærsk, 31.2%; Chevron Corp., 12.0%; Nordsøfonden, 20.0%; Royal Dutch Shell plc.36.8%)	16 fields in Danish North Sea	173,000
Do.	do.	DONG Energy AS	5 fields in Danish North Sea ²	NA
Do.	do.	Hess Corp. ³	1 field in the Danish North Sea	NA
Refined	do.	Statoil A/S	Kalundborg	110,400
Do.	do.	Dansk Shell A/S (Royal Dutch Shell plc. 100%)	Fredericia	63,000
Salt		Akzo Nobel A/S	Mine (brine) at Hvornum, plant at Mariager	1,000
Steel, semimanufactures		NLMK DanSteel A/S (NLMK International BV, 100%)	Plant at Frederiksværk	250
GREENLAND				
Gold	kilograms	Angel Mining plc ⁴	Nalunaq Mine at Nanortalik	1,100

Do., do. Ditto. NA Not available.

¹Mærsk Olie og Gas A/S was the operator for all Dansk Undergrunds Consortium activities.

²A sixth field, the Herje field, was expected to begin producing oil and gas in 2016.

³HESS Corp. operated and owned 65.1% of the South Arne field; DONG Energy A/S owned 36.8%, and Danoil A/S owned 1.7%.

⁴Mine was placed under administration and operations were suspended in 2013.