

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

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Denmark's mineral resources are concentrated mainly in natural gas and petroleum fields in the North Sea that have, together with renewable energy, made Denmark a net exporter of energy since 1996. Most of the mineral commodities produced in Denmark were exported with a majority shipped to European Union (EU) countries. The Danish economy was strong, with a public budget surplus and low inflation. However, its extensive foreign trade made the economy vulnerable to foreign shocks, including the Asian and Russian financial crises. Employment in the nonfuels minerals industry (mining and quarrying, basic metal industry, etc.) accounted for about 2% of total employment.

Denmark opted out of the European Monetary Union's third phase (establishment of a joint EU currency and relinquishment of jurisdiction over monetary policy), although the country's economic performance exceeded the established convergence criteria for membership.

Private ownership and exploitation of minerals are allowed under Danish law. A tax of \$0.91 per cubic meter was levied against all extracted minerals, regardless of type or ownership. However, this tax is exempted if the mineral is exported. Individual counties execute the permitting procedure for mineral production, and the environmental regulations are at a level comparable to the other EU member countries.

The mining and metal industry works closely with the Ministry of Environment and Energy, the Danish Environmental Protection Agency, local and community governments, and citizen groups to minimize any adverse effects to the environment. Environmental protection is the main focus of the Danish Environmental Protection Agency. A common goal of the steelworks and other industrial concerns is to make use of as much raw material taken into the plant as possible and to maximize the use of any byproducts, such as flue dusts.

Continued close cooperation with the other member countries of the EU was very important for Denmark because these countries remain the major export markets.

Denmark's steel industry was small compared with the majority of other EU countries and, as a result of its size, was not affected by the proposed cuts being studied by the European Commission in its efforts to make the EU steel industry more competitive with those of other countries. (See table 1.)

Denmark has no known economically exploitable reserves of metallic ores; but does have large reserves of nonmetallic materials, such as chalk, diatomaceous earth, limestone, and sand and gravel. Approximately one third of the bedrock area

in Denmark consists of chalk and limestone. Denmark's industrial minerals sector was based mainly on these easily accessible materials. Cement, chalk for paper filler, ground limestone, and lime, including agricultural and burnt, were produced. The structure of the Danish mineral industry, listing its major components, is shown in table 2.

Denmark was the only commercial producer of moler, which consists of a natural mixture of diatomite and 20% to 25% bentonite. Moler has a variety of applications, such as industrial absorbers, brake linings, and fertilizers, and is an important ingredient of insulation bricks. Dansk Moler Industri AS (Damolin) was the major producer of moler powder and granulates. Damolin had a production capacity of 100,000 metric tons per year (t/yr) on the island of Mors and 45,000 t/yr on the island of Fur (Knudsen, 1998).

Petroleum production continued to exceed consumption, allowing Denmark to stay self-sufficient in petroleum. An increase in natural gas production allowed the continued exporting of about 20% of Denmark's production. Dansk Underground Consortium (DUC) was responsible for virtually the entire production from Denmark's North Sea petroleum and natural gas fields. Denmark was the third largest producer in Western Europe after Norway and the United Kingdom. A.P. Moeller Group owned 39% of DUC; its two partners, Shell Corp. and Texaco Corp., owned 46% and 15% respectively. DUC's production from 12 fields exceeded the total Danish oil and gas consumption.

In May 1998, the Ministry of Environment and Energy awarded 17 licenses for offshore exploration and production. The awards follow Denmark's fifth offshore licensing round initiated in 1997. The licenses covered a total area of 6,341 square kilometers in the western part of Denmark's offshore sector. Operators of fifth round licenses have committed to spend a total of \$250 million on exploration over 6 years (Oil & Gas Journal, 1998).

Faroe Islands

The Faroe Islands, a self-governing overseas administrative division of Denmark, has no known mineral reserves. The economy remains dependent on fisheries, which collapsed in the early 1990's, causing an economic crisis. However, this could change if a dispute with the United Kingdom over a wide strip of sea between the Faroe Islands and the Shetland Islands, which has continued for the past few years, is eventually settled

in favor of the Faroes. The dispute concerned the boundary of the economic zone of the Faroe Islands and the Shetland Islands and intensified as a result of oil having been discovered in the Shetland zone less than 20 kilometers (km) from the present boundary and in the disputed zone.

Although commercially viable findings of oil or natural gas have not been found on the Faroe Islands, the Government planned to open the first licensing round in 1998. Interest in the area was expected to center on blocks in the vicinity of British Petroleum's 200-million-barrel (Mbbbl) Foinaven and 425-Mbbbl Schiehallion fields. Faroese company Føroya Kolvetni will manage the offer (Petroleum Economist, 1998).

Greenland

Since the cessation of mining activities in 1990, Greenland, a self-governing overseas administrative division of Denmark, has been looking for a means of diversifying its economy, which was based almost entirely on fishing and hunting. Recent legislation created favorable licensing terms and investment rules. This, together with diverse rock types in its geology, has resulted in increased mineral exploration in Greenland.

On July 1, the Danish Government and the Greenland Home Rule Government signed an agreement on the transfer of administration regarding mineral resources in Greenland to the Greenland Home Rule Government. The transfer implied that the political responsibility, including the granting of licenses, would rest with the Greenland Home Rule Government. The transfer will cover minerals and hydrocarbons. Implementation of the transfer will require the Danish Parliament to pass the necessary amendments to the Mineral Resource Act for Greenland (Greenland Minex News, 1998).

In 1998, several companies conducted exploration over more than 28,000 square kilometers (km²). Exploration has been directed toward base metals, diamond, gold, industrial minerals, iron, nickel, and platinum-group metals. The Danish and Greenlandic Governments are actively encouraging mineral exploration activities, and the Geological Survey of Denmark and Greenland provided support where possible.

Greenland was a part of the global diamond chase. Most of the Archean block of West Greenland was covered by exploration licenses. Although the history of Greenlandic diamond goes back 25 years, exploration was still in its early stages, characterized by airborne geophysical surveys and followup field sampling of kimberlite for diamond analysis and surface deposits for indicator minerals. Comparisons of Greenland's diamond resources with the Lac de Gras discovery in Canada remain in vogue (Greenland Minex News, March 1998, West Greenland diamond review and update, accessed March 23, 1999, at URL <http://www.bmp.gl/minerals/minex/index.htm>).

Platinova A/S reported the recovery of a microdiamond from a sample of kimberlite boulders on a lakeshore in west central Greenland. The 0.01-carat diamond was recovered from a sample taken from Platinova's 4,332-km² exploration concession. Elsewhere on the west Greenland project, Platinova was carrying out glacial till sampling, prospecting,

and geological mapping in a program aimed at evaluating more than 100 geophysical targets and kimberlite indicator mineral anomalies (Northern Miner, 1998b).

Fjordland Minerals A/S began a helicopter-supported glacial till sampling program in western Greenland. The Canada-based company was intending to focus on 24 areas where last year's reconnaissance sampling program turned up kimberlite indicator minerals. Airborne geophysical surveys over selected targets were also planned (Northern Miner, 1998a).

Denmark and Greenland awarded an international consortium a license for offshore petroleum and natural gas exploration and exploitation off Nuuk in western Greenland. The consortium was headed by Statoil A/S of Norway and Philips Petroleum Greenland Ltd. of the United States; each held 38.25% of the shares; the consortium also included the Danish-Greenlandic group Nunoil, which held 15%, and Denmark's Dopas, which owned 8.5%. Preliminary seismic surveys indicated that the offshore area known as Fylla Banke in the Baffin Sea some 50 to 150 km west of Nuuk, appears to contain large quantities of natural gas and some petroleum (Fischer, 1998).

The subsea continental shelf along Greenland's western coast would appear to contain natural gas and petroleum reserves similar to those in the North Sea. However, the waters are more than 1,000 meters deep, and special technology would be required to exploit the deposits. Statoil carried out seismic surveys in 1997, and the first exploratory well was expected to be drilled in late 1998. The concession covers an area of 9,487 km² and has been awarded for two 4-year periods until December 31, 2004 (Alexander's Gas & Oil Connections, 1996, NK-US Consortium wins oil and gas license off Greenland, December 1996, accessed April 21, 1998, at URL <http://www.gasandoil.com/goc/company/cne65102.htm>).

Denmark and Greenland are actively seeking to develop both areas' nonfuel mineral resources, particularly in Greenland. The hopes are that mining can once again become an important sector of the country's economy.

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Major Source of Information

Geological Survey of Denmark and Greenland
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2400 Copenhagen NV, Denmark

TABLE 1
DENMARK: APPARENT PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1994	1995	1996	1997	1998 e/
Aluminum metal, secondary e/	15,000 2/	14,000	14,500	14,000	14,000
Cement, hydraulic	2,430,000	2,584,000	2,628,528	2,683,039	2,600,000
Chalk	414,000	366,000	359,378	427,634	425,000
Clays: e/					
Fire clay	1,530 2/	2,000	1,800	20 2/	20
Kaolin	3,500	3,500	3,000	3,000	2,500
Other	224 2/	6,000	8,050	8,000	6,000
Moler, extracted	190	186 2/	185	185	185
thousand cubic meters					
Gas:					
Manufactured e/	1,700	1,500	1,210 2/	1,500	1,500
Natural:					
Gross e/	6,900	6,320	7,500	9,530	9,600
million cubic meters					
Marketable	4,630	4,700	5,710	6,960	7,000
do.					
Iron and steel metal, steel:					
Crude	722,000	654,000	737,000	787,000	805 2/
Semimanufactures	638,000	631,000	621,000	625,000 e/	706 2/
Lime, hydrated and quicklime	125,000	117,000	108,628	115,129	116,000
Natural gas plant liquids e/	48,000	46,000	45,000	45,000	45,000
thousand 42-gallon barrels					
Nitrogen, N content of ammonia e/	1,700	1,600	1,600	1,600	1,600
Peat	190,000	205,000	204,465	205,000	205,000
Petroleum:					
Crude 2/	68,800	67,858	78,795	83,950	84,000
thousand 42-gallon barrels					
Refinery products: e/					
Liquefied petroleum gas	1,600	1,600	13,879 2/	1,600	1,600
do.					
Gasoline	30,000	32,000	31,247 2/	30,200	30,000
do.					
Naphtha	1,200	1,200	1,666 2/	1,200	1,200
do.					
Mineral jelly and wax	4 2/	4	--	--	--
do.					
Jet fuel	1,930 2/	1,800	1,800	1,800	1,800
do.					
Kerosene	110	100	93 2/	100	100
do.					
Distillate fuel oil	28,400 2/	28,000	26,590 2/	28,000	28,000
do.					
Refinery gas	1,700	1,700	2,880	1,600	1,600
do.					
Lubricants	260 2/	300	300	300	300
do.					
Residual fuel oil	13,700 2/	13,500	15,951 2/	13,500	13,500
do.					
Bitumen and bituminous mixtures	52 2/	50	--	--	--
do.					
Petroleum coke	3	3	59 2/	60	60
do.					
Total	78,959	80,257	94,465	78,360	78,160
do.					
Phosphates, crude, gross weight e/	1,270 2/	1,200	1,200	1,200	1,200
Salt, all forms	633,524	603,326	600,000 e/	600,000 e/	600,000
Sand and gravel: e/					
Onshore	20,000	20,000	18,000	18,000	18,000
thousand cubic meters					
Offshore	5,000	5,000	5,000	5,000	5,000
do.					
Total	25,000	25,000	23,000	23,000	23,000
do.					
Of which, sand, industrial (sales)	25	50	50	50	50
do.					
Stone:					
Dimension (mostly granite) e/	24,800	25,000	27,198 2/	26,000	26,000
Limestone:					
Agricultural	703,000	826,000 e/	695,380	700,000 e/	700,000
Industrial e/	252,000 2/	250,000	250,000	250,000	250,000
Sulfur, byproduct	10,100	8,000 e/	7,465	10,585	10,000

e/ Estimated.

1/ Table includes data available through March 1999 based on estimated sales of domestically produced mineral commodities.

2/ Reported production.

TABLE 2
DENMARK: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Aalborg Portland A/S	Plant at Rordal	3,000
Chalk		A/S Faxe Kalkbrud	Quarries at Stevns and Sigerslev	250
Diatomite (moler)	thousand cubic meters	Dansk Moler Industri A/S (Damolin)	Quarries on Mors and Fur Islands	145
Kaolin		Aalborg Portland A/S	Mine and plant on Bornholm Island	25
Lime		A/S Faxe Kalkbrud (Aalborg Portland Holding A/S)	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	2,550
Petroleum:				
Crude	barrels per day	Dansk Undergrounds Consortium	Dan, Gorm, Rolf, and Tyra, Danish North Sea	127,000
Refined	do.	A/S Dansk Shell	Fredericia	55,000
Do.	do.	Kuwait Petroleum Refining A/S	Gulfhavn	56,500
Do.	do.	Statoil A/S	Kalundborg	65,000
Salt		Dansk Salt I/S	Mine (brine) at Hvornum, plant at Mariager	600
Steel		Danish Steel Works Ltd. (Det Danske Stalvalsevaerk A/S) (30% Government owned)	Plant at Frederilsvaerk	750