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2011 Minerals Yearbook

DENMARK, THE FAROE ISLANDS, AND GREENLAND

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The Mineral Industries of Denmark, the Faroe Islands, and Greenland

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DENMARK

The mining, quarrying, and mineral processing sectors have not traditionally been significant contributors to Denmark's economy. The country's mineral resources are limited and composed mainly of industrial minerals and mineral fuels, including peat. Denmark's industrialized market economy depended on imported raw materials and foreign trade. Denmark is a member of the European Union (EU) and is located convenient to European trade routes through the Baltic Sea, the North Sea, and the Skagerrak Strait (U.S. Department of State, 2012).

Private ownership and exploitation of minerals are allowed under Danish law. The permitting procedures for mineral production are developed and administered at the county level. Regulations concerning the mineral industry are comparable with those of other EU countries (Ministry of Foreign Affairs, 2011).

In 2011, EU countries accounted for 72% of Denmark's external trade. The United States was Denmark's leading non-European trading partner in 2011, accounting for about 1% of external trade (Statistics Denmark, 2011, p. 67).

U.S. exports to Denmark in 2011 totaled $2.2 billion and U.S. imports from Denmark totaled $6.7 billion. U.S. exports to Denmark included, in order of value, petroleum products ($32.8 million), nonferrous metals ($31.1 million), fuel oil ($15.7 million), coal and other fuels ($15.4 million), and iron and steel products ($6.4 million) (U.S. Census Bureau, 2011a). U.S. imports from Denmark in 2011 included, in order of value, fuel oil ($78.5 million), iron and steel products ($49.4 million), finished metal shapes, except steel ($38.4 million), other petroleum products, ($12.5 million), and bauxite and aluminum ($4.1 million) (U.S. Census Bureau, 2011b).

Production

Denmark lacked economically exploitable reserves of metallic mineral resources; however, it does have reserves of nonmetallic materials, such as chalk, clays (including bentonite and kaolin), lime, peat, salt, and stone (including dimension stone and limestone). Denmark was the world's only commercial producer of moler, which is a natural mixture of diatomite and smectite clay that is used in filtration systems and insulation bricks. Petroleum production was declining as reserves were being depleted. In 2011, petroleum production decreased for the fifth year in a row, dropping from a level of about 114 million barrels (Mbbl) in 2007 to about 81 Mbbl in 2011. Data on mineral production are in table 1.

Structure of the Mineral Industry

The Danish mineral industry was mostly privately owned. Table 2 is a list of the country's major mineral industry facilities, their capacities, and their locations.

Commodity Review

Metals

Iron and Steel.—NLMK DanSteel A/S, which was a subsidiary of NLMK International B.V. of Russia, was the only steel plate producer in Denmark. DanSteel announced that it would build a new steel-rolling mill and expected it to be completed by yearend 2012. The new mill would be able to produce plates of up to 4 meters (m) in width. DanSteel's plates were used on bridges, offshore and onshore wind turbines, and ships. The investment cost was reported to be about 600 million Danish kroners (DKK) ($105 million[1]) (NLMK DanSteel A/S, 2011).

Industrial Minerals

Cement.—Aalborg Portland A/S (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 Rordal, which had a capacity of 2.7 million metric tons (Mt) of gray cement and 850,000 metric tons (t) of white cement. Aalborg was the world's leading manufacturer of white cement, which had a wide range of applications, ranging from aesthetic uses to highway safety barriers (Aalborg Portland A/S, 2011).

Diatomite.—Damolin A/S produced diatomite (moler) from its quarries at Fur and Mors Islands. Damolin had the capacity to produce 230,000 metric tons per year (t/yr) of diatomite from five rotary kilns. Diatomite is the key industrial mineral used in various types of filtration systems. Diatomite is used in about 65% of the world's filtration systems (Industrial Minerals, 2011).

Mineral Fuels and Other Sources of Energy

All Denmark's production of natural gas and petroleum in 2011 was from 278 active wells in the Danish area of the North Sea. These mineral fuels were the most valuable mineral commodities produced domestically. Production was from 19 fields of various sizes that include 79 natural gas wells and 199 petroleum wells. In addition, there were 109 active water-injected wells and 6 gas-injected wells. Petroleum production on the Danish Continental shelf was mainly by

[1]Where necessary, values have been converted from Danish kroner (DKK) to U.S. dollars (US$) at an average rate of DKK5.7=US$1.00.

three operators—Maersk Oil AS (15 fields), DONG Energy AS (3 fields), and Hess Corp. of the United States (1 field) (International Energy Agency, 2011, p. 7).

Denmark's petroleum production in 2011 was valued at DKK48 billion ($8 billion). The value of natural gas production was DKK10 billion ($2 billion) (Danish Energy Agency, 2011, p. 20, 50).

Denmark had two refineries—one in Kalundborg and the other in Frederica—that had a total (combined) crude distillation capacity of 172,000 barrels per day. The Kalundborg refinery processed primarily Norwegian crude but could process condensates and other types of crude oil as well. The Frederica refinery processed mostly Danish North Sea crude oil that was supplied by pipeline from Danish offshore wells. Denmark had been a net exporter of crude oil since the mid-1990s and was expected to remain a net exporter through 2018 (International Energy Agency, 2011, p. 8).

Geothermal Energy.—The Geological Survey of Denmark identified significant geothermal resources in porous sandstone layers beneath the surface in Denmark. These resources are related mainly to the Mesozoic succession of the Danish basin and the Fennoscandian Border Zone, which had been discovered from the drilling of about 60 deep wells drilled either for hydrocarbons, geothermal energy, or natural gas storage. Denmark's geothermal plant located at Thisted in northwestern Denmark produced heat from water that was heated to 44° C (111° F) by geothermal processes and pumped from the Upper Triassic Gassum sandstone aquifer at about 1-kilometer (km) depth. The wide distribution of such underground reservoirs made it possible for many of the existing district heating networks to make use of geothermal heat (Vanglilde-Pedersen, Ditlefsen, and Højberg, 2012).

Outlook

Further exploration of natural gas and petroleum reserves will likely continue in an effort to offset the country's declining production and maintain Denmark's role as a net exporter of natural gas and petroleum. Denmark is expected to remain a net exporter of natural gas until yearend 2020 and of petroleum until yearend 2018. Continued research in new technology and the testing of new exploration methods are expected to play a major role in Denmark's future natural gas and petroleum production. The Government is also likely to continue to consider the introduction of a long-term target of becoming fully independent of fossil fuels by the year 2050. Such a policy would likely encourage greater energy efficiency and growth in renewable energy production.

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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 on fishing and salmon farming and was aided by an annual subsidy of about 6% of the gross domestic product from Denmark. 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. Foreign petroleum companies were engaged in geophysical exploration and possible exploration well drilling. Future discoveries in the Faroese area could make the eventual production of petroleum possible.

Exxon Mobil Corp. of the United States acquired stakes in three Faroe Island licenses from Statoil ASA of Norway. ExxonMobil acquired a 50% interest in licenses 009 and 011 and a 49% interest in license 006. Statoil was Norway's leading natural gas and petroleum producer, and it had six offshore licenses in the Faroe Islands area (Stigset, 2011).

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GREENLAND

On January 1, 2010, the Inatsisartut [Mineral Resource] Act No. 7 on mineral resources and related activities came into force. The Mineral Resource Act replaced the Consolidation Act No. 368 of June 18, 1998. The Mineral Resource Act establishes the framework for future development and control of mineral resources. In 2011, there was broad political agreement within the Government to support the development of the mineral industry (Government of Greenland, 2011, p. 3).

Commodity Review

Metals

Gold.—By early in 2011, the Nalunaq gold plant, which was owned by Angel Mining plc of the United Kingdom, had been

commissioned and was operational. The company expected to produce about 700 kilograms per year. Angel planned to minimize transport and refining costs by shipping gold dore once it had produced an optimal quantity. Angel planned further exploration programs to confirm the length and depth of the Nalunaq deposit. Nalunaq was classified as a narrow-vein mesothermal deposit (Metals Economics Group, 2011).

Lead and Zinc.—Angel Mining was continuing with its exploration and development program to reopen the Black Angel Mine. The company was conducting a detailed review of the project with GBM Minerals Engineering Consultants Ltd. of the United Kingdom, Golder Associates of the United States, and Qualter Hall & Co. Ltd. of the United Kingdom. The pillar extraction program to produce lead and zinc concentrate was expected to provide a mine life of about 5 years. It included four stages of extraction within the Angel and Cover Zones and involved the construction of a materials handling and processing mill. Angel Mining was expecting to begin commercial production by midyear 2013 (Angel Mining plc, 2011).

Ironbark Zinc Ltd. of Australia reported that its Citronen project was estimated to have indicated reserves of 19.3 million metric tons (Mt) grading 5.1% zinc and 0.6% lead and 25.5 Mt of inferred reserves grading 5.3% zinc and 0.5% lead. A feasibility study coordinated by Wardrop Engineering Inc. of Canada designed a 3-million-metric-ton-per-year operation using both open pit and underground mining to feed a processing plant. Production was projected to be between 175,000 and 275,000 t/yr of 55% zinc concentrate and between 10,000 and 26,000 t/yr of 50% lead concentrate (Mining Journal, 2011).

Nickel.—North American Nickel Inc. of Canada acquired a mineral exploration license for 4,841 square kilometers (km^2) in the Maniitsoq area covering numerous nickel sulfide occurrences associated with norite and other mafic-ultramafic intrusions along the southwest coast of Greenland. The Maniitsoq project is located about 160 km north of Nuuk. There had been relatively little exploration activity in the Maniitsoq area given its size and abundance of nickel occurrences, but historical results included 9.85 meters (m) averaging 2.67% nickel and 0.06% copper at Imiak Hill and 12.83 m averaging 2.24% nickel and 0.63% copper at Fossilik. Most of the nickel discovered was associated with younger, undeformed norite intrusions that are concentrated in a 15-km-wide by 75-km-long arcuate belt, referred to as the Greenland Norite Belt, that rims a large complex known as the Finnefeld gneiss complex (North American Nickel Inc., 2011).

Industrial Minerals

Diamond.—NunaMinerals A/S identified a kimberlite float at its Qaamasoq license and established through testing that the chemistry of the mantle-derived material was favorable for the occurrence of diamond. High concentrations of float occurred in a number of sites, notably in the 250-m by 550-m Ullu [the Nest] area. Rocks were characterized as having visible garnet and, as such, were considered favorable for diamond. NunaMinerals was planning to follow up on these results in 2012 (NunaMinerals A/S, 2012).

Gemstones.—True North Gems Inc.'s Fiskenaesset ruby and sapphire project, which is located on the coast of Greenland about 160 km south of Nuuk, consisted of eight claim blocks covering 823 km^2. More than 30 ruby occurrences had been found in the Fiskenaesset district. From the material collected from the exploration program and processed, more than 65 kg of gem and more than 129 kg of near-gem ruby and pink sapphires were recovered. The gemstones occur along a regional geologic contact between amphibolite and anorthosite that extends for 200 km in the Fiskenaesset district. True North Gems was continuing with its exploration program and stated that mining could begin as soon as 2013 (True North Gems Inc., 2011).

Rare Earths.—In 2011, Greenland Minerals and Energy Ltd. (GMEL) of Australia was continuing with its investigation of the Kvanefjeld deposit, which the company reported to be a large rare-earth elements (REE) deposit that also contains uranium and zinc. The Kvanefjeld deposit was second in size to the REE deposit in China. In 2011, Kvanefjeld was an unusual deposit in that it was enriched with REE, uranium, and zinc. GMEL's permit was issued in accordance with the Government's amendment permitting uranium exploration and exploitation to be added to the standard terms for exploration licenses. This amendment by the Government created a framework for the evaluation of mineral deposits that contained uranium and provided for a full evaluation of the project. The main focus of Greenland Minerals's investigation was to develop an effective method of beneficiating the multielement ores (Greenland Minerals and Energy Ltd., 2011b).

Mineral Fuels and Related Materials

Natural Gas and Petroleum.—In the Arctic region, natural gas and petroleum companies faced high costs, high risks, and lengthy lead times for development. The Arctic resource base is largely composed of natural gas and natural gas liquids, which are significantly more expensive to transport over long distances than petroleum.

At yearend, the Bureau of Minerals and Petroleum (BMP) announced the opening of the Northeast Greenland licensing round. The Northeast Greenland licensing round was divided into two rounds—a preliminary round for the Kanumas Consortium members and an ordinary round for non-Kanumas Consortium members. The Kanumas Consortium was composed of the following international petroleum companies: BP p.l.c. of the United Kingdom, Chevron Corp. of the United States, Exxon Mobil Corp. of the United States, Japan National Oil Corp. of Japan, NunaOil AS of Greenland, Royal Dutch Shell plc of the United Kingdom, and Statoil ASA of Norway (Bureau of Minerals and Petroleum, 2011).

Cairn Energy plc of the United Kingdom commenced drilling operations on two wells offshore west Greenland. The AT–7 well was drilling in a water depth of 905 m about 160 km offshore Nuuk, and the LF–7 well was drilling in a water depth of 989 m about 300 km offshore Nuuk. Both prospects contain multiple structural targets in the sections that are of the Cretaceous and Tertiary periods (Rigzone.com, 2011).

Uranium.—In 2010, the Government amended its standard terms for exploration licenses and ceased a decades-old ban on uranium exploration to allow for the inclusion of radioactive elements as exploitable minerals. This amendment allowed Greenland Minerals to proceed with development of the Kvanefjeld REE deposit in 2011 and enabled it to conduct prefeasibility studies to demonstrate the potential for the development of a large-scale multielement mining operation there (Greenland Minerals and Energy Ltd., 2011a).

Outlook

Greenland has abundant mineral and natural resources. More areas for exploration are expected to open up if global warming continues, and new mineral deposits are likely to be discovered as a result. Finding new sources of hydrocarbons will continue to be very important for Greenland as possible sources of revenue and offshore exploration is expected to increase as interest in this area increases. The country's independent status and the Government's encouragement are expected to continue to accelerate the development of the mineral industry in Greenland.

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TABLE 1

DENMARK: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011
Aluminum metal, secondary		30,000	25,000	25,000	25,000	25,000
Cement, hydraulic		21,209 [3]	16,092 [3]	15,780 [3]	16,000	16,000
Chalk, calcium carbonate	thousand cubic meters	1,950	2,000	2,735 [3]	2,600	2,600
Clays:[4]						
Bentonite		20,093 [3]	22,458 [3]	24,040 [r]	23,832 [r]	24,000
Other		5,000	5,000	5,000	5,000	5,000
Moler, extracted	thousand cubic meters	241 [3]	252 [3]	202	225	225
Gas:						
Manufactured	million cubic meters	1,500	1,500	1,500	1,500	1,500
Natural	do.	9,128 [3]	9,564 [3]	9,600	8,438 [3]	9,000
Gold[5]	kilograms	1,639 [3]	1,518 [3]	1,600	1,600	1,600
Lime, hydrated and quicklime		115,000	115,000	115,000	115,000	115,000
Natural gas plant liquids	thousand 42-gallon barrels	48,000	50,000	53,000	53,000	53,000
Nitrogen, N content of ammonia		1,600	1,600	1,600	1,600	1,600
Olivine	thousand metric tons	1,100	1,100	1,100	1,100	1,100
Peat	thousand cubic meters	242,000	145,000	145,000	145,000	145,000
Petroleum:						
Crude[3]	thousand 42-gallon barrels	113,734	104,573	97,455	90,338	80,665
Refinery products:						
Liquefied petroleum gas	do.	1,862 [3]	1,314 [3]	1,606 [r, 3]	1,500 [r]	1,500
Gasoline	do.	16,608 [3]	16,352 [3]	17,666 [r, 3]	18,000 [r]	18,000
Naphtha	do.	50	50	50	50	50
Jet fuel	do.	4,271 [3]	3,942 [3]	3,212 [r, 3]	3,600 [r]	3,600
Distillate fuel oil	do.	24,054 [3]	23,068 [3]	24,674 [r, 3]	25,000 [r]	25,000
Refinery gas	do.	1,800	1,800	1,800	1,800	1,800
Residual fuel oil	do.	9,125 [3]	8,870 [3]	8,139 [r, 3]	8,200 [r]	8,200
Total	do.	57,800	55,400	57,100 [r]	58,200 [r]	58,200
Salt, all forms		557,917 [r]	496,593 [r]	511,063 [r]	601,046 [r]	600,000
Sand and gravel	thousand metric tons	68,255 [3]	59,937 [3]	46,932 [3]	46,932 [3]	50,000
Stone, crushed	do.	410 [3]	384 [3]	312	360	400
Sulfur, recovered		3,896 [3]	3,467 [3]	3,200	3,246 [r]	3,400

[r]Revised. do. Ditto.

[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through September 30, 2012.

[3]Reported figure.

[4]Denmark was believed to produce kaolin, but data on the amount produced were not available.

[5]Production from Greenland.

TABLE 2
DENMARK AND GREENLAND: STRUCTURE OF THE MINERAL INDUSTRIES IN 2011

(Thousand metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
DENMARK				
Cement:				
Gray cement		Aalborg Portland A/S (Cementir Holding S.p.A.)	Plant at Rordal	2,700
White cement		do.	do.	850
Chalk, (calcium carbonate)		A/S Faxe Kalkbrud	Quarries at Stevns and Sigerslev	250
Diatomite (moler)	thousand cubic meters	Damolin A/S	Quarries on Mors and Fur Islands	230
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
Olivine		Minelco A/S	Seqi Mine, Fiskefjord (closed 2010)	2,000
Petroleum:				
Crude	barrels per day	Maersk Oil AS	15 fields in Danish North Sea	NA
Do.	do.	DONG Energy AS	3 fields in Danish North Sea	NA
Do.	do.	Hess Corp.	1 field in the Danish North Sea	NA
Refined	do.	Statoil A/S	Kalundborg	102,000
Do.	do.	A/S Dansk Shell	Fredericia	70,000
Salt	metric tons	Dansk Salt I/S	Mine (brine) at Hvornum, plant at Mariager	6,000
Steel, semimanufactures		NLMK DanSteel A/S (NLMK International B.V., 100%)	Plant at Frederiksvaerk (closed)	250
GREENLAND				
Gold	kilograms	Angel Mining plc	Nalunaq Mine at Nanortalik	700

Do., do. Ditto. NA Not available.