



# 2007 Minerals Yearbook

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**NORWAY [ADVANCE RELEASE]**

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# THE MINERAL INDUSTRY OF NORWAY

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Norway has a varied geology with a broad spectrum of mineral resources for exploration and exploitation. Petroleum was Norway's most significant mineral commodity followed by, in order of value, industrial minerals and metals. The growth of its natural gas and petroleum sector has contributed significantly to the country's economy. The metals mining industry has declined owing to exhausted ore reserves. In addition to its rich natural gas and petroleum resources, Norway has hydroelectric power, which supplies the country's manufacturing and mineral-processing industries. The country's close proximity to the large European Union (EU) market was a competitive advantage for some raw materials, particularly aggregate, natural stone, and certain other industrial minerals.

## Minerals in the National Economy

Norway's mineral resources included coal, iron ore, natural gas, nickel, olivine, petroleum, and titanium. The mining and quarrying industry was a regional industry that was strongly represented along the coast. About 80 million metric tons (Mt) of various mineral resources valued at \$1.5 billion were extracted in 2007 by about 4,800 employees. The total export value for the mineral industry, excluding mineral fuels, was \$871 million in 2007 (Norwegian Geological Survey, 2008, p. 5).

## Production

Norway produced aluminum, cadmium, cobalt, copper, ferroalloys, nickel, and zinc metals. Mine production included feldspar, graphite, ilmenite, iron ore, and limestone. Aggregate and sand and gravel deposits were some of Norway's economically important mineral raw materials. Calcium carbonate, nepheline syenite, and olivine were the most important mineral products. Olivine is composed of two minerals: fayalite and forsterite. Fayalite is the iron-rich member and forsterite is the magnesium-rich member. Norway's production of olivine accounted for 66% of world production; the country's production of titanium accounted for 7.2% of world production; and its production of petroleum accounted for 6.2% of world production (Norwegian Geological Survey, 2008, p. 13).

The metals mining industry has declined owing to depleted ore reserves. Since the discovery of petroleum in the North Sea, petroleum production has become Norway's most important mineral industry activity, and petroleum was the country's most significant mineral commodity based on the value of exports (Norwegian Geological Survey, 2008, p. 3).

## Structure of the Mineral Industry

The Norwegian mineral industry was composed of a mixture of Government and privately owned operations. Table 2 lists the major mineral companies that were operating in Norway in 2007, and their respective mine and (or) plant locations and capacities.

## Commodity Review

### Metals

**Aluminum.**—Alcoa Inc. of the United States announced that it had opened a new 280,000-metric-ton-per-year (t/yr) anode plant at its aluminum smelter in Mosjoen. The facility would produce anodes to be used in the Mosjoen aluminum smelter in Norway and the Fjardaal smelter in Iceland. Alcoa built the anode plant with managing partner Elkem Aluminium ANS, which had a 36% share in the new plant. Alcoa owned 50% of Elkem Aluminium, which operated smelters in Lista and Mosjoen. Alcoa stated that the new anode plant would enable the company to reduce production costs and maintain its competitiveness (Mbendi Information Services (Pty) Ltd., 2007).

**Titanium.**—Titania A/S was one of the world's leading producers of ilmenite with about 6% of world production. Titania supplied ilmenite to the European titanium pigment industry, which converts the black ilmenite to a white titanium dioxide pigment. Production from the Tellnes open pit mine was about 2 million metric tons per year (Mt/yr) which resulted in about 800,000 metric tons per year (t/yr) of ilmenite concentrate containing 44.7% titanium dioxide (Norwegian Geological Survey, 2007).

### Industrial Minerals

Norway was a globally significant producer of industrial minerals from more than 30 mines. Norway's production of olivine accounted for 66% of world production, and that of ilmenite accounted for 14% of world production. Production of nepheline syenite was also globally significant. Aggregate, gravel, and sand were some of Norway's important raw materials. The Norwegian Geological Survey established a database that contains information on each of the country's deposits of aggregates, gravel, and sand, including each deposit's location, composition, quality, operating status, and volume (Norwegian Geological Survey, 2008, p. 12).

### Mineral Fuels

**Coal.**—Norway continued to be a net coal exporter because of production from Store Norske Spitsbergen Grubekompani AS's two mines on Spitsbergen Island, north of the Norwegian mainland. Mine No. 7 was scheduled to close in 2010. About one-half of the mine's production was used in the country's only coal-fired powerplant on Spitsbergen Island. The Svea Nord Mine was expected to operate for up to 25 years. Estimated coal reserves were between 35 Mt and 45 Mt. Coal for domestic use was imported. Coal was used primarily in the iron and metal processing industries and these industries require a year-round supply, which could not be guaranteed from Spitsbergen owing

to pack ice blocking the sea export route for most of the year (Sourcewatch, 2007).

**Natural Gas.**—Natural gas production commenced in late 2007 from StatoilHydro ASA's Ormen Lange field on the Norwegian continental shelf. Completion of this development will make Norway the world's second ranked exporter of natural gas after Russia. Maximum daily exports from Ormen Lange were projected to be 70 million cubic meters of natural gas and 50,000 barrels of condensate. The gas would be piped to the United Kingdom through the Langed pipeline, which, along with Vesterled, was the second direct export pipeline to the United Kingdom from the Norwegian continental shelf. When Ormen Lange reaches plateau production in 2010, gas exports from Norway could increase to 120 billion cubic meters, which would be sufficient to meet 20% of the EU's gas requirements. After Troll, Ormen Lange was the largest gasfield on the Norwegian continental shelf (Rigzone.com, 2007).

Construction of the \$1.16 billion Scandinavian Skanled natural gas pipeline was scheduled to start in October 2009, and the pipeline was expected to begin transmitting gas from Norwegian gasfields in mid-2011. The gas would flow to Sweden and Denmark. Once the Baltic pipeline is completed, gas would be piped from the Denmark terminal to Poland. The Baltic pipeline was scheduled to be completed in 2009 (Platts, 2007).

**Petroleum.**—The Government reported that a total of 31 exploration wells had been spudded in 2007 compared with 26 exploration wells spudded in 2006. The explanation was that there was better access to exploration drilling rigs in 2007. Of the total of 31 exploration wells, 20 were wildcat wells and 11 were appraisal wells. The Government expected this higher level of activity to continue because the accessibility to exploration rigs was starting to improve; however, in 2007, there was no additional available rig capacity. Most of the rigs were under contract through 2009, but construction of new rigs was expected to improve rig access considerably compared with previous years. Beginning in 2008, most of the rigs that go to the Norwegian shelf will operate under long-term contracts. The country's petroleum production capacity was about 3 million barrels per day. Norway was the world's third ranked petroleum exporter after Saudi Arabia and Russia and the seventh ranked natural gas exporter (Norwegian Petroleum Directorate, 2007).

Det Norske Oijeselskap ASA (NOIL) and Petra ASA (Petra) announced the merger of the two companies to form NOIL Energy ASA, which would be the second ranked operator after StatoilHydro. The merger was part of the two companies' strategy to establish a mid-cap operating company. NOIL Energy would operate 17 licenses offshore Norway and expected to operate 20 exploration wells during the next 3 years (Nortrade, 2007).

StatoilHydro announced that it had begun a 2-year drilling program in Arctic waters to determine the potential of Norway's share of one of the world's few remaining unexplored petroleum prospects. StatoilHydro also hoped to cooperate with Russian companies to find petroleum and natural gas further into the Arctic. StatoilHydro stated that it would like the Government to work with Russia on the future development of Arctic resources. StatoilHydro was chosen by Gazprom of Russia to be one of the

foreign partners to develop the massive Shtokman natural gas field off Russia's north coast (AFX News Ltd., 2007).

The Norwegian Oil Directorate confirmed a StatoilHydro oil strike in the Barents Sea, 65 kilometers north of Honningsvaag. The find may be larger than the Goliath Field. The new Nucula Field could contain as much as 300 million to 350 million barrels of oil compared to the estimated 250 million barrels of the Goliath. The two fields are located 45 kilometers apart. The Nucula test well was drilled to a depth of 1,692 meters (Alexander's Gas & Oil Connections, 2007a).

The Norwegian Petroleum Directorate stated that Norway needed to open up new offshore areas and step up the search in existing areas if it is to remain a key oil exporter. Oil production was declining by about 4% per year since it had peaked in 2000. The Government was also pushing the search for new supplies north in Arctic waters (Alexander's Gas & Oil Connections, 2007b).

## Outlook

Norway will continue to obtain nearly all its electricity from hydropower. Norway's economy is expected to remain highly dependant upon the country's hydrocarbon resources, and the Government is expected to continue to manage them. The Government is likely to continue exploration in the Barents Sea which it considers to be a potential source for new oil production and which has the potential to host large quantities of oil reserves. Industrial minerals will continue to be important to the economy.

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TABLE 1  
NORWAY: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Thousand metric tons unless otherwise specified)

Commodity	2003	2004	2005	2006	2007 <sup>c</sup>	
<b>METALS</b>						
<b>Aluminum:</b>						
Primary	metric tons	1,192,400	1,321,700	1,376,500	1,422,000	1,304,400 <sup>2</sup>
Secondary	do.	256,800	348,700	362,400	349,200	350,000
Cadmium, smelter	do.	331	260	200	150 <sup>r</sup>	150
<b>Cobalt:</b>						
Metal, refined	do.	4,556	4,670	5,021	4,927	3,939 <sup>2</sup>
Copper, metal, refined, primary and secondary	do.	35,900	35,600	38,500	39,700	34,212 <sup>2</sup>
<b>Iron and steel:</b>						
Iron ore and concentrate, Fe content		340	408	420	620 <sup>r</sup>	630 <sup>2</sup>
<b>Metal:</b>						
Pig iron <sup>e</sup>		90	100 <sup>r</sup>	100 <sup>r</sup>	100	100
<b>Ferrous alloys:<sup>c</sup></b>						
Ferromanganese		245	245	130	130	130
Ferrosilicomanganese		230	260	290	250	250
Ferrosilicon, 75% basis		350	300	165	93 <sup>r</sup>	90
Silicon metal		100	194	176	150	150
Other		15	15	60	60	60
Total		940	1,010	820	680	680
Steel, crude		698	695	701	679	740
Semimanufactures, rolled <sup>c</sup>		635	640	650	600	650
<b>Nickel:</b>						
<b>Mine output:</b>						
Concentrate <sup>e</sup>	metric tons	--	--	130 <sup>r</sup>	400 <sup>r</sup>	300
Ni content	do.	169	181	100 <sup>r</sup>	362 <sup>r</sup>	240 <sup>2</sup>
Metal, primary	do.	77,200	71,400	84,900	82,000	87,600
<b>Titanium:<sup>c</sup></b>						
Ilmenite concentrate		840 <sup>2</sup>	860	860	850	882 <sup>2</sup>
TiO <sub>2</sub> content		378 <sup>2</sup>	387	388	385	397
Zinc, metal, primary	metric tons	143,627	140,900	151,285	160,700	157,000
<b>INDUSTRIAL MINERALS</b>						
Cement, hydraulic <sup>e</sup>		1,860	1,870	1,900	1,850	1,800
Feldspar <sup>e</sup>	metric tons	74,000	75,000	88,690 <sup>2</sup>	65,000 <sup>r,2</sup>	65,000 <sup>2</sup>
Graphite <sup>e</sup>	do.	2,400	2,300	8,893 <sup>2</sup>	9,000 <sup>2</sup>	3,000 <sup>2</sup>
Lime, hydrated, quicklime <sup>e</sup>		100	100	100	100	100
Mica, flake <sup>e</sup>	metric tons	2,600	2,600	2,700	2,700	1,000
Nepheline, syenite <sup>e</sup>		300	300	300	312 <sup>r,2</sup>	312
Nitrogen, N content of ammonia		354	420	300	350	350
Olivine sand <sup>e</sup>		3,100	3,100	3,100	3,000	3,000
<b>Stone, crushed:<sup>c</sup></b>						
Dolomite		850	850	513 <sup>2</sup>	525	525
Limestone		7,200	7,300	7,200	7,200	7,200
Quartz and quartzite		1,500	1,500	909 <sup>2</sup>	1,000	1,000
<b>Sulfur, byproduct:</b>						
Metallurgical		100	85	80	80	80
Petroleum <sup>e</sup>		20	18	20	20	20
Total <sup>e</sup>		120	103	100	100	100
Talc, soapstone, steatite <sup>c</sup>		28	28	26 <sup>r</sup>	27	28
<b>MINERAL FUELS AND RELATED MATERIALS</b>						
Coal, all grades <sup>c</sup>		300	300	300	236 <sup>r,2</sup>	322 <sup>2</sup>
Gas, natural, marketed <sup>3</sup>	million cubic meters	73,124	78,465	84,964	96,000	130,800 <sup>2</sup>
Peat, for agricultural use <sup>c</sup>	do.	30	30	30	30	30

See footnotes at end of table.

TABLE 1--Continued  
 NORWAY: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Thousand metric tons unless otherwise specified)

Commodity	2003	2004	2005	2006	2007 <sup>c</sup>	
<b>MINERAL FUELS AND RELATED MATERIALS--Continued</b>						
<b>Petroleum:</b>						
Crude <sup>4</sup>	thousand 42-gallon barrels	1,041,400	1,024,400	964,290	965,000 <sup>r</sup>	965,000
Natural gas liquids <sup>e</sup>	do.	42,000	52,695 <sup>2</sup>	60,879 <sup>2</sup>	60,000	60,000
<b>Refinery products:<sup>e</sup></b>						
Naphtha	do.	27,000	8,741 <sup>2</sup>	10,017 <sup>2</sup>	10,000	10,000
Gasoline	do.	27,000	23,913 <sup>2</sup>	28,078 <sup>2</sup>	28,000	28,000
Kerosene	do.	9,000	4,774 <sup>2</sup>	5,771 <sup>2</sup>	5,800	5,800
Distillate fuel oil	do.	47,000	45,765 <sup>2</sup>	50,121 <sup>2</sup>	50,000	50,000
Residual fuel oil	do.	12,000	13,823 <sup>2</sup>	11,806 <sup>2</sup>	12,000	12,000
Other products	do.	5,000	3,351 <sup>2</sup>	4,194 <sup>2</sup>	4,000	4,000
Refinery fuel and losses	do.	5,000	2,757 <sup>2</sup>	2,977 <sup>2</sup>	3,000	3,000
Total	do.	132,000	103,124 <sup>2</sup>	112,964 <sup>2</sup>	113,000	113,000

<sup>c</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. <sup>r</sup>Revised. do. Ditto. -- Zero.

<sup>1</sup>Table includes data available through November 30, 2008.

<sup>2</sup>Reported figure.

<sup>3</sup>Reported as total methane sales.

<sup>4</sup>Excluding natural gas liquids.

TABLE 2  
NORWAY: STRUCTURE OF THE MINERAL INDUSTRY IN 2007

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity	
Aluminum	Hydro Aluminium ANS (Norsk Hydro A/S, 70%)	Smelters at Ardal, Hoyanger, Karmoy, and Sunndal	600	
Do.	do.	Plant at Holmestrand	90	
Do.	Elkem Aluminium ANS (Elkem A/S, 50%, and Alcoa Inc., 50%)	Smelters at Farsund and Mosjoen	250	
Do.	Sor-Norge Aluminium A/S (Alusuisse Group, 50%, and Hydro Aluminium ANS, 49%)	Smelter at Odda	50	
Cadmium	Norzink A/S (Outokumpu Oyj, 100%)	Smelter at Eitrheimsneset	0.3	
Cement	Norcem A/S	Plants at Brevik and Kjøpsvik	2,150	
Coal	Store Norske Spitsbergen Grubekompani AS	Mines at Longyearbyen and Svea	450	
Cobalt	Nikkelverk A/S (Falconbridge Nickel Mines Ltd., 100%)	Smelter at Kristiansand	5	
Copper:				
Ore, Cu content	Nikkel og Olivin A/S (Outokumpu Oyj, 100%)	Mine at Narvik	1	
Metal	Nikkelverk A/S (Falconbridge Nickel Ltd., 100%)	Smelter at Kristiansand	40	
Dolomite	Franzefoss Bruk A/S	Mine at Ballagen	350	
Do.	Norwegian Holding A/S	Mines at Hammerfall, Logavlen, and Kvitblikk	500	
Feldspar	Franzefoss Bruk A/S	Mine at Lillesand	100	
Ferroalloys	Elkem Salten (Elkem A/S, 100%)	Ferrosilicon plant at Straumen	90	
Do.	Elkem Bjølvfossen (Elkem A/S, 100%)	Ferrosilicon plant at Alvik	60	
Do.	Elkem Thamshavn (Elkem A/S, 100%)	Ferrosilicon plant at Orkanger	60	
Do.	Finnfjord Smelteverk A/S, Rana Metal (FESIL ASA, 100%)	Ferrosilicon plant at Mo i Rana	110	
Do.	A/S Hafslung Metal (FESIL ASA, 100%)	Ferrosilicon plant at Sarpsborg	75	
Do.	Ila og Lilleby Smelteverk (FESIL ASA, 100%)	Ferrosilicon plant at Finnsnes	20	
Do.	Oye Smelteverk (Tinfos Jernverk A/S, 100%)	Silicomanganese plant at Kvinesdal	235	
Iron, metal	Ulstein Jernstoperi A/S	Hordvikneset	10	
Iron ore	Rana Gruber A/S (Norsk Jernverk Holding A/S, 100%)	Mine at Mo i Rana	2,000	
Do.	Arctic Bulk Minerals A/S	Mine and plant at Kirkenes	1,500	
Lime	Hylla Kalkverk (Nikolai Bruch A/S, 100%)	Verdal/Trondheim Mine and plant	80	
Do.	A/S Norsk Jernverk	Plant at Mo i Rana	48	
Do.	Ardal og Sunndal Verk A/S	More og Romsdal Mine at Surnadal	20	
Do.	Brevik Kalkverk A/S	Alesund Mine at Larsnes	20	
Do.	Mjøendalen Kalkfabrik	Plant at Asen/Drammen	7	
Limestone	Norcem A/S	Dalen, Bjørntvedt, and Kjøpsvik Mines	1,600	
Do.	Vårdelskalk A/S (Franzefoss Burk A/S, 100%)	Sandvika Mine	800	
Do.	Brevik Kalkverk A/S	Visnes and Glaerum Mines	500	
Magnesium	Norsk Hydro A/S (Government, 51%)	Plants at Porsgrunn and Sauda	50	
Manganese, alloys	Eramet SA	do.	500	
Natural gas	million cubic meters	StatoilHydro ASA	Gama, Gullfaks, Sleipner Ost, and Statfjord Fields	12,270
Do.	do.	Phillips Petroleum Company Norway	Ekofisk Field	9,900
Do.	do.	Elf Petroleum Norge A/S	Frigg, Heimdal, and Ost-Frigg Fields	5,750
Do.	do.	Norsk Hydro Produksjon A/S	Troll-Oseberg Field	2,600
Do.	do.	StatoilHydro ASA	Mikkel Field	2,100
Do.	do.	Total SA, 40%; Petoro AS, 30%; Marathon Petroleum Norge AS, 20%; Norsk Hydro Produksjon A/S, 10%	Skirne Field	1,550
Do.	do.	BP Petroleum Development of Norway	Gyda and Ula Fields	1,040
Do.	do.	Esso Norge A/S	Odin Field	1,000
Do.	do.	Amoco Norway A/S	Hod and Valhall Fields	910
Nepheline syenite	North Cape Mineral A/S (Unimin Corp., 84%)	Mine at Stjernoy	350	
Nickel:				
Ore, Ni content	Nikkel og Olivin A/S (Outokumpu Oyj, 100%)	Mine at Narvik	3	
Do.	Titania A/S (Kronos Norge A/S, 100%)	Mine at Tellnes	0.5	
Metal	Nikkelverk A/S (Falconbridge Nickel Mines Ltd., 100%)	Smelter at Kristiansand	85	
Olivine	A/S Olivin	Aheim Mine and plant	2,500	
Do.	do.	Stranda Mine and plant	300	
Do.	Franzefoss Bruk A/S	Lefdal Mine at Bryggja	500	

TABLE 2--Continued  
 NORWAY: STRUCTURE OF THE MINERAL INDUSTRY IN 2007

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum	42-gallon barrels per day	StatoilHydro ASA	Gullfaks, Statfjord, Tommeliten, and Veslefrikk Fields	1,069,300
Do.	do.	Norsk Hydro Produksjon A/S	Brage, Mime, and Oseberg Fields	566,200
Do.	do.	Phillips Petroleum Company Norway	Ekofisk Field	237,500
Do.	do.	Saga Petroleum A/S	Snorre Field	170,000
Do.	do.	BP Petroleum Development of Norway	Gyda and Ula Fields	155,000
Do.	do.	A/S Norske Shell	Draugen Field	90,000
Do.	do.	ExxonMobil Refining & Supply Co.	Slagen Refinery	110,000
Do.	do.	Statoil Mongstad	Mongstad Refinery	200,000
Pyrite		Folldal Verk A/S (Norsulfid A/S, 100%)	Mine at Hjerkin	10
Quartzite		Elkem Tana (Elkem A/S, 100%)	Mine at Tana	540
Do.		Elkem Marnes (Elkem A/S, 100%)	Mine at Sandhornoy	200
Do.		Vatnet Kvarts A/S	Mine at Nordland	150
Do.		Snekkevik Kvartsbrudd	Mine at Kragero	110
Silicon metal		Lilleby Metall A/S (FESIL ASA, 100%)	Plant at Trondheim	9
Do.		FESIL ASA	Plant at Holla	50
Steel		Fundia AB (Norsk Jenverk, 50%, and Rautaruukki Group, 50%)	Plants at Christiania, Mandal Stal, Mo i Rana, and Spigerverk	600
Talc		A/S Norwegian Talc (Pluess-Stauffer AG, 51%)	Mine and plant at Altermark/Knarrevik and Framfjord	90
Do.		Kvam Minerals A/S	Mine and plant at Kvam	6
Titanium, concentrate		Titania A/S (Kronos Norge A/S, 100%)	Mine at Tellnes	800
Zinc, metal		Norzik A/S (Outokumpu Oyj, 100%)	Smelter at Odda	150
Do., do. Ditto.				