



# 2006 Minerals Yearbook

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## NORWAY

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# THE MINERAL INDUSTRY OF NORWAY

By Harold R. Newman

Since the discovery of North Sea petroleum, petroleum production has become Norway's most important mineral industry activity, and petroleum, the country's most significant mineral commodity followed by, in order of value, industrial minerals and metals. The metals mining industry has declined owing to exhausted ore reserves. The country's long shoreline and close proximity to the large European Union market were major competitive advantages for some raw materials, particularly aggregate, natural stone, and certain other industrial minerals.

Norway's production of olivine accounted for 66% of world production; production of titanium accounted for 7.2% of world production; and production of petroleum accounted for 6.2% of world production. Norway was the world's third ranked exporter of petroleum after Saudi Arabia and Russia (Norwegian Geological Survey, 2006).

## Minerals in the National Economy

The mining and quarrying industry was a regional industry, strongly represented along the coast. About 75 million metric tons of mineral resources was extracted in 2006, representing a value of \$1.8 billion. Sales of industrial minerals increased slightly to \$545 million in 2006 from \$528 million in 2005, and sales of metallic ore increased to \$207 million in 2006 from \$132 million in 2005. In 2006, the total export value of the mining and quarrying industry, excluding mineral fuels, was \$1.1 billion (Norwegian Geological Survey, 2006).

## Production

Norway produced aluminum, cadmium, cobalt, copper, ferroalloys, nickel, and zinc. 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. The petroleum sector, however, was the most significant contributor to Norway's economic vitality. Revenues from petroleum activities were projected to be about 23% of the gross domestic product in 2006 (International Monetary Fund, 2006).

## 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, their ownership, and their respective mine and plant capacities.

## Commodity Review

### Metals

**Aluminum.**—Norsk Hydro ASA announced that the Norwegian Pollution Control Authority had granted it a

10-month deferral (from January 1, 2007) for the shutdown of the Soderberg potline at its 267,000-metric-ton-per-year (t/yr) Karmoy aluminum smelter. Norsk Hydro was being compelled to shut down 25% of its aluminum smelting capacity, which used outdated Soderberg technology, in Norway because the technology did not meet new environmental standards. Some 22,000 t/yr of capacity was shut down at Hoyanger in early 2006. Soderberg technology is based on open cells, and produces higher carbon emissions and yields lower productivity than more modern cells with pre-baked anodes (Mining Journal, 2006).

**Nickel.**—LionOre Mining International Ltd. of Canada announced plans to buy Canada-based Falconbridge Ltd.'s Nikkelverk nickel refinery for \$650 million. The proposed transaction would be financed with \$400 million in cash and \$250 million in LionOre shares, which would give Falconbridge an 18.4% stake in LionOre. The transaction agreement included approval of a 10-year contract with Falconbridge to supply up to 60,000 t/yr of nickel concentrate to Nikkelverk (680News, 2006).

### Industrial Minerals

Norway was a significant producer of industrial minerals from more than 30 mines. On a global scale, Norwegian olivine was very important, accounting for 66% of world production; ilmenite was also a globally important commodity with 14% of world production (Industrial Minerals, 2006).

### Mineral Fuels

**Petroleum.**—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. It provided much of Western Europe's oil and gas requirements, particularly those of France, Germany, and the United Kingdom. The country had estimated proven reserves of 7.7 billion barrels of oil as of January 2006 (U.S. Energy Information Administration, 2006).

In March 2006, the Government offered 192 oil exploration blocks in one of the largest licensing rounds in 40 years and the third-largest since oil exploration began offshore Norway in 1965. Through a program called Awards in Predefined Areas (APA), the Government encourages companies to explore untested blocks in mature areas (where there are already fields in production) to boost capacity at a lower cost by using existing pipelines and platforms. Partly because of near-record crude oil prices, the Government expected that there would be strong interest in APA blocks (Alexander's Gas & Oil Connections, 2006b).

The Norwegian Petroleum Directorate stated that Norway needed to open up new offshore areas and step up the search in existing areas if it were 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, 2006a).

## Outlook

Norway is expected to continue to obtain nearly all its electricity from hydropower. Norway's economy is highly dependent upon the country's hydrocarbon resources, and the Government will continue to manage them—they are the country's leading single source of revenue. The Government will also continue to encourage 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.

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

(Thousand metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005	2006 <sup>c</sup>	
<b>METALS</b>						
<b>Aluminum:</b>						
Primary	metric tons	1,095,500	1,192,400	1,321,700	1,376,500	1,422,000 <sup>2</sup>
Secondary	do.	271,000	256,800	348,700	362,400	349,200 <sup>2</sup>
Cadmium, smelter	do.	209	331	260	260	250
<b>Cobalt:</b>						
Mine output, Co content <sup>c</sup>	do.	100	--	--	--	--
Metal, refined	do.	3,994	4,556	4,670	5,021	4,927 <sup>2</sup>
Copper, metal, refined, primary and secondary	do.	30,500	35,900	35,600	38,500	39,700
<b>Iron and steel:</b>						
Iron ore and concentrate, Fe content		350 <sup>e</sup>	340	408	420 <sup>e</sup>	400
<b>Metal:</b>						
Pig iron <sup>e</sup>		80	90	90	90	100
<b>Ferroalloys:<sup>e</sup></b>						
Ferrochromium		61 <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>
Ferromanganese		240	245	245	130 <sup>r</sup>	130
Ferrosilicomanganese		230	230	260 <sup>r</sup>	290 <sup>r</sup>	250
Ferrosilicon, 75% basis		390	350	300	165 <sup>r</sup>	80
Silicon metal		105	100	194 <sup>r</sup>	176 <sup>r</sup>	175
Other		15	15	15	60 <sup>r</sup>	60
Total		1,040	940	1,010 <sup>r</sup>	820 <sup>r</sup>	700
Steel, crude		694	698	695	701 <sup>r,2</sup>	679 <sup>2</sup>
Semimanufactures, rolled <sup>c</sup>		630	635	640	650	600
Magnesium, primary	metric tons	10,000 <sup>e</sup>	--	--	--	--
<b>Nickel:</b>						
<b>Mine output:</b>						
Concentrate <sup>c</sup>	do.	12,000	--	--	--	--
Ni content	do.	2,052	169	181	342 <sup>r</sup>	362 <sup>2</sup>
Metal, primary	do.	68,500	77,200	71,400	84,900	82,000
Platinum-group metals <sup>3</sup>	kilograms	15,600	--	--	--	--
<b>Titanium:<sup>e</sup></b>						
Ilmenite concentrate		750	840 <sup>2</sup>	860	860	850
TiO <sub>2</sub> content		340	378 <sup>2</sup>	387	388	385
Zinc, metal, primary	metric tons	144,538 <sup>r</sup>	143,627 <sup>r</sup>	140,900 <sup>r</sup>	151,285 <sup>r</sup>	160,700 <sup>2</sup>

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005	2006 <sup>c</sup>
<b>INDUSTRIAL MINERALS</b>					
Cement, hydraulic <sup>c</sup>	1,850	1,860	1,870	1,900	1,850
Feldspar <sup>c</sup> metric tons	75,000	74,000	75,000	88,690 <sup>2</sup>	86,000
Graphite <sup>c</sup> do.	2,400	2,400	2,300	8,893 <sup>2</sup>	9,000
Lime, hydrated, quicklime <sup>c</sup>	100	100	100	100	100
Mica, flake <sup>c</sup> metric tons	2,600	2,600	2,600	2,700	2,700
Nepheline syenite <sup>c</sup>	310	300	300	300	300
Nitrogen, N content of ammonia	330	354	420	300	350
Olivine sand <sup>c</sup>	3,200	3,100	3,100	3,100	3,000
Stone, crushed: <sup>e</sup>					
Dolomite	900	850	850	513 <sup>2</sup>	525
Limestone	7,400	7,200	7,300	7,200	7,200
Quartz and quartzite	1,400	1,500	1,500	909 <sup>2</sup>	1,000
Sulfur, byproduct:					
Metallurgical	102	100	85	80	80
Petroleum <sup>c</sup>	19	20	18	20	20
Total <sup>c</sup>	121	120	103	100	100
Talc, soapstone, steatite <sup>c</sup>	28	28	28	26 <sup>2</sup>	27
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Coal, all grades <sup>c</sup>	310	300	300	300	300
Gas, natural, marketed <sup>4</sup> million cubic meters	65,501	73,124	78,465	84,964	84,000
Peat, for agricultural use <sup>c</sup> do.	30	30	30	30	30
Petroleum:					
Crude <sup>5</sup> thousand 42-gallon barrels	1,092,800	1,041,400	1,024,400	964,290	1,016,890 <sup>2</sup>
Natural gas liquids <sup>c</sup> do.	41,000	42,000	52,695 <sup>2</sup>	60,879 <sup>2</sup>	60,000
Refinery products: <sup>c</sup>					
Naphtha do.	27,000	27,000	8,741 <sup>2</sup>	10,017 <sup>2</sup>	10,000
Gasoline do.	26,000	27,000	23,913 <sup>2</sup>	28,078 <sup>2</sup>	28,000
Kerosene do.	9,000	9,000	4,774 <sup>2</sup>	5,771 <sup>2</sup>	5,800
Distillate fuel oil do.	46,000	47,000	45,765 <sup>2</sup>	50,121 <sup>2</sup>	50,000
Residual fuel oil do.	12,000	12,000	13,823 <sup>2</sup>	11,806 <sup>2</sup>	12,000
Other products do.	5,000	5,000	3,351 <sup>2</sup>	4,194 <sup>2</sup>	4,000
Refinery fuel and losses do.	5,000	5,000	2,757 <sup>2</sup>	2,977 <sup>2</sup>	3,000
Total do.	130,000	132,000	103,124 <sup>2</sup>	112,964 <sup>2</sup>	112,800

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

<sup>1</sup>Table includes data available through August 31, 2007.

<sup>2</sup>Reported figure.

<sup>3</sup>Data represent exports.

<sup>4</sup>Reported as total methane sales.

<sup>5</sup>Excluding natural gas liquids.

TABLE 2  
NORWAY: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(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 Sundal	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 Kulkompani A/S	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 Sundal Verk A/S	More og Romsdal Mine at Surnadal	20	
Do.	Brevik Kalkverk A/S	Alesund Mine at Larsnes	20	
Do.	Mjoendalen Kalkfabrik	Plant at Asen/Drammen	7	
Limestone	Norcem A/S	Dalen, Bjortvedt, and Kjøpsvik Mines	1,600	
Do.	Vardelskalk 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	Statoil 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.	Statoil ASA	Mikkel Field	2,100
Do.	do.	Total, 40%; Petoro, 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 2006

(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	Statoil 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-Staufe 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