

# NORWAY

By Chin S. Kuo

Norway's economy is closely tied to its offshore oil and gas resources. In 2000, the country enjoyed healthy economic growth owing to higher world oil prices. The manufacturing sector is based on the country's cheap hydroelectric power. Norway has an extremely varied geology with a broad spectrum of minerals and rocks of interest for exploration and exploitation. The country's long shoreline and close proximity to the large European markets are major competitive advantages for some raw materials, particularly natural stone, aggregate, and certain industrial minerals. In addition, Norway was one of the world's largest exporters of oil, after Saudi Arabia. It also was one of the top gas suppliers to continental Europe.

Although the Government postponed partial privatization of Statoil ASA, the Ministry of Petroleum and Energy signaled policy changes in oil and gas activities. It also recommended changes in the tax system (World Oil, 2000b). The Government decided to work towards selling less than 50% of the state direct financial interest (SDFI), which accounted for 40% of Norway's offshore petroleum reserves, to Statoil, Norsk Hydro A/S, and other operators. This would allow large international oil companies to buy a stake in prize offshore petroleum fields. In addition, the Government decided to impose a new tax on sulfur dioxide emissions at the beginning of 2000.

## Commodity Review

### Metals

**Aluminum.**—Norsk Hydro was undertaking a major expansion at its Sunndal aluminum plant in western Norway, increasing production capacity to 321,000 metric tons per year (t/yr) with the addition of 234,000 t/yr in production capacity. The \$608 million project would come on-stream in 2004. Total production capacity for extrusion ingots and foundry alloys made from primary and remelted metal would be 350,000 t/yr. The old Soderberg-type smelter of 66,000 t/yr capacity would be closed. Raw material to feed the expanded Sunndal production would come in part from Brazil's Alunorte alumina refinery in which Norsk Hydro purchased a 25.3% interest (Engineering & Mining Journal, 2000b). The company also was considering investing a further \$67 million in increasing the anode production capacity of its Ardal Karbon plant.

Some of Norsk Hydro's workers were taking part in a strike at the extrusion plant at Raufoss, but smelting operations and metal shipments were not affected. The plant used about 45,000 t/yr of aluminum. The company's other metals operations were not affected by the strike (Metal Bulletin, 2000e).

Elkem A/S planned to invest in boosting capacity at its two aluminum smelters. A brownfield expansion at the smelters composing Elkem Aluminium [a 50-50 joint venture with Alcoa

Inc. (formerly Aluminum Co. of America)] would add another 105,000 t/yr of production capacity, a 42% increase (Metal Bulletin, 2000a).

**Base and Precious Metals.**—Kenor ASA and ScanMining, partners in the ScaNor Mining joint-venture company, reported that the exploration program at the Lake Gjedde gold property in 1999 had identified two new polymetallic anomalies. Two further prospecting targets were identified at Kobbfoss containing copper, gold, and zinc and at Finntjorna containing copper and gold (Mining Magazine, 2000).

Rio Tinto plc and Boliden Mineral AB, owners of Norway's Norzink A/S smelter, extended the terms of the letter of intent under which Outokumpu Oyj of Finland could acquire Norzink until the end of January 2001. The extension was needed to enable the parties to finalize the negotiations. Norzink was conducting a feasibility study for a production increase to 270,000 t/yr from 145,000 t/yr of zinc at its Odda zinc refinery. The study was slated for completion in mid-2001. The plant also produced 300 t/yr of cadmium and 27,000 t/yr of aluminum fluoride (Engineering & Mining Journal, 2000a).

**Iron and Steel.**—An indefinite general strike, the biggest labor conflict in Norway in 14 years, closed down Fundia AB's steel plant in Mo i Rana and Corus's tinplate plant in Bergen. Fundia is a part of Rautaruukki Group of Finland. Approximately 750 workers from Fundia's reinforcing and structural steel divisions were striking. The reinforcing steel division had a capacity of 2,300 metric tons per day. Steel exports were also being affected. At Corus Packaging Plus in Bergen, 220 of 280 staff were striking. The plant's production capacity was 140,000 t/yr (Metal Bulletin, 2000f).

Fundia might have to cut steel production at its Mo i Rana plant in Norway after the Government of Norway ordered it to reduce mercury emissions from its melting shop using scrap to feed the electric-arc furnace. The Norwegian environmental authorities imposed a maximum level of 80 kilograms per year for mercury emissions. Reinforced steel production at the plant was 700,000 t/yr from a workforce of 800 (Metal Bulletin, 2001).

Finnfjord Smelteverk AS (a subsidiary of the ferrosilicon producer FESIL ASA) renewed its marketing agreement with FESIL Sales AS, which initially would market between 20,000 and 25,000 t/yr of Finnfjord's standard-grade ferrosilicon and eventually all 100,000 t/yr of its tonnage. Elkem also sold the bulk of the Finnfjord material during the last 6 months of 2000. FESIL sold the Finnfjord material to carbon and stainless steel plants in Europe and the United States (Metal Bulletin, 2000c).

Globe Metallurgical Co. of the United States and Gurta AG of Switzerland fought for control of FESIL. Globe held 39.9% of

the shares of FESIL. The composite stake held by Tensil, Tennant Nordic, Midgley Group, and Gurta was 41.42%. The liquidity of the shares was further reduced by a 10% stake acquired by Elkem (Metal Bulletin, 2000d). Elkem was the world's largest ferrosilicon producer, while FESIL ranked third. Early in November, Globe withdrew its offer to acquire all outstanding shares of FESIL because its offer failed to attract the 90% acceptance level that was required. FESIL expected to produce 95,000 t/yr of ferrosilicon in high- and semihigh-purity grades and ferrosilicon granules. FESIL's Holla and Rana metalworks were among the lower cost producers in the industry. Demand for ferrosilicon was high owing to active stainless steel production (Metal Bulletin, 2000b).

**Nickel.**—A 5-day strike by workers at Falconbridge Nickel Mines Ltd.'s Nikkelverk refinery in Kristiansand ended on November 20. No loss of production was suffered. The action was taken in support of workers on strike at the company's Sudbury complex in Canada.

**Silicon.**—Elkem signed an agreement with AstroPower Inc. to develop a low-cost process to manufacture solar grade silicon in Norway. The market for solar-grade silicon generated around \$75 million per year and was expected to grow at a rate of 25% to 30% during the next 5 years.

Elkem sought to expand its silicon business through acquisitions and capacity expansions. A potential target of acquisition in the silicon industry might be FESIL, and expansion of silicon output could be through the conversion of furnaces from ferrosilicon production (Metal Bulletin, 2000a).

FESIL has 60,000 t/yr silicon capacity with five furnaces. Three of them were closed for most of 1999. One 8,500-t/yr furnace at Holla was restarted at yearend 1999 with the two others being restarted in 2000. All five were in full operation by mid-May. Demand for silicon in the chemical sector grew by 5% to 6%, with most demand coming from Europe and Japan.

### **Mineral Fuels**

The seven licensee groups covering the Snohvit, Askeladden, and Albatross gas/condensate fields on the Tromso Patch off northern Norway concluded a unitization agreement. The redistribution of interests in the unitized license gave Statoil 34.29%, and the SDFI, 30%. The unitization would give the licensees a common goal for future work on a Snohvit development based on gas liquefaction. Statoil expected to increase drilling activity by 11%, accounting for 45% of all Norwegian well drilling (World Oil, 2000a).

The startup of Statoil's new Norne-Heidrun gas pipeline system in the Norwegian Sea was postponed until November. Statoil was due to start exporting gas from Norne using a

pipeline extending 128 kilometers (km) south to tie into its Asgard transport trunk line. Heidrun gas is linked by a 39-km line into the Asgard trunk line, which extends to the Karsto treatment north of Stavanger. The Norne export line was expected to carry 1 billion cubic meters per year of gas, and the Heidrun part of the system, 75 million cubic meters per year (Oil & Gas Journal, 2000).

Norsk Hydro intended to double its total petroleum production to 800,000 barrels per day (bbl/d) from 400,000 bbl/d by 2010. The company planned to buy part of the SDFI in 150 Norwegian offshore licenses worth \$22.8 billion and could face stiff competition from Statoil. Meanwhile, the first production well on Statoil's Sygna field in the Norwegian North Sea came on-stream. A second well was due to start up before yearend. Sygna contained an estimated 53.5 billion barrels of recoverable oil (Alexander's Gas & Oil Connections, August 18, 2000, First production well on Statoil's North Sea Sygna field comes on-stream, accessed August 21, 2000, at URL <http://www.gasandoil.com/goc/company/cne03328.htm>).

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- 2000b, Norway signals policy changes: World Oil, v. 221, no. 9, September, p. 35.

### **Major Sources of Information**

Norwegian Geological Survey  
P.O. Box 3006 Lade  
7002 Trondheim, Norway

Royal Ministry of Petroleum and Energy  
P.O. Box 8148 Dep  
0033 Oslo, Norway

TABLE 1  
NORWAY: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1996	1997	1998	1999 e/	2000 e/
<b>METALS</b>					
Aluminum:					
Primary	863,002	918,558	995,619	1,020,215 3/	1,025,676 3/
Secondary	59,702	58,635	62,400	178,313 3/	260,000
Cadmium, smelter	274	290	270 e/	211 3/	298 3/
Cobalt	3,098	3,417	3,851	4,009 3/	3,433 3/
Copper:					
Mine output:					
Concentrate	30,000	28,000	11,000 e/	--	--
Cu content	7,400	6,671	2,698	--	--
Metal, primary and secondary, refined	28,526 r/	32,639	31,658	33,262 3/	27,000
Iron and steel:					
Iron ore and concentrate, Fe content	1,023 r/	462 r/	382 r/	355 r/ 3/	369 3/
Metal:					
Pig iron e/	70	70	70	60	60
Ferroalloys:					
Ferrosilicon	109 r/	145 e/	175 r/	160	165
Ferromanganese	215	235 r/	235 r/	235	235
Ferrosilicomanganese e/	210	230 r/	230 r/	230	230
Ferrosilicon (75% basis)	462	470 e/	470 e/	460	460
Silicon metal	110	110 e/	110 e/	100	100
Other e/	15	15	15 e/	15	15
Total e/	1,120 r/	1,210 r/	1,240 r/	1,200	1,210
Steel, crude	511	570 3/	644 3/	611 3/	620
Semimanufactures, rolled e/	300	300	300	300	300
Lead, mine output:					
Concentrate	2,600	2,600	--	--	--
Pb content	2,083 r/	2,000	--	--	--
Magnesium, primary	37,800	34,200	35,400	35,000	35,000
Nickel:					
Mine output:					
Concentrate e/	23,000	20,000	20,000	21,000	18,000
Ni content	3,135	2,454	2,959 r/	2,965 r/ 3/	2,538 3/
Metal, primary	61,582	62,702	70,151	74,137 3/	58,679 3/
Platinum-group metals e/ 4/	1,200	1,000	1,000	1,000	1,000
Titanium: e/					
Ilmenite concentrate	747 r/	750	590	580 r/ 3/	610
TiO <sub>2</sub> content	340	340	260	257 r/ 3/	270
Zinc:					
Mine output:					
Concentrate	17,182 r/	15,800 r/	--	--	--
Zn content	8,591 r/	7,900 r/	--	--	--
Metal, primary	134,900	137,400	128,000	132,600 3/	125,800 3/
<b>INDUSTRIAL MINERALS</b>					
Cement, hydraulic	1,664	1,724	1,676	1,700	1,720
Feldspar	76,000	75,000 e/	75,000 e/	72,777 r/ 3/	75,000
Graphite e/	2,600	2,600	2,600	2,500	2,500
Lime, hydrated, quicklime e/	100	100	100	100	100
Mica, flake e/	2,500	2,500	2,500	2,500	2,500
Nepheline syenite	300	300 e/	300 e/	305 r/ 3/	300
Nitrogen, N content of ammonia	295	279	245	122 r/ 3/	334 3/
Olivine sand	3,600	3,600 e/	3,600 e/	3,162 r/ 3/	3,200
Pyrite e/	6 3/	5	5	-- r/ 3/	--
Stone, crushed:					
Dolomite e/	800	800	800	893 r/ 3/	900
Limestone e/	4,600	4,500	4,500	6,915 r/ 3/	7,000
Quartz and quartzite	960	1,000 e/	1,000	1,314 r/ 3/	1,300
Sulfur, byproduct: e/					
Metallurgy	80	80 r/	80	105	100
Petroleum	20	20 r/	18 3/	12	15
Total	100	100 r/	98	117	115
Talc, soapstone, steatite e/	28	28	26	26	27

See footnotes at end of table.

TABLE 1--Continued  
NORWAY: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1996	1997	1998	1999 e/	2000 e/
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Coal, all grades thousand tons	261	260 e/	250	328 r/ 3/	330
Gas, natural, marketed 5/ do.	37,400	42,600 e/	43,600	43,000	42,000
Peat, for agricultural use e/ do.	30	30	30	30	30
<b>Petroleum:</b>					
Crude 6/ thousand 42-gallon barrels	1,104,096	1,105,584	1,100,000 e/	1,100,000	1,000,000
Natural gas liquids e/ do.	41,600	42,000	42,000	42,000	41,000
<b>Refinery products: e/</b>					
Naphtha do.	26,400 r/	26,000	26,000	26,000	26,000
Gasoline do.	25,000	25,000	25,000	25,000	26,000
Kerosene do.	9,000	9,000	9,000	9,000	9,000
Distillate fuel oil do.	45,000	45,000	45,000	45,000	46,000
Residual fuel oil do.	12,000	12,000	12,000	12,000	12,000
Other do.	4,000	4,000	4,000	4,000	4,000
Refinery fuel and losses do.	4,000	4,000	4,000	4,000	4,000
Total do.	125,000	125,000	125,000	125,000	127,000

e/ Estimated. r/ Revised. -- Zero.

1/ Table includes data available through July 31, 2001.

2/ Estimated data are rounded to three significant digits; may not add to totals shown.

3/ Reported figure.

4/ Data represent exports.

5/ Reported as total methane sales.

6/ Excluding natural gas liquids.

TABLE 2  
NORWAY: STRUCTURE OF THE MINERAL INDUSTRY IN 2000

(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 Årdal, Hoyanger, Karmoy, and Sunndalsora	600
Do.	Elkem Aluminium (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, 49%)	Smelter at Odda	50
Cadmium	Norzink A/S (Boliden Mineral AB, 50%; and Rio Tinto plc, 50%)	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	3
<b>Copper:</b>			
Ore, Cu content	Grong Guber A/S (Norsulfid A/S, 100%)	Mines at Royrvik and Gjersvik	8
Do.	Nikkel og Olivin A/S (Norsulfid A/S, 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 Rana (Elkem A/S, 100%)	Ferrosilicon plant at Mo i Rana	140
Do.	Elkem Salten (Elkem A/S, 100%)	Ferrosilicon plant at Straumen	85
Do.	Elkem Bjolvefossen (Elkem A/S, 100%)	Ferrosilicon plant at Alvik	60
Do.	Elkem Thamshavn (Elkem A/S, 100%)	Ferrosilicon plant at Orkanger	60
Do.	Finnfjord Smelteverk AS, Rana Metal (FESIL ASA, 100%)	Ferrosilicon plant at Mo i Rana	140
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	60
Do.	Oye Smelteverk (Tinfos Jernverk A/S, 100%)	Silicomanganese plant at Kvinesdal	235
Iron, metal	Ulstein Jernstoperi A/S	Hordvikneset	10

TABLE 2--Continued  
NORWAY: STRUCTURE OF THE MINERAL INDUSTRY IN 2000

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iron ore	Rana Gruber A/S (Norsk Jernverk Holding A/S, 100%)	Mine at Mo i Rana	2,000
Do.	Artic Bulk Minerals A/S	Mine and plant at Kirkenes	1,500
Lead ore, Pb content	A/S Bleikvassli Gruber (A/S Sydvaranger, 100%)	Mine at Bleikvassli	2
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.	Mjoendalen Kalkfabrik	Plant at Asen/Drammen	7
Limestone	Norcem A/S	Dalen, Bjornvedt, and Kjopsvik 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	Den Norske Stats Oljeselskap A/S	Gama, Gullfaks, Sleipner Ost, and Statfjord Fields	12,270
Do.	Phillips Petroleum Company Norway	Ekofisk Field	9,900
Do.	Elf Petroleum Norge A/S	Frigg, Heimdal, and Ost-Frigg Fields	5,750
Do.	Norsk Hydro Produksjon A/S	Troll-Oseberg Field	2,600
Do.	BP Petroleum Development of Norway	Gyda and Ula Fields	1,040
Do.	Esso Norge A/S	Odin Field	1,000
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 (Norsulfid A/S, 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	Åheim Mine and plant	2,500
Do.	do.	Stranda Mine and plant	300
Do.	Franzefoss Bruk A/S	Lefdal Mine at Bryggja	500
Petroleum barrels per day	Den Norske Stats Oljeselskap A/S	Gullfaks, Statfjord, Tommeliten, and Veslefrikk Fields	1,069,300
Do.	Norsk Hydro Produksjon A/S	Brage, Mime, and Oseberg Fields	566,200
Do.	Phillips Petroleum Company Norway	Ekofisk Field	237,500
Do.	Saga Petroleum A/S	Snorre Field	170,000
Do.	BP Petroleum Development of Norway	Gyda and Ula Fields	155,000
Do.	A/S Norske Shell	Draugen Field	90,000
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
Steel	Fundia AB (Norsk Jernverk, 50%; and Rautaruukki Group, 50%)	Plants at Christiania, Spigerverk, Mandal Stal, and Mo i Rana	600
Talc	A/S Norwegian Talc (Pluess-Staufe AG, 51%)	Mine/plant at Altermark/Knarrevik and Framfjord	90
Do.	Kvam Minerals A/S	Mine/plant at Kvam	6
Titanium, concentrate	Titania A/S (Kronos Norge A/S, 100%)	Mine at Tellnes	800
Zinc:			
Ore, Zn content	A/S Bleikvassli Gruber (A/S Sydvaranger, 100%)	Mine at Bleikvassli	10
Metal	Norzik A/S (Boliden Mineral AB, 50%; and Rio Tinto plc, 50%)	Smelter at Odda	137