

THE MINERAL INDUSTRY OF SWEDEN

By Harold Newman

On January 1, 1995, Sweden acceded to the European Union (EU). In anticipation of this event, Sweden liberalized its mineral policy to parallel EU standards. The new policy, based on the Swedish Minerals Act, 1992, eliminated laws requiring foreign companies to get special permission for prospecting, annulled the State's participation in mining enterprises (so-called "crown shares"), and revoked all taxes and royalties, except for the normal 28% corporate tax, one of the lowest in Europe. Some industrial minerals will no longer be the property of the landowner.

Furthermore, an exploration permit holder will not automatically have the right to an exploitation permit. Adequate financial and technical capabilities must be proven. The State Mining Property Commission was closed and previous restrictions on real estate ownership were eliminated, thus allowing foreign participation in the mining of a wide range of minerals. Exploration interest was significant with a number of Australian, Canadian and European mining companies applying for permits.

Sweden is endowed with significant deposits of iron ore, certain base metals (copper, lead, and zinc), and several industrial minerals, including dolomite, feldspar, granite, ilmenite, kaolin, limestone, quartz, and wollastonite. The country is well known for the production of high-quality steel. Sweden relies heavily on hydrocarbon imports, due to inadequate indigenous resources; as a result, the country has developed substantial nuclear and hydroelectric power. (*See table 1.*)

The mineral industry accounted for about 13% of Sweden's exports, about one-third of which was steel. Because Sweden lacked a zinc smelter, most zinc ore and concentrate, one of the largest mineral exports, was shipped to Norway. The country imported most of the raw material required to operate its copper and lead smelter. (*See table 2.*)

Sweden has a high recycling rate (90%) for aluminum cans because of close cooperation between its producer of can stock (Finspong), the can manufacturer (PLM Fosie), the collection companies (Returpak and PLM Fosie), and the secondary smelters (Gotthard Aluminum and Finspong). Consequently, secondary aluminum production has increased significantly in the past few years.

Electrolux AB, Stockholm, announced it had shelved plans to sell its aluminum and metal working unit, Granges AB. Earlier, Electrolux said it intended to offer 90% of its shares in Granges to both local and international investors.

Reportedly, the reason given was that market conditions had become unfavorable for a listing of Granges.

Trelleborg AS announced it plans to invest about \$20 million in expanding ore production at Boliden Mineral's Petiknas Mine in northern Sweden. Polymetallic ore production would be increased from 365,000 t/yr to 500,000 t/yr. Ores mined at Petiknas include copper, gold, lead, silver, and zinc. The project was expected to be completed by 1997.

Western Europe's largest gold mine, Terra Mining AB's opencast Bjorkdal Mine, was processing about 1 million metric tons per year (Mt/yr) of ore which was yielding a little over 2 t/yr of gold. Terra applied for a new license to process 1.3 Mt/yr. Large scale processing was helping to keep production costs down. Because of dwindling reserves at the mine, an estimated 19 Mt of gold ore grading 3 grams per ton of ore, Terra was continuing its exploration activities.

The recovery in the world economy in 1995 stimulated demand for iron ore and steel, a situation which benefitted Luossavaara-Kiirunavaara AB (LKAB). The company operated at full capacity in 1995. The new concentration and pelletizing plants in Kiruna went onstream in early 1995. The new grate kiln-type pellet plant has a capacity of 4 Mt/yr. This increased LKAB's previous capability of 10.5 Mt/yr to 14.5 Mt/yr of pellets. The Kiruna mining complex consisted of three open pit mines, Kiirunavaara, Leveaniemi, and Luossavaara.

LKAB reported that most of the capital investment in 1995, \$180 million, related to the Kiruna and Malmberget operations with construction of a new main level at the underground mine due to be operational in 1997, and final pelletizing expansion expenditures. Another big investment relates to the construction of a new harbor in Luleå, which was scheduled to be commissioned in October 1996.

Boliden Bergsö AB's secondary lead smelter in Landskrona has become the center for recovery of lead batteries in the Nordic countries. In 1995, it smelted about 58,000 metric tons (t) of lead batteries. Combined with other lead scrap the smelter produced over 42,000 t of secondary lead.

Svenskt Stal AB (SSAB) is Scandinavia's leading manufacturer of commercial steel. Most production consisted of steel sheets and plates, produced mainly in two SSAB subsidiaries: Oxelösund and Tunnsplåt. The SSAB Oxelösund AB complex consisted of a coking plant, blast

furnaces, a steel mill, and a continuous casting line for slabs and heavy plate of up to 155 millimeters in thickness. The 2Mmt/a SSAB Tunnpant was an integrated steel company with a coking plant, blast furnaces, and continuous casting line for the manufacture of slab and heavy plate.

In midyear 1995, the Zinkgruvan Mine, the largest zinc mine in Sweden, operated by Ammeberg Mining AB, was sold by its owner, Union Miniere (UM) of Belgium, to North Mining Svenska AB, a subsidiary of the Australian company, North Limited. Most of the zinc and lead concentrates produced by Zinkgruvan were processed at UM's refineries. Divestiture of Ammeberg Mining was reported by UM to be in line with its strategic objective to withdraw from zinc mining activities.

There has been extensive changes in ownership reported during the last 5 to 6 years in the industrial minerals area. This has been an expanding sector in Sweden and a significant number of deposits were owned or controlled by international owners.

Woxna Graphite AB has obtained the mining rights to four graphite deposits near Edsbyn, central Sweden. Woxna announced it was planning to start production in January 1996 using a 140,000 t/yr capacity plant that was under construction. The initial estimated production would be 10,000 to 14,000 t/yr of flaky graphite with a carbon content of 94%.

Limestone occurs in layers of different geologic ages and is found throughout the country. About one-half of the

industrial mineral value was contributed by limestone. A significant amount of limestone production was by Kalproduktion Storugns AB, owned by Nordkalk AB, a company within the Finnish Partek OY group.

The company mined about 2.8 Mt at Storugns on the Baltic island of Gotland. About 40% of this was consumed by the metallurgical industry while 30% ended up as burnt lime. Other uses included the chemical and sugar industries and environmental applications. About 55% of total production was exported.

Swedish peatland covers 6.4 Mha which is about 15% of the country's total land area. About 865,000 ha were considered suitable for commercial production. In 1995, almost 8,000 ha was in production, most of which was used for fuel: the remainder was used for agriculture. The 80% used for fuel purposes was mainly in cogeneration plants for electric power and district heating. Some local authorities and industrial enterprises used peat as fuel and produced an estimated 120 megawatts (MW) of power and 190 MW of heat.

Sweden has a well developed transportation system, especially in the southern part of the country. There were 97,400 kilometers (km) of highway and 12,000 km of railroads. About 65% of waterborne cargo was handled by the five biggest ports—Goteborg, Helsingborg, Lulea, Stockholm, and Malmo. Truck ferries have become an important form of transportation.

TABLE 1
SWEDEN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1991	1992	1993	1994	1995 e/	
METALS						
Aluminum metal:						
Primary	96,912	77,210	82,363	83,900	83,000	
Secondary	22,200	16,500	19,000	33,000	30,000	
Arsenic, trioxide, refined e/	2,500	--	--	--	--	
Copper:						
Mine output, Cu content	81,650	89,145	88,909	79,384	83,600	
Metal:						
Smelter:						
Primary	68,113	77,804	76,298	79,080	78,000	
Secondary	29,437	20,596	22,102	19,620	20,000	
Total	97,550	98,400	98,400	98,700	98,000	
Refined:						
Primary	67,587	71,634	76,300	77,300	75,000	
Secondary e/	29,000	30,000	22,486	25,750	75,000	
Total	96,587	101,634	98,786	103,050	150,000	
Gold:						
Mine output, Au content	kilograms	6,247	6,164	6,548	6,364	64,000
Metal, primary 2/	do.	6,856	5,366	7,278	7,998	7,800
Iron and steel:						
Iron ore concentrate and pellets:						
Gross weight	thousand tons	19,328	19,277	18,728	19,663	21,634
Fe content	do.	11,088	12,337	11,901	12,587	13,880
Pyrite, roasted	do.	462	500	500 e/	500 e/	500
Metal:						
Pig iron and sponge iron	do.	2,810	2,740	2,850 r/	3,040	3,020
Ferroalloys:						
Ferromanganese		120,884	133,300	127,543	134,076	130,000
Ferrosilicon		21,100	15,500	20,400	22,000	20,000
Total		141,984	148,800	147,943	156,076	150,000
Steel, crude	thousand tons	4,248	4,356	4,591	4,952	4,930
Semimanufactures, rolled e/	do.	4,000	4,000	4,000	4,000	4,000
Lead:						
Mine output, Pb content		91,127	106,657	111,709	112,787	100,000
Metal:						
Smelter: e/						
Primary:						
Crude		1,000	1,000	1,000	1,000	1,000
Refined		55,000	55,000	49,000	40,200	40,000
Total primary		56,000	56,000	50,000	41,200	41,000
Secondary		26,000	26,000	37,500	42,500	42,000
Total smelter		82,000	82,000	87,500	83,700	83,000
Refined:						
Primary		49,168	54,100	46,752	46,600	46,000
Secondary		38,835	37,100	37,764	36,000	36,000
Total refined		88,003	91,200	84,516	82,600	82,000
Molybdenum, oxide, roasted, Mo content		2,160	4,280	4,000 e/	4,000	4,000
Nickel, metal: e/						
Unwrought, secondary		244 3/	250	250	250	250
Primary		490 3/	500	500	500	500
Selenium, elemental, refined		23	32	50 e/	50 e/	50
Silver:						
Mine output, Ag content	kilograms	239,321	284,967	255,257	276,042	268,200
Metal, primary 2/	do.	293,632	269,755	293,700	295,000	290,000
Tin, metal:						
Unwrought		23	32	30	30	30
Alloy		1,240	1,000	1,040	1,100	1,100
Zinc, mine output, Zn content		161,170	171,539	168,617	159,858	160,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	2,400	2,290	2,200	2,300	2,500
Clays, kaolin e/		100	100	100	100	100
Feldspar, salable, crude and ground		32,900	34,600	30,000 e/	30,000 e/	30,000
Fertilizer, manufactured:						
Nitrogenous	thousand tons	403 r/	448	450 r/ e/	450 e/	450
Phosphatic	do.	92	3	10 r/ e/	10 e/	10
Mixed	do.	468	312	300 r/ e/	300 e/	300

See footnotes at end of table.

TABLE 1--Continued
 SWEDEN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1991	1992	1993	1994	1995 e/
INDUSTRIAL MINERALS--Continued					
Lime do.	506	460	500 e/	500 e/	500
Olivine e/ do.	114 3/	120	120	120	120
Pyrite, gross weight do.	89	37	--	--	--
Quartz do.	11	5	5 r/ e/	5 e/	5
Sodium sulfate, synthetic e/ do.	100	100	100	100	100
Stone:					
Dimension, mostly unfinished:					
Granite do.	91 r/	82	80 r/ e/	80 e/	80
Limestone do.	12	2	5 r/ e/	5 e/	5
Slate do.	23	22	20 e/	20 e/	20
Other do.	25 r/	20	20 r/ e/	20 e/	20
Crushed:					
Dolomite do.	450 r/	631	700 r/ e/	700 e/	700
Granite do.	4,920	4,447	5,000 e/	5,000 e/	5,000
Limestone:					
For cement manufacture do.	1,208	1,027	1,000 r/ e/	1,000 e/	1,000
For lime manufacture do.	600	712	700 r/ e/	700 e/	700
For other construction and industrial uses do.	1,922	1,560	1,500 r/ e/	1,500 e/	1,500
Chalk do.	40	28	30 r/ e/	30 e/	30
For agricultural uses do.	264	335	350 r/ e/	350 e/	350
For other uses do.	88	78	100 e/	100 e/	100
Total do.	4,122	3,740	3,680 e/	3,680 e/	3,590
Quartzite do.	1,474	1,433	1,500 e/	1,500 e/	1,500
Sandstone e/ do.	50	50	50	50	50
Undifferentiated e/ do.	28,963 3/	30,000	30,000	30,000	30,000
Other do.	715	749	700 e/	700 e/	700
Sulfur:					
S content of pyrite do.	89 r/	53	40 e/	40	40
Byproduct: e/					
From metallurgy do.	125	125	125	125	125
From petroleum do.	40	40	40	40	40
Total e/ do.	254	218	205	205	205
Sulfuric acid, gross weight	928	900	1,000 e/	1,000	1,000
Talc, soapstone e/	19,159 3/	20,000 r/	20,000 r/	25,000	25,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black thousand tons	26	24	25 e/	25 e/	25
Coal, anthracite and bituminous e/ do.	28 3/	30	30	30	30
Coke, metallurgical do.	1,110	1,150	1,200 r/ e/	1,200 e/	1,200
Gas, manufactured:					
Coke oven gas million cubic meters	514	545	500 e/	500 e/	500
Blast furnace gas do.	4,330	4,200	4,000 r/ e/	4,000 e/	4,000
Peat: e/					
Agricultural use thousand tons	263 3/	260	250	250	250
Fuel do.	1,400	1,400	1,400	1,400	1,400
Petroleum:					
Crude e/ thousand 42-gallon barrels	19 3/	20	20	20	20
Refinery products:					
Liquefied petroleum gas do.	2,950	4,620	3,000 e/	3,000 e/	3,000
Naphtha do.	226	-- r/	500 e/	500 e/	300
Gasoline, motor e/ do.	31,300 3/	31,500	31,500	31,500	32,000
Jet fuel e/ do.	2,390 3/	2,500	2,500	2,500	2,500
Kerosene e/ do.	38 3/	50	50	50	50
Distillate fuel oil e/ do.	80,700 3/	81,000	81,000	81,000	80,000
Residual fuel oil e/ do.	27,300 3/	28,000	28,000	28,000	28,000
Other e/ do.	4,000	4,000	4,000	4,000	4,000
Refinery fuel and losses e/ do.	10,000	10,000	10,000	10,000	10,000
Total e/ do.	158,904	161,670	160,550	160,550	159,850

e/ Estimated. r/ Revised.

1/ Table includes data available through June 1996.

2/ Includes only that recovered from indigenous ores excluding scrap.

3/ Reported figure.

TABLE 2
SWEDEN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Granges AB (Electrolux 100%)	Sundsvall smelter at Kubikenborg	98
Cement		Cementa AB (Euroc 100%)	Plants at Degerhamn, Skovde, and Slite	3,400
Copper:				
Ore, copper content		Boliden Mineral AB (Trelleborg AB 100%)	Mines at Aitik, Garpenberg, Kankberg, Kristineberg, Langdal, Petiknas, and Renstrom	68
Do.		Outokumpu Oy	Mine at Viscaria/Pahtohavare	22
Metal		Boliden Mineral AB (Trelleborg AB 100%)	Smelter and refinery at Ronnskar	100
Feldspar		Berglings Malm & Mineral AB (Omya GmbH)	Mines at Beckegruvan, Hojderna, and Limbergsbo	50
Do.		Forshammar Mineral AB (Omya GmbH)	Mines at Limberget and Riddarhyttan	30
Do.		Larsbo Kalk AB (Omya GmbH)	Mines at Glanshamar and Larsbo	20
Ferroalloys		Vargon Alloys AB	Plant at Vargon	175
Gold:				
Ore, gold content	tons	Terra Mining AB (Norsk Hydro A/S 42%)	Bjorgdal Mine	3
Do.		Boliden Mineral AB (Trelleborg AB 100%)	Mines at Aitik, Akerberg, Kankberg, Kristineberg, Langdal, Petiknas, and Renstrom	2
Metal		Boliden Metals AB (Trelleborg AB 100%)	Smelter and refinery at Ronnskar	9
Iron ore		Luossavaara-Kiirunavaara AB (Government 98%)	Mines at Kiruna and Malmberget	28,500
Iron and steel		Svenskt Stal AB (Government 48%)	Steelworks at Lule, Oxelosund, and Domnarvet	3,500
Kyanite		Svenska Kyanite AB (Svenska Mineral 100%)	Quarry at Halskoberg	10
Lead:				
Ore, lead content		Boliden Mineral AB (Trelleborg AB 100%)	Mines at Garpenberg, Laisvall, Langdal, Petiknas, and Renstrom	110
Do.		Ammeberg Mining AB (Union Miniere)	Zinkgruvan Mine at Ammeberg	20
Metal		Boliden Metals AB (Trelleborg AB 100%)	Smelter and refinery at Ronnskar	115
Lime		Euroc Mineral AB	Plants at Limham, Koping, and Storugns	250
Do.		Svenska Mineral AB	Plants at Rattvik and Boda	250
Petroleum, refined	barrels per day	Skandinaviska Raffinaderi AB	Refinery at Lysekil	210,000
Do.		BP Raffinaderi AB	Refinery at Goteborg	100,000
Do.		Shell Raffinaderi AB	Do.	82,000
Do.		AB Nynas Petroleum	Refineries at Goteborg, Malmo, and Nynashamn	54,000
Silver, metal	tons	Boliden Metals AB (Trelleborg AB 100%)	Smelter and refinery at Ronnskar	300
Zinc, ore, zinc content		Boliden Mineral AB (Trelleborg AB 100%)	Mines at Garpenberg, Laisvall, and Langdal	112
Do.		Ammeberg Mining AB (Union Miniere)	Zinkgruvan Mine at Ammeberg	60