The Mineral Industry of Australia

By Charlie Wyche [1]

The pattern of continuing growth in the Australian mineral industry was sustained in 1972, and outlook for the future is for further expansion. According to preliminary data, Australia's mineral production for the year was valued at $2.3 billion,[2] an increase of 10% over the $2.1 billion reported for 1971. In comparison with the national economy, the value of minerals produced and initially processed in Australia during 1972 represented 3.2% of the $72 billion adjusted gross national product (GNP). The mineral output index (based on 1959=100) approximated 465 in 1972, compared with 351 and 414 in 1970 and 1971, respectively.

Production of most of the major metals increased with the exception of aluminum, and titanium concentrates. Of the more than 60 commodities produced in Australia during 1972, 15 showed substantial increases. Notable among those were zinc, iron ore, bauxite and alumina, bituminous coal, nickel, petroleum, and copper.

In 1971, the most recent year for which complete data were available, 11 commodities supplied over 75% of the total Australian mineral output value. In descending order the list included the following, with value in million U.S. dollars: Iron ore concentrates and pellets, 471; black (bituminous and subbituminous) coal, 350; crude petroleum, 289; construction materials, 186; bauxite, 169; lead in ore and concentrates, 88; beach sands (including rutile, zircon, and ilmenite), 77; zinc in ores and concentrates, 64; tin-in-concentrates, 36; brown coal, 32; and gold, 23. The value added by domestic smelting and refining of concentrates of copper, lead, zinc, iron, tin, nickel, and alumina, increased the mine value of mineral output by about $654 million in 1971 compared with $644 million in 1970.

Western Australia maintained its position as Australia's most important mineral producing state, accounting for 31% of the Nation's mine output in 1971. The value of mineral and petroleum production in Western Australia for 1971 was $639 million compared with $510 for the preceding year. The leading mineral commodity produced in the state, in terms of value was again iron ore with a value of $425 million, followed by nickel ore and concentrates valued at $89 million, alumina at $79 million, and crude oil at $46 million. New South Wales retained second place with 23% in 1971. Queensland contributed 18%; Victoria, South Australia, Tasmania, and Australian Capital Territory contributed 17%, 6%, 5%, and 2%, respectively.

Despite revaluation of the Australian dollar on December 7, 1972, by 7.05% to the U.S. dollar, mineral exports in 1972 expanded to an estimated $1.8 billion compared with $1.6 billion in 1971. Exports of iron ore and iron ore pellets increased to 70 million tons valued at $635 million or 35% of the total value of mineral exports. Iron ore, alumina, and black coal continued as the three largest export earners and in 1972 accounted for about 61% of domestic mineral exports. Increased exports were also recorded for refined nickel, refined copper, tin, manganese, and pig iron. Australia exported minerals and metals to more than 100 countries, but during 1972 Japan, the United Kingdom, and the United States received about 90% of the exports. Japan imported large quantities of iron ore, coal, copper, aluminum, iron and steel, zinc, manganese, and mineral sands. Exports to the United States were principally lead, zinc, manganese, mineral sands, and tin. Exports to the United Kingdom

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[2] Unless otherwise indicated, values have been converted from Australian dollars (A$) to U.S. dollars at the rate of A$1=US$1.27.

consisted mainly of lead, zinc, copper, mineral sands, iron ore, tin, and coal. With the increase in exports there was growing support in Australia for greater domestic processing. Imports of minerals in 1972 were less than in the previous year as the downward trend of recent years continued. Imports continued to be dominated by crude petroleum, the estimated value of which in 1972 was $129 million or 52% of the total value of mineral imports. Other commodities imported in substantial quantities included phosphate rock, sulfur, asbestos, and industrial diamond.

There was continued interest in exploration and the high success ratio of recent years promised a strong resources position for all important nonferrous minerals. Since 1968 expenditures on mineral exploration have increased threefold to $216 million. The expanded level of exploration in 1972 resulted in the discovery of deposits of iron ore, gold, bauxite, and nickel in Western Australia, uranium in the Northern Territory, coal in Queensland, and natural gas in the Bass Strait, off the coast of Victoria.

PRODUCTION

Reflecting the improved condition of world mineral markets, impressive increases were recorded in most sectors of the Australian mineral industry in 1972. The most significant increases were in the metals and fuels groups. There were, however, appreciable increases in most nonmetallic products.

Table 1.—Australia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1970	1971	1972 p
METALS			
Aluminum:			
Bauxite, gross weight thousand tons	9,256	12,733	14,433
Alumina do	2,152	2,713	2,852
Metal, refined do	206	224	206
Antimony, mine output (content of antimony and lead concentrates)	930	1,362	1,331
Beryllium, beryl, gross weight	18	72	--
Bismuth, mine output metal content	191	256	e 377
Cadmium:			
Mine output metal content	1,639	1,487	e 1,600
Smelter output (refined)	614	560	719
Cobalt, mine output (content of zinc and nickel concentrates)	469	796	e 740
Columbium-tantalum concentrates, gross weight	101	75	e 190
Copper:			
Mine output metal content	157,790	177,261	180,453
Blister:			
Primary	111,652	142,867	144,655
Secondary	8,718	6,938	4,790
Refined:			
Primary	104,125	127,044	139,107
Secondary	20,517	15,356	34,656
Gold:			
Mine output metal content troy ounces	619,922	672,491	754,932
Refined (excluding recovery from scrap) do	604,795	598,201	652,580
Iron and steel:			
Iron ore, gross weight [1] thousand tons	51,188	62,063	63,870
Pig iron do	6,148	6,128	6,497
Ferroalloys: [2]			
Ferrochromium, high carbon	2,169	313	e 2,000
Ferromanganese, high carbon	42,569	38,852	e 43,000
Ferronickel	1,357	349	e 1,000
Ferrosilicon	9,406	9,960	e 10,000
Silicomanganese	23,188	21,316	e 24,000
Total	78,689	70,790	e 80,000
Crude steel thousand tons	6,822	6,737	6,744
Steel semimanufactures [2] do	6,217	5,579	NA
Lead:			
Mine output metal content	456,528	403,557	398,917

See footnotes at end of table.

Table 1.—Australia: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1970	1971	1972 p
METALS—Continued			
Lead—Continued			
Metal:			
Primary:			
Bullion for export	r 170,921	161,549	138,339
Refined	r 180,076	163,236	179,741
Total	r 350,997	324,785	318,080
Secondary (excluding remelt)	r 32,845	30,190	29,997
Manganese ore, gross weight	751,113	1,050,537	1,207,281
Mercury—76-pound flasks	37	9	e 6
Molybdenum, mine output metal content	r 69	14	15
Nickel:			
Mine output metal content	r 30,243	35,562	35,781
Metal, refined e	9,000	15,000	16,500
Platinum-group metals—troy ounces	3 1,643	e 3 1,400	e 3 1,400
Rare-earth minerals: Monazite concentrate, gross weight	4,437	4,381	5,023
Selenium (in refinery slimes)—kilograms	e 3,300	4 3,734	4 33,244
Silver:			
Mine output metal content—thousand troy ounces	25,992	21,811	21,422
Refined—do	9,422	8,429	8,354
Tin:			
Mine output metal content—long tons	8,689	9,876	11,765
Smelter output (primary only)—do	5,129	6,233	6,916
Titanium concentrates, gross weight:			
Ilmenite	886,452	800,945	708,808
Leucoxene	10,593	14,560	
Rutile	370,867	347,705	317,424
Tungsten, mine output metal content	1,265	1,440	1,074
Uranium oxide (U_3O_8) e	300	(5)	--
Zinc:			
Mine output metal content	487,207	452,647	502,187
Smelter:			
Primary	260,591	6 258,699	296,704
Secondary	7,863	7,043	NA
Zirconium concentrates, gross weight	395,352	412,947	360,192
NONMETALS			
Abrasives, natural:			
Beach pebble	1,688	1,617	NA
Garnet (sales)	202	516	300
Asbestos	828	846	e 15,000
Barite	r 44,774	53,811	e 24,800
Cement, hydraulic—thousand tons	4,599	4,721	4,936
Clays:			
Bentonite and bentonitic clay	358	288	e 350
Brick clay and shale—thousand tons	e 6,927	7,648	e 8,100
Cement clay and shale—do	300	292	e 300
Damourite clay (sales)	417	474	e 500
Fire clay—thousand tons	319	241	e 280
Fuller's earth	--	91	e 90
Kaolin and ball clay	89,577	76,497	e 90,000
Other—thousand tons	774	1,689	e 1,700
Diatomite	2,656	1,927	e 1,200
Feldspar	3,535	3,253	e 3,600
Fertilizer materials, crude, phosphate rock	14,489	6,786	e 10,000
Fluorspar	e 1,281	464	e 900
Gem stones e—value, thousands	$17,325	$21,000	NA
Gypsum	845,444	889,222	e 1,040,000
Kyanite and sillimanite (sillimanite only produced)	1,183	857	e 500
Lime e	210,000	230,000	250,000
Lithium minerals: Petalite, gross weight	783	1,674	e 1,800
Magnesite	r 22,663	18,087	e 19,000
Perlite, crude	838	2,122	NA
Pigments, natural mineral, ocher	660	71	NA
Pyrite, including cupreous:			
Gross weight	r 213,700	230,778	e 260,000
Sulfur content	103,039	105,391	e 125,000
Salt—thousand tons	r 3,071	7 3,788	e 4,000
Sand and gravel:			
Construction sand—do	16,973	18,394	NA
Gravel—do	12,093	12,849	NA
Stone:			
Dolomite—do	328	366	392
Limestone for cement—do	r 6,852	7,128	e 9,800
Limestone for other uses—do	3,143	3,208	
Silica in the form of quartz, quartzite and glass sand—do	879	1,112	NA

See footnotes at end of table.

Table 1.—Australia: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1970	1971	1972 p
NONMETALS—Continued				
Stone—Continued				
Other:				
Crushed and broken	thousand tons	r 8 50,793	8 50,275	NA
Dimension	do	r 8 90	7 81	NA
Unspecified	do	r 8 28,594	9 28,465	NA
Sulfur, byproduct [10]	do	146	135	NA
Talc, soapstone and pyrophyllite		r 55,224	47,876	e 56,000
MINERAL FUELS AND RELATED MATERIALS				
Coal:				
Bituminous [11]	thousand tons	49,211	49,002	59,625
Lignite	do	24,175	23,382	23,697
Total	do	73,386	72,384	83,322
Coke:				
Metallurgical	do	4,293	4,405	4,591
Gas house (including breeze)	do	236	197	e 200
Total	do	4,529	4,602	e 4,791
Fuel briquets	do	1,449	1,391	1,215
Gas, natural, marketable production	million cubic feet	53,061	79,049	112,581
Natural gas liquids	thousand 42-gallon barrels	478	1,692	NA
Petroleum:				
Crude	do	65,149	112,914	119,516
Refinery products:				
Aviation gasoline	do	246	407	269
Other gasoline	do	62,255	65,626	67,375
Jet fuel	do	8,753	10,254	9,937
Kerosine	do	1,676	1,784	1,308
Distillate fuel oil	do	34,043	37,598	26,155
Residual fuel oil	do	r 41,735	36,567	32,287
Lubricants	do	2,576	2,929	2,761
Other	do	12,876	15,105	14,151
Refinery fuel and losses	do	r 15,333	15,826	26,930
Total	do	r 179,493	186,096	181,173

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Excluding iron oxide for use in cement production, coal washing and gas purification; output of such material totaled 60,783 tons in 1970 and 65,881 tons in 1971 (1972 data not available).

[2] Data are for year ended November 30 of that stated.

[3] Partial data; figures represent actual smelter/refinery recovery from nickel concentrates exported to Japan from Kambalda. Additional quantities of palladium and platinum are present in Kambalda concentrates produced for domestic smelting and for export to Canada for smelting, but platinum-group metals reportedly are not recovered from domestically smelted materials, and the quantity recovered in Canada (if any) is not reported.

[4] Partial figure; output by Peko Wallsend Ltd. only for years ended June 30 of that stated; the Electrolytic Refining and Smelting Co. of Australia Pty. Ltd. also produces selenium from tank house slimes containing 1% to 3% selenium, but output data are not available for publication.

[5] Revised to zero.

[6] Excludes zinc dust.

[7] Excludes production from Victoria, for which no figures are published in Australian sources, although production did occur.

[8] Excludes production from Northern Territory and Australian Capital Territory.

[9] Excludes production from Northern Territory, Australian Capital Territory and Western Australia.

[10] Sulfur content of sulfuric acid produced as a byproduct of oil refining and nonferrous metal operations (excludes sulfur content of sulfuric acid derived from pyrite).

[11] Includes semianthacite and subbituminous.

TRADE

The trade data shown in tables 2 and 3, were provided by the Commonwealth Bureau of Census and Statistics and cover the official July 1 to June 30 annual reporting period; therefore, the data are not comparable with calendar year data presented elsewhere in this review.

Table 2.—Australia: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969–70	1970–71	Principal destinations, 1970–71
METALS			
Aluminum:			
Bauxite, gross weight [2] thousand tons	3,750	5,056	Japan 2,632; West Germany 1,459; France 325.
Alumina, gross weight [2] do	r 1,419	1,685	United States 1,125; Japan 498; New Zealand 62.
Metal:			
Scrap	2,718	2,335	Japan 1,936; France 156; West Germany 129.
Unwrought	50,521	79,846	Japan 50,696; East Germany 5,675; Hong Kong 5,469.
Semimanufactures [3]	2,955	4,735	Malaysia 1,434; New Zealand 1,323; Indonesia 565.
Beryllium ore and concentrate	25	59	All to United States.
Cadmium metal, refined	r 529	506	United States 239; United Kingdom 148; India 34.
Columbium and tantalum: Tantalite-columbite concentrates, gross weight	108	123	United Kingdom 97.
Copper:			
Ore and concentrate, gross weight	65,111	140,217	Japan 134,051; United Kingdom 5,904.
Metal:			
Copper-lead dross and speiss	7,112	1,420	Japan 779; United States 641.
Copper slags and residue	136	81	Spain 71; Belgium-Luxembourg 10.
Unwrought:			
Blister and cement	8,140	7,105	All to Japan.
Other, unalloyed	38,624	36,014	West Germany 12,231; United Kingdom 7,747; France 6,549.
Alloyed	57	37	Thailand 26; New Zealand 6.
Semimanufactures:			
Unalloyed	10,984	14,005	New Zealand 8,943; Malaysia 1,312; Singapore 917.
Alloyed	4,876	3,752	Hong Kong 2,131; New Zealand 572; Singapore 517.
Gold:			
Ore and concentrate, metal content [2] troy ounces	r 188,464	151,354	NA.
Mint bullion do	146,795	96,635	All to Hong Kong.
Refined bullion do	828,783	88,922	Hong Kong 88,130; New Zealand 784.
Iron and steel:			
Iron ore and concentrate thousand tons	33,778	48,348	Japan 36,296; West Germany 1,348; France 1,005.
Scrap do	529	468	Japan 401; New Zealand 24; Thailand 14.
Pig iron do	290	389	Japan 310; Romania 41.
Steel ingots and other primary forms [2] do	r 484	119	Philippines 71; Hong Kong 27; Japan 13.
Steel semimanufactures do	r 673	423	New Zealand 177; United States 53; Papua New Guinea 35.
Lead:			
Ore and concentrate, gross weight	121,385	83,097	United States 26,381; Japan 20,010; Belgium-Luxembourg 19,641.
Metal:			
Bullion, lead-silver, lead content	169,755	179,814	United Kingdom 145,177; Netherlands 27,649; West Germany 6,988.
Refined	162,919	123,374	United Kingdom 48,228; United States 39,422; India 16,604.
Lead-antimony alloys	5,945	3,189	New Zealand 1,239; Philippines 711; Thailand 536.
Semimanufactures	r 2,627	3,671	United Kingdom 3,010; Indonesia 234; Singapore 109; Philippines 109.
Manganese ore, gross weight	648,936	703,828	Japan 550,985; United States 95,696; Spain 27,548.
Platinum-group metals [3] troy ounces	6,245	8,365	Hong Kong 6,163; New Zealand 1,736; Singapore 210.
Rare-earth metals, monazite concentrate [2]	r 4,764	4,661	Netherlands 1,473; France 1,380; United States 713.
Silver:			
Concentrates and lead-silver bullion, silver content [2] thousand troy ounces	15,410	11,279	NA.
Mint bullion do	7,503	7,896	United Kingdom 5,118; Japan 2,508; Thailand 257.
Other do	611	63	New Zealand 58; Singapore 4.
Tin:			
Ore and concentrate, gross weight long tons	7,002	35,441	United Kingdom 32,160; Spain 1,567; Mexico 862.
Metal, unwrought do	r 640	1,456	United States 1,118; New Zealand 213; West Germany 54.

See footnotes at end of table.

Table 2.—Australia: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969–70	1970–71	Principal destinations, 1970–71
METALS—Continued			
Titanium concentrates, gross weight:			
Ilmenite	596,216	641,062	United Kingdom 247,496; Japan 243,519; France 80,051.
Leucoxene	2,861	8,562	United States 7,538; France 656; Japan 368.
Rutile	346,436	377,224	United States 211,031; Netherlands 31,552; Japan 34,967.
Tungsten concentrates, gross weight:			
Scheelite	1,431	1,214	United Kingdom 573; West Germany 510; Japan 131.
Wolframite	995	1,002	West Germany 648; Netherlands 244; United Kingdom 68.
Zinc:			
Ore and concentrate, gross weight	437,121	383,482	United Kingdom 178,191; Japan 118,806; Belgium-Luxembourg 34,271.
Metal:			
Slags and residues	5,965	5,782	Belgium-Luxembourg 2,245; Republic of South Africa 1,084; Netherlands 629.
Unwrought	154,716	136,831	United States 26,915; India 23,454; New Zealand 15,741.
Semimanufactures [3]	1,085	2,174	New Zealand 584; India 428; Japan 421.
Zircon concentrates, gross weight, minimum 30% $ZrSiO_4$ [3]	351,101	360,171	Japan 93,152; United States 71,089; Netherlands 37,536.
NONMETALS			
Abrasives, crude natural value, thousands	r $62	$69	Japan $46; United Kingdom $7.
Asbestos, crude and fiber [4]	551	228	Indonesia 136; New Zealand 92.
Cement, hydraulic [3]	10,273	13,810	Papua New Guinea 12,365; Nauru 561; Indonesia 480.
Clays, fireclay and others, including sillimanite [3]	6,279	7,461	Japan 3,486; United Kingdom 2,625; New Zealand 767.
Diamond:			
Gem [3]—carats	2,094	3,313	Belgium-Luxembourg 1,014; Israel 682; United Kingdom 634.
Industrial [3]—do	83,411	142,362	United States 79,056; United Kingdom 48,303; New Caledonia 9,979.
Gem stones, except diamond:			
Opals [3]—value, thousands	r $13,758	$12,741	Hong Kong $5,020; Japan $2,951; United States $2,140.
Sapphires [3]—do	$3,838	$3,620	Thailand $1,830; United Kingdom $477; Hong Kong $346.
Other [3]—do	r $312	$586	Hong Kong $138; United Kingdom $95; West Germany $93.
Gypsum	205,718	259,465	New Zealand 101,056; Taiwan 38,064; Singapore 18,362.
Magnesite	951	2,317	Netherlands 2,054; United States 181; New Zealand 82.
Salt	1,304,078	3,039,789	Japan 2,988,447; Republic of Korea 41,597; United States 9,252.
Talc and steatite [3]	39,221	36,138	Japan 24,593; Netherlands 9,946; New Zealand 1,477.
MINERAL FUELS AND RELATED MATERIALS			
Coal, including briquets—thousand tons	17,623	19,139	Japan 16,215; Netherlands 727; United Kingdom 622.
Coke and semicoke—do	455	593	Japan 339; New Caledonia 235; Portugal 19.
Petroleum:			
Crude—thousand 42-gallon barrels	--	1,020	United States 729; Japan 264; Singapore 27.
Partly refined—do	(4)	496	Japan 380; Singapore 116.
Refinery products:			
Gasoline—do	1,304	1,703	Singapore 1,004; New Zealand 581; Papua New Guinea 33.
Jet fuel and kerosine—do	1,041	1,741	New Zealand 757; Singapore 733; Fiji 180.
Distillate fuel oil—do	1,926	3,022	Singapore 1,392; New Zealand 796; Republic of South Africa 329.
Residual fuel oil—do	2,966	1,963	Singapore 859; New Caledonia 740; Fiji 232.
Lubricants—do	672	1,014	New Zealand 335; Republic of South Africa 272; Kenya 156.
Other products—do	r 474	408	New Zealand 344.

r Revised. NA Not available.

[1] Data are for years beginning July 1, unless otherwise specified.

[2] Data given are for years beginning January 1; in the cases of bauxite and alumina, figures are receipts by trading partner countries.

[3] Includes reexports.

[4] Less than ½ unit.

Table 3.—Australia: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969–70	1970–71	Principal sources, 1970–71
METALS			
Aluminum metal:			
Scrap	856	566	New Zealand 494; Fiji 32; Canada 31.
Unwrought	1,073	328	United Kingdom 190; United States 81; New Zealand 36.
Semimanufactures	r 3,720	3,480	United States 1,183; United Kingdom 932; West Germany 799.
Antimony metal, all forms	66	27	Japan 14; People's Republic of China 10; United Kingdom 3.
Arsenic trioxide	1,237	1,040	People's Republic of China 335; France 281; Sweden 265.
Bismuth metal, all forms	14	15	United Kingdom 9; Belgium-Luxembourg 4.
Chromium ore and concentrate	10,576	31,529	Philippines 22,845; Iran 8,535; Republic of South Africa 149.
Cobalt and cobalt base alloys	r 99	80	Zambia 31; Congo (Brazzaville) 14; Tanzania 12.
Copper:			
Ore and concentrate	5	39	New Zealand 15; Fiji 9.
Metal and alloys:			
Scrap:			
Unalloyed	1,328	749	New Zealand 509; Papau New Guinea 140; Fiji 34.
Alloyed	1,588	1,659	New Zealand 715; Papua New Guinea 502; Fiji 113.
Unwrought	r 100	145	New Zealand 55; United Kingdom 41; United States 26.
Semimanufactures	r 2,252	3,598	United Kingdom 2,214; Japan 780; United States 255.
Gold:			
Crude bullion, gold content troy ounces	134,015	123,168	Fiji 104,001; Papua New Guinea 19,146.
Refined bullion do	62,229	7,177	Fiji 5,844; Papua New Guinea 1,078; United Kingdom 173.
Iron and steel:			
Ore and concentrate, including roasted pyrite	181	2,393	Philippines 1,897; Republic of South Africa 436.
Scrap	1,556	1,012	New Zealand 889; United States 44.
Ferroalloys:			
Powder:			
Manganese	582	595	Japan 256; France 164; West Germany 163.
Other	492	233	United Kingdom 49; Republic of South Africa 41; United States 39.
Shot:			
Ferrochromium	9,607	10,595	Republic of South Africa 4,932; Finland 4,091; Japan 689.
Ferromanganese	6,116	9,241	Japan 6,017; Republic of South Africa 2,715; Italy 508.
Ferromolybdenum	247	234	United States 149; United Kingdom 38; Sweden 24.
Ferrosilicon	9,277	12,281	United States 5,379; Republic of South Africa 3,425; Canada 1,411.
Ferronickel	2,884	1,914	New Caledonia 1,384; Greece 530.
Other	2,523	4,134	United Kingdom 2,739; Republic of South Africa 683; Japan 414.
Steel, primary forms	16,699	39,367	Japan 38,081; United Kingdom 1,139.
Semimanufactures	346,474	633,312	Japan 499,642; United Kingdom 58,692; United States 18,761.
Lead, metal and alloys, all forms	321	96	New Zealand 47; United Kingdom 16; United States 13.
Magnesium, metal and alloys, all forms	1,602	1,280	United States 912; Norway 325.
Manganese ore and concentrates:			
Battery grade	3,028	996	All from Ghana.
Metallurgical grade	5,213	3,535	People's Republic of China 3,236; Indonesia 125; United States 122.
Mercury 76-pound flasks	1,012	1,283	United States 665; Spain 194; Philippines 100.
Nickel:			
Matte and similar materials	682	1,308	Canada 1,308.
Metal and alloys:			
Unwrought	r 1,512	2,102	Canada 1,895; United Kingdom 171.
Semimanufactures	r 875	1,196	United Kingdom 682; United States 255; Canada 1,458.
Platinum-group metals troy ounces	r 14,769	332,358	West Germany 180,009; United Kingdom 141,517; United States 9,082.
Silicon metal value, thousands	$696	$1,335	Canada $563; France $373; Italy $146.
Silver, crude bullion, silver content troy ounces	r 93,953	68,215	New Zealand 23,317; Fiji 22,643; Papua New Guinea 10,578.

See footnotes at end of table.

Table 3.—Australia: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969–70	1970–71	Principal sources, 1970–71
METALS—Continued			
Tin, metal and alloys, all forms_long tons	r 128	137	Mainly from Malaysia.
Tungsten, metal and alloys, all forms	r 20	18	West Germany 5; United Kingdom 5; United States 4.
Zinc:			
Metal and alloys, all forms	r 154	248	United Kingdom 76; Singapore 76; Japan 34.
NONMETALS			
Abrasives, natural, pumice and tripoli [5]	1,465	1,518	United States 715; New Zealand 505; Italy 104.
Asbestos:			
Chrysotile	46,160	54,303	Canada 53,159.
Amosite	8,405	11,671	Republic of South Africa 7,630; Canada 4,032.
Other	2,669	5,783	Canada 5,615.
Barite and witherite, natural and ground	r 2,194	915	People's Republic of China 503; United States 376.
Boron minerals, crude and concentrates	1,753	1,692	United States 1,676.
Cement, hydraulic	85,220	120,504	Japan 44,370; Okinawa 29,015; Republic of Korea (South) 20,935.
Chalk	8,151	7,887	France 5,949, United Kingdom 1,935.
Clays:			
Bentonite	68,699	74,667	United States 69,474; New Zealand 2,583; Japan 2,032.
White clays, including kaolin	33,686	43,319	United Kingdom 24,745, United States 18,529.
Fire clay and ball clay	23,849	22,152	United Kingdom 11,061, Republic of South Africa 5,204; United States 5,689.
Other	18,772	15,981	United States 7,971, Republic of South Africa 7,604.
Diamond:			
Gem_carats	33,826	49,816	Belgium-Luxembourg 16,552; Israel 12,522; Republic of South Africa 6,936.
Industrial, including dust_do	964,984	743,002	Republic of South Africa 333,306; United States 196,469; Netherlands 134,481.
Diatomite	8,227	6,191	United States 5,636; Mexico 274; Japan 246.
Dolomite	1,037	443	West Germany 352; United States 59.
Feldspar, leucite and nepheline	4,466	5,123	Canada 4,258.
Fertilizer materials:			
Crude:			
Nitrogenous (sodium nitrate)	4,588	3,242	All from Chile.
Phosphatic, phosphate rock thousand tons	2,692	2,107	Nauru 1,151; Christmas Island 610; Gilbert and Ellice Islands 308.
Manufactured:			
Nitrogenous	33,491	19,191	Japan 9,776; France 3,385; West Germany 3,287.
Phosphatic	1,649	3,141	Japan 2,023; Christmas Island 1,118.
Potassic	135,274	155,737	United States 69,533; Canada 62,735; West Germany 15,012.
Mixed and other	25,489	9,000	West Germany 6,396; Italy 1,593; United States 403.
Fluorspar and cryolite:			
Fluorspar	20,183	33,490	Republic of South Africa 19,164; United Kingdom 9,542; People's Republic of China 3,446.
Cryolite, natural and synthetic	269	310	Mainly from Denmark.
Gem stones (except diamond) pearls and and other precious and semiprecious stones_value, thousands	$2,323	$3,705	Australia (reimported) $1,052; Thailand $301; West Germany $277; Hong Kong $214.
Gypsum, crude and calcined	964	1,109	United Kingdom 581; United States 360; West Germany 133.
Graphite, natural	1,504	1,800	Republic of Korea 624; Ceylon 355; People's Republic of China 312.
Kyanite and sillimanite:			
Kyanite	4,430	1,595	India 1,005; United States 548.
Sillimanite	9	10	All from United Kingdom.
Magnesite, crude, calcined and fused	12,829	215	United States 166.
Mica:			
Block and/or sheet	10	8	Mainly from India.
Splittings	70	9	All from India.
Ground and scrap	797	1,040	Republic of South Africa 596; India 273; People's Republic of China 80.
Pigments, mineral, iron oxides	10,303	10,165	West Germany 7,080; United Kingdom 647.
Salt	r 8,316	7,046	United Kingdom 6,665.

See footnotes at end of table.

Table 3.—Australia: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969–70	1970–71	Principal sources, 1970–71
NONMETALS—Continued			
Sand, gravel and stone:			
Sand (except metal bearing)	690	401	United States 220; United Kingdom 98.
Stone:			
Dimension:			
Marble	1,941	7,053	Italy 5,985; Belgium-Luxembourg 1,036.
Slate	90	121	Japan 66; Italy 49.
Other	6,181	2,206	Republic of South Africa 960; Finland 608; Italy 175.
Other:			
Limestone	471,101	596,264	All from Japan.
Quartz and quartzite	785	1,126	Sweden 851; West Germany 108.
Gravel and crushed, n.e.s	10,180	4,042	Italy 3,691.
Sulfur, elemental	434,162	273,332	Canada 190,281; United States 61,022.
Talc and steatite	2,969	8,419	People's Republic of China 6,947; United States 848.
Vermiculite	3,763	3,961	Republic of South Africa 2,801; People's Republic of China 587; United States 501.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,134	1,223	United States 734; Trinidad and Tobago 457.
Carbon black and gas carbon	3,705	3,292	United States 2,754; United Kingdom 405.
Coal, all types, including briquets	10,503	11,042	Republic of South Africa 8,937; United Kingdom 1,291.
Coke and semicoke	88,370	5,773	United States 4,865.
Peat	3,705	4,097	West Germany 3,163; Ireland 613.
Petroleum:			
Crude—thousand 42-gallon barrels	139,363	65,727	Kuwait 21,802; Saudi Arabia 15,557; Iraq 9,858; Indonesia 9,010.
Partly refined—do	6,233	5,116	Singapore 2,077; Kuwait 1,733; Bahrain 658.
Refinery products:			
Gasoline—do	4,149	4,159	Bahrain 1,690; Iran 759; People's Democratic Republic of Yemen 557.
Jet fuel and kerosine—do	1,003	1,221	Singapore 495; Bahrain 373; People's Democratic Republic of Yemen 133.
Distillate fuel oil—do	2,162	3,619	Kuwait 1,013; Singapore 1,008.
Residual fuel oil—do	7,598	10,113	Singapore 4,316; Kuwait 2,139; People's Democratic Republic of Yemen 1,133.
Lubricants—do	256	366	United States 152; Netherlands 135; United Kingdom 65.
Liquefied petroleum gas—do	2	(4)	NA.
Bitumen—do	12	89	United States 70; Singapore 13; United Kingdom 1.
Other—do	2,597	1,761	Indonesia 700; United States 715.

r Revised. NA Not available.
[1] Data are for years beginning July 1.
[2] Includes refined bullion.
[3] Includes emery and natural corundum.
[4] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—In 1972, Australia produced 14.4 million tons of bauxite, increasing its lead as the world's largest producer. Although the production of bauxite and alumina set new records, the output of refined aluminum declined slightly. The increased production of alumina reflected the commissioning of expanded capacity by Alcoa of Australia Pty. Ltd. at Pinjarra, Western Australia, in May and at Gove, Northern Territory, during July. In August, Alcoa and American Metal Climax Inc. (AMAX) announced that additional contracts had been signed for the supply of alumina to AMAX which will result in further expansion at Alcoa's Pinjarra refinery. The initial agreement was for 400,000 tons of alumina per year starting in early 1975. The further expansion will increase production capacity at Pinjarra to 800,000 tons per year, which can be increased to 900,000 tons when required. This will give Alcoa a total alumina production capacity of 2.2 million tons per year, making it one of the largest alumina producers in the world. Alcoa has supplied AMAX with 200,000 tons of alumina annually from its Kwinana refinery in Western Australia.

The Western Australia Minister for De-

velopment and Decentralization announced in October the approval of a new site for an alumina plant to be constructed by Pacminex, Pty. Ltd. The new site is at Muchea, 30 miles north of Perth, and 16 miles north of the site rejected by the Environmental Protection Authority. In order to offset additional costs in construction of the refinery, estimated at $8 million, the state granted certain concessions to Pacminex. These included waiving of a company contribution toward the cost of a harbor berth and other infrastructure.

Comalco Industries Pty. Ltd. produced 7.3 million tons of bauxite at Weipa and output is being raised to 10.6 million tons annually. Between 30% and 40% of Weipa's output was processed at the Queensland Alumina Ltd. plant at Gladstone in Queensland; most of it was exported to Japan, Europe, and North America and the remainder was shipped to Comalco's alumina plant in Tasmania, with a capacity of about 95,000 tons per year. Comalco also has a 50% interest in an aluminum refinery in New Zealand and is associated with European aluminum producers in the construction of an alumina plant in Sardinia, Italy with a 600,000-ton-per-year capacity. All bauxite for the plant will be supplied from Weipa. The tremendous size of the Weipa bauxite reserves, estimated at about 2.5 billion tons, offers scope for a series of major developments. Construction of the world's largest refinery is being considered by Comalco and a group of international companies. The new alumina plant will be built near the ore body at Weipa. Other companies interested in the project include Alcan Australia, Ltd., Péchiney Group (France), Kobe Steel Ltd. and Mitsubishi Chemical Industries Ltd. (Japan), and Reynolds Metal Co. (United States). The ultimate capacity of the plant has been quoted as high as 4.8 million tons per year.

Another integrated bauxite-alumina-aluminum plant was established by Alcoa of Australia based on bauxite deposits in the Darling Ranges, near Perth, in Western Australia. The next major project to come into operation will be at Gove, Northern Territory, where Nabalco Pty. Ltd. is building an alumina plant with an initial output of 500,000 tons per year, which will be increased to 1 million tons by mid-1973. Australia's bauxite reserves are estimated at 4.5 billion tons, and if current plans come to fruition, capital expenditure of about $3 billion will be needed to provide new mining facilities and to increase alumina and aluminum capacity over the next decade.

Copper.—Growth in the Australian copper industry continued through 1972. The 1972 mine output of approximately 180,000 tons of copper was 2% higher than in the preceding year, and production of primary refined copper was 9.5% more than in 1971. The higher Australian output mainly reflected expanded output at Mount Isa and Mount Lyell, augmented by minor increases in production of copper in lead-zinc ores at Broken Hill and in nickel concentrates from the Kalgoorlie area. Production of blister copper increased only marginally in 1972 to 144,655 tons.

Principal producers and quantities of their output in recent years are summarized in table 4.

During the company year ending June 30, 1972, Mount Isa Mines Ltd. treated 4.10 million tons of copper ores containing 3.0% copper. In view of the world market situation, however, cuts were made in production of silver-lead-zinc ores so that the total throughput of all ores fell to about 6 million tons. Copper ore reserves at Mount Isa were increased by 8 million tons during the year to 141.5 million tons with an estimated average grade of 3.0% copper.

Mount Isa Mining Holdings Ltd. successfully negotiated a $42 million loan with an international banking consortium headed by the Chase Manhattan Bank of New York. The loan will be used in expanding the annual copper production at Mount Isa and Townsville to 155,000 tons by mid-1973.

Mount Lyell Mining and Railway Co. Ltd. continued to expand production at Mount Lyell. Mining of copper ore from the West Lyell open cut ceased in September and production from underground workings of the Prince Lyell mine was increased. Proven ore reserves in mid-1972 were reported at 32.9 million tons assaying 1.5% copper, 3.7 million tons less than on June 30, 1971. Probable ore reserves of 6.0 million tons assaying 1.5% copper showed an increase of 1.4 million tons over 1971. Although the expansion program currently underway was not scheduled for completion until June 1974, approximately 22,000 tons of copper contained in concentrates was produced in 1972.

Table 4.—Australia: Major copper industry facilities

Facility	Production (metric tons of copper [1]) 1969	1970	1971
Mine:			
Mount Isa Mines Ltd	78,229	84,225	122,143
Mount Morgan Ltd	8,139	r 6,971	7,232
Broken Hill Field	3,752	3,644	3,751
Cobar Mines Pty. Ltd	11,351	8,313	6,258
Mount Lyell Mining and Railway Co. Ltd	16,615	16,720	21,227
Electrolytic Zinc Co. of Australasia Ltd	1,790	1,674	2,448
Tennant Creek Field	6,608	5,482	6,254
Rum Jungle Field	140	120	240
Smelters:			
Mount Isa Mines Ltd	80,490	81,663	121,148
Mount Morgan Ltd	8,132	8,034	7,942
Electrolytic Refining and Smelting Co. of Australia Pty. Ltd.[2]	13,689	9,315	11,244
Mount Lyell Mining and Railway Co. Ltd	13,872	13,925	14,203
Refineries:			
Mount Isa Mines Ltd	77,380	80,521	115,987
Electrolytic Refining and Smelting Co. of Australia Pty. Ltd	23,474	21,959	24,639

r Revised.
[1] Metal content of ore for mines; primary blister copper for smelters; and primary electrolytic for refineries.
[2] Treats concentrates from Cobar Mines Pty. Ltd.

Peko-Wallsend Ltd. announced that studies were underway to determine whether the combined output of the Peko, Gecko, and Warrego mines could be treated at the new Warrego concentrator, scheduled to begin operation early in 1973. This followed excellent results from trial batch runs conducted at the Warrego mill which indicated that the plant could operate in excess of its designed capacity of 500,000 tons per year. The year's mine development and drilling activities at the Warrego mine indicated a new gold-copper-bismuth ore shoot which can be mined independent of the main ore body. The ore shoot is reported to contain 200,000 tons of material with an estimated average grade of 20 pennyweight per ton of gold, 2.5% copper, and 0.5% bismuth. Development work at Orlando revealed 100,000 tons of additional ore, with an estimated average grade of 5% copper, 0.7 pennyweight per ton of gold, and 0.10% bismuth.

Cobar Mines Pty. Ltd. extracted and treated 426,260 tons of copper and copper-zinc ores during the year ending June 30, 1972, in comparison with 41,707 tons treated during the preceding year. The average grade of ore mined was 1.9% copper. A total of 25,326 tons of copper concentrate averaging 25.5% copper was produced. The decline in production resulted from a 10-week strike at Cobar Mines and the slow return to full production following the end of the strike. Broken Hill South Ltd. announced in October that an additional copper stope at Cobar Mines was brought into production late in 1972. Installation of a third grinding mill and ancillary equipment was scheduled for early 1973. When the new unit is brought onstream it will bring the concentrator capacity at the CSA mine to 90,000 tons of ore per month.

In South Australia, Kanmantoo Mines Ltd. established a sixth bench at their Kanmantoo open pit operation. Ore extraction proceeded on schedule and the presence of oxidized material in the upper levels which had previously reduced recoveries in the concentrating plant were not encountered in the lower benches.

Gold.—Domestic production of gold increased to about 755,000 ounces in 1972, nearly 12% above the 1971 output. Approximately 46% of the nation's gold production came from Western Australia. The Northern Territory accounted for 34%; Queensland, 10%; Tasmania, 7%; the remaining 3% came from the three remaining states. Most of the increase came during the final 6 month's period as a result of rising prices in world gold markets. Also the Federal Government increased the maximum assistance granted to gold producers under the Gold Subsidy Act to $12 per ounce on January 1, 1972. Granting of the increased subsidy enabled several gold mining companies to continue operating and to defer planned closures.

Gold markets also improved as a result of developments in the United States where the official price, $35 an ounce, was

increased to $38 in mid-December 1971. Subsequently, the free market price also commenced to rise and reached $70 per ounce on August 1, 1972. The effect of high free market prices was particularly noted in the increased production of gold by Peko-Wallsend, the country's leading producer. At Kalgoorlie, both the North Kalgurli (1912) Ltd. and Lakeview and Star Ltd. increased exploration. Proven ore reserves at Gold Mines of Kalgoorlie (Aust.) Ltd. at the end of 1972 were 2,297,000 tons assaying 0.19 ounce gold per ton. The principal gold producers and quantities recovered during 1972 were as follows:

Company	Gold produced (troy ounces)
Central Norseman Gold Corp. N.L.	68,342
Golden Plateau N.L.	16,160
Gold Mines of Kalgoorlie (Aust.) Ltd.	142,670
Hill 50 Gold Mine N.L.	20,257
Lakeview and Star Ltd.	101,244
North Kalgurli (1912) Ltd.	37,410
Peko-Wallsend Ltd.	231,629

According to trade records, Australia in 1972 exported a total of 239,753 ounces of gold in all forms. Of this total, 119,519 ounces was in the form of refined gold and 120,234 ounces was contained in ores, concentrates, blister copper, and other materials.

Iron and Steel.—*Iron Ore.*—The growth trend in the Australian iron and steel industry continued through 1972, but at a much slower rate than in the preceding year. The increase in iron ore production was 3% in 1972 compared with 21% during 1971. The lower production rate in 1972 reflected a reduction in ore output in the Pilbara region because of the reduced overseas demand. Export of iron ore and pellets in 1972 decreased 8% to 31 million tons. In addition to reduced demand, industrial disputes at domestic port sites and delays caused by the strike of Japanese seamen also had an effect on exports.

Japan imported 24 million tons of iron ore from Australia in 1972, worth $270 million which accounted for 43% of total Japanese imports of iron ore. The original contracts called for a minimum 1972 tonnage of 51 million tons. Overly optimistic Japanese production projections upon which the contracts were based, plus the unforeseen slowdown of Japan's economy in recent months, resulted in the inability of the Japanese importing mills to utilize all the ore for which they had contracted.

Perhaps the situation which caused the greatest concern in the iron ore industry during 1972 was the loss of income resulting from the 1971 appreciation of the Australian dollar in reference to the U.S. dollar. The companies' prime problems, however, were that the long-term contracts for the export of iron ore to Japan are based on U.S. dollars. In the past 15 months the U.S. dollar was devalued 23% in terms of the Australian dollar, resulting in a $383 million drop in industry profits. Discussions between Australia's iron ore companies and Japanese steel mills are being held in an effort to increase ore prices.

In 1972 the iron mining industry consisted of 10 principal producers, including the Broken Hill Pty. Co. Ltd. (BHP) group of companies that dominates the production of iron and steel in Australia. In addition, the Western Australia State Cabinet approved an agreement for the development for two new iron ore projects—the 500-million-ton McCamey's Monster deposit and the 1-billion-ton, 61% iron deposit at Rhodes Ridge. The cost of developing McCamey's Monster was estimated at about $2.4 million. This includes mine and port development, a railroad linking mine to port, and associated infrastructures. The Rhodes Ridge iron ore project will be developed by Rhodes Ridge Mining Co. Ltd. and is expected to cost around $3.6 million.

The principal iron ore producers and quantities shipped during the year, were as follows:

Company	Quantity (thousand metric tons)
Goldsworthy Mining Ltd., Western Australia (lump)	6,785
Hamersley Iron Pty. Ltd., Western Australia (lump, pellets)	17,344
Western Mining Corp. Ltd., (WMC), Western Australia (lump)	637
Broken Hill Pty. Co. Ltd., Western Australia (lump)	4,559
Broken Hill Pty. Co. Ltd., South Australia (lump, pellets)	6,379
Savage River Mines, Tasmania (pellets)	2,454
Frances Creek Iron Mining Corp. Ltd., Northern Territory (lump)	685
Mount Newman Iron Ore Co., Western Australia (lump)	22,872

The BHP produced a total of 10,938,553 metric tons of iron ore, and an additional 1,458,484 tons of pellets during 1972. During the previous year, iron ore production of the company was 12,308,430 tons. The 1972 shipments amounted to 8,830,549 tons including 1,240,192 tons of pellets. At the largest mining properties, situated in the Middleback west of Whyalla, iron ore production of BHP totaled 6,379,500 tons. This quantity consisted of 3,248,800 tons produced at the Iron Baron and Iron Prince mines and 3,130,700 tons produced at the Iron Monarch mine at Iron Knob. At Whyalla, 1,458,500 tons of pellets were produced from ore originating at the Iron Prince mine in the fourth full year of operation of the pelletizing facilities. Production totaled 2,952,100 tons at Yampi Sound, in the northern part of Western Australia. The major tonnage comprised 1,849,000 tons from the mine on Koolan Island, and the remaining 1,103,100 tons originated at the mine on Cockatoo Island. Output of iron ore at Koolyanobbing in the southern portion of Western Australia amounted to 1,606,900 tons.

The ore was delivered by BHP principally to its steelworks in Newcastle and Port Kembla, New South Wales; Whyalla, South Australia; and Kwinana, Western Australia. The remainder was exported to Japan.

Mount Newman Iron Ore Co. increased ore production marginally at its Mount Whaleback mine. Production in 1972 was 12.9 tons, compared with 12.3 tons for 1971. Mount Newman is expanding its Pilbara, Western Australia, facilities to increase capacity to a yearly rate of 35 million tons of iron ore by 1974. The company is installing a third secondary crusher and providing more drills and dump trucks at the mine site. It is also adding four new locomotives and more ore cars to the railroad rolling stock and building more homes at Mount Newman and Port Hedland to accommodate the larger work force. Mount Whaleback, the company's prime ore body, contains proven reserves of 1.2 billion tons of high-grade hematite.

Hamersley Iron Pty. Ltd. produced 20.3 million tons at its Mount Tom Price mine in 1972 compared with 19.3 million tons in 1971. The company expects to increase its Western Australian pellet production from 2.6 million to 3.2 million tons per year by May 1974. Proven ore reserves at Mount Tom Price are 166 million tons of 64% iron and 377 million tons of indicated ore containing 64% iron. Hamersley's total reserves are 5.1 billion tons, of which 1.6 billion tons are high-grade hematite, 2 billion tons low-grade hematite, and 1.5 billion tons limonite.

Goldsworthy Mining Ltd. operating the Mount Goldsworthy mine, Areas A and B, located 70 miles east of Port Hedland, is making plans for the mining of Area C, located near the Ophthalmia Range. The iron mineralization is found in the Marramamba formation and is estimated to contain 480 million tons of 62.5% iron. The company is planning to start production in 1976 and will boost production at mining Areas A and B in the same year. Under present plans, total production by Mount Goldsworthy in 1977 will be 20 million tons per year. Some 45% of the planned output will be 6- by 30-millimeter-size ore and the remaining 55% will be below 6-millimeter-size ore.

Pig Iron and Steel.—Virtually all of Australia's primary iron and steel was produced by BHP and its wholly owned subsidiaries, Australian Iron and Steel Pty. Ltd. and Commonwealth Steel Co. Ltd. The consolidated annual reports for periods ending May 31, 1971, and May 31, 1972, summarize output of various products as follows:

Commodity	Quantity (thousand metric tons) 1971	1972
Pig Iron	6,087	6,022
Steel ingots and billets	6,608	6,579
Blooms and slabs	5,668	5,543
Sheets, bars, billets, etc	2,706	2,869
Plate and strip	2,450	2,273
Merchant	1,637	1,518
Rod	482	550
Narrow cold-rolled strip	101	103
Tinplate	304	317

Total pig iron output fell about 3% below that of last year, to 6,022,000 tons, and raw steel production was down 3%, to 6,579,000 tons. A record 2,776,000 tons of pig iron was produced at Port Kembla. The No. 5 blast furnace commenced operating early in March as part of the steel plant expansion to a capacity of 5,500,000 tons of raw steel annually. Both iron and raw steel production at Newcastle, of 1,811,000 and 2,028,000 tons, respectively,

was below the tonnage attained the preceding year. The downturn in market demand late in 1971 led to the shutdown of the 50-ton blast furnace in November. Whyalla operations were seriously affected by the market conditions during the second half of 1972. Iron production dropped to 745,000 tons, 24% less than that of 1971. Continuous operation of the Kwinana blast furnace was made possible by pig iron orders for export, particularly to the People's Republic of China, Japan, and Italy.

Lead and Zinc.—In 1972 the domestic lead and zinc industry began to show signs of recovery from the decline experienced during the preceding year. Although mine production of lead was below the 1971 level, increases were recorded in production of zinc in concentrates, primary refined zinc, and primary refined lead. Exports of lead bullion and refined lead decreased about 7% and 9%, respectively, and the export of zinc concentrates was reduced by 22%.

A doubling of capacity at the Rosebery mine in Tasmania, an increase in the capacity at Risdon, and freedom from industrial disputes was responsible for the improvement in zinc production. The export of zinc concentrates in the first half of 1972 was reduced as a result of temporary closure of the Avonmouth Smelter in the United Kingdom as well as by the Japanese seamens strike. The sharp reduction in exports to the United Kingdom (27,000 tons in the 6 months to June 30, 1972, compared with a total of 153,000 tons in 1971) resulted in the diversion of some concentrate shipments to markets in Finland and the Republic of South Africa. In contrast, shipments of refined zinc to the United States and to the United Kingdom, where closure of several smelters in 1971 created a shortage of refined zinc, was increased. Total shipments of refined zinc in 1972 were more than 50% higher than in 1971. The combined output of refined zinc from Risdon, Cockle Creek, and Port Pirie during 1972 was about 15% higher than the 1971 output.

Mine production at Broken Hill increased sharply above the 1971 level. A feature of the production recorded by the three major mines—Zinc Corp. Ltd., New Broken Hill Consolidated Ltd., and North Broken Hill Ltd., was the greater percentage increase in zinc content than in the lead content of concentrates. In April, Broken Hill South Ltd. announced that its loss on operations from the last half of 1971 had persisted into 1972. A review of all aspects of operations at the South mine showed that the remaining ore does not have the potential for returning the mine to a profitable operation. Subsequently, the South mine was closed in July, after 87 years of operation. The treatment of residue dump material was continued until the end of 1972.

Electrolytic Zinc Co. of Australasia Ltd. (EZ) produced 175,240 tons of slab zinc for the year ending June 30, 1972, an increase of 8% over that of 1971. Part of the zinc output throughout the year was produced under a toll contract for zinc concentrate treatment for another producer. The rate of production rose steadily following the commissioning of the new residue treatment plant and No. 6 cell unit early in the year. Increased output of ore during the year resulted from the additional rock hoisting capacity which became available when the Rosebery No. 2 Main Shaft commenced operation in October 1971. Ore delivered to the concentrating mill was about doubled. The average grade of ore milled in 1972 was 17.4% zinc, 5.8% lead, 0.8% copper, 6.6 ounces silver per ton, and 0.14 ounce gold per ton.

Mount Isa Mines treated 2.0 million tons of silver-lead-zinc ore in the year ending June 30, 1972, yielding 9.1 million ounces of silver, 121,058 tons of lead, and 90,973 tons of zinc, compared with 13.3 million ounces of silver, 130,368 tons of lead, and 88,280 tons of zinc in 1971. Ore reserves of silver-lead-zinc in the Mount Isa and Hilton Mines remained at 56.0 and 35.6 million tons, respectively. Mount Isa Holdings Ltd. commissioned a new $1.4 million mineral dressing pilot plant, a highly flexible unit capable of handling any type of ore at a rate of 1 ton per hour.

The Zinc Corp. Ltd. and New Broken Hill Consolidated Ltd., subsidiaries of New Broken Hill Consolidated Holdings Ltd., operated adjoining lead, zinc, and silver mines at Broken Hill. The Zinc Corp. milled 826,000 tons of lead-zinc-silver ore in 1972 and recovered 87,000 tons of lead and 80,000 tons of zinc in concentrates, compared with 829,000 tons of ore, 79,000 tons of zinc, and 86,000 tons of lead in 1971. New Broken Hill Consolidated milled

1,124,000 tons of ore in 1972 and recovered in concentrates 84,000 tons of lead and 142,000 tons of zinc, compared with 1,096,000 tons of ore, 84,000 tons of lead, and 142,000 tons of zinc in 1971. The marginal increase in total ore production in 1972 was due mainly to the absence of industrial stoppages during the year. The average grades of ore mined at both mines were slightly higher than in 1971.

The principal producing companies and quantites recovered in concentrates and other mine products in recent years were as follows, in metric tons:

Mine	1969		1970		1971	
	Lead	Zinc	Lead	Zinc	Lead	Zinc
North Broken Hill Ltd	71,529	60,568	66,234	48,524	64,837	49,451
Broken Hill South Ltd	24,141	27,501	25,733	29,012	17,791	13,408
The Zinc Corp. Ltd	101,252	81,509	95,245	78,120	86,105	79,152
New Broken Hill Consolidated Ltd	84,671	170,403	81,742	148,374	84,248	142,269
Mount Isa Mines Ltd	150,090	105,682	142,744	92,694	115,987	90,982
Electrolytic Zinc Co. of Australasia Ltd. (Read-Rosebery)	15,144	51,010	14,982	49,872	18,864	64,172

Manganese.—In 1972, mine production of manganese ore increased 15% above that of 1971. Most of the production gain was attributed to a full year of operation by Groote Eylandt Mining Co. Pty. Ltd. (subsidiary of BHP) in the Northern Territory. BHP supplied 80% of the total domestic output. Both production and shipments of manganese ore from Groote Eylandt increased to record levels. The increase in output was made possible by the commissioning of major new production facilities comprising a new ore concentrator, and associated mining, ore handling, and stockpiling facilities. Ancillary facilities including an additional power-generating plant, workshops, stores, housing, and township amenities were also completed. Shipments totaled 889,000 tons, of which 713,000 tons were exported. Japan received about 80% of the exports in 1972 and most of the remainder went to the United States and Europe. Production from the Tasmanian Electro Metallurgical Co. Pty. Ltd. plant at Bell Bay totaled 67,000 tons, made up of 43,000 tons of high carbon ferromanganese and 24,000 tons of silicomanganese.

The mining firm of Hancock and Wright was considering the possibility of setting up a manganese dioxide plant at Bunbury in Western Australia. The firm has a patented process to produce high-grade manganese dioxide and ferric hydroxide. This process would use low-grade manganese ore from the Pilbara region and the iron sulfate in the effluent from the Laporte titanium plant at Bunbury. The company expects to produce battery-grade (70%) manganese dioxide. Initial production from the Ripon Hill deposit in Western Australia is still planned for 1974.

Nickel.—Three companies produced nickel ore in Australia, with the largest mine operated by Western Mining Corp. Ltd. (WMC). In 1972, the Kambalda mines operated by WMC treated 1,074,000 tons of ore and produced 274,000 tons of concentrate containing 35,781 tons of nickel. Improvements in milling practice resulted in an increase in the grade of concentrates from 11.5% to cover 13% nickel towards the end of the year. Ore reserves, as of June 1972, were estimated at 22.3 million tons averaging 3.29% nickel. This represents a net increase of some 1.7 million tons for the year after allowing for production of approximately 1 million tons. Construction of the Kalgoorlie nickel smelter continued on schedule. The smelter is due to be commissioned early in 1973, with an initial input capacity of 200,000 tons of concentrate per year.

Great Boulder Mines Ltd. (in a joint venture with North Kalgurli) produced 136,000 tons of nickel ore from its Scotia mine in Western Australia. These concentrates containing 2,688 tons of nickel were sold to WMC. Development work at the Carr Boyd mine 50 miles north of Kalgoorlie continued. A special lot of 7,500 tons of ore was treated and the concentrates were sold, but full-scale production from the mine will depend on sale contracts being obtained.

Selcast Exploration Ltd.'s feasibility study on its nickel deposit at Agnew in Western Australia will be completed about mid-1973. Among other things, the study also includes the possibility of building a

refinery. Recent exploration results by Selcast indicate that the Agnew is the largest single deposit of medium to high-grade nickel ore known in Australia. Ore reserves have been more than doubled to 33 million tons averaging 2% nickel. Drilling continued, and samples were being sent to the United States and Europe for metallurgical testing. Reserves are sufficient to justify a mining operation but no decision will be made until the feasibility study has been completed.

During 1972, Poseidon N.L. signed an agreement for the sale of its total output of nickel concentrate from the Mount Windara mine, for a period of 5 years commencing in 1974. The agreement is the first made by a Western Australia nickel producer in 2 years. Under terms of the agreement signed with WMC and Sherritt Gordon Mines Ltd., each company will purchase half of the projected output of 11,000 tons of contained nickel per year from the mine. Ore production will be at the rate of 700,000 tons per year, which will be treated at a mill to be erected at Mount Windara. Concentrates will be transported to the WMC smelter near Kalgoorlie. Reserves at Mount Windara and the adjoining South Windara deposits are estimated at 8.9 million tons averaging 1.81% nickel. At the proposed rate of mining, these reserves are sufficient to ensure a life of 13 years for the mine.

Development work on the Greenvale open pit lateritic deposit by Metals Exploration N.L. and Freeport Sulphur Co. continued on schedule. Greenvale's main ore body of high-grade nickel laterite is situated 140 miles west of Townsville on the coast in Northern Queensland. Ore reserves of 40 million tons average 1.5% nickel and 0.12% cobalt. The major output will be exported to countries throughout Western Europe when it reaches production late in 1974. All contracts have been written for the life of the mine, which is expected to last more than 20 years.

Silver.—In 1972, mine production of silver recovered as a coproduct or byproduct of lead-copper, and zinc ores decreased slightly from 21.8 to 21.4 million ounces. The decline was mainly due to a slowdown in production at Mount Isa, where silver-lead-zinc ore treated decreased about 106,000 tons. Higher production rates by the three major silver producers failed to offset the decline at Mount Isa. According to data compiled for 1971. Queensland and New South Wales each accounted for 45% of the total Australian output of silver, Tasmania contributed 9%, and two other states accounted for the remaining 1%. About 86% of the silver output was recovered in lead-silver bullion from smelting lead concentrates. Zinc and copper concentrates contained 8% and 5%, respectively, and other mine products (including gold bullion) 1% of the total. Principal producers of silver and their output during 1970 and 1971 were as follows:

Company	Quantity (thousand troy ounces) 1970	1971
North Broken Hill Ltd	2,334	3,394
Broken Hill South Ltd	1,269	1,122
Zinc Corp. Ltd	1,935	2,122
New Broken Hill Consolidated Ltd.	1,276	1,993
Mount Isa Mines Ltd	13,880	8,224
Electrolytic Zinc Co. of Australasia Ltd	906	1,560

Australian refineries reported production of 8,354,000 ounces of silver in 1972, compared with 8,429,000 ounces the preceding year. In 1972, Broken Hill Associated Smelters Pty. Ltd. at Port Pirie recovered 7.2 million ounces of silver from lead concentrates produced by Broken Hill mines. The copper refinery of the Electrolytic Refining and Smelting Co. of Australia at Port Kembla produced about 0.7 million ounces of silver in 1972. The silver was contained in copper concentrates from Cobar and Mount Lyell and in slimes from the electrolytic copper refinery at Townsville. The Royal Mint in Perth produced 0.3 million ounces of refined silver in 1972, about one-third of which was derived from bullion of domestic origin. The remainder was derived from jewelry and bullion of overseas origin.

Exports of silver in lead bullion and concentrates, and all other products in 1971 were about 8.6 million ounces.

Tin.—Australian tin production, continuing the rising trend since 1963, increased sharply to 11,800 long tons in 1972, the greatest annual output since 1907. The spectacular increase in Australian tin production is a direct result of long-term expansion programs undertaken by the three major hard-rock producers, Renison Ltd. and Cleveland Tin N.L. in Tasmania and Ardlethan Tin N.L. in New South

Wales. Output from these mines increased progressively throughout 1972, and by the latter part of the year, combined production had been increased to an annual rate of 8,800 tons. Australia's other significant tin producers include Aberfoyle Tin Co. N.L. (Tasmania), Gibsonvale Alluvials N.L. (New South Wales), Greenbushes Tin N.L. (Western Australia), and Ravenshoe Tin Dredging Ltd. and Tableland Tin Dredging N.L. located in Queensland.

Renison, the largest producer, increased its ore reserves to 7.1 million long tons with an estimated tin content of 1.5%. Aberfoyle, Ardlethan, and Cleveland collectively reported a mid-year total of 7.8 million tons of ore reserves. The input capacity of Associated Tin Smelting Pty. Ltd. smelter at Alexandria, New South Wales, was increased by 50% to 15,000 long tons of concentrates. The expansion was part of a 5-year plan to keep pace with increasing mine production and to produce more metal within the country. In addition, about 900 tons of secondary tin was recovered from the treatment of tinplate scrap by M & T Chemicals (Australia) Pty. Ltd., Unanderra, New South Wales, and Albert G. Sims, Melbourne, Victoria. Principal producers of tin concentrates and quantities of contained tin produced in 1970 and 1971 were as follows:

Company	Quantity (long tons) 1970	1971
Aberfoyle Tin Co. N.L.	433	480
Ardlethan Tin N.L.	1,022	1,318
Cleveland Tin N.L.	1,580	1,814
Cooglegong Tin Pty. Ltd	72	98
Gibsonvale Alluvials N.L.	212	394
Greenbushes Tin N.L.	240	317
J. A. Johnson & Sons Pty. Ltd.	76	80
Pilbara Tin Pty. Ltd.	226	256
Ravenshoe Tin Dredging Ltd.	438	465
Rension Ltd.	4,723	5,231
Storeys Creek Tin Mining Co. N.L.	104	120
Tableland Tin Dredging N.L.	387	452
Tullabong Tin Ltd.	222	238

Domestic consumption of primary tin, mainly for the manufacture of tinplate, amounted to about 32,500 long tons. Exports of tin in 1972 included 2,122 tons of refined metal and 4,531 tons in concentrates.

Titanium Concentrates.—The market for titanium minerals, particularly rutile, was rather weak throughout the year, with a firming trend noticeable near yearend. Production of rutile declined to 317,424 tons in 1972, from 374,705 tons in 1971. Ilmenite concentrate production decreased to 708,808 tons, compared with 800,945 tons in 1971. Byproduct zircon production decreased to 360,192 tons compared with 412,947 tons in 1971. Moderate demand for the concentrates and revaluation of both the Australian and U.S. currencies combined to make 1972 a year of lower profits and two actual failures.

Litigation concerning the Eneabba claims continued during the year. It seemed clear, however, that in any case Allied Minerals N.L. would control enough of the deposit to proceed with development. About midyear, the 55% interest which had been held by A. V. Jennings Industries (Australia) Ltd. was relinquished; Allied Minerals, backed by Westralian Oil N.L., sought a new partner, which shortly was announced as Du Pont (Australia) Ltd. Du Pont's initial investment was $2.22 million, plus the cost of a pilot plant operation, in return for a 25% interest in the joint venture.

The plant of Coastal Rutile Ltd. of Queensland was purchased from the receiver for $144,000, was moved to Eneabba, and was reerected. Its capacity there will be 7,000 tons of rutile and 28,000 tons of ilmenite annually. If the operation is successful, six additional units of similar capacity will be erected. No metallurgical difficulties are foreseen, except that the heavy minerals are coated with a siliceous clay.

At yearend the new venture was christened Allied Eneabba Pty. Ltd. E. I. du Pont de Nemours & Co. Inc., contracted for delivery of 200,000 tons of ilmenite per year to its chloride-process pigment plants.

In addition to Coastal Rutile, Naracoopa Rutile Ltd. was also placed in receivership, and its rutile-zircon operations on King Island, Tasmania, sold to Buka Minerals Ltd. The new management expects to begin operations early in 1973 at a rate of 10,000 tons of rutile and 5,000 tons of zircon per year. Operations were also suspended at the Matthew Flinders rutile-zircon operation near Yamba, New South Wales, by the Dillingham Mining Co.

A joint venture of Mining Corp. of Australia and Kamilaroi Mines Ltd. is drilling sands at Jurien Bay, near Eneabba, to delineate a rutile-zircon-ilmenite body. Late in the year it was announced that enough reserves had been measured to support an-

nual production of up to 25,000 tons of rutile, 30,000 tons of zircon, and 130,000 tons of ilmenite.

Cudgen R.Z. and its subsidiary, Consolidated Rutile, are considering integration of operations and of financial arrangements. Such a merger would make the resulting company Australia's third largest producer of rutile and zircon.

Interest in processes to convert ilmenite to rutile remained high. Western Titanium N.L. was reportedly proceeding with construction of a $7.30-million plant at Bunbury, Western Australia, which will have initial capacity of 30,000 tons per year. Target date for full operation is late in 1974 or early in 1975. Expansion to a 100,000 ton-per-year capacity is contemplated. Western Titanium continued shipping products from its pilot plant during the year.

NONMETALS

Phosphate Rock.—Australia's production of phosphate rock remained negligible compared with domestic requirements. In 1972 domestic production of 10,000 tons was again confined to South Australia. Broken Hill South was making plans to start production from a deposit in Northwest Queensland in the late 1970's. If this operation goes ahead as planned, Australia could become self-sufficient in phosphate.

A number of companies were active in the search for phosphate in Queensland, including the International Minerals and Chemical Development Corp. of the U.S., Continental Oil Co. of Australia Ltd., and Mobil Oil. International Minerals and Chemical tested a deposit at Yelvertoft, Queensland, containing 500 million tons of medium grade ore. The most accessible deposits were discovered at Cooktown on the eastern coast of Cape York Peninsula.

Imports of phosphate rock were 2.6 million tons, most of which came from Nauru and Ocean Islands in the Pacific, Christmas Island in the Indian Ocean, and to a lesser extent, from the United States and Africa.

Salt.—An increase in salt production took place in 1972, as production was recorded from a number of recently established solar evaporation plants in Western Australia. Australia's salt industry produced around 4 million tons in 1972. All domestic salt production came from solar evaporating pans and dry-salt lakes.

Western Australia with an estimated production of about 2.2 million tons remained the chief source of supply in 1972. The combined production of Dampier Salt Ltd. and Leslie Salt Co. accounted for about two-thirds of the total Western Australian output. Capacity of Dampier company's 28,000-acre solar saltfield at Dampier is now estimated at 3.5 million tons per year. The original capacity of the Dampier operation was 850,000 tons per year when the project came onstream in 1971. The increased capacity was mainly due to four factors: (1) The salt content of sea water entering the field was 12% higher than expected; (2) a higher rate of water evaporation; (3) improved operating techniques in the salt-washing plant; and (4) the loss of saturated brine through the floor of the field was less than expected. Leslie Salt achieved full production capacity and shipped in excess of 1.0 million tons in 1972. Within the next 2 to 3 years, shipments will exceed 2.0 million tons per year. Small production rates were reported by Lefroy Salt Pty. Ltd., Ferada Mines Pty. Ltd., and Shark Bay Gypsum Pty. Ltd.

South Australia remained the second largest salt-producing state. The principal producer, Imperial Chemical Industries of Australia and New Zealand Ltd. (I.C.I.A.N.Z.) reported that salt production at the company's saltfields at Dry Creek amounted to 450,000 tons in 1972. At Whyalla, South Australia, BHP reported that production of salt by solar evaporation amounted to 70,000 tons. Other principal producing centers were Price, Stenhouse Bay, Lake Fowler, and Lake MacDonnell. The bulk of Queensland's 1972 production was from Central Queensland Salt Industries Ltd. and I.C.I.A.N.Z. (250,000 tons), both at Bajoal near Rockhampton. The principal salt producer in Victoria was Cheetham Salt Ltd. which operates solar evaporating pans near Laverton on Port Phillip Bay and at Lara and Geelong on Corio Bay.

Apparent domestic consumption of Salt by manufacturers of industrial chemicals and by refineries was estimated at 1.2 million tons in 1970 and 2 million tons in 1971.

Sulfur.—Imports of elemental sulfur, principally from Canada and the United

States, declined for the fourth consecutive year, from the record high level of 557,340 tons in 1968 to about 250,000 tons in 1972. Imports totaled 320,151 tons in 1970 and 264,286 tons in 1971. Although there are no known commercial deposits of native sulfur, three oil companies operate sulfur recovery units with a combined capacity of 70 tons of elemental sulfur per day. A small quantity is also recovered from indigenous pyrite and base metal sulfide ores.

In 1972 there were four companies in Australia that produced pyrites for use in the manufacture of sulfuric acid: Mount Lyell, in Tasmania (obtained as a byproduct of base metal operations); Nairne Pyrites in South Australia (obtained by direct pyrites mining); Gold Mines of Kalgoorlie in Western Australia (byproduct of gold mining); and Electrolytic Zinc Co. of Australasia, Ltd. (EZ) in Tasmania. EZ produced 51,558 tons of sulfur in 1972 compared with 18,193 tons in 1971. The quantity of sulfuric acid produced by EZ in 1972 was 223,219 tons. Total production of pyrites in 1972 was about 260,000 tons.

A large quantity of sulfur was contained in base-metal concentrates, particularly zinc concentrates exported from Australia. In 1971 the sulfur content of zinc concentrates exported was about 170,000 tons, of which 140,000 tons was recoverable.

Australian plants produced 1,673,000 tons of sulfuric acid in 1972, compared with 1,575,000 tons in the preceding year. Of the 1972 total, about 63% was made from elemental sulfur, 10% from pyrites, 25% from zinc and lead concentrates, and the remaining 2% from other materials.

Domestic consumption of sulfuric acid in 1971 totaled 1,600,000 tons, of which 73% was used in the manufacture of superphosphate fertilizers, 3% in ammonium sulfate, 21% in general chemicals, and the remaining 3% in mining and metallurgy.

MINERAL FUELS

Coal.—*Black Coal.*—The spectacular growth of Australia's coal industry continued through 1972 as output reached a record high of about 83.3 million tons, 16 more than in 1971. Production of black coal in New South Wales and Queensland during 1972 increased by 18% to 52 million tons compared with output of 44 million tons for 1971. Output from New South Wales increased by 14% to 39 million tons, the result of a 5% increase in production from underground mines and a 149% increase in open cut output. Production in Queensland increased by 18%, to 13 million tons, from 11 million tons in 1971. The major part of the increase in Queensland output resulted from the Goonyella open cut mine which commenced production in mid-1971. The two states accounted for 90% of the total black coal production. Mines in South Australia, Western Australia, and Tasmania produced a total of 6.7 million tons, most of which was consumed locally. There were 84 mines in New South Wales on December 30, 1972, as compared with 88 mines on December 30, 1971, with a total employment of 14,733. Over 99.9% of all coal recovered from New South Wales Underground mines was mechanically loaded.

Utah Development Co. announced in June on behalf of Central Queensland Coal Associates (85% Utah Development Co. and 15% Mitsubishi Development Pty. Ltd.) that new long-term contracts had been concluded with Japanese, French, the Netherlands, British, and Italian buyers for the sale of major quantities of coking coal over a 10-year period. Large-scale deliveries are to begin in 1974. Total deliveries under these contracts range from a minimum of approximately 34 million tons to a maximum of 52 million tons. The annual delivery levels will depend on future price agreement for optional tonnages. Part of the coal required will be produced from the new Peak Downs mine and the remainder will be supplied from a new mine to be brought into operation in 1974 at Saraji, located near the existing Peak Downs mine. The total cost of the Saraji mine is estimated at $140 million, thus making the total investment by Utah Development and Mitsubishi Development in the Bowen Basin in excess of $350 million. The development of the Saraji mine will result in an extension of port facilities at Hay Point, an additional railway line connecting to the existing Peak Downs line, and a new town. Shipments of Saraji coal are reportedly planned at 3.5 million tons in the first year of operation and between 4 and 5 million tons per year thereafter.

It was announced in August by Thiess-Peabody-Mitsui Coal Pty. Ltd. that exploration in the Nebo area, Queensland, has shown that measured reserves of both steam and coking coal to a depth of 1,000

feet was greater than 1,000 million tons. Studies have been carried out on the feasibility of developing three mines at an estimated cost of $250 million in the area.

Black coal reserves are estimated at around 25.1 billion metric tons, consisting of approximately 12.2 billion tons in Queensland; 12.1 billion tons in New South Wales; and the remaining 0.8 billion tons in Victoria, Tasmania, South Australia, and Western Australia. About 15.7 billion tons of the reserves consist of coking coal. The Joint Coal Board reported output in leading producing states as follows:

Table 5.—Production of black coal

(Thousand metric tons)

State	1969	1970	1971
Queensland	8,635	9,964	16,086
New South Wales	33,973	35,433	36,380
Tasmania	117	112	140
South Australia	2,245	1,827	3,025
Western Australia	1,107	1,198	3,052
Total	46,077	48,534	58,683

Domestic consumption of black coal in recent years was as follows:

Industry	Quantity (thousand metric tons)		
	1969	1970 r	1971
Iron and steel	7,782	7,956	7,533
Electricity	12,578	12,512	13,677
Railways	370	130	74
Town gas	702	384	246
Cement	899	790	779
Metallurgical coke	493	541	433
Other (including bunkers)	2,469	2,261	2,356
Total	25,293	24,574	25,098

r Revised.

Brown Coal (Lignite).—Production of brown coal in 1972 increased by 1% over that of 1971, to 23.7 million tons. Victoria was the only state in Australia where brown coal was produced. Substantial deposits are known in South Australia but are regarded as uneconomical under current conditions. The major deposits in Victoria are in the Latrobe Valley, 40 to 80 miles southeast of Melbourne, where operations of the State Electricity Commission (SEC) at Yallourn and Morwell were responsible for about 98% of the state's total production. Smaller quantities were produced from privately owned mines at Anglesea and Bacchus Marsh.

Alcoa operated the open cut mine at Anglesea, 60 miles southwest of Melbourne to provide fuel for its powerstation. Most of the electricity required by the Point Henry aluminum smelter is supplied from the powerstation. Maddingley Brown Coal Co. conducted the coal mining operations at Bacchus Marsh.

Because brown coal deteriorates rapidly and is subject to spontaneous combustion under stockpile conditions, virtually the entire mine production was consumed locally. The use pattern showed that 75% of the total was used to generate electric power, 20% to manufacture briquets (one-fourth of which was used in power generation), and about 5% as factory fuel.

The Yallourn Briquette Works produced about 260,000 tons of briquets from 1,085,000 tons of raw coal from the Yallourn open cut mine. Output from the Morwell briquet works was 1,283,300 tons from 3,390,000 tons of coal supplied from the Yallourn mine.

Petroleum and Natural Gas.—Domestic production of crude oil and natural gas continued to rise in 1972 along with an increase in demand. Crude oil production totaled 120 million barrels in 1972 (327,000 barrels per day), which was 6% above the 1971 output. The quantity of natural gas sold to consumers in 1972 was 113 billion cubic feet, an increase of 30% compared with that of 1971. The increased production of oil and gas was due mainly to the expanded output from the Gippsland Basin fields by BHP and Esso Exploration and Production. A full year of operation at the Kingfish field in the Bass Strait was also a contributing factor to the increased natural gas production. The total crude oil production by Esso-BHP from the Gippsland Basin fields amounted to 107 million barrels, an average production rate of 292,000 barrels per day. Of this production, 2 million barrels were produced from the Barracouta field, 57 million barrels from Halibut, and 47 million barrels from Kingfish.

Oil was also produced at the Barrow Island field in Western Australia by Western Australian Petroleum Pty. Ltd. (WAPET). The average rate of crude oil produced throughout the year was approximately 44,000 barrels per day, down slightly from 1971. A steady decline in production rate is expected to occur over the remaining life of the field. In Queensland, two oil-

fields, Moonie and Alton, produced a combined total of 2,300 barrels daily.

In addition to oil output, gas was produced at the Barracouta and Marlin fields in Victoria, the Barrow and Dangara fields in Western Australia, the Roma district, Queensland, and the Gidgealpa and Moomba fields in South Australia.

The current national reserves of crude oil as of December 31, 1972, were estimated at 1,550 million barrels compared with 1,850 million barrels at yearend 1971. National gas reserves stood at 37,700 billion cubic feet on December 31, 1972, more than twice the 13,800 billion cubic feet reported at yearend 1971.

Expenditures on petroleum exploration, development, and production in 1971 totaled $163 million. Private enterprise contributed $155 million, and Commonwealth and State Governments $8 million. Western Australia and Victoria used 21% and 18%, respectively, of the total private expenditure on offshore exploratory development. The footage drilled for petroleum exploration in 1972 was 971,387 feet, approximately 28% above the 1971 figure. The most significant features of the increase were as follows: A 45% increase in drilling in Western Australia; a 40% increase in South Australia; and a 741% increase in Tasmania. The distribution between onshore and offshore categories varied slightly with offshore drilling accounting for 466,025 feet (48%) in 1972 compared with 348,796 (46%) in 1971.

Despite a 2.9% decline in sales of fuel oil in 1971–72, the first decrease recorded since 1957–58, total consumption of petroleum products rose 4.9% compared with 3.5% in the previous year. The percentage increases in sales of motor spirit, heating oil, automotive distillate, industrial diesel fuel and liquefied petroleum gas were all higher in 1971–72 than in the preceding year. In contrast to a rise of 3.4% in 1970–71, refinery production of petroleum products increased only 2.3% in 1971–72. The percentage increase was significantly higher in motor spirit, aviation turbine fuel, heating oil, and solvents. Offsetting this, however, was a sharp drop in fuel oil production.

Exports of petroleum in 1972 were valued around $59.2 million, according to figures compiled from preliminary statistics made available by the Commonwealth Bureau of Census and Statistics. In 1971, the value of cargo exports was $55.3 million. The most valuable product exported was mineral lubricating oil, 1.1 million barrels valued at $11.9 million in 1971 compared with 956,000 barrels valued at $10.1 in the previous year. Other main products exported in 1971 were crude oil (4.3 million barrels valued at $8.6 million); motor spirit (1.5 million barrels valued at $6.5 million); automotive distillate (2.8 million barrels valued at $9.1 million); aviation turbine fuel (1.9 million barrels valued at $7.3 million); and fuel oil (1.2 million barrels valued at $2.5 million). The main destinations of exports in 1972 were Singapore, New Zealand, Japan, and the Pacific Islands.