COMMONWEALTH OF AUSTRALIA

Major Developments in the Australian Mineral Industry 1960 - 1970

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The statistics of the Australian mineral industry clearly show the advances made in mineral discovery and development during the last decade. Australia's three major mineral exports and their value in 1969 were iron ore ($230m), coal ($142m), and products of the aluminium industry (about $96m); in 1960 export of coal and the contribution from the aluminium industry were both negligible and exports of iron ore were nil. The value of ex-mine production has risen from $362 million to an estimated $1100m in 1969 and the total value of mineral exports has risen from $158m in 1960 to about $883m in 1969.

Discovery of gas and crude oil, to the extent of shortly producing about 65% of the local demand of crude oil and of supplying gas to three capital cities, discovery of nickel, phosphate rock, additional copper, tin and tungsten, the production of more salt and mineral sands and the refining of rare earths all emphasise the rising importance of mineral development.

This remarkable progress within the last decade has been in large measure the culmination of changes and developments which have been taking place within the mineral industry since the Second World War and it is appropriate that a review of recent developments should seek to identify these major changes and developments albeit they are many and complex.

About the time of the Second World War, and partly because of it, mineral exploration received a number of important new tools, ranging from air photographs to four wheel drive vehicles, geochemistry and improved geophysics. These tools with adaptations and improvements over the last twenty years have been basic to objective regional mapping and subsequent discovery of ore deposits - a rash of discovery well represented in the last decade and one which has clearly shown a change of emphasis in ore discovery from the prospector and the layman before World War II to the scientific exploration team of modern days.

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The tempo of exploration, discovery and development in the 1960's, as in the previous decade, was raised and made more effective by the active participation of foreign mining companies who have provided both risk and development capital to greatly augment that available in Australia. In the 1960's, foreign companies continued to find operations in Australia attractive, for a number of reasons; the continent possessed wide and very prospective areas including many provinces of Precambrian rocks which are host to many of the major ore deposits of the world; stable Government promised security of investment; Federal and State Governments have, in general, induced an environment attractive to mining ventures in a land which, although sparsly populated, provided a relatively skilled labour force and a relatively high rate of saving.

The Commonwealth Government has contributed directly to this favourable environment by subsidy payments in the case of petroleum search and by major contributions to fundamental knowledge in the exploration field by the work of the Bureau of Mineral Resources and by some sections of the Commonwealth Scientific and Industrial Research Organisation; most noteworthy has been the contribution to mineral exploration of regional geological mapping by the B.M.R., in cooperation with the State Geological Surveys, designed to delineate provinces and areas in which private enterprise could apply their money and prospecting techniques with most chance of success.

Less direct assistance to mineral search by the Commonwealth Government includes taxation concessions, which range from deduction for capital expenditure and exempt income in the case of many minerals to deductions allowed to shareholders and exemption of dividends. Mining legislation, mainly controlled by the State, is generally outdated although revisions are in hand; the situation in the 60's has been relieved to some extent by fairly realistic and sympathetic administration by State Governments.

Wiser use of Commonwealth Government controls has also featured in the last decade mainly in the revision of export control of iron ore manganese and uranium and both State and Commonwealth Governments have applied pressure to developing companies to maximise mineral processing in Australia. In general, Government control of development has followed guidelines seeking as much Australian equity and management as feasible, the adoption of good mining practices, opportunities for Aborigines, where these are associated with mining projects and, particularly, maximum mineral processing.

Turning to the record of production itself, statistics for the mineral industry for 1969 are not yet complete but an overall view of increases in mine production in Australia over the 10 year period 1958/68 is given in Table I; additional information on some of the major mineral products - petroleum, iron ore, coal, the aluminium industry, copper and nickel - is provided in following paragraphs.

Petroleum

The ten-year period has seen remarkable changes in the Australian petroleum industry. At the beginning of the decade, Australia had no production of crude oil or natural gas, and all requirements had to be imported. By the end of 1971, it is expected that Australia will be producing about 65% of its requirements of crude oil from six oilfields, two in Queensland, three in Victoria and one in Western Australia. By the end of 1969 three important market centres, Melbourne, Adelaide and Brisbane, were being supplied with natural gas from one offshore field in Victoria, two on land in South Australia and over a dozen small fields in the Roma area of Queensland; at least one more gas field in the Bass Strait may be producing by the end of 1970. Potential crude oil fields have been found in the Northern Territory and Western Australia and potential gas fields have been found in South Australia, Northern Territory and Western Australia. Proven and probable reserves of crude oil and natural gas liquids are currently estimated at 2,000 million barrels and those of natural gas at 14.4 trillion (million million) cubic feet.

Iron Ore

In 1960 the iron ore export embargo which had been in force since 1948 was partially lifted with the idea of encouraging research for iron ore deposits. It was in fact quickly established that Australia had very large reserves of high grade iron ore located mainly in the Pilbara region of W.A. but the potential for exporting iron ore to Japan has induced additional development in Tasmania, S.A. and the N.T. During the decade three pellet plants have come on stream, one each in Tasmania, S.A. and W.A. and the development of a metallised product (Himet) is underway in W.A.

Finance and development including the cost of all of the infrastructure for major projects in the Pilbara region of W.A., were based on long range contracts with Japan which now total 756 million tons of lump iron ore, iron ore fines and iron ore pellets valued at over $6,000 million over periods extending to 1992. The cost of initial development of the major projects, including the Robe River mine now underway, exceeds $700 million.

Coal

During the last decade Australian black coal production increased from 21.9 million tons to 42.5 million tons. All States contain some reserves of black coal but by far the largest reserves are in N.S.W. and Queensland and over the decade production has nearly doubled in N.S.W. and tripled in Queensland. While there has been an increase in the tonnage of steam coal produced, a much greater increase has occurred in the production of coking coal principally for export to Japan. This export trade has been confined to N.S.W. and Queensland and exports have increased during the period from about 1 million tons to some 16 million tons per year. The export market is almost exclusively in coking coal and contract shipments to Japan are expected to reach at least 35 million tons per annum in the early 70's.

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Domestic consumption of coal has increased with the main usage concentrated in electricity generation and in the steel industry. The steady improvement in mechanisation and mine efficiency in the coal industry has held the cost of production down to a level which makes Australian coal competitive with that produced overseas and this has been a major factor in the growth of export markets. Output of black coal per man shift has increased steadily during the decade and the proportion of coal mechanically cut and loaded underground in N.S.W. mines increased to about 70%.

The number of coal mines in operation in N.S.W. during the decade remained fairly static but the situation in Queensland changed dramatically in the second half of the period with the development of large open cut mines in the Bowen Basin.

Aluminium

Discovery of very large reserves of high grade bauxite during the 50's first aroused the interest of some of the world's major aluminium producers. From the Australian point of view overseas participation was desirable for two main reasons - the need to integrate Australian production with the world aluminium industry to facilitate the marketing of local products and the need for foreign capital and expertise in the processing of bauxite and alumina. The fast expansion of smelting capacity in major producing countries led to increasing overseas demand for raw materials with consequent benefits to Australia.

Within thirteen years of the discovery of the Weipa deposits in 1955, additional deposits had been discovered in Western Australia, Northern Territory and Queensland. Measured and indicated reserves are of the order of 4,000 million tons.

The Australian aluminium industry is characterized by complete vertical integration and covers all the major stages in aluminium production and marketing. About 50 per cent of the capital invested is held by overseas interests.

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The Australian aluminium industry has expanded during the last decade at a rate more rapid than any of the other non-ferrous metals - from a capacity of 13,000 tons yearly at the beginning of 1960 to 193,000 tons in late 1969, with an additional 20,000 tons expected by mid-1970.

Copper

Expansion of existing operations and the search for new deposits in the 1960's were needed to meet the growing domestic demand as well as to contribute to growing export markets.

Major developments among the established producers included the completion of a new shaft complex at Mount Isa, Queensland, in 1969 and the increase of that company's ore reserves from 45 million to 75 million tons. At Mount Lyell, Tasmania, the proving of extensive new reserves below the existing open cut and the discovery of new orebodies resulted in reserves being up-graded by over 30 million tons. Other important events during the period were the commencement of operations at Cobar N.S.W. and the proving and development of the Explorer 3 (Warrego) prospect at Tennant Creek in the Northern Territory.

In addition, significant discoveries were announced by exploration companies at Mount Gunson, S.A. and Gunpowder Creek and Mount Oxide, Queensland. Reserves totalling around 30 million tons of copper ore have been reported at the Mons Cupri deposit near Whim Creek, W.A., and a prospect at Kanmantoo in S.A. should be developed for mining in the 1970's. In addition, appreciable new reserves (proved and indicated) have been reported from Cadia, N.S.W., Mount Robyn, Queensland, Burra, S.A. and Warburton Range, W.A., and companies were actively exploring in North Western Queensland, Central and Western New South Wales, Moonta - Wallaroo, S.A., and the Arrino and the Kimberley areas, W.A.

Nickel

In 1960, Australia produced no nickel and all industrial requirements had to be imported; today only four years after the

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initial discovery at Kambalda, there are three separate mining operations established and mine production of nickel in concentrates is more than three times the level of domestic consumption, and continues to rise rapidly. Refined metal is now being produced near Perth, W.A., adding considerably to the value of production and reducing Australia's dependence on overseas supply. Production has increased from 2,061 tons of nickel in concentrates in the second half of 1967 to approximately 10,800 tons in 1969 and should reach about 30,000 in 1971.

Ore reserves disclosed by mining companies at the end of 1969 total about 27 million tons containing about 822,000 tons of nickel and a number of additional prospects have yet to be explored.

Moreover 60 million tons of lateritic nickel ore has been outlined at Wingellina, in W.A. near the border between S.A. and the N.T., and similar lateritic deposits are under investigation at Greenvale and near Rockhampton in northern Queensland. The deposit at Greenvale, totalling 45 million tons averaging 1.5 Ni, has been investigated in detail and will probably become a producer in 1973.

TABLE 1

Ex-mine Value and Quantity of Output - 1958 and 1968

Mine Product	Unit of quantity	1958 Quantity	1958 Value ($'000)	1968 Quantity	1968 Value ($'000)
Antimony ore and cons	ton	1,116	174	243	82
Antimony in mine products	"	1,356	(b)	842	(b)
Asbestos	S.ton	15,568	2,868	896	182
Barite	ton	6,802	66	39,155	412
Bauxite	"	6,909	32	4,876,822	n.a.p.
Beryllium ore	"	247	92	15	6
BeO content	unit	2,900	(b)	178	(b)
Bismuth cons	ton			1,558	2,226
Bismuth content	"			173	(b)
Bismuth cons	cwt	30	4		
Bismuth in mine products	"	21	(b)		
Construction materials	ton	34,882,000	36,994	95,342	94,975
Cadmium in mine products	"	872	(b)	1,355	(b)
Chromite	"	776	10	-	-
Clays -					
Bentonite & bentonitic clay	ton	153	(c)	303	8
Brick clay and shale	"	3,829,263	3,772	6,450	7,032
Damourite	"	482	6	486	5
Fullers Earth	"	120	2	75	1
Kaolin and ball clay	"	37,099	268	59,343	421
Other clays		737,027	1,190	1,330,066	1,724
Coal - black	"	20,441,852	103,316	40,184	188,653
brown	"	11,643,629	10,836	22,971	21,555
Cobalt in mine products	"	71	(b)	212	(b)
Copper ores & cons	"	339,621	29,540	542,406	92,307
Copper Content	"			102,215	(b)
Copper in mine products	"	75,715	(b)	108,779	(b)
Diamonds (industrial)	carat	158	4		
Diatomite	tons	4,240	40	13,185	69
Dolomite	"	138,832	282	312,853	727
Feldspar	"	70,016	64	4,838	42
Fluorspar	"	930	18		

Mine Product	Unit of quantity	1958 Quantity	1958 Value ($'000)	1968 Quantity	1968 Value ($'000)
Garnet Cons.	tons			88	1
Glauconite	"	112	10		
Gemstones					
Opal	Value		432	-	5,745
Sapphire	"		4	-	673
Others	"			-	158
Gold ore & cons	"	1,855	108		
Gold other forms	ozs	n.a.	32,394		
Gold Bullion etc.	"			959,492	24,358
Gold in mine products	"	1,103,980	(b)	787,310	(b)
Gypsum	tons	504,938	1,312	845,845	2,129
Ilmenite Cons	"	69,948	562	551,499	4,444
Iron ore	tons	3,925,524	8,786	25,929	132,074
Iron oxide		8,982	50	63,093	593
Lead ore & cons	tons	522,392	44,986	670,809	89,692
Lead content	"			371,449	(b)
Lead in mine products	"	328,347	(b)	382,777	(b)
Leucoxene cons	"			1,607	70
Limestone	'000 tons	5,325,000	7,348	8,697	12,108
Lithium ores	ton			735	11
LiO_2 content	unit			3,112	(b)
Magnesite	ton	69,391	570	22,349	223
Manganese ore	"	59,683	920	734,085	11,680
Mica - block	lb	31,391	90		
scrap	"	84,336	4		
Mineral pigments		283	4	526	8
Molybdenite cons.	cwt	90	6	22,539	n.a.p.
Monazite cons	ton	454	54	2,042	230
Nickel cons	"			36,699	n.a.p.
Nickel content	"			4,573	(b)
Osmiridium (native)	oz	42	8		
Pebbles for grinding	"	970	18	1,321	23
Perlite	ton	300	(c)	996	2
Petalite	"	68	(c)		

Mine Product	Unit of quantity	1958 Quantity	1958 Value ($'000)	1968 Quantity	1968 Value ($'000)
Petroleum					
Crude Oil	'000 bbls			13,877	39,198
Natural gas	'000 c.ft.			215,805	124
Natural gas condensate	gal			n.a.	n.a.
Phosphate Rock	ton	7,421	32	5,744	23
Platinum cons.	oz	28	(c)		
Pyrite cons.	ton	226,744	2,224	162,595	n.a.p.
Sulphur in mine products	"	321,551	(b)	348,653	(b)
Rutile cons	"	83,328	9,048	288,936	21,463
Salt	"	(e) 429,000	(e) 1,756	936,748	3,578
Serpentine	"	965	2		
Silica (glass, chemical, etc)	"	166,988	348	541,207	1,255
Sillimanite	"	1,696	22	2,108	47
Silver in mine products	'000 f.oz.	16,304,570	(b)	21,415	(b)
Slate (filler)	ton	15	(c)		
Talc	"	15,660	252	38,448	659
Tantalite-columbite cons	lb	13,507	18	238,134	310
Tin cons	ton	3,128	3,478	10,595	17,633
Tin content	"	2,237	(b)	6,650	(b)
Tungsten cons -					
Sheelite cons	"	733	n.a.	1,465	n.a.p.
WO_3 content	unit	478	(b)	105,432	(b)
Wolfram cons	ton	517	1,742(d)	546	(d) 5,744
WO_3 content	unit	372	(b)	38,951	(b)
Zinc ores and cons	ton	503,752	5,130	721,011	30,055
Zinc content	"	263,044	(b)	378,043	(b)
Zinc in mine products	"			415,717	(b)
Zircon cons	"	59,269	974	297,282	11,224
Total Value			311,910		855,392

Value in Australian dollars.

(b) included in value of mineral in which contained

(c) less than $1000

(d) includes value of scheelite cons

(e) estimated

n.a.p. not available for publication