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Lightweight high-voltage power lines are inspected in Oregon, USA.(Top). Bauxite mining by Kaiser Aluminum in Jamaica. (Bottom).

COMMODITY REPORT

Structural changes in the world aluminium industry – the implications for Australia

By Ann Hodgkinson

The following paper reviews the past and current beheviour of the leading aluminium companies, and especially the role that they have given to Australia in their new global strategies.

It also outlines the implications for Australia of the planned developments in the industry.

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The 1970s have been a period of world-wide economic changes, during which many international industries have been forced to make fundamental changes to their corporate strategies. The aluminium industry stands out as one where these developments have involved basic changes in decisions regarding pricing, investment and global location. The aluminium industry is one of the few where Australia has an important role in the new strategy.

In order to understand what these new developments mean for the Australian economy, it is essential to view the domestic changes within their broader international context. This paper reviews the past and current behaviour of those companies which are now proposing to establish aluminium smelters in Australia. It also outlines the implications for Australia of the planned developments in the industry.

BACKGROUND TO THE WORLD ALUMINIUM INDUSTRY

Aluminium is an example of a world industry in which facilities relating to the four stages of production; mining, refining, smelting, and fabrication; are found throughout the world but are linked into an integrated global enterprise through the activities of the large multi-national aluminium companies.

The industry is dominated by six major companies: *Alcoa, Reynolds,* and *Kaiser* of the United States; *Alcan* of Canada; *Pechiney* of France; and *Alusuisse* of Switzerland. Because of their sheer size and the far reaching nature of their interests, the 'six sisters' are able to dominate and control activity in the world industry. As different input requirements apply in each of the stages of production, the facilities are often located in clusters within those countries which are able to supply the specialized inputs in both adequate quantity and at low cost. Thus, although the industry is world-wide, it is more important to some countries than others, and, in some cases, the economies of these countries may become quite dependent on their share of the industry.

Bauxite

The location of bauxite mining depends on two factors: the natural occurences of good quality bauxite, and the commercial viability of mining it. In turn, commercial viability depends on factors such as infrastructure costs of opening new mines in remote locations, the level of royalty and/or export levy, transport costs to the alumina refinery, political stability and the attitudes of the host government to the undertaking.

The establishment of the *International Bauxite Association (IBA)* in 1974 was a reaction to economic problems in the main bauxite producing countries. Despite expansions in their mining and alumina capacity, all were experiencing declining tax revenues and rising unemployment. In addition, recent oil price rises had meant increasing import bills. OPEC served both as a catalyst and a model for the IBA.

The IBA had three main strategies:

- Firstly, it aimed to fix the return on bauxite at 7–5 per cent of the international ingot price of aluminium (to be increased to 8.5 per cent in 1976).[1] This was to be achieved by increased export levy and royalty charges. For example, in 1974, increases raised Guyana's tax on bauxite from 0.68 USD to 11.66 USD per ton, and that of Surinam from 2.50 USD to 11.20 USD per ton.[2] The imputed price of Jamaican bauxite (in 1973 USD, rose from 18.1 USD per tonne in 1973 to 24.4 USD per tonne in 1975.[3]

- Secondly, the IBA attempted to regain national control of bauxite land. Jamaica bought back a 51 per cent interest in alienated lands, while Guyana nationalized the mines and other interests held by Alcan and Reynolds.

- Thirdly, the nations set up jointly-owned aluminium plants using resources, including oil and gas, from different Third World countries.

The producer companies countered the IBA with more than rhetoric and legal action. One of the more tangible responses of the producer companies involved the cutting back and the shutting down of refineries in Jamaica and other activist IBA countries, paralleled by the search for alternative sources of supply in 'lukewarm' or non-involved countries. The search for alternatives to bauxite has not proved viable, however, companies in Australia, Guinea and Brazil expanded bauxite mining at the same time that output from Jamaica, Guyana and Surinam declined or remained static, as shown in Table 1.

Australia's membership in the IBA was little more than nominal from the start. Australia insisted on 'fair and reasonable' returns rather than setting minimum prices and argued against any strong OPEC-type pressures on customers. Before entering the IBA, Australia guaranteed its major customer, Japan, that its interests would be protected. In fact, Australia's role was frequently as a negotiator between the IBA and the companies.

Although Australia was a major producer, bauxite did not have the same importance to it as it did for the other producers. Bauxite was the main or only source of export income for many of the other members of the IBA while accounting for only a minor proportion for Australia. Being further from the aluminium smelters, Australia had a much larger freight charge to be added, and this limited its competitiveness. Furthermore, following Britain's entry into the EEC, Australia expected a period of falling agricultural exports, and planned to counter this by expanding mineral sales.

The availability of alternative supplies severely limited the IBA's bargaining strength, with Jamaica being forced to reduce its levy as an inducement for the companies to continue modernizing their facilities there. The original IBA bauxite increases added approximately 40 USD per short ton to the cost of producing aluminium.[4] In 1978 a minimum price of 24 USD per ton for base grade ore was agreed to. The rising price of aluminium in the 1974–1978 period had eroded this to 2.1 per cent of the list price for aluminium.[5] In January 1979, Australia announced it would not observe this minimum price but would rely on income taxes for revenue.[6]

Although Australia is currently the largest country involved in the world bauxite trade, it is expected in future to concentrate on alumina and aluminium production rather than mining bauxite for export. This is because the increasing freight cost involved in shipping bauxite to Europe and North America is making Australia a less attractive supplier of raw materials than Brazil or West Africa. Australia should remain the major supplier of bauxite to refineries in Japan and South-East Asia.[7]

Alumina

The second production stage involves refining the bauxite to alumina. The other major input at this stage is caustic soda. Rising transport costs have led to an in-

Table 1

World bauxite production and reserves (kt)[1]

Country	Mine production					Reserves
	1964	1967	1974	1977	1977	1977
Australia	798	4 263	19 994	26 086	27 583	4 500 000
Guinea	1 655	3 182	7 600	10 841	11 500	8 200 000
Jamaica	7 953	9 416	15 328	11 434	11 574	2 000 000
USSR (e)	4 378	4 480	6 600	6 700	6 700	(a)
Surinam	3 997	5 472	6 853	4 856	4 328	490 000
Greece	1 302	1 695	2 818	2 884	2 816	750 000
Guyana	2 522	2 729	3 606	3 344	3 450	1 000 000
Hungary	1 491	1 647	2 750	2 949	2 976	(a)
France	2 439	2 778	2 950	2 059	1 960	40 000
Yugoslavia	1 296	2 128	2 370	2 044	3 012	(a)
USA	1 630	1 672	1 981	2 013	1 752	40 000
Other market economies	3 162	4 025	8 199	7 671	6 781	6 700 000(b)
Other central economies	–	–	1 558	1 900	2 000	(a)
Total World (e)	**33 314**	**43 477**	**81 805**	**84 792**	**86 441**	**24 670 000**

(a) Total centrally planned economies' reserves estimated at 950 000 kt.
(b) Includes Brazil, reserves estimated at 3 000–4 500 000 kt.
(e) Estimate.

[1] kt = kiloton = 1000 metric tons.

Sources:

Australia, Bureau of Mineral Resources, Geology and Geophysics, *Australian Mineral Industry Annual Review*, 1967, 1977 and 1979, (AGPS, 1969, 1979, 1981).

Australia, Department of Industry and Commerce, *The Aluminium Industry-Supply Potential*, (AGPS, 1979).

creasing tendency to locate the alumina refinery as close as possible to the bauxite mine. This had led to an overall shift in alumina refining from North America and Europe towards the bauxite producing countries, especially if they are stable enough to be commercially viable. The major recipient of this move has been Australia, which has now overtaken the USA as the leading producer of alumina, as shown in Table 2.

The degree of foreign ownership is high in most of the major producer countries. Other than the centrally planned economies, the only ones which domestically own their alumina refineries are USA, Canada and France, which are the home countries of five of the "6 sisters", and Guyana which bought bauxite/alumina facilities from Alcan in 1971, and from Reynolds in 1974.[8] In Japan, domestic companies control the industry except for Alcan's 50 per cent interest in Nippon Light Metal. Australia, Jamaica and Surinam, the major exporters, are characterized by high levels of foreign ownership.

A second characteristic of alumina refining which has influenced location patterns is that the process produces large quantities of a waste product known as 'red mud', which either has to be stored in pits or dumped into a river or the sea. The high caustic soda content of red mud makes it toxic to the nearby environment. Remote locations help reduce the possibility of reaction from environmentalists, and hence reduces the cost of ensuring that wastes are properly stored.[9]

Table 2

World alumina production and degree of foreign equity

Country	Production (kt)				Foreign Equity (%)
	1969	1974	1976	1978	1973
Australia	1 931	4 089	6 206	6 776	72.4
USA	6 278	6 200	5 915	6 166	–
USSR (e)	2 600	2 900	3 350	3 300	–
Jamaica	1 102(a)	2 506	1 648	2 142	100
Japan	1 064	1 987	1 411	1 767	18.3
W Germany	680	922	1 331	1 556	38.7
Surinam	960	1 380	1 040	1 260	100
France	991	1 112	1 013	1 221	–
Other market economies	2 895	3 641	3 400	4 143	
Other central economies (e)	970	1 600	1 967	2 333	
World Total (e)	**19 647**	**26 629**	**27 536**	**30 802**	

(a) Exports
(e) Estimate (there are discrepancies between estimates of individual countries and world totals).

Sources:
Australia, Bureau of Mineral Resources, Geology and Geophysics, *Australian Mineral Industry Annual Review* 1973, 1977 and 1979, (AGPS, 1975, 1977, 1981).

US Department of Interior, Bureau of Mines, *Minerals Year Book*, 1973.

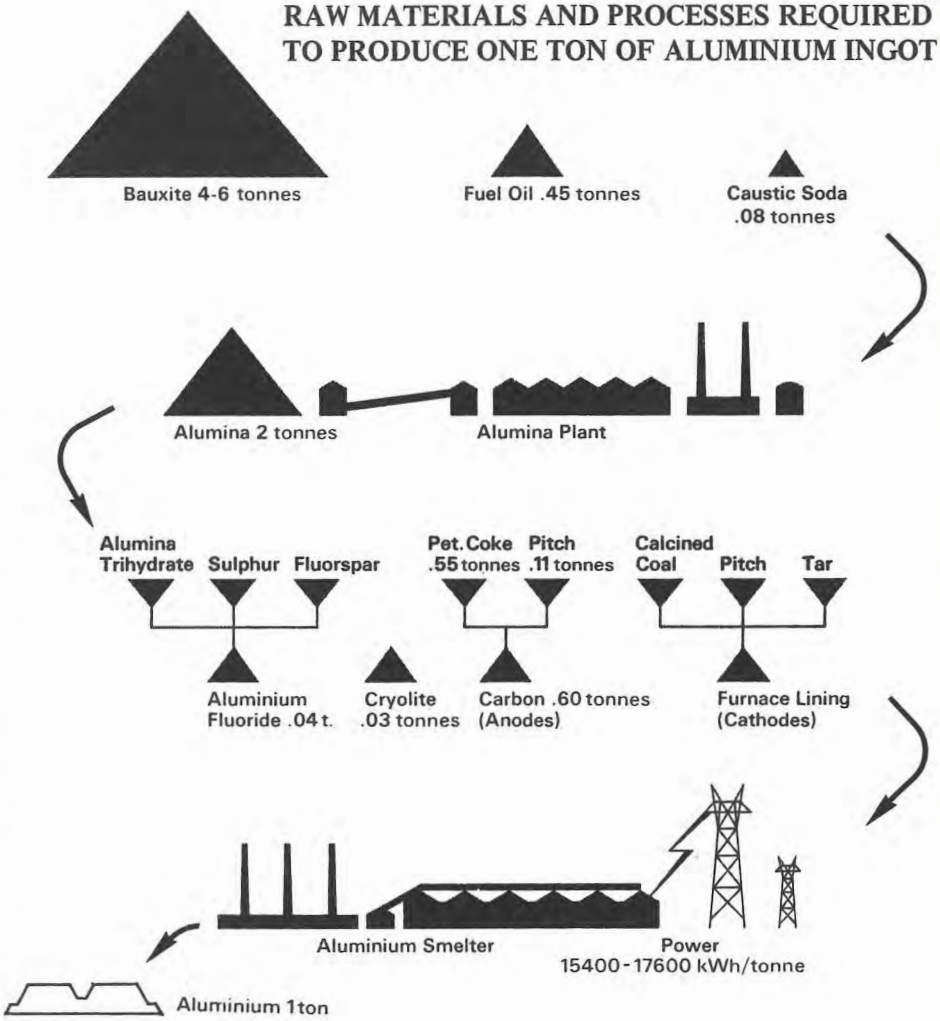
Aluminium

The third stage of production involves smelting the alumina into primary aluminium ingots. A small but growing aspect of this stage is the production of secondary aluminium from reclaimed scrap. The other major input is electric power, which constitutes up to 40 per cent of costs.[10] This stage, which is currently undergoing significant structural change, provides the prime focus of this paper.

In the past, aluminium companies have preferred to locate smelters near their major markets, that is, the USA, Europe and Japan. Within these markets, the prime determinant of location has been access to cheap and abundant sources of electricity. Smelters serving the American market have located in either Canada and the north-west region of the United States, using hydro-electricity, or in the Texas-Arkansas-South Carolina area, using electricity generated mainly from natural gas.

Although insulated from the direct effects of the OPEC oil price rises, the US smelters have been suffering chronic shortages of electricity supply since the late 1970s. This occurred because other users, previously using oil-based fuel, have been switching to electricity. Consequently, the smelters have been forced to pay higher prices, and it has become clear that large blocks of power will not be available in the future. The situation was exacerbated by exceptionally dry conditions, which reduced the availability of hydro-electricity. Some smelters have been forced to temporarily close pot-lines. However, the main impact has been the cancellation of all plans to build new smelters in the USA, that is, with the exception of a joint US/Japanese venture in South Carolina. Limited plans for expansion of existing facilities are continuing in favourable locations, but the focus of expansion has moved away from mainland USA. The Canadian smelting industry, based on company-owned hydro-electric facilities, has been able to continue normally.

RAW MATERIALS AND PROCESSES REQUIRED TO PRODUCE ONE TON OF ALUMINIUM INGOT



In Japan, the situation has been much more severe for electricity users. The Japanese electricity industry has relied heavily on oil as a fuel source and has been badly hit by the price rises. The electricity-intensive aluminium industry has been one of the most severely hit. After some early attampts to protect the local producers from the increasing flow of cheaper aluminium imports, the government became aware that Japanese aluminium fabricators would be unable to compete on world markets if forced to use the expensive local ingot. It has since embarked on a program of industrial restructuring, involving not only the cancellation of all local expansion plans but also the scrapping or freezing of 32 per cent of existing capacity by March 1980. In March 1982, this freezing of capacity was revised to reduce the planned 1983 capacity from 1 136 kt down to 712 kt. The freeze on capacity is to remain in force until at least June 1983.[11] These changes have opened up a significant new market for producers of cheaper aluminium.

In Europe, the aluminium smelting industry can be found in a number of countries, although only Norway, Iceland and Greece have been able to develop any significant export trade. The industry is based on a variety of fuel sources. Many of these countries fostered the aluminium industry out of a desire to be self-sufficient in basic metals, rather than any natural resource advantage. Thus they were frequently based on imported bauxite or alumina, plus inadequate, and consequently high cost supplies of electricity. The industry has consequently been characterized by sluggish growth, small-scale plants, a high degree of government protection and, in those areas reliant on oil fuels, escalating costs. The only area of expansion has been Spain. However, the European companies have been less willing to scrap or freeze capacity than either the US or Japan, and have relied on import protection and the development of alternative fuel sources, particularly nuclear power.

The foreign ownership patterns in aluminium smelting are not as clear-cut as at the alumina stage, because hitherto aluminium has not been a commonly traded commodity. Most countries have tended to produce predominantly for their own fabrication needs. Of the six largest producers, four are home countries of the 'six sisters'. West Germany, as well has having 35 per cent foreign equity, has 51 per cent government equity in its facilities. Norway combines 58 per cent foreign equity with 24 per cent government equity.

The highest degree of foreign equity outside Europe is found in the smaller exporting countries, such as Ghana, Surinam, Cameroun and New Zealand. Venezuela combines 50 per cent foreign equity with 50 per cent government participation, while Brazil has a policy of reserving 50 per cent of equity in new developments for local private interests or the state-run company CVRD.

In the late 1970s the companies found it increasingly uneconomic to conduct their smelting operations close to the main world markets. This resulted in a short-fall of capacity, as world demand recovered from the 1974–75 recession. The short-fall in capacity resulted in both rising prices and profits which encouraged the companies to again enter into expansion plans. However, the aluminium producers were now looking for locations with abundant and secure supplies of cheap electricity, in preference to easy market access. In this situation, Australia was particularly well placed, given its proximity to the beckoning Japanese market. However, other sites were also being considered. In Latin America, Venezuela and Brazil are hosting new developments but their output will mainly be exported to the US market. Malaysia, Indonesia and the Philippines are being considered as possible development sites in South East Asia.

Australia has advantages over Latin American and South-East Asian countries in that it has already developed much of the supportive infrastructure, including power supplies. This considerably reduces establishment costs and lead times for new smelter sites.

THE ALUMINIUM COMPANIES

The 'six sisters' controlled 55 per cent of world aluminium production in 1977. They operate as global integrated enterprises involved in all the stages of production of the industry. Each stage is vertically integrated into the next, in order to best meet the total needs of the enterprise. This 'transnational' aspect of the industry involves some serious problems for countries which only host the earlier production stages. These problems involve meshing the needs of the companies with those of the producing countries and deriving adequate tax income from the activities to enable national governments to pursue their economic and social welfare policies.

ALCOA – Aluminium Company of America

Alcoa was the first aluminium company established in North America and held a monopoly over this market until the 1920s, when anti-trust actions forced it to divest itself of its international assets. This action led to the formation of Aluminium Company of Canada (Alcan). For a lengthy period after this, Alcoa concentrated on the domestic market and, in 1978, accounted for over 32 per cent of US aluminium production.[12] It has recently renewed interest in international activity, but 77 per cent of its smelting capacity is still in the USA.[13] Alcoa's major overseas interests are in Australia and Norway, plus smaller plants in Latin America. The Australian interests are controlled by Alcoa of Australia, 51 per cent owned by the American parent.

Alcoa is the recognized market leader in the USA, pursuing an aggressive sales policy by developing and securing new product markets. In the post-war period, aluminium usage spread from aircraft to transmission lines, containers and building materials. Current efforts are aimed at penetrating the motor vehicle market. This rapid market growth was achieved through a policy of supplying 'cheap' aluminium to fabricators and tying this, where possible into long-term supply contracts.[14] 'Cheap' aluminium was achieved by a policy of transfer pricing, that is pricing close to costs during the early production stages, so that fabricating became the most profitable aspect of the industry.

Alcoa of Australia

This company owns bauxite leases in the Darling Ranges south of Perth. The total output is refined in Western Australia, in two large alumina refineries (Kwinana and Pinjarra) with a third (Wagerup), nearing completion. The alumina is exported to Japan and the USA, or smelted at their Point Henry plant in Victoria, where semi-fabricating facilities are also located. The Point Henry plant has been expanded to 168 kt and, whereas in the past the output has been used in local fabrication, the new capacity is earmarked for the export trade, especially to Japan.

Alcoa has now commenced construction of a second smelter with a first stage capacity of 132 kt at Portland in Victoria, scheduled to begin production in 1983. This smelter was originally planned to be expanded to 528 kt capacity on an undetermined time schedule. However, recent controversies over the price of electricity to the smelter and an apparently unexpected drop in demand have led to an indefinite postponement of this plan.

Alcan Aluminium Ltd

Alcan began in 1902 as the northern subsidiary of Alcoa in Quebec. In 1928 it was incorporated as a separate company, taking over Alcoa's Canadian facilities, plus its other assets outside USA. In this period, Alcoa and Alcan had identical shareholders. The split was used as a device to circumvent anti-trust legislation which forbade American companies from participating in European cartel arrangements. Canadian companies were not similarly constrained. In 1961, shareholders were forbidden to hold shares in both companies, and Alcan became an independent company.[15]

In terms of equity ownership of capacity, Alcan is the second largest aluminium company in the capitalist world, controlling 11.1 per cent of world production in 1977. By this measure Alcoa was the largest controlling 13.3 per cent of world production in 1977. However, because of its early start as the recipient of Alcoa's international assets, Alcan is the more widely dispersed over the globe. Canadian production amount to only 42.5 per cent of its capacity.[16] Alcan has been fairly aggressive in its expansionary activities, being the first to develop smelting facilities in Brazil and the only 'foreign' producer to obtain equity in Japan. It has a much greater penetration than the other North American companies in Europe.

Alcan's principal activity involves smelters located on hydro-electric power in Canada, producing aluminium for sale to its own and independent fabricators supplying the US market. A recent at-

tempt to purchase a smelter in the USA was rejected by the Justice Department.[17] It imports bauxite from Guinea, Guyana, Sierra Leone and Surinam to produce alumina in Quebec. It imports alumina from Queensland Alumina Limited (QAL) at Gladstone and from Jamaica.

Despite its extensive interests throughout the world, Alcan operations are not always profitable. The Canadian operations in particular have been characterized by prolonged strikes which have greatly reduced output. In 1976, it only returned 3 per cent on assets of over 3 GUSD.[18] Low profitability comes partly from the operation of small-scale facilities aimed at servicing small domestic markets. This has been the case in Australia in the past.

Alcan Australia and Alcan Queensland

These two companies, which operate separately, are subsidiaries of the Alcan.

Alcan came to Australia in 1936, when Australuce was formed by Alcan, British Aluminium and EZ Industries, each with a third of the shares. By 1963, Alcan had bought out its partners and offered the Australian public a 35 per cent shareholding in Alcan Australia.[19] It established a small smelter at Kurri-Kurri, in New South Wales, to supply both its own and local fabricators. Recent plans have existed to double its capacity to 90 kt to service the export markets to Indonesia and Japan. However the recent downturn in world demand has led to postponement of these plans.

Alcan obtains alumina from QAL (Queensland Alumina Ltd), in which it has a 21.4 per cent equity. This equity is held by Alcan Queensland Pty. Ltd. which is wholly owned by Alcan. Alcan Queensland also has a bauxite lease at the Wenlock River, next to the Weipa deposit. This company has announced plans to build a new smelter of 100 kt at Gladstone, then Bundaberg, in Queensland. This plan is now shelved.

KAISER ALUMINUM

Kaiser Aluminum and Chemical Corporation

Kaiser remains a family company. It was originally set up by Henry Kaiser and is now controlled by his son, Edgar Kaiser, who is chairman of all the major Kaiser companies. The family owns over 40 per cent of the share capital. Unlike Alcan, Kaiser has extensive interests besides aluminium. They are also heavily involved in steel, chemicals, refractories, real estate and energy; the Kaisers run a large international trading company, dealing in metals, minerals, fuel, oil, coal, fertilizers, petrochemicals, paper and forest products.

Between 1961 and 1971, the company went through a period of further diversification. However, many of these new areas were not profitable and precipitated a series of management changes, beginning in 1970, which saw many of the unprofitable divisions shut down. The company has since moved towards the natural resource areas, although many areas remain troubled, for example, Kaiser Steel. However, Kaiser Aluminum has remained buoyant, earning a 13 per cent return on invested capital in 1979, sufficient to provide funds for future growth.[20]

In the US, Kaiser operates two smelters in the North-West, based on hydroelectric power. Kaiser also has smelters in Ghana, Bahrain and India. One of its most profitable activities had been its 45 per cent interest in Comalco and through this, in QAL at Gladston. In October 1982, Kaiser sold its share in Comalco to Conzinc Riotinto of Australia and an Australian finance company (See p 43–47 and 64 ff of this issue).

Comalco

The largest presence in the industry in Australia is Comalco. This company was 90 per cent owned by the association of the Kaiser Aluminum Company and Conzinc Riotinto of Australia. Comalco controls the Weipa bauxite deposit, the QAL refinery at Gladstone, the Bell Bay smelter in Tasmania, and the New Zealand Aluminium Smelters Company.

Comalco is currently constructing a new smelter at Gladstone of 206 kt, which capacity could be doubled in the future. This smelter is a joint venture between

- Comalco 50 per cent
- Five Japanese companies 50 per cent

Although construction is continuing on schedule even this operation has not been without controversy, relating to the social problems in the "boom" town of Gladstone, the expected closure of the Bell Bay smelter, and the treatment of Aborigines near Weipa.

Reynolds Metals Company

Reynolds Metals Company was established in 1928 as part of US government action to break Alcoa's monopoly of that market. Almost three-quarters (73 per cent) of its capacity is in the USA, and this is the only company, besides Alcan, to operate in Canada. Together, its North American interests account for 86.5 per cent of Reynolds' capacity.[22]

In 1968, Reynolds formed an associ-

ation with Tube Investments UK to take over control of British Aluminium Limited. This movement allowed Reynolds to develop a world-wide distribution network, and consolidated its position in the world industry. Reynolds' overseas interests include smelters in the UK, West Germany and Venezuela. They also hold small shares in smelters in Iran, Ghana and Brazil.

Reynolds supplies its North American interests from Jamaica and also operates a refinery in West Germany. The company is less developed in the early stages of production than the other large aluminium corporations. Its new developments have frequently been is association with Billiton, a subsidiary of Shell.

Alwest

This project involves a proposed bauxite mining and alumina development at Worsley, south of Perth. The Reynolds Metals Company holds 40 per cent of the shares and is the managing partner. The project represents the firs incursion of this "sister" into Australia. Other shareholders are:

- Billiton, a Shell subsidiary, 30 per cent
- BHP 20 per cent
- Three Japanese companies 10 per cent[23]

This plant, which is about a year off completion, will be Western Australia's fourth alumina refinery. Its initial capacity will be one million tons. The Worsley refinery will draw bauxite from the eastern side of the Darling ranges deposits.

Pechiney Ugine Kuhlmann (PUK)

This French-based company was established in 1971 through the merger of Pechiney, established 1855, and Ugine Kuhlmann, established 1889. The merger produced a large diversified group with interests in mining, metals, chemicals and energy. Aluminium production is their largest interest, accounting for about 35 per cent of turnover. Other divisions cover steel and titanium, chemicals, mining and electrometallurgy, nuclear and 'new' technologies, copper fabrication and 'special' products. The company was nationalized in 1982.

Pechiney's aluminium venture began in France, based on local bauxite; they now monopolise production in that country. They also have extensive interests in other European countries, with large smelters in Greece, the Netherlands and Spain. Three-quarters of their capacity is in Europe.[24] Their interests outside Europe include Howmet, a smelting company in the US, a small smelter in Cameroun and a share in a small plant in South Korea. Their overseas sources of bauxite are Senegal, Malagasy and Guinea. They have a 20 per cent share in the bauxite deposits held by Aurukun Associates in North Queensland. Alumina is obtained from Guinea, Greece and from a 20 per cent holding in QAL at Gladstone.

Tomago Aluminium Smelting Company

Pechiney is currently constructing a smelter of 220 kt at Tomago in the Hunter Valley. PUK and Gove Alumina, an Australian consortium, will each hold 35 per cent equity in this plant, while AMP and a foreign interest (a West German company) will each hold 15 per cent equity.[25]

This plant, the least offensive of the three proposed aluminium projects in the Hunter Valley on environmental grounds, is continuing despite recent electricity price increases and is expected to commence production in 1985.

Alusuisse

Alusuisse was established in 1888; it has extensive smelting interests in Europe, where it has 55 per cent of its capacity.[26] Alusuisse operates plants in Switzerland, West Germany, Italy, Austria, Norway and Iceland. Its other major interest is a 60 per cent share in the USA based company, Consolidated Aluminium Corporation (Conalco). In addition, it has a 22 per cent share in a smaller South African smelter.

Bauxite for Alusuisse is mined in France, Guinea, Sierra Leone and Australia, where it holds a 70 per cent interest in Nabalco. Alumina is produced in West Germany, USA, Guinea and Australia (Nabalco). In the past, Alusuisse's European operations have been the main customer for bauxite and alumina exports from Gove in Queensland, however, an increasing proportion is now shipped to Japan. Alusuisse operates as an integraded aluminium producer and fabricator, it also have interests in associated power generation facilities.

Nabalco

Nabalco consists of a bauxite mining and alumina refinery operation situated on the Gove peninsula in the Northern Territory. It is 70 per cent owned by Alusuisse and 30 per cent by Gove Alumina Ltd. This latter is a consortium in which CSR holds 51 per cent and Peko-Wallsend 12.6 per cent of the equity.[27]

A separate smelting company, Nabalco Aluminium Pty. Ltd., 60 per cent owned by the Gove Alumina consortium and 40 per cent by Alusuisse, was formed. It was

refused an allocation of power by the New South Wales electricity authority after an unsuccessful search for a site in Victoria. It has since decided to establish a smelter near Dunedin, in New Zealand, using Gove alumina.

Hunter Valley Aluminium Pty Ltd

Alumax was granted a block of power by the New South Wales government to build a 236 kt smelter at Lochinvar in the Hunter Valley.[28] This smelter was to be 45 per cent owned by Alumax, 35 per cent by the BHP subsidiary Dampier Mining, and 20 per cent by Alfarl Pty Ltd, a Japanese consortium led by Mitsui.

Alumax is a joint venture between:

- AMAX, a giant American resources company, 50 per cent
- Mitsui, 45 per cent
- Nippon Steel, 5 per cent[29]

As well as the Hunter Valley smelter it has built the only new smelter in the USA in South Carolina. Alumax has a 70 per cent interest in a lease on a, as yet undeveloped, 200 Mt bauxite deposit in the Mitchell plateau in north-west Western Australia. In 1979, CRA bought a 10 per cent interest from Alumax, with an option for a further 42 per cent. There are tentative plans for a refinery based on North-West Shelf gas.[30] AMAX has a further 100 per cent interest in 1 980 Mt bauxite lease nearby at Cape Bougainville.

The Lochinvar smelter has been subjected to intense criticism on environmental and electricity pricing grounds. The subsequent review and increase in the price of electricity allegedly caused the withdrawal of Alumax and Mitsui from the project. However it is more likely the subsequent downturn in world demand coupled with environmental pressures was a more important factor in that the similarly affected Tomago smelter is proceeding. BHP was unable to find a new partner to proceed with the project, designed to use its share of the alumina from the Worsley refinery, and subsequently announced the abandonment of the project.[31]

BEHAVIOUR PATTERNS OF INTERNATIONAL ALUMINIUM COMPANIES

A. Past behavior patterns

Trade Flows

In the past, bauxite and more lately, alumina have been the traded commodities. Reaching the limit of domestic reserves of bauxite, the large companies began to develop supplies in the Third World countries. Increasingly, refineries have been located near the mines and the product exported as alumina to reduce transportation costs.

The major companies have interests throughout the world. However, the trade tends to fall into three geographical flows:

- *The North American flow* from Jamaica and Latin America to the USA and Canada. Some Jamaican alumina also goes to Norway. The future Brazilian developments will enter into this flow.
- *The European flow* from Africa (Ghana, Guinea and Sierra Leone) to France, West Germany, UK, USSR and Greece also contribute to this flow.
- *The Asian flow* from Australia, Indonesia and Malaysia to Japan. This flow has been the least clear cut. Australia has been supplying bauxite to Europe and alumina to Europe and North America in the past, as well as to Japan.

Structural problems in the Japanese industry are likely to influence this third flow in two ways. Firstly, more primary aluminium will be produced in Australia, using previously exported alumina, so that primary metal will become the trade commodity. Secondly, Japanese companies are looking to establish smelters in other Asian countries; these will be based on Australian alumina. This development therefore may increase Australia's trade with Indonesia, Malaysia and the Philippines. The long distance flows of bauxite to Europe and North America are likely to reduce, and Australia will be further replaced by Brazil and Guinea as suppliers.

World demand for aluminium

The demand for aluminium depends on the level of activity in other industries. The main users of aluminium are containers and packaging, building and construction and transportation, including aircraft. Other user industries include electrical goods, consumer durables, and machinery and equipment. The industry leaders have engaged in aggressive marketing activities to expand the use of aluminium, usually at the expense of other materials. The latest area of expansion has been into the automobile industry where the product can be used for a variety of body and engine parts.

Such policies have meant that demand for aluminium grew rapidly up to 1973. Growth averaged about 9 per cent per year in this period although there were significant variations from year to year. Declines in demand resulted in periodic building up of inventories as in 1966–67. However, the continued development of new markets helped cushion the industry from the cyclical activity common in more established basic metal industries. The continued growth in capacity in the main centres of North America, Europe and Japan in the 1960s and early 1970s apparently exceeded the real growth in demand in this period.[32]

The 1974–75 recession consequently severely affected the industry, with record inventories being recorded in April 1976.[33] In this period all expansions of capacity ceased and a number of pot-lines were closed. When demand started to recover in 1977, the world was faced with the prospects of shortages of aluminium. Demand projections, although down on past experience, indicated yearly increases of around 4 per cent[34] in the USA and 5 per cent[35] in Japan, encouraging plans for expansion again.

By early 1981, the earlier optimism as to the industry's future had faded. Led

by the USA, activity in a number of key user industries, particularly automobile and construction, declined. The sharp fall in demand exceeded that in production resulting in high inventories once again.[36] As a result, smelters in the USA and Japan were cut back to production levels well below capacity, and a number of new smelters in the planning stage in other countries were cancelled or postponed.

Company marketing policy

Aluminium is a basic metal, produced from a very abundant raw material. It is also a relatively new metal, first produced in 1888 but only becoming popular after World War I when its value in aircraft manufacture was proven. Expansion of demand has been achieved by aggressive marketing, pushing aluminium into numerous new uses, often replacing other metals such as copper and steel, or timber.

Smelters are high technology operations, involving large capital investments. The resulting large overhead costs mean that it is rational for companies to operate as close to full capacity as possible. New plants need to be operated as soon as possible to repay the high interest charges. Once capital costs have been written off on older plants, their costs of production are fairly low, and they can be pofitably utilized for some time. The operational life of a smelter is around fifty years. Technological developments have enabled the firms to keep costs down but have increased the scale of operations over time. Modern plants now have a minimum scale of around 200 kt/y capacity.

These factors have made growth and large volumes of production the main characteristics of the industry. The firms have preferred to use long-term, large volume contracts as the main form of sales, and have been prepared to accept lower prices in return for this sales security. Aluminium ingots are sold in two methods, the contract method, and on the free market.

The contract market, where prices are based on list prices, covers 90 per cent sales. Prices are set by individual agreement and are often significantly discounted below list prices for large quantity orders, loyalty rebates, etc. Contract prices can be 20 to 35 per cent below list prices when demand is low. The free market, where price fluctuates with demand and supply, covers 10 per cent of sales.[37] If the free market price, as measured on the London Metals Exchange, falls significantly below the list price discounting can be expected.

Competition within the industry

The industry is dominated by six integrated world concerns. It is moving towards larger scale developments, often due to the location of new exploitable reserves of bauxite and electric power in remote areas, necessitating accompanying large-scale infrastructure development. Thus, the capital costs of new projects, at least in the first three production stages, are very high. Because of the scale of the ventures, they are also frequently beyond the requirements (and probably the resources) of any one company. Thus there has been a tendency for aluminium companies to form partnerships, with each contributing a share of the capital, and each taking a share of the output on a "tolling" basis. Numerous examples of this can be found, such as QAL, NZAS, and Alumax's arrangement with Alcoa's refineries WA. With these types of agreements, inter-company competition is unlikely.

However, strong, though restrained, competition exists in the bids for newly created markets. These markets are accepted as:

- Taking over product lines from other metals. The current push is into the vehicle industry, as lighter aluminium parts results in greater fuel-efficiency than traditional materials.
- Gaining a greater share of the incremental market growth that has occurred in the post World War 1 period – currently estimated at between 4 to 5 per cent per year.
- Taking over markets vacated by less successful local enterprises. The current case is Japan.

Market competition tends to be on a 'first come, first served' basis. Once a company is established in a market, it frequently ties customers into long-term contracts. When all capacity has been filled, its rivals will leave that market alone. There is little encroachment into each other's market. Competition in the fabricating stage, where greater possibilities for product specialization exist, may be more intense. However, 'tie-ups' with the integrated producers would mitigate against this.

The secret of competitive success is thus the bringing on stream of new facilities before rivals. Once a firm commitment has been made to a new project by one company, rivals will reassess their own projects in the light of the remaining market. However, uncertainty as to the actual size of the new market, the long lead time (three years) in bringing new plants on stream and the desire not to be left out, mean that a period of short supply may be followed by one of over-supply and price discounting. The implication of this type of competition is that once facilities are established and their market developed, the industry will be fairly stable unless further restructuring occurs. This is not to say it will not experience periods of low prices and profits or inventory stockpiling in line with world recessions or periods of over-expansion. The long delay in restarting closed potlines means output and employment are unlikely to be cut unless absolutely necessary. Closed capacity limits a company's ability to get in at the beginning when demand recovers, and may mean the loss of valuable customers.

Aluminium pricing policy

In the past, the large aluminium producers followed a policy of market expansion.

They kept the price of aluminium low and stable but tied to long term, large volume contracts. In the period 1961 to 1973, the list price of aluminium remained static in monetary terms at around 25 US cents/lb.[38] However, between 1973 and 1979 a number of price rises took place pushing the price to 53 US cents/lb in 1978 and to 68 US cents/lb in 1979.[39] By contrast prices rose to 74–78 US cents/lb in Europe.[40]

These price increases can be attributed to a number of factors:

- Of prime importance was the high level of demand relative to capacity, which means that all production could be shipped to consumers and that plants can be operated at efficient capacity levels without the large-scale discounting that had been common in the past.
- Secondly, the producers had been faced with large price rises for domestic fuel as contracts had been renewed. These increases had to be covered by price rises.
- Thirdly, the energy shortages had limited expansion potential in the established production areas, and had made the future of these plants less secure. Companies were thus anxious to get as high a return as possible in order to cover existing capital charges and to cover losses accrued when pot-lines had to be closed.

Prices have been set in terms of the companies' long-term marketing strategy rather than as direct responses to world demand and supply conditions. This marketing strategy has called for low, stable prices to facilitate growth and the penetration of new markets. Until the mid-1970s surge, prices did not rise with fluctuations in demand, although discounting in periods of recession was common.

Prices in the first three stages of production in the industry were consequently set in relation to long term goals and the firms' main objective was to produce cheap ingots for the more specialized fabrication stage. It is thus to be expected that the firms will price the output at the earlier stages close to costs as it is transferred from one stage of their operations to the next.

As the different stages of an integrated aluminium enterprise are frequently located in different countries, this form of transfer pricing has international as well as national implications for host governments and taxation policy.

In addition, enterprises such as QAL, which are owned by a consortium of different companies, are operated on a 'toll' rather than profit basis where each company takes a share of the output at cost rather than as a market sale. Both procedures mean there is little in the way of surplus income available for taxation.

Despite the decline in domestic demand which US producers began experiencing in 1980, the domestic list price was pushed up by price leader, Kaiser Aluminum, to 76 US cents/lb in October 1980 and to 80 US cents/lb in October 1981.[42] These prices reflected the desired level of profits in the industry, amd with the spot price at around 65 US cents/lb[43] were being discounted considerably.

The willingness of the firms to push up list prices against the trend in world demand reflects their desire to keep long-term profits at the postenergy-crisis levels. Nevertheless, current profits are declining with Alcoa experiencing a 50 per cent drop in profits and capacity in the USA cut to 76 per cent[44] in 1981.

Profit levels and taxation policy

In the past, the policy of cheap aluminium has meant the first three stages of production have not been especially profitable. Returns on assets, ranging between 3 and 6 per cent per annum have not been uncommon. The fabricating stage, which offered greater opportunities for product differentiation, has been the most profitable stage. New plants have traditionally been financed by borrowing, which has involved aluminium smelters in heavy interest charges. These charges in turn have meant that most plants have had to operate at full capacity, making long term contracts a necessity.

As the future of smelting became less secure in the traditional areas, policy changed in that expansion only occurred if a substantial proportion could be financed from internal funds. This meant that the operation had to be more profitable and, accordingly, home prices rose. In 1978 and 1979, companies recorded return on assets ranging from 12 to 14 per cent; these were twenty-year records.[45]

The low levels of profit have meant the industry has not proved a particularly good source of taxation revenue; a situation which helped participate the establishment of the IBA. The specific sources of government revenue from the industry are royalties of bauxite production, export levies, and company tax on profits. In addition general taxes such as payroll tax, income tax from employees, withholding taxes on payments overseas, land tax, council rates, indirect taxes on inputs, etc, may be incurred.

The international aspects of the industry make it difficult to collect revenue from the industry. The transfer pricing procedure means profits and hence company tax payments will be low as well as facilitating the movement of profits to low tax countries.

Attempts to increase revenue from production taxes such as royalties and export levies have not been successful. The IBA has been able to achieve only minor gains due to the ability of the companies to develop alternative resources in Australia, Guinea and Brazil and to reduce production in the more militant areas.

In Australia, aluminium facilities have not paid large amounts in taxes in the past. For example, Alcoa paid no tax for the first ten years of its operation in Australia.[46] Royalty charges on bauxite are not high. In 1978, Comalco was paying 5.33 AUD in royalties on the quantity of bauxite which produced a tonne of aluminium selling for an average 919 AUD cif. Alcoa's royalty payments were less than 1 per cent of total production costs.[48]

B. The oil crisis and the industry response

Fuel crisis

Aluminium is one of the most energy intensive products, with electricity constituting from 25 to 40 per cent of costs. Raw materials constitute approximately 30 per cent of costs, and labour about 14 per cent.[49] Recent rises in the price of fuel oil have affected those smelters located in countries which use oil as a means of generating electricity. It has meant that there are marked differentials in electricity charges to smelters in different countries. Power charges to large customers are often secret, but some approximate charges in 1979 were (in AUD)[50]:

Japan	8	cent/kWh
Europe	4	"
USA	3	"
Australia	0.5–1.6	"
Brazil	0.2	"

It is these differentials in prices which have caused the reduced production levels in Japan and the cancellation of expansion plans in the US and Europe. However, of equal importance to electricity prices are security of supply and guarantees of large blocks of power on fixed contract prices.

The result is that the world supply of aluminium had fallen below world demand to such an extent that, by 1985, it was estimated an additional 4.3 Mt of capacity would be needed if a growth factor of 4 per cent per annum was built into estimates of demand.[51] Because of the energy situation, the major consumers were unlikely to undertake a rapid expansion of capacity, instead they were looking to fill the gap with a rising influx of imports. The US was expected to import 1.6 Mt in 1985, double the 1978 level of imports.[52] In 1985, Japanese imports were estimated at approximately 1.25 Mt in order to cover 'frozen' facilities, plus the growth in demand.[53] Attention moved towards those countries which could combine natural resources with abundant cheap power. Areas such as Latin America, Australia and South-East Asia were investigated. In many of these countries, extensive development of infrastructure and power generation facilities needed to accompany the smelter development. This adds to capital costs and increases the lead-time in bringing smelters on stream.

In this situation, Australia had considerable advantages, as basic infrastructure was frequently available and power could be taken directly from the states' grids. These advantages were very attrac-

Table 3

World aluminium production, capacity and foreign equity (kt)[1]

Country	Production			Government equity (%)	Foreign equity (%)
	1967	1977	1979	1979	1979
USA	2 973	4 117	4 557	–	11.7
USSR (a)	1 425	2 200	2 400	100	–
Japan	383	1 188	1 010	–	8.1
Canada	887	976	860	–	14.9
German FR	254	742	742	43.8	47.0
Norway	372	637	674	47.9	18.7
France	362	399	395	–	–
UK	39	349	360	–	52.9
Italy	128	260	269	89.3	10.7
Australia	93	248	270	–	52.4
Netherlands	n a	237	257	–	54.3
Spain	76	212	260	24.8	27.4
Romania	n a	210	220	100	–
China (a)	120	200	250	100	–
Yugoslavia	n a	197	173	100	–
India	n a	184	209	34.0	27.7
Brazil	–	170	238	6.1	57.9
New Zealand	–	150	154	–	100.0
Greece	n a	130	141	40.0	60.0
Bahrain	–	121	126	58.0	42.0
Poland (a)	93	105	101	100.0	–
Other central economies (a)	162	170	105	100.0	–
Other market economies (a)	677	1 000	1 339	41.6	33.7
Total (a)	**8 044**	**14 201**	**15 110**	**17 536**	

(a) Estimate
(b) Includes estimates of capacity in central economies.

Sources:

Australia, Bureau of Mineral Resources, Geology and Geophysics, *Australian Mineral Industry Annual Review*, 1967, 1977 and 1979 (AGPS, 1969, 1979 and 1981).

Metals Week, *Aluminium: Profile of the Industry*, McGraw-Hill, New York, 1982.

tive to companies anxious to capture the excess demand as soon as possible, but if developments in the Third World countries progress, these advantages will be eliminated.

Relocation in Australia

Australia has become one of the main centres of attention in the process of restructuring the smelting stage of the world aluminium industry, as it was during the restructuring of the refining stage. Its attractions are:

- abundant raw materials
- large supplies of relatively cheap electricity combined with pricing policies that encourage large-scale users
- relatively well developed supporting infrastructure and skilled labour force
- stable political climate
- proximity to the Japanese market.

There was a rush of announcements of plans to establish new capacity in Australia. Six new "greenfields" smelters were proposed for the eastern states plus expansions of two existing smelters. In Western Australia, construction of two large alumina refineries commenced and the possibility of two smelters was considered. Smelter capacity in the west would be dependent on the development of new power facilities. All this new capacity was earmarked for export, particularly to Japan.

The total new capacity announced in these plans was a minimum of 1 132 kt and a maximum of 1 734 kt. The planned smelter developments are shown in Table 4. This would have elevated Australia to the third largest producer in the world and was a major component in the much vaulted "resources boom" of the 1980s. Most of these developments involved consortiums headed by one of the "six sisters" with the remaining equity being taken by Japanese interests and Australian firms. The Australian equity was taken predominantly by large companies such as CSR, CRA, BHP and WMC.

By the beginning of 1982, it was clear only three of the new smelters would go ahead, and that the third of these was doubtful. The two new refineries were delayed because of a lack of demand for their output. The cutbacks fell unevenly on the companies. Some, such as Comalco and Pechiney, appear to be proceeding as planned while Alcan, Nabalco, and Alumax have completely cancelled. Alcoa appears to have been caught in the middle. It had committed itself to new facilities to the extent of borrowing 680 MUSD on the Eurodollar market to finance its development[54] and signing contracts with Japan for part of the Portland output at around 1 500 USD/t.[55] The Wagerup refinery was near completion. Construction, involving 250 MUSD of sub-contracting commitments and well-publicized confrontations with environmentalists and Aboriginal groups, of the Portland smelter had commenced. However, it is clear that the company has no immediate market for the output of these facilities. On 19 July 1982 it was announced that construction of the Alcoa-Portland smelter would be frozen until at least 1985.

In part these changes in plans can be explained by the nature of competition in the industry. With the cutbacks in production in Japan a large potential market was available. This would go to the firms first able to capture it in terms of sales contracts, in other words, to the firms first able to bring new capacity on steam. In this race, Comalco, Pechiney and then Alcoa Portland were the winners. In the face of uncertain demand, it would be prudent for the others to reconsider their position in light of the remaining market, if any.

Nevertheless, it appears other unforeseen factors have also intervened to cause a significant revision of the expansion plans. This revision has resulted in an over-expansion of facilities in relation to what might now be considered suitable for this market, leaving some companies with some costly investments on hand. The cancellation of the Alumax plant has deprived both Alcoa and BHP of an outlet for the new Western Australian alumina production. Alcoa's new markets can be just as easily serviced from the Point Henry expansion was obviously a change in plans although its Queensland plant never proceeded beyond the feasibility stage.

These over-expansions of facilities (measured in terms of commitments of investment before securing sales contracts) resulted from excessive optimism in the industry following the oil crisis. The industry apparently felt it had solved its problem by relocating in energy rich countries. It was optimistic towards the future based on the existing high profits and the new market in Japan. The last history of expansive marketing resulted in healthy projections of future growth in demand.

With hindsight, it is possible to identify three factors the companies did not expect when planning their new facilities:

- Firstly, the current drop in demand is obviously much more severe than expected. In the past, the companies had been able to moderate demand fluctuations with expansions into new product lines. The current recession shows them more vulnerable to market conditions than in the past.
- Secondly, the extreme rise in interest rates, both in Australia and in the world economy, would have effected those companies still seeking investment funds. On the Australian market, they have had to compete with other resource projects and utilities for a small pool of funds.
- Thirdly, most of these companies had been promised electricity supplies by the state governments at prices based on past costs. The state electricity authorities have had to expand capacity to meet the smelters' needs and have found their future costs, incorporating the higher interest charges, much more than anticipated. The states have been forced, spurred by public opinion, to raise charges to the smelters beyond that in the original agreements. Given the past pricing policies of these companies, such rises may have affected the viability of some projects al-

Table 4

Australian aluminium capacity and resources requirements

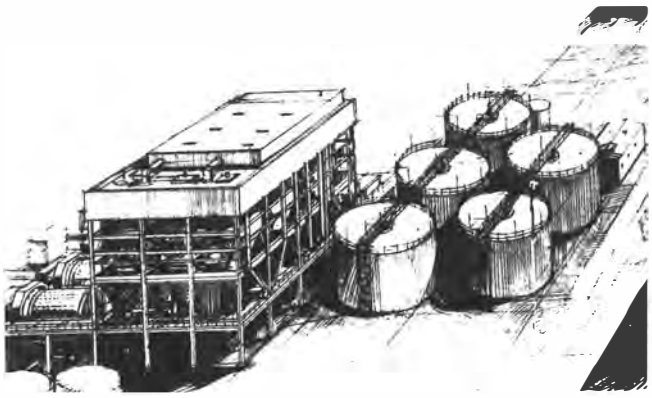
Plant	Date	Annual capacity (ton)	Est. capital cost MUSD 1979[1]	Employment (number)	Power Req. (MW req. at smelter)	Annual alumina requirement (ton)	Foreign Ownership First Est. (a) %	Foreign Ownership Second Est. (b) (c) %
Existing								
Comalco–Bell Bay	1955-77	112 000	99	1 250	400 (e)	220 000	100	43
Alcoa–Geelong	1963-79	100 000	100 (e)	1 772	150	200 000 (e)	51	51
Expansion	1981	68 000	89	200	100	100 000	51	51
Alcan–Kurri Kurri	1939-79	70 000	80	572 (d)	130 (e)	140 000	70	70
Total Existing		**350 000**	**368**	**3 794 (d)**	**780 (e)**	**660 000 (e)**	**38.5**	**52.2**
Definite								
Comalco–Gladstone	1982	206 000	600	1 080	360	400 000	50	71.5
Alcoa–Portland	1985	132 000	363	500	230	240 000	51	51
Pechiney–Tomago	1985	220 000	500	1 798 (d)	360	400 000	50	50
Total Existing plus Definite		**908 000**	**1 831 (e)**	**7 172 (d)**	**1 730**	**1 700 000 (e)**	**45.7**	**55.8**
Proposals – Indefinite or Cancelled								
Alumax–Lochinvar		236 000	641	900	420	455 000	65	65
Alcan–Bundaberg		100 000	250	817 (d)	200	200 000	100	100
Nabalco		150 000	500	1 226 (d)	280	300 000	40	40
Alcan–Kurri Kurri Expansion		20 000	40	164 (d)	40	40 000 (e)	70	70
Alcoa–Portland Expansion		396 000	637	677	690	800 000	51	51
Comalco–Gladstone Expansion		206 000	900	620	360	400 000	50	71.5
Total Proposals		**2 005 000**	**4 799**	**10 966 (d)**	**3 720**	**3 895 000**	**52.2**	**59.1**

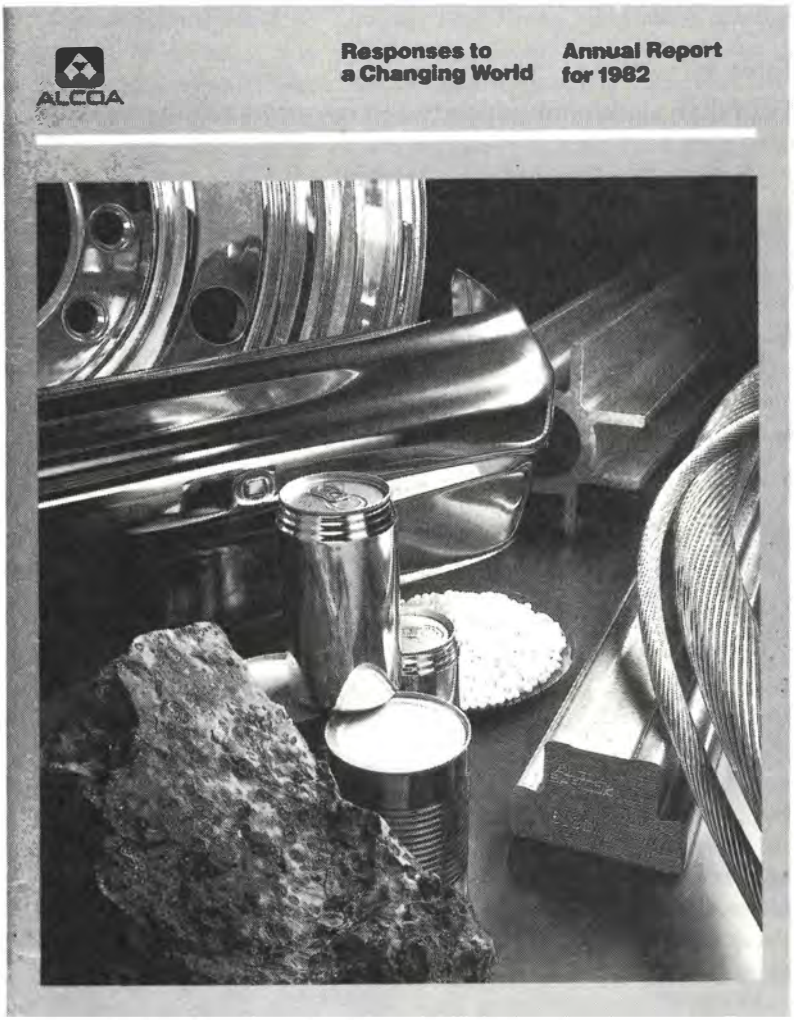
Source:
Australian Parliamentary Library Service, *Some Implications for Australia of Rapid Development of the Aluminium Industry* 1979-12-05, updated from press reports.

Notes:
(a) Smelter partnerships divided so that only those partners not registered in Australia are classified as foreign.
(b) Smelter partnerships where foreign ownership of Australian registered companies are included as foreign. Main effect is that RTZ's 72.6 per cent (1979) ownership of CRA (part-owner of Comalco) is included as foreign.
(c) Ownership of Australian companies is divested in a number of financial institutions or Nominee Companies. It is assumed these are wholly Australian owned.
(d) Employment estimates include only direct employment at the smelter and associated facilities. This would probably increased by additional employment at Head Offices.
(e) Estimated.

Annual reports of the leading aluminium companies reflect their new global strategies, in which Australian resources play a key role.
Reynolds' Annual Report 1980 (left) and Alcoa's of 1982 (right).

Basic expansion in Western Australia spearheads new initiatives abroad





ready rendered marginal by the market situation.

International structural adjustments

With the recovery of demand in the later 1970s and projections indicating supply shortages at least until 1985, the major aluminium companies again made plans for expansion. Significantly, a large proportion of this new capacity was planned for Australia, South-East Asia, and Latin America.

According to Alcoa, "(t)he only reason for primary capacity moving offshore is to get more abundant, cheaper power,"[56] and to Alumax, "(t)he political risk is apparently lowest in Australia, as producers are concentrating there."[57] Nevertheless, the change in location appears to have meant more than a simple devise to reduce the costs of production of aluminium. Whereas previously the main North American, European and Japanese companies were using international sources of materials to meet the needs of domestic fabricators, the output of the post-crisis smelters is not necessarily so destined. With anticipated supply shortages, the American companies have been less willing to woo prospective aluminium users such as the automobile industry and have sent production overseas. Exports from USA rose by 300 per cent in 1980[58] while auto-makers were told that "metal would be available for major conversions if they were prepared to commit for it".[59] The companies were thus prepared to risk expansion at home in return for a greater share of more rapidly expanding markets abroad. The internationalization of the industry appeared in another guise with the recession of 1981. In place of exports, the American market showed a significant 27 per cent increase in imported ingots while domestic production fell to 90 per cent of capacity[60] with the three large producers, Reynolds, Alcoa and Kaiser operating at 66 per cent, 76 per cent and 75 per cent of capacity respectively.[61] 72 per cent of these imports came from Canada where Reynolds owns capacity. Alcoa and Kaiser both have new plants overseas capable of lower cost production

than their domestic smelters. It would thus appear that in recessions these companies are prepared to put international cost competitiveness before national loyalty.

CONCLUSION

The behaviour of the aluminium smelting companies now establishing in Australia can only be understood in the context of the world-wide behaviour of their parent companies. This paper has given some indication of the forces affecting these companies during the current process of restructuring within the world aluminium industry.

The movement of the world smelting industry into Australia highlights the issues which must be confronted as part of this restructuring. Current policies of federal and state governments facilitate expansions within the industry, but indications are that the conditions under which these developments will take place will be determined almost entirely by the needs of the corporate fraternity.

This is an industry which will have a profound impact on Australia – an impact on ownership and control within our economy, income distribution, energy policy, the quality of the environment, capital markets, government fiscal policy and employment. Decisions made by conservative governments on these issues are already being justified on the basis of our comparative advantage in energy-intensive industry, and the munificient benevolence of market forces. As this paper has shown, market forces in the world aluminium industry have largely been tamed by the confederate clan of siblings.

Notes:

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[16] Stewert R. Spector, *Aluminium Industry* (Oppenheimer & Co., New York), 1978-02-17.

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[22] *Ibid.*

[23] *Australian Financial Review*, 1979-11-26.

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[25] *The Age*, 1979-11-21.

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[27] *Australian Financial Review*, 1978-03-29.

[28] *The Age*, 1979-09-27.

[29] *Australian Financial Review*, 1979-11-03.

[30] *The Age*, 1979-06-16.

[31] *The Canberra Times*, 1982-04-24.

[32] *Iron Age*, 1980-12-01, p. 83.

[33] *Ibid*, 1981-11-02, pp. 113–114.

[34] *Purchasing*, 1978-01-25.

[35] Australia/Japan Joint Study Group, *Australian and Japanese Aluminium Smelting Industries*, (AGPS: 1980) p. 2.

[36] *Iron Age*, op. cit.

[37] Mining Journal,

[37] *Mining Journal*, 1978-08-25.

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[44] *Ibid*, 1981-11-02.

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[49] OECD, *Structural Adaptation in the Aluminium Industry*, p. 17.

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[55] *The Age*, 1980-04-02.

[56] *Iron Age*, 1980-10-15, p. 35.

[57] *Ibid*, p. 36.

[58] *Ibid*, 1981-03-02, p. 103.

[59] *Ibid*, 1980-10-15, p. 36.

[60] *Ibid*, 1981-09-28.

[61] *Ibid*, 1981-11-02, pp. 113–114. ■