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Subsidies to the Aluminium Industry and Climate Change

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Contents

Executive summary

The aluminium smelting industry accounts for 16% of greenhouse gas emissions from the electricity sector and 6.5% of Australia's total emissions (excluding land-use change). The aluminium industry has been a strident voice in the debate over climate change policy and has led industry resistance to effective measures to cut emissions.

The industry argues that it is of great economic importance to Australia, especially for the foreign exchange its exports earn. It frequently threatens governments with the prospect of closing down its Australian smelters and moving offshore if it is forced to pay higher prices for electricity as a result of climate change policies. Since the Kyoto Protocol was agreed in December 1997, it has argued that the burden for cutting emissions should be placed on other sectors of the economy and households rather than being distributed equally across polluting sectors.

In this paper the aluminium smelting industry is examined in detail to test the claims of the industry, and to ask whether Australia would be any worse off if the aluminium smelting industry carried through with its threat to move elsewhere.

Of the total aluminium output of Australia's six smelters, 79% is exported. These exports were worth around A$2.8 billion in 1998. Exports of the entire aluminium industry, including bauxite and alumina, totalled A$6.5 billion. The smelting industry employed around 5350 people in 1995-96 with an average wage of A$41,200 per annum.

Overall, around 59% of the output of the aluminium smelting industry in Australia is foreign owned, with Japanese (17%), British (14%) and US (12%) interests dominant. The level of control is substantially higher.

The prices paid for electricity by aluminium smelters are set in long-term contracts and are a closely kept secret. However, enough information is available to make a good estimate of the extent of subsidies. The general belief in the electricity industry is that smelters pay between 1.5 and 2.5 cents/kWh for delivered electricity compared to around 5-6 c/kWh paid by other large industrial users. The former Victorian Treasurer revealed that other high-voltage customers were paying up to three times the price paid by the two Victorian smelters. The Victorian Auditor-General estimates that in 1997-98 the Victorian Treasury paid $180 million to the State Electricity Commission to subsidise the cost of electricity to the two smelters (Portland and Point Henry), indicating a subsidy of 2 c/kWh. On the basis of all available evidence, the total subsidy to aluminium smelters in Australia amounts to A$410 million per annum.

In addition, the aluminium smelting industry is responsible for a large proportion of greenhouse gas pollution, a cost imposed on others which can be valued by the anticipated cost of permits to emit greenhouse gases. The industry has said that it believes it should not be required to pay the costs of its pollution, and that other sectors of the economy should bear all of the burden. The failure to pay for the costs of the pollution for which it is responsible amounts to an additional subsidy to aluminium smelting. At a conservative price for an emission permit of A$15/tonne CO_2, this additional subsidy amounts to A$430 million per annum. The extent of the subsidies to aluminium smelting – in absolute terms and per employee – is

summarised in the table. It shows that the subsidy to aluminium smelting in Australia is A$840 million per annum or $157,000 per employee.

Subsidies to the Australian aluminium smelting industry (A$)

Subsidy	Amount	Per employee
Financial subsidy from underpriced electricity	$410 m	$76,600
Uncompensated costs of greenhouse gas emissions	$430 m	$80,400
Total subsidies	$840 m	$157,000

If the aluminium smelters carried through with their threat to shift out of Australia in response to the introduction of greenhouse gas abatement policies, the analysis above indicates that their departure would result in a net economic benefit to Australia. Every dollar of income from primary aluminium exports has a resource cost of $1.24. Through industry development programs and wage subsidies, the $410 million in direct financial subsidies freed up could be used to provide many more jobs than the industry currently provides. Indeed, all of the industry's employees could be paid $70,000 to stay at home and there would still be funds left over.

In addition, by saving 28.5 Mt in greenhouse gas emissions per year – 6.5% of Australia's total emissions (excluding land clearing) – the departure of the industry would make it a great deal easier for Australia to meet its Kyoto target by freeing up a large tranche of emissions for other, unsubsidised sectors.

The large subsidies received by aluminium smelters in Australia are almost certainly contrary to the provisions of the General Agreement on Tariffs and Trade, especially as 79% of the product is exported. It seems likely that the Australian subsidies have not been challenged in the WTO because the same companies that dominate the Australian smelting industry also dominate the industries in the other producing countries. Thus a challenge would be a challenge by these companies against themselves, upsetting the global system of public subsidies the industry has managed to put in place. If the Australian Government were to mount a challenge on behalf of taxpayers and electricity consumers in Australia, a favourable ruling may provide legal grounds for State governments to escape from their onerous contracts with the smelters.

In terms of policy development, effective greenhouse gas abatement policies will ensure that every industry and consumer takes responsibility for their own contribution to climate change. The aluminium industry is not taking economic responsibility for its own activities, relying on large subsidies to be competitive. By its efforts to undermine the development of emission reduction policies the industry has illustrated it is also unwilling to take responsibility for its greenhouse gas emissions. The aluminium smelters should be recognised as a heavily-subsidised, selfish and largely foreign owned industry. Their threats of relocation and carbon leakage should not undermine the development of sound emission abatement policies.

1. The aluminium smelting industry and the climate change debate[1]

In accordance with the terms of reference, this submission seeks to illustrate some of the direct and indirect incentives encouraging the consumption of predominantly fossil fuel-sourced energy by the aluminium smelting industry. Such incentives are particularly important where they undermine the effectiveness of industry programs and policies designed to reduce greenhouse gas emissions. This submission analyses one particular industry – aluminium smelting – and examines the impact this industry has on climate change, and attempts to contrast this with the economic and employment benefits created by the industry. The purpose of this analysis is to provide policy-makers with an insight into one of the industries that is actively undermining attempts to improve Australia's emission reduction policies.

The aluminium industry has been a vociferous opponent of policy proposals aimed at reducing Australia's energy emissions, except those policies that are voluntary and relatively ineffective. It has successfully lobbied the Federal Government to defer the introduction of the 2% renewables policy that the Prime Minister promised in November 1997. It has often been the most strident voice heard from industry. In the lead-up to the agreement to restrict greenhouse gas emissions at the Kyoto conference in November 1997 it was at the forefront of industry claims that mandatory targets would cause severe economic damage in Australia. In more recent times it has argued that the burden for cutting emissions should be placed on other sectors of the economy and households rather than being distributed equally across the economy. Its constant refrain is that measures to restrict emissions will damage its international competitiveness resulting in lost market share and a decline in Australian economic welfare.

The aluminium industry was one of the business groups to contribute $50,000 to gain a place on the Steering Committee of ABARE's MEGABARE model that was used to justify the Government's position in the preparation for the Kyoto conference. It is also a prominent member of the Australian Industry Greenhouse Network (AIGN), the industry lobby whose principal aim is to head off effective abatement policies. Aluminium companies were some of the largest sponsors of the 'Countdown to Kyoto' conference in Canberra in August 1997 organised by the far-right US organisation Frontiers of Freedom and the Australian APEC Study Centre. The conference featured Senator Chuck Hagel and Congressman John Dingell, two ultra-conservative US politicians who reject greenhouse science and want no action taken.[2]

The aluminium industry, through its industry association, the Australian Aluminium Council (AAC), argues that the industry is of great economic importance to Australia, especially for the foreign exchange it earns. It frequently threatens governments with the prospect of closing down its Australian smelters and moving offshore if it is forced to pay higher prices for electricity as a result of climate change policies.

The various claims of the aluminium industry have not been questioned, but *prima facie* there are doubts about the contribution of the industry, especially its smelting component, to Australian economic welfare. In this paper the aluminium smelting

[1] Thanks are due to Hugh Saddler and Alan Pears for reading and commenting on drafts of this paper.
[2] These facts help to explain why the confidential media strategy for the conference, prepared by Hannagan Bushnell, described government and corporate attitudes to the conference as 'ambivalent'.

industry is examined in some detail to test the claims of the industry, and to ask whether Australia would be any worse off if the aluminium smelting industry carried through with its threat to move elsewhere.

2. Structure of the aluminium smelting industry

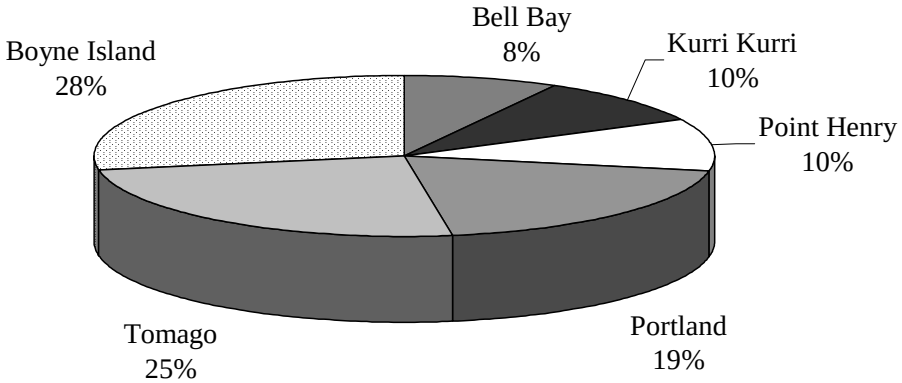
Components and emissions

The aluminium industry can be divided into four stages of production – bauxite mining, alumina refining, aluminium smelting and fabrication. It is estimated that each stage adds an order of magnitude to the value of the product, i.e. on a per tonne basis aluminium is ten times the value of alumina which is in turn ten times the value of bauxite (AAC 1997). There are six smelters in Australia, three large ones at Boyne Island, Tomago and Portland and three smaller ones at Kurri Kurri, Point Henry and Bell Bay (see Figure 1).

Smelting is the most energy-intensive stage of aluminium production, being entirely dependent on large amounts of electricity to reduce aluminium oxide (alumina) to aluminium metal. Aluminium smelting uses 14% of Australia's total electricity production and accounts for 25 Mt of CO_2 emitted from the electricity industry. Consequently, it is responsible for 16% of total greenhouse gas emissions from the electricity sector.[3]

The National Greenhouse Gas Inventory Committee estimates that an additional 2 Mt of CO_2 is released during the aluminium smelting process as a result of the oxidation of carbon anodes, and another 1.4 Mt of CO_2-equivalents in the form of perflourocarbons (NGGIC 1999, p. 71). The total sector emissions of 28 Mt CO_2 amount to 6.5% of Australia's total greenhouse gas emissions from all sources (excluding forest and grassland conversion).

Figure 1 Smelter shares of Australian aluminium production capacity 1998 (1,750,000 tonnes pa)



[3] Taking account of the shares of aluminium produced using electricity from Victorian brown coal, NSW and Queensland black coal and Tasmanian hydro.

Production

According to the International Primary Aluminium Institute (IPAI), total primary aluminium production in Oceania (Australia and New Zealand) in 1998 was 1,934,000 tonnes.[4] This amount was produced by six Australian smelters and one New Zealand smelter. The Australian Aluminium Council (AAC) estimates that the Australian contribution was 1,626,000 tonnes.[5] According to company information, Australian capacity is around 1,750,000 tonnes per annum.[6] The structure and organisation of the Australian smelting industry is presented in Table 1.

The AAC estimates that Australia exported around 1,282,000 tonnes of aluminium metal in 1998 (around 79% of production) worth around $2.8 billion, based on an average price of A$2194/tonne (Capral Annual Report 1998, p. 2). The entire aluminium industry (including bauxite and alumina, but excluding finished products) earned A$6.5 billion in export revenue in 1998.

Turnover and profit

The Industry Commission estimates that in 1995-96 the aluminium smelting industry had a turnover of $3.9 billion (IC 1998, p. 19). Profit margins in the Australian primary aluminium industry appear slim, although profits reported in Australia may be artificially low due to transfer pricing. Capral's smelting and trading operations generated earnings before interest and tax of $39 million in 1998 (Capral Annual Report 1998, p. 2). The Boyne Island smelter, producing almost 500,000 tonnes of aluminium metal per annum, and returned an operating profit before tax of only $11.2 million to Comalco (54% owner) in 1998 (Annual Report 1999, p. 60). WMC earned $320 million in 1998 from its 40% share of Alcoa's aluminium operations (WMC 1999, p. 18). However, 80% of sales value was from alumina, not aluminium.[7] CSR earned a net profit before abnormals of $57 million from its 70% share in Gove Aluminium, a part owner of the Tomago smelter (36%), but again Gove Aluminium has a large alumina business and it is difficult to determine the profit attributable to smelting.

Employment and wages

The Industry Commission estimates that in 1995-96, the aluminium smelting industry employed around 5350 people (IC 1998, p. 99). This is consistent with the information available from companies as presented in Table 1.

The average wage in the aluminium smelting industry in 1995-6 was $41,200 per annum (IC 1998, p. 98-99). Based on total employment numbers, the total value of wages paid in the smelting industry is $220 million per year.

Electricity consumption

The smelting of aluminium is the most energy-intensive stage of aluminium production, with each tonne of aluminium requiring around 15 MWh of electricity.

[4] http://www.world-aluminium.org/
[5] http://www.aluminium.org.au/
[6] Excluding 20,000 tonnes of recycled aluminium at Kurri Kurri – see Table 1.
[7] Based on production (WMC 1999, p.18) and prices for alumina and primary aluminium (LME, 1998).

Table 1 Australian smelters: location, ownership, production, employment and electricity consumption (1998)

Location	Owner/ Operator	Production capacity (tonnes pa)	Employment	Power contract/consumption (MW)	Energy consumption[a] (GWh)
Bell Bay Tasmania	Comalco	142,000	600 direct 100 contract	256 HEC	2250
Boyne Island Queensland	Boyne Smelters	490,000	900 prior to start–up of Line 3	>800 NRG/ Comalco	7000
Kurri Kurri NSW	Capral	150,000 (+20,000 recycling)	2500 in all operations[f]	300 (est)[d] Delta Energy[e]	2600
Point Henry Victoria	Alcoa of Australia	185,000	1100 incl. Anglesea power station	375 SECV[g]	3300
Portland Victoria	Portland Smelter Services	345,000	Ne	620 SECV[g]	5400
Tomago NSW	Tomago Alumin-ium	440,000	1100	690 Macquarie Generation	6050
Total		**1,750,000**	**5346[b]**	**3040**	**26600[c]**

a. Assuming 24-hour, 365-day consumption of contracted load. Importantly, maximum load allowable under contract may not always be drawn.
b. Based on Industry Commission estimates for 1995-96 (IC 1998, p. 99).
c. This is consistent with the IPAI's estimate of 27,400 GWh consumed in Oceania-based smelters in 1997 (to make 1,804,000 tonnes).
d. Based on consumption of similar plants.
e. Contract expired in 1999 (IC 1998, p. 72).
f. Including fabrication. On the basis of employment in other smelters, Capral's smelting operations probably employ 600-800.
g. The Point Henry and Portland smelters have contracts with the Smelter Trader of the State Electricity Corporation of Victoria (the shell of the former operator of the Victorian electricity system) which has a long-term supply contract with Edison Mission Energy (Victorian Treasury 1998, p. A4-116).

Sources: Boyne Island (http://www.comalco.com.au/05_operations/06_boyneisland.htm, http://www.networks.digital.com/dr/stories/boyne-01.html);
Bell Bay (http://www.comalco.com.au/05_operations/05_bellbay.htm);
Tomago (http://www.tomago.com.au/public/brochure.html);
Kurri Kurri (Capral Annual Report 1998);
Portland and Point Henry (http://www.energy.dtf.vic.gov.au/domino/web_notes/energy/dtf_epd_www.nsf/WebPages/Aluminium, http://library.northernlight.com/ML19990823090004797.html?cb=&dx=#doc, Victorian Auditor–General http://www.audit.vic.gov.au/sfo98/afs9808.htm, ALCOA http://www.alcoa.com/news/newsbriefs/australia.asp, http://www.alcoa.com/frameset.asp?page=%2Fbusiness%2Fworldwide%2Fby%5Flocation%2Faustralia%2Findex%2Easp, WMC Annual Report 1998, Alcoa 1999, p. 5.2);
General: Industry Commission 1998; Tomago (http://www.tomago.com.au/)

The Australian industry consumed a total of around 25 TWh in 1997 (IPAI 1999). This equates to around 14% of all electricity generated in Australia – total electricity generation in 1997 was 183 TWh (IEA 1999, p. II.273) – and a higher proportion of electricity available for final consumption after transmission losses and electricity used in generation.[8] Electricity consumption for each smelter is presented in Table 1.

The AAC estimates that 'energy constitutes about one-third of the total costs of production of aluminium' (AAC 1997). This concurs with information from Comalco: 'electricity is a major raw material, accounting for nearly one third of the total cost of converting alumina to metal'.[9] In contrast, the Industry Commission, in a major study on the aluminium industry, suggests that energy costs amount to around 22% of the total costs of aluminium smelting (IC 1998, p. 26–7). This difference reflects the distinction between operating costs and total production costs (see ABARE 1992, p. 3).

3. Ownership of the industry

The majority of Australia's aluminium production is owned and controlled by foreign companies (see Figure 2). The only operation that is not owned by major overseas aluminium interests is Capral, operating the smelter at Kurri Kurri.[10] The ownership structure of each smelter is shown in Figures 3a-f. Comalco and Alcoa of Australia are the dominant operators in the industry. Alcoa of Australia is owned by its United States counterpart, ALCOA (USA) (60%) and Western Mining Corporation (39.25%). Comalco is mostly owned by Rio Tinto (72.4% at 30 June 1999). Rio Tinto, after a merger with the British Rio Tinto plc, is now effectively foreign owned.[11] A number of Japanese firms are also involved in the Australian smelting industry, as are a number of major European aluminium companies. Appendix 1 provides the references for the information presented in Figure 3 along with a more detailed picture of the ownership structure of aluminium smelting in Australia.

Overall, around 59% of the output of the aluminium smelting industry in Australia is foreign owned with Japanese (17%), British (14%) and US (12%) interests dominant. The level of control depends on the definition of a 'controlling interests' but is substantially higher.

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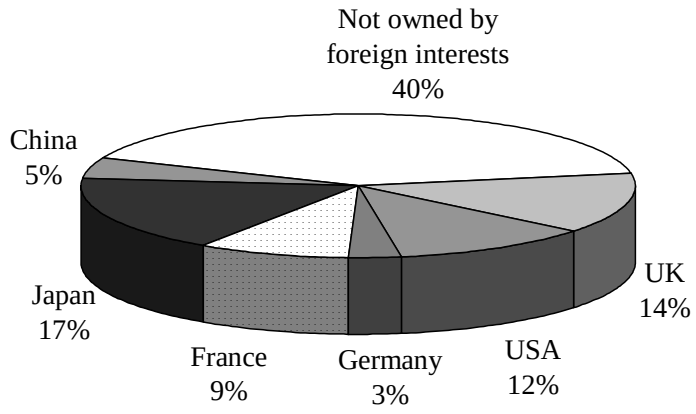
[8] ABARE estimates that 168 TWh were available for final consumption in 1997–98 (Bush *et al.* 1999, Table A10) with the difference accounted for by own-use and transmission losses.

[9] http://www.comalco.com.au/05_operations/05_bellbay.htm

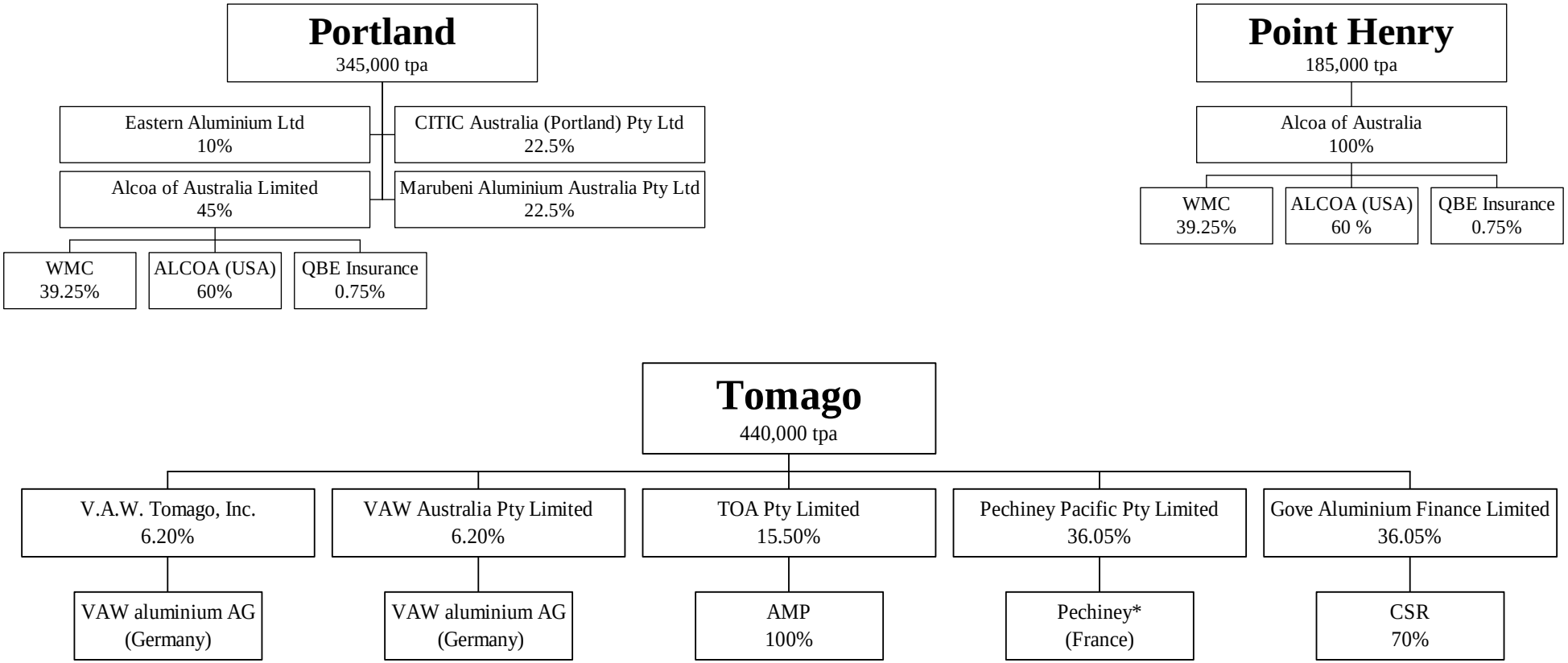
[10] Capral was formerly known as Alcan Australia and was owned by Alcan (Canada) until 1994.

[11] The merger was designed to 'place the shareholders of both companies in substantially the same position as if they held shares in a single enterprise who owned all of the assets of both companies' (Annual Report 1999, p. 71). To this effect, 'any dividend or capital distribution per Rio Tinto plc Ordinary Share shall be matched by an equal dividend or capital distribution per Rio Tinto Limited Share (and vice versa)'. As at 26 February 1999, Rio Tinto plc had 1,060 million shares on issue and Rio Tinto Ltd had 602 million. The merger agreement essentially makes one Rio Tinto plc share worth one Rio Tinto Ltd share, with the combined entity having 1,662 million shares on issue. In addition, Rio Tinto plc also owns 48.75% (294 million shares) of Rio Tinto Ltd.

Figure 2 Ownership of Australian primary aluminium production

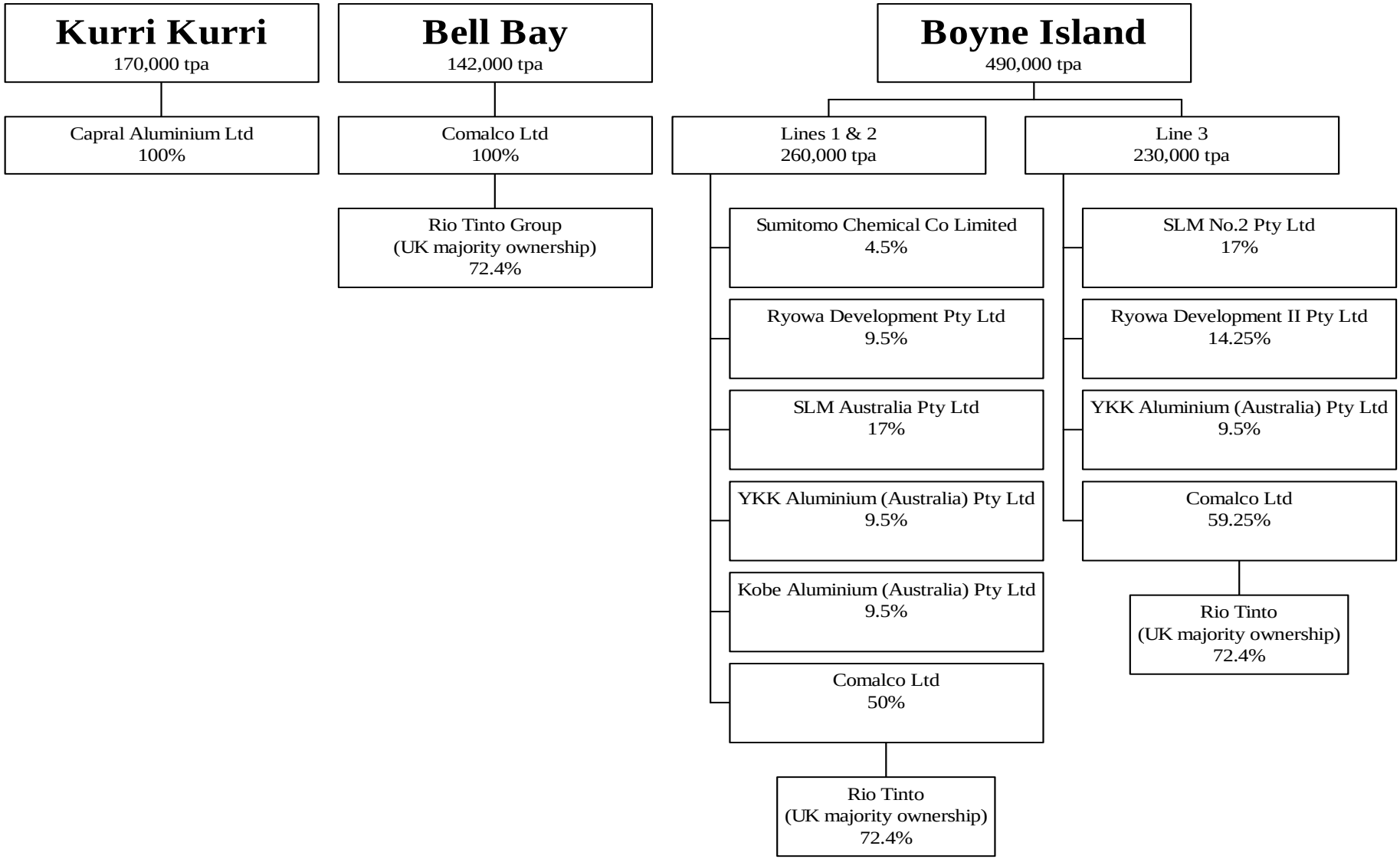


Figures 3a–c Ownership of the Portland, Point Henry and Tomago smelters



* Pechiney is planning to merge with Alcan (Canada) and algroup (Switzerland)

Figures 3d–f Ownership of the Kurri Kurri, Bell Bay and Boyne Island smelters



4. Electricity pricing and subsidies

Prices paid by aluminium smelters for electricity are locked in by long-term contracts, often covering 20 to 30 year periods. Over the years, State governments with surplus generation capacity have offered low-priced electricity to attract new aluminium smelters.

The prices are a closely kept secret, but there are enough pieces of information available to build a reasonably accurate picture. While noting that the price paid for electricity 'is not publicly available', the Industry Commission confirms common knowledge in the industry that smelters receive cheaper electricity than similar large industrial consumers (IC 1998, p. 69).

This is consistent with a 1992 ABARE study into the aluminium industry which concluded that 'in 1991 the average Western world price was US1.92c/kWh, with the Australian price being around this average' (ABARE 1992, p. 4). During 1991 the Australian dollar was valued between 75 and 80 US cents.[12] Accordingly, the ABARE report suggests Australian prices were around 2.4-2.6 c/kWh. Since smelters typically operate under long-term contracts it is reasonable to assume similar, if not lower, prices are paid now. Although smelter contracts are not affected by price movements in the National Electricity Market (NEM), any new contracts, or the renegotiation of existing contracts, may be affected by the lower electricity prices prevailing in the NEM (market prices have fallen throughout Australia since 1992, see Quiggin *et al.* 1998, pp. 52–53). However, flexible tariff arrangements that link the price of electricity to the price of aluminium may have slightly increased the price paid by smelters since world aluminium prices have risen a little since 1991 – see Appendix 2 – although for some smelters, notably Portland, the aluminium price has recently been below the 'formula floor' threshold (Eastern Aluminium 1999, p. 3).

Discussions with industry experts indicate that aluminium smelters pay 1.5-2.5 c/kWh for delivered electricity. This compares with 5-6 c/kWh for other large industrial users operating in the competitive market, suggesting a price difference of 2.4-4.5 c/kWh. The former Victorian Treasurer, Alan Stockdale, has said that other high voltage industrial customers in Victoria were paying up to three times the price paid by the Portland and Point Henry smelters (Stockdale 1995).

Only in Victoria is hard information on the electricity pricing arrangements for smelters publicly available. Electricity is supplied to the Portland and Point Henry smelters under a flexible tariff contract established in 1984 and running to 2016. The Victorian Department of Treasury & Finance has described the contracts to supply Portland and Point Henry with electricity from Loy Yang B as 'onerous and unfavourable' and indicated in 1997 that they were 'costing the Government over $200 million per year' (Department of Treasury & Finance 1997, p. 19). The Victorian Auditor-General estimates that in 1997-98 the Victorian Treasury made payments totalling $180 million to the State Electricity Commission of Victoria (SECV) to subsidise the cost of electricity supplied to the aluminium smelters (Auditor-General's Report on the Victorian Government's Finances, 1997-98).[13] The

[12] US Fed Reserve, http://www.bog.frb.fed.us/releases/H10/hist/dat96_al.txt

[13] The SECV is the shell of the organisation that ran the Victorian electricity industry before privatisation. The Smelter Trader arm of the SECV has negotiated a hedge contract with Edison

Auditor-General went on to estimate that the net present value of Victoria's liabilities under this pricing contract amounts to $1.3 billion.

Since the two Victorian smelters had supply contracts for around 8,700 GWh of electricity in 1998, the subsidy equates to around 2 c/kWh. This is consistent with the lower end of industry estimates of the deviation from the price established for large industrial consumers in the competitive market.

The Victorian smelters account for 33% of total electricity consumption by the industry (Table 1). Some evidence suggests that other Australian smelters receive electricity at similar prices to the Victorian smelters.[14] For example, the Industry Commission indicates that the Tomago smelter was being supplied electricity at a price that was '"in the market" for a smelter of its size'. On the other hand, Capral believes it is paying more for electricity than its interstate counterparts (IC 1998, p. 69). It has been suggested that Victorian smelters pay $14 per MWh, Tomago pays $22 per MWh and Capral around $27 per MWh (*Australian Financial Review* 1 July 1999, p. 72). Based on the audited subsidy to Victorian smelters, it appears that Tomago receives a subsidy of around 1.2 cents/kWh, and Capral around 0.7 cents/kWh.[15] This indicates that the industry as a whole receives a subsidy of around 1.5 cents/kWh and possibly higher. On the basis of the Victorian subsidy identified by Treasurer Stockdale, and the estimates of prices for electricity paid by Victorian and other smelters, we estimate that the total subsidy to the aluminium smelters in Australia due to low-priced electricity is $410 million per annum.[16]

The direct financial subsidy provided to the industry by taxpayers and other electricity consumers amounts to a large proportion of total industry costs. If electricity costs comprise one third of total operating costs, and smelters pay around 60% (probably at most) of the market price for electricity supplied to large industrial customers then the subsidy accounts for around 13% of total industry costs. This suggests that all of the profits of the industry are provided by subsidies paid for by taxpayers and other electricity consumers. Furthermore, most of these profits do not accrue in Australia but are repatriated to foreign parent companies.

Mission Energy which fixes the price paid for electricity at $23.95 per MWh. The SECV is then required to supply electricity to the Portland and Point Henry smelters according to a contract negotiated in 1984. Effectively, the SECV operates as a loss-making middleman between the generator and smelters. http://www.audit.vic.gov.au/sfo98/afs9808.htm

[14] The long-run marginal cost of generating electricity is about the same in Victoria and NSW. Although fuel costs using Victorian brown coal are much lower than for NSW black coal, the capital costs of power plants burning brown coal are higher since they must be much bigger due to the low calorific value of brown coal.

[15] This assumes that market (unsubsidised) prices in Victoria and NSW are the same (that is, customers have access to the NEM). Queensland market prices are likely to be at least those in NSW and Victoria.

[16] It is important to note that the Gladstone Power Station is partially owned by the operators of the Boyne Island smelter. It has been suggested that the Comalco-led consortium purchased this power station in 1994 for considerably less than the Goss Government was asking and made the expansion of the Boyne smelter conditional on such a favourable deal. Whether this is true or not, it is apparent that Comalco would not have purchased the power station unless they believed they could get cheaper power. Accordingly, it has been assumed that Boyne Island receives a similar subisdy to smelters elsewhere in Australia (although the subsidy was in the form of a cheap power station). A similar assumption has been made with regard to power supplied to Point Henry from the Anglesea power station, although in this case part of the subsidy is in the form of coal exempt from State levies.

A number of reasons have been put forward to explain why the aluminium smelters pay lower prices than other business and residential consumers for electricity (eg. IC 1998, p.69). Firstly, it is suggested that smelters demand a continuous base load which is advantageous to the generators. This provides more certainty of demand for generators.

Secondly, it is argued that smelters are usually located close to power stations, thereby reducing transmission costs. However, the weighted average distance of smelters from their generators is over 100 kilometres (an average heavily influenced by Portland's distance from the Latrobe Valley).[17] It is unlikely that other large industrial users are much further on average from their electricity suppliers. Moreover, the price estimates above already take into account the delivery costs, although in the case of the Portland smelter the Victorian Hamer Government heavily subsidised the construction of high-voltage transmission lines (Blake 1991).

Thirdly, smelters draw a high voltage load, reducing transmission losses. Contrary to this, it might be noted that Treasurer Stockdale referred to the fact that other *high voltage* industrial customers in Victoria were paying up to three times the price paid by the smelters. Tariff estimates from Citipower indicate that high voltage customers pay around 4.5 cents/kWh. This is probably close to the price smelters would be paying in the absence of subsidies.

Fourthly, electricity supply contracts generally contain 'take or pay' provisions, guaranteeing the smelters will pay for the electricity whether they use it or not, thereby contributing to certainty of demand for the generators.

The subsidy estimates presented earlier take into account the various arguments presented above. For example, the power contract the SECV has with Edison Mission Energy for the supply of the Portland and Point Henry smelters is essentially a contract for a continuous base load at high voltage. If Point Henry and Portland were paying a market price they would pay the same price paid by the SECV, not around $200 million per annum less. Accordingly, whatever the merits of the arguments for large industrial users of electricity receiving cheaper power, the estimate of the total electricity subsidy to the industry used in this paper incorporates these arguments.

5. Costs of pollution from the aluminium smelting industry

In 1997 the electricity sector accounted for 35% of Australia's total greenhouse gas emissions (excluding forest and grassland conversion, NGGIC 1999, p. xix). As we have seen, the aluminium smelting industry accounts for 14% of the total electricity consumed in Australia. It accounts for 16% of greenhouse gas emissions from the electricity industry, a higher share because one-third of the industry's power is drawn from Victorian brown coal-fired power stations which are more polluting than those

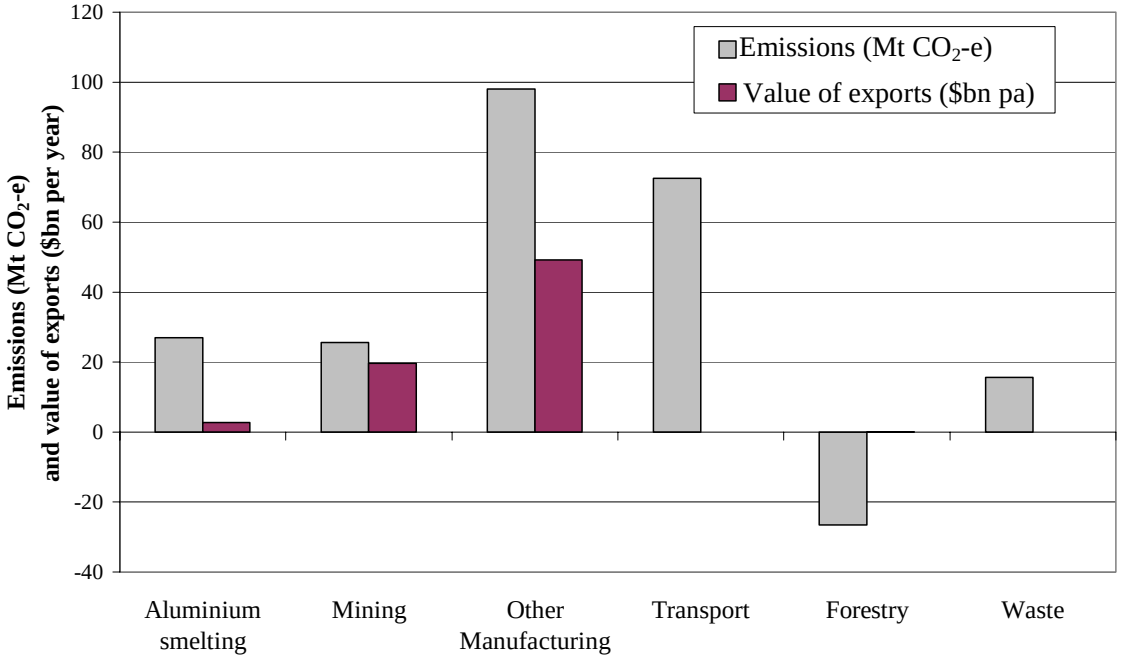
[17] The Gladstone Power Station and the Boyne Island smelter are taken to be immediately adjacent. The Point Henry smelter is around 30 km from the Anglesea Power Station. The distance from the Tomago smelter to Macquarie Generation's Bayswater power station is at least 40 km, a similar the distance between Capral's Kurri Kurri smelter and Vales Point. The Bell Bay smelter is at least 50 km from Potina. The distance from Loy Yang B (Latrobe Valley) to the Portland smelter is estimated to be at least 400 km. Additional power for Point Henry (Anglesea is only 150 MW) needs to travel over 100 km, also from Loy Yang B.

located elsewhere in Australia.[18] Figure 4 compares the quantity of emissions from aluminium smelting with those released from other activities.

The development of nascent markets for greenhouse gas emission permits allows a price to put on the greenhouse pollution for which various activities are responsible. In a recent paper, the Australian Greenhouse Office (AGO) reviewed the range of estimates of prices of a permit to emit one tonne of CO_2 that might prevail in an international system of emissions trading. It gave a range of A$10-A$50/t CO_2 and settled on A$30/t CO_2 as a best estimate (AGO 1999, p. 13-15). The Australia Institute has also reviewed the evidence and suggests that, in a domestic trading system, a price of A$20/t CO_2 may be more accurate, with a lower figure for an international system (Hamilton and Turton 1999, p. 36–37). In this analysis we assume a world permit price of $15/t CO_2, half that indicated by the AGO.

On this basis, the emissions saved from the aluminium smelting industry – 25 Mt CO_2 from electricity generation and 3.5 Mt CO_2-e from smelting itself – are valued at $430 million per annum. This is the value of the additional subsidy provided to the aluminium smelting industry by the fact that it is not at present required to pay for the damage to the climate system that its emissions are responsible for. Looked at another way, the claim by the aluminium industry that it should be excused from the need to hold emission permits if Australia adopts emissions trading or equivalent policy measures, or that it should be granted permits to cover its emissions at no charge, is in fact a call for an additional financial subsidy to the industry of $430 million per annum.

Figure 4 Comparison of emissions from various sectors, 1997



Sources: NGGIC 1999, p. xix; Bush *et al.* 1999, Table A10; GCO 1997, p. 29; ABS 5422.0

[18] Although this is somewhat offset by the fact that Bell Bay in Tasmania draws its power from emission-free hydroelectric power. State-specific emission factor were obtained from the Greenhouse Challenge Workbook (GCO 1997, p. 29)

6. Implications of the subsidisation of aluminium smelting industry

In sum, the analysis of shows that the aluminium smelting industry receives $410 million annually in financial subsidies paid for by taxpayers and other electricity consumers to subsidise its cheap electricity, and is receiving another $430 million in subsidies through its failure to pay for its share of the costs associated with Australia's greenhouse gas emissions.

The subsidies to the aluminium smelting industry, expressed in absolute terms and per employee, are summarised in Table 2. They amount to around $157,000 per employee each year. This compares to the industry's average wage in 1995-6 of $41,200 per annum. The total annual subsidy of $840 million compares to the industry's total annual wage bill of approximately $220 million.

These subsidies almost certainly exceed the profits generated in the industry, profits that are mostly remitted to the foreign companies that control the industry. While the industry earns substantial export income, the extent of the subsidies mean that every dollar of income from aluminium exports has a resource cost of $1.11 if only electricity subsidies are included, and $1.24 if the costs of pollution are also added.

Table 2 Subsidies to the aluminium smelting industry

Subsidy	Amount	Per employee
Financial subsidy from underpriced electricity	$410 m	$76,600
Uncompensated costs of greenhouse gas emissions	$430 m	$80,400
Total subsidies	$840 m	$157,000

Note: Employment includes employees at Bell Bay.

If the aluminium smelters carried through with their threat to shift out of Australia in response to the introduction of greenhouse gas abatement policies, the analysis above indicates that their departure would result in a net economic benefit to Australia. Through industry development programs and wage subsidies, the $410 million in direct financial subsidies freed up could be used to provide many more jobs than the industry currently provides. Indeed, all of the industry's employees could be paid $70,000 to stay at home and there would still be funds left over.

In addition, by saving 28.5 million tonnes of greenhouse gas emissions per year – 6.5% of Australia's total emissions (excluding land clearing) – the departure of the industry would make it a great deal easier for Australia to meet its 108% Kyoto target.

The large subsidies received by aluminium smelters in Australia are almost certainly a subsidy under the World Trade Organization (WTO) definition. They meet the three criteria: they are (i) a financial contribution (ii) by a government or public body which (iii) confers an industry-specific benefit. The adverse effect would easily be shown to be 'actionable' since the subsidies exceed the WTO benchmark of 5% of the value of the product. Other consumers of electricity suffer adverse effects and, since 79% of the product is exported, competitors in other countries face a disadvantage.

The question arises as to why smelting companies in another aluminium-producing country (such as Canada, the Former Soviet Union or the USA) have not demanded that their government challenge Australia's export subsidies at the WTO. The answer seems to be that the same companies that dominate the Australian smelting industry also dominate the industries in the other producing countries. Rio Tinto, ALCOA, Pechiney and VAW have aluminium interests around the globe. Thus a challenge would be a challenge by these companies against themselves. Having persuaded governments in the other main producing countries to provide similar levels of subsidy,[19] the major corporations are loath to upset the global structure they have built up.

The problem lies in large measure in the secrecy surrounding electricity contracts. This secrecy is contrary to good policy as it has been the means by which huge subsidies have been concealed. The Federal Government's National Greenhouse Strategy appears to recognise this problem by requiring acceleration of energy market reform including 'transparent funding of network cross-pricing subsidies' and 'removal of derogations as quickly as feasible' (NGS 1998, p. 42). The Federal Government should acknowledge that the subsidies to aluminium smelting mean that Australia's greenhouse gas emissions are substantially higher than they would be if smelters had to pay the market price. If the Australian Government were to mount a challenge on behalf of taxpayers and electricity consumers in Australia, a favourable ruling may provide legal grounds for State governments to escape from their onerous contracts with the smelters.

7. Concluding comments

This submission has clearly identified a subsidy to the aluminium smelting industry that provides a perverse incentive to consume electricity, most of which is generated from fossil fuels. This incentive runs counter to, and in all likelihood overwhelms, many existing industry programs and policies aimed at reducing greenhouse gas emissions. Importantly, this industry has consistently opposed almost every policy aimed at emissions abatement, except those that are voluntary and largely ineffective.

The aluminium smelters already receive special treatment compared to other industries within Australia. The industry's threats about the consequences for aluminium smelting if greenhouse gas reduction policies are implemented is a poorly disguised attempt to maintain and extend its extensive subsidies. The analysis presented above illustrates that, in terms of resource cost, the smelting industry is probably costing Australia more than it is contributing and therefore if the aluminium smelters carry out their threat to relocate offshore it may well benefit Australia.

This conclusion is confirmed by a University of Tasmania cost-benefit study of Comalco's Bell Bay smelter which concluded the state would be better off if the smelter closed down, not least because it would release a large amount of electricity to be sold at market prices (CREA 1993). As Bell Bay is supplied by hydro-power, it does not benefit from the additional greenhouse subsidy of smelters on the mainland.

[19] According to ABARE estimates, earlier this decade some US aluminium smelters received electricity for –US0.5 cents/kWh, i.e. they were paid to consume electricity (ABARE 1992, p. 28). ABARE also estimated that smelters in Canada and Venezuela paid US0.5-0.9 cents/kWh for hydroelectricity – regarded as the cheapest form of electricity because governments often subsidise the large capital costs of dam construction (ABARE 1992, p. 28).

On the other hand, if Australian smelters shifted to countries that do not have greenhouse gas reduction obligations, this would lead to some carbon leakage and may not reduce global greenhouse gas emissions. Although the potential for carbon leakage is a relevant concern, it should not undermine efforts to develop sound domestic policy measures to reduce greenhouse emissions. Australia has little to lose by calling the bluff of the aluminium smelters.

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Appendix 1 Ownership of primary aluminium production in Australia

Location	Production	Primary Ownership		Secondary ownership		Foreign owned or controlled		Ownership of Production		
	(tonnes pa)							Foreign owned (tonnes pa)	No foreign interest (tonnes pa)	Total (tonnes pa)
Kurri Kurri	170000	100%	Capral	100%	No large or controlling interest	0%		0	170000	170000
Bell Bay	142000	100%	Comalco	72.40%	Rio Tinto Group	81.40%	Rio Tinto plc / UK	83700	58300	142000
Boyne Island										
Lines 1 & 2	260000	50%	Comalco	72.40%	Rio Tinto Group	81.40%	Rio Tinto plc / UK	76600	53400	130000
		17%	SLM Australia	Control	Sumitomo Light Metal Industries (Japan)	100%	Japan	44200	0	44200
		9.50%	Kobe Aluminium (Aust)	Control	Kobe Steel Ltd	100%	Japan	24700	0	24700
		9.50%	YKK Aluminium (Aust)	Control	Yoshida Koghyo KK	100%	Japan	24700	0	24700
		9.50%	Ryowa Develop.	Control	Mitsubishi Corp	100%	Japan	24700	0	24700
		4.50%	Sumitomo Chem	Control	Sumitomo Chem	100%	Japan	11700	0	11700
Line 3	230000	59.25%	Comalco	72.40%	Rio Tinto Group	81.40%	Rio Tinto plc / UK	80300	55975	136275
		17%	SLM No. 2	Control	Sumitomo Light Metal Industries	100%	Japan	39100	0	39100
		9.50%	YKK Aluminium (Aust)	Control	Yoshida Koghyo KK	100%	Japan	21850	0	21850
		14.25%	Ryowa Develop.	Control	Mitsubishi Corp	100%	Japan	32775	0	32775
Portland	345000	45%	Alcoa Aust/AWAC	60%	ALCOA*	100%	USA	93150	0	93150
				39.25%	WMC	0%		0	60950	60950
				0.75%	QBE Insurance Group	0%		0	1150	1150

Location	Production (tonnes pa)	Primary Ownership		Secondary ownership		Foreign owned or controlled		Foreign owned (tonnes pa)	No foreign interest (tonnes pa)	Total (tonnes pa)
Portland continued		10%	Eastern Alumin	16%	CITIC	100%	China	5520	0	5520
				11%	ALCOA*	100%	USA	3630	0	3630
				27%	QBE Insurance Group	0%		0	9300	9300
				47%	No large interest	0%	est	0	16050	16050
		22.5%	Marubeni	Control	Marubeni	100%	Japan	77625	0	77625
		22.5%	CITIC Australia	Control	CITIC	100%	China	77625	0	77625
Point Henry	185000	100%	Alcoa Aust/AWAC	60%	ALCOA*	100%	USA	111000	0	111000
				39.25%	WMC	0%		0	72600	72600
				0.75%	QBE Insurance Group	0%		0	1400	1400
Tomago	440000	36.05%	Pechiney Pacific	Control	Pechiney*	100%	France	158620	0	158620
		36.05%	Gove Alumin	70%	CSR	0%		0	158620	158620
		15.50%	TOA	100%	AMP	0%		0	68200	68200
		6.20%	VAW Aust	Control	VAW (Germany)	100%	Germany	27280	0	27280
		6.20%	VAW Tomago	Control	VAW (Germany)	100%	Germany	27280	0	27280
Total	**1772000**							**1046055**	**725945**	**1772000**
								59%	**41%**	**100%**

* Pechiney is planning to merge with Alcan (Canada) and algroup (Switzerland). Alcoa is planning to merge with Reynolds.

Note: Some columns do not add exactly due to rounding.

Ownership structure references

Boyne Smelters Ltd

http://www.comalco.com.au/05_operations/06_boyneisland.htm
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Portland Smelter Services Ltd

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Eastern Aluminium Annual Report 1998

Point Henry

http://www.alcoa.com/frameset.asp?page=%2Fbusiness%2Fworldwide%2Fby%5Flocation%2Faustralia%2Findex%2Easp

Bell Bay

http://www.comalco.com.au/05_operations/05_bellbay.htm
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Kurri Kurri

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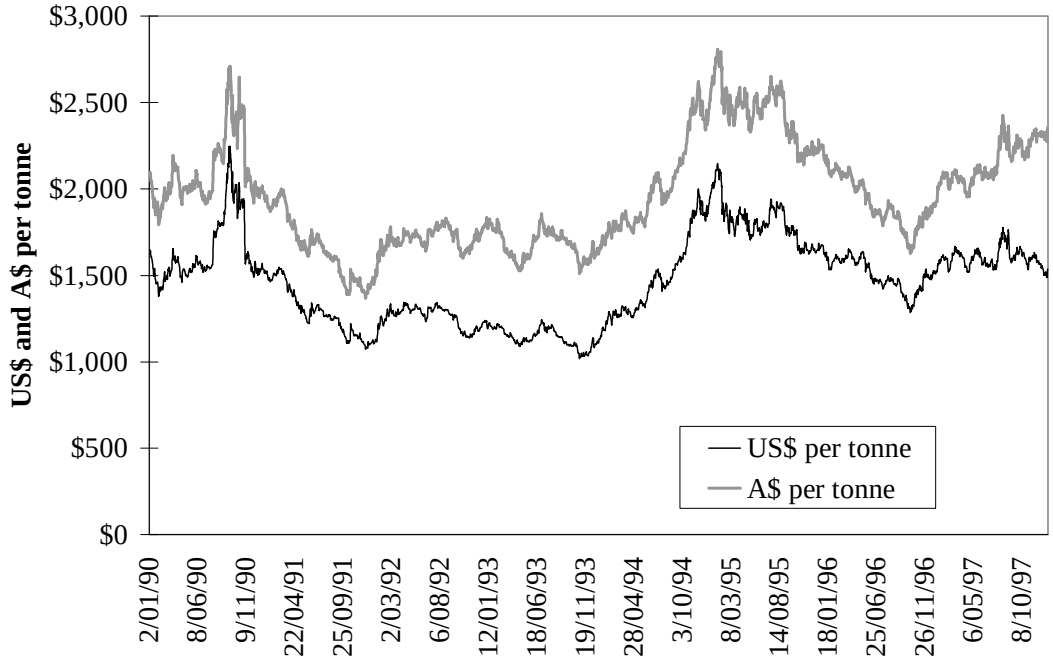
General

ABN-AMRO (*pers. comm.*)

Appendix 2 Aluminium cash price, 1990-1997



Source: London Metal Exchange (http://www.lme.co.uk/Stats.htm) and USA Federal Reserve (http://www.bog.frb.fed.us/releases/H10/hist/dat96_al.txt).