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Inquiries about this and all other publications should be directed to:

Media and Publications Support
Industry Commission
Level 3, Nature Conservation House
Cnr Emu Bank and Benjamin Way
BELCONNEN ACT 2617

PO Box 80
BELCONNEN ACT 2616

Phone: (02) 6240 3200
Fax: (02) 6240 3311

http://www.indcom.gov.au/

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# FOREWORD

Over the last decade or so, Australian governments have introduced many changes to our economy promoted as microeconomic reforms. While a considerable amount of work has been done to highlight the expected economy-wide gains from these reforms, little is known about their direct impacts on many Australian industries and firms.

This report attempts to reduce this information gap by examining the impact of microeconomic reform on the Australian aluminium industry. Earlier studies have examined the impact of microeconomic reform on Australia's agri-food and automotive industries.

The aluminium industry was selected as a case study industry for several reasons. First, it is a large user of a number of infrastructure services — including electricity, natural gas and transport — most of which have been subject to substantial reform in recent years. Second, firms in the industry are subject to intense global competition and face the challenge of improving their competitiveness. The industry's competitiveness is affected by government actions in areas such as industrial relations, taxation, environmental regulations and the management of resource access. Third, as with other industries, there has been considerable debate about the adequacy of the pace of reform in many of these areas. It was also important that all key players in the industry were prepared to participate in the study and provide the necessary data and other information.

The main objectives of the study are to provide information on: factors within the influence of government that are unnecessarily impeding the competitiveness of the industry; factors that affect decisions to invest in Australia or abroad; firms' assessments of the impact and adequacy of the pace of a selection of microeconomic reforms; and firms' assessments of priority areas for future reform.

Gary Banks
Acting Chairperson

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The development of the paper was guided by Bill Scales, John Cosgrove and Garth Pitkethly.

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Responsibility for all views expressed and any errors and omissions in this paper lies with the Industry Commission.

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# ABBREVIATIONS

| | |
|---|---|
| AAC | Australian Aluminium Council |
| ABARE | Australian Bureau of Agricultural and Resource Economics |
| ABS | Australian Bureau of Statistics |
| ACS | Australian Customs Service |
| ADCA | Aluminium Development Council of Australia |
| AGA | Australian Gas Association |
| AGL | Australian Gas Light Company |
| AIRC | Australian Industrial Relations Commission |
| ALCAN | Aluminium Company of Canada |
| AMWU | Australian Manufacturers' Workers' Union |
| ATO | Australian Taxation Office |
| AWA | Australian Workplace Agreement |
| AWU | Australian Workers' Union |
| BBCT | Broad-based consumption tax |
| BCA | Business Council of Australia |
| BIE | Bureau of Industry Economics |
| CA | Certified Agreement |
| CEPU | Communications, Electrical, Electronic, Energy, Information, Postal, Plumbing and Allied Services Union of Australia |
| CIS | Commonwealth of Independent States |
| COAG | Council of Australian Governments |
| CSOs | Community service obligations |
| DFAT | Department of Foreign Affairs and Trade |
| DFRS | Diesel fuel rebate scheme |
| DOT | Department of Transport |
| EFA | Enterprise Flexibility Agreement |
| EIA | Environmental Impact Assessment |
| EPA | Environmental Protection Authority |
| EPAC | Economic Planning Advisory Commission |
| ESD | Ecologically sustainable development |
| ESAA | Electricity Supply Association of Australia |
| FBT | Fringe benefits tax |
| FCCC | Framework Convention on Climate Change |
| FDI | Foreign direct investment |
| GDP | Gross domestic product |
| GHG | Greenhouse gas |
| GST | Goods and services tax |
| IC | Industry Commission |

| | |
|---|---|
| IGAE | Intergovernmental Agreement on the Environment |
| IPAI | International Primary Aluminium Institute |
| IPART | Independent Pricing and Regulatory Tribunal of NSW |
| Kt | Kilotonne |
| LME | London Metal Exchange |
| MNEs | Multinational enterprises |
| MOU | Memorandum of Understanding |
| Mt | Megatonne |
| NEM | National electricity market |
| NEPC | National Environment Protection Council |
| NTA | Native Title Act 1993 |
| OECD | Organisation for Economic Co-operation and Development |
| OH&S | Occupational health and safety |
| ORR | Office of Regulation Review |
| PET | Polyethylene terephthalate |
| PFC's | Perfluorinated carbon compounds |
| QAL | Queensland Alumina Limited |
| QR | Queensland Rail |
| R&D | Research and development |
| SCNPMGTE | Steering Committee for National Performance Monitoring of Government Trading Enterprises |
| SRG | Shipping Reform Group |
| WIRA | Waterfront Industry Reform Authority |
| WMC | Western Mining Corporation |

## Box 1 Aluminium case study — report at a glance

- The bauxite mining, alumina and aluminium industry is a major Australian exporter with prospects for strong growth over the next 3-5 years.
- Australia's alumina refineries and aluminium smelters are among the world's lowest cost producers. They have lifted their labour and capital productivity in recent years, and the smelters are among the most energy efficient in the world.
- Internationally, the industry is experiencing increased competitive pressures. These represent an urgent challenge to which Australian firms must respond.
- Australian governments have a role to play in helping the industry to respond to this competitive challenge by progressing microeconomic reform on a broad front — although the challenge of continuous improvement applies equally to firms/industries as well as to governments.
- Industrial relations reform is seen as having the largest positive impact on the industry's competitiveness between 1990 and 1996. Other leading positive reforms include rail freight services, the waterfront and changes to tariff concessions and policy by-laws.
- Policy changes viewed as having the greatest negative impact between 1990 and 1996 were changes to air emission regulations, taxes on non-labour inputs, labour on-costs and land access/resource security.
- The pace of microeconomic reform in five areas attracted a relatively high proportion of satisfactory ratings. The five areas are water emission regulations, electricity supply, hazardous waste regulations, land rehabilitation regulations and telecommunications.
- In contrast, the pace of microeconomic reform in eight areas attracted a relatively high proportion of unsatisfactory ratings. The areas are coastal shipping, the waterfront, gas supply, rail freight, tariff concessions/by-laws, tariff reductions on inputs, taxes on business inputs and land access and resource security. Most firms consider that reform in these areas is progressing too slowly.
- Progressing reforms in coastal shipping and the electricity and natural gas supply industries, together with outcomes in relation to controls over greenhouse gas emissions, are seen as having the greatest impact on competitiveness over the next 3-5 years.
- Beyond these priority areas, firms indicated that microeconomic reform needs to be pursued on a broad front as there are a wider range of government actions which impact significantly on their competitive position.

# SUMMARY

Over the last decade or so, Australian governments have introduced many changes to our economy. Many of the changes have been promoted as microeconomic reforms, with the objective of raising Australia's productivity and enhancing the well-being of Australians.

Economy-wide studies of Australia's microeconomic reforms have highlighted the generally positive and continuing gains from these reforms. However, the effects on particular firms and industries are often not clear. This study of the aluminium industry is the third in a series of industry-based studies which are intended to improve understanding of these effects (BIE 1996a). The first case study, covering the agri-food industries (BIE 1996b), was released in June 1996. The second study, covering the automotive industry (BIE 1996c), was released in October 1996.

A broad overview of the study is provided in box 1 (opposite page).

## The aluminium study — approach

Analysis of the aluminium industry provides valuable insights into the reform process, mainly because of certain key features of this industry, namely:

- its cost structure, net returns and investment decisions are influenced significantly by a range of government reform initiatives covering areas such as infrastructure services, labour markets and industrial relations, the environment and resource access arrangements, and taxation arrangements;
- the industry is highly export-oriented and provides an indication of some of the challenges faced by other Australian export industries in maintaining/improving their international competitiveness; and
- the industry competes for new investments with locations in other countries.

The main sources of data and information for the study included a survey of key firms in the industry, written submissions from most of these firms and interviews with these firms. All eight firms operating in the three core stages covered by the study (bauxite mining, alumina refining and aluminium smelting) responded to the survey. The Commission also held discussions with the Australian Aluminium Council, the Minerals Council of Australia and the Queensland Mining Council.

## The aluminium industry — a snapshot

Distinctive features of the Australian and global aluminium industry are its relatively high concentration — it comprises a small number of large firms — and vertical integration. The dominant role played by large multinational firms reflects the large amounts of capital involved and the importance of technical know-how.

The Australian industry is a dynamic and significant activity in both domestic and global terms (box 2).

### Box 2 Distinctive features of Australia's bauxite mining, alumina and aluminium industry

- Australia is:
  - the world's largest miner of bauxite and refiner of alumina, accounting for almost 40 per cent and 30 per cent, respectively, of world production; and
  - the world's fifth largest smelter of aluminium, with a 7 per cent share of world output.
- In 1996-97, exports of bauxite, alumina and aluminium were around $4.8 billion — Australia's second largest export after coal.
- The export shares of production vary — from around 80 per cent for alumina and aluminium to only 12 per cent for bauxite. Most bauxite is processed within Australia.
- The industry generates an annual turnover of around $8 billion and directly employs over 13 000 people.
- The industry is responsible for significant investment. Companies based in Australia invested almost $3 billion on major projects between 1990 and 1996 (around 80 per cent comprised expansion of installed plant capacity). Over the next 3-5 years, around $3.6 billion is expected to be invested on major projects. This includes:
  - Comalco's proposed new refinery at Gladstone or in Malaysia ($1 billion);
  - a $0.8 billion expansion of Worsley's refinery; and
  - an expansion of Alcoa's Wagerup refinery costing around $1 billion.

Notwithstanding current weakness in Asian demand, the industry expects to benefit from strong overall demand growth over the next 3-5 years. Recent projections by ABARE (1998a) point to a 15Mt increase in Australia's bauxite production between 1996 and 2003. Over the same period, alumina and aluminium production are projected to increase by about 3Mt and almost 0.4Mt, respectively.

## Industry performance

Australia's bauxite mining, alumina and aluminium industry is a world leader. Its alumina refineries and aluminium smelters are among the world's lowest cost producers (chapter 3). As a result, the industry is a vigorous and highly successful competitor in global markets.

The cost advantages enjoyed by Australian producers reflect, in part, the availability, quality and accessibility of the primary resource — bauxite. Competitively priced energy and the positioning of refineries in relatively close proximity to bauxite mines are also advantageous. Relatively cheap electricity and access to highly competitive sources of alumina provide a competitive edge to Australia's smelters. The scale of Australia's refineries and smelters — which are large by international standards — also helps to explain why they are among the world's lowest cost producers.

The overall productivity of the surveyed firms increased between 1990 and 1996. The leading contributors included changes in the scale of production, investments in new machinery and technology, benefits from enterprise agreements, changes to work practices and improved capacity utilisation.

Measures of labour productivity and energy efficiency confirm the improvement in Australia's alumina refineries and aluminium smelters performance in recent years. Australia's aluminium smelters are among the most energy efficient in the world.

## Competitiveness and microeconomic reform

Australian-based aluminium firms currently expect to invest around $3.6 billion in major projects (ie single investments in excess of $30 million) over the next 3-5 years. The bulk of this is expected to be directed towards increasing plant capacity. However, the extent and timing of future investment will be governed largely by the competitive position of the Australian industry.

The aluminium industry is characterised by keen competition domestically and internationally (chapter 3). Most firms reported increased global competition since 1990, mainly reflecting the integration of the former Soviet Union into world markets, competitors upgrading their technology and production processes, new entrants and competition from alternative products. Competition is expected to remain keen over the next few years. These developments are seen as posing an urgent challenge for Australian-based firms — the competitiveness of the Australian industry will have to improve if it is to maintain its market position and attract new investment.

The competitive position of the Australian industry is shaped by a number of factors. Some are subject to the control of the firms themselves, while others are dependent on the actions of Australian governments. Further microeconomic reform is seen as a way in which Australian governments can help the industry respond to its competitive challenge. Microeconomic reform has direct impacts on the cost and quality of major inputs used by the industry — such as electricity, gas, rail freight, coastal shipping and port services. It also affects labour market arrangements and the productivity of workplaces, as well as the industry's use of natural resources and other environment assets. Taxation arrangements and other government regulations also have an impact on industry costs.

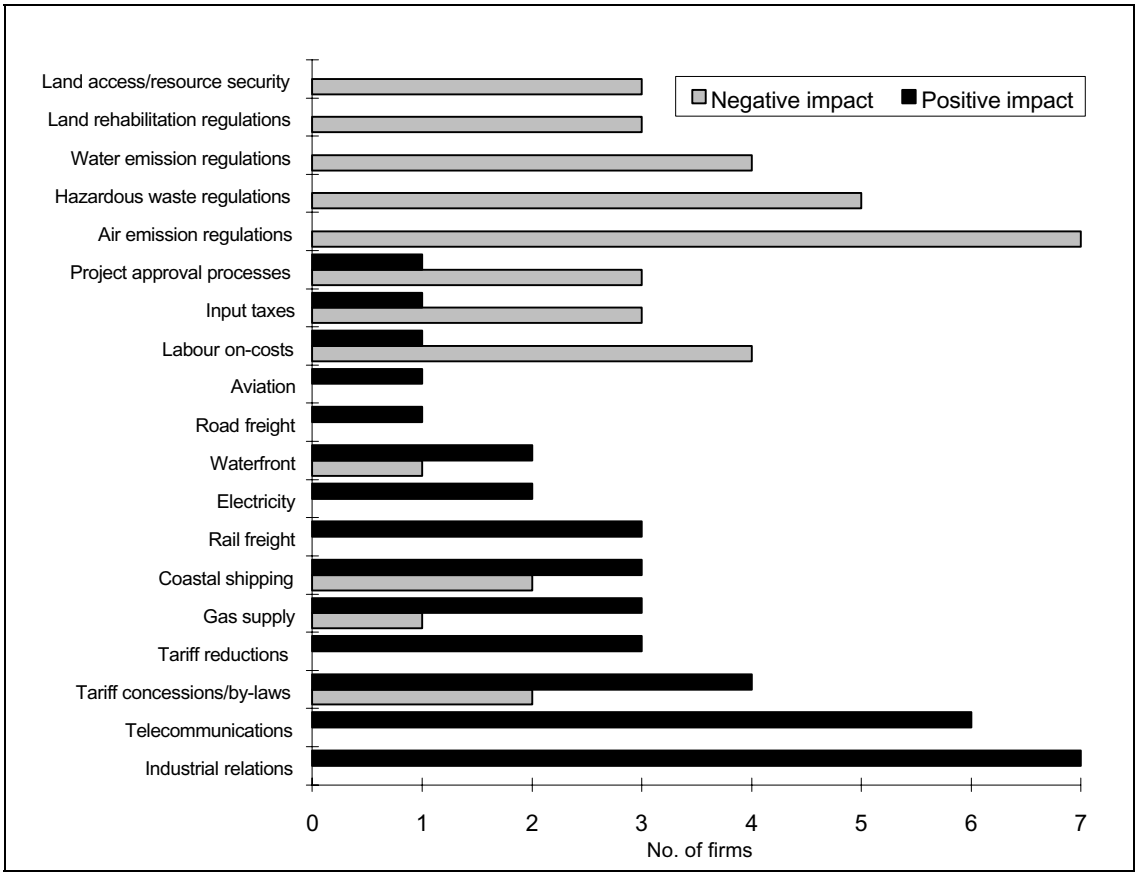
## Effects of past microeconomic reforms

Firms responding to the Commission's survey indicated their perceptions about the impact of various microeconomic reforms on their competitiveness between 1990 and 1996. They also ranked the four reforms making the greatest positive contribution to their competitiveness and the four making the greatest negative contribution over this period. In all, around twenty microeconomic reforms covering five broad areas were covered in the survey — infrastructure reforms, labour market reforms, taxation-related reforms, changes to various industry assistance arrangements and other regulatory reforms (including those relating to the environment and access to natural resources).

Firms' assessments of the impact of individual reforms varied considerably. For most reforms, some firms indicated that they had a positive impact on their competitiveness, but others indicated that they had a negative or zero impact. In a limited number of cases, firms indicated that particular reforms were not directly relevant to their operations.

Across the twenty reforms covered in the survey, seven attracted positive rankings from three or more of the eight respondent firms (figure 1). These were: rail freight; coastal shipping; gas supply; tariff reductions on inputs; tariff concessions and policy by-laws; telecommunications; and industrial relations. Changes to industrial relations arrangements attracted the highest positive ranking — receiving a positive assessment from seven of the eight firms.

Figure 1 Firms' perceptions of the impact on their competitiveness of a range of microeconomic reforms, 1990 to 1996




Source: IC aluminium industry survey 1997.

Eight areas attracted negative assessments from three or more firms. These were: project approval processes; taxes on inputs (other than labour); land rehabilitation regulations; land access and resource security; labour on-costs; water emission regulations; hazardous waste regulations; and air emission regulations.

The perceived low impact of some reforms may be explained, to some degree, by differences in the extent to which firms use particular inputs (eg some firms are relatively small users of water and road freight services). The operations of some firms (such as those with company-based port facilities for bulk loading and unloading) may make reforms in some areas (eg publicly owned ports) of limited direct relevance to a firm. In other cases, the existence of long-term supply contracts may delay the receipt of benefits (eg electricity and natural gas).

Firms' overall rankings of the four most important positive and negative microeconomic reforms**,** in terms of the impact on the competitiveness of their businesses from 1990 to 1996, were:

**Most positive reforms**

- Industrial relations
- Rail freight/Waterfront
- Tariff concessions/policy by-laws

**Most negative reforms**

- Air emission regulations
- Taxes on inputs (other than labour)
- Labour on-costs
- Land access/resource security

Reform of Australia's industrial relations arrangements was not only ranked as the leading positive reform, but also as the area of reform likely to have the most positive influence on investment over the next 3-5 years. Firms supported changes introduced by the Workplace Relations Act. This and earlier reforms has facilitated significant changes to their workplaces and has removed some of the rigidities that in the past impaired productivity. However, some firms consider that further reforms are needed to simplify procedures and improve flexibility (chapter 6).

Many of Australia's alumina refineries make extensive use of rail freight services. While the process of reform has been slow and performance continues to lag best practice, firms and industry bodies acknowledge that there have been worthwhile improvements (chapter 5). For instance, reforms have contributed to declining rail freight rates, improvements in operating efficiency and improved reliability of service.

Firms also acknowledge noticeable improvements in the performance of the waterfront over the last decade in areas such as the commercial orientation of port authorities, handling rates and charges. Nevertheless, they see considerable scope for further improvement (chapter 5).

The ranking of tariff concessions/policy by-laws as the fourth leading positive reform appears to reflect access to duty-free purchases of plant and equipment and some key material inputs.

Firms' negative views about air emission regulations relate mainly to the more stringent fluoride emission standards governing fluoride emissions from smelters. The refineries also mentioned the more stringent controls over dust in alumina production (chapter 7).

Firms' negative perceptions about changes to taxes on inputs (other than labour), and petroleum products in particular, relate to the cost of complying with some of these taxes, the distortionary effect that they have on production

choices, and their negative impact on the industry's international competitiveness (chapter 8).

Firms were critical of the level of labour on-costs and associated regulatory arrangements which increase administration and compliance costs (chapter 6). The fringe benefits tax and arrangements relating to workers' compensation attracted most criticism.

The ranking of land access/resource security arrangements as the fourth most negative factor affecting competitiveness is related to firms' concerns about the operation of various resource management regimes, including uncertainty surrounding native title rights and the costs and delays associated with Native Title Act processes (chapter 7).

## The adequacy of the pace of microeconomic reform

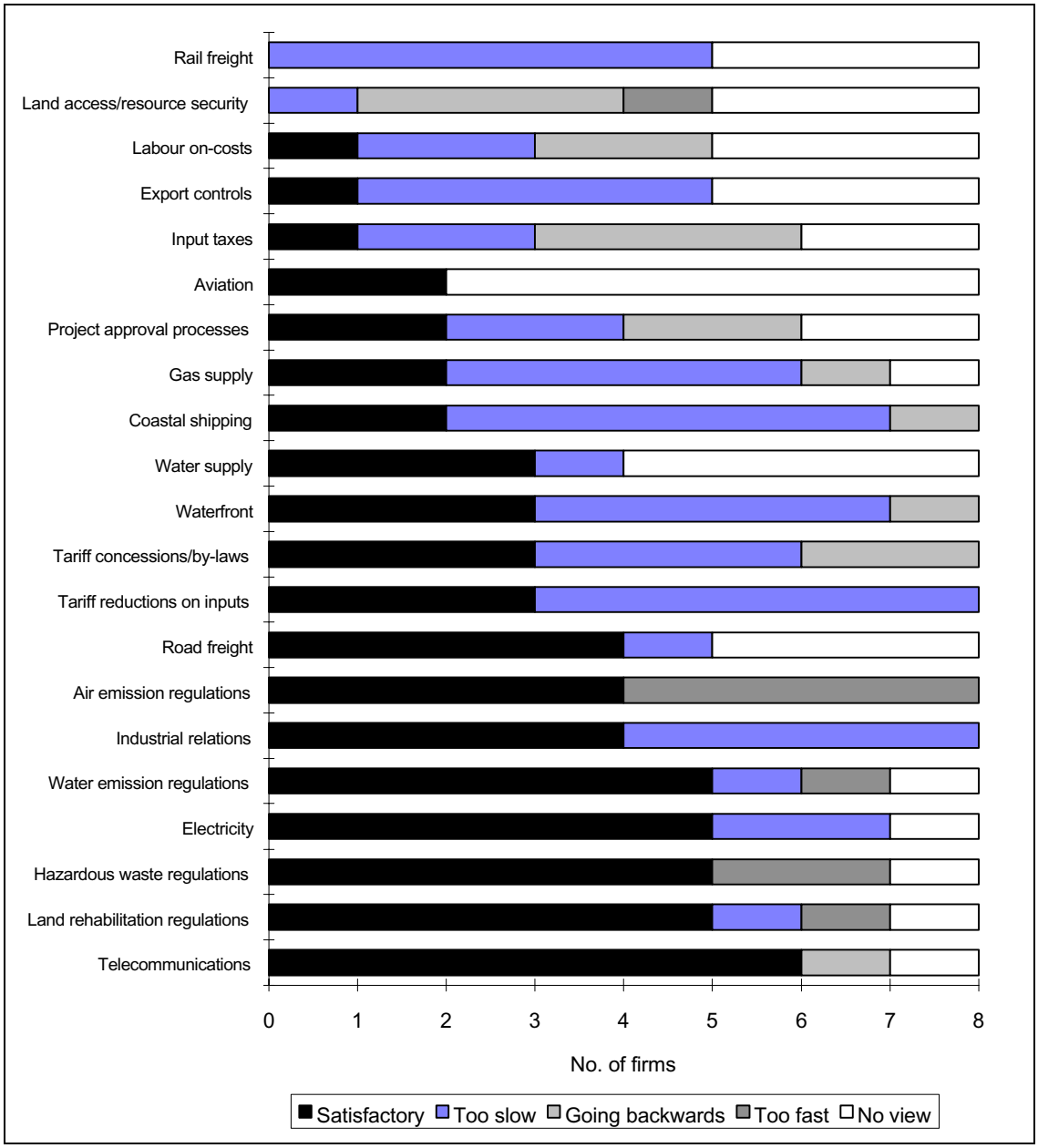
As evident from figure 2, firms' perceptions about the adequacy or otherwise of the pace of microeconomic reform display considerable variation.

In five areas, the pace of microeconomic reform attracted relatively high proportions of satisfactory rankings (from five or more of the eight respondents). The relevant areas are: water emission regulations; electricity supply; hazardous waste regulations; land rehabilitation regulations; and telecommunications.

Five areas of microeconomic reform attracted somewhat mixed results, with four firms out of eight expressing dissatisfaction with the pace of reform. The areas are: export controls; labour on-costs; project approval processes; air emission regulations; and industrial relations. The reasons for dissatisfaction varied. For example, in the case of industrial relations reforms, all dissatisfied firms considered the pace of reform too slow. In the case of air emission regulations, dissatisfaction reflected an assessment that change was proceeding too quickly.

In eight areas, the pace of microeconomic reform attracted a relatively high proportion of unsatisfactory ratings. These are: coastal shipping; the waterfront; gas supply; rail freight; tariff concessions/by-laws; tariff reductions on inputs; taxes on inputs (other than labour); and land access and resource security. At least five out of eight firms were dissatisfied with the pace of reform in these areas (the exception was coastal shipping where six firms expressed dissatisfaction). Most of these firms considered that reforms were progressing too slowly. Some considered that the pace of reform had slipped backwards, notably in the areas of taxes on inputs (other than labour) and land access and resource security.

Figure 2 Firms' perceptions of the adequacy or otherwise of the pace of microeconomic reform




Source: IC aluminium industry survey 1997.

While some firms acknowledged benefits from most areas of reform, they highlighted the importance of accelerating the pace of reform to help them remain among the lowest cost producers in the world.

## Challenges for the future

Firms within the aluminium industry stressed that the key challenge facing them is to improve their competitiveness by successfully embracing a continuous improvement culture. Linked to this, they consider that Australian governments have a role to play by supporting their efforts to improve their competitiveness through progressing the microeconomic reform agenda. In this context, they consider Australia's microeconomic reform performance record is too mixed and must be improved.

Firms indicated that the four microeconomic reforms most needed to enhance their competitiveness over the next 3-5 years relate to coastal shipping, electricity, natural gas and the development of an effective response to greenhouse gases.

The emphasis on coastal shipping reflects its significance to the industry — movements of bauxite and alumina account for about 20 per cent of Australia's coastal freight task. Firms consider that reforms to date have not adequately addressed the lack of competition in the industry. The implementation of the Shipping Reform Group's (SRG 1997) recent recommendations, including the removal of cabotage, is viewed as having the potential to significantly improve the performance of Australia's coastal shipping industry.

The importance attached to pursuing further reform of Australia's electricity and natural gas industries reflects the significance of energy inputs in the production of alumina and aluminium. While reforms over the last decade have yielded clear benefits to user industries, aluminium firms identified a need for governments to pursue remaining opportunities for reform with more vigour. In the case of electricity, firms stressed the need to push ahead with the national electricity market. With regard to natural gas, firms identified a need for measures to strengthen competition — such as the implementation of a national grid. Developing effective access and pricing regimes was seen as vital to realising the benefits of natural gas reform.

Concerns about the Government's greenhouse gas policy are related directly to the industry's high energy intensity. The policy stance of the Australian Government in relation to greenhouse gas emissions, together with international developments in this area in the lead up to the Kyoto Conference, attracted considerable interest within the industry. The industry endorsed Australia's stance on differentiated emission targets and has subsequently responded positively to the outcome of the Kyoto Conference in terms of Australia's overall emission targets. However, most firms were of the view that the exclusion of developing and newly industrialising countries from the Kyoto

agreement could have an adverse effect on Australia by diverting future investments to countries with less stringent emission requirements.

Reforms in the areas of land access and resource security, industrial relations, changes to taxes on inputs (other than labour) and labour on-costs are also viewed as relatively important areas for future reform. These responses emphasise the importance of recognising that microeconomic reform is a continuous process. It needs to be pursued on a broad front because a wide range of government actions affect the competitive position of firms.

Responses by firms indicate that there are opportunities to secure worthwhile gains across a wider range of reform areas than the four priority areas nominated above. Reflecting this, the Commission's analysis of microeconomic reform for this study is built up around four broad areas — infrastructure services (chapter 5), labour market and workplace reforms (chapter 6), environmental regulations and resource access (chapter 7) and taxation arrangements (chapter 8).

# 1 INTRODUCTION

## 1.1 Background

Over the last decade or so, Australian governments have introduced substantial changes to many spheres of our economy, many of which have been promoted as microeconomic reforms. Microeconomic reform involves action by governments aimed at improving the incentive structure for firms and individuals and, through this action, making the Australian economy work more effectively. It affects the production, distribution, consumption and investment decisions of industry, workers and households. This paper focuses on the impact of microeconomic reform on firms and workers in the aluminium industry.

Microeconomic reforms affect firms' competitiveness, both directly and indirectly, through changes to unit revenues and input costs. For example:

- reforms to infrastructure industries, such as rail and electricity supply, affect user firms by changing the prices paid for infrastructure services, as well as their quality;
- competition policy reforms may result in new entrants or changes in relationships between existing suppliers; and
- industrial relations and workplace reforms influence the flexibility of pay and employment conditions and labour productivity.

A considerable amount of work has been done to highlight the expected economy-wide gains from a range of microeconomic reforms (see, for example, BIE (1990a), EPAC (1994), BCA (1994) and IC (1990 & 1995a)). Little, however, is known about the impact of such reforms on individual firms and industries. To redress this, the previous Government initiated a project to monitor the impact of microeconomic reform at the firm and industry level (Keating 1994). Subsequent consultations by the BIE and IC involving government departments and agencies and industry bodies have confirmed the continued relevance of research in this area.

In January 1996, *Setting the Scene, Micro Reform — Impacts on Firms* was released as the first report in this new area of work (BIE 1996a). That report examined the evolution of the microeconomic reform agenda and discussed how reforms in various key areas of the economy have affected, and are likely to affect, firms and industries. The report observed that a key determinant of

how microeconomic reform has an influence at the firm level is the responses of firms to the changed environment induced by the reform process. As such, a 'case study' approach, pitched at the firm level for particular industries, was judged to be the most appropriate research vehicle. This case study on the aluminium industry is the third in a series of industry-based studies. The first case study, covering the agri-food industries (BIE 1996b), was released in June 1996. The second study, covering the automotive industry (BIE 1996c), was released in October 1996.

## 1.2 Why the aluminium industry?

The aluminium industry was considered a good case study industry for several reasons. Firms in this industry compete in a highly competitive world market and, like firms in other export oriented industries, are faced with the continual challenge of improving their international competitiveness. Moreover, because of the global nature of the aluminium industry, Australia must compete with other locations as a place for firms to invest. This issue is an important one because firms within the Australian industry are considering investments of around $3.6 billion over the next 3-5 years.

The aluminium industry is a significant user of a number of infrastructure services which have been targeted by the microeconomic reform process. Alumina refining and aluminium smelting, for example, require large amounts of energy and the relatively large distances between bauxite mines and refineries/smelters mean that transport and related handling costs represent a significant cost to the industry.

Because the aluminium industry has operations in different parts of Australia, a study of the industry also provides an opportunity to examine progress in microeconomic reform in a number of states. Bauxite/alumina operations are located in Western Australia, Queensland and the Northern Territory, while aluminium smelters are located in New South Wales, Victoria, Queensland and Tasmania.

In recent years, there has been considerable debate within the aluminium industry about the adequacy of the pace of reform in a number of areas. CRA[1], for example, commented that (CRA's Submission to the IC's inquiry into the implications for Australia of firms locating offshore, 1995, p. 18):

[1] In June 1997, CRA Limited was renamed Rio Tinto Limited and The RTZ Corporation PLC became Rio Tinto plc. This followed the creation of Rio Tinto in 1995 by the unification of The RTZ Corporation PLC and CRA Limited to form a dual listed company.

> Government non-tax charges are imposts on Australian mining as many of them are at a level that are difficult to justify. This stalling of the micro economic reform programme discourages new project development. There are excessive costs involved in the provision of rail and port services as a result of using charges as a tax mechanism and despite Australia's abundant energy resources, the [cost of] electrical energy generated from them could be much lower.

The Aluminium Development Council of Australia (ADCA 1994a, p. 4) has also called for policies which ensure that the industry remains internationally competitive:

> Few other industries generate more export dollars for Australia than does the aluminium industry. In the longer term, the prospects for this value adding industry continuing to play this important role are sound, provided Government policies recognise the need for the industry to remain internationally competitive.

Firms in the industry have also expressed frustration with Australia's industrial relations system. Comalco's experience with developing and negotiating contracts with its employees has shown that the process can be very long and costly. An enterprise agreement for the company's Boyne Island smelter (Queensland), which had been agreed to by management and employees, was rejected by the Industrial Relations Commission three times. And, although Comalco has achieved similar workplace outcomes in both Australia and New Zealand, the company reports that it was considerably more difficult to work through the legislative process in Australia (PC 1996a).

Environmental policies are also of major concern to the Australian aluminium industry, with the key area of concern being the Government's response to global efforts to curb greenhouse gas emissions. Because the industry is responsible for a disproportionately large share of Australia's greenhouse gas emissions, the adoption of policies to reduce greenhouse gases further could have a significant impact on costs within the industry.

The Australian Aluminium Council (AAC 1997a, p. 1) commented that:

> The greenhouse gas abatement regime being developed under the United Nations Framework Convention for Climate Change is a critical issue for the Australian aluminium industry.

And, following the international greenhouse negotiations in Kyoto late last year, the AAC (1997b, p. 1) observed that:

> The result, which includes differentiation for all Annex 1 countries, inclusion of land clearing and forest sinks and coverage of a comprehensive range of gases, is a step towards reality and a focus on the real nature of this long term problem and how to deal with it.

For these reasons, combined with the fact that all the firms in the industry were willing to participate in the study and the AAC was willing to endorse the study, the aluminium industry was selected as the third case study.

The study covers the three core stages of the aluminium value adding chain namely, bauxite mining, alumina refining and aluminium smelting. As such, it provides an opportunity to examine the extent to which microeconomic reforms have had, and are likely to have, differential impacts on the three core stages of the industry.[2] Moreover, many of the microeconomic reform issues affecting the industry are highly relevant to the mineral processing sector in general.

## 1.3 Key objectives of the study

The main objectives of this case study are to provide information on:

- factors within government influence that are impeding the competitiveness of the aluminium industry;
- factors that affect decisions to invest in Australia or abroad;
- firms' assessments of the impact and adequacy of selected microeconomic reforms on the industry; and
- firms' assessments of the priority areas for future reform.

## 1.4 Study methodology

Information for the study was gathered in two main areas:

- factual information on the structure and performance of the aluminium industry; and
- quantitative and qualitative information from key firms and industry bodies.

The main mechanisms adopted for gathering data and information were:

- interviews with key firms in the aluminium industry and with representatives from the AAC, the Minerals Council of Australia and the Queensland Mining Council;
- inspections of some key industry facilities — a bauxite mining operation and two alumina refineries/aluminium smelters;

[2] The term 'aluminium' in this report is used to describe the primary aluminium industry only, that is, bauxite mining, alumina refining and aluminium smelting. It does not cover downstream activities such as rolling, extruding, casting and recycling.

- a survey of key firms in the aluminium industry;
- written submissions; and
- general research.

The mail-out survey was sent to the eight key firms in the industry during April 1997 — Alcoa of Australia, Worsley Alumina, Comalco Minerals and Alumina, Comalco Smelting,[3] Queensland Alumina Ltd, Swiss Aluminium Australia Ltd (Nabalco), Capral Aluminium and Tomago Aluminium — and achieved a 100 per cent response rate.

Submissions to the study were also received from Alcoa of Australia, Comalco Minerals and Alumina, Comalco Smelting, Queensland Alumina Ltd, Capral Aluminium and Swiss Aluminium Australia Ltd. All the key firms in the industry and the AAC also provided written responses to a follow-up questionnaire covering the implications of the Kyoto climate change convention for the industry. The Commission is grateful for the help and co-operation received from the AAC and individual firms within the industry during the course of the study.

Further details covering the firms which participated in the study and the facilities examined by the study team are provided in appendix A. The main mail-out survey forms are reproduced in appendix B.

## 1.5 Structure of the paper

The paper is structured as follows:

- chapter 2 provides a description of the Australian aluminium industry and its place in the global industry. The chapter also outlines the industry's cost structures.
- chapter 3 outlines the performance of the Australian aluminium industry since 1990. The chapter examines the key factors affecting the performance and international competitiveness of the industry.
- chapter 4 presents firms' perceptions of the impact of a range of microeconomic reforms on their competitiveness and influences on their decision to invest in Australia.
- the following four chapters discuss in detail the key factors, within government influence, that are affecting the competitiveness of the aluminium industry. These are infrastructure services (chapter 5),

[3] Comalco Minerals and Alumina and Comalco Smelting are two businesses of the one integrated aluminium company, referred to as Comalco in this report.

industrial relations (chapter 6), resource access arrangements and environmental regulations (chapter 7) and taxation arrangements (chapter 8).

- appendices A and B supplement the information presented in the main body of the paper.

# 2 THE AUSTRALIAN ALUMINIUM INDUSTRY

*Australia is a major player in international aluminium markets — it accounts for almost 40 per cent of world bauxite production, 30 per cent of global alumina refining and around 7 per cent of total aluminium smelting. In 1996-97, combined bauxite, alumina and aluminium exports were Australia's second largest export earner. The main cost components of the industry include: raw materials; energy; labour and capital costs; transport and other infrastructure services. Microeconomic reforms in these areas have the potential to impact on the cost competitiveness of firms within the industry.*

*The global aluminium industry is relatively highly concentrated and vertically integrated. High set-up costs and technological requirements help explain the dominant role played by large multinational firms. Rising global demand — largely in the construction, packaging and transport sectors — has driven strong production growth over the past few decades in a number of countries, including Australia. Australian production of bauxite, alumina and aluminium is expected to grow strongly over the next 3-5 years in response to steady increases in demand for aluminium.*

This chapter presents an overview of the main features of the aluminium industry in Australia. The first section provides a brief snapshot of trends in global production and trade flows, as well as changes in prices. This is followed by a profile of the Australian aluminium industry, which outlines a range of structural and market characteristics of the industry. Finally, cost structures of both the bauxite/alumina and aluminium smelting industries in Australia are presented, together with a discussion of the influence of government.

## 2.1 The industry in a global context

The global aluminium industry has grown rapidly since the Hall-Heroult process for the commercial extraction of aluminium was discovered in 1886. The development of the industry in the first half of this century was largely due to the efforts of a few key entrepreneurs and innovators. The companies which developed operated at all stages of the industry — from mining and refining to smelting and fabrication of aluminium products. Until the late 1950s, most of the world's smelting capacity was concentrated in the same regions as the world's bauxite mines and alumina refineries (in the United States and Western Europe).

Up until the end of World War II, the industry was dominated by the Aluminum Company of America and Pechiney and Alusuisse in Europe. United States Government sales of defence production plants at the end of the war assisted Kaiser Aluminium and Chemical and Reynolds Metals Company to enter the aluminium smelting industry. The only other major player at the time was the Aluminium Company of Canada (Alcan), formerly the Canadian subsidiary of Aluminum Company of America. Together these companies formed what was known as the 'big six'.

Strong growth in global demand since the 1950s has resulted in the establishment of new smelting and refining operations across a range of countries, including Japan, the Middle East, Canada, South America and Australia. The oil price shocks of the 1970s provided a significant impetus to the spread of the industry beyond the major consuming markets of the United States, Europe and Japan. The energy intensive nature of the production process meant that rises in energy costs boosted the locational attractiveness of countries with lower priced electricity.

One of the key reasons for the continuing high levels of vertical integration in the global aluminium industry is that the large capital costs of production and processing facilities encourage firms to seek secure input supplies and markets for their products. These can be secured by either binding long-term contracts or, more commonly, by vertical integration along the value adding chain. Nevertheless, the development of a substantial third-party market for alumina in recent years has reduced the degree of vertical integration somewhat. For example, the proportion of alumina consumption in the Western world supplied by third-party purchases (ie purchased under contract at market prices from plants not affiliated to the smelters) has doubled over the past three decades — from 20 to 39 per cent between 1964 and 1994 (King 1995).

### 2.1.1 World production

Total world economic demonstrated reserves of bauxite in 1996 were estimated to be around 23 000 million tonnes (Mt), around 13 per cent of which are located in Australia (3024 Mt in 1996, BRS 1997, ABS 1997a).[1] This places Australia equal first in the world with Guinea in West Africa. World bauxite production was an estimated 128 593 Kt in 1996, with Australia accounting for 36.4 per cent (table 2.1), the largest share of any country.

[1] Australia's total reserves of bauxite are much larger — with a further 5329 Mt of sub-economic and 1598 Mt of inferred bauxite reserves identified in 1996 (BRS 1997).

In 1996, around 70 active alumina plants operating in Western countries, Eastern Europe, Asia, Africa and the Commonwealth of Independent States (CIS) produced over 45 Mt of alumina. Australia was also the world's largest producer of alumina, accounting for almost 30 per cent of total world output (table 2.1).

Table 2.1 World bauxite, alumina and aluminium production, 1996

| | *Bauxite* | | *Alumina* | | *Aluminium* | |
|---|---|---|---|---|---|---|
| | *(Kt)* | *% of world production* | *(Kt)* | *% of world production* | *(Kt)* | *% of world production* |
| **Australia** | **46 808** | ***36.4*** | **13 334** | ***29.5*** | **1 371** | ***6.6*** |
| New Zealand | 0 | .. | 0 | .. | 285 | *1.4* |
| North America | 33 | **a** | 5 884 | *13.0* | 5 860 | *28.1* |
| Latin America | 38 019 | *29.6* | 9 334 | *20.7* | 2 107 | *10.1* |
| Western Europe | 3 013 | *2.3* | 5 733 | *12.7* | 3 369 | *16.1* |
| Eastern Europe | 7 117 | *5.5* | 5 073 | *11.2* | 3 513 | *16.8* |
| Africa | 18 875 | *14.7* | 622 | *1.4* | 1 015 | *4.9* |
| Asia (Middle East) | 100 | *0.1* | 0 | .. | 792 | *3.8* |
| Asia (other) | 14 628 | *11.4* | 5 157 | *11.4* | 2 549 | *12.2* |
| *Western countries* | *113 676* | *88.4* | *37 378* | *82.8* | *15 563* | *74.6* |
| *Eastern countries* | *14 917* | *11.6* | *7 758* | *17.2* | *5 299* | *25.4* |
| **Total world** | **128 593** | ***100.0*** | **45 136** | ***100.0*** | **20 862** | ***100.0*** |

**a** Less than 0.1 per cent.
Source: Estimates by King (1997).

Production of aluminium has grown steadily over the past three decades, increasing from around 3 Mt in the Western world in 1960 to over 15 Mt in 1996. Although it relies heavily on imported bauxite and alumina, North America remains the largest aluminium producer, with more than one-quarter of global smelting capacity. Australia's production of primary aluminium, 1.4 Mt in 1996, was almost 7 per cent of world output. Although substantial, this share is considerably smaller than Australia's shares of bauxite or alumina production.

### 2.1.2 World consumption

The demands for bauxite and alumina are largely derived demands, reflecting their status as intermediate goods in the production of aluminium (box 2.1). However, producing aluminium is not the only use for alumina. Alumina is also used as an absorptive material in the chemical industry, as an abrasive in industrial processes as well as in many consumer products, in the manufacture of ceramics and glass, and as a refractory material. But these activities remain a

relatively small component of the overall demand for alumina, with more than 90 per cent of the world's alumina used to make aluminium.

### Box 2.1 Stages of aluminium production

There are three stages to the production of aluminium — bauxite mining, alumina refining and aluminium smelting. These are briefly discussed below.

*Bauxite mining*

Although bauxite is in plentiful supply around the world, deposits suitable for mining are less common. Australia's exploitable reserves of bauxite generally occur in large shallow deposits covered by a thin layer of earth or rock. Once the covering layer and vegetation is removed, the bauxite is extracted using heavy earth moving equipment. After an area has been mined, the pit is usually covered with the landfill extracted at the start of the process and the native vegetation is regenerated.

*Alumina refining*

Once mined, the bauxite is crushed on site then transported (usually by ship, rail or conveyor) to a refinery where the aluminium oxide is extracted. The resulting product, a fine white powder called alumina, is the basic material from which aluminium is made. The bulk of the world's alumina is produced via the Bayer process. This comprises four stages: digestion — where the alumina content of the bauxite is dissolved in a caustic soda solution (referred to as the 'liquor stream'); clarification — where waste residues are removed from the liquor stream; precipitation — where crystals of alumina hydrate are formed and removed; and calcination — where water of crystallisation is removed in furnaces at temperatures of 1000 °C.

*Aluminium smelting*

Aluminium smelting, the final stage of aluminium production, involves the separation of the alumina into its chemical components (aluminium metal and oxygen) via a process of electrolytic reduction in a series of furnaces (commonly called 'pots' or 'cells'). These pots are steel tanks lined with carbon and connected electrically. Current flows into each pot via a carbon anode, through a bath of molten cryolite which contains alumina, and out through the carbon cathode cell lining. In the process, the oxygen in the alumina combines with the carbon to form carbon dioxide at the top of the pots, while molten aluminium forms at the bottom. The molten aluminium is siphoned off periodically and stored in large holding tanks. It is then purified, mixed with alloying elements (commonly silicon and magnesium) and cast into various forms for shipment to semi-fabricating plants for casting, rolling and extruding.

Source: ADCA (1994a).

The amount of bauxite required to produce alumina varies considerably depending on the richness of the ore. In Australia, it ranges from around 32 per

cent (alumina concentration in the bauxite ore) in the Darling Ranges to around 50 per cent at Weipa. This surprisingly broad range differs somewhat from the alumina content in overseas bauxite mines. Although Australia's Weipa deposit is the sixth richest in terms of alumina content,[2] no major bauxite deposit other than in Australia has an alumina content below 40 per cent. Clearly, there are other factors beyond alumina concentration which determine the refining value of a bauxite reserve. These are discussed further in chapter 3.

In Australia, it takes around 2 tonnes of alumina (as well as 30 kg of cryolite and 500 kg of carbon) to make one tonne of aluminium. With their extensive smelting capacities, Canada and the United States are the largest buyers of alumina, while South Africa and China also import large quantities.

Aluminium consumption is closely linked to world economic growth — this reflects a strong correlation with demand in transport, construction and packaging applications. Combined, these industries accounted for over 70 per cent of Western countries' consumption of aluminium in 1990 (ABARE 1997a). Aluminium is also used in the machinery, equipment and electrical industries, but to a somewhat lesser extent.

While aluminium has a large number of uses, it also has a number of fairly close substitutes in most applications. The area where aluminium is currently most vulnerable to substitutes is packaging. Steel, glass and increasingly polyethylene terephthalate (commonly known as PET) are popular substitute materials for use in containers. Steel is also the major substitute for aluminium in the construction and transportation industries. Its relative price stability gives it an advantage over aluminium in a number of applications. Finally, copper is used as a substitute for aluminium in the electrical industry.

The fastest growing markets for aluminium in recent years have been in the developing countries of Asia — including China, South Korea and Taiwan. Over the period 1990 to 1995, total world consumption increased by around 5 per cent. However, if Asian consumption is excluded, this growth falls to less than 0.5 per cent. In general, per capita consumption of aluminium — including domestic and industrial uses — closely follows the degree of development of an economy. Developed countries typically register per capita consumption levels of up to 20 kg of aluminium per year. As Japan, Taiwan and South Korea registered per capita consumption of between 14 and 19 kg per year in 1995, the likelihood of continued high growth rates in these markets is low. Less developed countries such as China and India (with per capita consumption of

[2] The highest is the Greek Parnassos area, with an available alumina content of 54 per cent (Bardossy and Bourke 1993).

1.5 and 0.6 kg per year in 1995) are expected to show strong medium and long-term growth in future demand for aluminium (ABARE 1997a, 1998a).

### 2.1.3 Prices

Aluminium is an internationally traded commodity. Prices are established on a daily basis at the London Metal Exchange (LME). They provide a reference point for spot market transactions as well as contractual negotiations. Because aluminium prices are one of the most volatile commodity prices in the world, hedging through forward sales, the LME futures market and derivatives is widespread. One of the main reasons for the price volatility of aluminium is that the global supply curve is relatively steep in the short to medium-term — additional capacity cannot be added quickly, and reductions in output are extremely costly to smelters and refineries (Bird 1996a). Fluctuations in global aluminium stocks (more than half of which are held by the LME) reflect changes in demand and supply conditions worldwide. Movements in the level of stocks trigger price movements which, in time, flow through into supply responses.

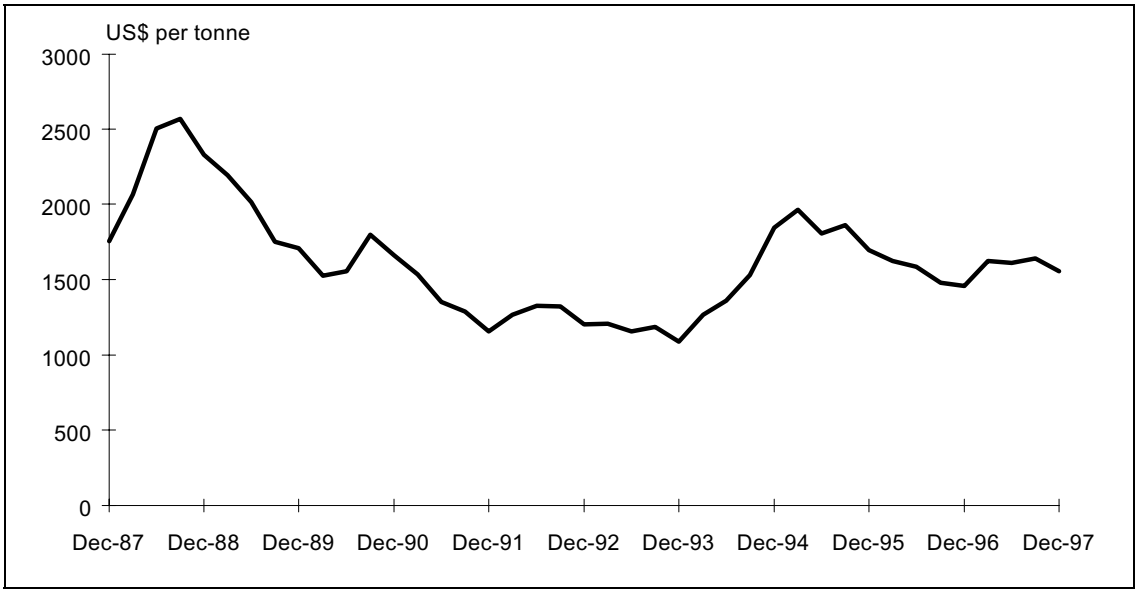
Over the past decade, the price of aluminium has varied between almost US$2600 per tonne in the September quarter 1988 to under US$1100 per tonne in the December quarter 1993 (figure 2.1). Low aluminium prices in the early 1990s were the result of the fall in world economic growth coinciding with the break-up of the former Soviet Union.

In contrast to most of the Western world, the major industry which consumed aluminium in the former Soviet Union was the machinery and equipment industry, which accounted for over 40 per cent of consumption. This reflected the large demand by the defence sector and the civil aviation and space industries. The break-up of the Soviet Union in the early 1990s led to a significant reduction in domestic consumption, with a shift in Soviet Union production onto world markets. This was exacerbated by the collapse of the rouble, which provided the CIS with a significant but short-lived cost advantage. For example, in 1991, CIS aluminium production costs were around 5 per cent of Western costs. However, by 1993, they had risen to 90 per cent. They are now around 11 per cent above Western costs (Bird 1997).

The short-term oversupply in the early 1990s resulted in a sharply falling price of aluminium and placed considerable pressure on refineries and smelters around the world. In response, the governments of major aluminium producers (United States, Canada, Russian Federation, Australia, Norway and the European Union) took the unprecedented step of meeting via multilateral forums in late 1993 and early 1994 to discuss the problem. These meetings led

to the development of a Memorandum of Understanding (MOU) which acknowledged the significant oversupply of aluminium. The agreement was subject to scrutiny by a number of antitrust authorities, including the forerunner to the Australian Competition and Consumer Commission, the Trade Practices Commission. The MOU resulted in numerous voluntary production cuts that reduced global aluminium output substantially. In Australia, the result was the announcement of a series of medium-term production cuts to Comalco's Bell Bay smelter (36 000 tonnes), Capral's Kurri Kurri smelter (15 000 tonnes), Alcoa's Point Henry and Portland smelters (of around 25 000 tonnes each), and Tomago Aluminium's smelter (of about 38 000 tonnes) (Sheales and Neck 1994).

Figure 2.1 London Metal Exchange aluminium prices, December 1987 to December 1997 [a]




**a** LME three-month price — 99.7 per cent purity.
Source: LME (1998).

## 2.2 The Australian industry — a broad profile

In spite of the dominant role Australia plays in the global aluminium industry (box 2.2), the domestic industry has been in operation for only a relatively short time. Until the mid-1950s there were no proven bauxite deposits of acceptable quality or size in Australia to use for producing alumina. However, three major deposits were found in quick succession in the mid-1950s and early 1960s at Weipa in Queensland, Gove in the Northern Territory and the Darling Ranges in Western Australia (figure 2.2). Mining operations began on a commercial basis at Weipa and the Darling Ranges in 1963 and at Gove in 1971.

Australia's alumina refining industry developed in conjunction with the opening of the bauxite mines, with the country's first refinery sited at Kwinana (WA) in 1963, followed by Gladstone (Qld) in 1967, Pinjarra (WA) and Gove (NT) in 1972 and Wagerup (WA) and Worsley (WA) in 1984.

### Box 2.2 Some key facts about the Australian aluminium industry

- It is a multi-billion dollar industry, with turnover of around $8 billion in 1995-96.
- It directly employed over 13 000 people in 1996 (a further 17 000 are employed in downstream processing of aluminium).
- Australia is:

  – the world's largest miner of bauxite, producing over 46 million tonnes of bauxite in 1996 (36 per cent of world production);

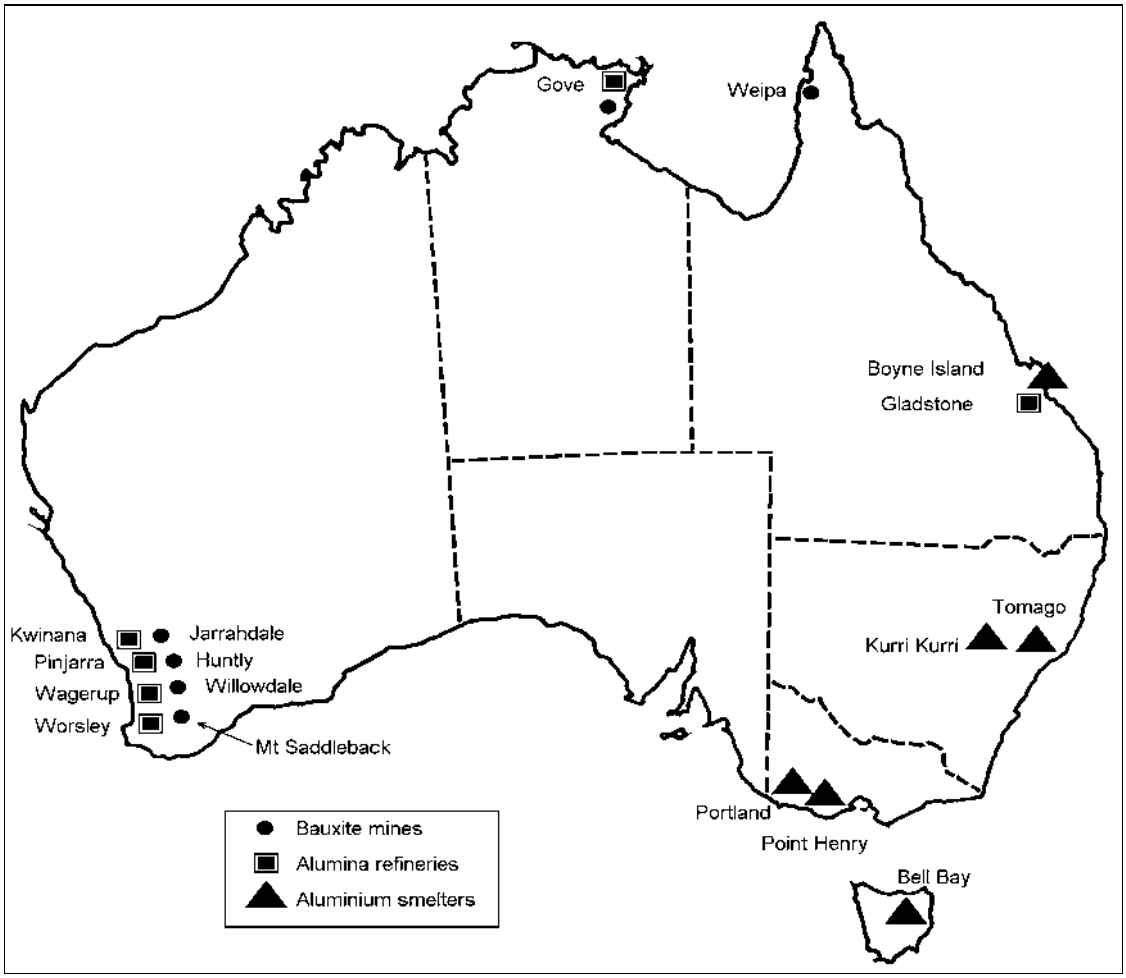
  – the world's largest refiner of alumina, producing over 13 million tonnes of alumina in 1996 (30 per cent of world production); and

  – the world's fifth largest producer of aluminium, smelting around 1.4 million tonnes of aluminium in 1996 (7 per cent of world production).
- It is a large exporter. Combined exports of bauxite, alumina and aluminium were valued at around $4.8 billion in 1996-97, Australia's second largest export after coal ($7.9 billion).
- Around 80 per cent (by volume) of total Australian alumina and aluminium production was exported in 1996. By contrast, bauxite exports represented approximately one-tenth of total bauxite mined in the same year, because most was converted into alumina in Australia.
- In 1996, per capita consumption of aluminium in Australia was around 19 kg.

Sources: Hague and Murray (1996), ABARE (1997a, 1998a) and King (1997).

The Commonwealth Government built Australia's first aluminium smelter at Bell Bay in Tasmania in 1955 (Standard and Poor's 1994). At only 12 Kt per annum, the smelter's capacity was relatively small and it was dependent on imported alumina. However, its capacity was increased to 28 Kt per annum when Comalco acquired the smelter in 1960. Two more aluminium smelters were built in the 1960s — Point Henry (Vic) in 1963 and Kurri Kurri (NSW) in 1967. Australia's smelting industry then remained relatively stable until the early to mid-1980s when three new high capacity smelters were built — Boyne Island (Qld) in 1982, Tomago (NSW) in 1983 and Portland (Vic) in 1986 (figure 2.2).

Figure 2.2 Location of Australia's bauxite mines, alumina refineries and aluminium smelters




Source: ADCA (1994a).

Although Australia's aluminium industry now comprises activities at eighteen sites across the country — six mines, six refineries and six smelters — these are controlled by only seven companies. Bauxite mining, for example, is dominated by four companies. It takes place in only two states and the Northern Territory, with Western Australia producing around 60 per cent of Australia's bauxite, and Queensland and the Northern Territory accounting for the remainder. Due to economies associated with locating alumina refineries close to the source of bauxite, these three locations house all of Australia's alumina refining capacity. Again, Western Australia dominates, with over 60 per cent of Australian refining capacity. The only refinery not located within conveyor or rail distance from a bauxite mine is at Gladstone, where bauxite shipped from Weipa is refined.

Australia's smelting industry, by contrast, is located predominantly in Australia's southeast. New South Wales and Victoria combined account for over two-thirds of Australia's aluminium smelting capacity, while Queensland and Tasmania share the remainder. Despite dominating bauxite and alumina production, Western Australia has no aluminium smelter. This outcome, in part, reflects Western Australia's relatively high electricity charges.[3] Alcoa (1996a), for example, stated that high energy costs were one of the key factors preventing the development of a smelting industry in Western Australia. The importance of electricity cost and availability in determining the location of aluminium smelters is discussed in chapter 5.

### 2.2.1 Industry concentration and market structure

The dominance of large multinational corporations in the aluminium industry around the world partly reflects the high capital outlays required to establish operations of sufficient size to take advantage of the considerable scale economies. But, more importantly, it is a reflection of the high degree of technical expertise necessary for success in the industry. Indeed, Australia's aluminium industry could not have developed without the help of key global players including: the Aluminum Company of America, Alcan, Kaiser, Pechiney, Reynolds and Alusuisse (Senate Standing Committee on National Resources 1981).

Access to a large, high grade deposit of bauxite is, of course, essential for the success of a bauxite mining operation. However, the potential for downstream integration is also important due to several factors including: the necessity of an assured and long-term source of demand for the bauxite extracted at the mine;[4] the high costs of transporting bauxite over large distances due to its low value-to volume ratio; and the potential to earn greater profits through further processing of the ore extracted at the mine. This, combined with the fact that a prerequisite for a successful refining operation is access to a reliable and good quality supply of bauxite, means that refineries are commonly linked to bauxite

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[3] Although there have been considerable reductions in WA electricity prices since the early 1990s, prices remain above the Australian average (ESAA 1997). This reflects, in part, the higher cost of fuel inputs and smaller scale of operations in WA compared with the eastern states in particular. However, given that smelters typically are able to negotiate healthy discounts in energy prices, the location of Australia's smelting capacity also reflects, to some degree, the willingness and capacity of state governments/electricity authorities to negotiate on electricity prices.

[4] Alumina refineries typically demand bauxite ores which possess specific compositional characteristics.

mines. These links take the form of either long-term contracts or, more commonly, vertical integration.

All of Australia's major producers of bauxite are also involved in alumina refining, and some also manage or have significant financial interests in aluminium smelters. Close links also exist between Australia's refineries and smelters. A steady supply of consistent quality alumina is as important to aluminium smelters as reliability of customer demand is to alumina refineries. Unlike the market for primary aluminium, the market for alumina differentiates between different types of alumina, with consistency of composition and texture valued by smelters, along with reliability of supply. This means that customer relationships are important to refineries, who expend considerable resources on product and process enhancement to meet smelter requirements (Stuckey 1983).

The tight ownership structure of Australia's industry means that the marketing of bauxite in Australia is relatively simple, with five of the mines supplying bauxite directly to co-owned refineries. The operations are generally linked by overland conveyor or rail networks. The exception is the Weipa bauxite mine, which ships feedstock to the Queensland Alumina Limited (QAL) refinery. As noted earlier, a small percentage of Australia's bauxite is also exported.

The domestic marketing arrangements of Australia's refining and smelting industries are not as straightforward. For example, QAL operates as a tolling company. This means that alumina produced at the refinery is supplied to the owners of the company, including: Comalco (Boyne Island and Tiwai Point); Pechiney (Tomago); Alcan Aluminium Limited; and Kaiser Aluminum and Chemical Corporation in percentages commensurate with their equity shares. Capral also purchases QAL alumina for its Kurri Kurri smelter. In Western Australia's Worsley refinery, each of the joint venture partners takes its share of alumina and exports it either within its own global operations or to third party customers. The other refineries in Western Australia — all owned by Alcoa — supply alumina directly to the company's two smelters in Victoria (at Portland and Point Henry).[5] Finally, Nabalco's Gove refinery in the Northern Territory also operates as a tolling operation.

The extent of vertical integration of the Australian aluminium industry does not end here. In recent years, changes in the governance and operation of infrastructure, in particular power generation facilities, has provided the potential for upstream integration. For example, in March 1994, a Comalco-led consortia completed the purchase of the Gladstone power station in Queensland. Moreover, a number of companies which own smelters also have interests in

[5] The partners in the Portland smelter must take alumina from the Alcoa refineries in WA, but can reduce the price if they can find more competitive alumina elsewhere.

downstream processing facilities including aluminium rolling, drawing and extruding. Capral, for example, is Australia's largest extruder of aluminium and a major producer of rolled products, while Alcoa is a major partner in KAAL Australia, a significant producer of cansheet and other rolled products. The extent to which aluminium smelters are linked to downstream processing has been declining in recent years. For example, in 1995 Comalco sold its extrusion business, rolling operations and distribution network as part of its strategy to focus on core upstream activities of mining, refining and smelting (Comalco 1995).

### 2.2.2 Economic importance

The latest available ABS data (ABS 1997b) indicate that total industry gross product for the alumina refining and aluminium smelting industries combined was $2.7 billion in 1995-96. This translates to 0.6 per cent of Australian GDP (table 2.2). In contrast, employment by these two industries accounted for only 0.14 per cent (11 634) of total Australian employment in 1995-96. Data on Australia's bauxite mining industry are not available on the same basis. However, data for 1994-95 reveal that its employment share was also much smaller than its contribution to Australia's GDP (ABS 1997c).

The fact that the production share for the aluminium industry is significantly higher than its share of Australia's labour force reflects the industry's high capital intensity. This is consistent with the relatively high percentage of net capital investment in Australia accounted for by the industry observed in earlier surveys (3 per cent in 1992-93, ABS 1996a).

Putting these data into perspective, the aluminium industry, including bauxite mining and alumina refining, but excluding downstream processing, is around half the size of Australia's coal mining industry in terms of employment, and generates around 60 per cent of the export revenue of the coal industry (ABS 1997a,b and ABARE 1998a).[6] However, as table 2.2 excludes the downstream processing of aluminium, it understates the full impact of the industry on GDP and employment. The Aluminium rolling, drawing and extruding and Architectural aluminium product manufacturing industries employed a further 16 695 people in 1995-96 and generated over $3 billion worth of turnover (ABS 1997b).

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[6] This example is presented for illustrative purposes only. The industries are not strictly comparable as the aluminium industry comprises a number of activities at different stages of processing, whereas the coal industry is overwhelmingly accounted for by coal extraction.

Table 2.2 Importance of aluminium to economic activity, 1995-96

| | Turnover ($ m) | Gross product ($ m) | Employment[a] (persons) |
|---|---|---|---|
| Alumina refining | 3 182.5 | 1 029.3 | 6 174 |
| Aluminium smelting | 3 874.7 | 1 627.8 | 5 460 |
| Total | 7 057.2 | 2 657.1 | 11 634 |
| % of economy total | na | 0.6 | 0.1 |
| *Bauxite mining (1994-95)* | *856.3* | *554.1* | *1 713* |
| *% of economy total* | *na* | *0.1* | *0.02* |

**a** The employment data in this table differ slightly from those presented in chapter 6. This reflects the different reference points used (June 1996 for alumina refining and aluminium smelting and June 1995 for bauxite mining in this table compared to December 1996 which is used in chapter 6), as well as slight differences in collection methodology and coverage.**na** Not applicable.
Sources: ABS (1997a,b,c).

### 2.2.3 Exports

In percentage terms, the largest contribution the aluminium industry makes to economic activity is to Australia's export earnings. In 1996-97, combined exports of bauxite, alumina and aluminium were valued at $4.8 billion (almost 6 per cent of total Australian merchandise exports in that year, table 2.3). This was an 8 per cent decline from the previous year, driven largely by a fall of almost $300 million in aluminium exports. It follows steady increases since 1993-94 which reflected the recovery in global aluminium prices after the MOU, as well as some increases in volumes. However, ABARE forecasts indicate that total exports of aluminium, alumina and bauxite will increase by over 20 per cent in 1997-98.

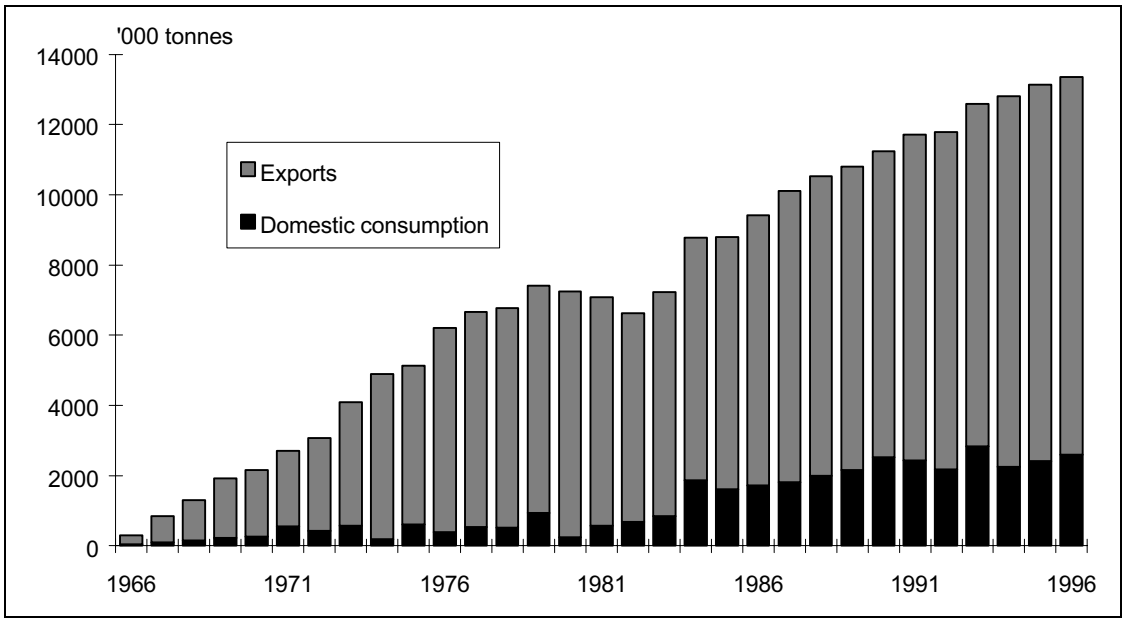
Table 2.3 Australian aluminium, alumina and bauxite exports, 1995-96 to 1997-98

| | 1995-96 ($ m) | 1996-97 ($ m) | 1997-98 ($ m forecast) |
|---|---|---|---|
| Aluminium | 2 379 | 2 088 | 2 860 |
| Alumina | 2 717 | 2 604 | 2 816 |
| Bauxite | 116 | 104 | 142 |
| Total | 5 212[a] | 4 796 | 5 818 |
| *% of total merchandise exports* | *6.9* | *5.9* | *na* |

**a** This figure exceeds the value of production in the industry presented in table 2.2. This is because exports is a sales measure, whereas industry gross product is a value-added measure — the value of the industry's output minus the value of intermediate inputs.**na** Not applicable.
Source: ABARE (1998a).

An examination of trends in exports of alumina and aluminium over the past three decades provides further insight into the development of Australia's aluminium industry (figures 2.3 and 2.4).

Figure 2.3 Australian alumina exports and domestic consumption, 1966 to 1996[a]

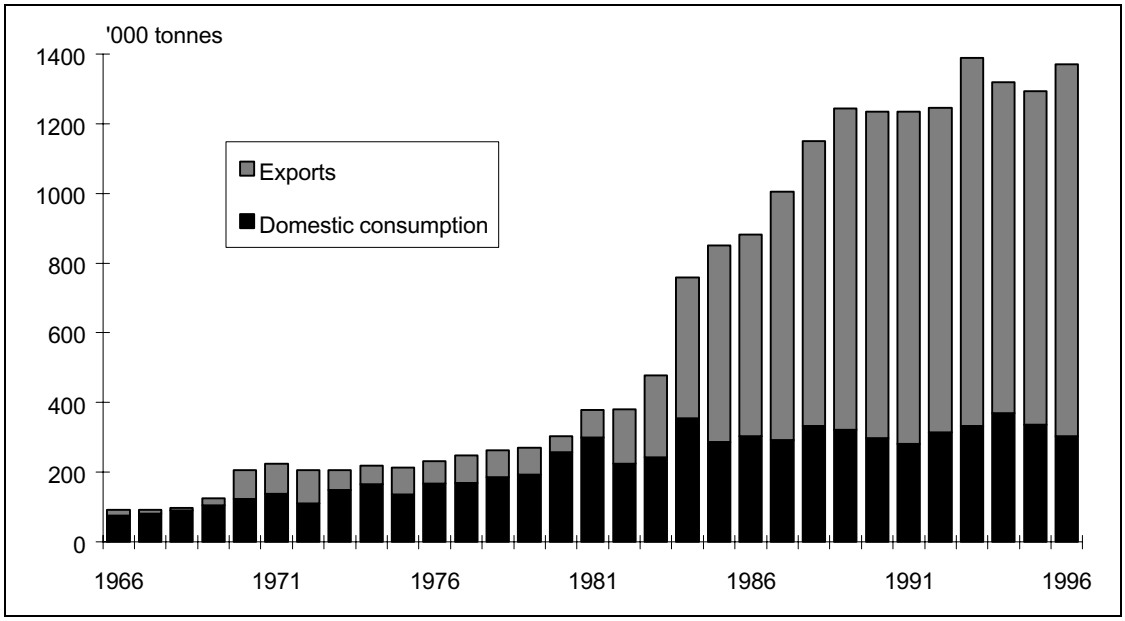



**a** Data for the years 1966 to 1970 were available for total Australian production only. Hence the break-up of total alumina production between domestic usage and exports for the years 1966 to 1970 are estimates based on average consumption/export shares between 1971 and 1975.
Source: ABARE (1997b).

Data on alumina exports indicate that export volumes (Kt) have grown steadily over the period 1966 to 1996, increasing at an average annual rate of 13.1 per cent. The major markets for Australian alumina include the United States, the Middle East, Canada, South Africa and Europe. Despite this strong performance, the export propensity of the industry (the share of production exported) has fallen somewhat over the past decade and a half, down from around 90 per cent in the early 1980s to around 80 per cent in the 1990s (figure 2.3).

The reason for this is clear from figure 2.4. The rapid development of Australia's aluminium smelting industry over the 1980s has resulted in more alumina being processed domestically. The bulk of the increase in aluminium produced was sold overseas, with Australia's exports of aluminium increasing at an average annual rate of 21.7 per cent (in volume terms) between 1980 and 1996. In contrast, domestic usage of aluminium has grown relatively slowly — at an average annual rate of 1.0 per cent between 1980 and 1996.

Figure 2.4 Australian aluminium exports and domestic consumption, 1966 to 1996 [a]

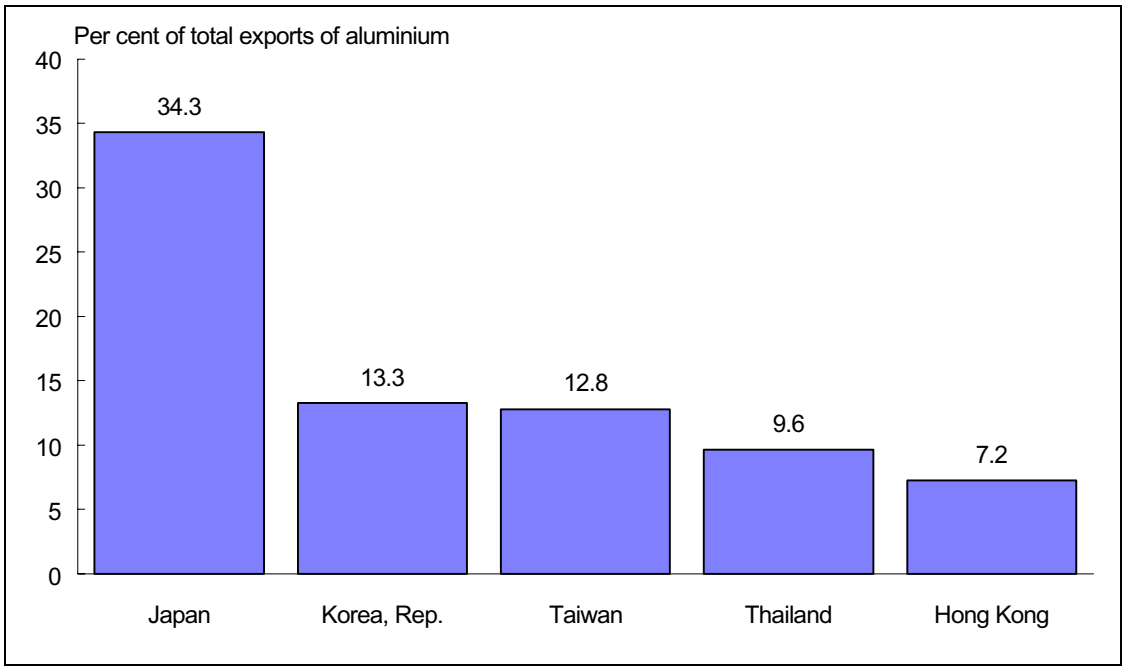



**a** Data relate to primary aluminium only.
Source: ABARE (1997b).

Figure 2.5 indicates that North East Asia (including Japan) continues to be the dominant market for Australian aluminium. Indeed, in 1996, five Asian countries purchased almost 80 per cent of Australia's aluminium exports. Japan remains the dominant buyer, purchasing aluminium valued at almost $1 billion in 1996, over one-third of the total.

Australian industry also draws heavily on aluminium for domestic usage. The largest user of aluminium in Australia was the building and construction industry, which accounted for over one-third of the 307 000 tonnes of aluminium used in Australia in 1993. Other large users were the packaging, transport, machinery and equipment industries, which combined accounted for over half of Australia's aluminium consumption in that year.

Figure 2.5 Top five markets for Australia's aluminium exports, 1996




Source: DFAT (1997a).

### 2.2.4 Industry outlook

Australian production of aluminium, alumina and bauxite is expected to grow strongly over the next 3-5 years on the back of steady increases in global demand for aluminium. In the mature economies in Western Europe and North America, one of the biggest potential areas of increased demand for aluminium is the automotive and transport sector. However, the recent financial and economic upheaval experienced by a number of Asian countries adds to the uncertainty about the regional and global outlook for aluminium demand.

ABARE considers that, although this is likely to dampen global demand for aluminium in the short term, the outlook for the aluminium industry over the medium and longer term (as the effects of the upheaval wear off) is for generally strong demand growth — with global primary aluminium consumption projected to increase at an annual average rate of 2.4 per cent between 1996 and 2003. In response, alumina production is projected to increase by 7 Mt over the same period (ABARE 1998a).

Production increases in a number of smelters and refineries around the globe are expected over the next few years to meet the demand increases. Some of the increased demand will be met through re-commissioned smelting capacity idled following the MOU, as well as several expansions to existing smelters.

However, as this will be insufficient to meet all demand, a number of greenfield smelting projects are currently under consideration in Canada, India and Oman (ABARE 1998a).

In Australia, aluminium production is projected to increase from an estimated 1.3 Mt in 1995-96 to 1.7 Mt in 2002-03 (ABARE 1998a). Much of this increase reflects the 230 000 tonne expansion at Comalco's Boyne Island smelter which began production in 1997. Joint venturers, other than Alcoa in the Portland aluminium smelter, will also lift production in 1997-98 following successful negotiations to secure 100 megawatts of supplementary power for the smelter. This agreement will allow the smelter to raise its output by 50 000 tonnes per year — largely by restoring the capacity shut down under the MOU, as well as some increases due to technical improvement. Finally, the Tomago aluminium smelter in New South Wales is likely to commission a 40 000 tonne capacity expansion in 1999.

Alumina production is projected to increase by over 3 Mt between 1995-96 and 2002-03, on the back of substantial capacity expansions in two Western Australian refineries. A key contributor to this projection is the first phase of a two stage expansion at Aloca's Wagerup refinery. The first stage, a 440 000 tonne expansion, is scheduled to come on-stream around the middle of next year. The second stage — involving an additional 1 Mt of capacity — is predicted to be operational by 2003. In 1997, Worsley also announced a further 1.25 Mt expansion to their refinery. This is expected to come on-stream in the first half of 2000. Finally, bauxite production is projected to rise sharply over the outlook period — by around 15 Mt between 1995-96 and 2002-03 (ABARE 1998a).

Looking beyond the short and medium term, a number of commentators have observed that the outlook for Australia's alumina industry in particular is very positive. McLean (1998), for example, argues that Australia's prominence in the industry is likely to increase sharply over the next twenty years. Reasons cited include Australia's favourable resource base (Bardossy and Bourke 1993), positive political and social environment, dominant position as the world's largest alumina producer and the fact that it is the centre of the world's expertise in the Bayer process. McLean argues that Australia could support a further four large alumina refineries, leading to a doubling of its alumina production capacity (from 13 Mt to 26 Mt) by the year 2020 — in the process gaining around half of the total increase in world alumina production over the period.

## 2.3 Industry cost structures

As published ABS input-output data were not available for the aluminium industry at a sufficiently detailed level, the Commission collected industry input cost data as part of its aluminium survey. Confidentiality restrictions preclude the presentation of individual firm data. Instead, production-weighted industry averages are provided for both the alumina refining and aluminium smelting industries. This aggregation masks differences between establishments for several of the cost components of both the mining/refining and smelting industries.

Divergences in operating costs among Australia's refineries and smelters are due to a number of factors, including: age of plant and equipment and technology employed; scale of production; geographic factors such as the quality of ore deposits; and availability of infrastructure services. In spite of these differences, the weighted industry averages provide an indicative guide as to the importance of various inputs to firms in the industry.

A drawback associated with using data on costs collected directly from firms is that they do not account for indirect requirements embodied in inputs. A notable example of this is transport costs. Except where they have been explicitly separated (ie bauxite and alumina transport) these costs are subsumed into the costs of the raw materials. Given that transport costs constitute a non-trivial component of the price of many intermediate inputs, the importance of infrastructure requirements to Australia's aluminium industry is understated by the data below.

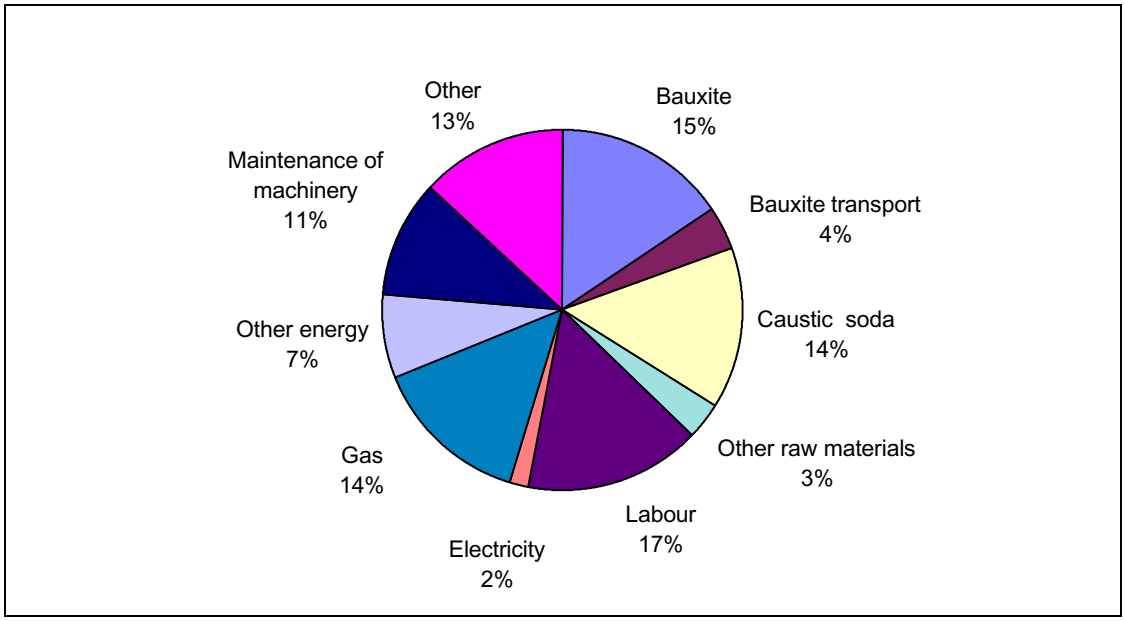
### 2.3.1 Alumina refining costs

The largest cost component of the refining industry is raw materials, representing one-third of total industry costs in 1996 (figure 2.6). As expected, bauxite is the most important raw material cost to Australia's alumina refineries, accounting for 15 per cent, on average, of total costs. As all but one of Australia's bauxite mines are co-located with refineries, this figure has been derived as an estimate of the costs of extraction and semi-processing of bauxite at the mines rather than as a direct estimate based on purchases of bauxite.

Of particular note is the high share of refining costs accounted for by caustic soda. This, coupled with the high volatility in the price of caustic soda, means that alumina production costs, and hence profitability, can fluctuate significantly. It also means that efforts to reduce caustic soda usage per tonne of alumina produced can yield substantial cost benefits to a refinery. Other raw

materials used in the refining process include lime, starch and flocculants — accounting for a further 3 per cent of costs.

Figure 2.6 Alumina refining production costs, Australia 1996 [a]




**a** Bauxite mining is subsumed within alumina refining since, as noted earlier, all but one of Australia's refineries are linked by conveyor or rail to a dedicated mine and are treated as single entities by company management. These data are presented as shares of total industry production costs, excluding a return on capital. Source: Aluminium industry survey 1997.

Energy usage is the next largest cost to the refining industry, accounting for almost one-quarter of total industry costs in 1996. By far the largest single energy source within the industry is natural gas (61 per cent of energy costs in the same year). The remaining energy requirements of the industry are met by electricity, diesel, coal and fuel oil. Although no one energy source stands out among these from an industry perspective, each is important from the point of view of particular firms within the industry. Nabalco's refinery at Gove, for example, obtains all its energy — both for the heat required in the refining process as well as the electricity generated for ancillary operations (including supplying power to the town of Gove) — from fuel oil shipped in from overseas.

The other major cost component is labour. The weighted industry average cost share accounted for by labour was 17 per cent in 1996 (figure 2.6). Within the industry there was substantial firm-to-firm variability in the importance of labour costs. The firm level data suggest that labour costs are a considerably more important operating cost to bauxite mines than they are to alumina refineries.

The largest of the remaining costs include: maintenance of machinery, plant and equipment; transportation of bauxite and alumina; administration costs; and payments to contractors.

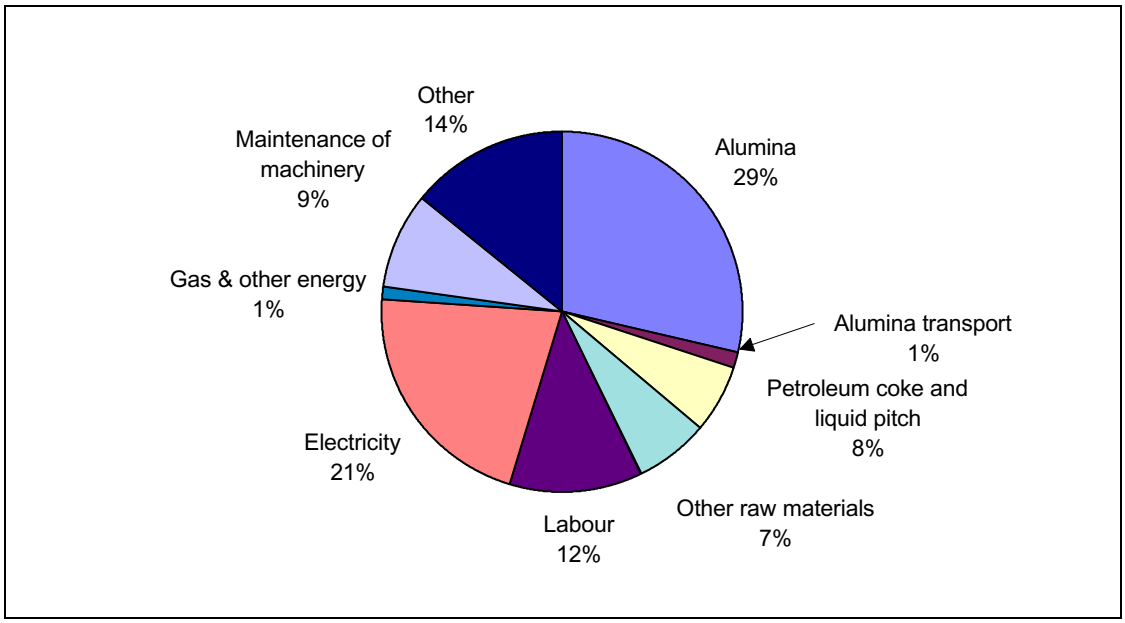
### 2.3.2 Smelter costs

As is the case for the refining industry, raw materials constitute the largest component of operating costs for Australia's smelting industry (figure 2.7). These data reinforce the importance to the smelting industry of access to competitively priced alumina, with alumina alone constituting 29 per cent of operating costs in 1996. However, this is not the only raw material used in large quantities by the smelting industry. Petroleum coke and liquid pitch — used by smelters for the production of the carbon anodes — account for 8 per cent of operating costs. A further 7 per cent of costs is accounted for by a number of other raw materials including alloying elements and hardeners (such as magnesium and silicon), aluminium fluoride, soda ash and potlining materials.

Energy usage in the smelting industry constitutes the next largest component of operating costs — over 20 per cent in 1996. The aluminium smelting industry mirrors the alumina refining industry in regard to the importance of energy to the production process. But there is an important difference. Whereas electricity is a relatively minor part of the refining industry's power requirements, it accounts for nearly all (95 per cent) of the smelting industry's energy usage (figure 2.7). This difference largely reflects the production technologies of the two industries. The manufacture of alumina requires mainly process heat, which can be generated with any fuel (including electricity). In the case of smelting, the transformation of alumina to aluminium occurs via a process of electrolytic reduction, which, by definition, cannot occur without electricity. Hence, a key focus of R&D activity within the industry is to reduce the amount of electricity consumed per tonne of aluminium produced by lifting a smelter's 'current efficiency'.

ABS data confirm the high energy intensity of the aluminium industry, relative to most other manufacturing activities. Alumina refining and aluminium smelting combined accounted for almost one-quarter of the usage of electricity and fuels by the entire Australian manufacturing sector in 1989-90, but less than five per cent of manufacturing value added (ABS 1993).

Figure 2.7 Aluminium smelting production costs, Australia 1996




Source: Aluminium industry survey 1997.

A comparison of figures 2.6 and 2.7 reveals that labour costs are more important to the refining industry than they are to aluminium smelting. In 1996, labour accounted for 12 per cent of operating costs in aluminium smelters, around 5 percentage points below the comparable figure for alumina refining.[7]

Although labour cost shares in the aluminium industry are not high relative to other manufacturing industries, the importance of labour market issues to the competitiveness of the industry should not be discounted. Industry performance is largely determined by how well management and the labour force make use of the sizeable capital stock of the industry. So, in addition to the direct and indirect costs of labour, there are important issues with respect to the flexibility and effectiveness of labour usage which influence capital productivity, and hence overall productivity.

Finally, the remaining costs of operating a smelter largely constitute expenditures associated with the maintenance of machinery and equipment (9 per cent) and a number of other costs including depreciation, external services

[7] Due to differences in collection methodology, the labour costs data used in this paper are not directly comparable with published data for the manufacturing sector overall. However, ABS manufacturing census data provide some indication of the relative labour intensity of Australia's aluminium industry. Latest data indicate that wages, salaries and supplements as a share of turnover for the alumina and aluminium industries combined were around one-half of the manufacturing average in 1995-96 (ABS 1997b).

and other operating supplies, which combined accounted for a further 14 per cent of total costs (figure 2.7).

### 2.3.3 Influence of government on the cost to make and sell aluminium

Governments, through both their macro and microeconomic policies, directly or indirectly affect industries' cost structures and the environment in which firms operate. For example, a number of the major inputs used by the aluminium industry (ie electricity, gas, and labour) have been subject to a range of microeconomic reforms. These reforms have the potential to influence the competitiveness of firms as they can affect the price, quality and range of inputs used by the industry. As a result, they can also affect investment in the industry.

The cost data presented above provide some insights into the areas where government's microeconomic reform policies are likely to have the biggest impact on the aluminium industry. These areas are likely to include:

- infrastructure reforms — as a relatively large user of infrastructure services, including energy and transport services, the aluminium industry could be expected to be one of the major beneficiaries of infrastructure reforms. Energy costs, particularly for aluminium smelting, are one of the key factors influencing the cost competitiveness of firms. Similarly, given the large distances between the bauxite mines/refineries and aluminium smelters in Australia, transport services are an important determinant of firms' competitiveness relative to their overseas rivals. From the perspective of the Australian aluminium industry, reforms in the areas of coastal shipping, waterfront and rail freight are likely to be important;
- industrial relations reforms — labour costs and labour on-costs are sizeable in this industry, so microeconomic reforms that affect the flexibility of the workforce and the productivity and cost of labour will influence the competitiveness of firms in the aluminium industry;
- environmental regulations — the Australian aluminium industry is subject to a range of environmental regulations covering air and water emissions, hazardous waste, site rehabilitation and noise pollution. Reforms that seek to streamline and improve the cost effectiveness of these regulations reduce compliance costs for firms. More stringent environmental regulations, however, could significantly increase firms' production costs. Given the energy intensive nature of alumina and aluminium production, any environmental policies which affect the cost of energy — either directly via taxes/charges on raw material and energy supplies, or indirectly via more stringent emission standards — would have the

potential to significantly affect firms' competitiveness and decisions about further investment in the industry in Australia; and

- taxation reform — areas of particular relevance to the aluminium industry include the fuel excise, diesel fuel rebate, fringe benefits tax and research and development tax concession.

In summary, the cost structures for alumina refining and aluminium smelting highlight the importance of government policies to most aspects of Australia's aluminium industry. However, this brief examination of industry costs represents only the first step in determining the impact of microeconomic reforms on the Australian aluminium industry. As the next step in this analysis, the following two chapters look at the performance of the Australian aluminium industry in recent years and the influence of microeconomic reforms on the industry's performance.

# 3 PERFORMANCE OF THE AUSTRALIAN ALUMINIUM INDUSTRY

*International cost comparisons show that Australia's alumina refineries and aluminium smelters are among the world's lowest cost producers. The favourable cost position of the refineries reflects the quality of Australia's bauxite resources, competitively priced energy and the location of the refineries in close proximity to bauxite mines and to ports. Relatively cheap electricity and access to competitive sources of alumina are important factors influencing the position of the smelters on the international cost curve. Also, Australian refineries and smelters are of sufficient size to capture the benefits of economies of scale. Measures of labour productivity and energy efficiency indicate that Australia's alumina refineries and aluminium smelters have improved their performance in recent years. International comparisons also show that Australia's aluminium smelters are among the most energy efficient in the world.*

This chapter examines the performance of the Australian aluminium industry over the period since 1990. Section 3.1 reports on the international cost competitiveness of Australia's alumina refineries and aluminium smelters. This section includes an examination of the key factors influencing the cost position of Australian plants. Section 3.2 examines the productivity performance of Australia's refineries and smelters, including a discussion of the key factors driving changes in productivity. Section 3.3 looks at investment in the industry since 1990, as well as investments planned over the next 3-5 years.

## 3.1 International cost comparisons

The most common way of assessing the performance of plants in the aluminium industry is to compare operating costs. For commercial reasons, the aluminium companies do not release details of operating costs. However, a number of industry analysts specialising in the aluminium industry, including James King, the Commodities Research Unit International Ltd, and Anthony Bird, estimate operating costs. The aluminium companies provided the Commission (on a confidential basis) with data on operating costs — these data confirm that the estimates made by the analysts are fairly close to actual operating costs.

### 3.1.1 Alumina refineries

International comparisons of costs per tonne of alumina show that Australia's refineries are among the lowest cost producers in the world. King estimates that, in 1996, when ranked by operating costs, four of Australia's alumina refineries were among the ten lowest cost refineries in the world (McLean 1998). The refineries located in Western Australia (in particular Worsley, Pinjarra and Wagerup) are estimated to be the lowest cost refineries, while QAL is generally ranked as Australia's highest cost refinery. However, information provided to the Commission on QAL's international cost position (based on the cost of manufacturing and bauxite shipping) indicates that the refinery's ranking has improved substantially over the period 1990 to 1996.

The favourable cost position of Australia's alumina refineries is a reflection of a number of key factors including:

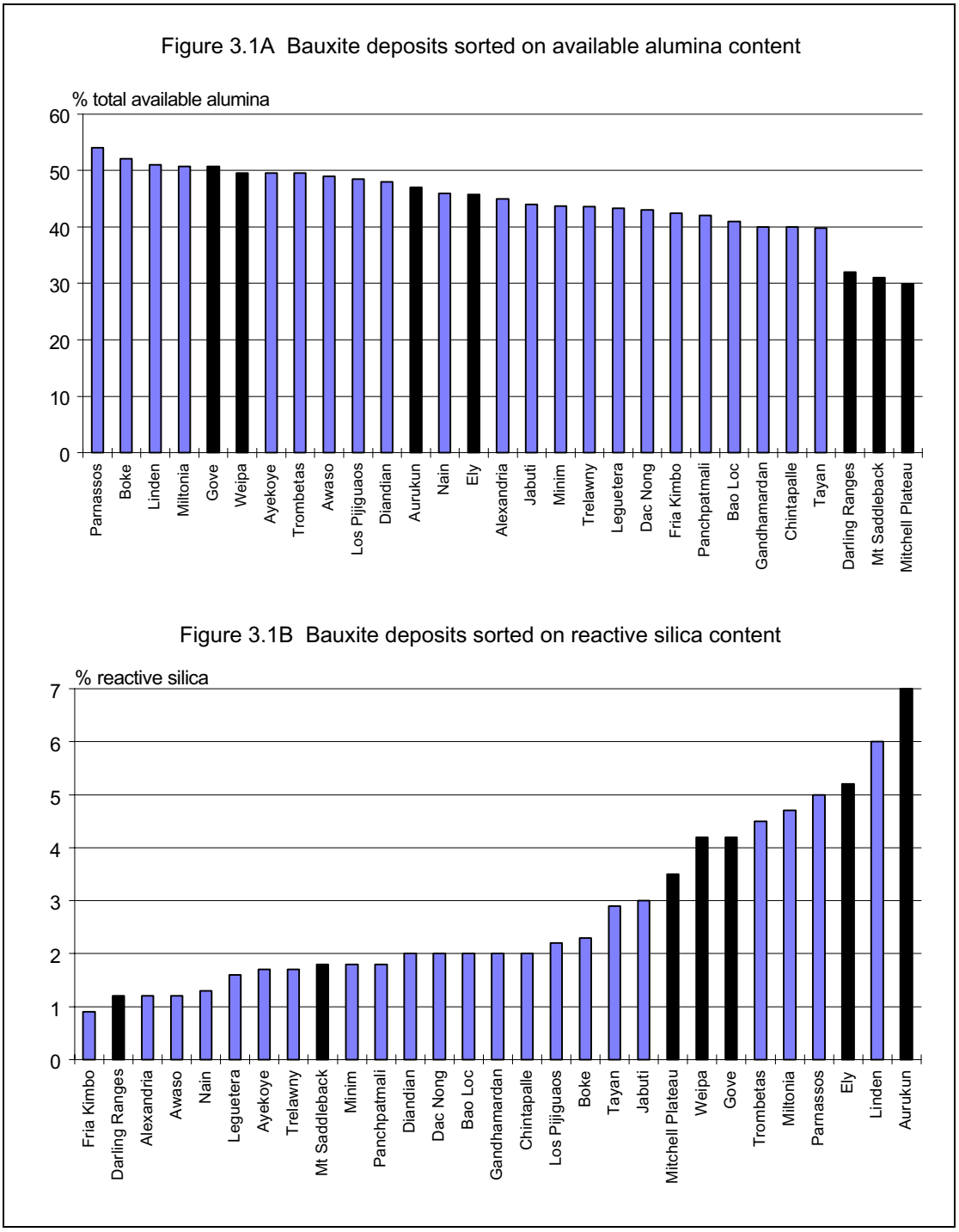
- the quality of Australia's bauxite — this is determined by the amount of available alumina and the level of contaminants (particularly reactive silica) in the bauxite, as well as the energy required to produce a tonne of alumina. The higher the extractable alumina in the bauxite, the lower the production costs associated with bauxite mining, alumina processing and red mud disposal. The higher the amount of reactive silica in the bauxite, the more caustic soda is required in the refining process — caustic soda is a significant production cost (see chapter 2).

  By world standards, the bauxite at Weipa and Gove has high levels of available alumina (around 50 per cent), but also high levels of reactive silica. Available alumina content in major world bauxite deposits ranges from around 30 to 54 per cent. The ore mined in the Darling Ranges and at Mt Saddleback, Western Australia, on the other hand, has relatively low percentages of alumina (around 32 per cent), but processing costs are low because it has low levels of reactive silica and is amenable to low temperature and pressure digestion (Leane 1996).

  Figure 3.1 ranks major world deposits of bauxite in terms of their available alumina content and reactive silica content.

- Another advantage of the bauxite deposits in Australia is that they are shallow and so are amenable to low cost stripping and open-cut mining. In most instances only the top soil and around 1 to 3 metres of overburden needs to be stripped — as a result, bauxite mining costs in Australia are low compared with those elsewhere in the world.

Figure 3.1 Major world bauxite deposits sorted on available alumina content and reactive silica content [a]




**a** Australian bauxite deposits are highlighted by the darker shaded bars.
Sources: Bardossy and Bourke (1993) and data provided by Nabalco.

- relatively low cost energy, as energy is a major operating cost (see chapter 2). Also, the majority of Australian refineries use low temperature processes (trihydrate processing) which typically requires around 25 per cent less energy than plants using high temperature processes (monohydrate processing).
- the refineries are of sufficient size to capture sizeable benefits from economies of scale. There are substantial economies of scale in alumina refining arising from the considerable capital costs associated with this operation. Bardossy and Bourke (1993), for example, claim that the minimum economic output for a greenfield alumina plant is approximately 1 million tonnes per annum, but plants producing around 3 million tonnes per annum are far more cost effective. Australia's alumina refineries are among the largest in the world — QAL's Gladstone refinery is the largest in the world with a capacity of around 3.4 million tonnes, followed closely by Alcoa's Pinjarra refinery (capacity of 3.1 million tonnes). The other Australian alumina refineries have capacities of between 1.6 and 1.9 million tonnes.
- relatively low transport costs. All of Australia's alumina refineries (with the exception of QAL) are located close to their bauxite reserves. In fact, many of the refineries are immediately adjacent to the mines and are fed by conveyor belts. This represents a considerable cost saving over rail transport.
- the favourable location of some of Australia's bauxite resources. The Western Australian mines/refineries have the advantage of not being located in remote areas — as a result, Alcoa and Worsley have not had to set up towns and associated infrastructure.

Alcoa (1993, p. 11) attributes its position as the world's lowest cost alumina producer to the availability of bauxite, the location of its refineries and competitive energy prices, claiming that:

> In alumina refining, Alcoa is the lowest cost producer in the world because of the availability of bauxite and the efficiency of our refineries right on the mining areas.

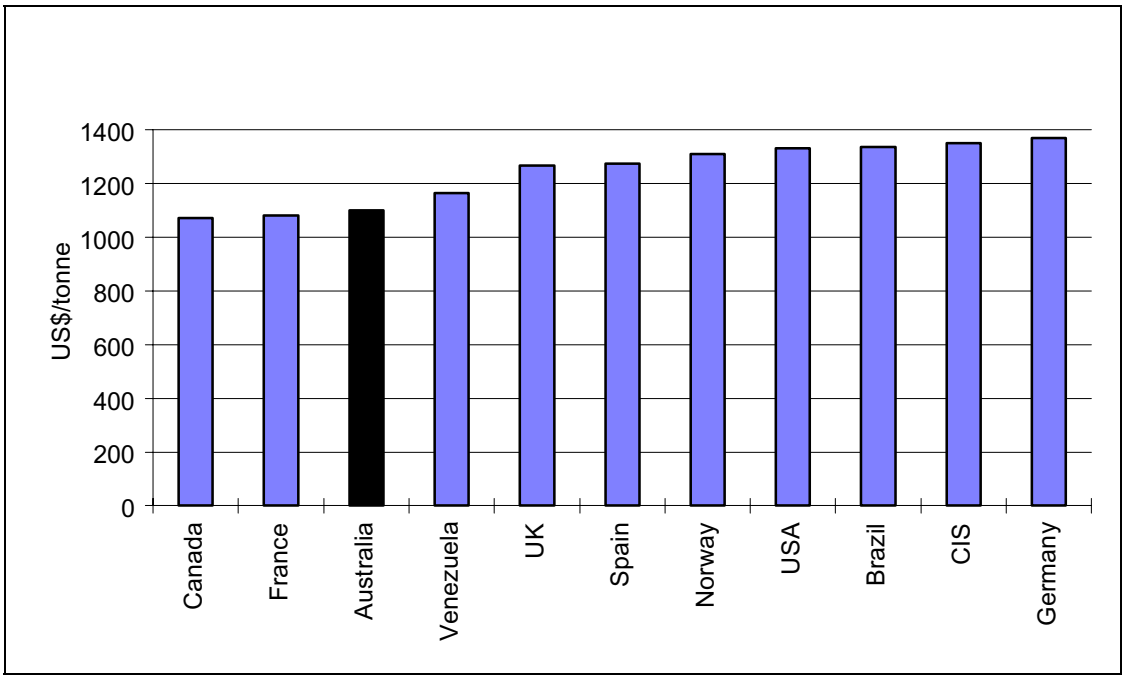
And,

> ... the plentiful availability of natural gas from the North West Shelf at world competitive prices represents a further large comparative advantage into the future.

### 3.1.2 Aluminium smelters

International comparisons of the costs associated with producing primary aluminium show that Australia's aluminium smelters are also among the world's lowest cost producers. Bird (1997) estimates that Australia's aluminium smelters production costs averaged around US$1100 per tonne in October 1997, compared with the world average of around US$1254 — 1216 for Western smelters and US$1351 per tonne for the CIS smelters. According to Bird's estimates, only smelters in Canada and France had lower average operating costs than Australia in October 1997 (figure 3.2).

Figure 3.2 Aluminium smelting operating costs, 1997




Source: Bird (1997).

Although Australia's smelters as a group are ranked among the lowest cost producers in the world, there are significant variations between the production costs of Australian smelters — the older smelters typically have higher production costs than those built in the 1980s reflecting the fact that the technology employed at the smelters is one of the key determinants of cost competitiveness.

Key factors influencing the favourable cost position of Australia's aluminium smelters include:

- access to highly competitive sources of alumina (see section 3.1.1);

- relatively low cost energy. The cost of energy typically represents around 20 per cent of the total cost of production. Consequently, energy prices are a key determinant of competitiveness;
- sufficient size to capture sizeable benefits from economies of scale. Economies of scale in smelters come from the technology of the potline. According to Stuckey (1983), the minimum efficient scale is a capacity of at least 100 000 tonnes per year; and
- access to the latest technology. Many of Australia's aluminium smelters employ the latest available technology. Also, the more modern plants typically have superior energy efficiency.

Of the factors listed above, electricity prices are probably the most significant factor in determining the position of smelters on the international cost curve. The AAC (1997a, p. 1), for example, claim that:

> Aluminium production is a capital-intensive global industry based on long term competitive-cost supplies of raw materials, energy and labour.
>
> Australia, along with Canada, is the only developed country where this industry has grown significantly over the past two decades, primarily because of competitively priced energy.

The use of modern technology is also important as this has a considerable influence on the amount of energy required. According to Sheales and Neck (1994, p. 58):

> ... the majority of high cost producers are located in Europe and the United States with the lowest cost producers in Canada, Australia, the Middle East and a number of countries in South America. Excluding Europe and the United States, a common link between these producers is access to low priced electricity and modern technology. The high cost producers tend to be located where there are large alternative markets for electric power and relatively high electricity prices. By using modern technology, consumption of electricity per unit of metal produced can be reduced by as much as a third from that used in old smelters.

Alcoa (1993, p. 11) also claims that:

> In aluminium smelting, the flexible power tariff contracts in Victoria, our innovative technology and the continuing outstanding operation of the Anglesea generator assist in maintaining our competitive position.

And, (1996a, p. 23):

> Portland is one of the lower-cost smelters in the world, owing in part to highly efficient electricity usage.

In general, there have been only marginal shifts in the relative competitiveness of Western world smelters in the different countries over the 1990s (table 3.1). Canada, Australia and Venezuela have consistently remained among the

world's lowest cost producers, while France has improved its cost position in recent years.[1] The American producers, on the other hand, have struggled to maintain their mid-range position. The competitive position of the Brazilian producers has declined significantly — from being the fourth lowest cost producers in 1990 and 1993 to being among the highest cost producers in 1996 and 1997.

Table 3.1 Estimated average operating costs of smelters, 1990, 1993, 1996 and 1997

| | *1990* | | *1993* | | *1996* | | *1997* | |
|---|---|---|---|---|---|---|---|---|
| | *US$/ tonne* | *Ranking* | *US$/ tonne* | *Ranking* | *US$/ tonne* | *Ranking* | *US$/ tonne* | *Ranking* |
| Canada | 1 168 | 2 | 926 | =2 | 1 008 | 1 | 1 072 | 1 |
| France | 1 455 | =7 | 1 058 | 3 | 1 131 | 4 | 1 081 | 2 |
| **Australia** | **1 190** | **3** | **904** | **1** | **1 108** | **2** | **1 100** | **3** |
| Venezuela | 1 014 | 1 | 926 | =2 | 1 117 | 3 | 1 164 | 4 |
| UK | 1 301 | 5 | 1 213 | 6 | 1 220 | 5 | 1 268 | 5 |
| Spain | 1 499 | 8 | 1 389 | 8 | 1 345 | 8 | 1 274 | 6 |
| Norway | 1 455 | =7 | 1 146 | 5 | 1 305 | 6 | 1 310 | 7 |
| USA | 1 433 | 6 | 1 257 | 7 | 1 309 | 7 | 1 331 | 8 |
| Brazil | 1 213 | 4 | 1 102 | 4 | 1 359 | 9 | 1 336 | 9 |
| Germany | 1 565 | 9 | 1 411 | 9 | 1 442 | 10 | 1 370 | 10 |

Source: Bird (*Aluminium Analysis*, several years).

Aluminium smelters in the former Soviet Union experienced major shifts in competitiveness over the 1990s. The rouble collapsed with the fall of communism and, as a result, CIS production costs were very competitive when translated into Western currency. But, by about 1993, the real exchange rate began to rise rapidly reversing the competitive position of the CIS smelters. CIS production costs are now well above Western levels — around 11 per cent higher and, because the smelters are old and inefficient, CIS production costs are likely to remain above Western levels for some time (Bird 1994, 1997).

[1] The improvement in France's competitive position is largely due to a new smelter at Dunkirk.

Smelter production costs, as shown in table 3.1, have a tendency to be fairly volatile. This volatility can be explained partly by the fact that many smelters have contracts for key inputs (such as electricity and alumina) that are linked to the final price of metal. Thus, when the price of aluminium falls the price paid by the smelters for alumina and electricity falls and vice-versa. These contracts mean that smelters are better able to survive periods of low metal prices but, when metal prices are high, the higher returns are shared with the suppliers of alumina and electricity.

## 3.2 Productivity performance

While favourable exchange rates and input prices can improve firms' competitiveness temporarily, over the longer term competitiveness is driven by a firm's productivity performance.

Productivity measures reflect the relative efficiency with which resources are used to produce a certain output. This section reports a number of partial productivity measures, including labour, capital and energy. It should be recognised that individual partial productivity measures tell only part of the story — high labour productivity may, in part, be driven by larger inputs of capital. Nevertheless, when considered together, a range of partial productivity measures can provide a general impression of efficiency levels and changes in relative performance over time.

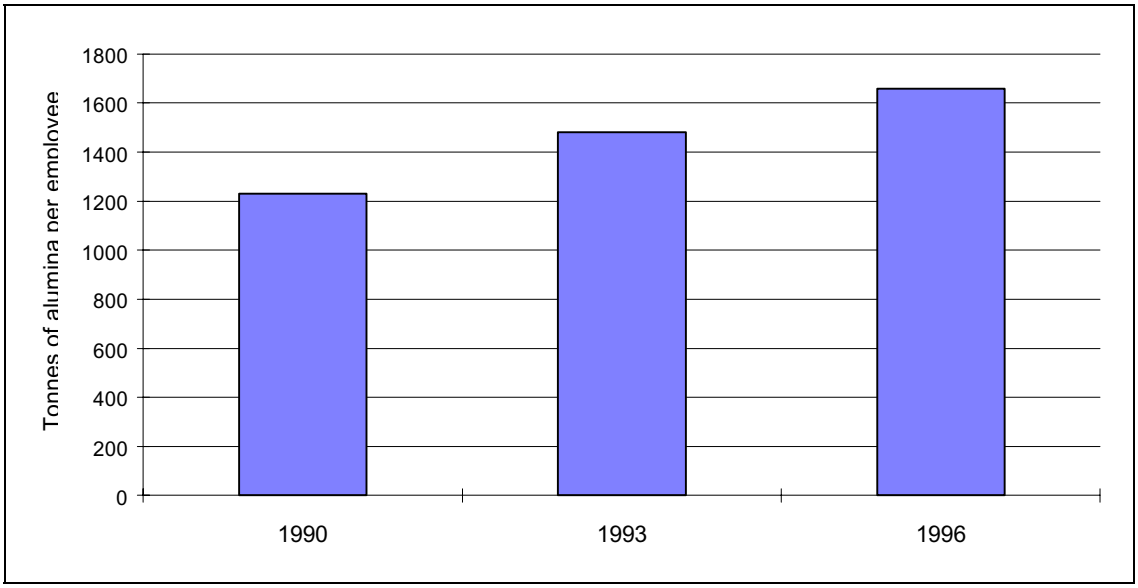
While total factor productivity (taking into account all inputs used in the production process) is a more complete way of measuring productivity, it requires a large amount of data and hence is frequently difficult to assess. While the IC has estimated changes in multifactor productivity at the sector level — ten broad industry sectors (see IC 1997a) — no analysis has been undertaken at the more disaggregated industry level. In order to gain some indication of the change in total productivity firms were asked, as part of the survey, to indicate their perceptions of how their business' overall productivity had changed over the period 1990 to 1996.

Productivity measures presented in this section are reviewed over time and, where possible, with plants in other countries.

### 3.2.1 Labour productivity

The most commonly used labour productivity measures in the industry are tonnes of alumina and tonnes of aluminium produced per employee. Estimates made by the Commission from data provided by the industry indicate that labour productivity in Australia's bauxite mines/alumina refineries has improved steadily over the period 1990 to 1996. Labour productivity, as measured by tonnes of alumina produced per employee, increased from 1231 to 1658 — an improvement of almost 35 per cent (figure 3.3). While all the mines/refineries reported an improvement in this labour productivity measure over the period, there were significant variations between them — the percentage improvement in labour productivity varied from around 16 per cent to over 55 per cent.

Figure 3.3 Tonnes of alumina per employee [a], Australian plants,1990, 1993 and 1996

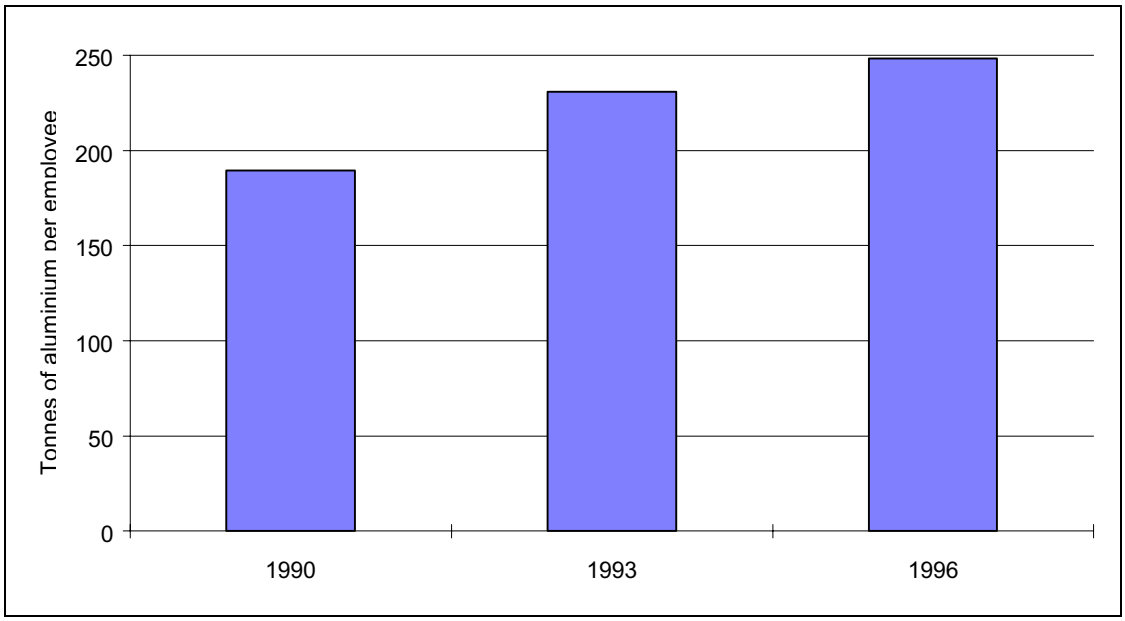



**a** Employees include production employees, contractors, administrative staff and senior management. Industry average weighted by employees. Comalco's Weipa operations were combined with QAL's refinery.
Source: IC estimates based on industry data.

Labour productivity in Australia's six aluminium smelters, as measured by tonnes of aluminium produced per employee, improved by around 31 per cent over the period 1990 to 1996 (figure 3.4). This result, however, masks significant variations between smelters. Three of the smelters, for example, reported improvements of more than 40 per cent, while the other three reported improvements of 25 per cent or less. There is also considerable variation between the best and worst Australian plants — the best plant in each year

produced around twice as many tonnes of aluminium per employee than the worst performing plant.

Figure 3.4 Tonnes of aluminium per employee, [a] Australian plants, 1990, 1993 and 1996




**a** Employees include production employees, contractors, administrative staff and senior management. Industry average weighted by employees.
Source: IC estimates based on industry data.

While labour productivity measures are relatively easy to calculate, they also have a number of weaknesses. Improvements in labour productivity, for example, may simply reflect the fact that firms are replacing labour with capital equipment. Also, given that the aluminium industry is such a capital intensive industry with high fixed costs associated with setting up and maintaining refineries and smelters, the efficiency with which capital is utilised is likely to reflect more closely changes in the overall productivity of the industry.

### 3.2.2 Capital productivity

Measuring capital productivity is not easy because capital is not consumed in the same way as other inputs. Much of the capital used in refineries and smelters has an average life of around 30 or more years. Hence, estimates of capital usage need to take account of the gradual consumption of capital over time.

Output (tonnes of alumina and tonnes of aluminium) per insured value of firms' capital stock was used to measure capital productivity. An examination of

tonnes of alumina produced per dollar of mine/refinery capital reveals that output per capital input declined by around 13 per cent over the period 1990 to 1993, before increasing by around 10 per cent over the period 1993 to 1996. This result largely reflects additions to the value of capital stock in 1993 as a result of major capital investments by Nabalco, Worsley and Alcoa, which at the time were not fully operational (see section 3.5). The improvement in capital productivity over the period 1993 to 1996 most likely reflects greater utilisation of installed capacity.

For the aluminium smelters, tonnes of aluminium produced per dollar of capital input remained fairly constant over the period 1990 to 1993, but declined by around 15 per cent between 1993 and 1996. The decline in output per capital input over this period most likely reflects:

- the impact of the 1994 MOU on aluminium smelting production levels — an agreement among the major aluminium producing nations to unilaterally reduce output from existing smelters for a period of two years as a way of dealing with the excess supply of aluminium arising from the break-up of the former Soviet Union (see chapter 2);
- major capital investments (for example, a third potline at both Comalco's Boyne Island smelter and Tomago Aluminium's smelter) that were not in full operation; and
- restraints on capacity at Alcoa's Portland smelter due to a dispute (now resolved) with the Victorian Government concerning the pricing of electricity.

### 3.2.3 Energy efficiency

Because the aluminium industry is such a large user of energy, efficiency in energy use is an important element of competitiveness. In this context, one firm commented that they have become 'experts in minimising energy requirements'.

Energy efficiency in Australia's alumina refineries tends to be fairly high because combustion heat (generated from either natural gas or oil) is used not only in the beneficiation process, but also to produce electricity. Alcoa (1992, p. 20) claims that:

> Energy conservation is being achieved in all facets of refinery operations. For example, the biggest area of energy use is in steam for the first stage of the bauxite digestion process. To conserve energy, heat given off in the digestion process is carefully captured and used to preheat the recycling caustic solution, thereby reducing the amount of new steam required to drive off water.

The technology employed at the alumina refineries is a key factor affecting energy efficiency. And, while refineries can be upgraded to become more energy efficient, older refineries are not as efficient as newer plants. Alcoa's Kwinana plant, for example, is much more energy efficient today than it was in 1963 when it commenced operation. But, Alcoa's Pinjarra refinery (operational in 1972) consumes only about 85 per cent as much energy per tonne of alumina as the Kwinana plant, while the Wagerup refinery (operational in 1984) consumes only about 75 per cent as much as the Kwinana plant (Alcoa 1996a).

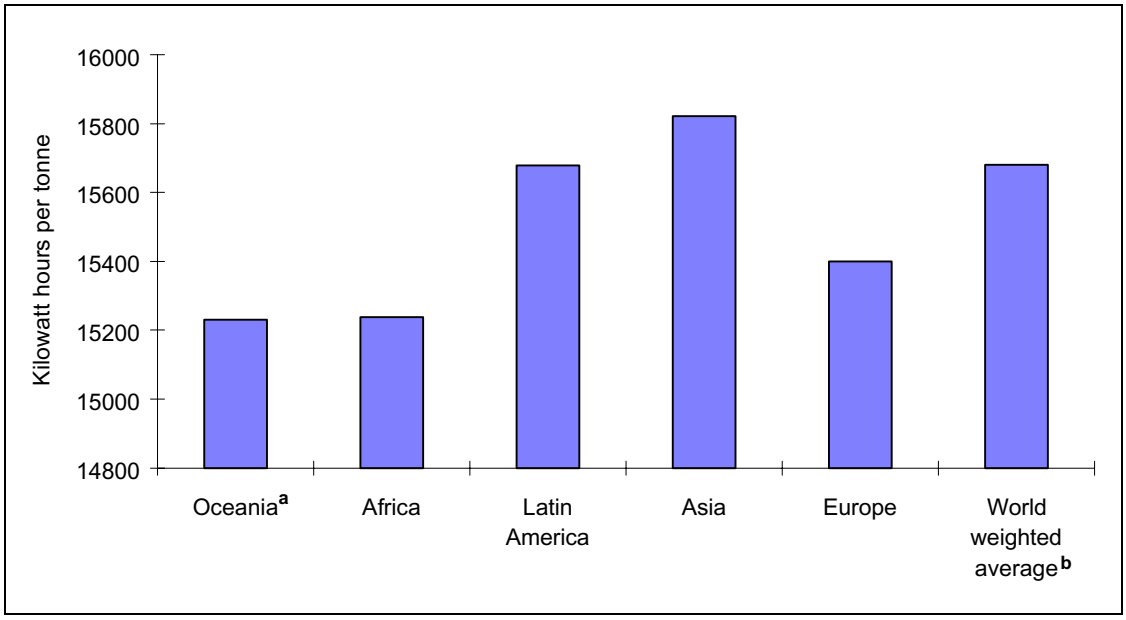
Current energy efficiency, a measure of the output of metal to power use, is a common performance indicator employed by the smelters to measure energy efficiency. Estimates provided by firms indicate that average current efficiency at the six Australian smelters has improved from 92.6 per cent in 1990 to 93.5 per cent in 1996. Even small improvements in current efficiency are significant for the smelters. The Managing Director, Comalco Smelting, (Stewart 1995, p. 11), for example, commented that:

> ... what an improvement in current efficiency does is give you a greater tonnage of metal for the same use of electricity and other materials with the exception of alumina and because the metal price varies day by day its impact on the bottom line is variable. But if you take an average metal price of around US$1500 a tonne, the impact of a 1 per cent (increase) in current efficiency is the same as though you had 100 to 120 fewer employees.

International comparisons show that Australia's aluminium smelters are among the world's most energy efficient plants in terms of energy consumed per tonne of aluminium produced. A survey by the Aluminium Development Council of Australia (ADCA 1994b) found that for the most energy intensive operation of smelting (the potrooms) Australian smelters require between 13 and 15 megawatt hours of energy to produce one tonne of molten aluminium — 13 megawatt hours per tonne is the world's best energy efficiency rating for this performance measure. The ADCA also found that the average amount of energy needed to produce a tonne of metal in the Australian industry decreased by around 2 per cent over the five year period to 1994 and that smelters plan to achieve a further 2 per cent reduction before the turn of the century.

Estimates by the International Primary Aluminium Institute (IPAI) of electricity consumption per tonne of primary aluminium produced also show that, in 1996, the Oceania region (in which Australian production dominates, but which also includes New Zealand) led the world in terms of energy efficiency. The Oceania region required about 3 per cent less electricity to produce a tonne of aluminium than the average for the world (figure 3.5).

Figure 3.5 Electricity consumption per tonne of aluminium produced, by region, 1996




**a** Oceania comprises Australia and New Zealand **b** Weighted by tonnes of aluminium produced.
Source: IPAI (1997).

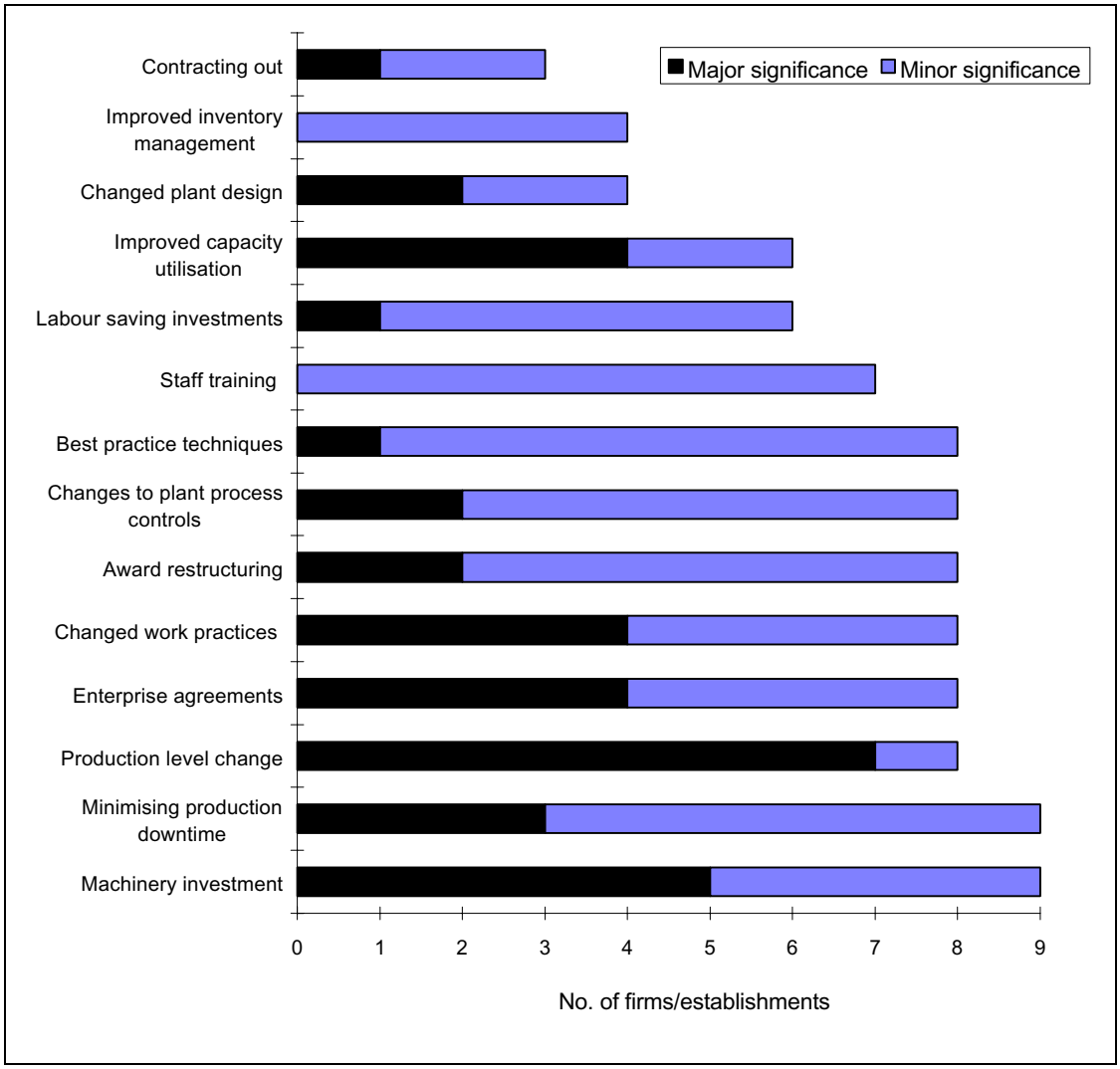
The age of a smelter is one of the key factors affecting energy efficiency performance and the potential for improvement. Australian smelters built in the 1980s have the latest cell design technology and therefore have limited scope for improving energy efficiency. The older smelters can potentially improve their energy efficiency, but this is constrained by the initial design of the smelter and the technology employed. Energy efficiency can be improved by making modifications to cell control, alumina feed technologies and work practices (ADCA 1994b).

### 3.2.4 Overall productivity

The Commission's aluminium survey asked firms to indicate their perceptions of how their business' overall productivity had changed over the period 1990 to 1996. All the surveyed firms reported an increase in overall productivity over this period.

A range of factors were reported as contributing to this increase (figure 3.6).

Figure 3.6 Factors contributing to productivity increases over the period 1990 to 1996




Source: Aluminium industry survey 1997.

A change in the scale of production was nominated as a factor of major significance by the majority of firms/establishments. Given the economies of scale associated with alumina refining and aluminium smelting, this result is not surprising. Other related factors that firms identified as being of major significance include: investments in new machinery and technology; improved capacity utilisation; enterprise agreements; changed work practices (less demarcation); and procedures to minimise production downtime.

Examples of new machinery/technology which can improve productivity — particularly current efficiency at the smelters — include automatic alumina feed systems and the computerisation of smelting cells (where account is taken of

the various current operating variables so that the voltage in the pot is optimised for prevailing conditions).

Comalco reported that productivity has improved at its smelters due to better inventory control and improved process control. Changes to anode handling systems at its Tiwai Point and Boyne Island smelters, for example, have improved the efficiency of the potline (Comalco 1993). Comalco also nominated the move to staff contracts as a major contributing factor to the increase in productivity achieved at their operations. The company claims that (Comalco 1994, p. 18):

> The extension of staff employment removes symbols of unproductive 'them and us' cultures, removes unnecessary distinctions between employees and creates the circumstances in which employees give of their best and are recognised for it.

Commenting on the contribution of changed work practices to improvements in productivity, Alcoa (1996b, p. 5) said:

> In recent years, employees have been involved in many programs aimed at supporting productivity and efficiency objectives, and a number of significant changes to work practices have been introduced as a result. Locations have invested considerable time and resources in restructuring the workplace and broadening the decision making base at the shop floor, providing employees with a much greater opportunity to input into the way they carry out their work and meet business objectives. This has not only raised the level of job satisfaction but has led to improved performance and customer focus.

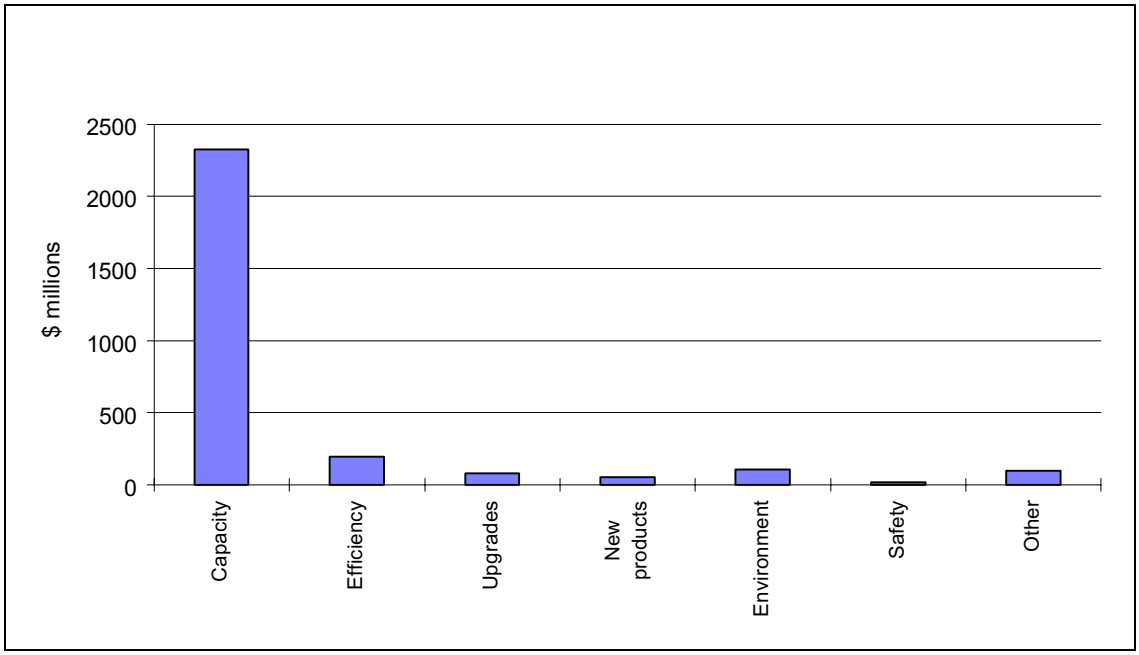
Chapter 6 discusses in more detail the impact of industrial relations reforms and workplace initiatives on productivity.

## 3.3 Investment

As noted above, firms nominated investments in new machinery/technology as one of the key drivers of productivity improvements. Our survey results confirm that investment in the industry (bauxite mining, alumina refining and aluminium smelting) has been relatively strong over the period 1990 to 1996, with Australian aluminium companies spending close to $2.9 billion on major investments (ie single investments in excess of $30 million).

Firms provided details of their major domestic investment expenditure by the following categories — capacity, efficiency, upgrades, new products, environment, safety and other (figure 3.7).

Figure 3.7 Major domestic investment expenditure by investment categories, 1990 to 1996 [a,b]




**a** Major investments are defined as single investments in excess of $30 million. **b** The **capacity** category includes investments undertaken specifically to extend plant capacity in order to increase output. **Efficiency** includes investments undertaken to achieve improved productivity, quality cost savings, etc. **Upgrades** includes capital expenditure on replacing/modifying existing production facilities. **New products** includes investments undertaken to set up production of a new product. **Environment** includes capital expenditure undertaken to satisfy environmental regulations/improve environmental performance. **Safety** includes capital expenditure undertaken to satisfy regulations/improve safety performance. **Other** — capital expenditure not included in the above categories.

Source: Aluminium industry survey 1997.

The majority of capital expenditure (in excess of $2.3 billion) over the period 1990-96 was directed towards the expansion of plant capacity. The major capacity upgrades included:

- the construction of a third potline at Comalco's Boyne Island smelter ($960 million);
- the construction of a third potline at Tomago's smelter ($700 million) — allowing for a 60 per cent increase in production;
- capacity expansion at Worsley's ($150 million) and Nabalco's alumina refineries ($110 million); and
- construction of a second unit at Alcoa's Wagerup refinery and expenditure on major equipment ($350 million).

Capital expenditure directed towards efficiency improvements — including investments undertaken to achieve improved productivity, quality and cost

savings — was the second largest investment category accounting for close to $200 million over the period. The next largest category was capital expenditure to satisfy environmental regulations and/or improve environmental performance, with firms spending more than $100 million over the period 1990-96.

Investment on new products reflects Alcoa's move to diversifying its product range by developing specialty alumina feedstocks. The company set up a new unit at its Kwinana plant in 1995 to produce specialty aluminium tri-hydrate for chemical applications. The unit produces around 270 000 tonnes of high quality, low impurity hydrate. According to Alcoa, the markets for these specialty aluminas are highly competitive, but the Kwinana plant has been able to win an increasing share, particularly in South-East Asia.

All investing firms nominated the need to improve operating costs/efficiency as a factor of major significance underlying new investment. Other key factors nominated by firms were growth strategy and changes in technology. The relative importance of these factors is reflected largely in the areas where firms have spent their investment dollars.

Because of the significance of economies of scale in both alumina refining and aluminium smelting, expenditure on capital to increase the scale of production can result in significantly lower unit production costs.

### 3.3.1 Future investment

Future investment in the industry gives some indication of the longer-term viability of the Australian aluminium industry. Future investment plans are influenced by the current and likely future performance of firms' operations. QAL, for example, claims that, to justify new investment in its operations at Gladstone, the company has to improve its competitive position (Submission 1, p. 2):

> Improvement in QAL's international competitive position is essential for future survival and to entice the owners to continue to invest their capital to sustain and expand the plants production capacity.

All of the firms covered by the Commission's survey indicated that they have plans to undertake major domestic investments in Australia — in aggregate, they may spend close to $3.6 billion over the next 3-5 years. Again, the majority of planned capital expenditure is directed towards increasing capacity (almost $3.3 billion). The more significant investments include:

- Comalco's proposed new refinery (which may be located at Gladstone or in Malaysia) at a capital cost of around $1 billion;

- a $800 million expansion of Worsley's refinery. In September 1997, Worsley confirmed that it would proceed with the expansion which will almost double the capacity of its refining operations;
- an expansion of Alcoa's Wagerup refinery at a capital cost of around $960 million. Alcoa announced in November 1997 that it will begin a 440 000 tonne expansion of its Wagerup refinery — this is the first stage of the expansion. The second stage, not yet scheduled, is expected to involve an additional 1 million tonnes of capacity; and
- an expansion of potlines 1 and 2 at Tomago's smelter — the expansion would increase the smelters production by around 10 per cent.

Alcan South Pacific also announced in August 1997 that it was setting up a bauxite mining operation at Ely (located on Cape York Peninsula). In February 1998, however, Alcan announced that it had signed an agreement with Comalco for the development of the Ely Reserves. The agreement, according to Alcan, (1998, p. 1):

> ... adds substantial value to both companies compared with the stand-alone Ely project announced by Alcan in August 1997.
>
> Agreement on a long-term integrated approach also eliminates complexities of processing two bauxite qualities simultaneously at the QAL joint-venture refinery. In addition, regional bauxite mining and shipping infrastructure will be optimized and will enable environmental and community impacts to be managed on an integrated basis.

Firms nominated a number of market-based factors, including global demand outlook, abundance and quality of mineral deposits, and the cost and availability of other key inputs as important determinants of this future investment.

Comalco commented that Australia's bauxite deposits are an important factor influencing investment in the industry, claiming that (Submission 3, p. 1):

> A major incentive for investing in the aluminium industry in Australia is the bauxite resource. These are world-class deposits which have warranted feasibility investigation and subsequent development of alumina refineries and aluminium smelters.

The growth potential of the Australian economy, policies of overseas governments and proximity to customers were, in general, seen as less influential determinants of this investment. However, a number of actions by Australian governments are likely to be important in influencing firms' future investments.

The following chapter examines the factors within government control that are likely to affect future investment in the industry and the performance of the Australian aluminium industry more generally.

# 4 GOVERNMENT INFLUENCE ON FIRMS' PERFORMANCE — SURVEY RESULTS

*The performance of firms in the Australian aluminium industry has been influenced by a range of factors, a number of which are affected by government actions. Labour market policies were nominated by firms as the area of reform having the most beneficial effect on their competitiveness since 1990. Firms also claim that reforms in this area are likely to have the most positive influence on their investment decisions over the next 3-5 years. Air emission regulations were nominated by firms as having the greatest negative influence on competitiveness and as the factor likely to have the most negative impact on future investment in the industry.*

*In terms of future competitiveness, firms reported that the most important reforms will be in the areas of coastal shipping, electricity, natural gas and air emission regulations.*

This chapter looks at the extent to which factors within government control affect the performance of firms in the aluminium industry. Section 4.1 looks at government-related factors that are likely to influence future investments in the Australian aluminium industry. Section 4.2 presents firms' perceptions of the impact of a range of microeconomic reforms on their recent and future competitiveness.

## 4.1 Government influence on future investment in the Australian aluminium industry

Firms' decisions about whether or not to continue investing in the aluminium industry in Australia will be determined ultimately by expectations about returns from investing in Australia relative to those available elsewhere.

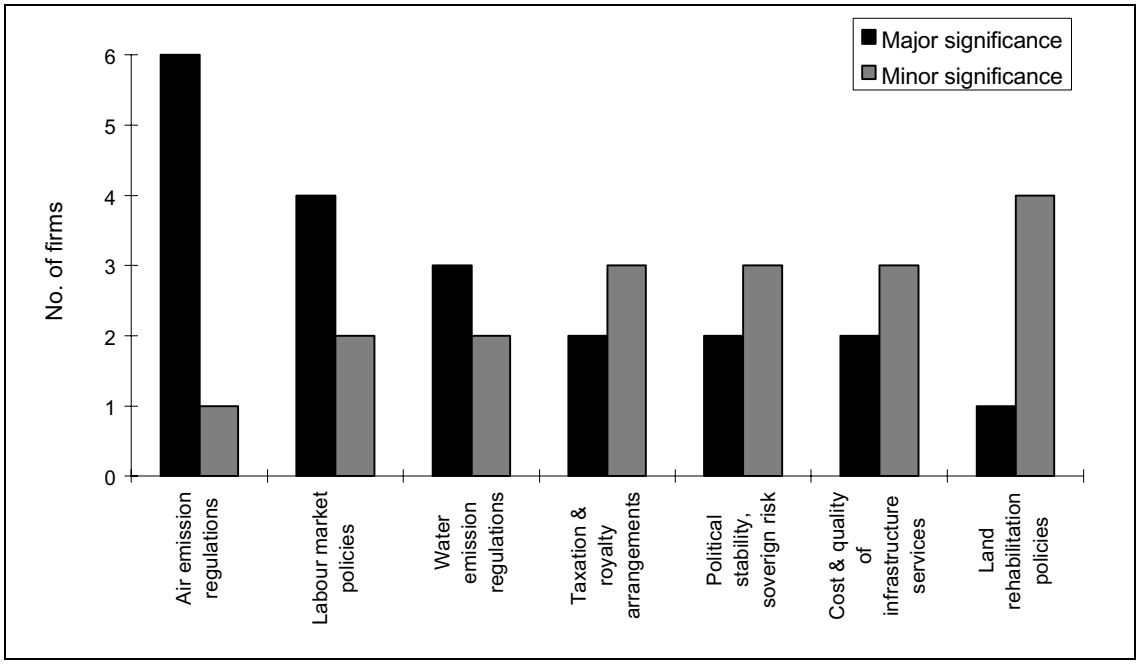
Commenting on Comalco's plans to build a new alumina refinery in either Australia or Malaysia, the Managing Director of the company's Minerals and Alumina division (Kinkead-Weekes 1997, p. 320) indicated that:

> The race to add value to resources is fiercely competitive as is the desire of many rapidly developing countries in our region to capture major industrial growth projects. Given this and the capital intensity of a large refinery project, the location decision is crucial to the potential value of projects.

Governments in Australia have the capacity to significantly influence the returns obtained by aluminium firms. For example, many of the aluminium industry's key inputs, such as energy and transport services, are provided by government business enterprises and/or private businesses subject to government regulation. The flexibility and cost of other inputs such as labour are also influenced by government policies. Taxation and royalty arrangements, as well as the regulatory environment (including legislation relating to environmental controls and land use) also affect firms expected returns on investments.

Air emission regulations and labour market policies were nominated by firms as key factors within government influence that are likely to affect their investment decisions over the next 3-5 years (figure 4.1).

Figure 4.1 Key government-related factors affecting investment decisions over the next 3-5 years




Source: Aluminium industry survey 1997.

Other government-related factors nominated by firms as being likely to influence future investments include: water emission regulations; taxation and royalty arrangements; political stability/sovereign risk; cost and quality of infrastructure services; and land rehabilitation policies. Box 4.1 presents some firm and industry analysts views on the key factors that influence investment in the aluminium industry.

### Box 4.1 Some views on factors influencing future investment in the Australian aluminium industry

Comalco (Submission 3, p. 1) commented that 'Continuation and further development of this industry in Australia, require Government support, in particular:

- access to discover, prove and mine the deposits;
- environmental approval to establish, operate and expand mines, refineries and smelters; and
- practical taxation to enable commercial products which compete in the global markets'.

The Managing Director of Comalco Minerals and Alumina, (Kinkead-Weekes 1997, p. 320), commenting on the location decision of future investments said that: 'Several factors have a significant influence on location:

- government encouragement of major investments, reflecting their understanding of the value of the project to the community, and demonstrated by a willingness to take a proactive role in the development of supporting infrastructure, fiscal support and facilitated approval processes;
- a stable political, legal and economic environment with clearly articulated rules and processes;
- low cost energy supply;
- competitive ocean freight and port systems; and
- productive labour systems'.

Bardossy & Bourke (1993, p. 891) in an article that assessed world bauxite deposits as sources for greenfield alumina development commented that 'Investor confidence in country security is an important risk factor as investment in bauxite mines and alumina plants is both large and long term'. Bardossy & Bourke concluded that of all the potential bauxite deposits, 'Australia is considered as having the best relative country risk, followed by Greece, both characterised by 'high' country security'.

Alcoa (Submission 5, p. 16) commented that: '... unless the Federal Government maintains a 'no-regrets' attitude towards the nation's aluminium industry, Australia will cease to be an attractive region for investment in aluminium smelting'.

Alcoa's Executive Director, Victorian Operations, (Hayward 1998, p. 235) also noted that: '... the cost of energy and the long term expectation of possible changes in the cost of energy are critical investment decision factors'.

Of the government-related factors identified as having an influence on investments in the aluminium industry in Australia over the next 3-5 years, firms ranked air emission regulations covering their plants and electricity

suppliers as the factor likely to have the most *negative* effect on such investments (table 4.1).

Table 4.1 Firms' rankings of key government-related factors affecting their investment decisions over the next 3-5 years

| *Important **negative** contributors* | *Important **positive** contributors* |
|---|---|
| 1. Air emission regulations | 1. Labour market policies |
| 2. Taxation and royalty arrangements | 2. Cost and quality of infrastructure services |
| 3. Water emission regulations | 3. Declining tariffs on outputs/inputs |
| 4. Land access arrangements | 4. Political stability/sovereign risk |

Source: Aluminium industry survey 1997.

Commenting on this issue ahead of the Kyoto climate change conference, firms expressed concerns about the impact that some greenhouse gas policies could have on future investment in the industry. Initiatives to curb greenhouse gas emissions have the potential to increase energy costs and thereby significantly reduce the expected returns on investments in the aluminium industry, particularly the smelting operations. Because Australia depends relatively heavily on coal for energy generation, controls over emissions have the potential to increase the cost of electricity to aluminium smelters in Australia more than in countries which have greater access to hydroelectricity or nuclear power.

The AAC (1997a, p. 2) commented that:

> Investment in the industry's growth could total more than $7 billion over the next two decades.
>
> ... but current sound growth prospects will not be realised if industry costs are raised significantly as a result of the climate change convention — and the greenhouse intensity of Australia's energy supply means that it would not take much in taxes or other measures for the cost increases to be significant.
>
> In these circumstances, new investment will more than likely go to developing countries not required to make greenhouse commitments — such as China, India and some in Africa, Latin America and the Middle East — or those countries granted concessions, such as the economies in transition of the former Soviet bloc.

Commenting on Comalco's proposals to invest in a greenfield refinery in Australia, Tayles (1995, p. 148) indicated that any advantage Australia currently has would be undermined by the introduction of greenhouse taxes on fossil fuel use in developed countries:

> With any massive greenfield capital investment in a highly competitive environment, it is difficult to achieve acceptable returns and to attract venture partners. The imposition of a carbon tax undermines the competitiveness of the product, the competitiveness of one of the major end users and the confidence of potential investors.
>
> With competing projects in such countries as India and Indonesia, imposition of a carbon tax is likely to drive away potential investors and close the window of opportunity of another major Australian employer.

Alcoa's Executive Director, Victorian Operations, (Hayward 1998, p. 237) indicated that investment decisions are influenced by outcomes arising from agreements such as the Kyoto agreement:

> A global industry has to take account of the different circumstances in each country, the impact of global financial trends, and variations between nations arising from agreements such as the Kyoto protocol on climate change.
>
> There is reason to be cautious about any flow-on effects of Australia's response to climate change, announced by the Prime Minister on 20 November 1997, and the Kyoto protocol to the UN framework convention on climate change, which might consequently affect electricity costs.
>
> Hence, the future of our industry in Victoria vitally depends on what happens in the power market over the next fifteen to twenty years. Equally, it is critical to the electricity generating industry that aluminium smelting in Victoria should remain viable and competitive.

The AAC (Submission 13) also commented that the omission of developing countries from the Kyoto protocol 'is critical for smelting as those locations are in strong competition with Australia for new investment'.

Greenhouse gas policies are discussed in more detail in Chapter 7.

Taxation and royalty arrangements, water emission regulations and land access arrangements were also ranked among the top four areas expected to have important *negative* effects on future investments in the industry in Australia (table 4.1).

Alcoa (Submission 5, p. 13) commented on the importance of secure access to their bauxite reserves as a key factor influencing its future investments:

> The addition of a third refining unit at Wagerup is one of a number of potential expansions available to the alumina industry, both within the Alcoa world-wide system and by competitors, around the world. Any uncertainty about access to bauxite would be a substantial negative factor in this consideration.

Land access arrangements and environmental regulations are discussed further in Chapter 7. Issues relating to taxation arrangements are examined in Chapter 8.

Labour market policies were nominated by firms as the factor likely to have the most *positive* influence on future investment decisions (table 4.1). Labour market policies that increase the flexibility of Australia's industrial relations system have the potential to improve labour (and capital) productivity performance and, hence, returns on investments.

Firms ranked the cost and quality of infrastructure services as the second most important positive government-related factor having an influence on future investments in the industry. This is not surprising as the aluminium industry is a relatively large user of infrastructure services. According to the Minerals Council of Australia (Minerals Council Submission to the IC's inquiry into the implications for Australia of firms locating offshore, 1996a, p. 46):

> Microeconomic reform of basic infrastructure sectors, such as transport and energy, can have a significant and positive impact on investment opportunities, tipping the balance on whether projects are able to proceed here in Australia, or whether they are lost to other countries.

Similarly, Tayles (1995, p. 147) commented that Comalco's commitment to a greenfield alumina refinery in Australia will be dependent on access to world competitive inputs:

> The initial investment in a 1 million tonne a year refinery exceeds A$1 billion and the economics are critically dependent on the long term world competitiveness of major inputs.

Other government-related factors viewed by firms as being likely to have a positive effect on future investment decisions in the industry include declining tariffs on inputs/outputs and political stability/sovereign risk. Reductions in tariffs, including policies which commit the government to further reforms in this area, will have a positive impact on the cost of firms' capital equipment and some other key inputs. Because of the long-term nature of investments in both refineries and smelters, political stability and an acceptable level of sovereign risk are critical. Indeed, as observed by Alcoa (1993, p. 2):

> Government, through its legislative and regulatory functions as the protector and promoter of the community interest, plays a major role in creating and maintaining the confidence of investors and their markets. Anyone contemplating long term investment needs to be sure that the business climate so established will not be upset by sudden and/or capricious changes in government policy.

Firms also seek consistency in key policy areas such as taxation, the environment, access to land and other natural resources, and energy contracts (including contracts for electricity and gas supply).

## 4.2 Microeconomic reform — its influence on the competitiveness of firms

Microeconomic reforms affect not only investment decisions, but by influencing the cost of inputs, flexibility in the workplace and the predicability of the operating environment, they can also affect a firm's ability to compete both domestically and internationally.

In recent years, added pressure has been placed on firms in the Australian aluminium industry to improve their competitiveness. Six of the aluminium firms covered in the Commission's survey reported that the level of global competition faced by their business had increased since 1990. Of these, four firms indicated that global competition had increased substantially, while two firms indicated that it had increased marginally. The main factor identified by firms as contributing to this increase in competition was the integration of the former Soviet Union into world markets. This redirection of Russian aluminium from domestic use (mainly defence) to the world market resulted in a squeeze on the industry's returns and forced firms to look for new ways to reduce costs. Comalco (1993, p. 13) commented that:

> The collapse of the former Soviet Union has brought permanent shifts in production and demand as the industry becomes truly global, with the old barriers between Eastern bloc and western producers and markets now gone.
>
> ... it has always been a cornerstone of Comalco's operating philosophy that its businesses must continue to find ways to reduce costs, increase efficiency and improve the quality of its products. However, the recent extreme difficulties in world aluminium markets have made this even more critical.

Other factors identified by firms as contributing to the increase in competition included competitors upgrading technology, new entrants, and competition from alternative products. In commenting on the challenges presented to the industry as a result of these factors, the Plant Manager at Tomago's aluminium smelter (Tomago Aluminium 1996a, p. 3) observed that:

> Our plant is at a pivotal point in its history. Developments within the aluminium industry internationally mean we are entering the new year faced with important challenges. The way in which we deal with these challenges will decide our future.
>
> World-wide, the aluminium industry is being 'shaken up'. New, state-of-the-art plants with low cost structures are starting up and existing plants are becoming more efficient at an increasingly rapid rate. Companies that only maintain current performance levels will be left behind.
>
> Put simply, it is becoming tougher for producers to gain and maintain a competitive edge. ... One of the challenges facing companies as they enter the new year is to lower cost structures while continuing to deliver high quality products to customers.

### 4.2.1 Impacts of microeconomic reform — perceptions at the firm level

Firms responding to the Commission's aluminium survey were asked to assess the impact of various microeconomic reforms on their competitiveness over the period 1990 to 1996. In all, some twenty microeconomic reforms covering five broad areas were covered in the survey —labour market reforms; infrastructure reforms; other regulatory reforms (including those relating to the environment and access to natural resources); changes to industry assistance arrangements; and taxation-related reforms (appendix B).

Firms' assessments of the impact of individual reforms differed. For most of the reforms some firms indicated that they had a positive impact on their competitiveness, while others indicated that they had a negative impact. A number of firms reported that, in their view, some reforms had no impact on their competitiveness. In a limited number of cases, firms did not comment on the impact of certain reforms (eg rail freight and aviation) because they were not viewed as directly relevant to their operations.

The majority of aluminium firms perceived that reforms in the areas of — electricity, water supply, road freight, tariff reductions on inputs, the waterfront and land rehabilitation regulations — had no impact on their competitiveness. The somewhat surprising result for electricity can be explained by the timing of firms' electricity supply contracts. Most firms in the industry are locked into long-term contracts for electricity supply (ie prices were effectively 'fixed' over the survey period) and so have not benefited from general reductions in electricity prices. Benefits are, however, likely to accrue as contracts are renewed or where terms for additional electricity are negotiated.

The perceived low impact of some of the other areas of reform may be explained by the relative significance of some of these reform areas to firm's cost structures (eg some firms are only relatively small users of water and road freight services). Hence, even substantial price reductions arising from the reform process could conceivably be attributed by firms as having minimal or no direct impacts on their competitiveness. Also, the benefits from reforms are not always readily identifiable with some gains flowing to firms indirectly. For example, some gains can flow from indirect usage of infrastructure services such as transport, the costs of which are embodied in inputs purchased by firms. Other benefits may be even less tangible, such as those arising from reductions in tariffs on inputs, given that the final prices facing users are influenced by other factors as well including, for example, exchange rate changes.

On a number of firms basis, industrial relations reforms stand out as being the reform that has had the most positive impact on the competitiveness of firms

over the period 1990 to 1996 (figure 4.2). Four of the eight aluminium firms perceived that industrial relations reforms had a *major* positive impact on their competitiveness, while three judged they had a *minor* positive impact.

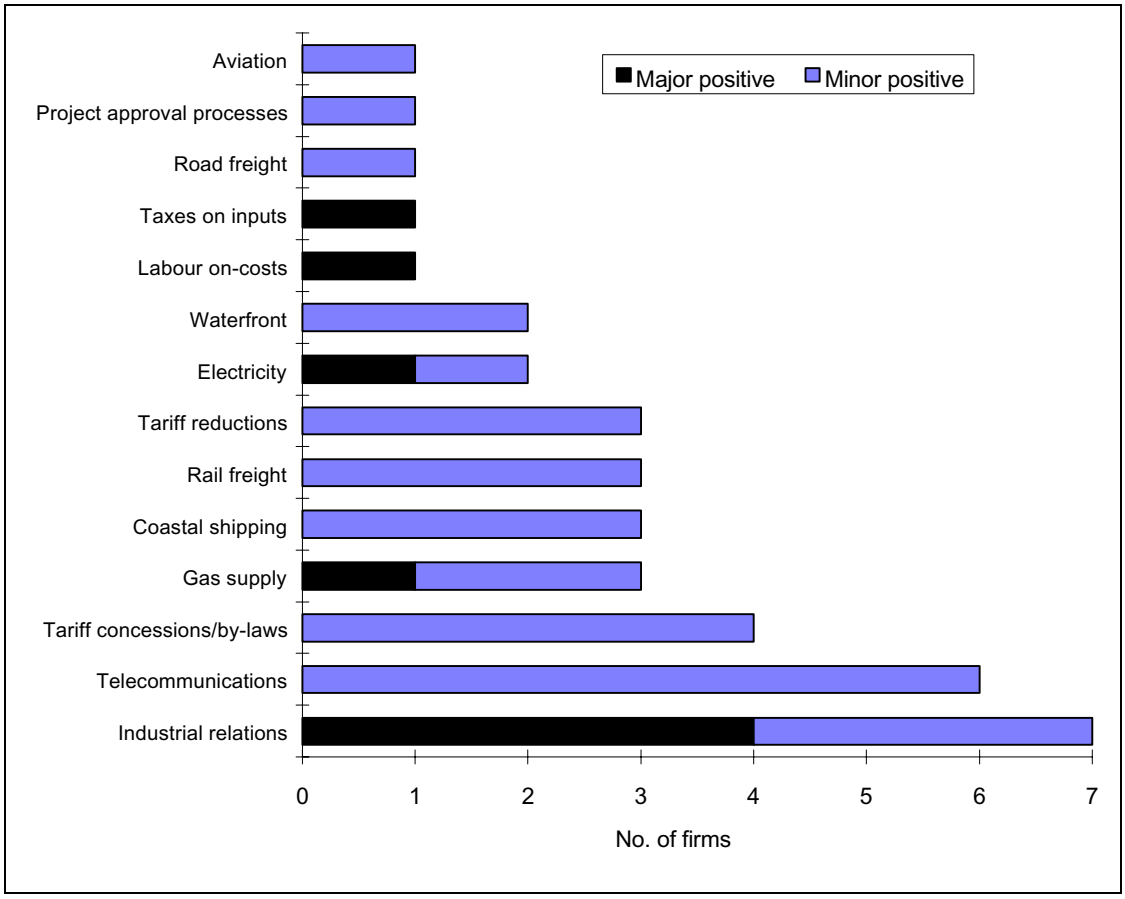
Although labour costs account for only around 17 per cent of bauxite mining/alumina refining costs and 12 per cent of smelting costs, reforms in this area obviously have provided opportunities for labour and capital productivity improvements. Firms indicated that industrial relations reforms over the last decade have facilitated significant changes to their workplaces and have been effective in removing some of the rigidities that in the past impeded the effective operation of their workplaces (see chapter 6 for more detail). Also, as mentioned in the previous chapter, firms nominated award restructuring and the implementation of enterprise agreements and changed work practices as factors contributing to increases in productivity over the period 1990 to 1996.

Telecommunications reforms were viewed by all bar two firms as having a minor positive impact on their competitiveness. Firms most likely viewed the gains from reforms in this area as being minor because of the relatively small significance of telecommunication services in their cost structures.

Tariff concessions/policy by-laws, tariff reductions on inputs and reforms to gas supply, coastal shipping, rail freight, electricity and the waterfront were the next group of reforms most commonly referred to by firms as having positive impacts on their competitiveness over the period 1990 to 1996.

Reforms seen as having the smallest positive impacts on firms competitiveness included changes to labour on-costs, taxes on business inputs, road freight, project approval processes and aviation.

Figure 4.2 Firms reporting positive impacts on their competitiveness from microeconomic reforms, 1990 to 1996




Data source: Aluminium industry survey 1997.

In an attempt to gauge the relative importance of these reforms to the industry, the survey also requested firms to rank the four reforms making the greatest positive contribution to their competitiveness over the period 1990 to 1996. Weighted rankings identified reforms to industrial relations, rail freight, waterfront, and tariff concessions/by-law arrangements as the leading four positive contributors to firm competitiveness.[1]

[1] The leading positive reforms were identified by giving each reform a weight based on its ranking by individual firms. Where a reform was listed as making the greatest positive contribution it was assigned a weight of 1.0. The next three leading reforms were assigned weights of 0.75, 0.5 and 0.25 respectively. Different weighting systems produced similar results.

Of these reforms, industrial relations had by far the highest ranking — the weighted ranking for this reform (5.5) was more than three times higher than that for the next highest ranking reforms (1.75). This result, however, may be partly explained by the fact that labour is a significant cost for all firms in the industry. Hence, industrial relations reforms have the potential to affect all firms' competitiveness. Reforms in other areas, such as rail freight, directly affect only some firms in the aluminium industry.

Rail freight and waterfront reforms were ranked by firms as making the second greatest positive contribution to their competitiveness over the period 1990 to 1996. Tariff concessions/policy by-law arrangements and coastal shipping reforms, however, received only marginally lower weighted rankings. This indicates that these areas of reform were also perceived as having relatively high beneficial effects on firms' competitiveness.

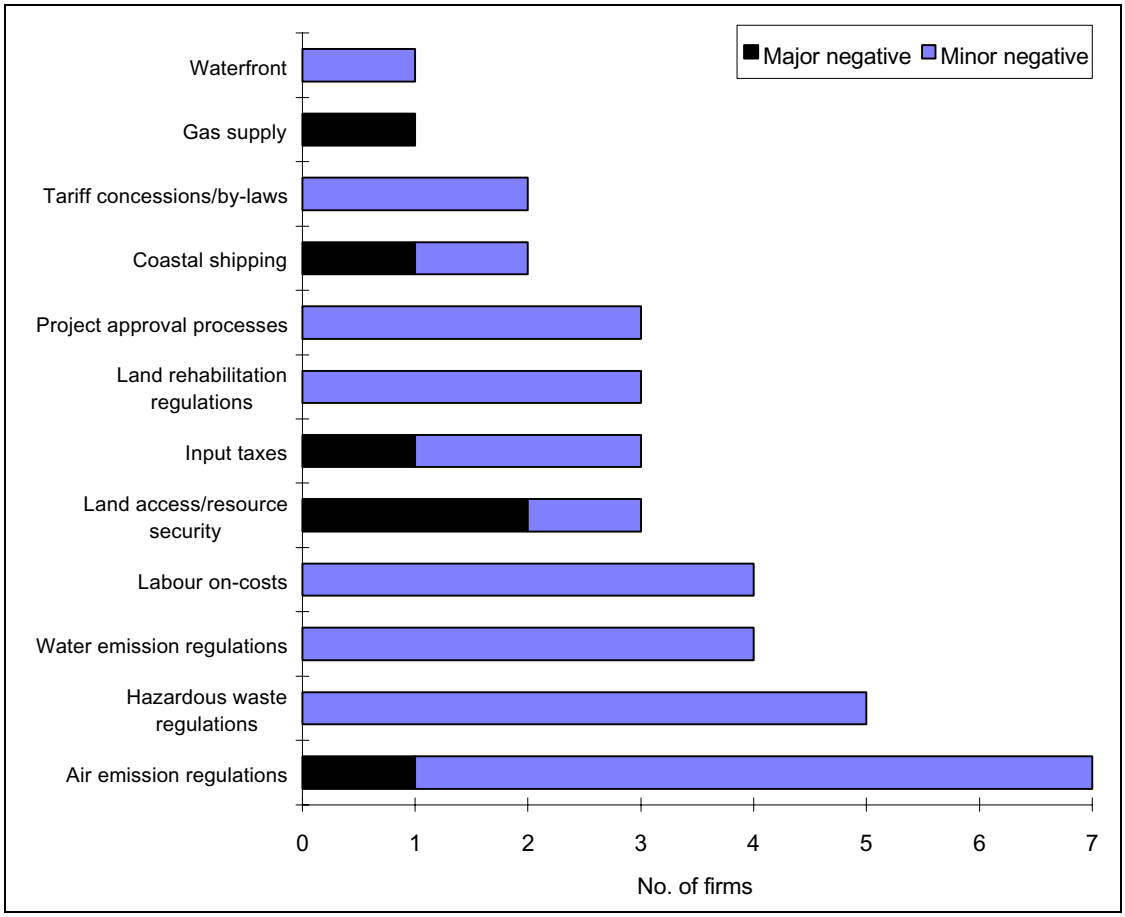
The reforms perceived as having the most widespread *negative* impact on firm competitiveness, on a number of firms basis, were changes to air emission regulations, changes to hazardous waste regulations, changes to water emission regulations and changes to labour on-costs (figure 4.3).

The reforms perceived as having relatively small negative impacts on firm competitiveness included those covering the waterfront and gas supply followed by coastal shipping and changes to tariff concessions and policy by-laws.

A weighted ranking obtained from individual firms' rankings of reforms considered to have made a negative contribution to firm competitiveness between 1990 to 1996 (using the same approach as that applied to positive reforms discussed earlier) identified changes to air emission regulations, taxes on (non-labour) inputs, labour on-costs and land access/resource security arrangements, as the four areas making the greatest negative contribution to competitiveness.

Air emission regulations were consistently ranked by firms in the top three negative reforms, resulting in this area of reform receiving the highest negative ranking. Firms' negative views about air emission regulations mainly related to the more stringent fluoride emission standards governing fluoride emissions from smelters. The refineries also mentioned the more stringent controls over dust in alumina production. Firms' also commented on the more onerous monitoring and the higher compliance costs arising from changes to air emission standards over the period 1990 to 1996.

Figure 4.3 Firms reporting negative impacts on their competitiveness from microeconomic reforms, 1990 to 1996




Data source: Aluminium industry survey 1997.

While taxes on business inputs was ranked as the reform making the second most negative contribution to firms' competitiveness, the overall ranking for this area of reform (2.5) was considerably lower than that for air emissions (5.25). Firms' negative perceptions about changes to taxes on business inputs, and petroleum products in particular, relate to the cost of complying with such taxes and the distortionary effect that they have on production choices and the bias against production for export. In the area of labour on-costs, firms were critical of the level of these costs and regulatory arrangements which increased administration and compliance costs for the payment of these on-costs. Survey respondents of both the agri-food and automotive case studies (BIE 1996b,c) also ranked changes to input taxes and labour on-costs highly as areas of reform having a negative influence on competitiveness.

The ranking of land access/resource security arrangements as the fourth most important negative factor affecting competitiveness reflects, in part, firms'

concerns about the operation of various resource management regimes, including uncertainty surrounding native title rights and the costs and delays associated with administrative processes under the Native Title Act (see chapter 7 for more detail).

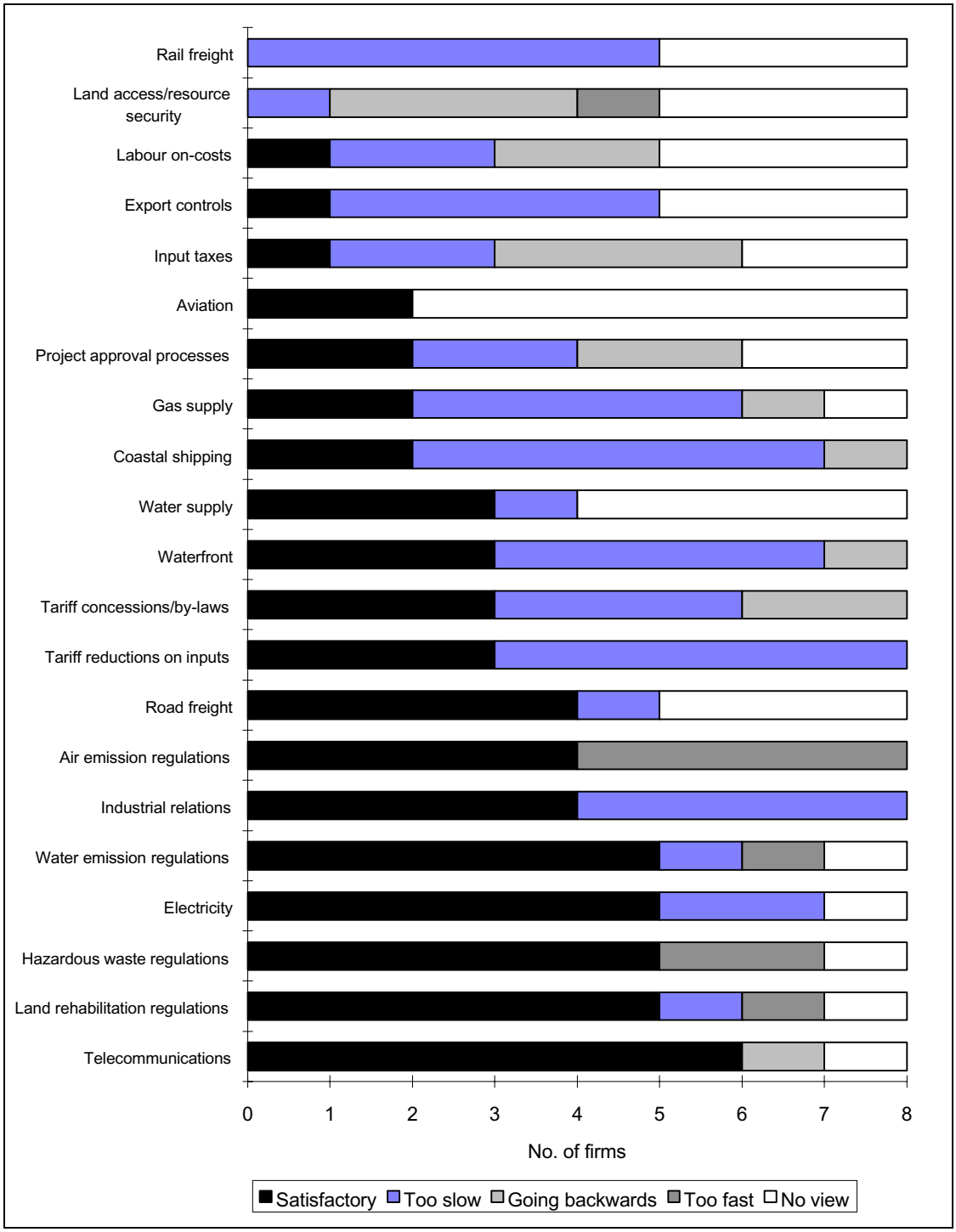
### 4.2.2 The adequacy of the pace of reform — firms' views

The aluminium survey asked firms to indicate their views about the adequacy or otherwise of the pace of various microeconomic reforms at the time of the survey (April 1997). Firms' views about the pace at which microeconomic reforms have been implemented displayed considerable variation. However, most firms felt that reforms have not progressed quickly enough (figure 4.4).

Firms expressed greatest dissatisfaction with the pace of reform in eight areas: coastal shipping; the waterfront; gas supply; rail freight; tariff concessions/by-laws; tariff reductions on inputs; taxes on inputs other than labour; and land access/resource security. The majority of these firms considered that reforms in these areas were proceeding too slowly. Some firms indicated that the pace of reform for many of these areas had actually gone backwards. While firms have seen small benefits from reforms in some of these areas (eg input taxes and the waterfront), they highlighted the importance of pushing ahead with reforms, particularly in the area of infrastructure, as other countries are also proceeding with reform in these areas. Firms believe that, if they are to continue to remain among the lowest cost producers in world, the pace of reform in many areas needs to be accelerated.

Five areas of microeconomic reform attracted mixed results — four out of eight firms expressed dissatisfaction with the pace of reform. The relevant areas are: export controls; labour on-costs; project approval processes; air emission regulations; and industrial relations. In the case of the latter two, firms were evenly divided in their assessment between being satisfied and dissatisfied. However, the form of their dissatisfaction varied. In the case of air emission regulations, dissatisfaction reflected a view that reform was proceeding too quickly. In the case of industrial relations reforms, all dissatisfied firms concluded that the pace of reform had been too slow. For the remaining areas of reform with a mixed result, of the firms who were able to make an assessment, a majority were dissatisfied with the pace of reform because it was proceeding too slowly and/or slipping backwards.

Figure 4.4 Firms' views on the adequacy of the pace of microeconomic reform




Data source: Aluminium industry survey 1997.

On a number of firms basis, the reforms attracting the highest proportion of satisfactory rankings (from five or more of the eight respondents) were: telecommunications; electricity; water emission regulations; land rehabilitation regulations; and hazardous waste regulations.

### 4.2.3 Key microeconomic reforms for future competitiveness

The survey also asked firms to rank the four most important microeconomic reforms to the competitiveness of their business over the next 3-5 years. On a weighted basis (using the approach previously discussed), the leading four reforms for future competitiveness are: coastal shipping; electricity; natural gas; and air emission regulations.

Reforms in the areas of land access/resource security, industrial relations, changes to taxes on inputs (other than labour), and labour on-costs are also viewed as relatively important areas for future reform. The weighted rankings for these reforms were only marginally lower than the weighted ranking for air emission regulations.

Issues associated with microeconomic reform in these and other areas are discussed in more detail in the following chapters. Chapter 5 looks at infrastructure reform and the impact that it has had on the competitiveness of aluminium firms, including an examination of the areas that continue to impede their competitiveness. Chapter 6 examines labour market issues and workplace reform and the impact that reforms in this area have had on productivity. Environmental regulations and land access/resource security issues are examined in chapter 7. Chapter 8 looks at taxation arrangements.

# 5 INFRASTRUCTURE SERVICES

*The aluminium industry is a large user of infrastructure services which have been targeted by the microeconomic reform process. Benefits to the industry from reforms in electricity and gas supply have been limited to date as long-term contracts reflecting pre-reform arrangements apply. While firms expressed some reservations about the security of these contracts, they anticipate being able to negotiate lower tariffs for future contracts within a more competitive energy market.*

*Unreliability and the high cost of coastal shipping, waterfront and rail freight services were identified by firms as impeding their international competitiveness. While firms recognised that reforms in these areas have provided some benefits, they called for further reforms to close the gap between prices paid for these services in Australia and those paid by their competitors overseas.*

As firms in the aluminium industry are large users of infrastructure services, microeconomic reforms in this area could provide considerable benefits. QAL, for example, indicated that (Submission 1, p. 3):

> Plant material and energy input costs are in excess of 60 per cent of QAL's manufacturing costs. Therefore, to improve our competitive position, these inputs need to reflect world benchmark prices. Government micro economic reforms, particularly in the areas of deregulation of the electricity, gas and rail transport industries and industry reforms of coastal shipping and ports, can greatly enhance competition and result in reduced business input costs.

Cost reductions and improvements in the reliability of infrastructure services will directly affect firms' ability to compete on both domestic and international markets. Infrastructure reform also may result in firms having more options in terms of choice between providers. The deregulation of the electricity market, for example, will allow firms in some states to choose between electricity suppliers whereas, in the past, there was a single supplier.

This chapter looks at the impact that infrastructure reforms have had on firms in the Australian aluminium industry. It also examines the scope for further reforms directed at improving infrastructure and the competitiveness of aluminium firms in Australia.

## 5.1 Electricity

The aluminium industry is the single largest consumer of electricity in Australia. Aluminium smelters account for around 18 per cent of total electricity consumption in the four states in which they operate — Victoria, New South Wales, Queensland and Tasmania. Comalco's Bell Bay smelter, for example, consumes about the same amount of energy as the City of Hobart.

While alumina refineries and aluminium smelters consume electricity, most of the electricity is used in the smelting process — electricity costs account for around 21 per cent of aluminium production costs compared with around 2 per cent of alumina production costs (see chapter 2).

The energy-intensive nature of the industry is reflected in data which show that expenditure on electricity and other fuels represents around 15 and 18 per cent of turnover for the alumina refining and aluminium smelting industries, respectively. By contrast, the comparable figure for the manufacturing sector is around 2.5 per cent (ABS 1993).

Access to competitively priced electricity has an important influence on both the competitiveness of the industry and the location of aluminium smelters. According to the Aluminium Development Council of Australia (ADCA 1994a, p. 14):

> A prime requirement in the smelting of aluminium is the availability of electric power at low cost.

Alcoa (1996b, p. 18) commented that:

> Energy costs and availability are major criteria in determining the location of the aluminium industry.

And Comalco (1993, p. 11) said that:

> The supply and price security of power is the most important factor in evaluating smelter investments.

As mentioned in chapter 2, Australia's smelting industry is located in the eastern states of Australia — this is a reflection of the relatively high electricity charges in Western Australia.

According to Alcoa (1996a, p. 21):

> There are no aluminium smelters in Western Australia, though several feasibility studies have been conducted. The last study, which examined the feasibility of a $2 billion smelter and power station complex in the South West of Western Australia, did not initiate a project. Relatively high energy costs are the major factor preventing development of smelting in this State.

Reliability of supply is also important to aluminium smelters. While smelters can accommodate short interruptions, the withdrawal of power for longer than a few hours can cause molten alumina to set in the pots. In such an event, major maintenance is required on the potline and it could take up to several months to restart production.

Electricity is typically supplied to aluminium smelters and alumina refineries under long-term contracts. These contracts usually cover a 20 to 30 year period with 'take or pay' provisions which specify a price for a fixed annual quantity of electricity. Information relating to the price paid for electricity under these contracts is not publicly available. It is common knowledge, however, that aluminium smelters pay lower electricity prices than other large industrial users (Sheales & Neck 1994). There are a number of reasons for this — smelters constitute a continuous (24 hours per day, 365 days per year ) base load; smelters are generally located close to power stations thus minimising transmission costs; smelters draw power in high voltages thereby minimising transmission losses; and, under the 'take or pay' provisions of the contracts, smelters guarantee to purchase electricity whether or not delivery is taken.

Another feature of the electricity tariffs paid by many aluminium smelters is that they typically fluctuate according to a formula that takes account of movements in world aluminium prices — the smelters pay less for electricity as the price of aluminium falls and more when it increases above some nominated benchmark.

The commercial sensitivities associated with power prices and pricing mechanisms governing power supply contracts to smelters make it impossible to compare electricity prices paid by smelters in Australia with those elsewhere in the world. The ADCA (1994b, p. 14), however, claims that:

> The price of electricity varies widely around the world but it is recognised that Australian smelters pay around the world average price. The price is lower in countries where hydroelectricity is the dominant power source and where oil based power is available the price is higher.

Tomago said that it was being supplied electricity at a price that was 'in the market' for a smelter of its size. However, it also commented that in recent years prices in Australia have become less competitive as electricity prices elsewhere in the world have fallen. Capral (Submission 2) considered that it was paying more for its electricity in New South Wales than the smelters in the other states.

The pricing mechanisms applying to Alcoa's electricity contract for its Portland smelter, which was put in place over a decade ago, are publicly available. There has been considerable debate about whether electricity supplied to this smelter

is subsidised (see, for example, Swan 1981). The Victorian Government claims that taxpayers are subsidising the smelters' electricity costs. According to the Treasurer (Stockdale 1995, pp. 1-2):

> ... the smelters' flexible tariff agreement, negotiated by the Cain Government in 1984, committed Victorian taxpayers to subsidise the smelters electricity costs by up to $200 million per year.
>
> ... The smelters had been subsidised to as low as an average 1.6 cents/kW in the past four financial years, with most other high voltage customers paying up to three times this level for their electricity.

While information is generally not available on average prices actually paid for electricity under contract, the BIE's international benchmarking report compared international published tariffs on electricity offered to large industrial users (ie customers with 10 000 kW annual maximum demand at 80 per cent load factor) and found that tariffs offered to these customers by Australian utilities were relatively low by international standards. The cheapest Australian utility in 1995 — Eastern Energy (Victoria) — ranked 7th among 42 electricity utilities. Sydney Electricity (New South Wales) ranked 11th and Queensland Transmission and Supply Corporation (Queensland) ranked 13th. The highest Australian tariff, published by Western Power in Western Australia, was about 55 per cent higher than observed international best practice (BIE 1996d).

Capral (Submission 2, p. 2), commenting on the electricity tariff paid by its smelter compared with those paid by smelters elsewhere in the world, indicated that:

> Cost intelligence indicates that we are in the third cost quartile of World Western Smelter Capacity for electricity tariffs. This makes power pricing and the effectiveness of the reform process of great importance to the Capral smelter.

QAL reported that benchmark electricity prices within the alumina industry are between A$33 MWh and A$47 MWh for base load coal fired generation. QAL expects that electricity prices from the initial Queensland interim market will decline to some extent, but anticipates further price decreases coinciding with the full implementation of the national electricity market (NEM).

### *Electricity reforms — any benefits to aluminium firms?*

Over the past decade or so, Australia's electricity supply industry has been subject to an extensive program of micro reforms. While the pace and extent of these reforms has varied between the states, it has generally involved a combination of commercialisation, corporatisation, privatisation, pricing reforms and reforms aimed at increasing competition, including initiatives aimed at creating the NEM.

The Electricity Supply Association of Australia (ESSA 1996) reported that performance improvements between 1988 and 1995 have led to a 30 per cent decline in utilities' operating costs. And, while some of the gains from reforms have been passed on to customers (in the form of lower prices), and some of the gains have been retained by the industry (improved cost recovery and debt reduction), the majority of the gains have gone to government in the form of higher dividend and tax payments.

Most firms in the aluminium industry reported that, to date, they have not benefited from electricity reforms because most are locked into long-term contracts and have not been able to take advantage of lower tariffs resulting from reforms. Comalco Smelting (Submission 4, p. 1), for example, observed that:

> A large proportion of the electricity consumed is purchased under long term contracts, the essence of which are expected to be maintained during the reform process.

In contrast, QAL indicated that it does expect to benefit from electricity reforms. QTSC (Queensland Transmission and Supply Corporation) has recently agreed to allow QAL to be released from its existing long-term supply agreement without incurring a penalty. The company expects to have reached agreement on revised electricity tariffs by the end of March 1998.

While Comalco, to date, has not benefited from lower tariffs, the reform to the electricity industry in Queensland has allowed Comalco to purchase the Gladstone power station. The benefits of owning its own power station include reduced sovereign risk and the ability to protect its investment in the Boyne Island smelter. Tayles (1995, p. 147) indicated that, if Comalco had been unable to purchase this station, it would not have proceeded with the expansion of the Boyne Island smelter.

Alcoa also raised the issue of sovereign risk in relation to the Victorian Government's recent efforts to renegotiate the Portland power contract. The contract runs until 2014 but, until recently, the Government had refused to permit incremental power to be provided to the smelter unless the contract for the additional power was renegotiated. As a result, the smelter has been operating at reduced capacity since 1994. An agreement, however, was reached in September 1997 to supply 100 megawatts of supplementary power to the smelter for a period of five years starting 1 January 1998. The deal, according to Stockdale (1997, p. 1) 'was commercially based, and did not expose the State to any additional financial obligations'. It is interesting to note that the contract is only for a period of five years — this may reflect the fact that it is no longer in firms' interest to negotiate long-term contracts given the more competitive electricity markets (and expectations of lower electricity prices over the next

few years). Some firms suggested that this was the case for their natural gas contracts.

Many of the aluminium firms, especially those involved in smelting, expressed some reservations about the future security of their long-term power contracts arising from the deregulation of the electricity markets in Australia. Tomago Aluminium, for example, said that changes to the corporate form of the NSW Electricity Commission have left it feeling less secure about its long-term electricity contract. Capral (Submission 2, p. 2) also said that electricity reforms in NSW, which have resulted in changes to the ownership of generating capacity, have meant that:

> The generating assets which feature in elements of our contract pricing have become divorced from the entity responsible for servicing the contract.

Most of the benefits from electricity reform are likely to affect the aluminium firms only as their contracts come up for renewal or as they negotiate terms for additional electricity. For example, Capral Aluminium's twenty year electricity contract with Delta Electricity is due to expire in 1999 and, according to the company, future investment and expansion plans will be dependent on the conditions of its new electricity contract.

### *Firms' views on the pace of electricity reform*

The majority of firms considered that electricity reforms were proceeding at a satisfactory pace, with only two firms believing the pace of reform to be too slow. A number commented on the importance of pushing ahead with the NEM. QAL, for example, expressed frustration with the pace of electricity reform in Queensland, particularly in relation to the state's link to the NEM. The company claims that, in order to achieve competitive electricity prices, action is required to accelerate the construction of the Queensland connection to the national grid. This is currently scheduled for an October 2001 completion.

Firms also expressed concerns about proposed greenhouse gas policies and the likely impact of these policies on electricity prices in Australia (see chapter 7 for a full discussion). Because Australia depends relatively heavily on coal for energy generation, the adoption of a carbon tax, for example, has the potential to increase the cost of electricity to aluminium smelters in Australia more than in countries that have greater access to hydroelectricity or nuclear power.

While the aluminium companies are locked into long-term contracts for the supply of power, they are not necessarily insulated from changes to government taxes as it is common for power contracts to have a provision for price adjustments relating to changes in government taxes and charges (although this is usually capped). In the light of proposed greenhouse policies, proceeding

with reforms that reduce the price of electricity becomes even more important as such changes will help to counter any increases in prices resulting from the adoption of some greenhouse policies.

Capral raised the issue of the NSW Government's $100 million levy on electricity distributors' charges for businesses and the impact that this will have on electricity prices and the competitiveness of smelters in NSW. The levy will increase the maximum price for distribution charges that can be levied on big contestable business users. Commenting on the levy, Capral (Submission 2, p. 2) said:

> These (electricity distribution charges) appear to totally negate the potential benefits of the reform process.

While the aluminium smelters in NSW have not been affected by the levy to date, the levy could have an impact on future contracts. The levy also may affect the competitiveness of the NSW smelters vis-a-vis smelters in the other states and internationally.

### *Scope for further reforms*

While electricity reforms have resulted in some benefits to users, there is considerable scope for further improvements in the efficiency of the Australian electricity supply industry. The first stage of the NEM, involving the harmonisation of the NSW, Victorian and ACT systems and provision for competitive interstate trade of electricity, commenced in May 1997. The full implementation of the NEM is scheduled to be completed by 2001. This will provide an impetus for further productivity improvements in the industry and lower electricity prices.

The Commission (IC 1991a, PC 1996b) has advocated structural separation of integrated electricity utilities as a way of increasing competitive pressure and improving efficiency. This should encompass separation of generation, transmission and distribution/retail activities and, wherever practical, the horizontal separation of generation and distribution/retail entities. It has recommended that each entity be corporatised and consideration given to privatising the corporatised entities (particularly generation entities). Significant progress has been made in this area. In Victoria, for example, electricity distribution, generation and transmission have been divided vertically into separate companies and distribution and generation have also been horizontally separated. Most of these businesses have now been sold. Similarly, in NSW, the transmission functions of Pacific Power have been separated from its generation utility which in turn has been horizontally restructured. NSW is considering the possibility of privatising its electricity supply industry along the lines of that pursued in Victoria.

Comalco Smelting stressed the importance of pushing ahead with electricity reforms in Australia because other countries also are reforming their electricity supply industries. In the United States, for example, Comalco indicated that restructuring has resulted in decreases in smelter electricity costs and an improvement in the competitiveness of US smelters. The Commission agrees that reforms must continue to take place if the Australian aluminium industry is to maintain its favourable cost position in the international market.

## 5.2 Natural gas

The alumina refineries (with the exception of Nabalco) are large users of natural gas. Alcoa, for example, is the largest single user of natural gas in Western Australia. In 1996, the Australian alumina refineries' natural gas bill was just over $350 million — around 14 per cent of total alumina refining production costs. The aluminium smelters also consume natural gas, although considerably less than the refineries — the smelters' natural gas bill was around $20 million (about 1 per cent of production costs) in 1996.

Natural gas prices were mentioned by a number of aluminium firms as impeding their competitiveness. Alcoa, for example, commented that Western Australian gas 'is not cheap by world standards', however, this partly reflects the fact that gas is transported more than 1500 kilometres from the North-West Shelf.

Within NSW, two companies provided comments on gas prices applying in the state prior to the recent finalisation of the third party access regime applying to AGL's gas distribution system. Tomago Aluminium commented that the 'cost of gas in NSW is a real handicap for the aluminium industry' and 'AGL's profits are derived from delivery charges which are some ten times what they should be'. According to Tomago Aluminium, it pays twice as much for gas as its competitors in Victoria and Queensland.

Capral told a similar story. It reported that natural gas prices in the Hunter Valley provide a pricing penalty on its smelter (estimated to be around 30-50 per cent) compared with the prices paid by smelters in the other states. Capral claims that 'AGL are well and truly exploiting their monopoly power'.

Both Tomago and Capral, however, are located at the periphery of the NSW gas network and, as such, they incur higher transport charges than customers in more central parts of the network (eg in Sydney).

The Independent Pricing and Regulatory Tribunal of New South Wales (IPART) acknowledges that prior to the new access and pricing arrangements for NSW there was a substantial over-recovery of costs for the contract

(industrial) market. However, in the Tribunals view, no substantial monopoly rents were being earned for the network as a whole. Hence, the over-recovery of costs for the contract market would appear to largely comprise a cross-subsidy between this market and the non-contract (ie tariff) market (IPART 1997). Under the new access undertaking, the cross-subsidy is to be reduced substantially over the next three years.

Comparisons of average Australian gas prices show considerable variation in industrial prices, with prices in NSW and Queensland typically being higher than in other states (AGA 1996). Variations in the performance of gas transmission and distribution systems, however, are partly influenced by external factors such as proximity to a gas basin, customer density and climatic conditions (BIE 1994a). In NSW, for example, there is a relatively low penetration of gas into households and a low per capita usage rate of gas by users.

AGL points out that the relatively higher industrial gas prices faced by the smelters in NSW (Capral and Tomago) can be partly explained by the fact that smelters in Victoria (Portland and Point Henry) are located closer to their supply of gas than those in NSW. The gas for the Victorian smelters is transported almost entirely through high pressure transmission pipelines, with very little use of local distribution networks. In consequence, supply charges in Victoria are lower.

Tomago Aluminium also indicated that prices in Australia are higher than those paid elsewhere in the world. It claims that recent benchmarking work by Pechiney (Pechiney has a 36 per cent interest in Tomago Aluminium), which compared the price of natural gas at its various plants, found that gas prices paid at its Australian smelter were around 60 per cent above the company's best observed gas price.

Also, benchmarking work by Capral (Submission 2, p. 2) suggests that it faces:

> ... a 50-80 per cent cost penalty in terms of US and Canadian smelters in this cost element.

At a more general level, international price comparisons show that natural gas prices in Australia compare favourably with those in most countries. Average industrial natural gas prices in Australia are less than those paid in Europe, New Zealand and Japan, but higher than those in the United States and Canada. Lower natural gas prices in the United States reflect, in part, the availability of interruptible supply contracts for industry and larger residential gas consumption per customer. Canada and the United States also have the advantage of a large interconnected system — the higher throughput provides scope for substantial economies of scale and better technical efficiency.

### *Natural gas reforms — any benefits to aluminium firms?*

Reforms to the natural gas industry since the early 1990s have been aimed at creating a more competitive industry by removing or lessening restrictions on competition and trade. Reforms have included:

- the removal of legislative and regulatory barriers to trade;
- the introduction of a uniform framework for third party access to gas transmission pipelines;
- structural separation or ring fencing of the natural monopoly elements in the gas industry;
- the reform of distribution franchise arrangements;
- reform of price controls in the industry; and
- the commercialisation of publicly owned gas utilities (Gas Reform Task Force 1996).

The Council of Australian Governments (COAG) in November 1997 signed a national Natural Gas Pipeline Access Agreement. The agreement establishes a uniform national framework for access to natural gas transmission pipelines both between and within jurisdictions. Under the new arrangements, any supplier, retailer or gas consumer will be able to contract with monopoly pipeline owners (on 'fair and reasonable terms') to transport gas across a pipeline (Parer 1997).[1]

In Western Australia, the introduction of open access provisions for large suppliers and users has meant that Alcoa now has a direct contract with the Joint Venture Partners (JVPs) in the North West Shelf Project. Previously Alcoa had a long-term contract with SECWA which, in turn, had a gas purchase contract with the JVPs. According to Alcoa, the open access provisions have resulted in an increase in competition with it receiving offers for the supply of gas from a number of suppliers. With the announcement of the expansion of its Wagerup refinery, Alcoa has recently agreed to a new gas supply agreement with NWS Gas — the agreement covers Alcoa's existing contract and a new 15 year contract. NWS Gas report that 'a lot of hard negotiation' was involved in coming to a new supply agreement and that it expects to face competition to win future contracts.

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[1] Pricing and access issues covering a number of infrastructure service industries are discussed in more detail in a BIE publication covering the results of an infrastructure pricing policy forum held in 1995 (BIE 1996e) and in a submission by the Industry Commission to the National Competition Council on the National Access Regime (IC 1997b).

Many of the other firms reported that, to date, they have not benefited from reforms because they are supplied gas under long-term contracts. In the more competitive gas market, however, there appears to be some move away from long-term contracts. Capral, for example, reported that AGL was trying to negotiate a five year contract with the company for the supply of gas to its Kurri Kurri smelter, but that 'with the increase in competition (in NSW) this is not in Kurri Kurri's interest'. Capral indicated that it is interested in negotiating a contract for natural gas that covers a much shorter period.

QAL was one company that reported lower gas prices resulting from the reforms. QAL (Submission 1, p. 5) stated that:

> In response to the National Competition Policy reforms which promoted the divestment of State owned monopoly infrastructure assets, the Queensland Government sold its interest in the State Gas Pipeline which runs from Wallumbilla to Gladstone to PGT [Pacific Gas Transmission] Australia Pty Ltd on 30 June 1996. QAL's gas transportation tariff immediately reduced by around 25 per cent and the tariff pricing principles provide for further incentive pricing as pipeline throughput increases.

QAL also anticipates further decreases in natural gas prices in Queensland following moves by the State Government to approve access arrangements along with licences to build pipelines that link the South West Queensland gas fields with existing markets in South East and Central Queensland.

While Comalco reported that its business to date has not benefited from natural gas reforms, the company expects that gas prices will fall in the longer term. Comalco commented that, in the expectation of lower gas prices, its Boyne Island smelter has converted its anode baking facilities (and other incidental facilities) from oil-fired processes to natural gas.

### *Firms' views on the pace of natural gas reforms*

Firms expressed more dissatisfaction with the pace of natural gas reforms than electricity reforms. Four firms considered natural gas reforms are proceeding too slowly, while one felt reform had slipped. Only two firms expressed satisfaction with the pace of reform.

Capral was critical of the pace of reform in NSW, claiming that it has been too slow in challenging the monopoly position of AGL. Capral's (Submission 2, p. 1) concerns are related to the third party access pricing arrangements applying in NSW:

> The industry reform coming from IPART's [Independent Pricing and Regulatory Tribunal of New South Wales] Draft Determination on Third Party Access to AGL Distribution System, and AGL's Proposed Access Undertaking has been a slow process, and essentially has done nothing in terms of smelter gas costs.

IPART acknowledges that getting the access regime in place in NSW has taken longer than anticipated (just under two years). However, the process involved extensive consultation within the industry and had to deal with a range of new and relatively complex issues. IPART makes the point that the other states have not made as much progress as NSW in opening up their gas markets to competition. Access arrangements for Victoria, for example, are unlikely to be approved before July 1998. And, while all of the NSW gas market will be open to competition by 1999, in Victoria and South Australia this will not occur until 2001 and in Western Australia not until 2002.

Capral (Submission 2, p. 1) also claims that the third party access regime actually disadvantages its smelter because of:

> ... its location in the Hunter Valley, and increases [in] the cost of the process, due to its approach to establishing 'decremental customers' status in future negotiation.
>
> The potential outcome is no cost reduction at the smelter level, while Australian competitors may receive benefits of Reference Price Tariffs due to physical location.

Capral does acknowledge, however, that 'there may be some benefits in terms of pricing to Sydney based downstream Capral operations'.

Under the access regime, prices have changed to reflect more closely system use of assets. The reference tariffs are determined by a customer's location on the system, and by the size and utilisation of the pipes serving the customer. Under this system, customers at the periphery of the network and/or mains with relatively few other customers face higher charges reflecting the inherently higher costs of supply relative to customers using core elements of the network on mains with high loads and usage factors.

IPART (1997) reports that the reference tariffs featured in AGL's Undertaking have resulted in distribution tariffs declining for the majority (around 90 per cent) of contract customers in NSW — average contract market transport prices are estimated to decline by around 60 per cent in real terms over the period 1995-96 to 1999-2000. However, price decreases vary between regions within the state — these variations reflect the assets required to serve each region. Average transport prices for Sydney customers, for example, are forecast to decline by around $1.52 per gigajoule over the same period, while for Newcastle customers average transport prices are expected to fall by around $0.35.

A small number of customers face increases in prices under the Undertaking. According to IPART (1997, p. 53):

> Any price increase to customers are due to the change in the pricing methodology from a commodity based price structure to a capacity based, asset related price structure.

The access undertaking also provides for a sizeable rebalancing of prices between the contract and non-contract (tariff) markets — contract market revenues are forecast to fall from $151 million in 1995-96 to $84 million in 1999-2000 — further adjustments beyond 1999 may also be required. IPART (1997, p. 24) reports that:

> Through the period to 1999/2000 the average price charged by AGL to industrial customers will be reduced dramatically, bringing AGL to a level which is within the range of charges in the USA. Even so, AGL's charges will still be at the upper end of this range.

The fall in contract market revenues is not to be fully offset by increasing charges within the tariff market. AGL is expected to pursue opportunities for growing the gas market and improving its operating costs in order to accommodate some of this adjustment.

IPART (1997) expects that a transition period of up to five years may be required to complete the rebalancing of charges between the tariff and contract segments of the market. It also suggests that further work will be required to determine an appropriate target range for transportation charges in the respective segments.

Capral contends that, because it has been made a decremental customer under the access undertaking (ie a customer whose existing negotiated price is lower than the applicable reference tariff), it will be disadvantaged relative to its competitor, Tomago Aluminium (not a decrement customer). It should be noted, however, that the reference tariff simply provides a basis for negotiation and arbitration for contract customers. Although suppliers will be required to pay the reference tariff for transport, customers retain the right to negotiate with suppliers for a price which is lower than the reference tariff. Moreover, negotiated prices are not specific to a particular supplier — users can, and should, reveal these prices to potential suppliers.

Both Capral and Tomago commented on the rate of return used to determine reference tariffs in NSW. The suggestion was that the pricing model developed by IPART is a profit-driven model rather than a cost of service model. However, the model underlying the setting of reference tariffs is based on the notion of efficient costs, inclusive of a return to system assets.

The model used to guide the setting of the reference tariffs is based on AGL's network earning a pre-tax nominal return of 13.5 per cent on the Depreciated Optimised Replacement Cost (DORC) of the assets used to service the contract

market. The Tribunal acknowledges that interest rates have fallen since the 13.5 per cent return was determined. It also questions the appropriateness of the DORC valuation technique, suggesting that the initial capital base of AGL's assets are around $250 million below DORC. As part of the scheduled 1999 review of the access undertaking, IPART will be considering the issues of valuing network assets and the level of sustainable revenues for future years.

Capral (Submission 2, p. 1) also expressed concerns about the treatment of past capital contributions claiming that:

> There are also outstanding issues in relation to the capital costs of the distribution system which may have already been met by major customers, but which will not be recognised in allaying future charges.

Capral reported that for ten years the company paid a capital contribution to cover the capital cost of its gas spur line. Under the access regime, however, these past payments are not recognised. Tomago had similar concerns relating to this issue, claiming that under the Undertaking no account has been made for users' past contributions to capital and that firms are required to 'pay again'. IPART is of the view that, because reference tariffs must relate to a service that will be sought by 'a significant part of the market', it is not appropriate that they reflect the circumstances of particular customers which have in the past made capital contributions. IPART also made the comment that customers which have made capital contributions may still negotiate prices and, if not satisfied, they can seek arbitration.

Tomago considers that AGL's Access Undertaking will not lead to a competitive natural gas market in NSW. The company claims that there is little incentive for alternative gas suppliers to enter the market because the high costs associated with the right to transport gas through the AGL system negate any competitive advantage the suppliers may have from buying cheaper gas. Because transport costs are the same for all suppliers, they can only compete with each other based on the price reductions they can realise in the competitive sectors of the gas supply chain (production and retail services). While a number of retailers have registered as authorised suppliers in NSW, to date only one supplier has been able to make a deal for the supply of gas. If competition is being restricted in the gas market in NSW it would appear that it is because retailers have been unable to purchase gas (ie an upstream problem).

Capral (Submission 2, p. 2) commented that the benefits from the reforms in NSW may become more evident as the access framework emerges:

> In terms of future impact of the natural gas reforms, we do not see great benefits at this stage. These may become clearer as the process continues and we see the framework emerge.

Tomago commented that AGL's reference tariffs continue to exceed the cost of service and that, under the access regime, customers in NSW will continue to pay the highest gas distribution charges in Australia. However, the rebalancing of prices between the tariff and contract segments of the market over the next few years should result in reference tariffs becoming more cost-reflective. Also, AGL's distribution network is considerably under-utilised, relative to other distribution networks in Australia, resulting in higher capital costs per unit of gas in NSW. Although better utilisation of the NSW system has occurred in recent years, this has not removed the advantages that other state systems enjoy due to factors such as a higher concentration of customers on their networks, proportionately larger customer demands and the benefits of additional compression or looping that considerably increases the capacity of a pipeline for a very small additional cost. In an attempt to improve the rate of utilisation of the distribution system in NSW, IPART has encouraged AGL to seek to grow the gas market in NSW.

QAL, while recognising the benefits from natural gas reforms, considered that the reforms had not gone far enough in terms of increasing competition within the Queensland market. QAL (Submission 1, p. 6) claims that:

> The establishment of a national network of interconnecting pipelines to allow access to multiple suppliers is required if true gas on gas competition is to be available in Central Queensland. The current pipeline network in Queensland only provides gas purchasers with access to markets that are dominated by a relatively small number of producers who control the majority share of the gas market in Queensland. Interconnecting pipelines from New South Wales, the Cooper Basin, Papua New Guinea, the Off-shore Northern Territory fields and North West Shelf gas fields would individually or collectively provide market competition.

Comalco, commenting on its proposal to build a new alumina refinery in either Queensland or Malaysia, indicated that one of the disadvantages of locating in Gladstone (Qld) was its inability to obtain competitively priced gas. The company is currently looking at the possibility of obtaining gas for the refinery from Papua New Guinea. If the proposed new gas pipeline from Papua New Guinea proceeds, it could be supplying gas to Queensland by 2001.

### *Scope for further reforms*

While reforms have led to improvements in the transmission and distribution of gas within Australia since the early 1990s, there is considerable scope for further improvements. The Commission (PC 1996b) observed that, for some time to come, Australia's gas markets are likely to consist of only a small number of businesses. As a result, measures to strengthen competition within the industry, such as the implementation of a national grid which connects the

markets, will be particularly important. Interbasin competition will be driven by pipeline developments designed to connect the Victorian reserves to the Sydney and/or Adelaide markets. In this context, the development of the Albury to Wagga link is likely to provide opportunities for greater competition within the natural gas market in NSW.

Access conditions and pricing arrangements will also play an important role in stimulating supply side competition. The National Gas Access Regime represents a major achievement in this regard. The next step involves each jurisdiction passing legislation to give effect to the national access code. Implementation of the national access regime will be progressive as each jurisdiction applies the Gas Pipelines Access Law (Gas Reform Implementation Group 1997).

To ensure non-discriminatory access and to realise the full benefits of competition, the Commission also supports further structural reform, including the full structural separation of transmission and distribution. If transmission and distribution businesses are separated, there is no scope for related businesses to gain preferential treatment vis-a-vis other market participants. Once vertical separation has been achieved, publicly owned gas distributors could be privatised.

A number of reforms aimed at further increasing competition in the market are already in progress. The Victorian Government has announced the restructuring of its gas transmission and distribution utilities in preparation for privatisation within the industry. The Western Australian Government has also recently sold the Dampier-Bunbury pipeline to Epic Energy Australia. The National Competition Council (1997) believes that the National Gas Access Regime will result in further structural reform, including ring-fencing between gas pipelines businesses and other business activities, such as retailing.

## 5.3 Coastal and trans-Tasman shipping

Bauxite and alumina together accounted for around 21 per cent (equivalent to 22.5 thousand million tonne-kilometres) of all coastal freight in Australia in 1994-95 (Department of Transport 1995). The efficiency of these services affects the international competitiveness of firms in the aluminium industry.

QAL (Submission 1, p. 8), for example, commented that:

> Waterfront and coastal shipping reforms are integral to improving QAL's international competitiveness in the world alumina markets, particularly as QAL's Gladstone refinery is located some 1200 nautical miles from the source of bauxite ore at Weipa. Coastal shipping is a major cost contributor to our total

> refining cost as we have to transport by sea 2 and a half tonnes of bauxite for each tonne of alumina produced at the refinery. After allowing for the conveyor transfer of alumina to the recently expanded Boyne Smelter facility, QAL transports over 72 per cent of its output by ship to Australian and overseas smelters.

Capral (Submission 2, p. 2) noted that coastal shipping costs:

> ... are significant in terms of the volume of alumina (290 000 tonnes p.a.) shipped into Newcastle from Gladstone.

Aluminium firms ranked coastal shipping reforms as the most important area of reform for the competitiveness of their businesses over the next 3-5 years (see chapter 4).

Coastal and trans-Tasman shipping are, in many instances, the only feasible means of transporting bauxite and alumina across long distances for further processing. (Comalco transports alumina to its Tiwai Point smelter in New Zealand.) And, while many of the aluminium firms own and operate and/or contract out the management of their own coastal trading vessels, they must comply with labour conditions and other standards prevailing in the Australian shipping industry.

A number of firms commented on the relatively high cost of coastal shipping in Australia. CRA, for example, indicated that, in some instances, raw materials can be transported to Australia from other countries more cheaply than is possible to ship them between Australian ports using Australia's coastal shipping services. CRA claims that (CRA Submission to IC Inquiry into the implications for Australia of firms locating offshore 1995, p. 18):

> ... in the establishment of any alumina plant at Weipa, the freight charges on coal from Queensland will be 50 per cent more expensive than if sourced from Indonesia.

The factors nominated by firms as contributing to the high cost of coastal shipping in Australia include:

- the restrictions applying to international flag vessels operating in Australia's coastal waters;
- high operating costs of Australian vessels; and
- fuel excise on fuel used by Australian vessels.

These factors, by inflating the cost of coastal shipping in Australia, reduce the international competitiveness of aluminium firms and influence the extent of processing in Australia. Freight rates between ore deposits and processing plants are often an important aspect of firms' decisions about whether to build or expand their operations in Australia or invest overseas.

### *Coastal and trans-Tasman shipping reforms — benefits to date*

In recognition of the poor performance of Australia's coastal and trans-Tasman shipping industry, since about the mid 1980s the Commonwealth Government has initiated a number of reforms. As observed by the BIE (1995a, p. 12):

> Reform initiatives from the mid 1980s to around 1993 have yielded substantial improvements, particularly in reducing crewing levels, improving crewing skills and flexibility and encouraging investment in technologically advanced vessels.

A number of firms acknowledged that shipping reforms have delivered benefits to the industry. Tomago Aluminium indicated that coastal shipping charges have improved over the period 1990 to 1996. Comalco Smelting also reported that 'Trans-Bass freight rates have fallen by around 20 per cent in real terms' over the past 10 years.

CRA Shipping commented that there have been some benefits from initiatives that increased the flexibility of licences for foreign vessels operating in Australia's coastal waters — occasionally empty coal carriers from Japan stop at Weipa to move bauxite down the coast. These reforms, however, were viewed as only freeing the coastal trade to a very limited extent.

Other firms, such as Capral, claim that the reforms have not been effective at all.

### *Firms' views on the pace of coastal shipping reforms*

Firms were generally dissatisfied with the pace of coastal shipping reforms in Australia — most viewed reforms as proceeding too slowly over the period 1990 to 1996, while one firm claimed they have been going backwards. Only two firms were satisfied with the pace of reforms. Most considered that Australia's coastal shipping industry continues to be uncompetitive and in need of further reform. Comalco Smelting (Submission 4, p. 2), for example, said that:

> The SIRA reforms were commendable but have a substantial distance to go to make Australian shipping internationally competitive.

### *Scope for further reforms*

Firms generally felt that shipping reforms have not adequately addressed the lack of competition in the industry. CRA Shipping said that the reforms to date have been 'clayton reforms', as they have not led to real competition.

The maintenance of cabotage was cited as the key reason for the lack of competition. Cabotage restricts foreign ships from competing with Australian vessels for work in the coastal trades. While foreign vessels can operate in

Australia's inter-state coastal trades, they can do so only under certain conditions — vessels must be licensed and conform with international standards relating to crewing, crew conditions and safety. Licences are subject to the condition that crews are paid Australian wage rates while engaged in coastal trade and the vessel must not be in receipt of any government subsidies. Alternatively, under certain restrictive conditions, international operators can obtain a single voyage permit, or multiple voyage permits, to carry cargo. In addition, the Union Accord between Australian and New Zealand unions, which restricts the involvement of foreign ships in transporting goods across the Tasman, has effectively closed the market to foreign ships.

CRA Shipping claims that the removal of cabotage would result in freight charges nearly halving.

Another area pinpointed by firms as being in need of further reform was labour productivity on Australian ships. While the crew to berth ratio on Australian ships has declined in recent years, at around 2.1 crew members per berth this ratio remains high by international standards and well above the target rates of 1.5 to 1.7. Generous leave provisions for crews is one of the key factors contributing to Australia's relatively high crew to berth ratio.

A recent study by the Shipping Reform Group (SRG) found that, while coastal shipping reforms have improved performance, further reforms are required if Australia is to be internationally competitive. The SRG (1997, p. 14) reported that:

> While previous reform succeeded in reducing operating costs, its focus was more on improving from what was a very high cost base position, rather than on driving towards internationally competitive cost structures. Therefore, despite this extensive period and program of reform, Australian costs remain uncompetitive by international standards and the Australian Flag's participation in international coastal trades has declined. Accordingly, targets set in any further reform program must be those which deliver international competitiveness because ultimately it is this benchmark which will determine the nature and extent of Australian flagged and crewed vessels' involvement in the nation's shipping task.

The study found that, on average, Australian ships cost about $2 million a year more to operate than similar vessels on international registers. Freight rates in Australia's coastal trade also were found to be up to 30 per cent more than international shipping. To address this situation, the SRG (1997, p. 1) recommended further reforms in three main areas including:

- significant labour market reform — involving initiatives aimed at reducing crewing costs on Australian ships (including moves towards company

employment and changed leave provisions and workers' compensation arrangements);

- exposure to competitive pressures via the winding back and ultimate removal of the current cabotage regime. This would involve removing the current licensing provisions, as well as the requirements for single and continuing voyage permits; and
- equity with foreign competition through the establishment of an Australian Second Register. The SRG recommended that the second register offer a set of fiscal arrangements (comparable to other OECD second registers) which could be accessed by the parts of the industry that embrace the reform measures and that are subject to international competition. Such measures would provide shipowners with the opportunity to reduce their costs and compete on more equitable terms with foreign competitors.

The implementation of the SRG's recommendations, particularly the removal of cabotage, would go a long way towards increasing the competitiveness of the Australian coastal shipping industry and reducing freight rates.

In response to the SRG's recommendations, in December 1997, the Government announced that it would cease to administer the Seaman's Engagement System — this will encourage a move away from pooled labour in the industry towards company-based employment arrangements. The Government also announced that the single and continuing permit systems (which allow foreign vessels to trade on the Australian coast), will be streamlined to generate greater flexibility in interstate coastal trade. Also, cabotage for vessels operating on the Christmas Island run and cruise vessels operating in Australia waters is to be removed (Reith 1997).

Further reforms are expected to be announced during 1998.

## 5.4 Waterfront

While the aluminium industry is a large user of ports, parts of the industry have been isolated from many of the problems associated with Australia's waterfront. This is because a number of firms own and operate their port facilities and staff them with their own labour. For example, in remote locations such as Weipa and Gove, Comalco and Nabalco have built their own port facilities. Alcoa and Worsley also have their own bulk handling facilities at the port of Bunbury. Other firms, such as Capral and Tomago, have their own port facilities for unloading alumina, but rely on publicly provided facilities (Newcastle port) for loading aluminium.

In general, the waterfront becomes more of a problem for the aluminium industry the more processed the ore becomes. This is because the more processed the ore, the more likely it is to be loaded at regular ports. Also, the further down the processing chain the ore goes, the more likely it is to pass through a number of ports. Bauxite from Weipa, for example, will be loaded at Weipa and sent to Gladstone for processing to alumina, and then shipped to either Newcastle or Tasmania to be processed into aluminium before being transported back through the port to be exported.

The cost and efficiency of waterfront services were identified by a number of firms as impeding their competitiveness. This reflects the exported-oriented nature of the industry and the gaps in performance between waterfront services in Australia compared with elsewhere in the world. The Australian Aluminium Council, for example, claims that break bulk rates in Australia are around four time those in New Zealand. Relatively low rates of physical productivity in handling cargoes, as well as poor reliability, were firms' key areas of concern in relation to waterfront services.

Concerns about the cost, efficiency and reliability of Australia's waterfront are widespread. Survey respondents to both the Agri-food and Automotive case studies (BIE 1996b,c) expressed similar concerns to the aluminium firms. A survey published by the Metal Trades Industry Association (MTIA 1996) also found that the most pressing problems on the waterfront identified by their member companies were: productivity (the time taken to process freight); reliability in delivery of freight; the cost of doing business; and industrial relations concerns.

These concerns are supported by the results from a number of analyses of the performance of the waterfront. The BIE (1995b), for example, found that while waterfront reforms have had some success with port authorities becoming more profitable and their charges falling during 1994 and 1995, there was also evidence of some backsliding. The study found that break bulk cargo charges were high by international standards. Australia's port-based bulk commodity terminals were found to be highly mechanised and efficient operations. The Bureau of Transport and Communications Economics (BTCE 1995) reported that stevedoring performance had declined to levels below that achieved in 1992. Two forthcoming studies from the Industry Commission on international benchmarking of the waterfront and work arrangements in the stevedoring sector also highlight continuing performance gaps (IC 1998a,b).

### *There have been gains from reform*

Over the past decade or so, the Commonwealth and State governments have undertaken an extensive program of waterfront reform (IC 1993, BIE 1995b

and IC 1998a,b). The reforms have covered two main areas — labour market reforms aimed at reducing costs and improving terminal productivity; and initiatives aimed at lifting the performance of government-owned port authorities, including commercialisation, corporatisation and privatisation of the authorities.

Reforms to the stevedoring sector were coordinated and monitored by the Waterfront Industry Reform Authority (WIRA) which operated between 1989 and 1992. At the conclusion of the program in October 1992, an industry-wide or pooled employment arrangement covering the sector had been replaced by enterprise employment arrangements. These reforms had some success. The BIE (1995b) reported that:

- the three year stevedoring WIRA program resulted in a 57 per cent reduction in the stevedoring workforce, and a 45 per cent reduction in ship turn-around time;
- towage reforms reduced crew sizes between 1989 and 1994 and realised annual savings of up to $480 000 per tug; and
- the financial performance of port authorities improved and their charges fell.

The BTCE (1995) estimated that waterfront reforms benefited shippers to the extent of about $276 million in 1993. Of this, about $267 million went to shippers of non-bulk cargoes and $9 million to shippers of bulk cargo.

Some of the aluminium firms agreed that there have been noticeable improvements in the performance of the waterfront over the period 1990 to 1996. QAL (Submission 1, p. 9), for example, observed that:

> ... corporatisation of the Port Authorities in Queensland was an important step towards achieving a commercial focus for this vital service sector.

Capral (Submission 2, p. 2) also stated that the reforms have led to lower ship unloading costs and higher labour productivity on the waterfront:

> The Waterfront Reform from the early 1990's has been used to advantage at our raw materials unloading facility (a joint venture with Tomago Aluminium Ltd.) as a continuation of 1985 arrangements where KBF commenced negotiation of our own manning arrangements with the unions. This action along with ongoing improvements in equipment performance have seen ship unloading costs fall from A$2.10/tonne to less than A$0.85/tonne in the period from 1985 to now, as tonnes discharged per man-hour have improved from about 30t/hr to 120t/hr.

However, while Capral (Submission 2, p. 2) reported improvements at its own raw material unloading facilities, the company claimed that the improvements have not flowed through to the publicly owned port facilities:

> This rate of improvement has not been matched on the waterfront generally, and there is obvious room for improvement on approximately 70 000 tonnes of smelter product exported annually.

Tomago told a similar story to Capral, claiming that productivity at its own unloading port facility has improved, but that productivity of port loading of aluminium (at the Port of Newcastle) remains low.

### *Firms' views on the pace of reforms and areas of continuing concern*

While firms indicated that waterfront reforms had resulted in some benefits, they also saw the need for further reforms as the performance of Australia's waterfront continues to lag well behind world best practice. The majority of firms reported dissatisfaction with the recent pace of waterfront reform.

Comalco Smelting (Submission 4, p. 2) commented that:

> The pace of waterfront reform has fallen very short of the mark due to the unwillingness of government to tackle the difficult issues relating to the union monopoly position.

Four of the firms said that the reforms were proceeding too slowly, while one firm considered they were going backwards. Three firms were satisfied with the pace of reform.

While firms generally supported moves by state governments to provide port authorities with a more commercial focus through commercialisation or corporatisation reforms, they considered that more of the gains from reforms should be passed on to customers in terms of lower port charges.

QAL (Submission 1, p. 9), commenting on the likely success of the corporatisation of port authorities in Queensland, said that:

> ... its ultimate success in finally delivering an internationally competitive service and costs will depend heavily on how the relevant corporatisation model is applied.

Firms' concerns about sharing in the benefits of reform centre around the valuation of port assets and the returns sought on these assets. On the valuation of port assets, QAL (Submission 1, p. 9) highlighted the need for an asset valuation model that provides for appropriate treatment for under-performing assets, land held for future use, assets funded by users and the valuation of channels and breakwaters. QAL also indicated the need for transparency in the setting of target rates of return.

Setting target rates of return is a complex task. Port authority assets, however, should be required to return at least their opportunity cost over their useful lives — that is, a return at least equivalent to the return which could be obtained from

their best alternative use. The Commission (IC 1993, pxx) recommended that in the application of this principle:

- underperforming assets should be written down if they have no better commercial use;
- the value of land held for future use should be excluded from the asset base used to determine the level of charges for current port users;
- when a port authority assumes ownership of assets explicitly funded initially by users, the value of those assets should be taken into the authority's balance sheet, but the credit given in exchange to users should also be properly accounted for; and
- long-lived non-depreciating assets such as channels should be valued at zero, but their capital cost should be recovered from users rather than the community at large.

Although the towage industry has undergone considerable reform in recent years, a number of firms identified continuing problems, attributing them to the lack of competition within the industry.

Capral (Submission 2, p. 3) expressed concerns about continuing overservicing by tugs, claiming that:

> There has been some flexibility afforded to operation of tug boats in the Port of Newcastle due to recent Enterprise Agreements, however the process of reform in Port Authorities has not extended to a complete rationalisation of numbers of tugs required based upon the docking capabilities of the vessels involved. This is an area where further reform could occur.

Past benchmarking work by the BIE (1995b) found that towage charges are generally higher at Australian ports than overseas. This reflects low tug utilisation and the use of more tugs per ship movement at some Australian ports. Measures aimed at creating a more contestable environment within the towage industry, including calling tenders for the provision of towage services, may provide one mechanism for improving performance in this area.

A number of firms cited the monopoly position held by the Maritime Union of Australia as being one of the main reasons for the continuing poor waterfront performance in Australia. The Commission's stocktake report (PC 1996b) found that waterfront performance largely reflects the poor industrial relations environment which has existed between Australia's two major stevedoring companies, P&O Ports and Patricks, and their operational employees — most of whom are members of the Maritime Union of Australia.

The new Workplace Relations Act, which ends compulsory unionism and allows for non-union individual contracts to be negotiated directly with

employees, should help to address some labour market concerns. However, improvements in the performance of Australia's waterfront will also depend on a number of other issues, including the scope to improve contestability in various areas such as stevedoring services and improving co-ordination between service providers covering the interfaces between the sea-based and land-based transport systems. These and other issues bearing on the performance of the waterfront are addressed in two forthcoming Commission studies on international benchmarking of the waterfront and work arrangements in stevedoring (IC 1998a,b).

## 5.5 Rail freight

Rail freight services are used quite extensively by the alumina refineries (with the exception of Nabalco). Alcoa, for example, accounts for around 20 per cent of Westrail's freight business. Production inputs, such as coal and caustic soda, are usually transported by rail to the refineries and a number of the refineries rail alumina to ports. The cost of rail freight services is therefore embedded in the cost of many of the refineries' major inputs, as well as in the cost of transporting the alumina to the smelters for further processing.

### *Rail reforms — have there been any benefits?*

Rail freight reforms initially focused on administrative changes such as improving management and work practices, reducing staff levels and replacing and upgrading obsolete equipment. In recent years, reforms have been influenced strongly by competition policy initiatives and have been extended to include:

- measures aimed at ensuring that rail systems operate on a commercial basis;
- increasing competitive pressures on service provision through the disciplines associated with competitive tendering;
- structural separation of rail network management from other business groups within some rail authorities;
- pricing reforms — such as reducing the extent of cross-subsidisation and eliminating monopoly pricing behaviour;
- allowing third party access to rail tracks; and
- eliminating regulations which unjustifiably restrict competition (eg regulations mandating carriage of some freight to rail).

Rail freight reforms have had some success. For instance, for most railways, freight rates fell in real terms over the period 1990 to 1996 (SCNPMGTE 1996, 1997). Rail freight rates charged by Westrail (used by Alcoa and Worsley) declined by around 35 per cent over the period, while freight rates charged by Queensland Rail (used by QAL) declined by around 11 per cent.

The reliability of Australia's rail network has also improved in recent years. In 1995-96, for example, 81 per cent of rail freight services ran on time (ie within 30 minutes of scheduled time) — this compares with an average of 63 per cent in 1991-92 (SCNPMGTE 1996, 1997).

### *Firms' views on the pace of reform*

The aluminium firms that use rail services were generally critical of the slow pace of rail freight reforms. QAL, for example, indicated that in Queensland there has been 'a lot of rhetoric but not a lot of action'. However, QAL (Submission 1, p. 7) indicated that:

> Queensland Rail has made some progress towards improving the efficiency of its operations in recent years and has partly addressed the issue of 'hidden royalties' which were embodied in the excessive rail freight rates for export and domestic customers.

QAL (Submission 1, p. 7) also commented on the significant gap that remains between the performance of Queensland Rail (QR) and world best practice:

> ... it [QR] still has a long way to go before it can claim it has an efficient operation that is offering world benchmark freight rates to its customers.

And (p. 8):

> Benchmark world freight rates for coal transportation on routes similar to the Moura-Gladstone line would be of the order of $4.00 per tonne. QAL's recently renegotiated freight contract with QR, which includes freight incentive provisions, is significantly higher than this benchmark rate.

Commenting on reforms in Western Australia, where regulations restricting the transport of bulk commodities to rail have been removed but little progress has been made towards introducing open access, the Chamber of Mines and Energy of Western Australia (Submission to IC Inquiry into the implications for Australia of firms locating offshore 1996, p. 5) claims that, while Westrail has undergone a number of major changes, it is still subject to only limited competition.

And, like QAL, the Chamber of Mines and Energy of Western Australia identified the need to continue reforms because, while Westrail's performance has improved in recent years, there continues to be a gap between its performance and world best practice.

The Chamber (Submission to IC inquiry into the implications for Australia of firms locating offshore 1996, p. 5) claims that:

> Westrail may be the best performing rail system in Australia but its operating costs would need to be reduced by 18 per cent to match world's best practice.

### *Scope for further reform*

The lack of competition and the limited accountability in the rail freight industry in the past has meant that Australian railways have had little incentive to match best international practices. Also, the monopoly power given to some rail authorities via legislation that restricted some bulk commodities to rail, meant that they could set freight rates well above costs. Reforms that increase competition, including allowing third party access to the rail tracks and the removal of regulations restricting competition, will increase pressures on rail authorities to improve their performance and should result in lower rail freight rates to users.

QAL spoke of the need for a competitive rail market in Queensland, indicating that this would require: clear guidelines for access to rail infrastructure; the early removal of the State Government exemption of five years on third party access contained in the Competition Policy Reform Act of 1995; a review of the current system of domestic coal royalties to ensure appropriate offsets are offered via lower rail freight rates; a review of the methods used by QR for asset valuation; and a review of the policy covering community service obligations (CSOs).

The Commission recommends that, when subjecting rail authorities and corporations to the Competition Principles Agreement, priority areas should include: achieving competitive neutrality; direct funding of CSOs; structural separation of track bed and rolling stock operations; and introducing effective access arrangements to the track bed (PC 1996b). The National Competition Council (NCC 1997) recommends the development of a national rail agreement between governments to further promote reform and to deal with impediments to competition in this area. The rigorous application of these reforms is particularly important in the area of coal freight where freight rates remain well above world benchmark rates.

## 5.6 Concluding comments

Infrastructure reforms have delivered some benefits to aluminium firms in Australia. In the area of energy, benefits to firms have been fairly limited, largely because of the existence of long-term contracts. However, the

aluminium firms are likely to benefit from reforms in this area as contracts come up for renewal or as they negotiate terms for additional energy.

While firms were generally satisfied with the pace of electricity reforms in Australia, the majority reported dissatisfaction with natural gas reforms claiming they were proceeding too slowly. Firms highlighted the need to accelerate development and operation of the gas and electricity grids and the associated access arrangements. Other countries are deregulating their energy markets, and Australia needs to push ahead with these reforms so that Australian alumina refineries and aluminium smelters can improve their competitive position.

In the transport sector, firms identified a number of areas where aspects of the performance of Australian coastal shipping, the waterfront and rail freight services are well below international best practice. While firms acknowledged that recent reforms have provided some benefits in terms of lower input costs and improved reliability of services, they highlighted the need for further reforms in areas such as the direct costing of CSO's, restructuring of charge regimes and the removal of impediments to competition.

The next chapter looks at industrial relations and workplace reforms and the impact they have had on the competitiveness of Australian aluminium firms.

# 6 LABOUR MARKET AND WORKPLACE REFORMS

*Labour market and workplace arrangements have a major impact on the competitiveness of firms in the aluminium industry. Labour market reforms since the late 1980s have allowed firms greater freedom to modify workplace arrangements. Firms reported that these reforms have had an important positive influence on plant productivity, work pattern flexibility and labour skill levels. Also, labour turnover, absenteeism and occupational, health and safety problems have been reduced. However, firms identified a number of regulatory factors which continue to impede the more flexible use of labour and impair competitiveness. Further reforms are required to simplify procedures and lessen legislative impediments to greater flexibility.*

*Despite some reforms since 1990, regulations pertaining to labour on-costs remain a significant impost on firms. Firms claim that some recent changes have had a negative impact on their competitiveness.*

Australian industries which have been exposed to strong competition tend to be characterised by better management practices and workplace arrangements than highly protected industries (see, for example, Ergas and Wright 1994 and BIE 1996b). The aluminium industry is a case in point. Faced with an increase in the level of global competition, firms within the industry in recent years have made a number of changes to their labour arrangements aimed at reducing costs and boosting productivity. This chapter examines the impact that labour market and workplace reforms and associated changes to labour management arrangements have had on firms in the aluminium industry. It also comments on the scope for further reform aimed at increasing workplace flexibility and productivity.

Section 6.1 briefly outlines some of the key characteristics of the industry's labour force. This is followed by a discussion of the impact of labour costs and arrangements on firms' competitiveness (section 6.2). Recent reform initiatives and the changes these have brought about in the industry are canvassed in section 6.3. This section also includes a discussion of the differing approaches to workplace reform adopted by firms within the industry. The extent to which these reforms have increased productivity and workplace flexibility is examined in section 6.4. Factors that continue to inhibit productivity improvements and workplace flexibility are examined in section 6.5. A brief examination of the

impact of labour on-costs on firms' competitiveness is presented in section 6.6. Concluding comments are presented in section 6.7.

## 6.1 Key characteristics of the aluminium industry's workforce

In 1996, a total of 13 521 people were employed by the aluminium industry in its core business activities — 60 per cent in bauxite mines and alumina refineries and 40 per cent in aluminium smelters (table 6.1). The number of people employed in the industry has been declining — over the period 1990 to 1996 employment fell by around 13 per cent (almost 2000 employees). The mining/refining and smelting stages contributed to this reduction in roughly equal shares, but the proportional fall in smelting employment was greater (15 per cent compared with 11 per cent for mining/refining).

In 1996, three-quarters of those employed in the industry were production employees, with administrative/senior management employees accounting for another 15 per cent. Contract labour employed in core business activities, such as maintenance, residue disposal and rehabilitation, accounted for a relatively constant 10 per cent share of the workforce in each of the years surveyed.

### *Wages and salaries*

The aluminium industry is a relatively high-wage industry — a characteristic it shares with a number of Australia's other capital-intensive resource-based industries with high export propensities. Total wages and salaries per person for the alumina refining and aluminium smelting industries combined was $45 900 in 1995-96 — this compares with $32 600 for workers in the manufacturing sector overall (table 6.1).

Nevertheless, wages have been rising more slowly in recent years in the manufacturing side of the aluminium industry. In the six years to 1995-96, wages and salaries per person employed increased by only 14.2 per cent (in nominal terms) for the alumina and aluminium industries combined. This was around two-thirds of the average increase for the manufacturing sector overall. In contrast, wages paid to bauxite employees increased at roughly the same rate as those for the mining sector.

In recent years, the level of remuneration has been higher at the earlier stages of production. For example, in 1995-96, wages and salaries per person employed in the alumina industry were around 20 per cent above those in the aluminium smelting industry. Although information for bauxite mining is not available for the same year, data for 1994-95 reveal that average wages and salaries in the industry were 5 per cent higher than those in the alumina refining industry.

Wage increases for bauxite and alumina workers have also been larger than those for workers involved in aluminium smelting over the period 1990 to 1996. There was also considerable variability in the level of remuneration provided by the different firms in the industry. For example, in 1996, wages and salaries earned by production employees (on an hours worked basis) typically varied by up to 10 per cent around the mean for the industry.

Table 6.1 Labour usage in the Australian aluminium industry

| | *1990* | *1993* | *1996* |
|---|---|---|---|
| *Employment level (No.)* | | | |
| Mines/refineries | 9 215 | 8 700 | 8 175 |
| Smelters | 6 258 | 5 697 | 5 346 |
| **Total** | **15 473** | **14 397** | **13 521** |
| *Employment type (% of total)* | | | |
| Admin/senior management | 17.1 | 16.5 | 15.0 |
| Production employees | 72.9 | 73.7 | 75.1 |
| Contractors[a] | 10.0 | 9.8 | 9.9 |
| *Wages and salaries ($ '000 per employee per year)* [b] | | | |
| Bauxite mining | 37.2 | 45.2 | 53.6 |
| Alumina refining | 40.2 | 47.5 | 50.0 |
| Aluminium smelting | 40.2 | 43.1 | 41.2 |
| *Unionisation* | | | |
| % of industry workforce unionised[c] | 70.2 | 68.7 | 52.7 |
| Average number of unions on site[d] | 4.6 | 3.9 | 3.8 |

**a** These figures exclude contractors engaged in major construction projects**b** Wages and salaries data were obtained from ABS. Other labour data presented in the table were derived from the Aluminium industry survey 1997. The data relate to financial years 1989-90, 1992-93 and 1995-96, respectively, with the exception of the final bauxite mining figure, which relates to 1994-95. ABS 1995-96 mining census data were not available at the time of printing. **c** Weighted average based on estimates of plant unionisation rates provided by firms**d** Simple average.

Sources: Aluminium industry survey 1997 and ABS Cat. Nos 8221.0 and 8414.0 (various years).

### *Unionisation*

The Australian aluminium industry, in common with most other large-scale manufacturing and mining industries, is characterised by a relatively high degree of unionisation of its workforce. In 1996, around half of the workforce was unionised. This was almost double the unionisation rate for the private sector as a whole (ABS 1997a). Unionisation rates have fallen sharply in recent years — down from over 70 per cent in 1990.

The decline in unionisation at the industry level, however, masks considerable variability at the establishment level. At Worsley's refinery in Western Australia, for example, the workforce was fully unionised in 1993, but by 1996

this had fallen to around 1 per cent. (This corresponded with a move to staff contracts in 1994.) Comalco also registered large declines in unionisation rates for all its operations over the period — again this decline coincided with a switch to staff contracts. In contrast, other operations saw their unionisation rates increase slightly — at Capral's Kurri Kurri smelter, for example, unionisation increased from 71 per cent in 1990 to 76 per cent in 1996. This result, however, reflects a greater reduction in staff numbers than production employees over the period.

Following a number of union amalgamations and rationalisations, the number of unions on site has fallen in recent years, down from an average of 4.6 in 1990 to 3.8 in 1996 (table 6.1). In 1996, three unions — the Australian Workers' Union (AWU), the Australian Manufacturers' Workers' Union (AMWU) and the Communications, Electrical, Electronic, Energy, Information, Postal, Plumbing and Allied Services Union of Australia (CEPU) — accounted for roughly 90 per cent of union members in the industry.

## 6.2 Labour — its impact on firms' competitiveness

Labour costs are a significant cost in the process of producing alumina and aluminium and, hence, bear on firms' competitiveness. Direct labour costs (comprising wages and labour on-costs) account for around 17 per cent of bauxite mining/alumina refining costs and 12 per cent of aluminium smelting production costs (see figures 2.6 and 2.7 in chapter 2).

For a capital-intensive industry like the aluminium industry, it is not only direct labour costs that affect firms' competitiveness, but also the effectiveness with which labour is combined with other inputs in the production process. For example, it is important to have flexible working arrangements that allow equipment to be used intensively (eg continuous shifts).

Faced with an increase in the level of global competition in recent years, firms in the aluminium industry have increasingly focused attention on improving workplace flexibility and making better use of their employees. Comalco (1994, p. 18), for example, stated that:

> To be successful in the fiercely competitive international markets in which Comalco competes, the company must make sure that its people and their talents, like its other resources, are used to best effect.

Similarly, Tomago Aluminium (1996b, p. 12) observed that:

> Things are getting tougher for industries worldwide. Everyone realises that to remain competitive they must build good relations with their people. Especially in smelters where the technology is ageing, it is vital that all employees have an opportunity to contribute to improving processes.

Labour market reforms that increase the flexibility of the industrial relations system have the potential to facilitate improvements in both labour and capital productivity and, hence, returns on investments. Firms' responses to our survey indicate that, since 1990, labour market policies have been the area of microeconomic reform having the most positive impact on their competitiveness. Firms also nominated these policies as the factor (subject to government control) that is likely to have the most positive impact on investments in the industry over the next 3-5 years (see chapter 4).

The influence of labour market arrangements on investment in the industry was recently demonstrated when Worsley Alumina held off plans for a $800 million expansion of its refining facilities until it was able to seal an industrial relations agreement with the WA Trades and Labour Council, various unions and contractors (see box 6.1 for more details).

### Box 6.1 The impact of labour arrangements on Worsley's decision to expand its refining facilities

In early 1997 it appeared that Worsley Alumina was going to shelve its plans for a $800 million expansion of its refining facilities in Western Australia. The reason — continuing industrial relations problems with construction contractors. In late 1996, Worsley sacked around 65 contractors and scrapped a $10 million small-scale expansion project which had been dogged by industrial disputes over travel and site allowances. According to Worsley's human resource manager, 'such problems made it difficult for the company to convince overseas investors to sink up to $800 million in the main project'.

What convinced the company's investors to give the major expansion the green light was a pre-construction agreement that Worsley was able to negotiate with the intended construction managers (Kaiser Bechtel Joint Ventures), the WA Trades and Labour Council and the construction unions.

The Project Partnership Agreement sets out project salaries for contractors (based on a 50 hour week, covering base salary rates and *all* allowances) for the life of the project. Under the agreement, industrial action is prohibited for the term of the project. Worsley's General Manager believes that the industrial agreement is a 'win-win' and that 'it will serve as a blueprint for future large construction projects in WA'.

Sources: Dixon (1997), MacDonald (1997) and Worsley (1997).

Comalco also indicated that the productivity improvements associated with the move to staff contracts at its Tiwai Point smelter in New Zealand was one of the key factors influencing its decision to invest around NZ$ 400 million in 1994 to upgrade and expand the twenty year old plant. In discussing this investment in its 1995 Annual Report, Comalco (1995, p. 29) observed that:

> The improvements in productivity and performance since the 1991 change to a single status, all staff contract workforce continued. This was an important factor in justifying the large investment to upgrade the smelter. These improvements have enhanced the competitiveness of the smelter and put it ahead of many others of similar age, as well as newer smelters.

## 6.3 Industrial relations in the aluminium industry

Until quite recently, firms have had limited ability to negotiate pay and work conditions directly with their employees. CRA (Submission to IC inquiry into the implications for Australia of firms locating offshore, 1995, pp. 18-19), for example, claimed that:

> Institutional arrangements (partly award and union structures) have restricted the capacity of business, unions and tribunals to bring about changes in work practices at a pace sufficient to cope with the demands of the international market place.

This reflects the fact that Australian governments historically have exerted considerable influence over the pay and conditions of employees. This influence was driven by the Constitution which empowered the Commonwealth Government to legislate for the prevention and settlement of industrial disputes extending beyond the borders of one state. State governments traditionally have followed the Commonwealth's example and legislated for the prevention and settlement of disputes within their borders. An informal system has always operated in parallel with this formal system whereby employers, unions and employees have negotiated and resolved disputes without the intervention of any industrial tribunals. Nonetheless, Australia's wages system, until quite recently, has centred around the decisions or 'awards' made by industrial tribunals. As a result of their quasi-legal status, awards tended to become entrenched and were amenable to change only through some form of disputation (BIE 1996a).

### 6.3.1 Recent reform initiatives

By the late 1980s, there was a degree of consensus among governments, industry and the unions of the need for a more flexible and decentralised industrial relations system. Since then, a number of labour market and workplace reforms have reduced the degree of centralisation of Australia's industrial relations system. Reform initiatives have included award restructuring, union amalgamations, union-negotiated Certified Agreements, Enterprise Flexibility Agreements (EFAs), and a shift towards closer employer-worker relations and award simplification under the aegis of the *Workplace Relations Act 1996* (see box 6.2 for further details).

Running parallel with this process were a number of state and territory initiatives also designed to improve labour market flexibility. These included the *Employee Relations Act 1992* in Victoria, the *Workplace Agreements Act 1993-94* in Western Australia and the *Industrial and Employees Relations Act 1994* in South Australia. In 1997, a number of states took steps towards harmonising their industrial relations legislation with that of the Commonwealth. Victoria referred its industrial relations powers to the Commonwealth Government, thereby creating a single industrial relations system in the State. In March 1997, Queensland passed legislation which allows individual or collective agreements to be negotiated at the workplace level. And, in Western Australia, reforms have modified dispute resolution procedures, unfair dismissal laws and the rights of unions to become involved in workplace disputes (IC 1997c).

Governments' also have been active in implementing reforms covering other aspects of the labour market such as:

- occupational health and safety and workers' compensation arrangements. All Australian governments have gone some way towards reforming their occupational health and safety legislation and regulations governing workers' compensation and rehabilitation; and
- training/ skill enhancing. A number of training policies and institutions have developed under the Training Reform Agenda. Priority areas have included: developing a national system (rather than separate state systems) of vocational education and training; introducing competency-based training, national competency standards and a national curriculum; developing a more diverse and competitive training market; and implementing measures to promote access and equity (PC 1996b).

## Box 6.2 Recent changes to Australia's industrial relations system

- Award restructuring commenced in 1988-89 and resulted in the modernisation of classification structures (away from crafts and occupations and towards enterprises and industries), the introduction of multi-skilling, the adjustment of pay relativities between awards and the more flexible application of key award provisions covering hours of work, shift work, meal breaks, annual leave and annual close-down arrangements.
- Fixed term Certified Agreements (CAs) were introduced as part of the reforms embodied in the *Industrial Relations Act 1988*. These provided enterprises and workers with the capacity to negotiate a somewhat wider range of terms and conditions of employment. CAs were confined, however, to unionised enterprises and heavily constrained by a 'public interest' test.
- Union amalgamations were facilitated by the Commonwealth's 1990 amendments to the *Industrial Relations Act 1988*, which raised the minimum membership level for unions. Unions also received financial assistance to progress the costly transition to amalgamation. These steps aided a move away from craft and occupation-based unions to enterprise and industry-based unions.
- The scope for enterprise bargaining was extended by the *Industrial Relations Reform Act 1993* which came into force in March 1994. The Act introduced Enterprise Flexibility Agreements (EFAs). EFAs allowed workplace agreements to be negotiated in non-unionised workplaces. EFAs did not require that unions be parties to agreements, but unions could challenge their ratification in certain circumstances. Moreover, EFAs were subject to AIRC deliberation as to whether the terms and conditions of the agreement disadvantaged employees relative to the relevant award.
- The *Workplace Relations Act 1996* makes provision for the simplification of awards to provide a safety net of minimum wages and conditions. (The Act sets out 20 allowable award matters covering pay, leave and other key conditions.) The Act facilitates agreement making by providing employers and employees the choice of informal over-award arrangements, formalised individual agreements (Australian Workplace Agreements) or formalised collective agreements (Certified Agreements). All formal agreements must meet the no-disadvantage test relating to relevant award conditions. CAs are to be certified by the AIRC, while AWAs must be approved by the (newly formed) Employment Advocate. The Act also removes paid-rates awards as well as monopoly and compulsory membership of industrial organisations. The power of the AIRC to direct that industrial action stop or not occur is also strengthened.

Sources: PC (1996a,b), BIE (1996a) and DIR (1997).

### 6.3.2 Implementation of workplace changes in response to reforms

According to firms in the aluminium industry, industrial relations reforms over the last decade have facilitated significant changes to their workplaces. Firms viewed the reforms as being effective in removing some of the rigidities that in the past impeded workplace efficiency.

Comalco's Chief Executive (Stump 1992, cited in Ludeke 1996, p. 127), for example, said that:

> Many sacred cows are being challenged; job demarcations, compulsory unionism, traditional time-served based and narrowly defined apprenticeship systems, and bargaining structures are just a few. If you step back from these developments and look for the thread running through them, all the changes are directed at giving people more choice, the opportunity to use their discretion and to removing impediments that are preventing them from working at their highest level of competence.

Our survey results confirm that firms have responded to the reforms by implementing a number of key changes to their labour and management arrangements. The approach adopted by firms to implementing workplace changes, however, has varied. Most have adopted an approach of working with the unions and negotiating agreements on a collective basis to effect improvements to their operations. Comalco and Worsley, on the other hand, have opted for the introduction of individual contracts for most or all employees. Box 6.3 examines the different approaches adopted by firms to reforming labour market arrangements.

Some of the key changes are briefly discussed below and summarised in figure 6.1.

#### *Award restructuring*

All operations in the industry covered by our survey reported implementing award restructuring. Some firms spoke about the increased workforce flexibility and efficiency achieved from restructured awards via revised job classifications, the introduction of improved career paths/multiskilling and better work organisation. Worsley, for example, reported that award restructuring enabled the company to make a number of workplace changes such as: restructuring of job classification levels; a review of in-house training criteria for promotion through levels; the removal of a range of allowances such as higher duties for working at certain heights, in confined spaces, etc; and the removal of payment for length of service.

## Box 6.3 Firms' different approaches to workplace reform

*Negotiating agreements on a collective basis*

Alcoa, Nabalco, QAL (with some exceptions), Capral and Tomago Aluminium all have adopted the approach of working with the unions to develop collective workplace agreements as a way of achieving desired workplace reforms. These companies have sought to develop business partnerships with the unions and the employees represented by them whereby employees share a genuine commitment to the company's goals and objectives and accept responsibility for helping to achieve them. QAL, for example, commented that 'the company's approach to industrial relations is founded on a basic premise: management, unions and employees believe they can achieve their major objectives more effectively with the support or consent of the other parties. This means that industrial relations management is built on trust, employee participation and leadership'.

A common view of the firms which have adopted this approach is that its success relies on recognition by all parties of the mutual benefits that flow from continuous improvement. Having said that, some firms indicated that removing the 'them and us' mentality and achieving a culture whereby unions and employees are pursuing the same goals as management is by no means an easy task. One way in which firms have sought to convince unions and employees of the need for a changed work environment is by highlighting the importance of being competitive, building an identity of interest in the need for competitiveness (and the associated benefits) and an enhanced understanding of the main areas in which performance must be improved to promote competitiveness.

Firms which have gone down the route of working with unions generally agreed that collective enterprise agreements have been particularly useful for introducing cultural changes in the workplace and improving flexibility and productivity. Tomago, for example, believes that its EAs have provided a framework for developing a Best Practice Culture within its smelter and that 'unions and delegates have now got a great sense of ownership - not only of the process but also the results it will achieve' (Goldstiver, B. Industrial Relations Manager, Tomago Aluminium cited in IRM 1996, p. 13).

Firms also spoke about creating more co-operative workplaces by moving to more flexible management styles which rely on self managed/multi-disciplined teams, and measures which encourage continuous improvement among the workforce (including bonus systems).

*Staff contracts*

Both Worsley Alumina and Comalco have introduced staff contracts for their employees. In the case of Worsley, staff contracts eventuated as part of the gradual shift in culture away from a traditional industrial relations framework towards a more team-based framework emphasising devolution of responsibility. Management at Worsley was impressed with the way its staff worked and wanted to create a similar environment and incentive structure for its production employees.

## Box 6.3 Firms' different approaches to workplace reform (cont'd)

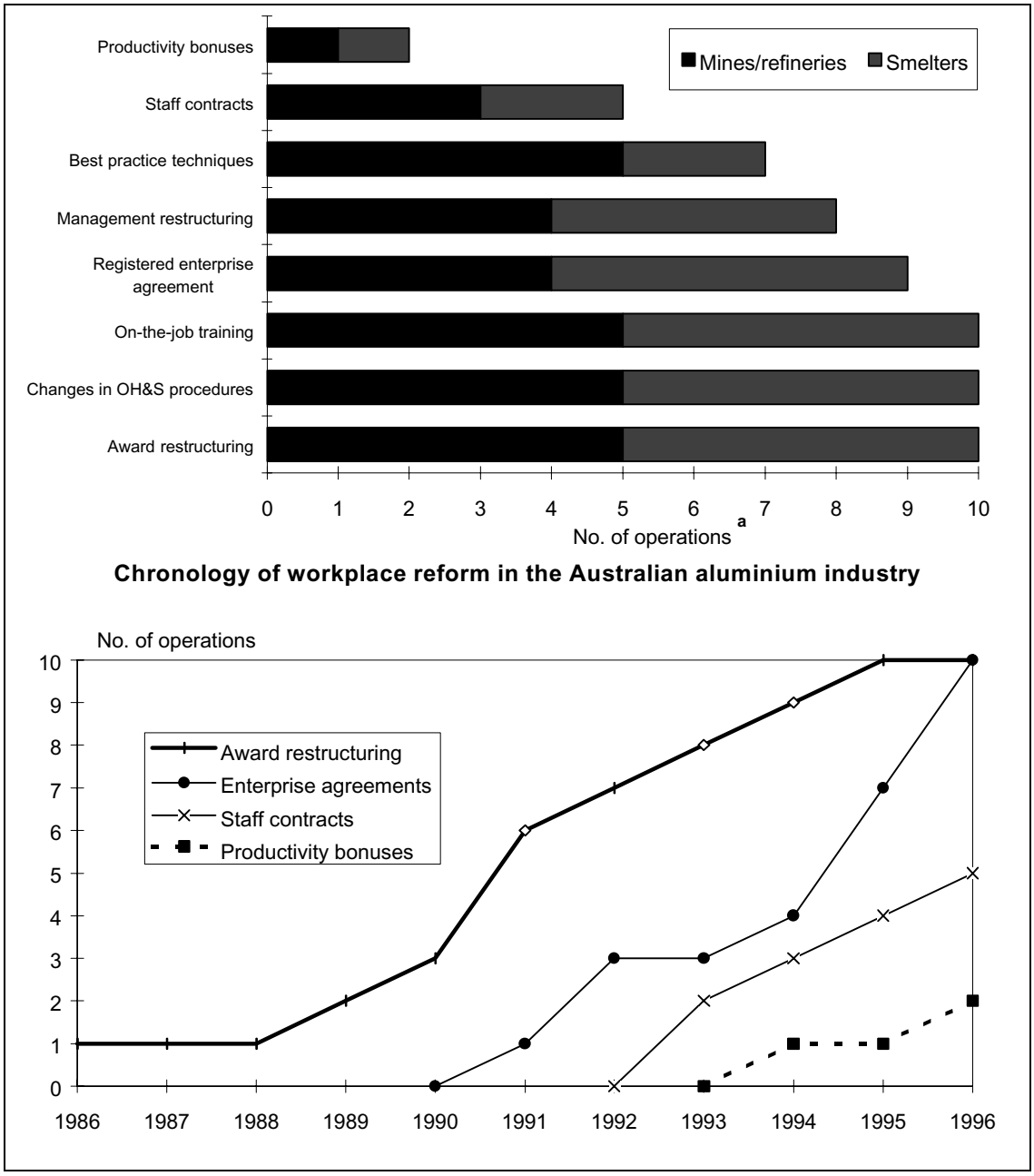
Enterprise agreements were used in the first instance as a step towards creating 'one class of employees'. The company's 1992-93, agreement, for example, contained provisions such as average pay, annual shift allowances and commitments by employees to productivity targets and performance appraisal systems. Then, in 1994, the company offered employees a choice of enterprise agreement coverage or individual contracts for all employees. The 1994 enterprise agreement contained a number of rather innovative provisions, including: an escape clause under which employees could opt-out into individual contracts; a remuneration system which was based on yearly individual assessments; and a provision for no industrial action. The individual contracts offered to employees contained similar conditions as the EA, with the exception of additional superannuation contributions and private health care benefits. Not surprisingly, the majority of employees opted for individual contracts.

Comalco's decision to offer staff contracts to employees reflected a long history by the company of seeking to build competitive advantage from its people and to make labour relations as flexible as possible. Back in the late 1970s, CRA management found that it was frequently falling into conflict with its workforce. The CEO at the time — Sir Roderick Carnegie — looked to work by Elliot Jacques and Ian MacDonald on the theory of the organisation of work and told his senior managers that (cited in Ludeke 1996, p. 8): '... CRA's competitiveness, internationally and domestically, will be assured if we organise and manage in a way that encourages and allows each person in the Group to give of his or her best.' He saw the need to become '... a relatively decentralised organisation in which individuals are expected to take personal initiative to contribute to our total progress'. Other factors influencing management's decision to go down the route of staff contracts were: the company's positive experience working with staff (for example, during industrial disputes management found that staff could step in and run the smelters more efficiently and with considerably fewer people than it normally took to run the operations); and the outstanding improvements in productivity at the New Zealand Tiwai Point smelter following the introduction of staff contracts. (This provided confirmation to the company that this approach worked.)

In the early 1990s, Comalco proceeded to offer staff employment contracts to its employees at Bell Bay, Weipa and Boyne Island. At both Bell Bay and Boyne Island, staff contracts for employees were achieved via the implementation of an Enterprise Flexibility Agreement (containing an opt-out clause that allowed employees to move to staff contracts). For Comalco's Weipa operations, the AIRC delivered a decision whereby the company was required to give award employees the same pay and conditions as those applying to staff (provided that they accepted the more flexible work practices of staff).

Sources: IC interviews with firms, IRM (1996) and Ludeke (1996).

Figure 6.1 Aluminium industry implementation rates for recent workplace reforms




**a** Most firms provided a single response. The exceptions were Alcoa (which provided one response for its mining/refining operations and one for its smelting operations) and Comalco (which provided one response for its Weipa mine and one response for each of its two Australian smelting operations).
Source: Aluminium industry survey 1997.

Other firms claimed that the benefits from award restructuring were fairly limited. For example, following the AIRC handing down the National Wage Case decision allowing wage increases based on award restructuring in 1989, Comalco introduced a Job Redesign scheme at its Weipa mine. Under the scheme, wage increases were provided to employees following assurances by the unions to a commitment to change, including measures aimed at improving flexibility and efficiency and removing impediments to multiskilling. The scheme, however, resulted in only 'meagre' returns and according to Ludeke (1996, p. 74):

> There were few tangible improvements of the type contemplated by the Commission and eventually, the wage increases were '... written off to experience.'

### *Enterprise agreements*

Enterprise agreements are also widespread in the industry — all operations, with the exception of Comalco's Weipa bauxite mine, have negotiated some form of an enterprise agreement with their employees. Some firms, such as Alcoa, have implemented certified agreements while others, such as Comalco (Bell Bay and Boyne Island), have implemented EFAs.

While there are some variations in the content and timing of these agreements, some common innovations and benefits negotiated as part of them include:

- annualised salaries (eg eliminating overtime, penalty rates);
- twelve hour shifts (box 6.4);
- elimination of rostered days off;
- changed leave conditions, such as unlimited sick leave, more favourable superannuation;
- continuous production clauses (industrial action prohibited);
- detailed targets for efficiency improvements and performance-based pay; and
- elimination of restrictive work practices, reduced demarcation and greater emphasis on team work.

Firms' views on the success of these agreements were mixed. Some firms reported improvements in workplace efficiency, including greater flexibility in skills usage, better use of available worktime (including shift work and overtime arrangements) and the removal of demarcation. Tomago Aluminium, for example, reported that it no longer has the demarcation problems that it had in the past. Management at Tomago commented that, with employees focusing more on ways to reduce the cost of producing a tonne of aluminium, employees

had in some instances suggested to management that they employ contractors for trades work. This, according to management, represents a very different situation from that of the past.

QAL also reported that the elimination of restrictive work practices has meant that tradespersons now operate mobile equipment for bauxite recovery, thus eliminating the need for overtime or contractors.

### Box 6.4 Twelve hours shifts — the way to go?

All firms in the aluminium industry have introduced 12 hour shifts at their operations over the past few years. Firms noted that some of the benefits of these shifts are reduced overtime payments and the elimination of weekend penalty rates. Twelve hour shifts are particularly beneficial for the smelters as they minimise the number of disruptions to the pots (ie twice a day instead of three times a day). This can have a significant positive influence on plant productivity. Employees also like 12 hour shifts — they don't have to go to work so often and so have bigger blocks of leisure time. In a single year, employees working 12 hour shifts can end up with 20-30 days extra leave.

Twelve hour shifts, however, are not problem-free. One firm reported that weekend absenteeism at its plant had increased following the introduction of these shifts. Because employees are not paid penalty rates at the weekend under the new shift arrangements, there is less incentive to show up. The same company also has noticed an increase in absenteeism on specific shifts, notably when employees are rostered on for only 2 twelve hour shifts in a week. Because the company's EA states that employees can take 2 days off on sick leave without a certificate, employees appear to be taking sick leave on the weeks where they have only 2 shifts so that they can have seven days leave.

Source: IC interviews with firms.

Alcoa's then Managing Director (Slagle 1994, p. 14), commenting on improvements resulting from its agreements indicated that:

> Most of our production employees, for example, now work within much the same set of conditions as staff. Their wages have been annualised: that means that their pay packet remains the same throughout the year, and that it reflects the amount of work they need to do to get the job done. There is a strong incentive to do the job right the first time, because otherwise overtime — which is no longer separately rewarded — will be required to rework the job a second or third time.

Other firms spoke about some of the costs associated with enterprise agreements. One firm reported that, as part of its agreement, it had agreed to an up-front increase in wages for promised improvements in productivity. But, because the productivity improvements have been less than anticipated, the agreement meant that the firm is around $130 000 a month worse off.

Nabalco commented on the large amounts of management time that are devoted to the process of developing agreements and some of the problems associated with dealing with multiple unions. Commenting on some of the costs associated with the process of negotiating EAs, Nabalco (Submission 6, p. 3) said:

> Both agreements [1995 and 1997 Agreements] were probably negotiated over a similar period of time, ie about twelve months. The 1997 Agreement required a significant amount of management time however this was due to:
>
> a) a highly consultative process being used which sought to not only settle a certified agreement in terms of percentage wage increases but secure real agreement to organisational changes; and
>
> b) involvement of 5 unions rather than one. Even a small union with few members can cause significant delays to the process.

Nabalco, however, expects that future negotiations will be 'less arduous' as a result of the company establishing greater trust with its workforce and developing an environment which encourages continuous improvement.

Firms commented that negotiating and implementing enterprise agreements is very much a learning-by-doing exercise. Although in most instances enterprise agreements led to positive outcomes, firms believed that more recent agreements have been (or are likely to be) more successful than earlier ones. Original agreements were viewed as being very much the 'first step' towards changing workplace practices and culture.

Capral, for example, commented that it is 'trying to do everything different' the second time around. According to the company, effective communication between management and employees is one of the key elements of successful enterprise agreements. The company is currently negotiating its second agreement and has allocated considerably more resources this time to make the process more interactive. Capral also believes that there needs to be commitment by both employees and management to an agreement if it is to succeed. The company's first enterprise agreement was implemented with support from 55 per cent of its employees but, according to the company, this was not enough to ensure its success. For the second agreement, the company's goal is to gain the support of around 80 per cent of employees.

### *Bonus systems*

Three firms reported that they had introduced bonus systems as part of their enterprise agreements. Tomago and Nabalco, for example, have bonus systems which are linked to critical performance indicators.

Again, firms reported mixed results. Nabalco commented that most of the targets set out in its scheme were achieved in 1997 — this represents a

significant improvement on the company's previous performance (see box 6.5). Tomago, on the other hand, reported that the bonus system introduced as part of its 1996 EA has had, at best, only limited success. Tomago suggested that this was because the performance indicators turned out to be 'not very good'. As the performance measures were at the plant level, bonuses were paid on an equal basis to all employees. The company indicated that it has plans to introduce performance measures at the crew level.

### Box 6.5 Bonus system — employees rewarded for improved plant performance

Nabalco introduced a bonus scheme as part of its 1997 Enterprise Agreement. The scheme set out Continuous Improvement Goals for 1997 which, if achieved, would result in one-off payments (as much as 2.5 per cent of the applicable remuneration base, per annum) being made to employees. The goals relate to:

- alumina production — if a target of 1.73 million tonnes is reached, employees will be paid an extra 0.63 per cent of their remuneration base; if 1.745 million tonnes is produced, employees receive an extra 0.31 per cent;
- costs of producing alumina per tonne — if reduced by $1.00 below budget (excluding primary and secondary materials), employees will be paid an extra 0.63 per cent;
- safety — if the site total case frequency rate[1] is less than 125, employees will be paid an extra 0.63 per cent; and
- attendance — if the absentee rate is reduced from 4.1 to 3.5 per cent, employees will be paid an extra 0.31 per cent.

Nabalco reported that most of the targets were achieved in 1997 — this represents a significant performance improvement.

Sources: IC interview and AIRC (1997).

Capral also commented that as part of its next EA it is trying to negotiate a bonus system whereby wage increases are linked to decreases in the cost of producing a tonne of aluminium (including only those costs that are under the control of the smelter — ie excluding alumina, power, scrap purchase price).

### *Staff contracts*

Other firms have taken workplace reforms beyond enterprise agreements and introduced individual staff contracts. Comalco has introduced staff contracts at all of its operations (Weipa, Bell Bay and Boyne Island). Worsley Alumina also has the majority of its workforce operating under staff contracts.

[1] Calculated by the number of injury cases times 1 million, divided by the total number of hours worked.

Comalco claims that it was the changed industrial relations environment that enabled it to offer staff contracts to the majority of its employees. According to Comalco, this workplace initiative has had a positive impact on employee relations. The company observed (Comalco, 1993, p. 7):

> In recent years a number of Comalco operations have achieved substantial gains through changes in work practices. The employee relations environment is changing, and this has enabled some Comalco businesses to offer their employees the choice of accepting employment as salaried staff. Changes are being effected to remove the debilitating 'them and us' syndrome which has bedevilled employee relations in the past.

In the process of implementing staff contracts, both Worsley and Comalco have virtually eliminated union involvement at their plants. Comalco reports that, while its attempts to move towards staff contracts aroused strong suspicions among unions that the company's strategy was to eliminate unions, it saw the move to staff contracts as an opportunity for management to start competing with the unions for leadership. Davis (1995, at the time Director and CEO of CRA Ltd, cited in Ludeke 1996, p. 122) commented that:

> Many employees have preferred the leadership of their unions, traditionally looking to them for guidance on issues which go well beyond the maintenance of safety net awards. Extending staff employment is likely to bring CRA into competition with the leadership provided by the unions beyond the safety net. We expect to compete for that leadership by earning the trust of employees and we recognise that employees have a free choice about whether they give it.

Similarly, Worsley's human resource manager claims that, while employees on individual contracts have the option of being union members, the reality is that unions do not have much to offer employees operating on individual contracts.

The process of moving to staff contracts was a fairly 'painless' exercise for Worsley Alumina. It took less than 12 months and was achieved without industrial disputation. In May 1994, Worsley's bauxite mine/alumina refinery operations were a completely closed shop — by May 1995, 96 per cent of employees had signed individual contracts.

Comalco's experience was quite different. The process of moving employees at each of its Australian plants from award conditions to staff contracts was not achieved easily. The process involved much litigation and industrial disputation. For example, a 49 day strike at Weipa was settled only after the AIRC delivered a decision that extended staff terms and conditions of employment to all employees at Weipa. It also took three years, and many AIRC hearings, for an EFA to be approved for the company's Boyne Island smelter.

### *Other workplace initiatives*

All surveyed operations reported implementing changes to occupational health and safety (OH&S) procedures and on-the-job training (figure 6.1). Changes to OH&S procedures have the potential to reduce the human and economic loss associated with workplace accidents. Comalco, for example, has put in place a Safe Work program at all of its plants which aims to achieve world best practice in OH&S and is based on a process of continuously identifying hazards in the workplace and developing procedures to reduce them (Comalco 1994).

Other workplace initiatives implemented by firms over the period 1990 to 1996 included management restructuring and the development of best practice techniques (figure 6.1). Tomago's CEO views benchmarking and 'increased use of the Pechiney family' as important ways of keeping its smelter focused on cost structures and key areas for improvement (Tomago Aluminium 1996b, p 4):

> By comparing the way we do things with the way things are done by other smelters, we can target areas for improvement, and gain ideas on how this improvement can be achieved.
>
> Benchmarking within the Pechiney group is very useful because it is like a clean window: everyone can be completely open with one another. In this way we can clearly see where we need to do things better and work with real figures.

### *Firms' responses to reforms*

Figure 6.1 also highlights the relatively early and rapid take-up of industrial relations and workplace initiatives in the aluminium industry. For example, although only three operations had undertaken award restructuring by 1990, by 1995 all operations in the industry had done so. The take-up of enterprise agreements has been rapid since the early 1990s, while the move towards staff contracts (for production and maintenance workers) and productivity bonuses has been a more recent development.

The following section examines the productivity improvements that have accompanied these workplace changes.

## 6.4 Building more productive workplaces

The over-riding aim of the reforms made to the industrial relations system over the last few years has been to provide greater scope for employees and employers to negotiate mutually advantageous changes to workplace and management practices to increase workplace flexibility and enhance productivity. The aluminium industry has been active in implementing

industrial relations and workplace initiatives in response to these reforms. However, these initiatives are not an end in themselves. Rather, it is the improved economic performance — productivity growth and workplace flexibility — which accompanies them that is the name of the game. This section looks at the impact of labour market reforms and workplace initiatives on productivity and the flexibility of firms' workplace practices.

### 6.4.1 Industrial relations, workplace reforms and productivity changes

Our survey results indicate that over the period 1990 to 1996 labour and overall productivity in the aluminium industry increased (see chapter 3). A range of factors were nominated by firms as contributing to these productivity increases (section 3.3) including a range of labour market initiatives. Award restructuring and enterprise agreements were nominated among the top four factors contributing to overall increases in productivity.

Other factors nominated by firms as having an important influence on productivity were: changed work practices (such as fewer demarcations); implementation of best practice techniques; upgrading of workforce skills; and the implementation of staff contracts. One of Comalco's Bell Bay employees, providing evidence for the Weipa case, gave some indication of how changed work practices can improve the efficiency of plants (cited in Ludeke 1996, p. 90):

> ... the demarcation requirements that existed when we were award employees made the running of the plant inefficient at times ... Under the staff system we have the flexibility to do the work ourselves.

Most firms commented on how industrial relations reforms and workplace initiatives have led to productivity improvements. Alcoa, for example, reported that, although its Point Henry smelter is a relatively old plant, workplace reform initiatives have had a strong influence on maintaining the competitiveness of the plant. It claims that (Alcoa 1996a, p. 22):

> Point Henry runs at or close to world benchmarks in a number of key operating parameters and whilst technology has played its part, it has been the empowerment of people through job redesign, removal of unnecessary demarcations, upskilling and creation of a self-managed team-based environment which has helped lead this relatively old plant to significant increases in productivity, environmental performance, innovation and efficiency.

Comalco Smelting (Submission 4, p. 3) also suggested that the move to staff contracts had a positive influence on the performance of its smelters:

> The change to staff conditions of employment has resulted in improved performance in the smelter operations, reducing costs, and therefore improving the international competitiveness of the operations.

In evidence presented to the AIRC covering the introduction of the staff contract system, Comalco noted the following improvements at its Bell Bay smelter (AIRC 054/96 Print M8600):

- improvements in off-specification metal. In June-September 1992, management reported that this indicator had reached a level which 'seriously concerned management', but after May 1994 when employees began to accept staff employment this indicator improved considerably. By September-December 1995, the indicator was the lowest it had been in years;
- current efficiency. After May 1994, the smelter's records show a rise in the level of current efficiency achieved. Management claims that the technology was the same and that the increased efficiency followed from the higher quality of work by operators; and
- lost time injury frequency rate. Over the period May 1994 to January 1996, the rate was reported to have declined by around 60 per cent — management put this down to operators paying more attention to detail and accepting a greater sense of individual responsibility.

A number of firms commented on the positive impact that the elimination of demarcation problems has had on productivity. Firms now require fewer employees and can operate their equipment more intensively. Comalco reported that the move to staff contracts has removed all demarcation issues at its plants and, because there are no overtime payments, employees have an incentive to get the job done.

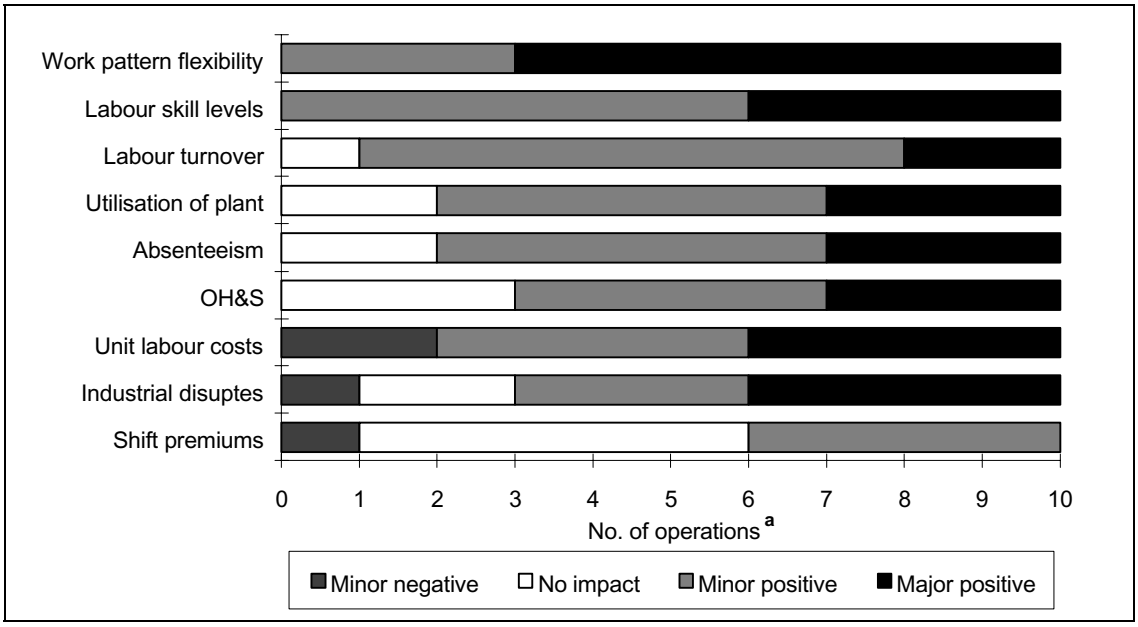
Similarly, QAL reported that changed work practices have resulted in fewer people being required to perform specific tasks at its Gladstone refinery. Management indicated that under previous working arrangements seven people were required to change an electric motor — two fitters, one electrician and an assistant, one operator, one crane driver and one rigger. The number of workers required for this task has now fallen to three — this corresponds with a decline in the number of unions at the plant from seven in 1990 to three in 1996.

The effectiveness of workplace initiatives in improving productivity was also supported by the large proportion of respondents with positive views of their impact on a range of work-related factors (figure 6.2).

All firms stated that workplace reforms have had a positive impact on work pattern flexibility — 70 per cent of which considered that they have had a major positive impact. This result most likely reflects the industry-wide move to

twelve hour shifts. Comalco Minerals and Alumina, for example, reported that the move to a continuous shift at its Weipa bauxite mine resulted in the business being able to decommission seven haul trucks (equivalent to 32 per cent of the fleet), two front-end loaders and five light vehicles. Also, whereas in December 1989 the mine employed 1000 people, it now employs around 500 people to produce the same output. The equipment is the same (now older) and the haul distances are longer.

Figure 6.2 Impact of workplace reforms and changes to management practices on work-related factors, 1990 to 1996




**a** Most firms provided a single response. The exceptions were Alcoa (which provided one response for its mining/refining operations and one for its smelting operations) and Comalco (which provided one response for its Weipa mine and one response for each of its two Australian smelting operations).
Source: Aluminium industry survey 1997.

Workplace reforms have also had an overwhelmingly positive impact on labour skill levels. They have generally resulted in employees taking on greater responsibility and a wider range of tasks, and as a result management are placing greater emphasis on training and the need for employees to be multi-skilled.

Firms also stated that workplace reforms have improved their labour performance across a range of other measures including absenteeism, utilisation of plant, labour turnover, OH&S, unit labour costs and industrial disputes. For the last two, however, firms were not unanimously positive. In particular, two firms argued that the changes had actually raised unit labour costs (figure 6.2). This result most likely reflects the fact that most enterprise agreements/offers of

staff contracts have included salary increases. Unit labour costs may have increased, but consideration also needs to be given to changes in labour productivity resulting from changed work practices.

In addition to the overall performance indicators such as labour productivity and current efficiency, firms supplied *quantitative* evidence on a range of partial indicators to support their views. Although each firm differs in the type of indicators it uses (as well as the way data are collected), a sufficient number of firms provided data to gain an overall impression of industry-wide outcomes in four key areas. They are listed below. However, at the outset it needs to be stated that caution should be exercised in attributing causality for the results discussed below. The general economic conditions prevailing in 1996, for example, differed substantially from those in 1990.

### *Working days lost due to absenteeism*

All firms which provided data recorded reductions in working days lost due to absenteeism. For the industry as a whole, absenteeism declined by around 30-40 per cent between 1990 and 1996. The data suggest that reduced absenteeism is a benefit associated with the move to staff contracts. Over the period 1993 to 1996, absenteeism at Worsley's operations fell by around 40 per cent. Similarly, at Comalco's Bell Bay smelter, absenteeism rates remained relatively constant between 1990 and 1993, and then halved in the three years to 1996.

### *Staff turnover*

The majority of firms experienced reduced staff turnover, with only two firms recording increases for this indicator. For the industry as a whole, average annual staff turnover fell from 12 to 10 per cent between 1990 and 1993, but remained constant between 1993 and 1996. However, the industry average masks some variability at the firm level. Worsley and Alcoa's WA operations saw their rates of staff turnover fall steadily from 1990, down 3 percentage points each to 6.5 and 4.4 per cent respectively in 1996. The only firm that reported a large rise in staff turnover attributed the increase to a one-off program of redundancies.

### *Lost time injury frequency rates*

Lost time injury frequency rates declined for seven of the nine firms which supplied data (falls ranged from one-third to three-quarters between 1990 and 1996). The largest reductions were recorded at Comalco's Bell Bay smelter and Tomago's smelter. Worsley, by contrast, registered a slight increase in injury frequency between 1990 and 1993. But this result masks the fact that Worsley has been consistently one of the top safety performers during the 1990s, with

lost time injury frequency rates of less than 1 per 200 000 employee hours worked.

### *Working days lost due to industrial disputes*

Results were mixed for this indicator. Four firms reported a decline in working days lost due to industrial disputes, while three reported an increase between 1990 and 1996.

Working days lost due to industrial disputes at Comalco's Weipa operation were consistently both high and volatile, increasing fourfold between 1990 and 1993, then falling by more than half between 1993 and 1996. The company, however, reports that in the last 18 months there have been no disputes at Weipa and this is at a time when there have been major changes at Weipa — for example, the move to one mine which led to the loss of around 60 jobs; also the Kaolin operations were closed. Worsley also saw its level of industrial disputation at its mine/refinery fall away markedly — from rates broadly in line with those registered at Weipa in 1990 to no disputes in 1996. Like a number of other firms in the industry, Worsley has negotiated, as part of its staff contracts, continuous production clauses which prevent workers from striking.

## 6.5 Factors inhibiting productivity improvements and workplace flexibility

Half of the firms in the aluminium industry indicated that they were satisfied with the pace of industrial relations reforms over the period 1990 to 1996 — the other half considered that reforms had proceeded too slowly. Firms generally acknowledged that industrial relations reforms had progressed in recent years, but further reforms were required.

Comalco pointed out that its experience in progressing the implementation of EFAs and staff contracts highlighted some of the constraints of the industrial relations system in Australia. The lack of flexibility to negotiate agreements with individuals (prior to the new Workplace Relations Act) was an area of concern. Ludeke (1996, p. 41) commenting on Comalco's experience said:

> In the numerous Comalco cases which were brought before the Commission [Australian Industrial Relations Commission], the constant theme was that, in substance, workplace negotiations meant negotiations with unions which had members at the workplace. Enterprise Flexibility Agreements, which were intended to provide a means by which an employer could negotiate directly with its workforce, had to run the gauntlet of determined opposition from site union officials and the ACTU. The experience of the people at Boyne Island showed that no matter how overwhelming the employee support for a site agreement

> might be, the system recognised a union role which could prevent the agreement receiving the approval of the Commission.

Some of the constraints that Comalco faced when attempting to implement EFAs and staff contracts have been removed in the latest legislation. The irony, according to Comalco, is that it achieved its workplace changes under the previous arrangements. Ludeke (1996, p. 48) commenting on the new arrangements said:

> The reforms generally to the system will recognise and encourage the form of relationship that Comalco and its people have achieved within the present statutory arrangements. But at Bell Bay, Weipa and Boyne Island, compliance with those statutory arrangements involved long and complicated proceedings.

A number of firms indicated that the industrial relations system remains complex and costly to operate within. Capral, for example, commented on the costly process of implementing an enterprise agreement — the company estimates that its latest agreement cost around $100 000. It also spoke about the enormous amount of management time that is devoted to the process including, for example, fortnightly meetings that involve all senior management, staff and unions. At the same time, however, Capral commented that the existing legislation does not restrict the changes that management are seeking to bring about and that much of what is left to do is dependent on the capacity of management to bring about changes.

Similarly, the development of the Boyne Island EFA proved to be a very lengthy and costly process for Comalco Smelting. The PC (1996a) reported that this process involved: 13 Australian Industrial Relations Commission (AIRC) hearings taking up 14 days of court time; 14 union/management meetings taking up 18 days; approximately ten union/employee/management meetings and union/employee meetings; two work stoppages; and one picket line lasting nine months. Legal expenses were estimated at over $450 000 and the opportunity cost, in terms of staff hours involved in the process, was also considerable.

A number of firms considered that a lack of simplicity and clarity in the Commonwealth legislation adds to process costs. Comalco noted that, although it was able to implement staff contracts in both Australia and New Zealand, it was considerably more difficult to work through the legislative process in Australia. The current system in New Zealand reflects the *Employment Contract Act 1991* (ECA). The ECA allows employers and employees to determine the terms of their employment relationship with few constraints other than contract law and minimum legislated standards.

A number of firms commented that the latest legislative changes (*Workplace Relations Act 1996*) go some way towards addressing some of these problems.

In fact, most firms were generally optimistic about the recent changes. Capral (Submission 2, p. 1), for example, commented that:

> A significant improvement to the level of output per employee is crucial to our success, and is the basis of current management initiatives. This aspect of our costs is being tested, with unionised employees moving forward at a pace which is set to stall the process. Fortunately we believe the current legislation and regulation allows us to progress these issues, providing us with the scope and challenge to manage these issues.

Comalco Smelting (Submission 4, p. 3), also said that:

> There are still rigidities in Australia's system of awards, unions and enterprise bargaining, although recent reforms are a significant attempt to address these problems.

Comalco indicated that the main problem with the new legislation is that it presumes that organisations cannot be trusted to deal fairly with employees. The company suggests that the Government allow organisations to demonstrate that employees prefer internal systems of fair treatment. The legislation need only provide minimum standards and the right to a procedural review of fairness issues. Comalco was also of the view that the legislation should not mandate a particular approach to workplace reform, but should facilitate the necessary changes that companies need to make in order to improve flexibility and productivity.

Other firms were generally positive about the new legislation. Nabalco (Submission 6, p. 2), for example, commented that:

> No single provision of the new Act directly influenced Nabalco's new EBA provisions. However, it may be that to some extent the Unions were more prepared to engage in meaningful negotiations given that AWA's and individual contracts are options under the new Act. There seemed to be less expression of the Union's own 'Federal' views and better representation of employees' wishes.

The OECD also recently made the assessment that the Workplace Relations Act addresses major shortcomings of the system and encourages employers and employees to negotiate at the enterprise level. The OECD (1997, p. 63) commented that:

> The *Workplace Relations Act 1996* addresses major shortcomings of previous legislation which aimed at a more flexible and adaptable labour market. By further reducing the importance of awards and the role of unions in the industrial relations system the *Act* provides more opportunities for employers to deal directly with employees and to agree on terms and conditions of employment that suit individual workplaces.

Overall, the reforms associated with the Workplace Relations Act were viewed positively by firms. However, some firms are of the view that there is further scope to simplify procedures and processes and lessen legislative impediments

to greater flexibility in working arrangements while retaining a minimum standards safety net. Another criticism of the legislation was that it 'maintains a lot of the status quo' and the AIRC continues to have 'too much discretion'. One firm suggested that the provisions which allow unilateral AIRC arbitration on 'allowable matters' could be interpreted to include all matters. Beyond this, firms were generally of the view that success in building productive enterprises in a more open and competitive operating environment was increasingly dependent on the capacity of management and workers alike to effectively embrace the necessary changes at the enterprise level.

These views are not dissimilar to the OECD's assessment of the changes associated with the Workplace Relations Act. The OECD (1997, p. 63) commented that :

> ... while the reforms represent an important progress doubts still prevail as to whether sufficient flexibility in industrial relations can be achieved as long as the award system (including the AIRC) remains such an important part of industrial relations.

And, (1997, p. 65):

> ... the legislation in itself will not automatically provide for increased workplace flexibility. Instead, the success of the new legislation depends largely on how much use employers make of the new Act's provisions and the extent to which employers work with their employees to make workplaces more productive and efficient.

## 6.6 Labour on-costs

As with many other industries, labour on-costs constitute a sizeable cost impost on firms in the aluminium industry. Major on-costs include: payroll tax; superannuation; fringe benefits tax; workers' compensation premiums and expenditures on OH&S.

A number of firms commented on the high level of labour on-costs in Australia and the negative impact that they have on their cost competitiveness compared with competitors in other countries. Capral (Submission 2, p. 1) for example, said:

> The significance of labour on-costs is also significant in the fourth quartile cost positioning for labour. Payroll tax, Worker's Compensation and Superannuation Guarantee amount to approximately 17 per cent of total labour cost, without the impact of legislated levels of Long Service Leave and Annual Leave which are not present in competing countries.

Data collected as part of our survey confirm that labour on-costs represent a substantial (and increasing) proportion of total labour costs. In 1996, the four key labour on-costs (superannuation, payroll tax, workers compensation and fringe benefits tax) accounted for around 13 per cent of firms total labour cost — this compares with a figure of 11.4 per cent in 1990 (table 6.2). Labour on-costs for the aluminium industry, however, appear to be broadly in line with those for the manufacturing sector as a whole.

Table 6.2 Selected labour on-costs in the Australian aluminium industry (percentage of total labour costs)

| | *Australian aluminium industry* [a] | | | *Manufacturing industry* [b] | *Total private sector* [b] |
|---|---|---|---|---|---|
| | *1990* | *1993* | *1996* | *1993-94* | *1993-94* |
| | *%* | *%* | *%* | *%* | *%* |
| Superannuation | 4.6 | 4.2 | 4.5 | 4.4 | 4.9 |
| Payroll tax | 4.9 | 5.1 | 5.2 | 4.4 | 3.5 |
| Workers' compensation | 1.1 | 1.1 | 1.3 | 2.9 | 1.9 |
| Fringe benefits tax | 0.8 | 0.7 | 1.7 | 0.6 | 0.9 |
| **Total selected on-costs** | **11.4** | **11.1** | **12.7** | **12.3** | **11.2** |

**a** These data are estimates based on responses to the Commissions' industry survey. They exclude Comalco's Weipa bauxite mine and Bell Bay aluminium smelter**b** Based on ABS data.
Sources: Aluminium industry survey 1997 and ABS (1995).

The increase in labour on-costs, as a proportion of total labour costs over the period 1990 to 1996, was driven largely by increased payments (in percentage terms) for payroll tax and the fringe benefits tax.

### *Recent changes to labour on-costs*

There have been a number of reforms and other changes to labour on-costs in recent years. For example:

- the compulsory superannuation guarantee levy. The levy, introduced in July 1992, required employers with annual payrolls above $1 million to contribute 5 per cent of their employee's earnings to superannuation. A levy of 4 per cent applied to payrolls under $1 million. As of July 1996, all employers were required to contribute 6 per cent of employees earnings to superannuation. This will increase to 7 per cent in July 1998, 8 per cent in July 2000 and 9 per cent in July 2002.
- increases in the exemption thresholds for payroll tax in most states/territories in recent years, as well as other changes to payroll tax arrangements, have lessened the associated tax burden on small firms. Nevertheless, large firms, such as those in the aluminium industry, would not have benefited from these changes and probably are paying higher levels of payroll tax than otherwise to compensate for the revenue forgone by increases in the thresholds. In fact, payroll tax payments as a whole have increased steadily in recent years (ABS 1995).
- reforms to workers' compensation arrangements have focussed on lowering the cost of claims by encouraging employers to introduce improved safety standards and rehabilitation programs. Reforms have included restructuring premiums to better reflect risk factors in industries. The effectiveness of these initiatives has varied between states and territories (IC 1994a).
- firms also raised a number of concerns relating to changes to fringe benefits tax arrangements — these issues are examined in chapter 8.

In contrast to the generally positive impact which firms considered changes to industrial relations arrangements have had on their competitiveness, changes to labour on-costs were generally viewed by firms as having a negative effect. Indeed, when asked how labour on-cost changes between 1990 and 1996 affected their competitiveness, four establishments said they had a negative (albeit minor) impact. This resulted in labour on-costs ranking third in the list of reforms which had the greatest negative impact on competitiveness in the industry over this period.

The industry was also critical of the recent pace of reform in this area. Only one firm was satisfied with the pace of reform. The majority of firms claim that reforms were either progressing too slowly or going backwards. These results largely mirror those of the BIE's Agri-food and Automotive case studies (BIE 1996b,c).

The main criticisms of reforms to labour on-costs were that they had not gone far enough and that compliance costs remained too high. Of the range of on-costs canvassed in the survey, changes to fringe benefits tax were identified by firms as having the most negative impact on their competitiveness — all seven firms reported a negative impact on their competitiveness (see chapter 8 for further discussion).

Changes to the superannuation guarantee levy were also viewed by the majority of firms as having a negative impact on their competitiveness. In the absence of compulsory superannuation payments by firms, however, take-home returns to employees (ie wages) may, on average, have been higher. For this reason, the superannuation levy, on average, may not have increased firms total labour related costs of doing business. Nevertheless, the imposition of the levy may have increased the costs of employing labour (ie administration costs associated with the levy). Such costs could reduce firms' competitiveness. Also, the superannuation levy has the potential to disadvantage firms if it is higher in Australia than similar imposts in other countries. As a result, governments need to weigh up the relative effectiveness of different approaches to the attainment of policy objectives in this and related areas such as training and development.

Self-insurance for workers' compensation was mentioned by several firms as an area in need of further rationalisation. Many firms reported that they could not self-insure because their companies are not large enough. In the final report of the Heads of Workers' Compensation Authority to the Labour Ministers' Council (May 1997), the Authority called for significant changes to the present system to promote the development of a streamlined approach which will enable national corporations to self-insure in any state or territory. The Authority recommended that 'suitably qualified employers' should be able to self-insure as long as they comply with agreed national prudential and allied standards.

In response to this, Alcoa (Submission 5, p. 23) stated:

> As a national employer we strongly endorse such an initiative. Every state has developed its own unique body of self insurance regulations and compliance requirements. As a result, companies contend with overlays of complexity, administrative barriers, incompatible standards and the costs that result.
>
> Self insurers are characteristically large well-managed corporations in export industries, with high-level performance features in areas such as safety

> management. To allocate public monies in this field is wasteful of the limited resources of government, particularly given the high levels of duplication and redundancy.

Alcoa went on to suggest that the Commonwealth Government should provide a 'single point of contact' for setting up and maintaining self-insurance. The company also urged further 'evaluation, simplification and removal' of the myriad of state self-insurance regulations.

## 6.7 Concluding comments

Labour market and workplace arrangements have a major impact on the competitiveness of firms in the aluminium industry. A series of microeconomic reforms to labour markets since the late 1980s, culminating in the Workplace Relations Act 1996, have allowed firms across a range of industries — including in the aluminium industry — more freedom to modify workplace arrangements to improve competitiveness. Implementation rates for many industrial relations and workplace initiatives in the aluminium industry have been high. For example, all companies have implemented award restructuring, on the job training and changes to OH&S procedures. Implementation of enterprise agreements, management restructuring and best practice techniques has also been widespread.

There have been two rather different approaches to workplace reform adopted by firms in the aluminium industry in recent years. However, while the approaches differ (ie collective enterprise and staff contracts routes to workplace reform), they are based on similar principles. These include a shared vision of the commonality of interest between workers and managers, the importance of adopting a continuous improvement philosophy and the need for organisational and workplace innovation to give effect to continuous improvement.

Firms in the industry suggest that it is of utmost importance that all parties agree on common goals and recognise the mutual benefits that exist from working together to achieve continuous improvement. It appears that this can be achieved under either a two or three party relationship.

All firms in the industry reported that reforms to labour arrangements had an important positive influence on their productivity by facilitating initiatives at the plant level to improve work pattern flexibility, labour skill levels and plant utilisation rates, whilst simultaneously reducing labour turnover, absenteeism and OH&S problems.

Despite the important role played by industrial relations reforms in recent years, only around half of the firms were satisfied with the pace of reform between 1990 and 1996. Firms, however, generally viewed the latest changes associated with the Workplace Relations Act positively. They felt that the changes help facilitate increased flexibility and a shift to closer worker-employer relations. Continuing areas of concern include the overly complex and process-driven nature of the legislation. Firms agreed that there was scope for further reforms to simplify procedures and processes and lessen legislative impediments to greater flexibility while retaining a minimum standards safety net. However, increasingly the challenge of building productive and competitive workplaces rests with the ability of managers and workers to effectively respond.

Changes to labour on-costs in the 1990 to 1996 period were generally perceived by firms as having a negative impact on their competitiveness. The main criticisms of recent changes were that reforms were processing too slowly, had in some cases taken a step backwards and that compliance costs remain too high.

# 7 ENVIRONMENTAL REGULATIONS AND RESOURCE ACCESS

*Regulations pertaining to air and water emissions, management of waste and hazardous chemicals, environmental planning and assessment, and resource access/multiple land use govern key aspects of the three stages of primary aluminium production. In recent years, Australian governments have improved the way in which these regulations are framed and administered. These improvements have focussed on reducing duplication and overlap, streamlining approval processes and making greater use of market-based mechanisms. Despite this, there remains clear scope for further reform at all levels of government.*

*Resource access issues — including the uncertainty surrounding native title rights and the associated transaction costs and delays to affected firms — are a source of concern for a number of players in the industry. Native title concerns relate largely to future investment decisions by the industry rather than to established operations. The Government's response to global efforts to curb greenhouse gas emissions is another key issue. This reflects the energy-intensive nature of alumina refining and aluminium smelting. In general, the industry views the outcome of the recent Kyoto climate change conference positively, although the exclusion of developing countries from the agreement is likely to result in emission leakage.*

One of the key ways in which Commonwealth and state/territory governments in Australia influence the operations of the aluminium industry is through environmental and resource access regulations. All three stages of the aluminium production chain have an impact on the natural environment. Mining and processing activities are also affected by provisions relating to access to, and use of, various common environmental resources, including regimes designed to handle competing uses of these resources.

Section 7.1 highlights the importance of environmental issues to the industry, summarises recent changes to environmental regulations and identifies areas for further reform. Section 7.2 reviews developments in the area of resource access and multiple land use regulation. Section 7.3 canvasses issues related to initiatives to achieve greenhouse gas abatement and their likely impact on the Australian aluminium industry. Concluding comments are presented in section 7.4.

In common with mineral processing activities in general, the characteristics of the production processes in the aluminium industry mean that a wide range of environmental regulations affect the industry. A detailed mapping of changes to these regulations over the last decade is beyond the scope of this study (for a summary of microeconomic reforms to environmental regulations see IC 1998c). Instead, the treatment is at a relatively general level, with a focus on broad policy reform initiatives since 1990 and outstanding issues.

## 7.1 The aluminium industry and the environment

When the Australian industry commenced its expansion stage in the mid-1960s, community and government concerns about environmental issues were quite limited. The intervening three decades have witnessed a growth in the level of interest in environmental and resource access issues, with a consequent growth in related regulation in Australia. Environmental regulations now have a pervasive influence on the aluminium industry.

Australia's environmental standards in general are more stringent than those in many other countries, including many developed countries (IC 1996a). The appropriate nature and extent of environmental regulation in a particular region depends on a number of factors including: the capacity of the environment to absorb pollutants; the costs and benefits of alternative courses of action; and the community's environmental objectives/preferences. Since these influences can, and do, vary across jurisdictions as well as over time, environmental regulations are likely to differ between jurisdictions and require revision over time.

Australia's environmental regulations are, in the main, applied and administered at the state/territory government level and affect all stages of the aluminium industry's production. Key areas where environmental regulations have an impact on the industry include:

- *Resource access and land use*. A prerequisite for bauxite mining is access to land for exploration, as well as long-term security of access to underpin the sizeable investments required. Resource access is also important for alumina refineries — particularly in relation to obtaining land for rail, road and conveyor access corridors; provision of buffer zones; and residue disposal.
- *Construction of new production facilities*. All significant new capital expenditures, such as new potlines, refinery boilers and storage facilities, are subject to some form of environmental planning and assessment regulation. The first stage of this process is the requirement that an environmental impact assessment (EIA) be prepared which complies with

state/territory government requirements in terms of content, scope and coverage.

- *Air and water emissions*. Air emissions are a big issue for aluminium smelters (and to a lesser extent the refining industry). The process of electrolytic reduction which takes place in aluminium smelters emits a number of gases, the most important of which, are perfluorinated carbon compounds (PFCs, or 'fluorides'). Although fluoride emissions from aluminium smelters do not have significant effects on human health, they can have injurious effects, under certain circumstances, on vegetation and some animals (United States Environmental Protection Agency quoted in Tomago 1998). As there is no commercially feasible process of smelting aluminium which does not rely on fluoride, emissions are an integral part of the smelting process. Consequently, smelters are required to carefully monitor and control their potline and anode bakehouse emissions. Box 7.1 provides some insight into how the Tomago smelter controls fluoride emissions and the role played by government in the process. The issue of water emissions, in contrast, is of most concern to alumina refineries due to the nature of their production process, which requires them to safely handle and treat large quantities of water contaminated with caustic soda.
- *Hazardous chemicals and waste management.* All states/territories have regulations specifying minimum standards for the transport, storage and disposal of hazardous chemicals and other wastes from smelters and refineries. As with most forms of heavy industry, the aluminium industry requires the use and disposal of a number of hazardous substances. The smelting industry, for example, has to periodically dispose of large quantities of used cathode potlinings. The spent potlinings contain fluoride and cyanide and commercially feasible ways of detoxifying them are only just emerging. Their disposal and storage is subject to careful scrutiny by governments. The major waste management issue for alumina refineries is the treatment and disposal of the large quantities of 'red mud' which remain after the alumina has been extracted. This mud is highly alkaline and has to be disposed of safely — a process which is very land-intensive. A number of regulations control how the residue is disposed of, including the standards to which residue pits should be lined to prevent seepage. This is a particularly important issue for the Worsley refinery because it operates and disposes of residue in a hill system — the only operation of its type in the world.
- *Land rehabilitation.* This is an important issue for bauxite mines. Because of the way bauxite is deposited, the mining process is relatively land-intensive. All jurisdictions with bauxite mining operations (WA, Qld and

the NT) have regulations which outline minimum standards of rehabilitation for used bauxite mine sites. Examples include specifications on landscaping, topsoil replacement and regeneration of native vegetation.

### Box 7.1 Fluoride emissions and the Tomago smelter

The Tomago aluminium smelter is situated on a 500 hectare site about 13 km north west of Newcastle in the industrial suburb of Tomago, adjacent to the Hunter River in New South Wales. Its location in one of Australia's more prominent wine producing regions has ensured that environmental concerns have played an influential role in many aspects of the smelter's planning, construction and operation. A major focus of concern has been the level of fluoride emissions from the smelter. Although fluoride emissions from aluminium smelters are not in general considered harmful to humans, in the early 1980s, there were concerns about their impact on agricultural industries in the Hunter Valley — see, for example, *Farms choking on industrial fallout (in the Hunter Valley)* (Venn 1981) and *Fluoride: Death sentence for our environment* (Smith 1984).

Compounding the problem was the fact that there was already an aluminium smelter in the area (the Capral smelter which had been in operation at Kurri Kurri since the late 1960s). Although no vines had actually died from the fluoride emissions at Kurri Kurri, and the proposed Tomago smelter was to be sited around 30 km from the nearest vineyards, local farmers were concerned that the addition of another smelter would raise the level of fluoride emissions in the region to unsafe levels. Consideration of these issues delayed the granting of environmental approval for the construction of the Tomago smelter. There was debate about the acceptable level of fluoride emissions per tonne of alumina produced by the smelter. The final agreed level was 0.7 kg per tonne. To meet this target, and other environmental standards, around 10-15 per cent of the $700 million capital cost of the smelter was devoted to environmental equipment. The major component of this was an advanced emission-control system (figure 7.1).

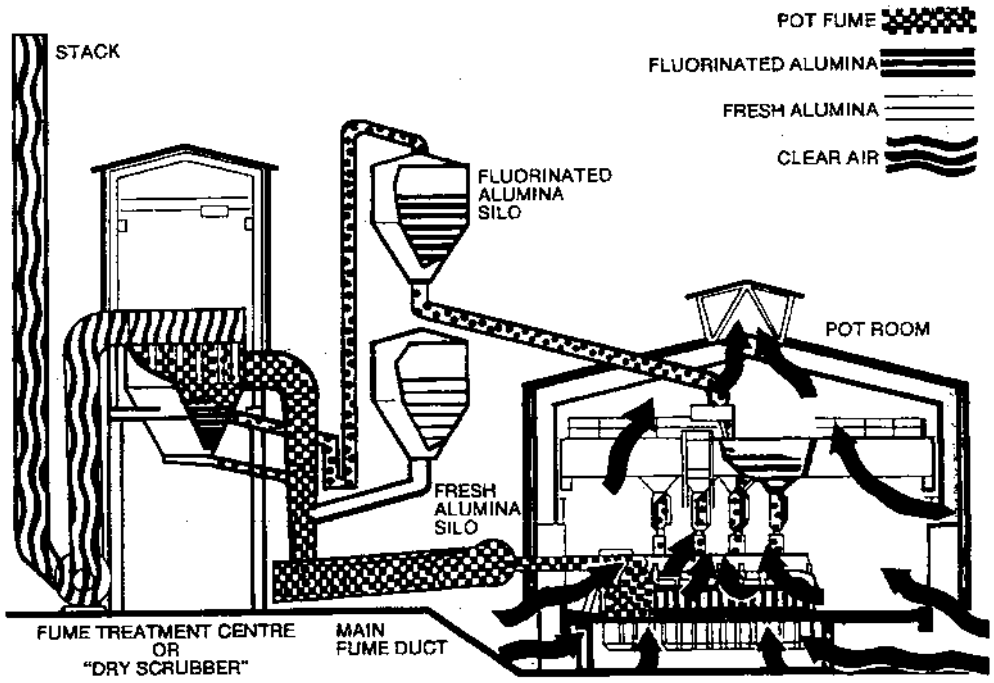
This system has a number of features. The smelter pots are designed to be completely enclosed during normal operations to prevent the escape of untreated fumes. The raw material, alumina, is added to the pot automatically without opening the hoods, while suction fans maintain a constant negative pressure inside the pots, so that any leakage results in air entering the pot rather than emissions escaping. Emissions created in the smelting process are extracted from the pot room through ducting to treatments plants — known as 'dry scrubbers' — which absorb fluoride and other impurities from emissions. At the dry scrubbers, alumina is injected into the gas stream. Almost all the fluoride in the gas stream reacts with the alumina and becomes attached to it. The partially-cleaned gases are then passed through banks of large filter bags where the fluorinated alumina and the remaining solid particles are caught and stored in silos to be re-used in the electrolytic process. Tomago also conducts additional monitoring of the effects of fluoride on domestic and native fauna, flora and water up to a radius of 20 km from the smelter.

### Box 7.1 Fluoride emissions and the Tomago smelter (cont'd)

Results from this system have been good, with a very low level of fluoride emissions — 0.5 kg per tonne of aluminium in 1996. This was well below the standard required by the NSW Environment Protection Authority (EPA). In addition, the smelter operates within the requirements of the NSW Clean Air, Clean Waters, Noise Control and Environmentally Hazardous Chemicals Acts. Environmental performance is monitored closely by

management, with air monitoring stations located within and outside the plant. These results are periodically audited by the EPA. Since the smelter began producing in 1983, the EPA has found no breaches in fluoride emissions. Australia's aluminium smelter fluoride emission standards are high by international standards and the Tomago smelter is one of the lowest emitters in Australia.

**Figure 7.1 Tomago aluminium smelter emission control system**




The strong environmental performance of the smelter, as well as the extensive research and information dissemination program undertaken by Tomago, has meant that the company has earned acceptance by the local community and the wine industry despite some misgivings at the time the smelter was built. The Tomago experience highlights the importance of environmental issues for the aluminium industry. It is also a timely reminder of the need for government to provide transparent environmental guidelines for industry, particularly in light of the extensive delays which the Weston Aluminium company is experiencing in trying to gain approval for an aluminium dross recycling plant in the region.

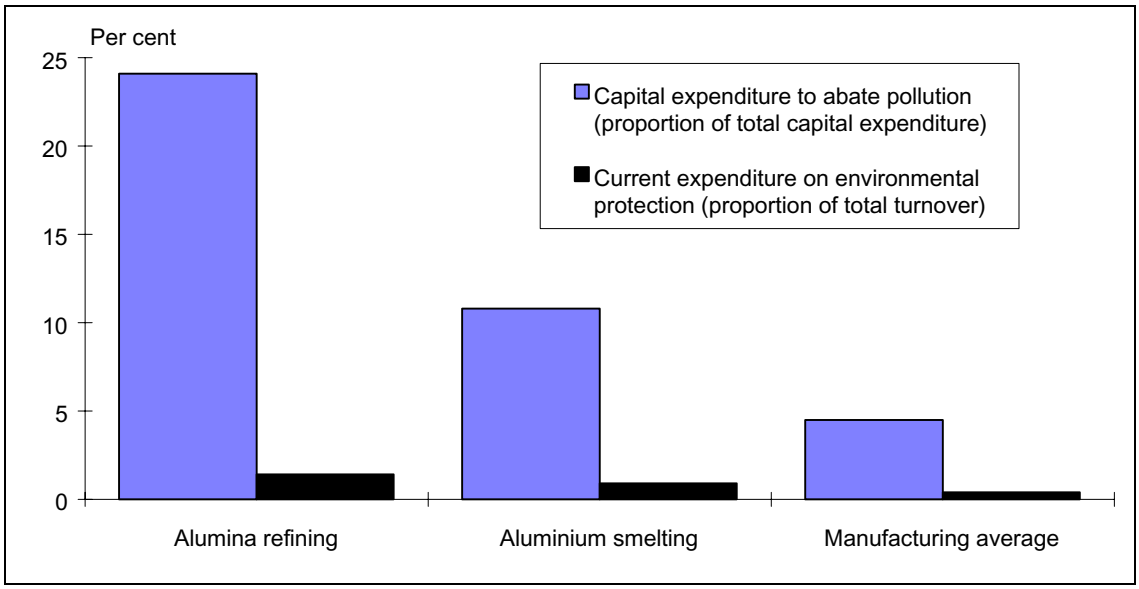
Sources: Interview with Tomago, Tomago (1998), Smith (1984) and Venn (1981).

Beyond these areas where environmental regulations directly impact on the aluminium industry, there are the indirect impacts on the industry which result from concerns about the emission of greenhouse gases in the off-site generation of the electricity used by the smelters. This point is taken up later in the chapter.

### 7.1.1 Expenditure on environmental protection

Latest available environmental expenditure data reveal that, in 1992-93, firms within the alumina refining and aluminium smelting industries spent over $113 million on *capital* expenditure to abate pollution (ABS 1996a). Included within this were expenditures on new plant, machinery and equipment designed to abate or control pollution by using either end-of-line techniques or change-in-production processes. This expenditure represented 24.1 and 10.8 per cent of total capital expenditure for the alumina refining and aluminium smelting industries respectively. By contrast, the comparable figure for the manufacturing sector in the same year was 4.5 per cent (figure 7.2).

Figure 7.2 Expenditure on environmental protection by the alumina refining and aluminium smelting industries, 1992-93 [a]




**a** Environmental expenditures by firms involved in bauxite extraction are not included as the data source used covered the manufacturing sector only.
Source: ABS (1996a).

Data on *current* expenditures indicate that the industry spends between two to three times as much on environmental protection (as a percentage of total turnover) as the average for the manufacturing sector (figure 7.2). A key component of this expenditure includes money spent on waste management — such as storage facilities for hazardous waste and residue disposal. Other costs include: government and council fees; charges and taxes relating to pollution abatement and control; research and development expenditure on pollution abatement and control (which includes salaries of environmental scientists paid to monitor the impact of emissions from smelters and refineries on the local

ecosystem); and expenditure on environmental impact assessments and environmental audits.

As expected, the sizeable current and capital expenditures on environmental protection undertaken by the aluminium industry affect the production costs (and hence competitiveness) of firms within the industry. The Commission's survey questionnaire asked aluminium firms how their production costs per unit of output had changed between 1990 and 1996. Of the mine/refining operations which experienced significant changes in production costs over the period, four of them nominated changes to environmental standards/regulations as a factor in increasing their unit costs.

Combining these data with the results for the smelters, it appears that environmental factors increased the unit costs of most establishments. Changes to air emission regulations — including more stringent/onerous monitoring procedures — were nominated by all but one firm as having a negative impact on competitiveness. Despite this, environmental regulations did not rank among the four most important factors which raised unit costs in the aluminium industry. This suggests that, although these regulations have increased firms' unit costs over the period, other factors were more influential in increasing unit costs.

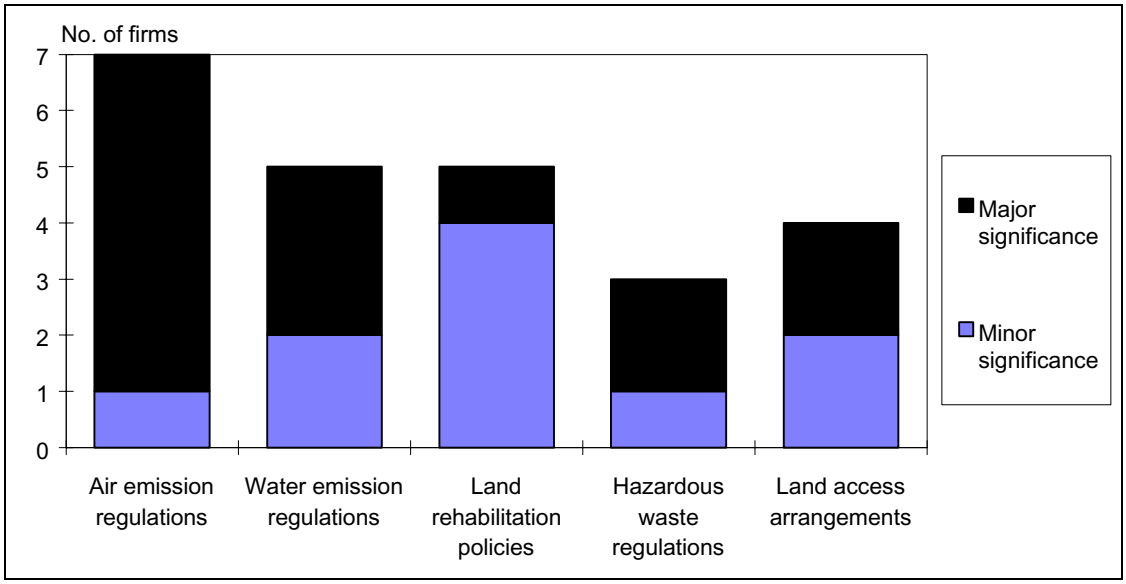
### 7.1.2 Impact on industry investment

Concerns about the impact of environmental factors in general, and air emission regulations in particular, were reflected in responses to the survey questions on investment plans within the industry over the next 3-5 years (figure 7.3). As mentioned in chapter 3, the survey responses suggest that, although investment linked directly to the environment (such as expenditures on emission control equipment) is expected to account for a relatively small share of total anticipated future investment spending, environmental considerations are likely to be an important determinant of whether other planned investments actually proceed.

Indeed, three of the top four ranking issues — which the companies nominated as having the greatest likelihood of preventing planned investments taking place — were environmental. The key one was air emission regulations, with six out of eight firms nominating it as an issue of major significance. Follow-up interviews with firms identified that these concerns were related to possible government efforts to curb Australia's greenhouse gas (GHG) emissions in the lead-up to the Kyoto climate change conference in December 1997. Firms also identified as factors likely to influence their investment plans over the next 3-5

years: water emission regulations; land rehabilitation policies; hazardous waste regulations; and resource access arrangements (figure 7.3).

Figure 7.3 Importance of environmental factors in determining whether investment plans of Australia's aluminium companies proceed




Source: Aluminium industry survey 1997.

### 7.1.3 Reform of environmental regulations

Although Australia's system of environmental regulations has evolved steadily over the past few decades, the process of reviewing environmental management systematically has gathered momentum only since the early 1990s. Part of the motivation for these review processes has been a response to industry and wider community concerns about weaknesses in the administration and the cost-effectiveness of environmental regulations. Some key points are briefly reviewed in the following discussion.

#### *Overlap and duplication*

Within Australia, a significant problem has arisen from overlap and duplication of environmental regulation between and within jurisdictions. At the national level, the signing of the Intergovernmental Agreement on the Environment (IGAE) in May 1992 was the first systematic attempt to establish processes to review and rationalise the plethora of overlapping local, state and

Commonwealth regulations. Although parts of the agreement have been implemented, progress has been slow (PC 1996b).[1]

In its submission to the IC's firms locating offshore inquiry, the Minerals Council of Australia (1996a) stated that several of the processes flowing from the IGAE should be expedited. In particular, it noted that a systematic, well defined approach to the issue of accreditation of environmental regulation ('full faith credit' provisions) still has not been implemented between the Commonwealth and the states and territories. It also called for an acceleration of the moves towards mutual accreditation of Commonwealth and state/territory EIA processes, including the signing and implementation of the National Agreement on EIA.[2]

Duplication and overlap of environmental regulation and its administration was a concern for firms in the aluminium industry. For example, QAL (Submission 1, p. 11) argued that it resulted in unnecessary reporting and management costs for industry in general, and that:

> There are perceived benefits for industry and legislators if they could utilise existing legislation or combine all issues under one code, eg hazardous goods, dangerous goods, waste management and hazardous facilities.

At the Council of Australian Governments (COAG) Meeting in November 1997, the Council gave in-principle endorsement to an agreement which will reform Commonwealth/state roles and responsibilities for the environment by: reducing overlap and duplication between state/territory and Commonwealth environmental protection regimes; introducing streamlining, increased transparency and greater certainty in relation to EIAs and approval processes; and establishing more effective and efficient delivery mechanisms and accountability regimes for national environmental programs of shared interest.

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[1] A key process stemming from the IGAE was the establishment of the National Environment Protection Council (NEPC) in 1994. Its aim is to develop national environmental standards and thereby ensure that 'decisions by businesses are not distorted and markets are not fragmented' (NEPC 1998). Areas of NEPC jurisdiction include: ambient air and water quality; interstate differences in noise regulations; guidelines for the assessment of site contamination; hazardous wastes; and recycling.

[2] The process by which a company meets government EIA requirements can be very costly. In addition to the direct cost involved in paying for the research required to produce an EIA, the delays that are associated with this process — and the subsequent deliberation by departments/agencies — can have a substantial impact on industries. Alcoa, for example, stressed the value of state governments allowing environmental approval for new capital expenditure to be obtained 'in parallel' with other approval procedures. This flexibility can influence the success with which Australian-based firms bid for new expansions with their global parent companies.

According to the Federal Environment Minister, the principles endorsed by COAG reflect an increased commitment by the Commonwealth to accreditation of state/territory processes and, in some cases, state/territory decisions made under agreed management plans (Hill 1997). Information on the rationale and scope of the Commonwealth Government's planned reforms of environmental legislation is contained in Hill (1998).

A specific instance of direct impact on the aluminium industry was the issue of Commonwealth Government export control powers, which have been used by successive governments as a means of influencing environmental outcomes and access to land and resources. The Commission examined export controls in its inquiry into *Mining and Minerals Processing in Australia* and recommended that all existing export controls (with the exception of those relating to the Nuclear Non-Proliferation Treaty and Australia's bilateral safeguards agreements) should be abolished. The Commission argued that export controls imposed a range of costs through their distortionary impact on prices as well as through the delays imposed on companies in gaining necessary approvals, the increased uncertainty placed on trading partners and the resources they tied up in setting, monitoring and enforcing the regulations (IC 1991b).

Firms in the aluminium industry expressed dissatisfaction with export controls, arguing that they gave rise to unnecessary duplication. For example, Comalco (Submission 3, p. 3) stated:

> Export permits on this mature, global industry are unjustified. There is no obvious benefit for industry from this double jeopardy. Also, the Inter-governmental Agreement on the Environment provides for the recognition by the Commonwealth of states' and territories' environmental administration. Duplication by the Commonwealth of the effort involved in environmental assessment is needless.

The company also argued that the Commonwealth's objectives could be better served through a focus on process audit, rather than the development of extensive standards, or the duplication of operational assessments. Instead, regular checks of the states' and territories' administration would be more appropriate, resulting in better use of government resources while minimising disruption to the industry (Submission 3).

The Commonwealth Government saw the removal of export control powers as consistent with the approach outlined in the 1992 IGAE. After initial rejection by the Senate, a bill was passed in June 1997 which removed the remaining

export controls (with the exception of uranium, where safeguards are required for international sales).[3]

### *Regulation review*

Beyond the problems of overlap and duplication, there are other reasons why environmental regulations need to be reviewed periodically. These include: the need to reflect changes in community preferences/attitudes to the environment; new information on the environmental and health impact of industrial activities; changes to production techniques/products; and shifts in the distribution of the population and industry.

All states and territories now have in place generic and sectoral regulation review programs and requirements that all proposed regulations are accompanied by a regulatory impact statement.

A number of changes to environmental regulations which affect the aluminium industry are currently being canvassed by Australian governments. For example, the NSW Government is directly involved in reviews of clean air and clean water regulations, emission limits, noise control regulations and load-based licensing. It also has been investigating the streamlining of development approval processes without compromising environmental standards or public participation in the assessment system. An important step in this process has been the passing of the *Environmental Planning and Assessment Amendment Bill* by the NSW Parliament in December 1997. The Bill comes into effect on 1 July 1998.

In Queensland, a new Environmental Protection Act (and associated regulations) was introduced in 1995-96 to replace the Clean Waters, Clean Air, Noise Abatement and State environmental Acts. Firms previously required to hold multiple licences can now hold a single authority covering all aspects of environmental management at a particular site (IC 1996b).

### *Flexibility and cost effectiveness*

Some firms expressed concerns about a lack of flexibility by authorities in the framing and administration of environmental regulations. The unnecessarily high administrative burden arising from compliance with some state/territory

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[3] Export controls were introduced for price related reasons, not for environmental or resource access scrutiny. Prior to the removal of controls covering the aluminium industry, the Australian Aluminium Council, the Australian Taxation Office (ATO) and the Department of Primary Industries and Energy signed a voluntary arrangement which provides government with adequate information to ensure that there is no loss of tax revenue and to keep the industry in the ATO's low risk transfer pricing category.

government monitoring procedures was one such area. For example, one firm stated that it had several employees working full time preparing extremely comprehensive statistical reports on a regular basis for an environmental monitoring authority. In that firm's view it would not have been possible for the authority to analyse even a small fraction of the data it received. The firm argued that the administrative burden was unnecessarily onerous, and that the desired environmental outcomes could be achieved at lower cost.

Several firms raised concerns about the process by which regulations are modified, in particular, where older environmental standards are replaced with more stringent ones. While new industrial developments are subject to current environmental standards, problems can arise where standards for older facilities are upgraded. For example, one firm stated that when it sought environmental approval for new facilities at its operation, the regulatory authority applied progressively more stringent emission requirements over time. In meeting these requirements, company policy has been to build in a safety margin to ensure that it will be able to meet the environmental requirements even under difficult or unusual circumstances.

However, over time, government regulators have noted this response and made the emission standards for new and pre-existing facilities more stringent. One problem stemming from this is that the company has experienced some difficulty in upgrading its older facilities to meet the new standards. Clearly, there is a need for regulatory bodies to assess both the social and private costs associated with emission controls relative to the benefits.

Australia's environmental protection authorities have made efforts over the last few years to move away, where possible, from prescriptive 'command and control' type regulations towards a greater reliance on techniques which allow firms more flexibility in meeting environmental goals. In Western Australia, for example, environmental requirements have shifted from pollution prevention licensing — specifications of pollution control in licence conditions and fees based on production output — to a more flexible system which focuses on creating appropriate incentives for industry to be environmentally responsible. The revised system encompasses various elements of 'best practice' regulatory design including, licence fees based on measured contaminant loads and opportunities and incentives for business to adopt codes of 'good environmental practice' as an alternative to licensing. Victoria's proposed Regulatory Efficiency Legislation and New South Wales' Regulatory Innovation proposals are two further examples, both of which allow business to put forward alternative ways of meeting regulatory objectives (IC 1996b).

This shift reflects a growing recognition by government regulators of the merits of using market-based incentives and related economic instruments such as

environmental taxes, subsidies and tradeable emission permits to achieve the objectives underlying their environmental policies. These economic instruments have a number of advantages over the traditional 'command and control' instruments. They can provide more flexibility and are generally more cost-effective as the burden of reducing emissions, for example, can be shared between those polluters who can reduce emissions at relatively low cost compared with those who face higher costs in reducing emissions. Firms are also provided with an incentive to develop new methods for meeting their obligations at a lower cost.

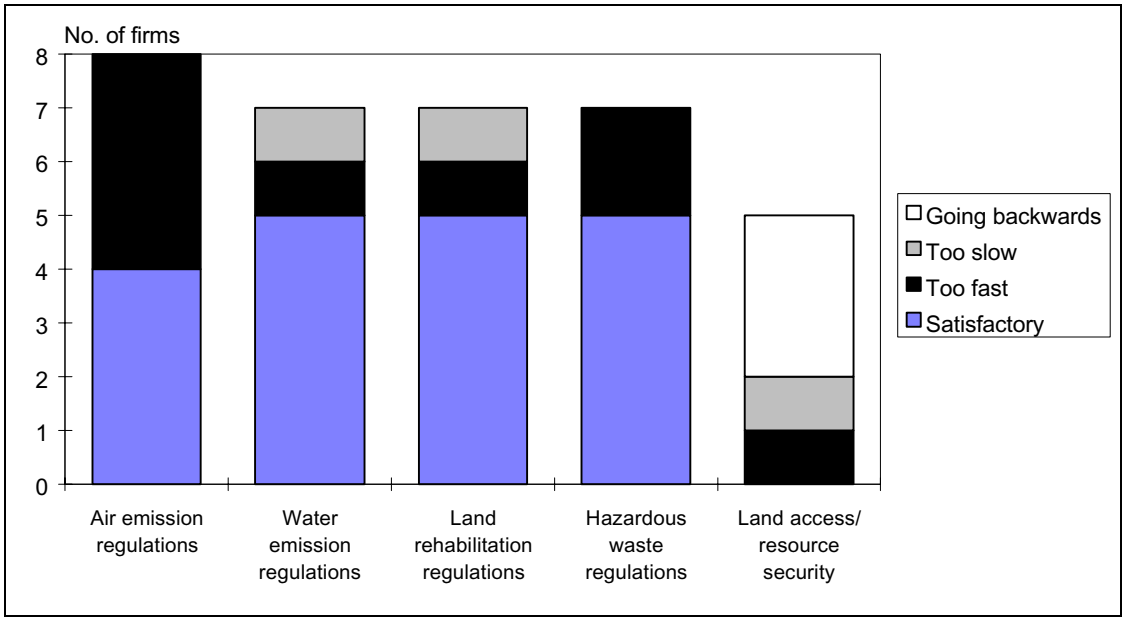
Nevertheless, progress towards the implementation of more cost-effective measures in the pursuit of environmental objectives has been slow. The potential for greater use of economic instruments to improve the cost effectiveness of environmental regulations has been examined in a number of studies including the PC (1996b), IC (1997d), BIE (1992) and James (1997).

### *Pace of reform*

Firms' views on a number of environmental issues, including the adequacy of the pace of reform to environmental regulations since 1990, were also elicited through their survey responses. Most respondents thought that reforms to water emission regulations, hazardous waste regulations and land rehabilitation arrangements had progressed at a satisfactory rate (figure 7.4).

There were, however, two notable exceptions. Reforms to land access and resource security regimes were generally viewed unfavourably, with three firms claiming that reforms in these areas had gone backwards. Conversely, half of the respondents thought changes to air emission regulations had been too fast. The remainder of this chapter examines land access/resource security and air emission issues — in particular the question of greenhouse gas abatement — in more detail.

Figure 7.4 Aluminium industry's views on the adequacy of the pace of change to environmental regulations, 1990 to 1996




Source: Aluminium industry survey 1997.

## 7.2 Resource access and multiple land use

A key policy issue impinging on the current and prospective activities of the mineral processing industry, including the aluminium industry, relates to access arrangements for exploration, mining and processing. Although state/territory governments have prime responsibility for the administration of access arrangements for natural resources for these activities, the Commonwealth Government has also played an increasing role.

Intensifying competition for the use of natural resources means that mechanisms are required to resolve competing claims and conflicts in resource use. A number of factors are relevant here such as: the specification of property rights, including native title; the administration of national estate and world heritage listings; and the impact of various international environmental agreements and conventions to which Australia is a signatory. The operation and performance of these arrangements affect perceptions relating to sovereign risk and have the potential to deter new investment.[4]

[4] The operation and performance of Australia's national resource access regime was a major issue in the Commission's 1991 inquiry *Mining and minerals processing in Australia* (IC 1991b). The influence of Australia's environmental and native title legislation on the domestic and off-shore investment decisions of local and global firms

The subsequent discussion focuses on three particular issues relating to resource access and land use which were emphasised during discussions with firms in the aluminium industry — resource access and land-use conflict resolution processes, native title and sovereign risk.

### 7.2.1 Resource access and land-use conflict resolution processes

The aluminium industry is based on the extraction and processing of bauxite, a non-renewable resource. Each bauxite deposit has a limited life span based on its size and quality and the economic viability of the extraction operation. The long-term viability of the bauxite mining and alumina refining industries (and to a somewhat lesser extent the smelting industry) requires additions to Australia's proven reserves of bauxite. Although increases in commodity prices and/or decreases in operating costs can lead to additions to economically exploitable reserves, the major means of this occurring is via the discovery of new deposits.

When the aluminium industry was in its infancy in Australia in the late 1950s and early 1960s, obtaining government approval to explore and mine land was relatively straightforward. Australia's mining industry was quite small and underdeveloped, and governments were generally supportive of attempts to exploit Australia's mineral wealth. As there were relatively few environmental regulations in place at that time, obtaining secure access to land for exploration and mineral extraction was not a major concern for mining companies.

Western Mining[5], for example, obtained approval in 1957 to begin an extensive exploration of the bauxite deposits in Western Australia's Darling Ranges. In 1961, the Western Australian Parliament enacted the *Alumina Refinery Agreement Act* which provided the company with exclusive access to known bauxite resources. The lease extended for four 21-year periods. Subject to

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was examined as part of the Commission's 1996 inquiry *Implications for Australia of firms locating offshore* (IC 1996a). Performance gaps in Australia's resource access and environmental regulations were examined by the Commission as part of its *Stocktake of progress in microeconomic reform* (PC 1996b).

[5] Western Mining Corporation (now WMC Limited) was the Australian company which initially explored the bauxite reserves in the Darling Ranges. It then invited two other Australian mining companies, Broken Hill South Ltd and North Broken Hill Ltd, to join it in a venture to develop an integrated aluminium industry based on exploitation of Australia's bauxite reserves. A new company, Western Aluminium NL, was formed. As noted in chapter 2, the large capital requirements and high degree of technical expertise required for such an undertaking were then not available in Australia. This resulted in an offer of partnership status to the Aluminum Company of America in exchange for the required capital and technological support. Alcoa of Australia was formed in June 1961 (Williams 1997).

certain requirements applying to each period, Alcoa was given access to the bauxite from 1961 to 2045. This provided the company with the security it needed to commit the large expenditures required to set up its first bauxite mine at Jarrahdale and alumina refinery at Kwinana.

Approval for the Kwinana-Jarrahdale operation was obtained without the need for a preliminary environmental review, environmental management plan or rehabilitation plan. The original lease agreement stated (Williams 1997):

> ... the Company will where economically possible dump the overburden [from mining areas] into excavations made for the purpose by the Company ... The Company will ensure after its operations on an area that the area is rendered and left tidy but not necessarily restored to its original contour.

This occurred although the bauxite deposits were situated beneath the world's only Jarrah forest — a hardwood much sought after for building and furniture — which was one of the state's major natural resources (see box 7.2).

Obtaining access to the other major Australian bauxite deposits — by Comalco at Weipa in Queensland and by Nabalco in Gove in the Northern Territory — was also relatively straightforward, with both companies being granted long-term mining leases through special State Acts of parliament.

Over the past decade or so, increasing public concerns about conserving the environment and a growing appreciation of cultural and heritage values have had an impact on government decisions relating to land use and resource access. Given that there are a number of possible, often competing, uses for any particular tract of land (including mining, recreation, conservation, tourism, farming, forestry, urban settlement and preservation of Aboriginal heritage), governments have a responsibility to ensure that appropriate trade-offs can be made between conservation and development goals.

The key challenge which governments face in designing institutional frameworks governing ownership and access rights to land and the minerals and other assets it contains, is to ensure that the decision-making process allows competing land-use claims to be assessed fairly and accurately. This increases the likelihood that the community's resources will be allocated to uses which enhance community welfare.

## Box 7.2 Bauxite under the jarrah — multiple land use in WA

An example of the application of multiple and sequential land use concepts is provided by Alcoa's bauxite mining operations which have coexisted with the forestry industry for over thirty years in the jarrah forest in Western Australia's Darling Ranges. Forestry activity in this region has been an important source of wealth and employment for over a century and a half, with large parts of the forest having been logged at some point. Today, the forest covers 20 000 square kilometres, of which Alcoa's mining lease comprises a little under 5000 square kilometres. In recent years, the conservation value of the forests has been appreciated to a greater extent than in the past.

The effective management of these competing land-use claims has been assisted by Alcoa's mine site rehabilitation program. When Alcoa's operations began in 1963, there was no requirement that the company rehabilitate mine sites. By the late 1960s, however, the company had formed the view that at some time in the future, mine rehabilitation would become a mainstream requirement. Unfortunately, the skills and knowledge required to rehabilitate a mined-out bauxite pit in a dry Mediterranean environment — with heavy infestation of an exotic root-rot disease (called 'jarrah dieback') — were not available in Australia, or anywhere else in the world at that time.

Through an extended phase of consultation with universities, CSIRO and other research agencies, Alcoa was able to develop an effective system of rehabilitating the jarrah forest — with a current rehabilitation success rate of 80 per cent of floral species. The program involves: reshaping of mined areas to blend with the surrounding landscapes; construction of earthworks to control run-off and soil erosion; return of topsoil; contour ripping to assist tree root penetration, water infiltration, and erosion control; planting or direct seeding the eucalypt species which are indigenous to the jarrah forest (Jarrah and to a lesser extent Marri, Blackbutt and Bullich); distribution of one to two kilograms per hectare of shrub seeds to supplement understorey growth; and the application of 500 kilograms per hectare of a nitrogen and phosphate fertiliser by helicopter.

In 1990, Alcoa's rehabilitation of bauxite mining areas was recognised by the United Nations Environment Programme through listing on the Global 500 Roll of Honour for environmental achievement. It was the first Australian company, and the only mining company in the world, to be so acknowledged.

For every million tonnes of alumina it refines from bauxite, Alcoa clears, mines and rehabilitates about 75 hectares of land in the Darling Ranges. By the end of 1996, more than 7000 hectares had been revegetated. The current costs to Alcoa for rehabilitation average $15 500 a hectare, with a total of $13 million spent annually on rehabilitation planning, operations and research.

In recent years the increasing size of conservation reserves has meant that there has been less land available for mining and forestry. Effective application of the multiple land use principle requires accurate estimation of the values placed on the land for different activities. Given that a hectare of jarrah forest has an economic yield of less than $20 000 when cut for timber, compared with a yield of more than $2 million from bauxite mining, it is clear that the environmental override threshold — the point at which the value of the land for conservation purposes exceeds that of other uses — is much lower for the timber industry than the mining industry. In any case, the effectiveness of Alcoa's rehabilitation program has reduced the degree of competition between the mining, forestry and conservation land-use claims. When a piece of land is ready for mining, Alcoa notifies the WA Department of Conservation and Land Management which lets contracts for removal of saleable timber. After the bauxite is extracted, Alcoa rehabilitates the land so that it can become either a sustainable resource for the timber industry or used for conservation.

Sources: Interview with Alcoa of Australia Limited and Williams (1997).

The concept of multiple resource use has been broadly accepted as a basic principle of ecologically sustainable development (ESD) for several years (Ecologically Sustainable Development Working Groups 1991).[6] But moving from this broad principle to an effective decision-making framework has been difficult, particularly in the case of exploration and mining (Cox 1997).

Governments at the Commonwealth and state/territory level have pursued a number of broad policy initiatives in relation to resource access in recent years. The ESD concept was formalised for use in assessments of natural resources, land use and approval processes with the signing of the IGAE in May 1992. In 1996, the Commonwealth Government reiterated its commitment to ending the unnecessary duplication of land access decision-making where the states and territories had effective and compatible environmental legislation (Parer 1996). Moreover, according to the Government, land use decisions involving the Commonwealth would: specify clearly and in detail why a reserve had been set aside (rather than just specifying 'tourism' or 'recreation' as reasons for example); make full use of available information; and allow for multiple and sequential land use where appropriate (Cox 1997).

Another area which has the potential to benefit from reform is the means by which conservation areas are classified. The Commonwealth and state/territory governments have recently reached broad consensus on the desirability of adopting an international classification system for protected area management as the basis for a simpler and more consistent categorisation of Australia's conservation areas.[7] A key challenge for policy makers is to ensure that the system does not become too rigid. Successful multiple land use management relies on the use of rigorous cost-benefit processes to ensure that competing land uses, including multiple land uses, are assessed adequately. Also required is an appreciation of the need for dynamic flexibility in resource management regimes to take into account changes in geoscience, mining technologies, markets and social preferences, all of which could require that resource access decisions be revisited at a later stage (Cox 1997).

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[6] Key ESD principles identified by the Working Groups included that: conservation and development needs should be considered using an integrated approach; the goal of resource use decisions should be the maximisation of net benefits to the community, in terms of efficiency as well as environmental and equity considerations; and both conservation and development interests may be accommodated concurrently or sequentially (Commonwealth of Australia 1990).

[7] The relevant system is based on the *Guidelines for Protected Area Management Categories* developed by the International Union for the Conservation of Nature and Natural Resources.

### 7.2.2 Native title

A high-profile land access and use issue which has affected the aluminium industry in recent years is native title. The industry has expressed concerns about a lack of clarity with respect to native title, including uncertainties about the status of Aboriginal property rights stemming from processes under the *Native Title Act 1993* (NTA).[8] One of the industry's key players, Comalco, was directly affected by the original Wik land claim in 1992. This claim was made over 35 000 square km of Western Cape York Peninsula, and included the southern half of Comalco's bauxite mining leases between Weipa and Aurukun.

Although there were a number of different elements to the claim, in essence the Wik peoples argued in the Federal Court that the 'Comalco Act' of 1957 was invalid. After rejection by the Federal Court, the Wik claimants then changed tack slightly and challenged the validity of the so called Comalco Agreement which was executed under the Act and signed between the Queensland Government and Comalco, and the validity of a special bauxite lease granted under the Act. The High Court declared that Comalco's mining lease was valid. The Wik also asserted native title to land covered by a pastoral lease (the Holroyd pastoral holding) and native title to land that was previously subject to a pastoral lease (the Michelton pastoral lease). The High Court determined that the leases involved did not confer rights of exclusive possession on the lessee and did not necessarily extinguish native title. An implication of this determination is that if a mining company — including a company that explores for and mines bauxite — wishes to gain access to minerals on pastoral leases it will need to comply with the NTA, which is likely to involve negotiations with native title claimants.

Although Comalco successfully defended its long-term right to mine bauxite at Weipa, it argues that '... the claim heralded a period of uncertainty concerning access to land' (Submission 3, p. 1). The period of uncertainty also affected the company's planned investments. In its 1993 Annual Report, the company commented that (Comalco 1993, p. 8):

> ... while the Wik land claim is before the courts it casts a shadow of uncertainty over Comalco's bauxite leases. This has led to banks seeking a comprehensive explanation of any likely risks in relation to the Weipa leases before agreeing to

[8] The NTA was introduced in response to a High Court decision in 1992 which recognised native title as an interest in land that survived the declaration of sovereignty over Australia by the British Crown. The Act was intended to meet several objectives: to reduce uncertainty arising from the Mabo (No. 2) decision of the High Court; to give statutory recognition to, and protection of, native title; to address complex social objectives (eg Aboriginal reconciliation and self-determination); and to clarify native title, primarily through case-by-case negotiation.

> finance Comalco's proposed $1.8 billion project to purchase the Gladstone power station and expand the Boyne Island smelter.

In commenting on the costs associated with the Wik land claim, Comalco (Submission 3, p. 2) observed:

> The action involved three levels of Government and a cross-section of land-holders. There were five years of litigation, involving significant legal expenditures by all parties.

Comalco also commented on the increased costs of access to resources under the NTA. It claims that (Submission 3, p. 2):

> Basically, where land may be claimed under the NTA, the cost of access to the resource has been increased, because:
>
> - additional people are involved;
> - time for a decision is extended;
> - more resources are needed to support a negotiation process;
> - scope for compensation for alienation and disturbance of land is augmented; and
> - potential for an expanded royalty regime is introduced.

Alcoa's Western Australian operations have also been subject to native title claims by a number of Aboriginal groups, including the Nyoongah community which has claimed title to Crown land in a region that includes all of Alcoa's mining operations in the Darling Ranges. While Alcoa is confident that its access to bauxite at these sites is secure, the company has observed that (Williams 1997 p. 72):

> If Alcoa's title was more recent, the company would be seriously concerned by this claim.

Due to the age of the bauxite mining leases held by Australia's aluminium companies, the existing industry is reasonably confident of maintaining resource security in the face of native title claims. The four companies which mine bauxite in Australia all had their mining leases approved by state/territory Acts in the 1950s and 1960s. These predate both the Racial Discrimination Act 1975 and the NTA. Hence, for the duration of these leases, native title is suspended, but not extinguished.

But the situation with respect to future developments in the industry is less clear. The only major new bauxite operation initiated since the NTA was Alcan South Pacific's proposed Ely bauxite mine north of Weipa.[9] As part of the

[9] Despite the fact that construction work for the mine and infrastructure had already begun, the project was suspended by Alcan after it signed a long-term bauxite supply agreement with Comalco in February 1998. The agreement provides for Alcan to access

approval process, Alcan successfully completed a series of negotiations with local Aboriginal communities on land access in 1997. The negotiation process took twelve months and involved a range of issues, including the appropriate size and composition of a compensation package.

Alcan's negotiations with the local Aboriginal communities were largely over access to land for road and port facilities to service the mining operation. This example is unlikely to be representative of other new bauxite mining operations, however, as the bauxite mining lease — the key to the project — was actually granted to Alcan in 1965 and also predates the NTA by nearly 30 years. Hence, it remains unclear what the full impact of the NTA and subsequent Wik decision will be on the future shape of Australia's aluminium industry.

Some groups, including Aboriginal representatives, have indicated that claims about uncertainty and related disruption are overstated. In their view, these problems will dissipate as precedents are developed and administration processes are settled.

Nevertheless, it seems inevitable that uncertainties associated with the implementation of the NTA and the implications of the Wik decision will affect mining investment decisions to some degree by raising perceptions of risk and additional costs. The longer it takes for these uncertainties to be resolved, the more costly it is likely to be.

Two broad options are available to the Commonwealth Government to deal with these uncertainties and to reduce transaction costs and delays associated with NTA processes. The first option involves the introduction of legislation to amend the NTA. The second option involves continuing with the status quo and leaving the issues to be resolved by the courts and negotiations between relevant parties. While neither option offers an easy way to resolve the issues, following a process of consultation with pastoralists, industry, indigenous interests and the states and territories, the Commonwealth Government developed a '10 Point Plan' involving proposed amendments to the NTA. The main proposed amendments which affect the mining sector relate to:

- a provision to validate actions by government between the commencement of the NTA (1 January 1994) until the Wik decision (23 December 1996) on land that was previously subject to a freehold or leasehold estate (such as the grant of a mineral exploration license over pastoral lease land);

up to 4 million tonnes of bauxite a year from Comalco's Weipa mine in return for revenue based on the provision of mining services (Howarth 1998).

- provision for a single 'right to negotiate' process and the streamlining of that process;
- the introduction of a stricter threshold test before the 'right to negotiate' is available; and
- the introduction of a sunset clause within which claims under the NTA would have to be made.

The Native Title Amendment Bill was put before the Senate in late 1997. The Senate passed the Bill with amendments, some of which were not acceptable to the House of Representatives when it considered the amended Bill on 6 December 1997. The Government reintroduced the Bill into the House of Representatives, incorporating some Senate amendments, in March this year. The Bill was passed by the House of Representatives and reintroduced into the Senate on 11 March. It is scheduled for debate later this month.

### 7.2.3 Sovereign risk

In discussions with key players in the aluminium industry, a consistent message which has been emphasised, particularly in relation to environmental and resource access issues, is that risk management is an integral part of doing business. An element of risk management extends to sovereign risk — dealing with uncertainty about government decisions affecting important elements of a project. Key areas of relevance to the industry include native title and other access issues, greenhouse gases and power pricing. Perceptions of sovereign risk in Australia compared with that in other countries can significantly influence future investment decisions and exploration patterns and activity levels.

In its submission to this study, Alcoa claimed that its single most pressing concern is to maintain the integrity of access to its bauxite resource which, if threatened, would put its activities at risk. Although Alcoa regards the threat of suspension or cancellation of its bauxite mining lease as minimal, it expressed some concern at recent developments which have reduced, and could further reduce, its available resource — through mechanisms such as native title, Regional Forest Agreements and Australian Heritage Commission listings.[10]

[10] In July 1994, Alcoa relinquished 44 per cent of its mining lease. This reduction was not a major concern to the company as it reduced the bauxite reserves by less than one per cent. The company, however, did express some concern about recent uncertainties associated with Regional Forest Agreement procedures and the potential negative impact on a proposed $1 billion upgrade to its Wagerup refinery. Finally, Alcoa also expressed reservations about the Register of the National Estate because, in its view, it

According to the company, the core of the dilemma is that, when a state/territory government issues title, it is subject to over-riding Commonwealth legislation. However, the Commonwealth does not have authority to issue title to most mineral resources. Although it may initiate actions which prevent free exercise of the benefits of title granted by a state, it cannot initiate actions which reinforce or confirm the rights to that title. As a consequence, 'mineral leases as a grant of title by the states are flawed title in which sovereign risk is inherent' (Submission 5, p. 7).

Alcoa considers that a state agreement, such as the one it received from the Western Australian Government in 1961 giving it long-term access to the bauxite in the Darling Ranges, remains a fundamental prerequisite to any major resource development — but that it is no longer a sufficient condition. The company (Submission 5, p. 7) concluded:

> Alcoa recommends that the Commonwealth and the states investigate ways to reform their legal relationships, such that resource developers may obtain from Government title which insures against sovereign risk from the Commonwealth to the same degree as it currently insures against that risk from the states.

Dealing effectively with the sovereign risk issue is not straightforward for Commonwealth or state/territory governments alike. While avoiding risk due to poor policy design and delivery is clearly desirable, environmental and resource access decision-making processes need to allow some flexibility so that decisions can be reviewed in the light of new information such as developments in mining technologies and changes in community preferences. The key for governments is to achieve an acceptable trade-off between certainty and flexibility.

## 7.3 Greenhouse gas emissions

Discussions with the key players in Australia's aluminium industry during the course of this study revealed that the issue of GHG[11] abatement was one of the most important policy questions facing the industry. The following section provides some background on international developments directed at curbing

carries with it the potential for selective Commonwealth intervention under Section 30 of the Australian Heritage Commission Act (Submission 5, pp. 1-13).

[11] GHGs are gases in the atmosphere that absorb and scatter radiation from the sun in a process known as 'radiative forcing'. This process disturbs the balance between incoming and outgoing radiation, and the climate responds to re-establish balance by either warming or cooling the surface of the earth. The major human contributions to GHGs are carbon dioxide and methane, and (to a much lesser extent) nitrous oxide, hydrofluorocarbons, PFCs and sulphur hexafluoride (ABARE 1997c).

the growth of GHG emissions and examines the implications of abatement policies for the industry.

### 7.3.1 International developments

Increased atmospheric concentrations of GHGs have led to global concerns that human activities could cause accelerated changes in climate patterns. While a range of views currently exist on the urgency and appropriate form of a global greenhouse response, the challenge for national governments is to assess the threat posed by climate change and to match this threat with policy responses that are timely and cost effective (IPCC 1995). One thing is patently clear, the problem cannot be solved by relying on action by single countries. Australia, for example, is responsible for around 1.4 per cent of global emissions. Hence, actions taken by Australia on its own to reduce these emissions would have little impact on the overall problem. What is needed is multilateral action. There have been substantial international efforts over the past few years to formulate policies to curb the growth of GHG emissions.

The United Nations Framework Convention on Climate Change (FCCC), which came into force in March 1994 (and to which Australia is a signatory), sought to stabilise the level of atmospheric concentration of GHGs at a level that would prevent 'dangerous human interference with the climate system'. Significantly, the Framework Convention recognised the desirability of considering the specific circumstances and capabilities of countries in allocating abatement responsibility and that the burden of abatement needs to be shared equitably (United Nations 1992).

The first Conference of the Parties to the FCCC was held in Berlin in early 1995. It resulted in agreement on a mandate for further negotiations aimed at developing policies and setting quantified GHG emission limitations and reduction objectives for a group of developed economies for the period beyond 2000.[12] The deadline for negotiations to conclude was the third climate change conference held at Kyoto, Japan in December 1997. Key outcomes from the Kyoto conference are summarised in section 7.3.4.

[12] Over 150 countries are Parties to the United Nations FCCC. These countries are split into two groups, Annex I and non-Annex I Parties. The former group is made up of countries which have committed to emission abatement under Article 4.2(a) and (b) of the FCCC. These comprise OECD economies (excluding Mexico and South Korea) and transition economies (including the former Soviet Union and other Eastern European countries). Non-Annex I Parties are those Parties not listed in Annexes to the FCCC (ABARE 1997c).

### 7.3.2 GHG emissions and the aluminium industry

There are several sources of GHG emissions from the aluminium industry. As noted earlier, aluminium smelters emit carbon dioxide and PFCs as part of the smelting process. Anode production also results in GHG emissions, largely due to the burning of natural gas during the lengthy (up to 28 days) baking process, and to a lesser extent from the anodes themselves as they cool down prior to being used in the potlines. In the refining industry, GHG emissions come about as a result of the high levels of process heat required to maintain the temperature of the caustic soda solution. This is generated by the on-site burning of fossil fuels — gas and coal in Alcoa and Worsley's WA operations, diesel fuel in Nabalco's refinery in Gove NT and coal in QAL's refinery at Gladstone. Hence, GHG emission abatement activities are also likely to have quite a substantial impact on the operations of the refining industry.

These direct emissions of GHGs from the aluminium industry are significant in their own right, but there is another, larger, source of aluminium-related GHG emissions. As noted in earlier sections of this study, the aluminium smelting industry is a large consumer of coal-based electricity — with the exception of Comalco's Bell Bay operation which uses hydroelectricity.[13] A study by the BIE (1996f) estimated that over half (53.4 per cent) of Australia's GHG emissions are energy-related. Aluminium smelting alone accounts for 18 per cent of total electricity consumption in the states in which it operates (ACIL 1995).[14]

Clearly, GHG emissions by the power stations cannot be attributed directly to the aluminium industry, but they are important to the industry in the context of the GHG emissions reduction debate. Depending on the type of policy adopted, government efforts to reduce Australia's GHG emissions could result in substantially higher costs of electricity generation, which would flow through into higher inputs prices for the aluminium smelting industry.

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[13] The overwhelming majority of the world's energy is derived from three sources: hydroelectricity, nuclear reactors and fossil fuels. Australia generated nearly 80 per cent of its electricity from coal in 1992. Of the remaining sources, gas accounted for 8.8 per cent, hydro 9.2 per cent, oil 2.3 per cent and renewables 0.4 per cent. This pattern of fuel usage differs greatly from most other countries. The European Union, for example, obtains only one-third of its electricity from coal, with nuclear power providing one-third and hydro 13.4 per cent. (ABARE 1997c).

[14] In terms of overall energy consumption, around 36 per cent of the energy used by Australian industry in 1993-94 was consumed by the manufacturing sector. The largest energy user within manufacturing is basic metals, accounting for one-third of the energy used by the sector — and the single largest energy user within the basic metals industry is the aluminium smelting and alumina refining industry.

The Australian aluminium industry is both directly and indirectly responsible for a disproportionately large industry share of Australia's GHG emissions. For example, ACIL (1995) estimates indicate that if Australia had no aluminium industry (and Australia's economy were the same size) carbon emissions would be reduced by 6.5 million tonnes and average per capita emission from all energy sources would be lower by 8 per cent. Hence, efforts to reduce GHG emissions have the potential to affect the industry significantly.

Despite its high energy requirements for initial production, aluminium has developed a reputation as an environmentally friendly metal, due, in part, to the ease and efficiency with which aluminium can be recycled.[15] Production of secondary (recycled) aluminium uses only 5 per cent of the energy required to produce primary aluminium, resulting in a 94 per cent saving in attributable carbon dioxide emissions. The metal is also used extensively in a range of transport applications as a result of its durability and lightness compared with other metals and materials. It allows high speed travel with reduced energy consumption and the same carrying capacity. Aluminium's recyclability also gives it advantages in packaging, while its strength-to-weight ratio is an added factor for building applications. These properties mean that a full appreciation of the impact of aluminium production and use on GHG emissions requires an examination of life-cycle issues. This question is beyond the scope of this paper, however it has been examined elsewhere (see, for example, ABARE 1992 and ACIL 1995).[16]

### 7.3.3 Policy measures to reduce GHGs

There are two broad types of policy measures to reduce GHG — 'no regrets' and 'pollution-response' policies. 'No-regrets' policies aim to reduce GHG emissions indirectly, as an outcome of improvements in the efficiency with which energy is generated and used. They do not rely on the possible detrimental effects of climate change for their justification. In contrast, 'pollution-response' policies target GHG emissions directly, drawing on the possible detrimental effects of climate change for their justification. The latter

[15] Aluminium is amenable to what is known as 'absolute' recycling, which means that provided the required metallurgical properties can be maintained during reprocessing — by adding small amounts of alloying compounds if needed — aluminium can be re-melted and re-used limitlessly, unlike many other recycled products.

[16] A related question is *where* the environmental benefits from use and recycling of aluminium are registered. Australia, for example, exports the vast majority of the aluminium and alumina it produces. For a discussion of Australia's overall trade structure and GHG emissions see BIE 1994b.

policies entail a loss of production and income in order to realise the benefits of emission reductions (ie a reduction in the social costs of GHG emissions). Each is discussed in turn.

### *'No-regrets' measures*

'No-regrets' measures are GHG abatement initiatives which are expected to impose no net costs and possibly produce net economic benefits to industries and the wider community. Examples include energy efficiency related education and information programs and reforms to inefficient energy pricing regimes. A major element of the Commonwealth Government's *Greenhouse 21C* program launched in 1995 involved the development of cooperative agreements directed at achieving voluntary reductions in GHG emissions by industry (Commonwealth of Australia 1995).

The aluminium industry was one of the first industries to join the program. All firms in the refining and smelting sectors have now signed voluntary agreements. Between 1990 and 2000, Australia's aluminium smelters anticipate reducing their total equivalent carbon dioxide emissions per tonne of aluminium by about 20 per cent. Total emissions will rise over the period because of smelter expansions, but at a slower rate than the growth in capacity. Over the same period, GHG emissions will fall by about 14 per cent per tonne of alumina. Again, total emissions will actually rise over the period, by around 10 per cent, although capacity will have grown by 18 per cent (AAC 1997a).

An example of how some of these improvements in energy efficiency will be achieved is provided by Comalco's Boyne Island aluminium smelter at Gladstone (Qld). Strategies to reduce the smelter's GHG emissions include: switching from crude oil to natural gas for a number of production processes; improved cell design; upgrading of the resmelt furnace; reducing net carbon consumption of anodes; and, employing state-of-the-art technology for the new third potline (BIE 1996f).

Studies have indicated that large energy users appear to use energy more efficiently than smaller users. Hence, the scope for cost-effective energy efficiency improvements is likely to be greater among smaller energy users and less for energy-intensive industries (BIE 1996f). As noted in chapter 3, the Australian aluminium industry is highly energy efficient, with the Oceania region (which also includes New Zealand) using about 3 per cent less electricity to produce a tonne of aluminium than the global average (IPAI 1997). A key determinant of energy efficiency is smelter age. Newer smelters are more energy efficient than older ones. Given that Australia's stock of smelters is relatively young by global standards and has limited opportunities to substitute low carbon energy sources for higher carbon sources, the scope for further

improvements in energy efficiency is relatively limited, unless there is a major technological advance. So, while there is scope to reduce Australia's GHG emissions via 'no-regrets' measures, the achievable reductions in GHG emissions are likely to be modest.

### *'Pollution-response' measures*

'Pollution-response' measures to achieve GHG emission reductions include regulatory standards, market-based mechanisms or a mixture of both. In broad terms, these measures seek to change relative prices to promote reductions in the consumption of high carbon fuels in favour of low carbon fuels and an overall reduction in fossil fuel consumption. Reductions in GHG emissions as a result of these measures induce changes in industry output levels and activity. The idea of applying a carbon tax as a 'pollution response' measure has attracted considerable interest. A carbon tax places higher taxes on high carbon emitting fuels (such as coal) relative to lower carbon emitting fuels (such as natural gas and renewables).

A number of studies have sought to estimate the likely economic impact of carbon taxes introduced to stabilise Australia's GHG emissions (see, for example, IC 1991c, McKibbin, Pearce and Stoeckel 1994 and ABARE 1997c). In general, these studies suggest that carbon taxes will have a negative impact on the Australian economy, with the energy-intensive/export-oriented industries bearing the greatest cost.[17]

Despite the growing number of these studies, very few disaggregate their findings to a detailed industry level. The most recent and comprehensive set of estimates which contain industry level assessments were presented in ABARE (1997c). The study estimated the possible impact on various Australian industries of a carbon tax sufficient to reduce Australia's energy-related GHG emissions to 1990 levels by 2010. The study also assumed that other Annex I countries stabilise emissions over the same time frame.

Declines in output were projected for a number of Australian industries. By far the largest declines were projected for the nonferrous metals industry — which is largely made up of the aluminium smelting and alumina refining industries. Nonferrous metals production in Australia was projected to be around 50 per cent lower in 2010 than would be the case under a business-as-usual scenario. As the target used is considerably tighter than was agreed at Kyoto, and does

[17] A survey of a number of studies relating to the economic impact of reducing GHG emissions in Australia by the BIE (1994c) found that stabilising emissions at 1990 levels by the year 2000 could cost the Australian economy between 0.4 and 1.6 per cent of annual GDP.

not include non-energy related GHGs and land clearing, the magnitude of the projected reduction overstates the likely industry level contractions in activity. The ultimate effects on energy-using industries are influenced also by assumptions made about the possibilities for substitution between different sources of energy, the rate of improvement in energy efficiency over time and the required level of tax to yield the target reductions in emissions.[18]

However, the model results do highlight the importance of GHG policies for the aluminium industry, particularly given that the projected decline was twice the magnitude of the fall in output expected for the next most adversely affected industry (Iron and steel).

An earlier ABARE study specifically looked at the impact of greenhouse gas policies on the aluminium industry (ABARE 1992). It argued that, since more than half of the world's aluminium is produced in smelters using hydroelectricity, these producers would largely avoid the impact of greenhouse policies on electricity generation. Moreover, around half the world's aluminium is produced in countries that have a wide range of energy sources including hydro and nuclear as well as coal, oil and gas. The study noted that Australia's reliance on coal-based electricity meant that (ABARE 1992, p. 8):

> Greenhouse policies, therefore, are capable of reducing the attractiveness of Australia to companies involved in the aluminium industry. The electricity price increases that are implied by a range of policy responses to greenhouse targets under consideration may result in the loss of a significant value adding and major exporting industry that may be very difficult to re-establish in the future.

Although, for the purpose of convenience, aluminium smelting and alumina refining are often grouped together (as in ABARE 1997c), a carbon tax or other form of pollution-response measure is unlikely to have a uniform impact on the performance of each industry. The alumina refining industry's differing cost structure and energy requirement profile, greater flexibility to change energy sources and other unique competitive advantages suggest that the industry as a whole is unlikely to be as adversely affected by a carbon tax as the smelting industry.

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[18] One of Australia's other leading greenhouse models — G-Cubed (McKibbin, Pearce and Stoeckel 1994) — generally requires a lower carbon tax for a given emissions reduction scenario than that used in MEGABARE. This means that the projected reductions in activity within the Australian economy are somewhat lower than ABARE's results. Unfortunately, G-Cubed does not provide a level of disaggregation sufficient to identify possible effects on the aluminium industry.

### 7.3.4 Implications of the Kyoto outcomes

The importance of the Kyoto climate change conference outcomes (see box 7.3) for the aluminium industry was highlighted in discussions with aluminium firms in the lead-up to the conference.

**Box 7.3 Key outcomes of the Kyoto climate change conference**

- Differentiated rather than uniform (or flat-rate) country targets were accepted as a core principle.
- An overall target reduction in total GHG emissions by Annex I countries (developed countries) of 5.2 per cent of 1990 levels by 2012 was agreed, with different targets for Annex I countries consistent with the overall target.
- Australia's total emissions of GHGs are allowed to rise by 8 per cent by 2012 from the 1990 baseline. Two other countries — Iceland and Norway — negotiated targets which permitted increases in GHG emissions over this period, while three countries — New Zealand, Russia and the Ukraine — agreed to stabilise their emissions at the baseline level.
- Countries can act jointly to fulfil their commitments. For example, although European Union members have committed jointly to an 8 per cent reduction in their aggregate emissions, they will be required to agree to individual targets and to notify these targets at the time of ratification.
- The changes in GHG emissions resulting from human-induced land-use change and forestry activities were included in all countries' targets. Land-use change and forestry activities account for almost one-fifth of Australia's emissions.
- Non-Annex I countries (developing and newly industrialising countries) were not part of the Protocol.

Source: United Nations 1997, ABARE 1998b and DFAT 1997b.

In light of aluminium firms' concerns, it was to be expected that the announcement of the key elements of the Kyoto protocol at the conclusion of the conference in December 1997 would result in a positive response from aluminium companies. This was generally the case. The Executive Director of Alcoa's smelting operations, for example, stated (Hayward, 1998, p. 240):

> ... the outcome secured by the government at the Kyoto climate change conference will provide us with a window of opportunity to determine an effective future strategy.

However, the AAC (1997b) also noted:

> A target for Australia of 8 per cent growth really means a significant reduction on the current projections of Australian emissions. It will be a major challenge to achieve such a cut in emissions growth in Australia without adverse impacts on economic growth.

In submissions to the Commission following the conference, nearly all firms indicated that it was too early to assess with any accuracy the likely impact of the Kyoto outcomes on their operations, the aluminium industry in Australia or the global industry. Nevertheless, firms did voice a number of concerns about the scope, coverage and ratification procedures. A selection of firms' reactions to the Kyoto outcomes are presented in box 7.4.

Most firms were of the view that GHG targets agreed to at Kyoto would have some impact on Australia's aluminium smelting and alumina refining industries. However, the impact on aluminium smelting was generally expected to be greater than that for alumina refining. For example, Alcoa (Submission 11, pp 1-2) argued that:

> The aluminium smelting industry will be impacted to a greater extent because of the higher energy requirements and the fact that most of the energy required is electrical energy whereas the refineries use fuel for combined cycle power generation and process heating.

Prior to the Kyoto resolution, a number of firms raised the prospect of emission leakage — the displacement of carbon dioxide emitting activities from countries with abatement policies to countries without abatement policies — in the event of the omission of developing countries from any ensuing international agreement to limit GHG emissions. Comalco Smelting, for example, argued that a carbon tax on its Australian operations would have a serious impact on its competitiveness relative to developing countries. According to the company (Submission 4, p. 2):

> To increase the regulatory burden in Australia would mean that non OECD countries would be the next point of development, a move which could be detrimental to the goal of controlling global greenhouse gas emissions.

Subsequent discussions with the industry in early 1998 revealed that most firms thought that the omission of non-Annex I countries (developing and newly industrialising countries) from the Kyoto Protocol was a significant negative outcome and would have an impact on the development of the global aluminium industry (box 7.4). The omission of these countries impairs the effectiveness of the Protocol for a number of reasons.

### Box 7.4 Aluminium industry reaction to Kyoto outcomes

'The outcome is a reasonable and fair result for Australia. If properly managed there will be room for further growth in the aluminium industry'.

'Although the Kyoto outcome appears to have been a good result for Australia in terms of the criteria and target, there are still major methodological issues, criteria and rules to be sorted out that may change the difficulty of achieving the target'.

'The Kyoto determination has not been ratified at the highest levels and may not be, hence the likely impact does little to increase certainty. The omission of developing countries from the Protocol increases the likelihood of offshore investment in the event of any carbon tax in developed countries'.
'If the Kyoto determination is not ratified by the US Senate, then there will have been nothing achieved in defence of the Australian industry position. The ultimate likely outcome will be a greenhouse gases tax, which will not help the industry in Australia'.

'There is already a trend for almost all greenfield smelters and most brown field smelter expansions to be in non-Annex I countries — the Kyoto outcome will reinforce that trend'.

'The universal expectation that the USA will not ratify the Protocol for many years (if ever) presents a further uncertainty and indicates that Australia has to be very careful when choosing policies and timing regulations that may impose costs on Australian industry ahead of even US industry, let alone the concern about non-Annex I industries'.

'Given the circumstances, Australia has made the best of the situation, but this issue has not disappeared'.

Source: Selection of comments made by aluminium firms in submissions to the study.

First, the exclusion of non-Annex I countries has the potential to significantly increase the costs of cutting global GHG emissions. Developing countries typically have low levels of energy efficiency, which can be improved through the transfer of appropriate energy technologies. The strong growth of developing economies has a tendency to increase the rate of obsolescence of old technology and improve the economics of replacement (BIE 1996f).

A related issue concerns the eligibility of Annex I countries to earn emission 'credits' for any abatement assistance provided to developing countries. An international tradeable permit or emission trading scheme has been promoted by some countries, such as the United States, as a mechanism to reduce the international cost of reducing GHG emissions. Some studies also suggest that the economic costs of reducing GHG emissions would be lower if a system of tradeable permits were employed within Australia instead of regional or activity-specific reduction targets (eg Cornwell, Travis and Gunasekera 1997).

Second, the omission of non-Annex I countries from the Kyoto Protocol means that some level of emission leakage is likely. This raises the prospect that the GHG abatement initiatives of Annex I countries (including Australia) may result (at the margin) in new investments in GHG-intensive activities such as aluminium smelting — and to a lesser extent alumina refining — shifting to those countries which have less stringent emission requirements. In this event, the overall GHG emissions from these activities will actually be higher than would have otherwise been the case. However, although energy prices are influential, they are only one of a number of determinants of investment

location. Investment decisions are influenced also by a host of other resource, commercial and government-related factors.

There are a number of issues yet to be resolved which will determine the full impact of Kyoto on the Australian aluminium industry and the economy in general. Several firms expressed concerns about whether the Protocol would actually come into force as all elements are not fully supported by major players, notably the United States (box 7.4). Moreover, even presuming that it is ratified by a sufficient number of countries, it is by no means clear when the Protocol will come into force. The period in which the Protocol is open for signature extends from March 1998 to March 1999. Following this, parties will have the option of ratifying the Protocol. The Protocol will then enter into force on (United Nations 1997, Article 24):

> ... the ninetieth day after the date on which not less than 55 Parties to the Convention, incorporating parties included in Annex I which accounted in total for at least 55 per cent of the total carbon dioxide emissions for 1990 of the Parties included in Annex I, have deposited their instruments of ratification, acceptance, approval or accession.

Finally, a factor which will influence the costs incurred by Australia in meeting its emission target is the extent of GHG emission reductions which can be achieved from changes in land-use. There remains uncertainty about the level of achievable reductions and how accurately these can be measured (DFAT 1997c). Moreover, the emission reductions available from land-use changes cannot be sustained indefinitely. Their inclusion in the Kyoto Protocol has provided Australia with some time to restructure other aspects of its energy production. In particular, it is expected that Australia's gas infrastructure will be expanded substantially over the next decade (Hill 1997).

## 7.4 Concluding comments

In recent years, Commonwealth and state/territory governments have sought to improve the way in which Australia's environmental regulations are framed and administered. Efforts to effect improvements have focussed on: reducing duplication and overlap; streamlining approval processes (including parallel regulation); and introducing greater sophistication and flexibility into the administration of environmental regulation. Although there remains clear scope for further reform in these areas, firms in general expressed satisfaction about the pace of change.

There were, however, two notable exceptions. The policy stance of the Australian Government in relation to GHG emissions together with international developments in this area in the lead up to the Kyoto Conference

attracted considerable interest within the industry, particularly in terms of possible adverse implications for the future competitiveness and viability of future investment in the industry. This reflects the energy-intensive nature of alumina refining and aluminium smelting. The industry endorsed Australia's stance on differentiated targets for GHG emissions and has subsequently responded positively to the outcome of the Kyoto Conference in terms of Australia's overall target. However, the exclusion of developing countries from the agreement could improve their attractiveness at the margin as a location for future investments. Such an outcome would be counterproductive from the viewpoint of initiatives to address global warming.

The other key issue related to land access/resource security. Some firms viewed reforms in this area negatively and expressed particular concern about processes for giving effect to the NTA. Firms argued that the costs of access to land have been raised due to the uncertainties and time delays associated with the process and additional resources expended in negotiation — the impact of which is expected to be manifest largely in *future* investment decisions by the industry rather than in the operations of existing facilities. The Commission considers that these influences will adversely affect investment decisions to some degree and that it is important to clarify the property rights inherent in native title and improve the associated administrative framework as soon as possible.

# 8 TAXATION ARRANGEMENTS

*A wide range of taxes and charges affect the aluminium industry's cost structure, net revenue, competitiveness and investment decisions. While it can be expected that firms would prefer to pay less tax, a range of concerns drive the largely negative perceptions of the Australian taxation system held by firms in the aluminium industry.*

*These concerns cover three broad areas. First, inefficiencies arising from the present tax structure, notably cost imposts on various inputs and related adverse effects on competitiveness. Second, various aspects of the corporate tax regime — including the statutory rate of corporate tax, the design of depreciation and investment provisions and the treatment of R&D — are perceived as impairing the industry's competitiveness relative to other countries. Finally, compliance and administration costs relating to some areas of the tax system are viewed as excessive.*

This chapter deals with a range of issues related to taxation and government charges. It begins by outlining some benchmarks commonly used for assessing the performance of tax systems (section 8.1). Firms' perceptions about the influence of various taxes and charges on their competitiveness and investment decisions are discussed in section 8.2. The subsequent discussion deals in turn with the main areas of taxes and charges affecting the industry — indirect taxes, corporate taxation, the fringe benefits tax (FBT) and the research and development (R&D) tax concession.

## 8.1 Benchmarks for assessing tax systems

Taxation is the major source of revenue to fund the activities of government. The way in which taxation is levied has significant efficiency and equity implications for economic agents throughout the economy. Taxation structures can be evaluated against criteria relating to efficiency, equity and simplicity. In broad terms:

- an efficient tax regime minimises distortions to pre-tax patterns of production, investment and consumption (ie minimises so-called 'deadweight losses');
- an equitable tax system provides similar treatment to taxpayers in similar economic circumstances (horizontal equity), and ensures that the

financially better off pay a greater share of the tax burden (vertical equity); and

- a simple tax system is one which is easily understood and applied, which implies cost effective administrative and compliance costs.

Other relevant considerations include:

- stability, which means that the tax system is not changed frequently, and on an ad hoc basis;
- the fiscal strategies of governments at the various levels, which define the revenue raising requirements of the tax system;
- the appropriate taxation of foreign firms which choose to invest in Australia, as Australia is entitled to first claim of the taxation revenue from returns on the Australian activities of foreign multinational enterprises (MNEs); and
- the appropriate taxation of Australian firms which choose to invest abroad, as foreign governments are entitled to first claim of the taxation revenue from those MNEs, and Australia is entitled to the residual.

In the following sections, the Commission refers to the criteria outlined above in examining the concerns raised by aluminium firms. In this context, it is critical to examine whether proposed changes would improve the overall performance of the tax system. This approach reflects the Commission's view that tax reform should improve the living standards of all Australians, rather than be used to favour particular industries or groups in the community.

## 8.2 Broad influences of taxes and charges on industry competitiveness

Of all the microeconomic reforms covered by the survey, changes to taxes on inputs (other than labour) were ranked by firms as having the second most important negative impact on their competitiveness over the period 1990 to 1996.

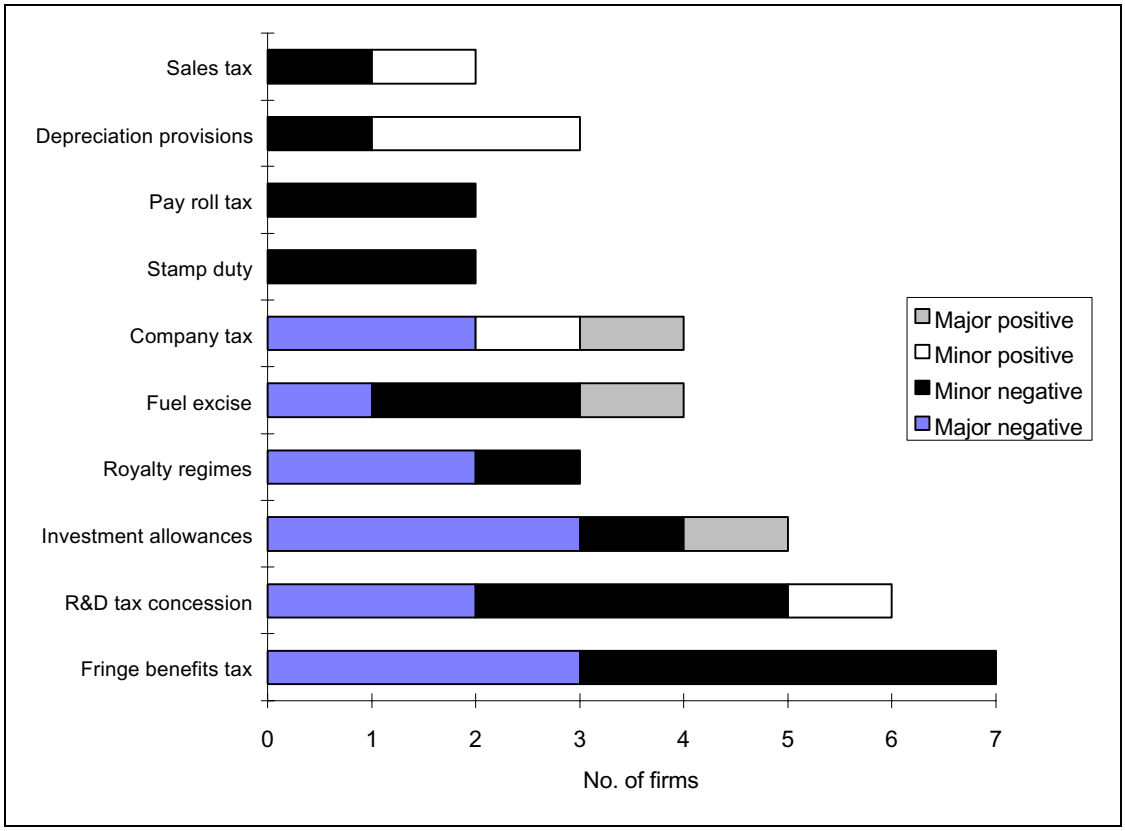
Taxation and royalty arrangements were also ranked as the second most important negative factor likely to affect investments in the aluminium industry over the next 3-5 years (see chapter 4). CRA (Submission to the IC's inquiry into the implications for Australia of firms locating offshore 1995, p. 18)

commented that:

> The mining industry must operate with a long term perspective and needs an environment conducive to long term decision making. This is particularly applicable in the taxation/royalties area.
>
> ... Changes to regulations affecting FBT and the Diesel Fuel Rebate add further pressure to new projects.

When firms were asked what impact changes to specific taxes and charges have had on their competitiveness between 1990 and 1996, most firms reported that the changes have had a negative impact. Changes to FBT, the R&D tax concession, investment allowances, royalties and fuel excise attracted the most negative assessments. Changes to company tax, depreciation provisions, sales tax, the R&D tax concession, investment allowances and fuel excise were viewed by one or two firms as having a positive impact on their competitiveness (figure 8.1).

Figure 8.1 Impact on competitiveness of changes to business taxes and charges, 1990 to 1996




Source: Aluminium industry survey 1997.

Firms also provided assessments of the impact of tariff reductions on their inputs, tariff concessions/policy by-laws on their operations, as well as the impact of various labour on-costs, including payroll tax. In general, firms indicated that the program of general reductions in tariffs had a small positive impact on their competitiveness. Views on changes to tariff concessions varied with four firms indicating a minor positive impact, while two firms assessed changes in this area as having a minor negative impact. The positive rating of some firms probably reflected the duty-free entry of non-competing imports (such as plant and equipment for use in refineries and smelters) up until July 1996. The negative assessments by the firms probably mirror the imposition of a 3 per cent duty on these imports from July 1996.

Changes to labour on-costs, such as payroll tax, workers' compensation and the superannuation levy also attracted differing assessments with most firms indicating that overall changes in this area had a minor negative impact on their competitiveness. Issues associated with labour on-costs are taken up in chapter 6.

Comments by firms in the aluminium industry and by related industry bodies, such as the AAC and the Minerals Council of Australia, highlighted what they regard as weaknesses in Australia's existing taxation system. Many of these comments mirror concerns raised as part of the wider debate about tax reform. The main concerns raised by the firms participating in this study included:

- inefficiencies associated with the existing tax structure, such as the cost imposts of taxation on business inputs and the adverse effects on competitiveness;
- aspects of the corporate taxation regime, including the statutory rate of corporate tax and the treatment of physical business inputs and R&D which are seen as deterring investment in the industry; and
- 'excessive' compliance and administration costs, notably in respect of depreciation provisions and FBT, which impose an extra burden on firms.

These issues were not confined to a limited set of taxes, but were seen by survey participants as relevant to many different forms of taxes. The subsequent discussion deals with the main areas of taxation — indirect taxes, corporate taxation, the FBT and the R&D tax concession — raised by firms in their submissions and during firm visits.

## 8.3 Indirect taxation

Firms and related industry bodies expressed particular concern about the many Commonwealth and State taxes that apply to business inputs, claiming that in

general they inflate production costs, have a cascading effect on final product prices and impose a cost penalty on their exports. They also commented on the narrowly based system of indirect taxes as well as the highly variable tax rates that apply.

The Minerals Council of Australia (Submission to the IC's inquiry into the implications for Australia of firms locating offshore 1996a, p. 40), for example, commented that:

> The mining industry has particular concern with the problem of taxation on inputs to production. This can have a very serious adverse impact on Australia's international competitiveness. Taxation on inputs to production becomes embedded in the cost of production but often cannot be passed on in terms of an increase in the export price. Most other industrialised countries support export industries with taxation systems which avoid taxing exports (or provide border taxation relief).

Several firms in the aluminium industry raised similar concerns in either their submissions or during industry visits.

The Commission agrees that a fundamental weakness of the current indirect tax structure is the failure to exempt all inputs into production processes. Freebairn (1997, p. 7) has noted that over half of the current indirect taxes fall initially on selected business inputs. These taxes become embedded in the cost of production, distort production choices and introduce a bias against production of exports. This can result in substantial losses to the economy. For example, the IC (1994b, p. 269) estimated that GDP would increase by $1.1 billion if taxes on petroleum products used as business inputs were replaced by a consumption tax on household purchases of petroleum products.

Commodity taxes in Australia tend to be narrowly based, with many exemptions (for example, services and some goods are not subject to wholesale sales tax). The rates applying under these taxes are also highly variable — this suggests that efficiency losses from these disparate taxes will be greater than if commodity taxes were rationalised and a more uniform rate structure applied. Albon (1996) estimated that replacing the wholesale sales tax, excise taxes and business franchise fees[1] with a uniform commodity tax to collect an equivalent amount of revenue would result in efficiency gains of at least $2 billion per year.

Firms in the aluminium industry were particularly critical of the fuel excise claiming that it is an inefficient tax that impedes their competitiveness.

[1] On 5 August 1997, the High Court determined that all business franchise fees are unconstitutional. The Commonwealth Government has since commenced levying similar fees on behalf of the State and Territory Governments.

Originally, farmers and miners did not pay tax on diesel but, since 1982, they have paid the full tax and received a rebate on excess tax paid for off-road uses.[2] The diesel fuel rebate for mining and mineral resources is set at just over 90 per cent of the excise — this is equivalent to around an 11.8 per cent wholesale tax on diesel used for off-road purposes (Access Economics 1996).

QAL (Submission 1, p. 11) commenting on the fuel excise indicated that:

> Australian mining and minerals processing operations are significantly disadvantaged by the level of taxation on diesel fuel when compared with the fuel taxes that are levied on our major exporting competitors.
>
> The imposition of fuel oil excise duty on export oriented industries such as the alumina industry directly impacts on their international competitiveness in this world commodity market.

And Alcoa (Submission 5, p. 21) commented that:

> It is widely agreed that duty on diesel fuel was introduced as an offset against the damage to Australia's public road network by (generally) heavy transport equipment, and that for reasons of equity the duty should not be paid by off-road diesel users. The principle is reinforced by the concern about the distorting effect of a tax on inputs to an export-oriented industry such as the mining industry. It has always been clear that a system of collecting and then rebating diesel fuel duty to eligible off-road users is an inefficient, costly and bureaucratic response to a simple principle, and that it leads to a constant concern by the mining industry that the duty has become a cemented feature of the tax base wherein rebates are continuously at risk.

Research by Access Economics (1996, p. 11) also found the diesel tax is 'strikingly inefficient' and estimated that:

> ... diesel taxes on miners destroy at least 49.7 cents in value for every dollar they raise.

It could be argued that a relatively heavy tax burden can be applied to petroleum products because the demand for them is relatively inelastic — use of petroleum products is less responsive (in the short term) to changes in prices than most other commodities. If this were true, taxes on petroleum products would be a relatively efficient way to raise revenue because activities would be distorted less than would be the case with taxes on other goods and services.[3]

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[2] In commenting on these changes, Gilbert (1997) points out that only road users paid the excise from its introduction in 1957 until the rebate system was introduced in 1982. In Gilbert's view, it is inappropriate to regard the rebate as a form of subsidy simply because of a change in the administrative arrangements for collecting the excise.

[3] The predominant reason for taxes on petroleum products is to raise general revenue. Commonwealth excise collected from transport fuels is no longer hypothecated to road expenditure.

However, some firms operating in highly competitive world markets cannot pass the taxes on petroleum products on to final consumers.

To the extent that taxes do not fall evenly across all firms/industries, they can reduce the competitiveness of one firm/industry versus another. Nabalco, which mines bauxite and refines alumina at Gove in the Northern Territory, is a case in point. It is the only Australian alumina producer directly dependent on fuel oil (it uses around 465 000 kilolitres of fuel oil per year for power generation and process heat, equivalent to 60 per cent of all fuel oil used in Australia) and it is unable to convert to natural gas or other fuels. The 3 cents a litre increase in the tax on fuel oil in 1993-94 increased Nabalco's production costs by $9 a tonne and effectively imposed a 13 per cent export levy on Nabalco's alumina (Nabalco 1994, p. 7). In December 1995, Nabalco was granted a concession (effective from 1 January 1996) — the rate of excise on fuel oil was reduced by 1.977 cents per litre which equates to a concession of around $11 million out of the company's total annual bill of around $41 million. Despite the concession, the tax remains as a discriminatory imposition on Nabalco's production costs.

QAL (Submission 1, p. 11), however, claims that, although it has reduced its direct exposure to the fuel excise by substituting natural gas as a fuel oil in its calcination operations, it is indirectly affected by the excise duty on fuel oil through the terms of its gas supply contract in which the price of gas is tied to the movements in the landed cost of fuel oil. The company reported that at the time of the signing of its gas supply contract, gas commodity markets in Queensland were non-existent and high excise taxes on competing fuels (such as furnace oil) had an impact on the final market price for natural gas.

QAL also raised the adverse effect that the removal of 'operations connected with beneficiation' clauses from the diesel fuel rebate scheme and the deletion of a rebate on sea transport of mineral ores from mine site to place of beneficiation have had on the firm's competitiveness.

Compliance costs associated with the diesel fuel rebate scheme were also an issue raised by firms. Alcoa (Submission 5, pp. 20-21), for example, commented that the scheme is a 'bureaucratic nightmare' and recommended that the government abandon it for those mining organisations which could achieve certification of their fuel management processes. It suggested that a spot inspection system be instituted by the Australian Customs Service, backed by substantial penalties, including suspension of the certification, for illegal use of duty free diesel fuel (box 8.1).

### Box 8.1 Management of the Diesel Fuel Rebate Scheme

Alcoa considers that 'management of the Diesel Fuel Rebate Scheme (DFRS) is becoming a bureaucratic nightmare'. The company reported that the Australian Customs Service (ACS) has circulated a redesigned claim form to meet the recommendations of the Australian National Audit Office. Part B of this claim form, which must be completed for every mine, asks forty-two questions, including information about all equipment that uses rebateable diesel fuel at every location. Also, the ACS requires detailed records to be kept of fuel consumption of all equipment at every location, so that it can audit how much fuel is rebateable and how much is not. DFRS participants will be required to list all diesel fuel purchased, including that part of any purchase for which a rebate is not claimed. This procedure, according to Alcoa, means that effectively 'every litre of every fuel purchased will have to be tracked to its final use in an identified piece of equipment at an identified time'. This, according to the company, is an 'onerous and unjust imposition'.

Alcoa recommends that the Government institute a process whereby it examines large corporations' management and internal audit practices to ensure that there is no possibility of rebateable diesel fuel being used for other than rebateable applications. Some of the suggestions raised by the company include: differentially-sized fuel pumping units matched to mobile equipment not licensed for road transport or a system of differentially-coloured fuel. Such systems would mean that firms do not have to keep exhaustive records for all fuel used, but only for those vehicles which the company uses for both on and off-road use.

Alcoa also suggested that the ACS inspectors be allowed to inspect any piece of equipment at any time, without notice, and be able to impose substantial fines for ineligible use.

Source: Alcoa (Submission 5, pp. 21-22).

Some firms called for the removal of the fuel excise while others advocated full rebates.

Comalco Minerals and Alumina (Submission 3, p. 5), for example, said :

> ... this impost should not be levied on export industries and should be an exemption rather than a rebate.

The Commission agrees that there are grounds for extending exemptions of taxes on business inputs. In 1994, the Commission (IC 1994b) advocated an extension of rebates to cover all business usage of fuel. However, as highlighted above, there are significant administrative and compliance costs associated with rebate schemes (box 8.1).

Some firms within the aluminium industry, together with related industry bodies, suggested the introduction of a broad-based consumption tax to replace the inefficient taxation of business inputs by Commonwealth and State/Territory Governments. QAL (Submission 1, p. 12), for example, said:

> QAL is receptive to the introduction of a GST consumption type tax which would replace both the fuel excise taxes and wholesale taxes, as this would enhance our competitive position in international export markets.

Recognising the failure of the current commodity tax system to exempt all inputs into production processes, and the administrative and compliance costs associated with rebate schemes, the Commission considers that the arguments in favour of some form of broad-based consumption tax (BBCT) are compelling.[4] In a revenue neutral environment, such a tax would, amongst other things: reduce the impost current commodity taxes place on business inputs, and hence on exports; address growing inequities caused by the existing indirect tax system; allow rationalisation of the current suite of indirect taxes; and help reduce avoidance and evasion (PC 1996b).

Reform of Australia's system of indirect taxation also requires action at the state/territory level to address a number of deficiencies including the impact of exemptions on the revenue bases of some taxes and the removal or reduction in the use of various inefficient taxes (eg stamp duties). Reform in these areas raises a broader issue — the capacity of the State/Territory Governments to meet their revenue needs in the absence of access to additional, broader based-taxes and/or reforms to Commonwealth-State financial arrangements.

In August last year, the Prime Minister announced the formation of a Taxation Taskforce which will report to the Government on options for reform of Australia's taxation system. As part of its brief, the Taskforce is examining the option of adopting a broad-based indirect tax to replace some or all of the existing indirect taxes together with issues relating to the reform of Commonwealth/State financial relations. The Government anticipates presenting options for tax reform to the public before the next Federal election (Howard 1997a,b).

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[4] Freebairn (1997, pp. 14-22) suggests that a BBCT would have revenue buoyancy, would remove taxation of business inputs, would provide a more neutral pattern of taxation of different goods and services and would restore horizontal neutrality. Currently, twenty-one of the twenty-four OECD countries have a Value-added Tax or a Goods and Services Tax. But, this sort of indirect tax change would aggravate the present vertical fiscal imbalance in Australia and require a significant overhaul of Commonwealth/State financial relations.

## 8.4 Corporate taxation

Corporate taxation affects the location and other investment decisions of MNEs, such as those making up the Australian aluminium industry, both directly, by its effects on investment returns and the repatriation of profits, and indirectly, by its potential to affect economic growth rates and patterns of consumer demand in a country. While international differences in statutory rates of corporate taxation affect rates of return, the effective rate of corporate tax is a more fundamental influence. The effective tax rate depends on the statutory rate of corporate tax, and other factors including rates of depreciation, investment allowances and grants, the equity discount rate, the rate of inflation and the taxation of dividends (BIE 1988a). Indirect taxes influence returns as well, through their effects on input and output prices (section 8.3).

A number of changes have been made to Australia's corporate income tax base since the mid-1980s. In 1986-87 the corporate tax rate was increased from 47 per cent to 49 per cent, a capital gains tax was introduced, and a system of full imputation for the taxation of corporate income distributed to resident shareholders was introduced. [5]

Further reforms, announced in 1988, involved a reduction in the corporate tax rate to 39 per cent, the replacement of accelerated depreciation allowances on plant and equipment with an effective life system plus a loading of 20 per cent, and the extension of the imputation system to superannuation funds and insurance companies. The key outcomes from the reforms were a more neutral tax treatment of alternative forms of investment (plant and equipment and buildings and structures), and of finance (debt and equity) supplied by resident shareholders (BIE 1990b).

In 1993 it was announced that Australia's statutory rate of corporate tax would be reduced from 39 to 33 per cent. The reduction would apply to taxable income for the 1993-94 and subsequent income years. In addition, a short-term general investment allowance at the rate of 10 per cent was announced with the aim of bringing forward the investment plans of business. These initiatives were intended, in part, to improve the competitiveness of Australia's business tax regime compared with our regional competitors in Asia for new manufacturing and large scale processing facilities. The company tax change was partially

[5] The imputation system allows Australian resident shareholders to claim a credit against their personal income tax for dividends paid by companies from earnings on which they have paid Australian income tax. Non-resident shareholders pay an Australian dividend withholding tax only on dividends derived from income on which companies have not paid tax (ie unfranked dividends).

reversed in the 1995-96 Budget, with an increase in the rate from 33 to 36 per cent.

### *Inward investment*

The taxation of the returns on capital owned by non-residents seeks to tax non-residents in a way which maximises the welfare of *residents*, while imposing the least possible discouragement to the level and financing of investment that otherwise would occur in Australia (BIE 1990b).

The extent to which Australia can raise tax revenue from the income derived by foreign capital invested in Australia is assisted by double-taxation agreements Australia has with other nations. Many countries (for example, Japan, the US, the UK) allow some or all taxes imposed on corporate or interest income arising in a foreign source to be credited against domestic tax liabilities which they would normally be liable for on that income. For capital from these countries, taxation by Australia of the income up to levels creditable abroad is likely generally to benefit residents of Australia (BIE 1988b, 1990b and Benge 1992). In effect, this is a transfer from overseas governments to the Australian government.

Research by the BIE (1988b, 1990b) and the trend to lower corporate tax rates (and creditable amounts) abroad suggest that Australia's attractiveness to foreign direct investment (FDI) from a corporate tax perspective was not improved significantly by Australian taxation reforms during the 1980s. In recognition of the likelihood of possible adverse effects on FDI in Australia and the Government's desire to improve the attractiveness of Australia as a location for investment, accelerated depreciation and investment allowance provisions were introduced in the 1992 *One Nation Statement* (PM&C 1992). These measures tended to reduce the effective tax rate in Australia on large investments by domestic and foreign firms.

However, if the depreciation and investment concessions reduced the tax burden in Australia below the amount creditable in the non-resident's home country, the concession would not decrease the total tax burden on repatriated dividends, as tax imposed by the home country government would simply replace Australian tax. In this case, the concessions would reduce Australian tax revenue and increase revenue in the non-resident's home country (BIE 1993a).

While the tax burden on MNEs operating in Australia appears to have been reduced in recent years, it is likely to remain higher than that in a number of Asian countries which discriminate in favour of inward foreign investment (Harris and Jones 1988, EPAC 1992). EPAC (1995) examined the overall impact of taxes on income earned from corporate investment in a range of

countries. It found that, as a location for cross-border investment, Australia's tax treatment compares favourably with most OECD countries and with Indonesia, Korea, Taiwan and Thailand. Only Malaysia, Singapore, Germany and the Netherlands were found to have lower real effective tax rates. When special incentives (ie such as accelerated depreciation allowances, tax free dividends and tax holidays) are taken into account, however, a number of Asian countries were found to have significantly lower effective tax rates than the standard regimes. But, the extent to which investors benefit from the lower rates is dependent upon tax treaties between countries.

Some firms commented on Australia's high corporate tax rate relative to that in other countries and called for a more internationally competitive taxation system. Firms also spoke about the influence that the level of corporate tax is likely to have on the location of future investments.

QAL (Submission 1, p. 11), for example, commented that:

> Australia's corporate income tax rate is higher than the average in Asia-Pacific countries that are competing directly with us for regional investment, albeit that taxes in general are slightly lower in the less developed nations when compared with the developed nations. Australia should follow the lead of the UK who has reduced its corporate rate to 31 per cent which puts it considerably lower than other OECD countries and the EU average of around 37 per cent. This is a definite move by the UK to stimulate investment and economic growth.

The Minerals Council of Australia also raised the issue of so-called 'black hole' expenditure items which are not deductible against Australian corporate income (including expenditure associated with pre-incorporation, exploration and evaluation, development and operation and closure).

The Council (Submission to IC's inquiry into the implications for Australia of firms locating offshore 1996a, p. vi) suggested that:

> Amendments to the income tax law should be made to eliminate Australian non-deductible business expenditures many of which are deductible in overseas jurisdictions with which Australia competes in terms of both trade and investment flows. This would also provide a more appropriate base for company income tax, enhance the competitiveness and growth of Australian industry, provide greater certainty to taxpayers and substantially reduce compliance costs.

These views have some appeal *prima facie*. However, there are a number of additional considerations which bear on the appropriate structure of a nation's tax system. A number of studies of factors influencing the investment decisions of firms suggest that taxation considerations — notably incentive-related arrangements — are generally of secondary importance (OECD 1983, 1989, BIE 1993b, IC 1996a, 1996c and UNCTAD 1996). The prime drivers of locational decisions tend to be shaped by more fundamental considerations such

as the size and growth rates of different markets, proximity to key markets, political security and profit opportunities. In some cases, the lower effective rates of corporate tax applied to businesses in other countries may be used to offset other costs of investment in these countries such as inadequate economic and social infrastructure. While tax and other incentives can matter at the margin, they can also give rise to transfers of income to foreign shareholders without producing sufficient offsetting benefits to the host economy. In determining corporate tax rates, consideration should also be given to broader government economic and social objectives. In this context, the IC (1996a, p. 130) recently observed that:

> It is clearly advantageous for Australia to have the lowest corporate tax rate consistent with meeting the overall objectives of government. But this does not imply that the *sole objective* of taxation policy in Australia should be to achieve tax rates lower than those of our trading partners. Australia's taxation of corporate income should be determined with a view to achieving the most efficient and equitable structure for the taxation system as a whole, while raising the revenue required to meet Australia's economic and social objectives.

The Minerals Council of Australia (Submission to IC's inquiry into implications for Australia of firms locating offshore 1996a, p. vii) proposed that urgent attention be given to renegotiating the dividend and other withholding tax clauses in Australia's international taxation treaties aimed at reducing or eliminating such taxes, thus bringing them into line with international trends. Following an examination of this issue, the IC (1996a) recommended that double taxation agreements be reviewed to assess whether a lower level of dividend withholding tax would be appropriate. In response to the IC's report, the Government announced that it agrees with the aim of negotiating a lower level of withholding tax on dividend remitted to Australia and indicated that it was pursuing this in negotiations (Howard et al 1996).

### *Compliance costs*

Firms also viewed compliance costs as being excessive. Comalco Minerals and Alumina (Submission 3, p. 5), for example, mentioned a number of areas which generate excessive commercial costs through administrative complexity. The company suggested that the plethora of rules pertaining to capital expenditure, transportation deductions and plant and equipment depreciation be investigated with a view to replacing them with a comprehensive equivalent. Overall, the company recommended that the Government review its taxation administration for its impact on the international competitiveness of Australia's resources.

In a similar vein, the Minerals Council of Australia (Submission to the PC's stocktake of progress on microeconomic reform 1996b, p. 9) pointed out that the taxation of capital income by the Commonwealth contains a variety of

differences in the treatment of different forms of income and expenses, resulting in significantly different effective tax rates applying to different forms of investment and savings, and different types of business activity.

Firms' concerns relating to the compliance burden and the wide variety of differences in treatment of different forms of income and expenses suggests that some aspects of the current taxation system fall short of desired outcomes in terms of criteria relating to efficiency, simplicity and cost effective administration. In recognition of these deficiencies, the Commission has previously recommended reviewing Commonwealth and State government taxation of the mining and other resource industries and commissioning an independent study to assess the extent of compliance costs in Australia and how they compare with those in other countries (PC 1996b).

## 8.5 Fringe benefits tax

Over the last decade or so, the Commonwealth Government has introduced a number of taxation measures aimed at curtailing income tax minimisation and avoidance through the payment of a variety of non-salary forms of remuneration. The FBT, which was introduced in 1986-87, represented a key measure in this regard. The FBT is payable by an employer on non-wage benefits provided to employees. The rationale for introducing the FBT was the widespread and growing incidence of non-taxable benefits being substituted for cash remuneration. The taxation of these fringe benefits was seen as improving the equity and efficiency of the overall tax system (Commonwealth of Australia 1985 and Keating 1985).

Firms in the aluminium industry were generally critical of the FBT claiming that it increases total labour costs associated with doing business. It should be noted, however, that the FBT is an optional tax — it is only paid if employers choose to pay part of employees' income in the form of fringe benefits. That means that if employers consider the tax and/or compliance costs to be too high they have the option of offering higher wages/salaries as an alternative to fringe benefits. However, while the tax is optional it should be recognised that employers are competing for labour in a fairly competitive market, and in some instances trying to attract employees to remote areas. As a result, employers may have to offer various fringe benefits (such as cheap housing and travel allowances) to simply attract and retain employees.

For the mining industry, most of the FBT liability arises for housing provided in remote areas at below cost. Although all industries with activities in remote sites receive a 50 per cent concession on FBT for remote area housing, firms operating in remote areas expressed concerns about the impact of the tax on

their cost competitiveness. Nabalco, for example, raised concerns about the value assessed by the Australian Taxation Office for housing it provides to its employees at Gove. The company claims that the valuations are 'unrealistic'.

Another area of contention relates to the FBT on airfares for employees' compulsory two weeks annual leave away from remote sites. One firm suggested that, given the circumstances, applying a FBT on such conditions is 'unfair'.

Comalco Minerals and Alumina (Submission 3, p. 5) suggested that the FBT led to differential impacts on the competitiveness of firms located near major cities compared to those in remote areas:

> ... classifying company housing, meals and annual leave travel as fringe benefits in remote areas, reduces international competitiveness. Fringe benefit taxation increases the advantage of companies operating near major cities like Perth, over companies near Weipa.

Similarly, Nabalco (Submission 6, p. 1) commented that:

> Nabalco is penalised twice for its remoteness, firstly in incurring higher based wages and on-costs in order to attract its workforce and then being penalised by FBT which is not paid by other Australian alumina producers because of its location.

However, as the IC (1991b, p. 119) commented previously:

> ... most companies continue to provide some housing fringe benefits despite FBT liability, obviously because their judgment is that this is better than the cash-only alternative. In this sense, the application of FBT is merely closing a loophole. Similarly, the Commission agrees that the FBT has increased the cost of remote area housing. While some new developments have opted for fly-in-fly-out, existing projects with local townships have had to pay the additional cost of the tax. However, neither of these arguments justify preferential treatment of the mining (or indeed other remote-area) industry for FBT liability.

Given the recent changes to enterprise bargaining arrangements (chapter 6), changes to the extent of fringe benefits may be negotiable with employees more readily in the future. Nevertheless, the value assessed by the Australian Taxation Office for housing and other non-wage benefits firms provide to their employees needs to be determined accurately given the location in which they are provided.

Firms also raised the issue of the administrative burden of complying with the FBT as an area of concern. Comalco Minerals and Alumina (Submission 3, p. 4), for example, commented that:

> As a separate issue from the quantum of taxes, administration of the taxation system is a major, hidden cost to industry. ... While lower tax rates would be welcomed, simplification of the system is warranted.
>
> Some imposts, such as royalties, require one simple calculation which is based on a commercially necessary figure, the number of tonnes of product shipped. Other imposts, such as fringe benefits tax, require substantially new recording and computational procedures.

Compliance costs should be as low as possible given the role of the FBT in broadening the income tax base and improving the equity of the taxation system. There is some evidence to suggest, however, that the compliance costs of the FBT are quite high. In 1990-91, the estimated compliance costs of the FBT was 10.6 per cent of the FBT tax revenue (ORR 1996).

In recognition of the high compliance costs of the FBT, the Government has made a number of changes to the FBT in recent years. One set of initiatives came out of the review of FBT compliance costs initiated by the previous Government. *Prima facie*, the measures which took effect from 1 April 1995 do not seem to have focused on the concerns raised above. Nor did the recent initiatives announced in the *More Time for Business* statement by the Prime Minister on 24 March 1997, which aimed to reduce the burden of regulation and red tape carried by small business in Australia (Howard 1997c). Indeed, Freebairn (1997) notes that the FBT (and corporate income tax) are expensive to comply with, in part because of frequent changes in regulations and rulings.

## 8.6 R&D tax concession

It has long been recognised that not enough R&D will be undertaken unless governments intervene. This is because individuals and firms aiming to create new knowledge are not always able to capture enough of the benefits to justify the effort. Governments can provide support by creating property rights, creating and strengthening markets and/or assisting financially (IC 1995b).

Between 1986 and the 1996-97 Budget, a key component of Commonwealth support for R&D was a 150 per cent tax concession. The concession provided special tax allowances, in the form of a 150 per cent deduction, for all eligible R&D expenditures. In the 1996-97 Budget, the Government announced its decision to reduce the premium rate for such expenditures from 150 per cent to a maximum of 125 per cent. It noted that the reduced concession remained concessionary, especially with respect to capital expenditures, in that the concession brought forward deductibility (compared with normal tax treatment of such items) as well as providing a premium.

Several aluminium firms expressed concern about this development. QAL (Submission 1, p. 12), for example, indicated that it:

> ... was disappointed when the Federal Government took the decision to lower the R&D tax concession from 150 per cent to 125 per cent. Australia is a major player in the world alumina market and the industry plays a vital macro and micro economic role within the Australian economy.
>
> ... QAL understands that the R&D concessional rate in Australia does not compare favourably with that available in other Western countries.

Comalco Smelting (Submission 4, p. 3) also commented that:

> The reduction of the research and development concession from 150 per cent to 125 per cent has adversely impacted on the research and development effort pertaining to the business.

The company has recently scaled back its research and technology effort, although this was being monitored closely to ensure that the effort retained the 'critical mass' needed as part of the required core competencies of a large-scale participant in the aluminium industry.

Several firms made clear the importance of R&D to improving the productivity of their facilities. They commented that, after the key cost decisions had been made at the inception of a project, the process of improving efficiency at a facility depended on the incremental improvements that were derived from their own research, or research undertaken for them by a university. For refineries, efficiency could be improved, for example, by solving technical problems that arose from the chemical properties of particular bauxite raw material. In addition, research could be undertaken into new production processes to support

the development of new products. For mines, the rehabilitation of mined-out pits benefited from research.

Firms' suggestions that the R&D tax concession be increased to a level similar to those available in other countries should be evaluated against whether or not such changes would improve the net social benefits of the scheme to Australia.

In an evaluation of the R&D tax concession (then 150 per cent), the BIE (1993c) looked at the extent to which the scheme had been effective and found that it had encouraged only some companies (around 23 per cent) to carry out more R&D than they would have done otherwise. The BIE pointed to two key features of the scheme which detracted from its effectiveness. Firstly, a substantial share of program costs accrues to R&D that would have taken place anyway. Secondly, while the tax concession would appear to return positive net social benefits for R&D undertaken by Australian-owned companies, negative net social returns tend to apply to foreign-owned companies, mainly because their share of the transfer component flows to foreign shareholders and hence is an economic loss to Australia.

The BIE (1993c) recommended that action be taken to address the welfare loss arising from transfer payments to foreign-owned companies. It suggested that foreign-owned companies be required to demonstrate that a net benefit to Australia flowed from their use of the R&D assistance provided by the concession. The average degree of foreign ownership of the aluminium firms in this study was almost two-thirds and ranged from 30 to 100 per cent.

The IC (1995b) also did not support changing the then 150 per cent tax concession, either to restore the effective value that applied in earlier years (at a 49 per cent statutory rate of corporate taxation) or to match rates that apply in other countries. The IC (1995b, p 544) argued that:

> On the cost side, any increase in the concession would increase the social cost of the transfers associated with the scheme (for R&D that would have been carried out anyway) — an increase in the tax concession from 150 to 200 per cent would at least *double* program costs. On the benefit side, while some additional R&D might well be induced by the higher concession rate, the spillover return to the extra R&D may decline because more marginal projects (with lower expected private returns) would be encouraged. On balance, therefore, the social benefit-cost outcome is likely to be less favourable.

Given the existence of a business case that (Comalco Smelting, Submission 4, p. 4): 'requires that the available technology produce aluminium more reliably and at lower cost on a continuing basis' and 'that an appropriate level of research and technology is vital in creating and maintaining competitiveness', it is likely that the majority of R&D would have been undertaken anyway by the firms.

In a policy statement — *Investing for Growth* — released in December last year, the Government made no further changes to the 125 per cent R&D tax concession, but announced a substantial increase in direct financial assistance for R&D through the R&D Start program (Howard 1997d).

## 8.7 Concluding comments

The study's participants identified current taxation arrangements that are a disincentive to investment and a constraint on their international competitiveness. A range of concerns drive the negative perceptions of the Australian taxation system held by aluminium firms. But overall, their perceptions have a solid base: some aspects of the taxation system in Australia are inefficient. In particular, serious shortcomings arise due to the failure to exempt from taxation all inputs to production. Taxing business inputs generally, and petroleum products in particular for firms in the aluminium industry, unnecessarily adds to costs, distorts production choices and introduces a bias against production for export. Introducing some form of broad based consumption tax would help to alleviate these shortcomings. This issue is currently being examined by a Taxation Taskforce which was set up by the Commonwealth Government in August last year.

It is important that government set the effective corporate tax rate at the right level. This is relevant for domestic and foreign firms alike and for domestic revenue raising. In principle, it is desirable for Australia to have as low a rate of corporate and other taxes as possible. However, this does not mean that Australia should necessarily match the tax rates and structures of other countries. The key design principles are that the level and structure of corporate taxation should be efficient, equitable, administratively sound and reflect Australia's own revenue needs. In recognition of some important deficiencies in the design and operation of Australia's business tax system, the Commission has recommended, amongst other things, reviews of taxation arrangements for Australia's mining and resource industries and an examination of tax compliance costs.

Despite the protests of firms operating in remote areas, taxation of fringe benefits is, in principle, equitable and efficient. Given the recent changes to enterprise bargaining arrangements, outlined in chapter 6, changes to the extent of fringe benefits may be negotiable with employees more readily in the future. Nevertheless, the value assessed by the Australian Taxation Office for housing and other non-wage benefits firms provide to their employees needs to be accurately determined, given the remote locations in which they are typically provided. Compliance costs should be as low as possible, given the role of the

FBT in broadening the income tax base and improving the equity of the taxation system.

Several aluminium firms expressed concern about the recent reduction to the R&D tax concession. But increasing the rate would have doubtful welfare implications for Australia given that firms in the industry are largely foreign-owned companies. This assessment reflects: the costs associated with raising the revenue to support projects that would have proceeded anyway; the flow of this revenue to overseas shareholders; and the possibility of lower spillovers from more marginal projects. The Commission, and the BIE before it, have recommended that action be taken to address the welfare loss arising from transfer payments to foreign-owned companies.

# APPENDIX A INDUSTRY INPUT TO THE STUDY

The Australian Aluminium Council (AAC), with the support of its members, provided valuable comments on the study's issues paper and the main mail-out survey questionnaire. It also endorsed the questionnaire and encouraged its members to provide a submission to the study. This endorsement contributed to the high questionnaire response rate (100 per cent) and eight firms providing submissions to the study. The AAC also provided the Commission with information on industry contacts.

The following table lists submissions received during the study.

| *Participant* | *Submission No.* |
|---|---|
| Alcoa Australia Ltd | 5, 11 |
| Australian Aluminium Council | 13 |
| Capral Aluminium Ltd | 2, 9 |
| Comalco Minerals and Alumina | 3, 10 |
| Comalco Smelting | 4 |
| Queensland Alumina Ltd | 1 |
| Swiss Aluminium Australia Ltd (Nabalco) | 6, 8 |
| Tomago Aluminium | 7 |
| Worsley Alumina | 12 |

Firms in the industry also provided the research team with information via:

- tours of their plant operations. The research team visited a bauxite mine (Alcoa's Huntly mine); two alumina refineries (Alcoa's Wagerup refinery and Worsley's operations); and two aluminium smelters (Tomago and Capral);
- face-to-face interviews. Firms provided comments on the draft questionnaire as well as material for firm and issue profiles.

Discussions were held with the following companies/organisations:

- Alcoa Australia;
- Australian Aluminium Council;
- Capral Aluminium;

- Comalco Minerals and Alumina;
- Comalco Smelting;
- CRA Shipping;
- Independent Pricing and Regulatory Tribunal of New South Wales;
- Minerals Council of Australia;
- Queensland Alumina Ltd;
- Queensland Mining Council;
- Swiss Aluminium Australia Ltd (Nabalco);
- Tomago Aluminium; and
- Worsley Alumina;

# APPENDIX B SURVEY FORMS

A mail-out survey, comprising two parts, was undertaken as part of the aluminium study. Part one sought firm-level views on a range of broad issues relating to the operation of their firm — including the pace of microeconomic-reform, competitiveness and investment decisions. Part two focussed on more specific aspects of the establishments within each firm — such as the impact of government decisions on the cost structures and productivity of individual mines, refineries or smelters. Slight variations were made to part two to account for differences in the operation of mine/refineries and smelters.

Forms were sent out to the eight key firms in the industry with the following results:

- Alcoa Australia provided a single response to part one (covering all of its operations) and two responses to part two — one for its Western Australian operations (Jarrahdale, Huntly and Willowdale bauxite mines and the Kwinana, Pinjarra and Wagerup alumina refineries), and another for its Victorian operations (Portland and Point Henry smelters);
- Comalco Smelting provided a single response to part one (related to its Boyne Island (Qld) and Bell Bay (Tasmanian) operations) and three separate responses to part two — one each for the Boyne Island, Bell Bay and Tiwai Point (New Zealand) smelters;
- The remaining firms (including Worsley Alumina, Comalco Minerals and Alumina, Queensland Alumina Ltd, Swiss Aluminium Australia Ltd, Capral Aluminium, and Tomago Aluminium) provided a single response to part one and a single response to part two of the survey.

The main mail-out survey questionnaire forms are reproduced below.

# MICROECONOMIC REFORM AND THE ALUMINIUM INDUSTRY

Please complete this survey for the Australian activities of the business shown on this label

## Purpose of this survey

This survey of firms in the aluminium industry will help government and industry identify the key factors affecting the competitiveness of the industry and key impediments to investment in Australia. It will also identify the extent of any benefits from recent microeconomic reforms and areas in need of further reform. Your completion of this survey will provide information about the types of reforms which you see as important. It will give your firm an input into decisions on the pace and direction of microeconomic reform in the future. **The survey is fully supported by the Australian Aluminium Council.** For these reasons you are urged to allocate the time necessary to complete this questionnaire. Please return the completed questionnaire by ***Friday 23rd May 1997*** to the **Industry Commission** in the enclosed reply-paid envelope.

## Please read this first

This questionnaire is divided into **two parts**. **Part one** seeks firm-level views on a range of broad issues relating to the operation of your firm (eg pace of microeconomic-reform, competitiveness, investment decisions). It is envisaged that a member of the senior management team at your firm's Head Office is the appropriate person to complete part one.

**Part two**, by contrast, focuses on more specific aspects of the establishments within your firm — such as the impact of government decisions on the cost structures and productivity of individual mines, refineries or smelters. Hence, the appropriate person to answer the second part of this questionnaire is likely to be the site/plant manager.

The following points should assist in completing this questionnaire:

- **What is a microeconomic reform?**

  Microeconomic reform is a program of Commonwealth, State and Territory Government initiatives which are collectively intended to improve Australia's overall economic welfare. Initiatives which fall into the category of microeconomic reform include — regulatory reform, tariff reductions, taxation and industrial relations reforms and reforms to government owned infrastructure including the waterfront, coastal shipping, electricity, gas and rail. All these initiatives have the potential to impact on this business' operations and performance. In some instances this impact may be positive but in others the initial impacts may be negative or negligible.

- **Calendar year data**

  A number of the questions request information for calendar years ending on 31 December. If this business has a different financial year please report for the appropriate 12 month financial period indicating the relevant reporting period.

- **Confidentiality**

  Your completed questionnaire remains confidential to the Industry Commission. No information identifying individual businesses or organisations will be released.

- **Due date**

  Please complete this questionnaire and return by **Friday 23 May 1997.** The questionnaire may be returned in the reply paid envelope to the **Industry Commission, Aluminium Industry Case Study, GPO Box 80, Belconnen, ACT 2616.**

- **Help available**

  **If you have any problems in completing this questionnaire or feel you may have difficulty meeting the due date, please contact Rosalie McLachlan (02) 6240 3327) or Colin Clark (02) 6240 3320). Facsimile enquires can be sent to (02) 6240 3322.**

# Part 1 Enterprise level

*Note*: The term ***business*** in this questionnaire refers to the Australian activities of the business named on the label on the front cover.

## 1.1 Background information

**1 Please indicate the person we should contact if any queries arise regarding this survey.**

| | | | |
|---|---|---|---|
| Name: | | Telephone Number | ( ) |
| Position: | | Facsimile Number | ( ) |

**2 Please indicate if your business would like to receive a copy of the report which will arise from this project.**

No ..... ☐

Yes ..... ☐

**3 In what year was this business established in Australia?** ☐☐☐☐

**4 What is the proportion of foreign equity in this business?** ☐

## 1.2 Microeconomic reform — impact on competitiveness

*Note*: The following block of questions seek to determine the role that microeconomic reforms have played in improving the international competitiveness of your business. The questions also seek business' views on the pace and adequacy of the microeconomic reform program to date and the priority areas for future reform. Areas canvassed include changes in government infrastructure provision, business and environmental regulation and government taxes and charges.

**5 Between 1990 and 1996, how have the following microeconomic reforms impacted on the competitiveness of this business?**

*Note*: Using best estimates tick one box in each row.

| Microeconomic reforms: | Major *negative* impact | Minor *negative* impact | No impact | Minor *positive* impact | Major *positive* impact | Not applicable |
|---|---|---|---|---|---|---|
| A Tariff reductions on inputs (machinery and equipment) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| B Changes to tariff concessions/policy by-laws | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| C Industrial relations reforms | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| D Changes to labour on-costs | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| E Changes to taxes on inputs l(other than labour) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| F Electricity reforms | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| FF G Gas reforms | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| H Coastal shipping reforms | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I Waterfront reforms | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| J Rail freight reforms | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| K Road freight reforms | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| L Aviation reforms | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| M Water supply reforms | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| N Telecommunications reforms | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| O Changes to air emission regulations ..... | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| P Changes to water emission regulations | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Q Changes to land rehabilitation regulations | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| R Changes to hazardous waste regulations | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| S Land access/resource security | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| T Project approval processes | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**6 Of the reforms (A) to (T) listed in Question 5 please rank up to four of the most important positive and up to four of the most important negative contributors to this business' competitiveness between 1990 and 1996.**

*Note*: In order of importance, list the letters which correspond to the reforms.

The reforms making the greatest positive contribution were:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

The reforms making the greatest negative contribution were:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

**7 In this business' view is the <u>current</u> pace of reform in the following areas progressing at a satisfactory rate?**

*Note*: Tick one box in each row.

| Microeconomic Reforms: | No - going backwards | Too slow | Satisfactory | Too fast | Don't know |
|---|---|---|---|---|---|
| A Tariff reductions on inputs (machinery and equipment) ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| B Changes to tariff concessions/policy by-laws ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| C Reforms to export controls ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| D Industrial relations reforms ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| E Changes to labour on-costs ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| F Changes to taxes on inputs (other than labour) ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| G Electricity reforms ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| H Gas reforms ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| I Coastal shipping reforms ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| J Waterfront reforms ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| K Rail freight reforms ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| L Road freight reforms ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| M Aviation reforms ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| N Water supply reforms ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| O Telecommunications reforms ..... | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | | | | |
|---|---|---|---|---|---|
| P Emission regulations (air) ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| Q Emission regulations (water) ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| R Land rehabilitation regulation ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| S Hazardous waste regulations ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| T Land access/resource security ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| U Project approval processes ..... | ☐ | ☐ | ☐ | ☐ | ☐ |

**8 Of the reforms (A) to (U) listed in Question 7 please rank the <u>four</u> most important to the competitiveness of this business <u>over the next 3-5 years</u>.**

*Note*: In order of importance, list the letters which correspond to the reforms.

The reforms of most importance to the future competitiveness of this business are:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

**9 Between 1990 and 1996, how have changes to the following business taxes and government charges impacted on the competitiveness of this business?**

| Business taxation and government charges: | Major *negative* impact | Minor *negative* impact | No impact | Minor *positive* impact | Major *positive* impact | Not applicable |
|---|---|---|---|---|---|---|
| A Changes to sales tax ..... | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| B Changes to pay roll tax ..... | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| C Changes to fringe benefits tax ..... | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| D Changes to fuel excise ..... | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| E Changes to stamp duty ..... | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| F Changes to industry levies (training & superannuation) ..... | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| G Changes to company tax ..... | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| H Changes to depreciation provisions ..... | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I Changes to investment allowances ..... | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| J Changes to research and development concessions ..... | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| K Changes to royalty regimes ..... | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| L Changes to local government taxes and charges ( please specify below) .... ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| M Other (please specify below) ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**10 Of the changes to government taxes and charges (A) to (M) listed in Question 9 please rank up to <u>four</u> of the most important positive and up to**

**four of the most important negative contributors to this business' competitiveness between 1990 and 1996.**

The changes to government taxes and charges making the greatest positive contribution were:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

The changes to government taxes and charges making the greatest negative contribution were:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

## 1.3 Global competition

*Note*: The following block of questions seek your views on the level of competition within the global aluminium industry. The aim is to establish whether the level of competition among firms has changed in recent years. An appreciation of these factors is likely to shed light on the relative importance of various government reform initiatives and the urgency with which new reforms are required.

**11 Has the level of global competition faced by your business changed since 1990?**

| | | |
|---|---|---|
| *No change* ..... | ☐ | Go to Question **13** |
| *Increased marginally*..... | ☐ | |
| *Increased substantially*..... | ☐ | |
| *Decreased marginally*..... | ☐ | |
| *Decreased substantially*..... | ☐ | |

**12 What factors contributed to the change in the level of global competition reported in Question 11?**

*Note*: Tick one box in each row.

| Contributing factors: | Major *negative* impact | Minor *negative* impact | No *impact* | Minor *positive* impact | Major *positive* impact |
|---|---|---|---|---|---|
| A Industry mergers or takeovers ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| B New entrants..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| C Expansions to existing facilities ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| D Removal of barriers to trade..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| E Integration of the former Soviet Union into world markets..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| F Pressure from customers (eg threat of re-sourcing) ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| G Competitors upgrading technology ..... | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | | | | |
|---|---|---|---|---|---|
| H Changes in the exchange rate ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| I Competition from alternate products ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| J Departures from the global industry ..... | ☐ | ☐ | ☐ | ☐ | ☐ |
| K Other (please specify below) | | | | | |
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

## 1.4 Investment

*Note*: The following block of questions seek to determine whether changes in government policies over the past 5-7 years have significantly influenced investment decisions by firms within the Australian aluminium industry, or are likely to do so over the next 3-5 years. Please note that the following questions relate to major investment decisions only, and hence exclude investment spending on repairs and maintenance and other smaller investments.

**13 Has this business undertaken any major domestic investments since January 1990?**

*Note*: In this question a major investment is equal to or greater than $30 million.

No ..... ☐ Go to Question **15**

Yes ..... ☐ Please provide details of major domestic investment expenditure for each of the following investment categories.

| Investment categories: | Total expenditure (A$m) |
|---|---|
| **Capacity —** include any investments undertaken specifically to extend plant capacity in order to increase output. ..... | |
| **Efficiency —** include any investments undertaken to achieve improved productivity, quality, cost savings, etc ..... | |
| **Upgrades —** include any capital expenditure on replacing/modifying existing production facilities (eg new smoke stack, heat exchanger, etc) ..... | |
| **New products —** include any investments undertaken to set up production of a new product (eg new capital for the production of specialist alumina) ..... | |
| **Environment —** include any capital expenditure undertaken to satisfy environmental regulations/ improve environmental performance ..... | |
| **Safety —** include any capital expenditure undertaken to satisfy safety regulations/improve safety performance ..... | |
| **Other —** specify type ..... | |

**14 What factors contributed to the decision to undertake these major domestic investments?**

*Note*: Tick one box in each row.

| Contributing factors: | Minor significance | Major significance | Not significant | Not applicable |
|---|---|---|---|---|
| A Changes in product demand/changes in the prices of major products ..... | ☐ | ☐ | ☐ | ☐ |
| B Changes in the level of competition ..... | ☐ | ☐ | ☐ | ☐ |
| C Need to improve product quality ..... | ☐ | ☐ | ☐ | ☐ |
| D Increased emphasis on export markets ..... | ☐ | ☐ | ☐ | ☐ |
| E Need to improve environmental performance ..... | ☐ | ☐ | ☐ | ☐ |
| F Need to improve operating costs/efficiency ..... | ☐ | ☐ | ☐ | ☐ |
| G Changes in technology ..... | ☐ | ☐ | ☐ | ☐ |
| H Tax concessions (investment allowances etc) ..... | ☐ | ☐ | ☐ | ☐ |
| I Changes in the rate of corporate tax ..... | ☐ | ☐ | ☐ | ☐ |
| J Changes to environmental regulations ..... | ☐ | ☐ | ☐ | ☐ |
| K Changes to safety regulations ..... | ☐ | ☐ | ☐ | ☐ |
| L Changes in unit labour costs ..... | ☐ | ☐ | ☐ | ☐ |
| M Growth strategy ..... | ☐ | ☐ | ☐ | ☐ |
| N Globalisation plans..... | ☐ | ☐ | ☐ | ☐ |
| O Other factors (please specify below) | | | | |
| ☐ | ☐ | ☐ | ☐ | ☐ |

**15 Does this business plan to undertake any major domestic investments ($30 million plus) over the next 3-5 years?**

No ..... ☐ Go to part two

Yes ..... ☐ Please provide details of major domestic investment expenditure for each of the following investment categories.

| **Investment categories:** | **Total (A$m)** |
|---|---|

| | |
|---|---|
| **Capacity -** include any investments planned specifically to extend plant capacity in order to increase output ..... | |
| **Efficiency -** include any planned investments aimed at achieving improved productivity, quality, cost savings, etc ..... | |
| **Upgrades -** include any planned capital expenditure on replacing/modifying existing production facilities ..... | |
| **New products -** include any investments planned for setting up production of a new product ..... | |
| **Environment/safety -** include any planned investment designed to improve environmental/safety performance ..... | |
| **Other -** please specify ..... | |

## 16 What factors will determine whether this domestic investment proceeds?

*Note*: Tick one box in each row.

| Determining factors: | Minor significance | Major significance | Not significant | Not applicable |
|---|---|---|---|---|
| **Subject to direct Australian government control** | | | | |
| A Labour market policies ..... | ☐ | ☐ | ☐ | ☐ |
| B Taxation and royalty arrangements ..... | ☐ | ☐ | ☐ | ☐ |
| C Declining tariffs on output/tariffs on inputs ..... | ☐ | ☐ | ☐ | ☐ |
| D Political stability/sovereign risk ..... | ☐ | ☐ | ☐ | ☐ |
| E Emission regulations (air) ..... | ☐ | ☐ | ☐ | ☐ |
| F Emission regulations (water) ..... | ☐ | ☐ | ☐ | ☐ |
| G Land rehabilitation policies ..... | ☐ | ☐ | ☐ | ☐ |
| H Hazardous waste regulations ..... | ☐ | ☐ | ☐ | ☐ |
| I Land access arrangements ..... | ☐ | ☐ | ☐ | ☐ |
| J Cost and quality of infrastructure services ..... | ☐ | ☐ | ☐ | ☐ |
| K Approval procedures ..... | ☐ | ☐ | ☐ | ☐ |
| L Competition policy ..... | ☐ | ☐ | ☐ | ☐ |
| M Other government-related factors (please specify below) ..... | | | | |
| ☐ | ☐ | ☐ | ☐ | ☐ |
| **Not subject to Australian government control** | | | | |
| N Abundance and quality of mineral deposits ..... | ☐ | ☐ | ☐ | ☐ |
| O Cost and availability of other key inputs ..... | ☐ | ☐ | ☐ | ☐ |
| P Global demand outlook ..... | ☐ | ☐ | ☐ | ☐ |
| Q Proximity to customers ..... | ☐ | ☐ | ☐ | ☐ |

| | | | | | |
|---|---|---|---|---|---|
| R | Growth potential of the Australian economy ..... | ☐ | ☐ | ☐ | ☐ |
| S | Policies of overseas governments (including taxation arrangements, financial concessions, trade barriers, environmental regulations)..... | ☐ | ☐ | ☐ | ☐ |
| T | Other non-government factors (please specify below)..... ... | | | | |
| | ☐ | ☐ | ☐ | ☐ | ☐ |

**17 Of the factors (A) to (T) listed in Question 16 please rank up to <u>four</u> of the most important positive, and up to <u>four</u> of the most important negative contributors to this business' decision to invest in Australia over the next 3-5 years.**

The most important *positive* contributors are likely to be:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

The most important *negative* contributors are likely to be:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

**18 Of the factors subject to direct Australian government control, listed (A) to (M) in Question 16, please rank up to four of the most important positive and up to four of the most important negative contributors to this business' decision to invest in Australia over the next 3-5 years.**

The most important *positive* contributors subject to Australian government control are likely to be:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

The most important *negative* contributors subject to Australian government control are likely to be:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

# Part 2 Establishment level

## 2.1 Bauxite mining/alumina refining production costs

*Note*: Microeconomic reforms, by affecting the prices and quality of inputs, can influence industry cost structures. The following block of questions seek to determine the influence of government on your production costs.

**19 What were the main cost components of your bauxite mining/alumina refining operations in 1996?**

*Note*: Please provide best estimates.

| **Main cost components:** | **1996 (A$ million)** | **1996 (per cent)** |
|---|---|---|
| Raw materials | | |
| - bauxite (base cost) | | |
| - bauxite (delivery/freight cost component) | | |
| - caustic soda | | |
| - lime | | |
| - flocculent | | |
| - other (please specify below) | | |
| | | |
| Labour (wages, salaries, labour on-costs) | | |
| Energy | | |
| - electricity | | |
| - gas | | |
| - other (please specify below) | | |
| | | |
| Water | | |
| Maintenance of machinery, plant and equipment | | |
| Taxes & royalties | | |
| Other (please specify below) | | |
| | | |
| **Total (ex refinery)** | **A$m** | **100%** |

| | |
|---|---|
| Transport costs (include handling costs) | |
| - refinery to port | |
| - port to port | |
| - port to smelter | |
| | **A$m** |

## 20 How have your bauxite mining/alumina refining production costsper unit changed over the period 1990 to 1996?

*Note*: Tick one box in each row and provide an estimate of any change in unit costs — measured at current prices (ie without adjusting for inflation).

| | | | |
|---|---|---|---|
| Remained relatively stable ..... | ☐ | Go to question **23** | |
| Increased ..... | ☐ | By how much have unit costs increased? | % |
| Decreased ..... | ☐ | By how much have unit costs decreased? | % |

## 21 What factors contributed to the change in production costs per unit over the period 1990 to 1996?

*Note*: Tick one box in each row.

| Contributing factors: | Decreased unit costs | Increased unit costs | No change | Not applicable |
|---|---|---|---|---|
| A Changes in labour costs/on-costs..... | ☐ | ☐ | ☐ | ☐ |
| B Changes in raw material prices ..... | ☐ | ☐ | ☐ | ☐ |
| C Changes in energy prices..... | ☐ | ☐ | ☐ | ☐ |
| D Changes in prices of machinery, plant and equipment ..... | ☐ | ☐ | ☐ | ☐ |
| E Changes in transport prices (rail, coastal shipping, etc).... | ☐ | ☐ | ☐ | ☐ |
| F Changes in other utility charges (water, telephone) ..... | ☐ | ☐ | ☐ | ☐ |
| G Changes in the level/scale of production ..... | ☐ | ☐ | ☐ | ☐ |
| H Better management of inputs..... | ☐ | ☐ | ☐ | ☐ |
| I Changes in energy efficiency..... | ☐ | ☐ | ☐ | ☐ |
| J Changes to environmental standards/regulations ..... | ☐ | ☐ | ☐ | ☐ |
| K Tariff reductions on inputs..... | ☐ | ☐ | ☐ | ☐ |
| L Changes to taxes on non-labour inputs..... | ☐ | ☐ | ☐ | ☐ |

M Other (Please specify below)

..... ☐ ☐ ☐ ☐

**22 Of the factors (A) to (M) listed in Question 21 please rank up to four of the most important contributors to any increase in unit costs and up to four of the most important contributors to any decrease in unit costs.**

The most important factors contributing to *increased* unit costs were:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

The most important factors contributing to *decreased* unit costs were:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

## 2.2 Productivity

*Note*: The following block of questions seek to determine whether the productivity of your bauxite mining/alumina refining operations has changed in recent years and the key factors driving any changes in productivity.

**23 Please provide best estimates of the following partial productivity measures for your business' bauxite mining/alumina refining operations:**

*Note*: For the purpose of this question operating employees are defined as: all employees directly and indirectly involved in the production process, eg operational/technical employees, foremen/supervisors and maintenance support as well as contractors for core business activities (see notes to Question 27). If any of the following partial measures are supplied on a different basis to those set out below please specify on what basis the data are calculated.

| Partial productivity measures: | 1990 | 1993 | 1996 |
|---|---|---|---|
| Tonnes of bauxite produced per operating employee per year..... | | | |
| Truck kilometres per tonne of bauxite..... ... | | | |
| Costs per tonne of alumina produced ($A/t) ..... | | | |
| Tonnes of alumina produced per operating employee per year ..... | | | |
| Conversion efficiency (per cent) ..... | | | |
| Other performance measures, eg av. truck utilisation rate (please specify below) ..... | | | |
| | | | |
| | | | |

**24 How has the *overall* productivity/efficiency of your mining/refining operations changed over the period 1990 and 1996?**

*Note*: Tick one box in each row.

| | | |
|---|---|---|
| Remained relatively stable ..... | ☐ | Go to Question **27** |
| Increased ..... | ☐ | |
| Decreased ..... | ☐ | |

## 25 What factors contributed to the change in *overall* productivity/efficiency?

Note: Tick one box in each row.

| Contributing factors: | Minor significance | Major significance | Not significant | Not applicable |
|---|---|---|---|---|
| A Investments in new machinery/new technology..... | ☐ | ☐ | ☐ | ☐ |
| B Investments in labour saving technology ..... | ☐ | ☐ | ☐ | ☐ |
| C Changes to mine/plant design ..... | ☐ | ☐ | ☐ | ☐ |
| D Changes to plant process controls ..... | ☐ | ☐ | ☐ | ☐ |
| E Adoption of procedures to minimise production down time..... | ☐ | ☐ | ☐ | ☐ |
| F Changes in capacity utilisation ..... | ☐ | ☐ | ☐ | ☐ |
| G Changes in level/scale of production ..... | ☐ | ☐ | ☐ | ☐ |
| H Changes in inventory management (eg raw material scheduling, just-in-time techniques) ..... | ☐ | ☐ | ☐ | ☐ |
| I Increased emphasis on contracting out ..... | ☐ | ☐ | ☐ | ☐ |
| J Award restructuring ..... | ☐ | ☐ | ☐ | ☐ |
| K Enterprise agreements ..... | ☐ | ☐ | ☐ | ☐ |
| L Upgrading of workforce skills..... | ☐ | ☐ | ☐ | ☐ |
| M Changed work practices (eg less demarcation) ..... | ☐ | ☐ | ☐ | ☐ |
| N Best practice techniques implemented ..... | ☐ | ☐ | ☐ | ☐ |
| O Other (please specify below) | | | | |
| ☐ | ☐ | ☐ | ☐ | ☐ |

**26 Of the factors (A) to (O) identified in Question 25, please rank up to four of the most important *positive* contributors to the change in productivity/efficiency and, if applicable, up to four of the most important negative contributors to the change in productivity/efficiency.**

The factors making the greatest *positive* contribution were:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

The factors making the greatest *negative* contribution were:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

## 2.3 Human resources

*Note*: **For all questions in this section please include Corporate/Head Office staff**. If you have multiple operations please allocate these staff to each operation on a pro-rata basis. Careful estimates are acceptable.

**27 How many people did this business employ in your mining/refining operations in the year ending December?**

| | |
|---|---|
| **Employment:** | |
| Include | — permanent, temporary and casual employees; working proprietors and partners; employees absent on paid or prepaid leave; managerial and executive employees; and full-time and part-time employees. |
| Exclude | — volunteers or unpaid employees; non-salaried directors; and consultants and persons paid solely by commission without a retainer. |
| **Employment types:** | |
| Administrative/ senior management | — include all Head Office employees and employees involved in sales, marketing, personnel and research/development. |
| Production | — include all employees directly and indirectly involved in the production process, eg operational/technical employees, foremen/supervisors and maintenance support. |
| Contractors | — include contractors for core business activities (for example maintenance, residue disposal and rehabilitation). Exclude contractors engaged in major construction projects. For contractors engaged periodically (ie, every few years) for core business, please provide estimates on a pro-rata basis. |

| Employment type: | 1990 | 1993 | 1996 |
|---|---|---|---|
| Administrative/senior management | | | |
| Production employees | | | |
| Contractors | | | |
| Total: | | | |

**28 Please provide details of the average yearly hours worked by individual employees for the years ending December:**

| | |
|---|---|
| *Note:* | Please provide an estimate of the average hours worked by an employee in each of the employment types, eg 38hpw x 48wks = 1824hr/yr. |
| **Employment types:** | |
| Administrative/ senior management | — include all Head Office employees and employees involved in sales, marketing, personnel and research/development. |
| Production | — include all employees directly and indirectly involved in the production process, eg operational/technical employees, foremen/supervisors and maintenance support. |

| Employment type: | 1990 (hrs/yr) | 1993 (hrs/yr) | 1996 (hrs/yr) |
|---|---|---|---|
| Administrative/senior management | | | |

| | | | |
|---|---|---|---|
| Production employees ..... | | | |

**29 Please provide details of total gross wages and salaries (before taxation and other deductions) for years ending December:**

| | |
|---|---|
| **Wages and salaries:** | |
| Include: | — wages or salaries paid to full-time and part-time employees (including permanent temporary and casual employees); salaries and fees of directors and executives; all paid leave, overtime earnings penalty payments and shift allowances; severance, termination and redundancy payments; retainers and commissions paid to persons who receive a retainer; payments made under incentive or profit sharing schemes; amounts paid through the payroll to employees on workers' compensation; and leave loadings and bonuses. |
| Exclude: | — drawings from profits; payments to persons such as consultants, and persons paid by commission without a retainer; payments to proprietors/partners of unincorporated businesses; reimbursements or allowances to employees for travel, entertainment etc; and Payroll and FBT. |
| **Employment types:** | |
| Administrative/ senior management | — include all Head Office employees and employees involved in sales, marketing, personnel and research/development. |
| Production | — include all employees directly and indirectly involved in the production process, eg operational/technical employees, foremen/supervisors and maintenance support. |
| Contractors | — include contractors for core business activities (for example maintenance, residue disposal and rehabilitation). Exclude contractors engaged in major construction projects. For contractors engaged periodically (ie, every few years) for core business, please provide estimates on a pro-rata basis. |

| Employment type: | 1990 ($'000) | 1993 ($'000) | 1996 ($'000) |
|---|---|---|---|
| Administrative/ senior management ..... | | | |
| Production employees ..... | | | |
| Contractors..... | | | |
| Per ... | | | |
| Total..... | | | |
| Per .. | | | |

**30 Please provide details of all labour 'on-costs' for your mine/refinery for the years ending December:**

| | 1990 ($'000) | 1993 ($'000) | 1996 ($'000) |
|---|---|---|---|
| Pay roll tax | | | |
| Fringe benefits tax | | | |
| Superannuation (company funded part) .... | | | |
| Training guarantee levy..... | | | |
| Workers compensation premiums ..... | | | |
| Other (please specify below — eg relocation costs etc) | | | |
| ..... Per | | | |

**31 What proportion of your mine/refinery workforce was unionised in December:**

*Note*: Using best estimates only.

| | *Years:* | *Percentage of workforce unionised* | |
|---|---|---|---|
| A | 1990..... | | % |
| B | 1993..... | | % |
| C | 1996..... | | % |

**32 Which trade unions covered the employees of your mining/refining operations, and how many members did they have, in December:**

*Note*: Using best estimates only.

| | *Years:* | *Number of trade unions* | *Names of unions & membership numbers* |
|---|---|---|---|
| A | 1990..... | | |
| B | 1993 ..... | | |
| C | 1996 ..... | | |

**33 Has this business' mining/refining operations implemented any of the following measures, and if so, in what year?**

*Note*: Tick appropriate box in each row and, if implemented, indicate year of implementation and whether it remains in place.

| | *Implemented* | *Year (s) implemented* | *Still in place? (Y/N)* |
|---|---|---|---|
| A Award restructuring ..... | | **1 9** | |
| B Best practice techniques (including benchmarking) ..... | | **1 9** | |
| C Changes in occupational health & safety procedures..... | | **1 9** | |
| D Management restructuring ..... | | **1 9** | |
| E Profit sharing arrangements..... | | **1 9** | |
| F Productivity bonuses ..... | | **1 9** | |
| G Registered enterprise agreement..... | | **1 9** | |
| H Unregistered enterprise agreement ..... | | **1 9** | |
| I On-the-job training or skill enhancement measures..... | | **1 9** | |
| J Staff contracts ..... | | **1 9** | |

**34 Between 1990 and 1996, what impact has workplace reform and other labour-related changes to your mining/refining operations had on the following:**

| | Major *negative* impact | Minor *negative* impact | No impact | Minor *positive* impact | Major *positive* impact |
|---|---|---|---|---|---|
| A Time lost due to industrial disputes..... | | | | | |
| B Unit labour costs..... | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| C Labour turnover..... | | | | | |
| D Absenteeism..... ... | | | | | |
| E Labour skill levels..... | | | | | |
| F Shift premiums..... | | | | | |
| G Work pattern flexibility..... | | | | | |
| H Utilisation of plant..... | | | | | |
| I Occupational Health and Safety performance..... | | | | | |
| J Other (please specify below) | | | | | |
| | | | | | |

**35 Please provide details on the following measures for the years ending December:**

| | 1990 | 1993 | 1996 |
|---|---|---|---|
| Working days lost due to industrial disputes (per 1000 employees) ..... ... | | | |
| Working days lost due to absenteeism (per 1000 employees) ..... ... | | | |
| Staff turnover (as a per cent of total workforce) ..... ... | | | |
| Lost time injury frequency rate (lost time injuries per 200 000 per employee hours worked) ..... | | | |
| Other measures that indicate the state of management/labour relations (please specify below ..... | | | |
| | | | |
| | | | |

## 2.4 Performance measures/operational statistics

*Note*: The dearth of official published statistics on the Australian aluminium industry means that it has been difficult to obtain consistent and timely data. In this regard, the following section seeks hard data on a number of key performance measures appropriate to your facility/plant. These data will be used to develop a range of partial performance indicators for the industry — providing a quantitative edge to the study and (it is hoped) providing support for some of the more qualitative/subjective questions in earlier sections of this survey. All data will be treated as commercial in confidence.

**36 Please complete the following table which relates to the operations of your mine/refinery only (see the table notes on the next page for clarification).**

| | | 1990 | 1993 | 1996 |
|---|---|---|---|---|
| **Production/ shipments** | | | | |
| | Bauxite (Tonnes '000) | | | |
| | Bauxite ($ millions) | | | |
| | Alumina (Tonnes '000) | | | |
| | Alumina ($ millions) | | | |
| | Total production ($ million) | | | |
| **Exports** | | | | |
| | Bauxite (Tonnes '000) | | | |
| | Bauxite ($ million) (bauxite) | | | |
| | Alumina (Tonnes '000) '000) | | | |
| | Alumina ($ millions) | | | |
| | Total exports ($ million) | | | |
| **Capital stock** | Buildings and structures ($ million) | | | |
| | Plant and equipment ($ million) | | | |
| | Total capital stock ($ million) | | | |
| **Capacity utilisation** | (per cent) | | | |
| **Expenditure on R&D** | ($ million) | | | |
| **Expenditure on environmental protection** | ($ million) | | | |
| **Capital expenditure on pollution abatement** | ($ million) | | | |

**Notes to question 36**

| | |
|---|---|
| Capital stock | Please provide the total insured value of all buildings and structures, machinery, plant and equipment at the site/operation. |
| Capacity utilisation | Relative to full operational rate — 24 hours per day, 365 days per year. |
| Research and development | Include all expenditure on basic research aimed at increasing your firm's knowledge of aluminium/alumina/bauxite products and production techniques as well as applied research into process innovations and new applications for your products. |
| Expenditure on environmental protection | Current expenditures on waste management and other operational or maintenance costs incurred in protection of the environment from pollution, including: expenditures on rehabilitation of mine sites and expenditure on environmental protection associated with residue disposal by alumina refineries; government and council fees, charges and taxes relating to pollution abatement and control, charges to remove and dispose of wastes arising from an establishment's production processes, R&D expenditure on pollution abatement and control and expenditure on environmental impact assessments and environmental audits. |
| Capital expenditure on pollution abatement | That portion of capital expenditure that is utilised in measures designed to abate pollution. Include purchases of land for buffer zones. |

**Thank you for your cooperation. Please indicate below the approximate time taken by your business to complete this questionnaire and return the form in the envelope supplied.**

**This form took approximately ..... hours to complete.**

# Part 2 Establishment level

## 2.1 Smelting production costs

*Note*: Microeconomic reforms, by affecting the prices and quality of inputs, can influence industry cost structures. The following block of questions seeks to determine the influence of government on your production costs.

**19 What were the main cost components of your smelting operations in 1996?**

*Note*: Please provide best estimates.

| **Main cost components:** | **1996 (A$ million)** | **1996 (per cent)** |
|---|---|---|
| Raw materials | | |
| - alumina (base cost) | | |
| - alumina (delivery/freight cost component) | | |
| - cryolite | | |
| - petroleum coke | | |
| - liquid pitch | | |
| - other (eg sodium carbonate, aluminium fluoride, alloys and hardeners etc — please specify below) | | |
| | | |
| Labour (wages, salaries, labour on-costs) | | |
| Energy | | |
| - electricity | | |
| - gas | | |
| - other (please specify below) | | |
| | | |
| Water | | |
| Maintenance of machinery, plant and equipment | | |
| Taxes & royalties | | |
| Other (please specify below) | | |
| | | |
| **Total (ex smelter)** | **A$m** | **100%** |
| Transport costs (include handling costs) | | |
| - smelter to port | | |
| | **A$m** | |

## 20 How have your production costs per unit changed over the period 1990 to 1996?

*Note*: Tick one box in each row and provide an estimate of any change in unit costs — measured at current prices (ie without adjusting for inflation).

| | | | |
|---|---|---|---|
| Remained relatively stable ..... | ☐ | Go to question **23** | |
| Increased ..... | ☐ | By how much have unit costs increased? | % |
| Decreased ..... | ☐ | By how much have unit costs decreased? | % |

## 21 What factors contributed to the change in production costs per unit over the period 1990 to 1996?

*Note*: Tick one box in each row.

| Contributing factors: | Decreased unit costs | Increased unit costs | No change | Not applicable |
|---|---|---|---|---|
| A Changes in labour costs/on-costs..... | ☐ | ☐ | ☐ | ☐ |
| B Changes in raw material prices ..... | ☐ | ☐ | ☐ | ☐ |
| C Changes in energy prices..... | ☐ | ☐ | ☐ | ☐ |
| D Changes in prices of machinery, plant and equipment ..... | ☐ | ☐ | ☐ | ☐ |
| E Changes in transport prices (rail, coastal shipping, etc).... | ☐ | ☐ | ☐ | ☐ |
| F Changes in other utility charges (water, telephone) ..... | ☐ | ☐ | ☐ | ☐ |
| G Changes in the level/scale of production ..... | ☐ | ☐ | ☐ | ☐ |
| H Better management of inputs..... | ☐ | ☐ | ☐ | ☐ |
| I Changes in energy efficiency..... | ☐ | ☐ | ☐ | ☐ |
| J Changes to environmental standards/regulations ..... | ☐ | ☐ | ☐ | ☐ |
| K Tariff reductions on inputs..... | ☐ | ☐ | ☐ | ☐ |
| L Changes to taxes on non-labour inputs..... | ☐ | ☐ | ☐ | ☐ |

M Other (Please specify below)

..... ☐ ☐ ☐ ☐

**22 Of the factors (A) to (M) listed in Question 21 please rank up to four of the most important contributors to any increase in unit costs and up to four of the most important contributors to any decrease in unit costs.**

The most important factors contributing to *increased* unit costs were:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

The most important factors contributing to *decreased* unit costs were:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

## 2.2 Productivity

*Note*: The following block of questions seek to determine whether the productivity of your smelting operations has changed in recent years and the key factors driving any changes in productivity.

**23 Please provide best estimates of the following partial productivity measures for your business' smelting operations:**

*Note*: For the purpose of this question operating employees are defined as: all employees directly and indirectly involved in the production process, eg operational/technical employees, foremen/supervisors and maintenance support as well as contractors for core business activities (see notes to Question 27). If any of the following partial measures are supplied on a different basis to those set out below please specify on what basis the data are calculated.

| Partial productivity measures: | 1990 | 1993 | 1996 |
|---|---|---|---|
| Costs per tonne of aluminium produced ($A/t) ..... | | | |
| Tonnes of aluminium produced per operating employee per year ..... | | | |
| Proportion of 'off-specification' metal produced (per cent) ..... | | | |
| Current efficiency (per cent) ..... | | | |
| Average pot life (per cent) ..... | | | |
| Other performance measures, eg fluoride emissions, etc (please specify below) ..... | | | |
| | | | |
| | | | |

**24 How has the <u>overall</u> productivity/efficiency of your smelting operations changed over the period 1990 and 1996?**

*Note*: Tick one box in each row.

| | | |
|---|---|---|
| Remained relatively stable ..... | ☐ | Go to Question **27** |
| Increased ..... | ☐ | |
| Decreased ..... | ☐ | |

## 25 What factors contributed to the change in *overall* productivity/efficiency?

*Note*: Tick one box in each row.

| Contributing factors: | Minor significance | Major significance | Not significant | Not applicable |
|---|---|---|---|---|
| A Investments in new machinery/new technology..... | ☐ | ☐ | ☐ | ☐ |
| B Investments in labour saving technology ..... | ☐ | ☐ | ☐ | ☐ |
| C Changes to mine/plant design ..... | ☐ | ☐ | ☐ | ☐ |
| D Changes to plant process controls ..... | ☐ | ☐ | ☐ | ☐ |
| E Adoption of procedures to minimise production down time..... | ☐ | ☐ | ☐ | ☐ |
| F Changes in capacity utilisation ..... | ☐ | ☐ | ☐ | ☐ |
| G Changes in level/scale of production ..... | ☐ | ☐ | ☐ | ☐ |
| H Changes in inventory management (eg raw material scheduling, just-in-time techniques) ..... | ☐ | ☐ | ☐ | ☐ |
| I Increased emphasis on contracting out ..... | ☐ | ☐ | ☐ | ☐ |
| J Award restructuring ..... | ☐ | ☐ | ☐ | ☐ |
| K Enterprise agreements ..... | ☐ | ☐ | ☐ | ☐ |
| L Upgrading of workforce skills..... | ☐ | ☐ | ☐ | ☐ |
| M Changed work practices (eg less demarcation) ..... | ☐ | ☐ | ☐ | ☐ |
| N Best practice techniques implemented ..... | ☐ | ☐ | ☐ | ☐ |
| O Other (please specify below) | | | | |
| ☐ | ☐ | ☐ | ☐ | ☐ |

**26 Of the factors (A) to (O) identified in Question 25, please rank up to four of the most important positive contributors to the change in productivity/efficiency and, if applicable, up to four of the most important negative contributors to the change in productivity/efficiency.**

The factors making the greatest *positive* contribution were:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

The factors making the greatest *negative* contribution were:

(1) ☐ (2) ☐ (3) ☐ (4) ☐

## 2.3 Human resources

*Note*: For all questions in this section **please include Corporate/Head Office staff**. If you have multiple operations please allocate these staff to each operation on a pro-rata basis. Careful estimates are acceptable.

**27 How many people did this business employ in your mining/refining operations in the year ending December?**

| | |
|---|---|
| **Employment:** | |
| Include | — permanent, temporary and casual employees; working proprietors and partners; employees absent on paid or prepaid leave; managerial and executive employees; and full-time and part-time employees. |
| Exclude | — volunteers or unpaid employees; non-salaried directors; and consultants and persons paid solely by commission without a retainer. |
| **Employment types:** | |
| Administrative/ senior management | — include all Head Office employees and employees involved in sales, marketing, personnel and research/development. |
| Production | — include all employees directly and indirectly involved in the production process, eg operational/technical employees, foremen/supervisors and maintenance support. |
| Contractors | — include contractors for core business activities (for example maintenance, residue disposal and rehabilitation). Exclude contractors engaged in major construction projects. For contractors engaged periodically (ie, every few years) for core business, please provide estimates on a pro-rata basis. |

| Employment type: | 1990 | 1993 | 1996 |
|---|---|---|---|
| Administrative/senior management | | | |
| Production employees | | | |
| Contractors | | | |
| Total | | | |

**28 Please provide details of the average yearly hours worked by individual employees for the years ending December:**

| | |
|---|---|
| *Note:* | Please provide an estimate of the average hours worked by an employee in each of the employment types, eg 38hpw x 48wks = 1824hr/yr. |
| **Employment types:** | |
| Administrative/ senior management | — include all Head Office employees and employees involved in sales, marketing, personnel and research/development. |
| Production | — include all employees directly and indirectly involved in the production process, eg operational/technical employees, foremen/supervisors and maintenance support. |

| Employment type: | 1990 (hrs/yr) | 1993 (hrs/yr) | 1996 (hrs/yr) |
|---|---|---|---|
| Administrative/senior management | | | |

| | | | |
|---|---|---|---|
| Production employees ..... | | | |

**29 Please provide details of total gross wages and salaries (before taxation and other deductions) for years ending December:**

| | |
|---|---|
| **Wages and salaries:** | |
| Include | — wages or salaries paid to full-time and part-time employees (including permanent temporary and casual employees); salaries and fees of directors and executives; all paid leave, overtime earnings penalty payments and shift allowances; severance, termination and redundancy payments; retainers and commissions paid to persons who receive a retainer; payments made under incentive or profit sharing schemes; amounts paid through the payroll to employees on workers' compensation; and leave loadings and bonuses. |
| Exclude | — drawings from profits; payments to persons such as consultants, and persons paid by commission without a retainer; payments to proprietors/partners of unincorporated businesses; reimbursements or allowances to employees for travel, entertainment etc; and Payroll and FBT. |
| **Employment types:** | |
| Administrative/ senior management | — include all Head Office employees and employees involved in sales, marketing, personnel and research/development. |
| Production | — include all employees directly and indirectly involved in the production process, eg operational/technical employees, foremen/supervisors and maintenance support. |
| Contractors | — include contractors for core business activities (for example maintenance, residue disposal and rehabilitation). Exclude contractors engaged in major construction projects. For contractors engaged periodically (ie, every few years) for core business, please provide estimates on a pro-rata basis. |

| Employment type: | 1990 ($'000) | 1993 ($'000) | 1996 ($'000) |
|---|---|---|---|
| Administrative/ senior management ..... | | | |
| Production employees ..... | | | |
| Contractors..... | | | |
| Per ... | | | |
| Total..... | | | |
| Per .. | | | |

**30 Please provide details of all labour 'on-costs' for your smelting operations for the years ending December:**

| | 1990 ($'000) | 1993 ($'000) | 1996 ($'000) |
|---|---|---|---|
| Pay roll tax | | | |
| Fringe benefits tax | | | |
| Superannuation (company funded part) .... | | | |
| Training guarantee levy..... | | | |
| Workers compensation premiums ..... | | | |
| Other (please specify below — eg relocation costs etc) | | | |
| ..... Per | | | |

**31 What proportion of your smelter's workforce was unionised in December:**

*Note*: Using best estimates only.

| Years: | Percentage of workforce unionised | |
|---|---|---|
| A 1990..... | | % |
| B 1993..... | | % |
| C 1996..... | | % |

**32 Which trade unions covered the employees of this smelter, and how many members did they have, in December:**

*Note*: Using best estimates only.

| Years: | Number of trade unions | Names of unions & membership numbers |
|---|---|---|
| A 1990..... | | |
| B 1993 ..... | | |
| C 1996 ..... | | |

**33 Has this business' smelting operation implemented any of the following measures, and if so, in what year?**

*Note*: Tick appropriate box in each row and, if implemented, indicate year of implementation and whether it remains in place.

| | *Implemented* | *Year (s) implemented* | *Still in place? (Y/N)* |
|---|---|---|---|
| A Award restructuring ..... | | **1 9** | |
| B Best practice techniques (including benchmarking) ..... | | **1 9** | |
| C Changes in occupational health & safety procedures..... | | **1 9** | |
| D Management restructuring ..... | | **1 9** | |
| E Profit sharing arrangements..... | | **1 9** | |
| F Productivity bonuses ..... | | **1 9** | |
| G Registered enterprise agreement..... | | **1 9** | |
| H Unregistered enterprise agreement ..... | | **1 9** | |
| I On-the-job training or skill enhancement measures..... | | **1 9** | |
| J Staff contracts ..... | | **1 9** | |

**34 Between 1990 and 1996, what impact has workplace reform and other labour-related changes to your operations had on the following:**

| | Major *negative* impact | Minor *negative* impact | No impact | Minor *positive* impact | Major *positive* impact |
|---|---|---|---|---|---|
| A Time lost due to industrial disputes..... | | | | | |
| B Unit labour costs..... | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| C Labour turnover..... | | | | | |
| D Absenteeism..... ... | | | | | |
| E Labour skill levels..... | | | | | |
| F Shift premiums..... | | | | | |
| G Work pattern flexibility..... | | | | | |
| H Utilisation of plant.....,,,.... | | | | | |
| I Occupational Health and Safety performance..... | | | | | |
| J Other (please specify below) | | | | | |
| | | | | | |

**35 Please provide details on the following measures for the years ending December:**

| | 1990 | 1993 | 1996 |
|---|---|---|---|
| Working days lost due to industrial disputes (per 1000 employees) ..... ... | | | |
| Working days lost due to absenteeism (per 1000 employees) ..... ... | | | |
| Staff turnover (as a per cent of total workforce) ..... ... | | | |
| Lost time injury frequency rate (lost time injuries per 200 000 per employee hours worked) ..... | | | |
| Other measures that indicate the state of management/labour relations (please specify below ..... | | | |
| | | | |
| | | | |

## 2.4 Performance measures/operational statistics

*Note*: The dearth of official published statistics on the Australian aluminium industry means that it has been difficult to obtain consistent and *timely* data. In this regard, the following section seeks hard data on a number of key performance measures appropriate to your facility/plant. These data will be used to develop a range of partial performance indicators for the industry — providing a quantitative edge to the study and (it is hoped) providing support for some of the more qualitative/subjective questions in earlier sections of this survey. All data will be treated as commercial in confidence.

**36 Please complete the following table which relates to the operations of your smelter only (see the table notes on the next page for clarification).**

| | | 1990 | 1993 | 1996 |
|---|---|---|---|---|
| **Production/shipments** | Aluminium ('000 tonnes) | | | |
| | ($ million) | | | |
| **Exports** | Aluminium ('000 tonnes) | | | |
| | ($ million) | | | |
| **Capital stock** | Buildings and structures ($ million) | | | |
| | Plant and equipment ($ million) | | | |
| | Total capital stock ($ million) | | | |
| **Capacity utilisation** | (per cent) | | | |
| **Expenditure on R&D** | ($ million) | | | |
| **Expenditure on environmental protection** | ($ million) | | | |
| **Capital expenditure on pollution abatement** | ($ million) | | | |

## Notes to question 36

| | |
|---|---|
| **Capital stock** | Please provide the total insured value of all buildings and structures, machinery, plant and equipment at the site/operation. |
| **Capacity utilisation** | Relative to full operational rate — 24 hours per day, 365 days per year. |
| **Research and development** | Include all expenditure on basic research aimed at increasing your firm's knowledge of aluminium/alumina/bauxite products and production techniques as well as applied research into process innovations and new applications for your products. |
| **Expenditure on environmental protection** | Current expenditures on waste management and other operational or maintenance costs incurred in protection of the environment from pollution, including: government and council fees, charges and taxes relating to pollution abatement and control, charges to remove and dispose of wastes arising from an establishment's production processes, R&D expenditure on pollution abatement and control and expenditure on environmental impact assessments and environmental audits. |
| **Capital expenditure on pollution abatement** | That portion of capital expenditure that is utilised in measures designed to abate pollution. Include purchases of land for buffer zones. |

**Thank you for your cooperation. Please indicate below the approximate time taken by your business to complete this questionnaire and return the form in the envelope supplied.**

**This form took approximately ..... hours to complete.**

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