THE MAKING OF THE NEWCASTLE INDUSTRIAL HUB 1915 to 1950

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STATEMENT OF ORIGINALITY

I hereby certify that the work embodied in the thesis is my own work, conducted under normal supervision.

The thesis contains no material which has been accepted, or is being examined, for the award of any other degree or diploma in any other university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to the final version of my thesis being made available worldwide when deposited in the University's Digital Repository, subject to the provisions of the Copyright Act 1968 and any approved embargo.

Robert Kear
ABSTRACT

Aim of this Thesis

The aim of this thesis is to chart the formation of the Newcastle Industrial Hub and to identify the men who controlled it, in its journey from Australian regional obscurity before 1915, to be the core of Australian steel manufacturing and technological development by 1950. This will be achieved through an examination of the progressive and consistent application of strategic direction and the adoption of manufacturing technologies that progressively lowered the manufacturing cost of steel. This thesis will also argue that, coupled with tariff and purchasing preferences assistance, received from all levels of government, the provision of integrated logistic support services from Newcastle’s public utilities and education services underpinned its successful commercial development. The availability of good coking coal and an operational port first attracted the steel industry to Newcastle. The BHP steelworks was operational in 1915 and by 1921 it had been joined by three new downstream steel fabrication companies which manufactured forged rolling stock products, steel wire and steel sheet products.

Led by Harold Darling, Chairman of the BHP board, and Essington Lewis, BHP’s Chief General Manager, the steelworks and the downstream fabrication companies developed and consolidated their manufacturing and financial positions during the 1920s. In parallel with growth of the steel companies, the Newcastle-based public utilities and heavy engineers, which provided the industrial logistic support base on which the steel industry relied, developed in parallel. The combination of organisational changes, government support and the introduction of improved technologies progressively lowered the cost of steel manufacture and increased the Australian steel industry’s competitive position. This was a factor which enabled the NIH to survive and recover from the Great Depression of the early 1930s.

The Great Depression was immediately followed by a boom in industrial growth by the Australian steel industry. In parallel with this manufacturing growth, from 1935 the NIH was progressively prepared for war. The declaration of war in 1939 found the NIH ready to manufacture the wide range of steel products and munitions required for war in quantity, until the end of the conflict in 1945. War encouraged innovation in the NIH, with a number of special products developed and manufactured by the BHP steelworks and each of the steel
fabricators. The labour shortages which ruled between 1942 and 1944 saw female workers recruited to work in the steel industry for the first time.

However, economic uncertainty at the end of the war saw an eruption of industrial relations problems in the steel and coal industries. This caused considerable industrial disruption between 1945 and 1950. In 1950, Darling died and Lewis retired, but with these driving forces gone the NIH was left seeking strategic direction, a problem that was not overcome until the 1960s.
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CHAPTER 1: INTRODUCTION

Colin Forster, in his 1964 book *Industrial Development in Australia 1920–1930*, observed that industrial history in Australia is a neglected field.¹ Little has changed in the ensuing half century, particularly in the case of regional industrial centres such as Newcastle, Australia. This thesis seeks to address this gap through a close study of the factors which influenced the development of Australia’s first large-scale manufacturing centre in Newcastle between 1915 and 1950. It was in this period that Newcastle became the site of a fully integrated manufacturing complex and logistics network, capable of high levels of production and technological innovation. With encouragement from the Federal and State Governments, together with carefully nurtured trans-national commercial arrangements, by 1920 this centre had commenced to develop into a large-scale multidisciplinary manufacturing and logistics network. This network, or cluster, existed because of the geographic concentration of associated firms and organisations involved in the chain production of steel goods and associated services. The firms and organisations involved in the Newcastle industrial cluster, because of its geographic separation from the Sydney metropolis, I have named the Newcastle Industrial Hub (NIH).²

The City of Newcastle is located 160 kilometres north of Sydney. Originally established as a convict settlement in 1801, it relied on shipping to move people and freight between each port. There was no all-weather road route available between the centres until 1830 and that remained the situation until 1925.³ A rail link was opened in 1889 which rapidly became the main method for both passenger and freight movement between each centre.⁴ The construction of a modern road link commenced in 1926 but due to the Hawkesbury River crossing an uninterrupted road was not available until 1945.⁵ As a consequence of this relative communications remoteness, passenger and freight movement by sea remained a common method of movement between both cities.

⁵ Tinni, ‘A Tale of the Trails’, p. 69
The NIH consisted of steel manufacturing, steel fabrication and heavy engineering companies, public utilities and associated supplier support services. Apart from steel manufacture, in the Australia of the day the combination of these facilities and services were usually only found in State capital cities. Originally the NIH existed because of the commercial and logistic relationships between the Broken Hill Proprietary Co. Ltd. and each of the downstream steel fabricators. But as logistic relationships matured, with the greater inclusion of the heavy engineers, public utilities and services, the NIH’s geographic concentration gave each member of the NIH the opportunity to achieve synergies, creativity and ideas generation. This facilitated the development of a steelmaking, steel fabrication, engineering and logistics management knowledge network, which bolstered the application of manufacturing technologies and mutual support. By the end of the 1920s, the NIH’s steel manufacturing diversity and mass, coupled with its technological and heavy engineering capability, supported by public utilities and technical training facilities, all located in a regional city, were unique in Australia.

Prior to 1915, aside from the development of the railways, the Port of Newcastle and local public utilities, Newcastle had attracted varying degrees of small-scale industrialisation, all based on the ready availability of cheap black coal. At various times enterprises had included a large scale cloth factory, soap and candle works, copper refining and a biscuit factory. Heavy engineering operations, such as Goninan, Morison and Bearby, and Varley had been established, using local finance to provide engineering support to the mining and shipping industries. However, apart from these operations, most other engineering facilities were small scale with little technological sophistication. As Boris Schedvin noted, this condition was common across Australia’s regional urban centres in the decades before the First World War.

The introduction of commercially driven technological changes through the birth of large-scale steel manufacturing made the NIH what it was. After 1915 it was driven by BHP’s commercial imperatives in its search for economic prosperity. The move into iron and steel manufacturing promised to provide the company with favourable long-term investment.

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security. Beginning in 1911, the timing of the investment was fortuitous, for the impact of the First World War on the Australian economy saw a steel shortage occur. The imported British-manufactured steel goods chain that Australia had relied on to maintain its standard of living rapidly collapsed. The absence of competition from imports gave Newcastle's new steel industry the opportunity to quickly develop a high degree of manufacturing maturity largely free of competition.

The scope and extent of British-based investment in the Australian steel industry and the influence that investment had in positioning Australia in the world economy is not well appreciated. As the consequence of the scope and intensity of industrialisation achieved in Australia between 1920 and 1950, largely in the Newcastle Industrial Hub, it was clear that by 1950 Newcastle had become the hard core of the Australian steel manufacturing industry. Already in 1935 it was capable of manufacturing a wide range of specialist steels and fabricated steel products as well as providing a broad range of heavy engineering services. This was a manufacturing capability that was not duplicated in any other Australian industrial centre until Lysaght established a cold strip rolling mill in Port Kembla in 1938. Figure 1.1 shows a map of the Port of Newcastle, the location of the BHP steelworks and the cluster of steel fabrication subsidiaries and associated companies which had co-located with the steelworks. The close co-location of steel manufacturer and steel fabricators aided cooperation and lowered logistic product movement costs. The central location of the suburb Tighes Hill, which during the 1930s became home to a new and large-scale technical college, also aided cooperation in the provision of diploma and trade training for all members of the NIH.

Wills’s map of the Newcastle industrial area provides a view which shows the locational relationships between members of the NIH, the Port of Newcastle and the connecting railways. This map indicates the location of the steelworks, each of the steel fabricators, the new State Dockyard and the location of the heavy engineers. In addition this map provides an outline of the city’s urban area.

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The view of the harbour, the location of the coal loading wharves, rail marshalling yards and the Carrington Basin provide a demonstration of just how compact the operational harbour was. However, as with all maps some important locations have not been identified. The Tighes Hill Technical College and the Zaara Street power station are not shown. Their location is described in the narrative.

Figure 2 provides a photographic view east from the Stewarts and Lloyds tube works along the line of the South Arm of the Hunter River towards the Port of Newcastle and the former Walsh Island Dockyard and Engineering Works in 1935. Next is the Lysaght steel sheet works, the Ryland Bros. (Aust) steel wire plant and the BHP steelworks. This figure highlights the close co-location of the steel fabricators and the steelworks.
A Comparative Analysis

In 1915, the Newcastle Industrial Hub (NIH) was centred on the BHP steelworks, the Port of Newcastle, a number of public utility organisations, locally based heavy engineers and the coal loading operations located at the harbour-side suburb of Carrington. By 1923, these operations had been joined by the Commonwealth Steel Co., Ryland Bros. (Aust.), Lysaght, and the Australian Wire Rope Works. In 1934, these steel fabricators were joined by Stewarts and Lloyds.

Newcastle itself was also home to a number of engineering materials stockists operations which provided direct materials support to all engineers and steel fabricators. The public utilities included the Hunter Water Supply and Sewerage Board, which was responsible for supplying fresh water and sewage services to urban and industrial customers. Electric power generation was conducted by the NSW Railways Electricity Branch at its Zaara Street power station which was positioned at a harbourside location at the eastern end of Newcastle City. The steel fabricators and the heavy engineers were
directly linked by rail and road to the BHP steelworks and to the port facilities in Newcastle. Ships delivered raw materials directly to the steelworks and the major harbour export was coal with coal loaded in the Carrington Basin and the Carrington wharves. After 1936 the suburb of Tighes Hill was also home to the Newcastle Technical College, one of the largest colleges in New South Wales. The combination of the features made Newcastle the most sophisticated and economically important industrial complex outside of the capital cities.

As Australia continued to withdraw from its agricultural commodity based economy towards an industrial economy, other regional industrial centres had demonstrated the potential for development along the same lines as Newcastle. These centres included Port Kembla in New South Wales, the Latrobe Valley in Victoria and BHP’s iron ore port of Whyalla in South Australia. As Hughes notes, the development of the Port Kembla steelworks began in 1924 when Charles Hoskins recognised that in order to survive the existing Hoskins iron and steel works at Lithgow in NSW had to move to a tidewater site.10 This move to Port Kembla was the beginning of a new iron and steel company, Australian Iron and Steel (AIS), began the industrialisation of Port Kembla.

Hoskins received considerable assistance from the New South Wales Government, together with financial and technical support from a number of British steel companies to establish a new steelworks in Australia. But in the face of a worsening world financial situation, the Australian Iron and Steel Company did not have the financial strength to build and operate a fully integrated steel plant in Australia. In addition, largely through the influence of the English partners, the plant was laid out along the lines of a British works, a manufacturing condition which was far behind the latest American practices. Hughes noted that the construction of the plant also lacked the firm direction of a David Baker, who had overseen the building of the Newcastle plant.11 Port Kembla also had problems with the availability of a local workforce and the company relied on workers who had been prepared to relocate from Lithgow. This shortage of production labour was exacerbated by the shortage of the necessary professional and skilled labour to operate and maintain the plant. In a similar vein to Newcastle the technical education facilities and services required to train additional professional and skilled labour were also lacking. These problems would not be

11 Hughes, The Australian Iron and Steel Industry, pp. 107–08
The town of Yallourn in the Latrobe Valley was developed industrially in the immediate aftermath of the First World War when the Victorian government determined to develop an electric power generation capability, based on the very large deposits of brown coal available there. This type of coal was not suitable for use as a smelting medium or to power steam engines on the railways, but it could be used in large boilers to generate steam. Using German technology, the brown coal deposits were exploited and power stations were erected. Brown coal did do much to make Victoria independent of black coal supplies from New South Wales. Industries such as paper milling were also established in the Latrobe Valley but until 1940 the main thrust of industry there was the generation and distribution of electricity.

Whyalla in South Australia was the third location which had the hope of industrial cluster development before the 1950s. In 1938, as a consequence of long negotiations with the South Australian government, BHP agreed to establish an iron plant at Whyalla, in exchange for extended leases over the iron ore deposits in the Middleback Range. The construction of a blast furnace and a small electric power plant commenced in that year and in 1941 the blast furnace was blown in. Initially, the blast furnace had a capacity to smelt 250,000 tons of iron per year. This pig iron was largely used as foundry iron for the Australian market with the remainder being transported to both Newcastle and Port Kembla for conversion to steel. In order to cope with the additional pig iron from Whyalla one new open hearth furnace was built in Newcastle during 1944 and two more were built in Port Kembla. In return, beginning in 1939 the South Australian and Commonwealth governments built a fresh-water pipeline and reservoirs between Morgan on the Murray River and Whyalla, to supply the new iron works and the town of Whyalla.

The Whyalla iron works was not developed into a fully integrated iron and steel works until after 1965. Encouraged by both Federal and State Governments, BHP funded the development of a shipbuilding operation at Whyalla during 1940. Shipbuilding commenced with the launching of the corvette *HMAS Whyalla* in 1941. All of the steel used to build the ships in Whyalla was rolled in either Newcastle or Port Kembla. The ships’ boilers were

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12 Hughes, *The Australian Iron and Steel Industry*, p. 187
largely built at the Cockatoo Island Dockyard in Sydney and the reciprocating engines were built at the Perry Engineering works in Adelaide or by the BHP workshops and heavy engineers in Newcastle. As machine tools became available they were installed at the shipyard but, in spite of the yard being able to build and assemble large vessels, this was the extent of its heavy engineering capability. As identified by David Baker’s reconnaissance in 1911, other potential Australian industrial hub sites had significant limitations when compared with Newcastle. The limitations of other potential industrial sites made a considerable difference to the degree of uniqueness that Newcastle had achieved in the Australian economy until 1950 and influenced its subsequent industrial development.

BHP’s Organisational Change

However, by 1920 BHP’s problems with the establishment of the Newcastle steelworks were compounded by a range of cost problems over which the company had no control. Wartime measures taken by the Federal Government had sparked inflation, a factor which undermined General Manager G. D. Delprat’s somewhat optimistic construction costs and steel sales forecasts. Between 1915 and 1920 the price of coal required to manufacture the coke and gas to fuel the blast furnaces had almost trebled. In addition, under the influence of the Holman Labor State Government, the cost of labour had soared. Between 1915 and 1920 the basic wage had almost doubled and the working week was reduced from forty-eight to forty-four hours. Other mounting costs included those of shipping, rail freight and insurance premiums. For BHP this, when combined with a nineteen-month strike at its Broken Hill mine, significantly impacted on company revenues. All of these factors provided significant anxiety for the BHP board, to the point where the future of the five-million-pound investment at Newcastle was being seriously questioned. BHP could do little itself to immediately reduce the cost of labour but it quickly introduced a number of in-house remedies to take control of the cost of materials and services.

It was at this uncertain point that the two men who would have most influence over the future development of the commercial and technical component of the NIH are introduced. They were board member Harold Darling and the company’s Deputy General Manager, Essington Lewis. Both men were South Australians from old Adelaide families. Darling, a prosperous grain merchant had succeeded his father as a BHP board member in

1914. Lewis, a graduate of the South Australian School of Mines, had worked his way up from being a miner at Broken Hill to be a supervisor at the BHP Port Pirie silver, lead and zinc smelter. Here during 1910 he had caught the eye of BHP’s General Manager Guillaume Delprat and had been progressively promoted to the point when on 23 March 1919 he was appointed Deputy Manager of BHP.\textsuperscript{14}

In November 1919 Delprat, who had just turned 63 years of age, advised the board that he was contemplating retirement. The board agreed to his resignation at a mutually convenient point and enquired as to whether Lewis would be a suitable successor. Lewis was endorsed for the task and, as Christopher Jay states, the endorsement prepared him for the forthcoming battles over technology and company re-organisation.\textsuperscript{15} The first test of Lewis’s technical judgement centred on the introduction of the Duplex system of steelmaking, as this was claimed to be a faster way of manufacturing steel. Delprat and David Baker, the manager of the Newcastle steelworks, were strongly in favour of adopting this technology, although its adoption would require an additional investment of £650,000. In July 1919, Delprat had convinced the board to proceed with this investment. In 1920, as part of its standard practice, BHP sent Darling and Lewis overseas to examine steelworks and steel manufacturing operations in North America and Europe. The Duplex system of steel manufacture, which used a combination of the Bessemer and the Open Hearth steelmaking systems, would be investigated.\textsuperscript{16}

Lewis and Darling inspected Duplex plants in America and Europe and by the end of 1920 Lewis had determined that this manufacturing process would not be suitable for Australian steel operations.\textsuperscript{17} Lewis advised Delprat of his concerns and was supported by Darling. Geoffrey Blainey notes that the directors were puzzled that the technical advice provided by Delprat and Baker was being challenged. They decided to wait, sending Baker to the United States of America to report fully before making any final decision. Darling and Lewis returned to Australia and on 21 February 1921 Lewis submitted his report to the board.\textsuperscript{18} This report challenged two of Delprat’s plans: the Duplex steelmaking process and

\textsuperscript{14} Geoffrey Blainey, \textit{The Steel Master: A Life of Essington Lewis} (South Melbourne: Macmillan, 1971), p. 58
\textsuperscript{15} Jay, \textit{A Future More Prosperous}, p. 107
\textsuperscript{16} Jay, \textit{A Future More Prosperous}, p. 107
\textsuperscript{17} Blainey, \textit{The Steel Master}, p. 63
\textsuperscript{18} ‘Lewis Replaces Delprat as the General Manager of BHP’, \textit{BHP Review}, (1925), [6 June 1925]
the continued use of the Semit Solvay coke ovens technology. On that day the directors met and at the conclusion of this meeting the board accepted the resignation of Guillaume Delprat as General Manager, appointing Essington Lewis as his replacement on a salary of £4,000 per year. Later in 1922 Bowes Kelly retired as chairman of the BHP board and on 27 October of that year Darling was elected as the replacement chairman, a position he held until his death in January 1950. The two men who were to have the most influence on the commercial and technical development of the NIH were now in power.

**Aim of this Thesis**

The aim of this thesis is to chart the formation of the NIH and the men who controlled it through its journey from regional obscurity before 1915 to be the core of an Australian steel manufacturing and technological development centre by 1950. This will be achieved through an examination of the progressive application of Darling’s and Lewis’s strategic direction for BHP and the adoption of manufacturing technologies aimed at lowering the manufacturing cost of steel. This thesis will also argue that, coupled with the assistance received from all levels of government, the direct provision of integrated logistic support services from Newcastle’s public utilities and education services underpinned its successful commercial development.

**Literature Review**

Somewhat due to the general neglect of Australian industrial history, much of the literature supporting this study is technologically rather than historically oriented and in many cases is rather dated. There are four key studies of the Australian iron and steel industry during the first half of the twentieth century. Neville Wills’s *Economic Development of the Australian Iron and Steel Industry* (1948) deals with the expansion of the industry up until its year of publication and the benefits BHP obtained from its control of coal and iron ore mines. Written immediately after the Second World War, it says little concerning the war years or the downstream steel fabricators, nothing about Newcastle’s public utilities and the integration of their services or supplies into the NIH. Helen Hughes’s *The Australian Iron and Steel Industry: An Examination of the Establishment of the Industry, Its Development, Present Distribution, Resources, and Importance in the Australian Economy* (Sydney: the author, 1948)

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20 Blainey, *The Steel Master*, p. 64
21 Blainey, *The Steel Master*, p. 184
Steel Industry, 1848–1962 contains considerable detail concerning the chronological history of BHP and the Australian Iron and Steel Co. Ltd. This work also contains tabulated iron and steel production tables, comparative prices for British and Australian steel and the costs of labour. However, like Wills, she says little about the steel fabricators and once again nothing about the role of the public utilities. Accordingly, her survey of Newcastle’s steel industry is incomplete. The development of BHP’s industrial policies and its control over the steel fabrication subsidiaries is ignored; to gain any view of pre-war and wartime union activities an article Hughes wrote titled ‘Industrial Relations in the Australian Iron and Steel Industry, 1876–1962’ must also be examined. The third book is A Measure of Greatness by E. M. Johnson-Liik, George Liik and R. G. Ward and is an official history of BHP.

With regard to Harold Darling and Essington Lewis, the two men most responsible for the drive and energy that drove the growth of the NIH, both men have been the subject of entries in the Australian Dictionary of Biography but only Lewis has been the subject of a scholarly biography. Geoffrey Blainey’s biography of Essington Lewis, The Steel Master: Essington Lewis, provides a thorough examination of Lewis’s life and achievements. It is one of the few works that examines the importance of Lewis’s 1934 journey to Japan, Europe and the United States in any detail. In addition, Blainey exposes the reasons that lay behind the establishment of the BHP London board in 1920. However, he provides little information concerning its directors, their influence on the company or the associated steel fabricators, despite this board representing a majority of shareholders in the company at that time. Some details concerning the members of the London board, together with details of the Newcastle-based steel fabrication management staff are discussed in the BHP Review: Jubilee Edition of 1935. Blainey also examines Lewis’s influence with the Joseph Lyons and Robert Menzies governments during the 1930s and how he and others, such as W. S.

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23 Hughes, The Australian Iron and Steel Industry 1848–1962
28 Blainey, The Steel Master, p. 123
Robinson of the Collins House Group, were eventually able to convince the government to accelerate the industrial preparation for war after 1937.

Alan Trengrove, in his book *What’s Good for Australia...!: The Story of BHP*, provides a detailed history of the company from its very inception, but Trengrove only sees Newcastle as a location. He provides no examination of the level of integration of Newcastle’s industrial base but he does provide a clear explanation of how BHP funded its growth without incurring debt. Peter Cochrane’s book, *Industrialization and Dependence: Australia’s Road to Economic Development, 1870–1939*, identifies the reasons behind the establishment of the totally British-based downstream steel fabrication industry in Newcastle. He argues that British steel manufacturers, who had developed large export markets in Australia prior to the First World War, responded to Australian protectionism and the promise of bounties to establish ‘branch houses’ co-located with the Newcastle steelworks. Colin Forster’s study of industrial development during the 1920s provides some interesting insights into the establishment of the steel fabricators in Newcastle but, again, he says little about the development and integration of the public utilities.

Christopher Jay’s book *A Future More Prosperous* is a celebratory work commemorating the history of the Newcastle steelworks; it was prepared for the shutdown of the Newcastle steelworks in 1999. It provides considerable chronological detail concerning the technological development of the plant and some information regarding the steel fabricators, but its examination of the whole of the Newcastle industrial base is slight. As for the steel fabricators, Ryland Bros., Lysaght, Stewarts and Lloyds, and the Commonwealth Steel Company, outside of company commemorative histories little is said concerning their integration into an industrial hub or their reliance on the logistic support provided by the public utilities. A. H. Smith’s M.Comm. thesis ‘The Australian Wire Industry: An Economic, Business and Technical History, 1870–1959’ is an exception but it is focused on the steel wire industry. This study contains considerable detail concerning Ryland Bros. (Aust) Ltd. and the Australian Wire Rope Works but says little about the logistic integration of both organisations with the remainder of the steel industry in Newcastle. One issue regarding the

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29 Alan Trengove, *What’s Good for Australia...!: The Story of BHP* (Stanmore: Cassell Australia, 1975)
31 Forster, *Industrial Development in Australia*
commissioned histories, such as those by Johnson-Liik, Liik and Ward or Jay, is that while they have high-quality chronological accuracy, they are largely non-scholarly celebratory works.

Many of the books written about the Australian iron and steel industry rely for much of their detail on having access to the BHP-Billiton archives in Melbourne. In 2016, these archives were closed for access by scholars, a short-sighted company policy. The University of Melbourne archive holds the Essington Lewis private papers and the W. S. Robinson private papers. These documents do provide useful insights into the personal and commercial relationships between BHP, the Collins House Group, Imperial Chemical Industries (Aust) Pty., General Motors Holden and the Federal Government. The Newcastle University’s Cultural Collections contain useful archive material concerning the Newcastle Trades Hall Committee. A number of theses contain valuable information, particularly that by Warwick Eather titled ‘The Trenches at Home: The Industrial Struggle in the Newcastle Iron and Steel Industry, 1937–1947’. In addition, records from the Newcastle Chamber of Commerce reports are useful because of their Newcastle-centricity, as opposed to the usual Melbourne- or Sydney-centric view of industrial history.

The most complete works concerning Newcastle’s industrial integration during the war years are the Civil Series of the Official War Histories. Paul Hasluck’s two volumes, The Government and the People, 1939–1941 and 1942–1945, together with S. J. Butlin’s two books concerning the War Economy, 1939–1942 and 1942–1945, provide considerable detail concerning a national narrative and the integration of the steel industry into the national defence plans. However, perhaps the most useful official history concerning the role of the steel industry at war is the fifth book in the Civil Series, The Role of Science and Industry by D. P. Mellor. Mellor’s discussion of the steel industry heavily relies on a pamphlet prepared by D. O. Morris for the Association of Metallurgists in 1947. Morris was the Assistant Superintendent of the Steel-making Department at the steelworks throughout

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the war and this pamphlet details the projects undertaken in the NIH.\textsuperscript{37} Each one of these projects was unique, with some, such as the development of Tungsten Carbide tools, requiring considerable research and development. Given the capability and size of the NIH, few of these projects were able to be duplicated in any of the capital city industries or by the Port Kembla steelworks at that time. Mellor also makes very positive comments regarding the development of technical education in Newcastle and the support it received from industry and the local community during the 1930s. These comments are supported by Joan Cobb in her history of technical education in NSW to 1949.\textsuperscript{38}

In addition to Cobb’s history of technical education, two studies provided information that directly concerned technical education in the NIH. The first was by Paul Mulconry, titled ‘Technical Education in Newcastle 1914–1940’, and the second was by F. J. Olsen, titled ‘Technical Education and Industry: A Study of the Relationship between Technical Education and Industry with Particular Reference to Newcastle, New South Wales’.\textsuperscript{39} Each of these studies provided details concerning enrolments and the building of the Tighes Hill Technical College during the 1930s, and emphasise the accuracy of Kerr’s comment that ‘Education is the Handmaiden of Industrialisation’.\textsuperscript{40} D. B. Copland’s book \textit{Towards Total War} provides a model as to how a modern industrialised economy, such as Newcastle’s was in 1940, converted to a total war manufacturing condition, a state Australia did not fully adopt until the end of 1941.\textsuperscript{41}

The period of the Great Depression is covered by many books, the majority of which either emphasise the economic tragedy of mass unemployment, almost to the exclusion of all else, or confine themselves to the national political and economic issues of the period. The most economically objective is Boris Schedvin’s book \textit{Australia in the Great Depression}.

\textsuperscript{38} Joan Cobb, \textit{Sweet Road to Progress: The History of State Technical Education in New South Wales to 1949} (Sydney: NSW Department of Education and Training, 2000)
\textsuperscript{41} D. B. Copland, \textit{Towards Total War: Address to the Victorian Branch of the Economic Society of Australia and New Zealand, 28 August 1942} (Sydney: Angus and Robertson, 1942)
Schedvin provides considerable detail concerning the tariff increases of 1929–30, the currency devaluation of 1930–31 and the reduction in the basic wage in 1932. In addition, he argues that it was the growth of the iron and steel industry between 1932 and 1934, then largely located in Newcastle, that led Australia out of the Depression.\textsuperscript{42} Alex Millmow also comments on the economic issues, emphasising how Australia’s Keynesian-style devaluation of 1930 was possibly the most useful activity presided over by government in that period.\textsuperscript{43} Barrie Dyster and David Meredith support Millmow’s comment.\textsuperscript{44}

David Potts’s book \textit{The Myth of the Great Depression} primarily addresses the social impacts of the Great Depression. While the emphasis of this book concerns conditions in Melbourne, it also includes comments which directly relate to the Newcastle humpy villages.\textsuperscript{45} Sheila Gray’s thesis ‘Social Aspects of the Depression in Newcastle, 1929–1934’ contains considerable detail concerning the social impact of the Great Depression on Newcastle but contains little analysis of Newcastle’s steel industry, the reasons for its survival and subsequent growth.\textsuperscript{46}

In common with Gray’s study many of the books and journal articles concerning the Depression emphasise the social problem of high unemployment and economic hardship, on a national level or in the two most populous cities, Melbourne and Sydney. But a work by the statistician F. R. E. Mauldon, \textit{The Use and Abuse of Statistics}, questions the basis for many of the commonly quoted statistics.\textsuperscript{47} Mauldon not only questions the basis of the unemployment statistical data collection by the trade union movement and its application regarding unemployment. It is curious that scholars have not used this work in the past to question the accuracy of the official unemployment figures or the validity of their meaning.

In terms of industrial relations in Newcastle between 1920 and 1950 two works provide a high level of analysis concerning industrial relations in the Australian steel industry,

\begin{itemize}
\item \textsuperscript{42} Schedvin, \textit{Australia and the Great Depression}. p. 11
\item \textsuperscript{43} Alex Millmow, \textit{The Power of Economic Ideas: The Origins of Keynesian Macroeconomic Management in Interwar Australia}, 1929–1939 (Canberra: ANU Press, 2010)
\item \textsuperscript{44} Barrie Dyster and David Meredith, \textit{Australia in the International Economy in the Twentieth Century} (Cambridge: Cambridge University Press, 1990)
\item \textsuperscript{45} David Potts, \textit{The Myth of the Great Depression} (Carlton: Scribe Publications, 2006)
\item \textsuperscript{47} F. R. E. Mauldon, \textit{The Use and Abuse of Statistics, with Special Reference to Australian Economic and Social Statistics in Peace and War}, 3rd edn (Crawley: University of Western Australia, 1949)
\end{itemize}
the great bulk of which resided in Newcastle. Hughes’s journal article ‘Industrial Relations in
the Australian Iron and Steel Industry, 1876–1962’ provides a broad view of industrial
relations in the Australian steel industry but is limited by its BHP-centricity. Eather provides
specific details of the industrial struggle in Newcastle from 1937 to 1947. He provides a
complete history of the strikes at the steelworks of 1943 and 1945 and the industrial disputes
at Ryland Bros. concerning women workers during 1943.48 This study is supported by Tom
Sheridan’s Mindful Militants: The Amalgamated Engineering Union in Australia 1920–1972
and John Merritt’s journal article ‘The Federated Ironworkers’ Association in the
Depression’.
Merritt provides a deeper understanding of the Federated Ironworkers’
Association (FIA) and the attitudes of the rank and file, but this work’s main theme is an
analysis of the union’s growth and the policies it adopted. His chapters on the war deal with
the union’s adoption of democratic socialism and the beliefs of Ernest Thornton, the union’s
General Secretary. Susanna Short’s book Laurie Short: A Political Life tells the story of how
Laurie Short succeeded the communist Thornton and the resultant turmoil of that
succession.50

There is also an extensive historiography available on Newcastle itself but, aside
from newspapers, and State and Federal Government Year Books, the majority of these
works are celebratory or commemorative. Scholars have conducted a number of studies
which detail the city’s economic and social development, from its beginning as a convict
settlement to the industrial status it achieved during the first half of the twentieth century.
The nineteenth-century period of coal mining and Newcastle’s early industry are well
covered in two books by John Turner.51 Likewise, the first quarter of the twentieth century is
well covered in Mauldon’s book A Study in Social Economics: The Hunter River Valley, New
South Wales.52 This book is an economic study of the Hunter Valley and the major urban
area of Newcastle. It provides considerable detail concerning the steel industry from its
beginning up until 1926 and discusses the integration between some of the public utilities
and problems with the industry’s workforce recruitment.

48 Eather, ‘The Trenches at Home’
50 Susanna Short, Laurie Short: A Political Life (North Sydney: Allen & Unwin, 1992)
51 J. W. Turner, Manufacturing in Newcastle, 1801–1900 (Newcastle: Newcastle Public Library, 1980); Turner, Coal Mining in Newcastle, 1801–1900 (Newcastle: Newcastle Public Library, 1982)
With respect to the public utilities that supported the steel industry in Newcastle, possibly the most useful publication was prepared by the Newcastle Division of the Institution of Engineers Australia, titled *Shaping the Hunter*.\(^{53}\) This book contains a number of refereed articles and detailed studies concerning every aspect of industrial development in Newcastle from the mid-nineteenth century until 1980. In addition, J. W. Armstrong’s book *Pipelines and People: The History of the Hunter District Water Board* details the activities of that organisation across the whole period of this study.\(^{54}\) Mark Fetscher’s book *Power Stations of the N.S.W.G.R.* details the development of the Zaara Street power station, its integration with the steel industry and growth across the whole period of this study.\(^{55}\)

In any discussion of the history of industrial development in Australia, the demographic domination of Sydney and Melbourne has to a large extent overwhelmed the industrial history of regional urban areas. As Eklund observed, regions are variously organised around a number of key industries and principal towns.\(^{56}\) Newcastle was such a place. Here, because of its relative isolation from the state capital city, it was obliged to develop as a totally independent industrial region. This was a factor in the style and scope of the development of the Newcastle urban area and its inhabitants.

**Structure of the Thesis**

The thesis consists of ten chapters, the first being the introduction. Chapter 2 provides an account of the period of change in BHP and the arrival of the first downstream steel fabrication companies, Commonwealth Steel Co. Ltd., Lysaght, Ryland Bros. (Aust) and the Australian Wire Rope Works between 1918 and 1925. This period saw major changes in the BHP board hierarchy, beginning with the establishment of a London board in 1920 and changes to the membership of the Melbourne board and in the senior management of the company. It will assess whether closing the steelworks for nine months during 1922 and 1923 was a help or a hindrance in achieving the cost reductions required.


This chapter will also analyse the method used to achieve reductions in the cost of coal and the control of shipping through the establishment of a vertically integrated organisation structure. The control of shipping was achieved by the establishment of a wholly owned company shipping line, as was the cost of coal, with BHP purchasing and developing its own collieries.

Chapter 3 covers the period between 1925 and 1930. It begins with Essington Lewis’s overseas trip in 1925, evaluates the trip’s outcome and concludes with a measure of the success of his next overseas trip in 1930. The agreement to establish a tube-making plant in Newcastle by Stewarts and Lloyds is analysed.

The fourth chapter discusses the survival and recovery of the NIH from the Great Depression in the years 1929 to 1934. There is, however, no evidence to suggest that given the national economic problems Newcastle’s steel industry would succumb. During 1930 the Scullin Labor Government raised the tariff levels to new heights to provide protection to manufacturing in order to protect jobs. In addition, this government oversaw — more through accident than design — the devaluation of the Australian currency by thirty per cent during 1930 and 1931. For Newcastle itself the nadir of this period was the closing of the State Government-owned Walsh Island Dockyard and Engineering Works in 1932.

Chapter 5 examines the growth of the NIH between 1933 and 1940. This chapter reviews the boom in the growth of industry to manufacture standard peacetime steel products and for war. Mellor, in the official history The Role of Science and Industry makes the point that after Lewis returned from his visit to Japan and Germany in 1934 it is difficult to say how far the rapid rise in steel production was due to purely economic factors or the result of a deliberate policy aimed at self-sufficiency. This period also witnessed the exponential growth of technical education in Newcastle. Beginning in 1933, the Wood Street College was expanded and beginning in 1936 a new large technical college was built in the suburb of Tighes Hill. The level of industrial autarky achieved between 1933 and 1940 made it possible for the steelworks and for each of the downstream steel fabricators to establish munitions annexes in the NIH after 1938.

\[\text{Mellor, The Role of Science and Industry, p. 177}\]
Chapter 6 covers the two-year transition to total war between 1940 and December 1941, this includes an evaluation of the technical innovation conducted in NIH in the first two years of the war.

Chapter 7 examines the period of Total War between 1942 and 1943. With a Labor Government in power, its review of the manpower-control rules and the introduction of women into the NIH is examined.

Chapter 8 reviews the final two years of the war and examines how the reduction in munitions manufacture was managed in Newcastle. Stuart Macintyre’s book Australia’s Boldest Experiment: War and Reconstruction in the 1940s covers this period well.

Chapter 9 is a review of the first five years of peace and discusses the reasons why the Australian steel industry did not fully engage the available steel export market after the war. In 1950, with the death of Darling, BHP underwent major top management change, its first since 1921. Lewis was appointed chairman of the company and many of the senior management in BHP and the associated steel fabricators were restructured.58

Chapter 10 is the conclusion, where the development of the NIH and the thirty-year reign over the development of Newcastle’s steel industry by Darling and Lewis is assessed.

In 1915, the BHP steelworks in Newcastle was officially opened. War in Europe and the Middle East was raging and the demand for steel and steel products was rapidly increasing. As the war in Europe consumed ever more men and steel, the domestic demand for iron, steel and fabricated steel products increased exponentially. Chapter Two will show how, through a combination of government and trans-national assistance, the new steelworks commenced its journey to become the centre of an industrial hub.

58 Jay, A Future More Prosperous
CHAPTER 2:
BEGINNINGS OF THE NEWCASTLE INDUSTRIAL HUB, 1915–1925

As a consequence of the First World War, between 1915 and 1919 Newcastle’s new steelworks enjoyed almost unrestricted access to the bulk of the Australian iron and steel market. The first test for this new venture in Newcastle had been to fill the market void for standard carbon steel products between 1915 and 1919. The second test would be to determine if, in a peacetime environment, the manufacture of iron and steel in Australia would continue to be as profitable as it had been during the war. By 1914, the first and second industrial revolutions had reached their respective apogees.¹ In Europe, manufacturing during the First World War reflected the technologies of both revolutions.²

From BHP’s standpoint, the temporary disappearance of overseas competition during the war was timely. In Australia, steel was required for the rails needed by each state railway system and to provide the wire and flat steel products required for a growing rural and urban economy. Iron was required by a range of downstream iron foundries, which manufactured an increasing range of consumer products. From 1920, the production of iron and steel by the Broken Hill Proprietary Co. Ltd. (BHP) in Newcastle progressively became the great pivotal activity around which a mixed family of upstream mining, downstream steel fabrication and heavy engineering companies had clustered. This industrial cluster was supported by public utility organisations that provided fresh water, electricity, rail transport, port services and technical education services. This chapter explores the impact of the changes which occurred in the high-level management of BHP between 1920 and 1922, together with the changes which brought about the formation of an industrial hub in Newcastle between 1920 and 1925. The chapter reviews the methods used by this new management team to establish control over a range of high-cost legacy issues and how the first downstream steel fabrication operations were encouraged to establish their operations in Newcastle.

² The First Industrial Revolution concerned the development and application of steam and iron manufacture. The Second revolved about iron and steel manufacture, metallurgy and chemical technologies, the application of electricity, telecommunications and the internal combustion engine.
Facilitated by the steelwork’s regional location, decision makers at BHP orchestrated the establishment or expansion of firms and organisations by which they could be linked logistically or commercially. The resultant industrial arrangements were able to achieve synergies, leveraging economic advantage from shared access to information and knowledge networks. Supplier networks and product distribution chains provided trans-national marketing intelligence, competencies and resources. By adopting this strategy, within a decade of its opening in 1915, BHP’s steelworks became the centrepiece of a Newcastle Industrial Hub (NIH). By 1929, in commercial terms and manufacturing capability, this industrial hub was, if not in size or product range, comparable to integrated manufacturing hubs which had developed in Pittsburgh in the United States during the nineteenth century.

In a similar vein to Newcastle, the ready availability of black coal allowed Pittsburgh to develop into a large-scale steelmaking centre in the United States in the 1880s. This growth, through United States Steel, was similar to the growth of BHP. The establishment of the steelmaking and fabrication industry was supported by both Federal and State Governments, which together with some private educational institutions provided the underlying infrastructure that the city’s steel industry was built on. In Pittsburgh, the manufacture of fabricated steel products, wire, flat steel, corrugated iron and tube was conducted by the steel manufacturer itself. The supply of the industry’s underlying infrastructure, such as the supply of fresh water and technical education, was conducted by local public or private utilities.

The creation of this industrial hub in Newcastle had more than just industrial outcomes. For the eleven municipalities collectively known as Newcastle, the major impacts during the 1920s revolved about population growth and education. In 1891, with an economy based on coal mining and shipping, Newcastle’s population was 50,662. With the progressive closure of coal mines in Newcastle and the opening of new collieries in the nearby South Maitland Coalfields, the 1911 census identified that with little change to the economic base, the population had grown by just ten per cent to 55,380. However, with the reorientation of the economy towards large-scale steel manufacturing, the 1921 census identified that Newcastle’s population had grown to 86,255, or by 56 per cent. People were

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attracted to Newcastle not only for jobs in the heavy industries but in the supporting trades, construction and retail services, all boosted by the activity of the hub and the increasing industrialisation of the city. Newcastle’s population growth was due not only to the geographic concentration of the steel industry and the presence of good quality coking and gas coal. The combination of these industries attracted a wide range of supporting ancillary operations. Machinery stockists, materials warehouses and specialist manufacturers which provided steel manufacturers with access to particular materials or engineering items were established in the city. This enabled a higher degree of labour pooling and manufacturing economy, through the use of shared suppliers and infrastructure.

The logic of industrialisation in Newcastle ushered in changes to the workforce which saw an increasing and widening range of specialist knowledge and skills supported by higher levels of education. Urbanisation became the normal way of life, as socialised industry such as coal mining declined. This brought a wider role for government to provide the services demanded by an urbanised society. In the Australian context of the time, Newcastle’s regional manufacturing location was unique. A complete range of end-user products were manufactured, ranging from wire netting, wire nails, steel wire rope and galvanised flat to corrugated steel. Locomotive axles, wheels and tyres were manufactured by the Newcastle-based steel fabricator Commonwealth Steel Co. Ltd. Raw chemicals such as Benzol and tar (with its constituents of sulphate ammonia, carbolic acid, creosote, fuel oils and pitch) were, as by-products of the coke ovens process, marketed as discrete products.

The manufacture of iron, steel and by-products was conducted by BHP, a public joint stock company with a paid-up share capital of £2,687,708 in 1921. Established as a mining company at Broken Hill in western NSW during 1885, by the 1920s it operated plants, mines and quarries in NSW, Victoria, South Australia and Tasmania. In 1921, its operations totalled £5,898,850 of capital investment. The Newcastle steelworks was its largest single operation directly employing 5739 men in 1921. To make steel in Newcastle, BHP had to assemble inputs from around Australia and from its region. In 1921, iron ore was shipped to Port

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6 ‘Steel Products Co., Ltd.’, *Newcastle Morning Herald and Miners’ Advocate* (Newcastle, NSW), 10 December 1923, p. 10
7 Mauldon, *A Study in Social Economics*, p. 86
8 Mauldon, *A Study in Social Economics*, p. 86
Waratah from Spencers Gulf in South Australia, limestone was shipped from Tasmania, silica rock (sandstone) was hewn at Gosford and 3000 tons of phosphate rock was shipped annually from Nauru and Ocean Island in the Central Pacific Ocean. However, the key ingredient in this mix of minerals was coal, which must be baked in a coke oven to make coke and to extract the by-products.

Coke is a fuel with high carbon content but with the impurities contained in raw coal driven out through the coking process. This process occurs by baking the coal in an airless oven at a temperature generally around 1000–1100 degrees Celsius. The resultant coke is then used as a fuel and as a reducing agent to smelt iron ore in a blast furnace. Coal was also used to power the steam boilers to create the steam that drove the rolling mills, powered the steam locomotives on the plant and was ultimately used to bunker the ships that bought other minerals to Port Waratah. In 1921, 11,000 tons of coal was consumed weekly by the steelwork's coke ovens.

In 1921, the key items of equipment at the Newcastle steelworks consisted of three blast furnaces to manufacture iron, one with a capacity of 500 tons and two with capacities of 450 tons of iron per day. These furnaces were able to be loaded or charged using electrically powered grabs into the top of the furnace. A typical charge comprised about five tons of coke, eight tons of iron ore, two tons of limestone, one-quarter of a ton of sandstone and about half a ton of steel slag. Apart from the pig iron produced each day, some 55,000,000 cubic feet (6,111,111 cubic metres) of waste gas was produced by the blast furnaces. This waste gas was collected and then used in various steam boilers or in other furnaces about the plant. The blast furnace process also formed large quantities of iron slag (approximately 1500 tons per week) which, after crushing, could be used for concrete or road-making purposes. The bulk of the iron produced was used in the downstream manufacture of steel but some was cast in ‘pig’ mills for sale to iron foundries. By 1922, iron

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9 Mauldon, *A Study in Social Economics*, p. 87
11 Mauldon, *A Study in Social Economics*, p. 90
12 Mauldon, *A Study in Social Economics*, p. 88
production in Newcastle had grown to 235,000 tons and steel production was 220,000 tons.¹³

Steel was produced in seven open hearth furnaces, each with a capacity of sixty to seventy tons. Iron was transferred from the blast furnaces in ladles by rail then loaded into the open hearth furnace. Electrically driven mechanical charging machines fed the furnaces with additional materials used to assist the transformation of iron into steel. The iron was heated up to 1800 degrees Celsius, regularly sampled and tested across a nine- to ten-hour cycle to produce a heat of steel. When ready the steel was tapped from the furnaces into seventy-five ton ladles then teemed into ingot moulds. After the ingots had sufficiently hardened, they were transported by a narrow gauge rail system to soaking pits at the steel rolling mill, stripped of the ingot mould and loaded into the mill's soaking pit furnaces.¹⁴ After heating in the soaking pit, the ingot, which weighed 3.25 tons, was loaded onto the rolling mill then guided back and forth through the blooming mill rolls. This mill, powered by a 13,000 horse-power (9750 kW) steam engine, reduced the dimensions and extended the length of the ingot for further downstream processing. The bloom mill had the capacity to roll 10,000 tons of steel per week. After rolling, the elongated blooms were moved to other mills for reheating and fashioning into end-user products such as rails, bars of various sizes, rods, fishplates and assorted steel shapes.

The formative years of the BHP steel works were eased by the protection from import competition offered by a world war. BHP faced new challenges in the interwar period and met them with changes in company organisation and direction at the highest level. Geoffrey Blainey, a leading author of Australian business histories, makes the point that the anatomy of power in a large public company such as BHP often seems mysterious. It is clear that with the promotion of the former mining engineer Essington Lewis to Assistant General Manager on 23 November 1919 a major organisational change had begun in the company. Guillaume Delprat had been the General Manager of BHP since 1898 but during his time the real source of power within BHP lay with the shareholders, acting through their Melbourne-based

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¹⁴ Mauldon, *A Study in Social Economics*, p. 89
board chaired by Bowes Kelly.\textsuperscript{15} As Delprat’s second-in-command Lewis’s craving for facts encouraged him to identify just who the shareholders were.\textsuperscript{16}

Since the 1880s, when every share in the company had been held in Australia, there had been a drift in share ownership to the point where, by 1920, British-based owners held a majority of the shares. As a concession to these shareholders, who had the voting power to have the company directed from London had they wished, BHP established a small London office and a board of London-based directors in early 1920. The London board gave advice but authority remained with the Melbourne board, which was always referred to as ‘The Board’.\textsuperscript{17} The Board’s policy in respect to the range of steel products it would produce was in many respects guided by BHP’s advisor and manager of the Newcastle steelworks, the American engineer David Baker. He endorsed large-scale integrated production to provide the larger total output at lower unit cost. The unintegrated production of small steel firms which still predominated in Britain was not acceptable in its former colony.

**BHP’s Development Strategy**

In November 1920, Delprat, the General Manager of BHP, clearly stated the company’s preferred strategic model and sense of its future direction:

> Our policy is not to make ourselves all of the articles that can possibly be made out of steel, but rather to make the best quality steel, and as much of it as possible, so that we can produce it cheaply. We wish to establish other firms alongside us in order to secure a constant and regular outlet of steel. We enter into contracts with firms possessed of experience in making special lines and guarantee their supply of raw material….. We aspire to be the Mother or Key industry of many dependent industries valuable and necessary to the growth and maturity of the Australian nation.\textsuperscript{18}  

\textsuperscript{16} Blainey, *The Steel Master*, p. 57  
\textsuperscript{17} Blainey, *The Steel Master*, p. 59  
\textsuperscript{18} Hughes, *The Australian Iron and Steel Industry*, p. 82
The formulation of a competitive strategy relies on the fit of the organisation’s products to its operational environment. The choice of strategic direction for BHP was a complex question, the answer to which developed over time in accordance with the national economic conditions in which BHP operated. Strategy depends on the available assets, together with the resources and time available to achieve the desired outcome. Once BHP had become a steel-maker in 1915, together with Australia’s new wartime circumstances, its business strategy was to expand its steel manufacturing capacity by focusing on import replacement. The other aspect of this strategy was to ensure that it could achieve this aim with the minimum of competition. To achieve this desired strategic outcome BHP, as outlined by Delprat, used all of its British-based trans-national business relationships to establish co-located steel fabricators in Newcastle, at the same time keeping competitors out of the Australian market.

In the immediate wake of the First World War this strategy was strongly supported by both tiers of government through tariff protection and purchasing preferences. This would encourage the development of steel product diversification at minimum risk for all parties and protected against future steel shortages. BHP was originally a very profitable non-ferrous mining company which had extracted silver, lead and zinc ores from the lode at Broken Hill since 1885. In 1912, at the suggestion of the company’s General Manager Guillaume Delprat, the company decided to move from the mining and processing of non-ferrous ores to the manufacture of steel. Delprat advised that ultimately the mine reserves would be exhausted and that the company’s long-term future was in manufacturing. BHP was extremely fortunate in that it moved into the steel industry at a time when Britain, the key supplier of steel to Australia, became involved in a world war. The war quickly absorbed the bulk of iron and steel production in Britain and this gave BHP its commercial opportunity in Australia. In addition, BHP was able to make use of the size of its British shareholder base to encourage the co-location of established British steel fabrication companies with its Newcastle steelworks.

The board of directors shared Delprat’s vision of the Newcastle steelworks as being the centrepiece of a cluster of steel fabrication plants which would provide the steelworks with a guaranteed local steel market. By 1920, Delprat’s long career was coming to an end, but his work had been highly valued. Blainey notes that Delprat often dined with the directors.

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of the company, at a time when many managers were treated as inferiors.\textsuperscript{20} However, Delprat had made mistakes. In 1909 he had failed to identify the full scope of the line of lode at the Broken Hill mine. Later, when a share in the BHP smelters at Port Pirie was sold to help fund the building of the Newcastle steelworks, because of his poor management of the smelters the new co-owners insisted that he resign as managing director at Port Pirie.\textsuperscript{21} It was not apparent in 1920, but Delprat had just convinced the BHP board to fund the building of a third and larger blast furnace in Newcastle. Its operations commenced in 1921, just as the domestic steel market collapsed.

In November 1919, Delprat, who had just turned 63 years of age, informed the board that he was contemplating retirement.\textsuperscript{22} The board agreed to his resignation at some mutually convenient time and Lewis was proposed as a successor. Christopher Jay observed that Delprat considered Lewis suitable for the job.\textsuperscript{23} Delprat’s last large project was to have introduced a Duplex steelmaking process. The Duplex system was a two-step iron-to-steel conversion process, making use of both the Bessemer and Open Hearth processes to speed the production of steel. This process, developed during the war, was used in some steelworks in North America and Europe.\textsuperscript{24}

BHP maintained good relations with overseas steel companies, arranging for its senior officers to regularly make site visits, to review or purchase new technology and to cement friendships with their counterparts. In 1920, Lewis, accompanied by Harold Darling (the youngest director on the BHP board), travelled overseas to inspect steelworks that were using the Duplex system in the United States and Europe. Lewis soon became convinced that it was the wrong technology for Newcastle. After a significant amount of correspondence between Lewis, Darling, Delprat and the BHP board, the decision to proceed with the plan for the adoption of the Duplex process was put on hold. On Lewis’s return to Melbourne he submitted his report, which as noted previously challenged Delprat’s plans for the Duplex system and the Semit Solvay Coke Ovens technology. On 18 February 1921 the board deliberated and made the decision that Lewis would replace Delprat as General Manager. Delprat was employed as an engineering consultant for two years on a salary of £4000 per

\textsuperscript{20} Blainey, \textit{The Steel Master}, p. 61
\textsuperscript{21} Blainey, \textit{The Steel Master}, p. 62
\textsuperscript{22} Christopher Jay, \textit{A Future More Prosperous: The History of Newcastle Steelworks 1912–1999} (Newcastle: BHP, 1999), p. 102
\textsuperscript{23} Jay, \textit{A Future More Prosperous}, p. 102
\textsuperscript{24} Blainey, \textit{The Steel Master}, p. 63
year, before handing the chief executive’s job over to Lewis. In 1922, Bowes Kelly retired as chairman of the BHP board and on 27 October 1922 Darling was elected chairman. These management changes put the two architects of the NIH in power and would have a profound impact on BHP and Newcastle itself over the next thirty years.

The new management team faced particular challenges as they sought to increase BHP’s profitability and ensure its long-term viability. Wartime production prosperity progressively ended for the Newcastle steelworks during the second half of 1919, leaving it with a range of fundamental problems, which also affected the whole of the Australian manufacturing industry. A post-war inflationary spiral had caused costs to rise particularly with regards to coal, a basic steel industry mineral. In 1915, coal had been purchased for 6s. 6d. a ton, in 1919 it cost 17s. 9d. a ton and in 1920 it had risen to 21s. 9d., remaining at this level until 1926. The coal owners’ cartel, known as the Vend, and the unions vied with each other to increase the cost of coal to all large consumers. Although they only sought to supply the domestic market, BHP always had to be aware of the cost structures in other nations, as this affected the price of imported steel.

In 1920, there was very little tariff protection for the steel industry and BHP relied heavily on Federal and State Government purchasing preferences to maintain a full order book. Nevertheless, it was clear to both Darling and Lewis that action to significantly lower costs of production was required if the Newcastle steelworks was to survive. Given the relatively inefficient Semit Solvay coking technology used by the steelworks, the disparity between the average cost of coke production of 22s. 6d. a ton in an English steelworks, 13s. 1d. a ton in an American steelworks and the 37s. 4d. a ton in Newcastle was mainly due to the inflated price of Australian coal. The small stream of imports of 1919 threatened to become a flood by 1920 as world demand fell and British steelmakers clamoured for access to the Australian market. If the competition was keen in 1919, by 1921 it was cut-throat.

25 Blainey, *The Steel Master*, p. 64
26 Jay, *A Future More Prosperous*, p. 262
27 Hughes, *The Australian Iron and Steel Industry*, p. 92
30 Hughes, *The Australian Iron and Steel Industry*, p. 86
In addition to coal prices, BHP’s main cost complaint concerned high direct labour costs. This was a matter in which the NSW and Commonwealth governments held sway and BHP lobbied both tiers of government strongly for lower wage rates. In 1920, the NSW government appointed a Royal Commission to inquire into the possibility of reducing the standard working week. In spite of opposition from both BHP and the Hoskins Steel Company in Lithgow during 1921, the standard working week was reduced from forty-eight to forty-four hours per week. Also in 1921, the ‘living wage’ in NSW was increased by 8s. 6d. to £4 13s. 6d. a week. BHP had argued in the Arbitration Court for a ten per cent reduction to the basic wage but, aside from some reductions granted to shift penalties and some margin rates, this was rejected by the court because any reduction would be too close to the sacrosanct living wage. Having received this decision, and still facing high coal prices, Bowes Kelly, the chairman of directors, announced that, rather than maintain production and incur a potentially heavy loss, the company had decided to shut the steelworks down. Accordingly, production ceased at the steelworks in June 1922 and did not resume until March 1923.

Throughout the nine-month shutdown about 840 staff and maintenance men were kept on to conduct deep maintenance and, in some cases, rebuild parts of the plant. Others were engaged as day or casual labour on the maintenance and rebuilding work. This was Newcastle’s first experience of BHP’s hard-nosed decision making, long familiar in Broken Hill and in much of the mining industry, where the company had a history of taking such decisions. Mauldon observed that Newcastle itself staggered under the loss of a weekly wages injection of £30,000 into its economy during the shutdown. Consequently, many individual workers and their families suffered considerable distress at this time. As will be shown, BHP continued with such direct policies over the next two decades, ensuring that it was well placed to financially survive the Great Depression and capitalise upon the opportunities presented by the preparations for and prosecution of the Second World War. From a company perspective the closure of the steelworks was only a temporary tactic, giving BHP time to put other measures in place which would assist in reducing operational costs. It was also about this time that the decision was made to introduce a new technology by making the change from steam to electric traction on a large scale in the steelworks.

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31 Hughes, *The Australian Iron and Steel Industry*, p. 94
32 *BHP Review: Jubilee Number*, (1935), p. 26
These few paragraphs outline the difference between the hope of 1915 and the reality of 1922. In reviewing this period, E. M. Johnson-Liik, George Liik and R. G. Ward observed that a fundamental problem had to be addressed. This problem lay in the difference between the social standards acceptable by Australian society, as defined by the Court of Conciliation and Arbitration, and those pertaining in the world of international commerce in which the Australian steel industry operated. To balance the gap between the two, either the price of the goods had to fall or the level of protection through the tariff increase. Increased tariffs, in turn, raised the price for local consumers and the ire of both rural and urban consumers. The price of goods could only be reduced by either obtaining cheaper coal, the socially unacceptable method of lowering of wages, or through a combination of both. While the steelworks were modern and well managed, increases in efficiency could only be assessed after production resumed.

**Vertical Integration**

BHP could do little itself to immediately reduce the cost of labour but it quickly introduced a number of in-house remedies to take control of the cost of materials and services. Lewis identified that the areas of coal supply and sea freight would be targeted. Possibly based on his own observation, together with advice from Baker, Lewis determined to adopt an organisational vertical integration solution similar to American practices. The small Australian market was rarely able to sustain sufficient upstream and downstream firms to maintain the required production rate of a continuous manufacturing operation as BHP had established in Newcastle. In the case of both shipping services and the supply of coal at an acceptable cost, vertical integration addresses this form of market failure. The adoption of a vertical integration strategy to overcome this market failure enabled BHP to pursue upstream or downstream growth opportunities. In addition, by internalising supply and distribution functions significant economies of scale could be achieved. However, this strategy was not without risk, as the concentration of additional fixed costs in the form of ship and colliery ownership increased and, unless each operation was carefully managed, expertise could shift away from the firm’s core competencies.

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The operation and delivery of coal supply and shipping services would be undertaken directly by BHP itself through the creation of wholly owned subsidiary companies. The key advantage BHP gained by adopting a vertically integrated organisational structure was that it gave the company greater operational and process control and in BHP’s case increased the supply chain coordination. This was particularly so in the case of the problem of the supply of black coal at an acceptable price. Coal was a large-scale and vital commodity for the steel industry, which required mining and movement operations to be conducted on a large scale. However, the adoption of this strategy required careful management to ensure that business flexibility was maintained. Vertical integration could be successful when the scale of operation was such that the business economy of scale was large enough to warrant the development of discrete business entities.

In 1923, BHP Collieries Pty. Ltd. was formed to manage coal production and future acquisitions. A British coal geologist, J. M. Morris, was engaged to inspect and make recommendations concerning various coal land options already held by BHP. After extensive exploration in the South Maitland coalfield BHP arranged to establish its own coal mines and in 1925 it acquired an existing colliery at Belmont North. This colliery was located on an existing rail link to the Port of Newcastle and was renamed John Darling after a former company chairman. At the same time, in cooperation with the Hebburn coal company, BHP acquired 1,538 hectares of coal-bearing land at Weston on the South Maitland coalfield. Here a new colliery, named Elrington, would be developed.

BHP determined that both of these collieries would make the maximum use of mechanical equipment to reduce the cost of coal extraction and its movement from the colliery to the steelworks. The John Darling colliery began supplying coal to the steelworks in 1925, just when coal prices from other suppliers had risen to 25s. 6d. a ton. The coal supplied from John Darling was primarily used for making metallurgical coke. Elrington would supply gas-making and steaming coal, however, due to an industrial dispute (which commenced in February 1929 and lasted until June 1930) the first coal from Elrington was not delivered to the steelworks until the third quarter of 1930. Both of these collieries were highly mechanised on American lines using a combination of electric-powered coal-cutting

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36 Jay, A Future More Prosperous, p. 263
38 Hughes, The Australian Iron and Steel Industry, p. 100
machines, powered materials-handling equipment and battery-powered locomotives to move the coal underground.39

After some early shipping industrial disputation and sailing coordination problems, in order to have control over the delivery of raw materials to Newcastle and the shipment of finished products to interstate markets BHP established a shipping department. The first vessel purchased was the ten-year old Koolonga on 22 November 1917, under a joint ownership arrangement, and on 30 July 1918 the ship was renamed Iron Monarch. BHP was now a ship owner. In 1923 and 1924 the company’s fleet was increased through the purchase of three vessels purchased from the Commonwealth Government. These vessels were renamed Iron Knob, Iron Master and Iron Prince and in 1925 a fourth vessel was purchased and renamed Iron Warrior.40 This fleet of five ships was adequate to service the needs of the Newcastle steelworks until 1936, when the company had an additional four ships built in Scotland. In parallel with the formation of BHP Shipping in 1923 the Port Waratah Stevedoring Co. Pty. Ltd. was formed to coordinate harbour and port materials handling facilities in various ports around Australia.41 In 1924, a new subsidiary company, BHP By-Products Ltd., was established. An American by-products expert was recruited and this subsidiary handled the sale of not only the by-products produced by the coke ovens, but also the crushed slag from the blast furnaces. The by-products of the steelmaking operations became a profitable sideline for BHP.

All tiers of government provided direct or indirect support to the NIH. The Federal Government supported the steel industry through the implementation of tariffs on imported steel and the payment of bounties to each of the steel fabricators and to Lysaght in Parramatta. The NSW State Government provided support through the actions of Newcastle’s public utilities, rail freight concessions and purchasing preferences. In terms of bounties, in 1925 the Federal Government authorised a bounty payment to Newcastle-based industries of £130,000 annually.42 Rail concessions saw rail freight in New South Wales charged at £1 15s. 5d. per hundred miles for locally made product and £2 9s. 7d. for imported product, or about a thirty per cent advantage for the local manufacturer.43 In spite of the benefits provided by both governments, competition from imports made expansion of

39 Mainwaring, Elrington, p. 15
40 Hughes, The Australian Iron and Steel Industry, p. 100
41 Johnston-Lilik, Lilik and Ward, A Measure of Greatness, p. 268
42 Mauldon, A Study in Social Economics, p. 116
43 Mauldon, A Study in Social Economics, p. 116
manufacturing capacity in the steelworks something of a conundrum for BHP. However, after the plant resumed production in March 1923 steel manufacturing capacity grew with the building of two additional open hearth furnaces, Nos. 8 and 9 in 1925.44

Prior to building the steelworks, BHP had negotiated conditions for the modification of the port of Newcastle, the supply of fresh water and other government services for the steel industry. In terms of the supply of fresh water, since 1892 the supply of fresh water to the urban populations of Newcastle, Maitland and Cessnock had been the responsibility of the Hunter District Water Supply and Sewerage Board. However, as the population of Newcastle and the South Maitland Coalfields grew, and with the imminent arrival of large-scale manufacturing in Newcastle, it was clear that the existing water supply scheme would not meet the forecast demand. In 1913, the NSW Public Works Department was tasked to augment the existing scheme.45 A new water scheme based on the Chichester River was operational in 1923.46 This new water scheme was ostensibly for residential use but the steel industry was the Board’s largest customer. The principle uses of fresh water were in the steam boilers, cooling product such as coke after it had formed and other process operations. In each case, after its initial use waste water was collected, filtered and reused.

The generation and distribution of electric energy began in Newcastle in 1890, the energy being generated by the Newcastle Borough Council’s new power station in Sydney Street — now Tyrrell Street, Newcastle. By the turn of the century, the Newcastle Borough Council had established an Electricity Supply Department which was named the Newcastle Electricity Supply Council Administration — or NESCA.47 In 1913, the Department of Railways had built a temporary generating station at the eastern end of the Newcastle Railway Yards near Zaara Street to supply power to the new electric coal-loading cranes located in the Carrington Basin and the new Walsh Island Dockyard.48 The coming of large-scale manufacturing, in the form of BHP, the Commonwealth Steel Company in 1918 and the Austral Nail Company in 1920, saw generation plant transferred to the Zaara Street

44 Jay, A Future More Prosperous, p. 263
48 Mark Fetscher, Power Stations of the N.S.W.G.R. (Charleston: the author, 2002), p. 56
During this period the Zaara Street and Tyrrell Street power stations were interconnected and NESCA expanded its distribution system. In 1924, the Railways Electricity Department transferred another 7.5 mW unit from the Ultimo Power Station in Sydney, increasing the Zaara Street power station generation capacity to 16.5 mW. NESCA controlled the distribution of electric energy distribution in Newcastle but the Railways provided the delivery of bulk power.

During the enforced shutdown period at the steelworks a decision was made to introduce electric traction to replace steam traction in the plant. In October 1924 a new powerhouse, capable of generating 10 mW of electric energy, was built and electric energy was distributed about the plant. To ensure both the availability and reliability of the electric energy, the steelwork’s electrical system was interconnected with the Zaara Street power station and the Newcastle power grid. This interconnection is another example of how the State Government reinforced the ability of the steelworks to increase its manufacturing efficiency and lower its costs of operation. In addition, it confirms the point made by Joel Mokyr concerning the application of production engineering. During the 1920s, the increasing availability of improved electrical controls encouraged BHP and its subsidiaries to expand the use of electric power on their plants to further increase operational efficiency.

Another government service that assisted the emergence of the NIH was public education. This included the free, compulsory and secular education to all Australian children up to the age of fourteen but, more specifically, the technical education required to train the highly skilled workers needed for modern industry. As Clark Kerr, J. T. Dunlop, F. H. Harbinson and C. Myers wrote, ‘education is the handmaiden of industrialisation’. Education is normally looked on as a service rather than as a public utility but this service and its integration into the NIH was fundamental to the Hub’s development and its success.

Technical education had been available in Newcastle since the 1870s through the School of Arts system but in 1896 the Colonial Government erected a new technical college.

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49 Fetscher, *Power Stations of the N.S.W.G.R.*, p. 57
50 Fetscher, *Power Stations of the N.S.W.G.R.*, p. 57
52 Joel Mokyr, ‘The Second Industrial Revolution, 1870–1914’, <https://pdfs.semanticscholar.org/769c/a06c2ea1ab122e0e2a37099be00e3c11dd52.pdf>, [accessed 19 September 2018], p. 8
53 Kerr, Dunlop, Harbinson and Myers, *Industrialism and Industrial Man*, p. 47
in Hunter Street West.\textsuperscript{54} This new technical college provided trade training for fitting and turning, blacksmithing, pattern making, plumbing and moulding apprentices. Professional training at the School of Arts was initially limited to that required by Colliery Managers and Marine Engineers. Diploma training required by the steel industry included metallurgy, mechanical and electrical engineering, and industrial chemistry, and was somewhat different. The need for diploma-level training developed largely in line with the growth of the steel and heavy engineering industry throughout the 1920s. Students attended classes in their own time and paid a fee of approximately five shillings per term. In 1920, 1317 students were enrolled at the Newcastle Technical College.\textsuperscript{55}

In 1925, as part of its new management development programme, BHP introduced an ‘in-house’ training scheme. The objective of this scheme was to ensure that all of those employees accepted as diploma trainees, or apprentices, completed their formal training commitments.\textsuperscript{56} Blainey observed that Lewis established the scheme when he discovered that only fifteen of the company’s junior technical officers had completed their full courses in metallurgy, chemistry or engineering. The impact of the scheme can be seen in 1932 when sixty-three technical officers had completed their full training.\textsuperscript{57} This company-based training scheme was also introduced across each of the subsidiary and associate companies in the NIH. Aside from the Government Railways or the Defence Forces, such a training scheme was unusual in any Australian industry at this time. Ultimately the concept was adopted by a number of other larger Australian companies, such as ICI (Aust) Pty. Ltd.\textsuperscript{58}

Unfortunately, the delivery of technical education in Newcastle during the 1920s suffered from a lack of investment in facilities and staff; consequently, complaints concerning this issue from within Newcastle’s growing steel industry increased. In 1915, the Hunter Street College expanded by taking over the neighbouring Trades Hall and the Great Northern Brewery buildings. In 1925, the college grew again but this time on a new site, with the takeover and conversion of the old Wood Street Brewery. However, this expansion was driven by the Federal Government’s training programmes for returned soldiers.

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\textsuperscript{55} Paul G. Mulconry, ‘Technical Education in Newcastle: 1914–1940’, unpublished M.Phil. diss. (University of Newcastle, 1972), p. 43
\textsuperscript{56} Jay, \textit{A Future More Prosperous}, p. 263; also see BHP, \textit{Staff Training Scheme Booklet} (1927)
\textsuperscript{57} Blainey, \textit{The Steel Master}, p. 80
\textsuperscript{58} Quincy Bent, Bethlehem Steel Co., USA, to Essington Lewis, Letter A 702, Essington Lewis Papers, Melbourne University Archives
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At the federal level, governments intervened to assist the steel industry by imposing tariffs on imported steel and steel products. In August 1919, BHP’s Chairman of Directors stressed the need for protection against low-cost countries and against the dumping of steel. The United States Webb Act, passed in 1918 to stop the Europeans from dumping steel goods in America, was widely quoted as an example Australia should follow at this time.\(^{59}\) Iron and steel manufacturers were in the forefront of claimants for high levels of protection and William Hughes’s Nationalist government was sympathetic. However some newspapers were against establishing a tariff on imported steel.\(^{60}\) A bounty was provided for the manufacture of black steel and galvanised steel sheets made from Australian materials at the new Lysaght plant in Newcastle from the start of production in Australia. In response to this appeal for protection, in 1920 W. Massy Greene, Minister for Trade and Customs, introduced a revised tariff which substantially increased the whole tariff schedule, including duties on iron and steel. With little opposition, the tariff bill was passed by the Federal Parliament and a Tariff Board was established to advise the Minister for Trade and Customs on tariff matters.\(^{61}\) The new tariff added twenty per cent on British imports and restricted competition to the main British firms, but throughout 1921 it failed to provide sufficient protection. Price cutting by importers continued, reaching its lowest point in mid-1922.

The other important aspect of government policy vital to the steel industry concerned the purchasing preference that favoured local manufacturers. This preference was given by the Commonwealth, some state governments and most semi-government authorities. In this way, both the Commonwealth and state governments demonstrated their willingness to encourage the development of the domestic iron and steel industry.\(^{62}\) The Newcastle steelworks produced some end-user products such as rail, pig iron, merchant bar and structural steel, which allowed local suppliers during the 1920s to dominate some parts of the Australian market. However, a large gap remained in the domestic market for imported steel products not manufactured in Australia. Other Australian-manufactured products required further processing before they could emerge as wire, plate and sheet or pipe and tube. It was these steel mills, an intermediate market for the products of the steelworks that

\(^{59}\) Hughes, *The Australian Iron and Steel Industry*, p. 87

\(^{60}\) [Untitled editorial: Protection for iron and steel is not warranted], *The Argus* (Melbourne, Vic), 30 March 1920, p. 6

\(^{61}\) Hughes, *The Australian Iron and Steel Industry*, p. 89

provided the largest market gap.\textsuperscript{63} Colin Forster asserts that the size of the Australian steel market throughout the whole of the 1920s varied between a half to one million tons of steel and fabricated steel products of all types.\textsuperscript{64} The manufacture of wire was the only large-scale steel fabrication achieved during the war period. Other fabricated steel products such as plate and sheet steel or tube required significant investment to achieve successful large-scale domestic manufacture.

This situation was not what BHP wanted. Furthering their aim of becoming the ‘Mother or Key industry’ closely surrounded by steel processors the company continued to encourage the relocation of Australian enterprises and the migration of British firms to Newcastle. The company eventually overcame the considerable reluctance to begin operations in this little known regional city. Nonetheless, steel fabrication companies that manufactured end-user products quickly emerged in Newcastle after 1918. The first downstream fabricator to establish its operations in Newcastle was the Commonwealth Steel Company. It was created by four Australian heavy engineering companies, A. Goninan & Co. Ltd., Clyde Engineering Co. Ltd., Ritchie Bros. and the Pioneer Spring Co. Ltd. in 1918 to manufacture a range of forged steel products for the domestic market. Later they were joined by Howard Smith, a colliery and shipping company. Born of necessity, this new company was registered in March 1918 with an authorised capital of £500,000.\textsuperscript{65}

Commonwealth Steel did not choose the location of Newcastle to be close to BHP as a steel supplier; it was drawn to the emerging NIH through the availability of the low-cost electricity supply offered by NESCA. The new plant consisted of three production departments: a foundry, a tyre rolling mill and an axle plant. The key items of equipment in the plant included a six-ton electric arc furnace, a six-ton steam hammer and tyre mill, a 2000-ton press and a machine shop. In late 1918 Taylor Bros. of Leeds — a major manufacturer of railway wheels, tyres and axles in Britain that had previously supplied the Australian market — joined the company. The steel furnace produced its first heat in February 1918 and the manufacture of tyres, axles and rail wagon wheels commenced. Late in 1919 the British Vickers company attempted to form an alliance with BHP to manufacture forged and cast rolling stock products. The Commonwealth Steel Company proposed that Vickers of Britain invest in the new company on a similar basis to Taylor Bros. and that all

\textsuperscript{63} Forster, \textit{Industrial Development in Australia}, p. 133
\textsuperscript{64} Forster, \textit{Industrial Development in Australia}, p. 130
\textsuperscript{65} ‘Commonwealth Steel Company’, \textit{BHP Review: Jubilee Number}, (1935), p. 137
steel would be purchased from BHP. This arrangement was accepted, Vickers bought into the Commonwealth Steel Company and the company changed its name to Vickers-Commonwealth Steel Products Ltd. There were significant benefits to the Commonwealth Steel Company in this arrangement through future technology transfers.

The second steel fabricator to establish in Newcastle was the Austral Nail Company. This first step in developing an Australian self-sufficient steel wire industry stemmed from an initiative by the Federal Government. In 1914, Prime Minister William Hughes approached James MacDougall, founder of the Austral Nail Company Limited of South Melbourne, to see whether he would be prepared to establish a wire plant large enough to supply the whole Australian market. In spite of European competition, the Austral Nail Company had grown into a large producer of wire and wire products using steel rod imported from Britain. After considerable discussion MacDougall decided to build a new wire plant in Newcastle, co-located with the steelworks. As a consequence of these discussions and on Baker’s advice, BHP purchased a continuous wire rod mill from the Morgan Construction Company of the United Kingdom. Once operational, this mill could supply sufficient steel rod for the Austral Nail Company in Newcastle and for the Titan Nail and Wire Company in Melbourne and Lysaght Bros. and Co. Ltd. of Sydney, the other two Australian wire manufacturers.66

BHP agreed to finance the procurement of the latest American wire-drawing machinery for MacDougall, and Baker arranged for the NSW Public Works Department to fill the site with spoil dredged from the shipping channel. Baker, in his role as steelworks manager, assisted MacDougall in the erection of the wire mill and construction work was largely undertaken by BHP and coordinated with work on the new rod mill. The first test run on the rod mill was held in August 1918; in September 1918, the first wire-drawing bench at the Austral Nail Company was operational. In its first full year of operation the new wire works produced 40,000 tons of wire, quickly becoming the largest single market for the steelworks. In 1920, output was increased when a galvanising plant and barbed wire machines were added.67 Negotiations between the Austral Nail Company and BHP revealed the quantity of steel required by this new wire mill, making its co-location with the steelworks in Newcastle a highly desirable outcome for BHP. The Federal Government had also promised tariff protection and a bounty for wire manufactured in Australia.

67 Hughes, The Australian Iron and Steel Industry, p. 84
At this point, Ryland Bros. of England, who had been considering establishing a wire netting operation in Australia, reviewed the Australian market. They became perturbed with the potential competition but, after negotiations, no doubt encouraged by BHP, the Australian interests of Ryland Bros. were merged with the Austral Nail Company. The new company adopted the name of Ryland Bros. (Aust) Ltd. and wire netting production was added at the Newcastle works. The first of the British ‘branch houses’ — as described by Peter Cochrane — was established in Newcastle. As Cochrane explained, it was wiser for British companies to be the first and strongest influence upon the young industrial communities overseas. This was definitely in Australia's interest, given the country’s commercial relationships with the London banks and its reliance on British engineering technology and engineering standards. In addition to being first to establish a ‘branch house’ operation in Newcastle, Ryland Bros. were already large shareholders in BHP and after the formation of BHP’s London board in 1920 had a director in the form of Sir Peter Ryland on BHP’s London board.

However, Ryland Bros. (Aust) Ltd. experienced great commercial difficulties in 1923 and 1924. Firstly, the temporary shutdown at the Newcastle steelworks closed off the supply of steel rod. Secondly, there was the threat from keen import competition. Concerned that one of its best customers was in danger of failing and with BHP already having an interest in the Austral Nail Company, it now negotiated to take the failing works over. During 1925, a controlling interest was achieved through an exchange of 215, 433 BHP shares with Ryland Bros. of England.

In 1923, BHP began negotiations with an English wire rope consortium, led by the firm of Bullivant’s, to establish a steel wire rope works in Australia. BHP and the British consortium formed a joint firm, Australian Wire Rope Works Pty. Ltd., with the British interests predominating. The new plant commenced operations in 1925. This was a strategy which attracted considerable Federal Government encouragement, for steel wire rope manufactured in Australia would ease the logistic lead time problems when importing this

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70 *BHP Review: Jubilee Number*, (1935), p. 155
71 Hughes, *The Australian Iron and Steel Industry*, p. 101
specialist product from Britain. In addition, trans-national arrangements such as this cemented deeper commercial and technical relationships. Initially, Australian mine managers were strongly prejudiced against the local product and, in the beginning, the feed wire was imported from Britain. Australian manufactured feed wire from the Ryland Bros. plant was slowly introduced and, after a considerable period of testing, the product was accepted by the mining industry.\footnote{Ian Stewart, ‘Process Engineering’, in Armstrong (ed.), \textit{Shaping the Hunter}, p. 130} The Australian Wire Rope Works was and remains the only steel wire rope manufacturing plant in Australia.

The third steel fabricator to establish in Newcastle was Lysaght, a British company which manufactured galvanised iron sheet. Galvanised iron is a building material with an almost universal application in Australia. In 1913, Australia was Lysaght (England)’s largest customer for galvanised iron, with imports of 85,000 tons per annum, representing approximately 70 per cent of the Australian market. Once again, Prime Minister Hughes intervened and during the war discussed the establishment of a galvanised steel sheet plant in Australia with Lysaght. Hughes promised protection in the form of tariffs and a bounty for production in Australia. In return, Lysaght agreed to establish a branch house operation in Australia\footnote{Cochrane, \textit{Industrialization and Dependence}, p. 43}.

Land adjacent to the steelworks on the south bank of the Hunter River was purchased in December 1914, filled with silt from the river by the Department of Public Works and more than 1000 wooden piles were driven to support the new plant.\footnote{John Lysaght (Australia) Ltd., \textit{Lysaght's Silver Jubilee, 1921–1946} ([Sydney]: Lysaght's Works, 1946), p. 21} In 1921, a plant large enough to manufacture 13,000 tons of black and galvanised steel sheet was operational. The great bulk of the mill equipment was manufactured in Newcastle by BHP and Goninan, with only the 1300 hp (975kW) mill motor and 34-foot (10.37 metres) diameter flywheel, which weighed 160 tons, imported from England.\footnote{John Lysaght Limited, \textit{The Lysaght Century, 1857–1957} (Bristol: John Lysaght, 1957), p. 27} In order to minimise plant start-up difficulties, seventy-five skilled sheet mill workers and twenty-eight galvanisers, together with wives and families were brought to Newcastle. Lysaght provided furnished brick bungalows for each family, either to rent or purchase, all built about a kilometre from the new
works around Vine and Avon Streets in Mayfield. The new Lysaght village quickly became known locally as ‘Pommy Town’.  

This original plant was minimally equipped, with only four rolling mills and a small galvanising capability, but it was a start. By the end of 1924, two more mills and an additional galvanising pot were installed and in 1925 production increased to 20,000 tons. The remaining Australian market continued to be served by imports from Lysaght in Britain. Similarly to Ryland Brothers’ actions, by establishing a new plant in this fashion Lysaght maintained profitable operations in Britain, satisfied Australian industrial aspirations and kept the competitors out of a valuable market.

The Heavy Engineers

Lastly, the growth of heavy engineering and its place in the NIH is discussed. From the 1850s, the growth of the coal industry in and around Newcastle had attracted numbers of engineering companies to the area to provide an increasing demand for engineering support services. While the great bulk of engineering support products and services were supplied from Britain, locally based companies took on an increasing share of the local market. The provision of effective heavy engineering support to manufacturers has three key elements. The first is the ability to conduct professional engineering assessments and design; the second is access to the appropriate equipment to cast, forge, fabricate and machine the required components, and the third is a sufficiently skilled workforce to conduct the required work. By the time of the First World War, the heavy engineering capability available in Newcastle was on a national basis significant. In order to demonstrate this capability, the outline of the three largest heavy engineering companies operating in the 1920s is examined.

In 1913, the Walsh Island Dockyard and Engineering Works was opened in Newcastle. This dockyard and engineering facility was owned and operated by the NSW Government. It provided the bulk of heavy engineering support for State and some Federal Government infrastructure programmes. The dockyard was located on a Hunter River

77 John Lysaght (Australia) Ltd., Lysaght’s Silver Jubilee, p. 21
estuary island, about four kilometres upstream from Newcastle. Through reclamation the Walsh Island site was enlarged to 400 acres (162 hectares) and equipped with a 600 metre long wharf. In common with large heavy engineering operations of the period, it was able to provide a complete range of engineering work from specification to design and manufacture. In 1928, aided by a Commonwealth subsidy, a floating dock was launched for use by the dockyard. This new floating dock had a lift capacity of 15,000 tons, making it the largest facility of that type in Australia.

Figure 2.1: Launching the Newcastle Floating Dock, Walsh Island Dockyard and Engineering Works, 1928

From a Newcastle perspective, the dockyard was important for two reasons. Firstly, with 2500 employees in 1920 it was the second largest employer in the city. Secondly, because of the range of heavy engineering manufacturing skills employed on the site, it was the nursery and home for the great bulk of the city’s professional engineering and skilled labour force.78

The next large heavy engineers discussed are A. Goninan & Co. Ltd. and Morison and Bearby Ltd. Goninan was founded at Wickham in 1899 by former Cornish engineer Alfred Goninan. The workshops were equipped with an iron foundry and pattern shop, a

78 George Imashev, ‘The Shipbuilders’, in Armstrong (ed.), Shaping the Hunter, p. 32
steel fabrication and a machine shop. The bulk of the company’s work came from the coal mines and railway rolling stock construction and repair. In 1910, Alfred Goninan set up an engineer’s supply company known as Engineers and Colliery Supplies, then in 1918, in concert with four other engineering companies, he established the Commonwealth Steel Company to manufacture previously imported rolling stock components. But by 1918 Goninan had outgrown its Wickham worksite and the company purchased the old English and Australian Copper Works site at Broadmeadow, relocating the entire works to the new site. The new plant was equipped with a new and larger iron foundry, a fabrication and machine shop and a small electricity maintenance operation. In 1919, the machine shop was equipped with a gear-cutting machine capable of cutting gears up to 3.5 metres in diameter; at that time this was one of the largest machines of its type in Australia. As with the Walsh Island Dockyard, Goninan provided a home for a predominantly skilled workforce of up to 500 men.79

The engineering firm of Morison and Bearby Ltd. was in many respects a mirror image of the slightly larger A. Goninan & Co. Ltd. The company had commenced operations in 1878. In 1920, the firm operated on a four-acre site (1.62 hectares) in Carrington, maintaining a workforce of around 300 men. Key items of equipment included an iron and a non-ferrous foundry, together with a pattern shop and a machine shop. The company maintained a limited design capability but manufactured a broad range of products. As was usual for Australian engineers at that time and since, the relatively small domestic market demanded an ability to manufacture or modify relatively small numbers of equipment as well as being able to conduct large-scale projects.80

The importance of refractories to the steel industry is sometimes overlooked by historians but, throughout most of its history, the refractory industry has been a vital support industry for its better known and more appreciated customer, the iron and steel industry. Refractories are materials that can stand up to the actions of corrosive solids, liquids or gases at high temperature and are critical to the steel and smelting operations. While standard fireclay bricks were relatively easy to produce, the ability to create high-quality fireclay bricks was vital. In recognition of this fact, BHP began negotiations with A. R. Newbold who had started a firebrick works at Lithgow to service the Hoskins iron and steel

80 Phong-anant and Stewart, ‘Perseverance Will Command Success’, p. 91
plant. As a consequence of the First World War, when the supply of European firebricks was cut off, the Newbold plant won their first contract from BHP in 1914.

BHP arranged for Newbold to meet with leading American silica brick makers in the United States and, as a consequence of the information he received, Newbold rebuilt his brick works in Lithgow and a second refractory brick plant was built in Newcastle during 1919. The location of a refractory plant in Newcastle was an important indicator of the level of industrial development of an industrial area, as firebrick production often only came with the development of a steel industry. This made the availability of a local supplier very advantageous.81 The Newbold plant was established on a four-acre (1.4 hectares) site in Waratah alongside to the Commonwealth Steel plant. The plant was equipped with a materials milling shed, a raw materials storage area, a drier and five kilns. The new refractory plant was capable of manufacturing 50,000 bricks per week and it employed some fifty men.82

The continued influx and expansion of the steel industry represented the greatest change in the scope and type of work available for Newcastle’s workforce since unskilled convicts began mining coal in the early 1800s. The real demands of manufacturing work, in a continuous operational environment, were quickly made apparent to the bulk of available labour, as well as the social consequences of this change. For the majority of the workforce in the steel industry, work meant a six-day, forty-eight hour week. Shift work was necessary, for production in each plant was continuous. Work also meant that each worker had to understand specific work processes or tasks which needed to be repeated with speed and accuracy throughout the entire shift. This was very different to work in the coal mines or on the wharves. From its beginnings in the 1870s, manufacturing in Newcastle had not been conducted on such a large scale and did not employ the great bulk of the workforce.83

From 1918, union strength was concentrated in the skilled metals unions, with the Amalgamated Engineering Union, the Blacksmiths’ Union, the Boilermakers’, the Moulders’ and the Patten Makers’ Union the most prominent. During the 1920s, as the application of

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82 Watson, ‘In the Shadow of BHP’, p. 8
electric traction increased, these metal unions were joined by the Electrical Trades Union. While union strength for skilled workers remained strong throughout the whole of the 1920s unskilled workers were poorly served. In 1919, BHP attempted to start a Company Union along American lines but had little success. This attempt only increased opposition from existing organised labour. Ultimately the remnants of this organisation joined with the Australian Workers’ Union but the nine month shutdown in 1922 and 1923 convinced many workers not to bother with union membership. A relatively high unemployment rate, particularly in the engineering and metal working trades, of between ten and fifteen per cent continued broadly in line with national rates, even after the re-opening of the steelworks in March 1923.84

In 1924, another round of senior management changes occurred at BHP. In December 1924 Baker resigned as manager of the Newcastle steelworks in order to return to the United States; his replacement was Leslie Bradford, an engineer and metallurgist. In 1925, Lewis again went overseas, visiting the United States and Europe, but Blainey says little about the objectives or outcomes of this trip. His journey allowed him to once more examine American and European steelworks at first hand and compare them with the Australian conditions. Obviously, while he was in Britain he liaised with BHP’s London Board and lobbied to increase the number of branch houses in Newcastle. It may have been during this visit that arrangements were made for G. S. McLay, a board member from Stewarts and Lloyds, the British-based steel tube manufacturer, to visit Australia. In 1926, McLay visited Newcastle and Melbourne to conduct discussions with BHP concerning tube manufacture in Australia.85

This review of the first five years of the 1920s showed that steel and steel product manufacturing in Newcastle had achieved logistic cohesion and some form of commercial normality. The level of government protection provided through the tariff system, bounties and purchasing preferences had seen steel production increase from 169,599 tons in 1920 to 336,750 tons in 1925.86 The company had suffered a loss of £106,000 in the closedown year of 1923 but net profits were increasing once again and investment levels in new plant and equipment were being maintained. In 1925, BHP enjoyed a net profit of £372,307 and paid a dividend of £123,614 — the future looked positive.

84 Forster, *Industrial Development in Australia*, p. 130
CHAPTER 3:
CONSOLIDATION OF THE NEWCASTLE INDUSTRIAL HUB, 1925-1930

The period of change introduced through the adoption of a large-scale fabricated steel product manufacture in Newcastle during 1920 and 1921 had, after some initial adversity, developed into an industrial hub. The key feature of this hub was in the development of close commercial, technical and logistic cooperation. Commercial cooperation was evidenced by BHP’s purchase of Ryland Bros. (Aust) in 1925. Logistic support cooperation, provided by each of Newcastle’s public utilities, was able to ensure that adequate supplies of fresh water and electricity were available and that the Port of Newcastle and the rail system remained operational for the ingress of raw materials and the egress of the finished product.

Many Australian interwar histories tend to emphasise the social problems that organised labour and the unemployed experienced in this period, particularly in the urban metropolises of Sydney and Melbourne. Regional industrial cities such as Newcastle generally receive little attention but Newcastle does receive a mention by F. R. E. Mauldon concerning the closure of the steelworks in 1922 and 1923.¹ On the other hand, Colin Forster concentrates on industrial development on the national scene during the whole of the 1920s.² He records that eight per cent of the potential national workforce suffered from either unemployment or under-employment. In Newcastle, even after the steelworks was re-opened in March 1923, this claim of chronic unemployment is applied with some justification.³ However, little scholarship, aside from company histories, has examined the development of secondary industry in regional areas, or the jobs, work and industrial issues created as a consequence of that growth.

This chapter reviews and discusses the history of consolidation of the developing NIH between 1925 and 1930. In 1925, Newcastle’s population and its steel fabrication industries were still recovering from the nine-month closure of the steelworks during 1922 and 1923. The previous chapter discussed the organisational changes made by BHP in

² Colin Forster, Industrial Development in Australia 1920–1930 (Canberra: Australian National University, 1964), p. 128
³ ‘Unemployment in Newcastle’, Newcastle Morning Herald and Miners’ Advocate (Newcastle, NSW), 24 March 1926, p. 9
order to gain control over labour, shipping and coal costs. In the later 1920s, the benefits of operating its own shipping line demonstrated this advantage, as delivery of raw materials occurred according to a plan and the shipment of finished steel products around Australia was controlled and cost effective. Likewise, the ownership of coal mines close by the steelworks provided some control over the cost of coal and its timely delivery.

**Cost Control**

As detailed in Chapter 2, the move to a vertically integrated organisational structure similar to American steel company practices made between 1920 and 1925 was consolidated between 1925 and 1930. The subsidiary company BHP Collieries purchased the John Darling Colliery at Belmont North in 1925 and started the development of the Elrington Colliery at Weston between 1925 and 1927. The operation of these two collieries put the coal mining industry on notice regarding the steady supply and price of coal.

In terms of steel production, by the end of 1925 the Newcastle steelworks had, to a large extent, recovered from the steelworks shutdown of 1922 and 1923. The downstream steel fabricators Ryland Bros. and Lysaght were able to consolidate their commercial position, continue training their workforce and confirm manufacturing processes. However, the internal economies instituted in the steelworks had not had time to fully mature and BHP remained insistent that the cost of labour must still be reduced. Some success was had with this when the basic wage for iron and steel workers, was reduced from £4 5s. 0d. a week to £3 19s. 0d. in 1922. In addition, the industry was exempted from the NSW legislation which reduced hours per week from forty-eight to forty-four and a price reduction on coal was obtained. To some extent, these cost reductions were negated by the introduction of workers compensation and a child endowment levy on employers in NSW during 1926 but the price for steel was able to be reduced.

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5 ‘Newcastle Steelworks: Record Year’s Output. Additional Plant Installed’, *The Argus* (Melbourne, Vic), 21 August 1925, p. 8
7 Forster, *Industrial Development in Australia*, p. 142
8 Forster, *Industrial Development in Australia*, p. 144
After the share issue and acceptance of debentures in 1921 and 1922, no further capital injection into the steelworks was required for the remainder of the decade. It was unnecessary for BHP to turn to the market again to finance its vertical integration reorganisation, and income made it possible to repay almost £1.2 million of debentures. Forster identified that the substantial depreciation allowed on the steelworks was £2,423,000 across the whole of the 1920s decade. However, the book value of the steelworks remained practically unchanged at £5,910,000 in 1922 and £5,976,000 in 1930, a testament to maintaining a nexus between capital expenditure and depreciation allowances — or the point where capital expenditure outlays were roughly equal to depreciation allowances.

In regard to BHP’s commercial condition, Forster records that, during the 1920s, £281,000 was written off the Broken Hill mine and, after allowing for this depreciation, profits were earned in each year between 1924 and 1929. The dividend policy was conservative, with five per cent being paid in 1924/1925 and then ten per cent in each of the following four years. Forster also notes that this dividend policy was sufficient to satisfy the shareholders, for BHP had been considered as providing a good rate of return since the 1890s. Given the extent of the amount written off on the Broken Hill mine, plus the fact that the mine was only operated on a broken schedule during the whole of the 1920s, it was clear that the steel industry in Newcastle was increasingly providing the bulk of the company’s revenue. This also demonstrated that the company strategy was now firmly dedicated to manufacturing.

In the wake of the shutdown of 1922 and 1923, a number of projects came to fruition. Two additional sixty-five ton open hearth furnaces, Nos. 8 and 9, were commissioned. The Australian Wire Rope Works, built in partnership with a British consortium led by Bullivants Co. Ltd., opened and development of the John Darling and Elrington Collieries began. Ryland Bros. was connected to BHP’s AC electrical system and the BHP Staff Training Scheme was introduced. These events were positive for both BHP and the downstream steel fabricators but the difficult and arduous working conditions that applied in some sections of the steelworks persisted. This, coupled with a general lack of amenities for employees, did not engender company loyalty from all employees.

9 Under British financial rules, a debenture is a long-term security yielding a fixed rate of interest against specific assets.
10 Forster, *Industrial Development in Australia*, p. 144
11 Forster, *Industrial Development in Australia*, p. 144
Safety Management

In the wake of the nine-month shutdown, issues related to on-site amenities — such as men having no lunch rooms to eat their meals and no shower facilities to clean themselves properly before walking home — aggravated an already tense industrial situation. Helen Hughes observed that this was reflected in the employee’s attitude to the introduction of BHP’s safety campaign, which assumed that it was employee carelessness rather than the conditions of work, which caused accidents.15 The idea that every man is responsible for his own safety did not fit well into the demands of the production machines or to the beliefs of organised labour. Hughes noted that the safety movement set itself an impossible task in attempting to make men infallible, although experience showed that making men safety-conscious did reduce the risk of accidents occurring.16 American experience suggested that, ultimately, the main influence on accident reduction was through safety training and safety-conscious engineering design.17 The provision of guards over rotating machinery and designing production processes to reflect safety as well as production output took time to develop. This safety campaign was an integrated approach by each NIH member. It aimed firstly to reduce the number of personnel injured at work, in order to minimise compensation costs, but also as a move that demonstrated a company commitment towards improved manpower management.

The introduction of the safety programme, combined with BHP’s attempts to defeat unionism (particularly in respect to the production workforce), accentuated the worker’s hostility towards the company. The difficult and sometimes arduous working conditions in some areas contributed to a constant friction between the workers and the company.18 However, intermittent work and a high level of local unemployment discouraged any outbreak of protracted industrial action. During 1927, the issue of the right to organise unions was highlighted, when the FIA applied to have union preference for employment of its members over non-members included in the steelworks award. The steelworks award was one of the few major industrial awards without such a clause. BHP opposed the idea of union preference, for, as Hughes suggested, BHP argued that it was not necessary since there was no discrimination against unionists in hiring, dismissal or promotion at work.

15 Hughes, The Australian Iron and Steel Industry, p. 97
16 Hughes, The Australian Iron and Steel Industry, p. 97
17 Hughes, The Australian Iron and Steel Industry, p. 97
18 Hughes, The Australian Iron and Steel Industry, p. 97
Hughes goes on to state that of the 2265 production workers on the plant only 1148 were members of the FIA — little more than half of the production workforce.\(^1^9\) Hughes observed that this was an abnormally low proportion for heavy industry, but she does not provide any comparison data which would permit analysis. The majority of the other steelworks employees belonged to skilled trade unions such as the Amalgamated Engineering Union (AEU) or Electrical Trades Union (ETU), both of which had high membership levels.\(^2^0\)

Management Change at the Steelworks

On 16 March 1925, David Baker, the first manager of the Newcastle steelworks, attended his farewell dinner at the Australia Club in Melbourne. The dinner was given by the BHP board prior to his return home to the United States. He had been working for BHP in Australia since 1911. Baker was initially employed as a consultant engineer charged to examine the potential of building a steelworks in Australia, then as the construction manager to supervise its construction in Newcastle and finally as the steelwork’s first manager.\(^2^1\) He had provided, and would continue to provide, advice to the BHP board and its senior management on a wide range of matters which related to the American steel industry. He was strongly in favour of organisational vertical integration and had been very supportive in the establishment of both the Austral Nail Co. in 1918 and Lysaght in 1921.

Growing the Trans-national Relationships

BHP’s senior staff worked diligently to ensure the technical wellbeing and expansion of the NIH. This included taking regular overseas trips to meet current and potential clients. In addition to these visits, close relations were maintained with the British companies Lysaght and Ryland Bros., as both of these companies had representatives on BHP’s London board. In 1926, an indication of success from Lewis’s overseas journey in the previous year became apparent when Stewarts and Lloyds sent a company director, G. S. McLay to Australia.\(^2^2\) McLay spent some months in Australia examining the conditions for local manufacture and negotiating the terms of an agreement with BHP.

\(^{19}\) Helen Hughes, ‘Industrial Relations in the Australian Iron and Steel Industry, 1876–1962’, *Journal of Industrial Relations* 4 (1962), pp. 120–36
\(^{20}\) Hughes, *The Australian Iron and Steel Industry*, p. 75
\(^{21}\) Jay, *A Future More Prosperous*, p. 55
In 1929, A. G. Stewart, chairman of Stewarts and Lloyds Pty. Ltd., came to Australia, confirmed McLay’s recommendations and signed an agreement with BHP. This agreement provided for the formation of a jointly owned company to manufacture steel tubes and fittings in Newcastle. The new company was formed immediately under the name of Buttweld Pty. Ltd.; the articles provided that capital should be held as 51 per cent by Stewarts and Lloyds Ltd. as to 49 per cent by The Broken Hill Proprietary Co. Ltd. It was agreed that the new tube works would be built on forty acres of land owned by BHP located immediately west of the Lysaght site. The BHP steelworks would manufacture and supply the steel strip known as skelp for the manufacture of a continuous weld pipe. This was how BHP grew and controlled the configuration of the NIH — actively seeking partners, liaising and being prepared to contribute towards the cost of establishing a new company in Australia. It did not insist on having a controlling interest, being content to be the raw steel provider for any new steel fabricator, but was also prepared to assume ownership later, as they had done with Ryland Bros. (Aust) in 1925.

As well as encouraging the co-location of other enterprises, during his 1925 journey, Lewis was able to witness the impact of the problems Britain’s coal and steel industry was suffering in the immediate wake of that nation’s return to the gold standard and the revaluation of sterling in March 1925. This saw the price of gold and sterling currency returned to its 1914 value, a move designed to show the world the strength of the British Empire and the British economy, demonstrating that the war had changed nothing. J. K. Galbraith states that as a consequence of this revaluation £1 0s. 0d. sterling bought US$4.86. This meant that the sterling currency cost approximately ten per cent more than the currency of British competitors. As a member of the British Empire, and given Australia’s currency’s parity with sterling, this move also had ramifications for the Australian economy, particularly if exports went outside of the British Empire. In addition to the problems caused by the revaluation of sterling, Lewis observed that, when compared with the American circumstance, the British steel industry was badly in need of rationalisation and modernisation.

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23 Thompson (ed.), Stewarts and Lloyds Limited, pp. 107–21
26 Galbraith, The Age of Uncertainty, p. 204
Many of the existing British steel plants were technologically outdated, often sited to meet the needs of a former age. Recognising this problem, a number of British steel manufacturers determined to amalgamate or to build new plants. For example, in 1929 Stewarts and Lloyds made the decision to build a new steel and tube manufacturing plant at Corby in Lincolnshire. This new plant would have a manufacturing capacity of one and a half million tons of steel per year. At the same time, the bulk of Stewarts and Lloyds’s tube-making works were moved from Glasgow in Scotland to the new site at Corby. This tube works employed the new Fretz-Moon tube-making manufacturing system from America. Similarly, Lysaght had gained access to a new American steel strip manufacturing process and installed it in their existing Bristol works. Both these new American fabricated steel manufacturing processes would be installed in Australia during the 1930s. In the 1920s, American steel fabrication technology led the world. Large companies such as Bethlehem Steel and American Rolling Mills invested in manufacturing systems that were highly automated and could manufacture certain steel products such as pipe, flat steel and wire with high levels of surface finish and accuracy.

It was during this second half of the 1920s decade that Lewis began to ensure that BHP had control of these new outlets for fabricated steel products as well as the associated products. A key associated product being developed was the sale of coke ovens by-products. Figure 3.2 provides an outline of some of the products available from the downstream processing of these by-products.

The still-new BHP By-Products subsidiary was now not only confined to selling crushed slag to road makers, it also sold a range of other coke ovens by-products to companies in Australia’s new organic chemical industry. Figure 3.2 Coal Tar Derivatives shows in diagrammatic form the chemicals and end products that were available from coal tars. It would still be some years before all of these derivatives would be manufactured in Australia, but Australian manufacturers were increasingly adopting import replacement strategies. For example, in 1924 a Benzol manufacturing plant was established as part of the BHP By-Products subsidiary. In Australia, during the 1920s, the bulk of the Benzol found its major use as an additive for petrol, where it was used to increase the petrol octane rate.

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However, high-grade Benzol was exported to both Europe and the United States for use as a base in the manufacture of synthetic phenols, dyes and aspirin.\textsuperscript{30}

\textbf{Figure 3.1: Coal Tar Derivatives}

\begin{figure}
\centering
\includegraphics{coal_tar_derivatives.png}
\caption{Coal Tar Derivatives}
\end{figure}

\textsuperscript{30} Mellor, \textit{The Role of Science and Industry}, p. 126
Lewis’s policy of gaining varying degrees of control over the steel fabricators was very different from that announced by his predecessor G. D. Delprat in November 1920, but Lewis recognised the higher profit levels earned by the steel fabricators.\(^\text{31}\) In 1927 Lewis and Darling arranged for BHP to purchase half of the shares in the nail and barbed wire section of the Titan Manufacturing Company of Melbourne.\(^\text{32}\) Six years later, BHP would go on to purchase the remainder of the company and all of its activities.\(^\text{33}\) In 1929, BHP bought control of Lysaght Bros. and Co., which made wire netting, nails and barbed wire on the banks of the Parramatta River, near Sydney.\(^\text{34}\) This purchase gave BHP direct control of all of Australia’s steel wire manufacturing.

Throughout the 1920s, BHP supplied the Vickers-Commonwealth Steel Company Ltd. with its steel requirements, maintaining both friendly commercial and close technical relations. However, with the increasing financial problems in Britain some of the British partners in the company were becoming restive and in 1929 BHP acquired 20,000 shares in the company, along with the right to appoint one director to the board. Lewis was appointed to be that director.

The extension of BHP’s investments into the steel fabricators was not accompanied by any neglect of its core business. The main aspect of this related to the control of operational cost in the steelworks. Two areas of cost control will be discussed, the first being Lewis’s championing of the introduction of the shadow board system to control the management of spares and tools. While the use of a shadow board system to store spares and tools may seem a minor investment, it was a demonstration of Lewis’s determination to manage waste and lost time.\(^\text{35}\) It is not known where, when or by whom the shadow board system was invented for the storage of spares and tools, but its enthusiastic application became a standard industrial practice at BHP.\(^\text{36}\) For example, one of the shadow boards in the No. 2 Blowing Engine House was 171 feet (52 m) long.\(^\text{37}\) The objective of this system was to have ‘a place for everything and everything in its place’, a factor which minimised

\(^{31}\) Mauldon, *A Study in Social Economics*, p. 93
\(^{32}\) *BHP Review* 15 (5), YEAR, pp. 10–11
\(^{33}\) Blainey, *The Steel Master*, p. 8
\(^{34}\) *BHP Review* 9 (2), (1932), p. 49
\(^{35}\) W. E. Wileman, ‘Shadow Boards’, *BHP Review* 10 (2), (1933), PAGES
\(^{36}\) ‘Plant Cleanliness and Shadow Boards’, *BHP Review* 16 (4), (1937), p. 9
time used searching for spare parts or special tools. In a plant the size of the steelworks, combined with the type of high cost spare parts and tools, this system enhanced the direct management of those items. Figure 3.3 shows a typical shadow board at BHP. This system was implemented throughout each of the subsidiary and associated plants and the concept spread throughout Australia.

Figure 3.2: Typical BHP Spares and Tools Shadow Board


The second area of control concerned lowering coal consumption across the plant. In 1922, Lewis offered the new combustion engineer at Newcastle a bonus of one penny for every ton of coal he could save in relation to a ton of finished product. When the steelworks had opened, the plant consumed from two and three-quarters tons to three and one-quarter tons of coal for every ton of finished steel produced. By 1939, with the introduction of the Wilputte by-product coke ovens in 1929, and in addition to a range of savings from other plant operations introduced after 1922, the combustion department had reduced the amount

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38 *BHP Recreation Review* 10 (2), (1933), p. 5
of coal used per ton of finished product to one and a quarter tons. This was the equivalent to the best of the American steelworks at that time.

Throughout the whole of the 1920s, in spite of the tariffs imposed by the Federal Government and preferential purchasing by state and many local governments, the pressure of competition forced BHP to put its house in order, in order to maintain its market share and to remain viable commercially. Prior to the 1920s, the steel specifications for rail and fishplates, major products for BHP, differed between each state. In 1921, the Commonwealth and State, and railway engineers agreed on a standard specification. This level of commonality of steel standards had a significant impact on manufacturing costs. The following year, the Australian Commonwealth Engineering Standards Association was formed, which allowed standards to be reviewed annually. This development of engineering and manufacturing standards gradually spread across all aspects of the Australian steel industry and its customers. Encouraged by BHP and the steel fabricators, the development of standardised product management systems was a demonstration of the increasing sophistication and competitiveness by all members of the NIH.

In 1927, BHP was finally able to purchase access to the Otto Wilputte by-product coke oven patent. Design and construction of new coke oven batteries commenced in the second half of 1928 and the first battery of fifty-three ovens was commissioned during the final quarter of 1929. The cost of this project was significant at £1,000,000. Expenditure of this magnitude was a demonstration, firstly, of the confidence the BHP board had in Lewis and, secondly, the ability of this technology to lower the cost of making coke, gas and, ultimately, the cost of steel. Given the state of the national economy between 1928 and 1930, the size of this investment was an expression of BHP’s confidence in the future market for Australian steel, as well as an example of the company’s ability to fund such an investment. However, the financial uncertainty that was becoming increasingly evident on a national basis throughout 1929 obliged BHP to delay construction of a second battery of new ovens until 1932. Nevertheless, the size of this single project provided the Newbold Refractory plant with a major work opportunity. The 1920s decade had not been kind to Newbold but, as Michelle Watson observed, 1929 saw Newbold post a modest profit and the

41 Forster, *Industrial Development in Australia*, p. 148
42 ‘New Coke Ovens in Newcastle’, *BHP Recreation Review 7* (8), (1930), p. 4
promise of large-scale work at the steelworks encouraged a complete reorganisation of its Waratah plant.\textsuperscript{44}

**Industrial Relations**

It was not until 1925 that trading conditions had sufficiently improved to allow BHP to take full advantage of the available levels of protection and recapture that portion of the domestic market they had enjoyed during the war. The recapture of much of the steel market was reflected not only in steel tonnage but also in employment at the steelworks. The growth in employment opportunities during the 1920s provided organised labour with the opportunity to organise the workers at the Newcastle steelworks. In 1926, the FIA had commenced a strong membership drive. Union delegates were appointed in all departments and their efforts were well rewarded; within the open hearth department 90 per cent of the production workers joined the union. This level of success did not go unnoticed and within two weeks the three men who were the open hearth department shift delegates were dismissed.\textsuperscript{45} This was a demonstration of BHP's standard anti-union attitude.

BHP kept a record of all men dismissed for union activity, ensuring that they would not be re-employed by the steelworks or any of its associated or subsidiary companies that had now become established in Newcastle. No doubt the company judged that this was a way of keeping the production workforce under control, but perhaps a greater reason for the lack of militancy amongst the production workforce was the group of unemployed seen waiting at the gate for casual work at the start of every shift. Nevertheless, as noted by Mauldon, the turnover of production labour remained high, a problem that was not solved before the end of the decade.

Mauldon uses Ryland Bros. (Aust) as an example of this problem. Ryland Bros. (Aust) began operations in 1920, a year when the annual labour turnover at the wire plant peaked at about 300 per cent. In 1926, the last year of Mauldon’s study, between fifty and sixty production workers had to be engaged each week. It cost around £50 to train a skilled wire worker and while some of the men who completed the training stayed on clearly many did not. The same issue affected the Lysaght plant where, to maintain a labour force of 300

\textsuperscript{44} Michelle Watson, ‘In the Shadow of BHP: Newbold General Refractories’, unpublished B.A. hons diss. (University of Newcastle, 1994), Ch. 3, p. 1

\textsuperscript{45} Hughes, ‘Industrial Relations in the Australian Iron and Steel Industry’, pp. 120–36
in 1926, at least 400 men had to be engaged annually. Mauldon also noted that the BHP steelworks maintained an average workforce of 4500, but in the skilled maintenance departments there was very little turnover.\textsuperscript{46} Union officials interviewed by Mauldon listed three reasons that affected employment in the Newcastle district: firstly, the relatively slow development of the BHP steelworks by the company confining itself to the domestic market; secondly, the absence of cheap and efficient electric power; and lastly, the inadequacy of the levels of protection given.\textsuperscript{47}

Most union members in the steel industry belonged to craft unions such as the AEU, the ETU and the Federated Boilermakers’ Society of Australia (FBSA).\textsuperscript{48} In spite of the relative uncertainty of employment at the steelworks, caused sometimes by frequent minor disputes and stoppages, few workers joined the FIA. Minor stoppages could be defined as those lasting for a single shift of eight hours or for one or two days. In order to combat the impact of these minor stoppages, BHP established operative staff as a new category of employment. These employees had no supervisory role and were below foreman status, but they were employed on a fortnightly, rather than on an hourly basis. When staff superannuation became available in 1930, the operative staff were eligible for its benefits but, in return, they had to cease being union members.\textsuperscript{49} The company’s argument regarding this measure was that it had to ensure plant safety during stoppages, but the unions saw it as a threat to their weapon of direct action. The unions also claimed that such appointments caused considerable social dissention amongst the production work teams.\textsuperscript{50} Table 3.1 outlines the increases in steel production and the employment numbers between 1925 and 1929. The table also shows the beginning of the decline in steel production and employment at the steelworks in 1930.\textsuperscript{51}

\textsuperscript{46} Mauldon, \textit{A Study in Social Economics}, p. 120
\textsuperscript{47} Mauldon, \textit{A Study in Social Economics}, p. 122
\textsuperscript{49} Hughes, ‘Industrial Relations in the Australian Iron and Steel Industry’, p. 127
\textsuperscript{50} Hughes, \textit{The Australian Iron and Steel Industry}, p. 93
\textsuperscript{51} Jay, \textit{A Future More Prosperous}, p. 254
Table 3.1: Steel Production
and Employment at BHP, 1925–1930

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<td>249,460</td>
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</tr>
</tbody>
</table>

Source: Jay, A Future More Prosperous, p. 254

In Newcastle during the 1920s, unemployment remained a constant issue. This was especially so as more people moved to the city seeking work, perhaps believing that unemployment in an urban area was preferable to unemployment in a rural area. The 1921 census showed that Newcastle’s population was 86,255. By 1930, it was estimated to be 108,640, an increase of 26 per cent in eight years.\textsuperscript{52} As the BHP steelworks had recovered, so too had Newcastle’s three steel fabricators and heavy engineers. The Lysaght operation had originally been established with a capacity for a plant of eight rolling mills, one annealing furnace and a pickling machine, but it was not until 1927 that all eight rolling mills were in operation.\textsuperscript{53} The production capacity of the Lysaght plant in Newcastle was then between 30,000 and 40,000 tons of galvanised sheet steel per year. During 1930, the entire plant was duplicated, with an additional eight rolling mills plus additional pickling and galvanising plant. Forster asks the question as to whether this slow rate of growth was due to inadequate tariff

\textsuperscript{52} T. Waites, The Official Year Book of New South Wales, 1929–30 (Sydney: Government Printer, 1931), p. 289

\textsuperscript{53} John Lysaght (Australia) Ltd., Lysaght Venture: A Survey of the Activities in Australia of the John Lysaght Organization, Compiled to Commemorate the Commencement at Port Kembla, of the Production of Sheet Steel from Strip by the Cold Reduction Process (Sydney: Stewart Howard and Associates, 1955), p. 6
protection, while Cochrane suggests that Lysaght only established the plant in Newcastle as a branch house to keep competitors out.54

Another reason may have been the change to continuous steel strip manufacturing technology that had been developed in the United States. This manufacturing system was soon to be installed in the Lysaght plant in Britain and, in 1939, a continuous steel strip manufacturing system would be installed at a new Lysaght-owned Commonwealth Rolling Mill plant in Port Kembla. The Newcastle operation continued using the older manufacturing technology, protected by Australian tariffs and, up until 1930, Lysaght was also paid a bounty. These two Federal Government protection measures allowed Lysaght to satisfy the Australian market while still providing a market niche for corrugated sheet from the Lysaght plant in Britain.

The wire industry provided BHP with one of its most important markets during the 1920s, with over one quarter of the steel produced going as coiled rod to the wire industry. The two most important products manufactured were fencing wire and wire netting. By the end of 1929, the combined effort of Ryland Bros. in Newcastle and John Lysaght in Parramatta was able to satisfy about 85 per cent of the Australian market.55 Between 1923 and 1930, Newcastle’s third steel fabrication company, Vickers-Commonwealth Steel Co. Ltd., only consumed approximately 5 to 6 per cent of BHP’s annual output. Table 3.2 shows the output of the company between 1923 and 1930.

In spite of the relatively small quantity of steel sales throughout the whole of the 1920s, a close technical relationship had been developed with BHP as the steelworks supplied the company with steel ingots for forging into tyres and axles across a range of steel standards. The relationship between BHP and the Commonwealth Steel Co. had grown out of a proposed trans-national joint venture arrangement with the British firm of Vickers in 1922.56

55 Forster, *Industrial Development in Australia*, p. 151
Table 3.2: Commonwealth Steel Company Production, 1923–1930

<table>
<thead>
<tr>
<th>Product</th>
<th>No. Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railway and Tramway Tyres</td>
<td>159,873</td>
</tr>
<tr>
<td>Railway and Tramway Axles</td>
<td>22,937</td>
</tr>
<tr>
<td>Pairs of Assembled Wheels and Axles</td>
<td>21,631</td>
</tr>
<tr>
<td>Pairs of Assembled Smaller Wheels and Axles for Collieries</td>
<td>16,816</td>
</tr>
<tr>
<td>Cast Steel Wheel Centres</td>
<td>48,387</td>
</tr>
<tr>
<td>General Steel Castings</td>
<td>6700 tons</td>
</tr>
<tr>
<td>Large Steel Castings</td>
<td>2</td>
</tr>
</tbody>
</table>


The Public Utilities

As noted in the previous chapter, Newcastle’s public utilities supported the NIH, under agreements with the NSW Government to provide the underlying infrastructure that the NIH relied on to operate commercially. Services such as port operation and maintenance, the supply of fresh water, rail freight and electricity were provided for a negotiated fee. Collectively, the public utilities, by virtue of the service or product they delivered, provided the underlying logistic and infrastructure base upon which private industry was able to build its manufacturing capability. In order to meet community and industrial expectations, a major expansion of the railway’s power station at Zaara Street, together with the building of transmission sub-stations, was undertaken in 1923. The interconnection with the steelwork’s new 10 mW power station was installed at the same time. High-tension cables were laid across the Carrington Basin, firstly to supply the coal cranes on the western side of the basin, then to the steelworks power grid via the Hydraulic Engine House Sub-station in 1923. The Zaara Street power station could now generate 16.725 mW of electric energy and the interconnection of the two power stations provided increased electric energy availability and reliability of supply to all industrial and urban consumers.
In NSW during the 1920s, the demand for electric energy was doubling every five years. To meet this demand the generation capacity at Zaara Street was progressively increased via generation and boiler plant transfers from the White Bay power station in Sydney. By 1928, Zaara Street’s installed capacity had grown to 31.725 mW — almost 90 per cent within five years. It can be argued that much of the growth in generation capacity at the Zaara Street power station had more to do with the growth of consumption by Newcastle’s growing steel industry than distributing electric energy to additional residential consumers on the Central Coast or in Hunter Valley towns.

The replacement of steam traction with electric traction at BHP during 1925 and its progressive application across the plant had everything to do with minimising operational costs. Electric traction was initially installed to drive the rolling mills, but was then progressively introduced through all production and maintenance departments. The centralised generation and distribution of energy quickly saw the costs of production fall. This was also a factor in lowering coal consumption, which in turn contributed to total plant efficiency. The increase in the application of electric traction was not just confined to the Newcastle steelworks, for, as electricity availability and reliability grew, so did the application of electric traction in each of the co-located steel fabricators. Table 3.3 provides an example of the increase in the application of electric traction in New South Wales and the demise of steam traction between 1901 and 1929.

<table>
<thead>
<tr>
<th>Year</th>
<th>Motors Driven by Electricity</th>
<th>Motors Driven by Steam</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Horse Power</td>
<td>% of Total</td>
</tr>
<tr>
<td>1901</td>
<td>3000</td>
<td>1</td>
</tr>
<tr>
<td>1911</td>
<td>20,600</td>
<td>22</td>
</tr>
<tr>
<td>1920–21</td>
<td>99,100</td>
<td>50</td>
</tr>
<tr>
<td>1928–29</td>
<td>215,500</td>
<td>70</td>
</tr>
</tbody>
</table>


---

After the end of the First World War, state governments or large semi-government bodies were usually the only organisations able to borrow the amount of finance required to build, generate and distribute sufficient electricity to meet this growing demand.\textsuperscript{58} In Newcastle, electric energy was generated by the Newcastle City Council and by the Railways Electricity Branch which operated an interconnected distribution system. However, despite the size of the Newcastle urban area and its electricity consumption rate, the city was an orphan system. Apart from the interconnection with the steelwork’s 10 mW generation plant, the local system stood alone. This was an issue that was not fully addressed until a crisis situation arose during 1942.

**The Heavy Engineers**

Heavy engineering as a business venture always seemed to work in either a feast or famine work environment. After the launching of the new floating dock at the Walsh Island Dockyard in 1928, large-scale projects faded away and gradually the largely skilled workforce began to shrink. Though the construction of Newcastle’s new sewerage system and other State Government projects did provide some work, the new floating dock did not attract as much work as had been originally planned. Competition from Sydney and Melbourne dockyards ensured that work was very competitively priced. In addition, the NSW Government was heavily lobbied by Sydney-based heavy engineers for whatever work was authorised by the State Government.\textsuperscript{59}

It was much the same story for Newcastle’s two large commercial heavy engineers, Goninan, and Morrison and Bearby. They found that their most reliable customers were BHP and the other steel fabricators. While much of the work from these sources was small-scale, it all helped to generate revenue. In 1928, the Cardiff Railway Workshops was officially opened. These workshops were the second largest rail workshops in NSW and, as was common at the time, carried the full range of workshop departments. With the opening of the Cardiff Workshops, most of the rolling stock work, along with many staff, were transferred from the Honeysuckle Workshops, in the city of Newcastle, to the new facility at Cardiff.

\textsuperscript{58} Barrie Dyster and David Meredith, *Australia in the International Economy in the Twentieth Century* (Cambridge: Cambridge University Press, 1990), pp. 113
Given the range of engineering services required, this new facility employed mainly skilled workers, a factor which required a large training programme, adding to the size of Newcastle’s skilled workforce. However, the NSW Railways conducted much of their own training, using a technical training facility located at the old Honeysuckle Workshops site.60

**Industrial Relations**

Industrial relations in Newcastle between 1925 and 1930 were something of a mixed bag for BHP and its subsidiaries. There were no major stoppages at the steelworks or at the downstream steel fabricators during the 1920s, but minor departmentally based stoppages were common. This was a factor which, in BHP’s eyes, justified the employment of operative staff, which in turn was a significant irritant to organised labour in Newcastle. However, from 1928 it was industrial disputation events on a national scale that would have the most impact on the NIH.

The first of these disputes occurred on the Melbourne waterfront in 1928, which quickly spread to other ports. In response to this strike, the Bruce Federal Government attempted to break the Waterside Workers’ Union through the Transport Workers Act of September 1928. In the union movement this became known as the ‘Dog Collar Act’. The second dispute involved the timber workers who, in February 1929, struck when the Arbitration Court increased the weekly hours of work from forty-four to forty-eight hours. The third dispute was the coal lockout which began in March 1929 and did not end until July 1930. These national industrial actions did not have much immediate impact on the NIH, but they did contribute to an increasingly militant industrial environment. Ultimately, these issues had a political outcome and at the federal election conducted in October 1929 the National Party was defeated in the House of Representatives, but maintained its hold in the Senate. Stanley Bruce, the conservative Prime Minister lost his seat and the Labor Party led by James Scullin formed the new Federal Government.61

Together, Scullin and the Labor Party were expected by many to quickly resolve the coal dispute, which had imposed restrictions on the national economy. However, in December 1929 the NSW Government intervened, bringing in free labour with a police guard

to operate a mine at Rothbury. The miners protested, a riot took place and a young miner was shot and killed by police. This dispute spilled over into some of the mines operating on the Northern Coalfield, but other mines continued to work, providing sufficient coal for the steelworks to continue operating, but only on a reduced scale.62

During 1929, it was decided that Lewis would make another overseas trip in 1930. Blainey observed that, throughout the 1920s, BHP had sponsored more overseas tours by senior company officers than all of the other mining and metallurgical companies of Australia combined.63 Blainey notes that, as a nationalist, Lewis believed that his company should promote its own employees. He then goes on to provide a brief outline of the type of man that Lewis wanted to hire for the steelworks: a person who had technical qualifications and was able to apply his knowledge, but was forceful, extremely practical around the plant and calm in any production crisis.64 Examples of such men included D. O. Morris who came to BHP in 1927 as a young mining engineer from Mt Morgan in Queensland, rising to Assistant Steel Making Superintendent by 1940, and Frank Ford, who joined BHP as an apprentice in 1923 and by 1937 had risen to Assistant Master Mechanic.65

Planning for his third overseas trip commenced during the second half of 1929. Lewis left Sydney in April 1930, crossing the Pacific to inspect mines in Bolivia, Chile and Argentina before travelling on to Britain, Europe and the United States. By September 1930, Lewis had visited steelworks in Germany and Belgium, but they were all working at a reduced pace. Visits to British steel plants revealed even more cold furnaces. During October 1930, he visited the new steelworks being built by Stewarts and Lloyds at Corby in the company of its board chairman Walter Macdiarmid. Blainey records that Lewis was offered the job of managing the building of this new plant by Macdiarmid, but he declined this offer. However, many English and German steel makers were impressed with the cheapness of BHP iron and steel and showed interest in establishing operations in Australia.66 No doubt Lewis would have also discussed the situation regarding the building of the new pipe mill that Stewarts and Lloyds and BHP intended to build in Newcastle. Lewis then left Britain for

62 Schedvin, *Australia and the Great Depression*, p. 112
63 Blainey, *The Steel Master*, p. 78
64 Blainey, *The Steel Master*, p. 78
66 Blainey, *The Steel Master*, p. 103
the United States where, according to Blainey, he spent six weeks attending conferences, touring steel plants and fostering intercompany relations, particularly with the men of Bethlehem Steel and Ingersoll Rand.67 He returned home in December 1930.68

By the end of the 1920s decade, the establishment of a large-scale, regionally based iron and steel industrial hub in Newcastle was a fact of life in Australia. To some extent, the NIH’s ongoing survival remained dependent on government assistance through tariff protection and purchasing preferences. However, its costs of operation had been lowered and it was far more competitive than it had been ten years before. The benefits of a vertical organisation structure were now apparent, as were the advantages gained through the commercial linking with each of the steel fabricators and the logistic linking with each of Newcastle’s public utilities. As the manufacturing elements of the NIH were the public utilities’ largest customers, this relationship was a factor fostering operational efficiency in the provision of logistic support between both parties. The advantage of having co-located steel fabricators was also clear, with Lysaght and Ryland Bros. alone consuming more than 40 per cent of the steel produced by the steelworks. In addition, the agreement to establish a new steel pipe manufacturing plant would only increase that quantity of local steel consumption. The consumption of steel by the associated steel fabricators was vital for BHP between 1929 and 1933. At the company’s Annual General Meeting, held on 28 August 1931, the Chairman Harold Darling advised that net profit for the production year ending in May 1931 had been £83,257 7s. 7d. and that the depreciation allowance was £232,752 4s. 0d.69

67 Blainey, *The Steel Master*, p. 104
68 ‘Essington Lewis’s World Tour in 1930’, *BHP Recreation Review* 7 (4), (1930), p. 3
69 ‘79th Annual General Meeting, Chairman’s Address, 28 August 1931’, *BHP Review* 8 (7), (1931), p. 12
CHAPTER 4:
THE GREAT DEPRESSION — SURVIVAL AND RECOVERY
OF THE NEWCASTLE INDUSTRIAL HUB, 1929–1934

When the Great Depression arrived in Australia late in 1929, it struck at every sector of the economy, ruining farmers, shop keepers and manufacturers alike. It brought house building and construction industries to a halt and, to some extent, tested the nation’s social cohesion. Consequently, it sometimes appears an almost standard axiom of Australian historiography that the national experience during the period of the Great Depression, between 1930 and 1934, was uniformly bleak. Histories of this period tend to emphasise the effects of high unemployment, economic uncertainty and personal deprivation, as it affected Australia’s capital cities, or drought affected rural areas. In contrast, comparatively little has been written about how regional industrialised cities, such as Newcastle, survived this economic tsunami and recovered. Those who have treated the subject, including Helen Hughes, Alan Trengrove and Sheila Gray, have emphasised the lack of economic activity and what people did to live without sufficient work. Newcastle was a place that Hughes went so far as to call a ghost town.¹

The aim of this chapter is twofold. Firstly, it will review the industrial survival of the NIH during the Great Depression, arguing that the NIH survived and recovered well from the economic storm. Secondly, it will examine the factors that lay behind its survival and recovery, including increased operational efficiencies brought about by investment in the new and improved technology installed during the 1920s. Increased manufacturing efficiency had lowered steel production costs. Higher levels of tariff protection, providing protection on a national basis, minimised the impact of cheap imports and a devalued currency increased the import barriers. Finally, the combination of government purchasing preferences and rail freight concessions provided a deeper level of protection that was difficult for the importers to overcome.

The National Perspective

Post First World War economic expansion in Australia peaked during the statistical year 1927/28.² During the 1920s, the Australian economy was highly dependent on agricultural commodity exports for income and on overseas finances to fund infrastructure works. Boris Schedvin notes that, for the 1920s decade as a whole, about one-fifth of total domestic investment was being financed by overseas borrowing.³ Yet almost 70 per cent of this capital inflow was consumed by public authorities funding a range of socially desirable infrastructure projects. This, coupled with the existing external national indebtedness incurred during the First World War by the Federal Government and the heavy loan operations by the State Governments in London and New York during the 1920s, greatly increased total international interest commitments. These interest commitments rose from 16 per cent of export earnings in 1919/20 to 28 per cent in 1928/29. Interest commitments rose far more rapidly than commodity income or import replacement values.

One reason for this spate of public authority borrowing was the major shift taking place in the Australian economy as it moved away from the primary sector and the creation of rural assets towards the industrial sector and the creation of urban assets.⁴ Shedvin observed that an industrial economy is built on a foundation of high per capita income and consumption standards. These high standards required the development of social assets consistent with a modern urbanised standard of living.⁵ The building of the Throsby Basin and the Lee wharf, and the expansion of Newcastle’s water and sewerage systems are examples of such expenditure in Newcastle. In addition, the provision of domestic and commercial electrical networks, telecommunications and educational infrastructure all competed for finance, but in Australia at this time all except housing depended on the public sector.⁶ The Australian domestic debt burden in 1929 is detailed in Table 4.1.

⁴ Schedvin, Australia and the Great Depression, pp. 3–4
⁵ Schedvin, Australia and the Great Depression, p. 4
⁶ Schedvin, Australia and the Great Depression, p. 5
Table 4.1: Australian Domestic Debt Burden in 1929

<table>
<thead>
<tr>
<th>State</th>
<th>Foreign Debt Amount £</th>
<th>Domestic Debt Amount £</th>
<th>Total Debt Amount £</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW</td>
<td>172,298,000</td>
<td>97,687,000</td>
<td>269,976,000</td>
</tr>
<tr>
<td>Victoria</td>
<td>64,493,000</td>
<td>91,497,000</td>
<td>155,990,000</td>
</tr>
<tr>
<td>Queensland</td>
<td>72,822,000</td>
<td>40,533,000</td>
<td>113,335,000</td>
</tr>
<tr>
<td>SA</td>
<td>43,304,000</td>
<td>50,952,000</td>
<td>94,256,000</td>
</tr>
<tr>
<td>WA</td>
<td>45,709,000</td>
<td>24,424,000</td>
<td>70,133,000</td>
</tr>
<tr>
<td>Tasmania</td>
<td>13,879,000</td>
<td>8,818,000</td>
<td>22,697,000</td>
</tr>
</tbody>
</table>

Source: Official Year Book of the Commonwealth of Australia 23 (1930), pp. 282, 664

A factor exacerbating public sector borrowing, particularly by all NSW Governments during the 1920s, was the practice of borrowing on overdraft when long-term funds could not be obtained to fund infrastructure commitments. The reason for this rather cavalier attitude to financial management was to overcome the need to float a new loan and incur additional loan funding costs. The overdraft then became the first charge on the next cash loan. During 1929, this method of financing infrastructure construction concerned the British banks who progressively ceased to lend money to the State Governments. Yet the projects had commenced and demanded continued funding.7

The key buffering factor for the NIH was that it manufactured products for the domestic rather than the international market. The dramatic fall in prices for Australia’s agricultural exports, which began in 1926/27, was a reflection of the decline in world demand for those products. This was exacerbated by the financial slump of 1929 in the United States, which rapidly spread to Europe and then to the broader world economy. In the four years between 1929 and 1933, the value of Australia’s exports fell from £124 million to £71 million or by 43 per cent. Wool, one of the better performing commodity exports, suffered price reductions of 49 per cent, wheat 35 per cent and meat 24 per cent.8 In these four

7 Schedvin, Australia and the Great Depression, pp. 132–36
8 Barrie Dyster and David Meredith, Australia in the International Economy in the Twentieth Century (Cambridge: Cambridge University Press, 1990), p. 124
years, the national income was cut by £60.7 million, but between 1928/29 import prices only fell by 11 per cent. By 1932/33 the Australian terms of trade had declined by 39 per cent.\(^9\) In addition, the international financial crisis which accompanied the slump in export earnings ushered in a balance of payments deficit in 1929/30 which represented 11.2 per cent of the Australian Gross Domestic Product (GDP).

> It was probably in 1930 that the NSW Government learnt that large and highly visible public projects tended to generate funding demands of their own. The building of the Sydney Harbour Bridge, with its associated road and underground rail systems, provides a good example. Once construction of the bridge had commenced, the government could hardly have a rusting arch stretching across the harbour without a roadway and railway, just to save money.\(^{10}\) Yet, until the new bridge and associated road and rail systems were completed and began to generate revenue, the State Government was still required to repay the loan taken out to fund the bridge and railway construction, together with the accruing interest on that loan. Adding to these project-funding issues were the political problems caused by the syphoning and redirecting of funds originally directed to regional areas back towards urban areas, in order to finance these very public projects. In NSW during 1930/31, Country Party members identified that £31.5 million had been redirected from approved regional projects to complete the electrification of the Sydney urban rail system.\(^{11}\) However, this attitude was of some assistance to BHP at least, for between 1931 and 1932 it supplied 10,500 tons of steel for the Sydney Harbour Bridge project.\(^{12}\)

The only significant casualty from the Great Depression in Newcastle was the State-Government-owned Walsh Island Dockyard and Engineering Works. As revenue from operations fell, this facility was closed in 1932 with the loss of 1540 jobs; machine tools and equipment were disposed of and the site abandoned in 1933. Nevertheless, the steel industry continued to manufacture steel and steel products, if at a lower production rate. The public utilities, public transport and much of Newcastle’s retail system remained in operation. This allowed the Newcastle urban area, the sixth largest economic area in Australia, to continue functioning with minimal disruption.

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\(^9\) Dyster and Meredith, *Australia in the International Economy in the Twentieth Century*, p. 124

\(^{10}\) Dyster and Meredith, *Australia in the International Economy in the Twentieth Century*, p. 141

\(^{11}\) Burke, *Making the Railways*, p. 201

\(^{12}\) Jay, *A Future More Prosperous*, p. 264
Historical accounts of the Depression in Australia tend to fall into two categories. The first highlights its social impacts, while the second investigates industrial, political and economic aspects at the international and national scale. Schedvin emphasises this point when he argues that from 1932 the production growth of the iron and steel industry, then concentrated in Newcastle, became the driving force behind the national economic recovery. Little attention is generally given to regional cities or their importance to the national economy. This chapter will provide evidence to support Schedvin’s contention, demonstrating that the NIH remained a viable and a significant employer of labour throughout the Depression years and quickly recovered from the end of 1932.

As in other urban areas, Newcastle was affected by the social impact of unemployment, the forced and unforced housing evictions and the need for some to live in the humpy villages. Steel production and direct employment at the steelworks declined sharply between 1929 and 1932 but, as shown in Table 4.3, production and employment in the downstream subsidiaries remained steady and in some cases increased. The combination of declining import competition, lower labour costs, a devalued currency, high tariff protection, together with government purchasing preferences towards Australian-made products, left the bulk of the domestic iron and steel market to Australian steelmakers. This allowed the NIH to not only survive intact and to remain the major employer of labour in Newcastle, but also to position itself to rapidly resume steel production in volume as soon as the market improved.

Newcastle and its economy had been beneficiaries of government infrastructure investment in the 1920s. Projects included the commencement of a major sewerage amplification scheme, the expansion of the Zaara Street Power Station and construction of the Throsby Basin in the Port of Newcastle. These projects provided local business with opportunities to supply materials and services in addition to the direct employment they provided. But the rapid reduction in public expenditure on public works stopped most new infrastructure development in Newcastle. These rapid reductions were a major cause in the

13 Schedvin, *Australia and the Great Depression*, p. 1
15 Schedvin, *Australia and the Great Depression*, p. 70
progressive decline in the size and scope of the domestic structural steel market in particular.

Competition from steel imports also fell in this period, with total British exports of iron and steel falling from a peak of 4.48 million tons in 1929 to just 1.89 million tons in 1932.\textsuperscript{16} Steel exports to Australia were limited to products such as the tinplate as used by the food industry and a small range of steel products not manufactured in Australia.\textsuperscript{17} This crisis in the British steel industry had direct implications for the steel industry in Australia, being particularly acute for those with investments in the Australian Iron and Steel Company. This company struggled to remain viable between 1930 and 1935.\textsuperscript{18} In response to the falling market, the two Australian suppliers, BHP and Australian Iron and Steel (AIS), reduced their output to a nadir in 1932, with steel production in Newcastle by BHP just 179,312 tons and only 26,000 tons by AIS in Port Kembla.\textsuperscript{19}

One of the strategies used to combat unemployment during the Depression that was beneficial to the NIH was tariff protection. Continuing their long practice, producers and the union movement were in tune by clamouring for additional protection through increased tariffs during 1929. The Australian selling price for steel bars was £12 12s. 6d. per ton compared with a duty free price of British bars of £9 15s. 0d. landed at Australian ports.\textsuperscript{20} The price difference of £2 17s. 6d. was greater than the £2 4s. 0d. per ton duty provided by the tariffs of 1921.\textsuperscript{21} This tariff had been first introduced with the object of blunting the dumping activities of British and European steel manufacturers in Australia in the wake of the First World War. From time to time throughout the 1920s, this tariff rate had been adjusted in order to maintain a viable manufacturing industry in Australia.\textsuperscript{22} But between 1930 and 1932, the Scullin Government dramatically increased the tariff rates on all imported goods. These increased tariff rates significantly reduced the competitiveness of imported goods and encouraged Australian manufacturers to adopt import replacement manufacturing strategies.\textsuperscript{23}

\begin{thebibliography}{99}
\item\textsuperscript{16} Derek H. Aldcroft, \textit{The Inter-War Economy: Britain, 1919–1939} (London: Batsford, 1970), p. 171
\item\textsuperscript{17} Hughes, \textit{The Australian Iron and Steel Industry}, p. 202 (Appendix, Table V)
\item\textsuperscript{18} Cecil Hoskins, \textit{The Hoskins Saga} ([Sydney?: the author,1969), p. 101
\item\textsuperscript{19} Hughes, \textit{The Australian Iron and Steel Industry}, p. 197 (Appendix, Table III)
\item\textsuperscript{20} Hughes, \textit{The Australian Iron and Steel Industry}, p. 109
\item\textsuperscript{21} Hughes, \textit{The Australian Iron and Steel Industry}, p. 109
\item\textsuperscript{22} Dyster and Meredith, \textit{Australia in the International Economy in the Twentieth Century}, p. 99
\item\textsuperscript{23} Schedvin, \textit{Australia and the Great Depression}, p. 372
\end{thebibliography}
A second economic lever the Federal Government deployed to assist recovery was deflation. In May 1929, the conservative Bruce-Page Federal Government identified high labour costs as being the key manufacturing problem in Australia. As Peter Cochrane described it, this reflected the conservative bourgeois view, that there should be an immediate and substantial fall in wages. For an industrial centre such as Newcastle, with its large workforce, these arguments had an immediate bearing. To emphasise this point, Bruce drew attention to two significant industrial problems facing the country in 1929. The first was a timber workers’ strike which had degenerated into a lockout by the employers. The second concerned the lockout of the miners on the Northern Coalfields.

After being on strike for ten months, the timber workers returned to work, finally accepting the industrial court decision to increase working hours to forty-eight hours a week in October 1929. Nonetheless, the coal miners on the South Maitland Coalfields remained solid in their refusal to accept the 12.5 per cent wage cut demanded by the coal mine owners. The militants demanded that the union call a general strike, but the central committee of the Miners’ Union refused, trusting that negotiations would ultimately be successful. The lockout largely applied to those collieries working in the Cessnock and Kurri Kurri areas, but other collieries on the Northern Coalfield remained open. These collieries were able to provide sufficient coal to maintain essential services and to keep the steel industry operational. The seriousness of this industrial dispute cannot be exaggerated, for the Northern Coalfields provided 70 per cent of all the black coal mined in Australia, with its South Maitland component providing more than 50 per cent of that total.

The conservative Bruce Government’s industrial policies did not resonate with the great bulk of the electorate and on 12 October 1929 a federal election was held, the second in only twelve months. This election resulted in a landslide defeat for the conservative government and bought the Labor Party to power in the House of Representatives for the first time in nearly thirteen years; Labor did not, however, gain control of the Senate.

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25 ‘The Coal Dispute: Pre-Lockout Rates; Further Negotiations; Reply to Mr Bavin’, *Newcastle Morning Herald and Miners’ Advocate* (Newcastle, NSW), 10 October 1929, p. 6.
27 ‘Mr Bruce’s Claims’, *Newcastle Morning Herald and Miners’ Advocate* (Newcastle, NSW), 10 October 1929, p. 6.
Settlement of the coal dispute had been a primary election commitment for the Labor Party and action was expected by the miners and the great bulk of the labour movement. But at the end of November 1929, the conservative NSW Government moved on its own initiative to reopen a Hunter Valley mine at Rothbury using free or non-union labour. In December, the miners, defying the State Government’s new no-picketing law, massed at the Rothbury mine site, clashing with the police. One man was shot and killed, and many others were injured. This event saw existing political strains within the new Federal Labor Government become an enormous rift. Aside from periodic shortages of coal at the steelworks and the public utilities, other than inflaming union militants, many of these issues had little direct effect on the NIH. But they do provide a backdrop to the level of national political and economic uncertainty, against which the survival of the NIH should be considered.

The factors that did have a direct influence on the NIH’s survival can be divided into external and internal modules. For the hub’s commercial component, the external factors were largely driven by the national government in its attempts to reduce expenditure and to raise revenue. The internal factors concerned what had been done in and by each component to upgrade their operations and increase the efficiency of their operations after the shutdown in 1922 and 1923. The first external factor concerned the Federal Government’s action to establish additional domestic control over the Australian gold stocks in order to stabilise the currency and to maintain the gold standard. This was achieved through the passage of the Commonwealth Bank Act at the end of November 1929. The effect of this legislation was to give the Commonwealth Bank control over the movement and the holding of gold in Australia. Schedvin comments that this action effectively saw Australia abandon the gold standard, but maintaining the currency’s relationship to sterling. The practical and immediate effect of this move was to ration the availability of both gold and foreign exchange to importers and exporters, effectively restricting their opportunity to use gold or sterling currency in their international transactions. For the NIH, the benefit of this action was to minimise and, in some cases, stop the importation of some fabricated steel products from Britain.

The second issue for government was to correct the trade balance, while at the same time minimising the effect of any correction on the Anglo-Australian exchange rate. This

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28 Schedvin, *Australia and the Great Depression*, p. 121
29 Cochrane, *Industrialization and Dependence*, pp. 66, 68
30 Schedvin, *Australia and the Great Depression*, p. 125
issue was addressed in a traditional Australian way when, on 3 April 1930, a revised tariff schedule was announced. In opposition, Labor had argued that tariff adjustments made during the 1920s had been inadequate to overcome the employment stagnation of the period. The changes to the April 1930 tariff schedule had an immediate effect on the NIH through the imposition of a prohibition of the importation of steel beams and associated steel products. The measures announced in April were essentially emergency measures, but between June and December 1930 six additional tariff schedules were announced, each one building the tariff wall higher. In addition to the tariff increases, the 1930/31 budget introduced a primage (or stevedoring) and goods handling charge of 2.5 per cent on all imports as a revenue measure. These policies were primarily designed to protect jobs in the manufacturing sector.

While tariffs were actively sought by the steel industry, for those segments of the economy dependent on commodity trade in primary products, such as wool, wheat and meat, with Britain, they were anathema. As Cochrane noted, later in the 1930s, interests such as the Australian Association of British Manufacturers and the Sydney Chamber of Commerce coalesced to form a number of powerful anti-tariff groups. While the Scullin tariff policy was rough and unselective, it did go a long way towards achieving its objectives of slowing and ultimately reducing imports, with direct positive impacts on the NIH and its production of steel products to satisfy the domestic market. While the tariff system provided protection against imported steel product, not all of the Federal Government’s economic measures were favourable to the NIH. In March 1930, as an expenditure saving, the Government ceased paying bounties to Lysaght for the manufacture of flat steel products, and to Ryland Bros. and John Lysaght for the manufacture of steel wire products.

The factor that had an immediate effect on the commercial component of the NIH was the combination of a devaluation of the Australian currency and a reduction in the basic wage. Both Schedvin and Cochrane provide detailed explanations of how and why between October 1930 and January 1931 the Australian currency was devalued by 30 per cent. Beginning in October 1930, the Bank of NSW acted with the other Sydney-based private banks to progressively devalue the currency. Devaluation was achieved through

31 Schedvin, *Australia and the Great Depression*, p. 141
32 Cochrane, *Industrialization and Dependence*, p. 125
33 Cochrane, *Industrialization and Dependence*, p. 125
34 Schedvin, *Australia and the Great Depression*, p. 144
35 Schedvin, *Australia and the Great Depression*, p. 140
normal currency trading and in the final analysis was a market reaction to the shortage of sterling exchange. On the other hand, the Melbourne-based banks, largely owned by British interests, together with the Commonwealth Bank, were much opposed to devaluation. Nonetheless, it was recognised that devaluation of the currency would assist both manufacturers and farmers. This battle of the banks continued, with the tacit support of the Federal Treasurer Joseph Lyons, until 29 January 1931, when the Australian exchange rate against sterling was fixed at a 30 per cent premium. Schedvin observed that Australia’s path to devaluation was haphazard and circumstantial, for no national policy had been decided. The Commonwealth Bank, which should have taken the initiative, just acted as a trading bank. Devaluation assisted the NIH by increasing the cost of sterling currency for steel and steel product importers, thereby leaving more of the domestic market to local manufacturers.

Both Boris Schedvin and Alex Millmow agree that the correct policy was stumbled on by accident rather than by design, with Millmow making the point that this was the beginning of the Keynesian economic revolution in Australia. In addition to currency devaluation, on 22 January 1931 the basic wage was reduced by 10 per cent. Barrie Dyster and David Meredith explain that the Federal Arbitration Court took over 20 per cent from the basic wage in one bite, half of it adjusting for a fall in the cost of living brought about by depressed prices, but 10 per cent of it was explicitly designed to peg the basic wage to a lower standard of living. Now the male basic wage was stated to be an adequate income for a married couple and one child, where previously it was adequate for a married couple and two children.

The combined effects of raising the tariff loading and devaluation of the Australian currency meant that by the middle of 1931 the average cost of manufactured imports from Britain had more than doubled in two years. Australian-made products, including steel products, avoided the tariff impost and could be produced at a lower cost because of the

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36 Schedvin, *Australia and the Great Depression*, p. 156
37 Cochrane, *Industrialization and Dependence*, pp. 68–70
38 Schedvin, *Australia and the Great Depression*, p. 167
39 Schedvin, *Australia and the Great Depression*, p. 167
41 Dyster and Meredith, *Australia in the International Economy in the Twentieth Century*, p. 137
reductions in the direct cost of labour. As a result, these national economic initiatives, together with the rapid decline in steel imports from Britain and a gradual steadying of commodity export prices, saw the Australian economy begin to stabilise late in 1931. This degree of national economic stabilisation was coupled with increases in the import replacement of manufactured steel products as imports declined. The contribution from each of these factors was sufficient to initiate a mild economic recovery for the NIH during the second half of 1932.\textsuperscript{42} The national economic stabilisation achieved by the end of 1931 is detailed in Table 4.2. This table also demonstrates the other side of Scullin’s trade policy — the expansion of exports. However, this part of the policy was not always a great success, as the campaign to grow more wheat was to prove. Exports never accounted for a large part of the NIH’s output and during the whole of the Depression were minuscule, but with stabilisation of the national economy during 1931 there were increases in intra-state and interstate sales.

Table 4.2: The Australian Balance of Trade 1930–1931
(Imports and exports, quarterly, in 1930 and 1931: all values in A£ millions)

<table>
<thead>
<tr>
<th>Year &amp; Quarter</th>
<th>Imports</th>
<th>Exports</th>
<th>Trade Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>33.0</td>
<td>24.2</td>
<td>– 8.8</td>
</tr>
<tr>
<td>June</td>
<td>25.4</td>
<td>23.6</td>
<td>– 1.8</td>
</tr>
<tr>
<td>September</td>
<td>21.5</td>
<td>17.0</td>
<td>– 4.5</td>
</tr>
<tr>
<td>December</td>
<td>19.6</td>
<td>26.3</td>
<td>+ 6.7</td>
</tr>
<tr>
<td>Total for the Year</td>
<td>99.5</td>
<td>91.1</td>
<td>– 8.4</td>
</tr>
<tr>
<td>1931</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>15.1</td>
<td>24.1</td>
<td>+ 8.0</td>
</tr>
<tr>
<td>June</td>
<td>11.7</td>
<td>21.4</td>
<td>+ 9.7</td>
</tr>
<tr>
<td>September</td>
<td>13.3</td>
<td>16.0</td>
<td>+ 2.7</td>
</tr>
<tr>
<td>December</td>
<td>14.4</td>
<td>29.9</td>
<td>+ 15.5</td>
</tr>
<tr>
<td>Total for the Year</td>
<td>55.5</td>
<td>91.4</td>
<td>+ 35.9</td>
</tr>
</tbody>
</table>

Source: C. B. Schedvin, \textit{Australia and the Great Depression} (Sydney, 1970), p. 145 (Table 20)

A third external factor that was influenced by Australian government policy and had a significant direct effect on the NIH was the dramatic fall in the importation of rolled steel

\textsuperscript{42} Schedvin, \textit{Australia and the Great Depression}, p. 288
products, such as merchant bar stock and steel plate from Britain. In 1929/30 imports of rolled steel products had totalled 280,000 tons, but by 1930/31 imports of these products had fallen to just 75,000 tons, or by 73 per cent.43 The reasons for this fall lay not only in the general collapse of world trade, but also in the structure and operation of the British steel industry.

As has already been examined, during the 1920s decade Australia borrowed significant sums and, during 1927 and 1928, as London tightened lending, the state governments went to the New York market for the funds they required. This tightening of loan funds saw a rapid fall in state government expenditure on numerous projects and this had a negative effect on steel and fabricated steel production in the NIH. In an effort to arrange some form of negotiated settlement between the British banks and each Australian government, the Federal Treasurer Ted Theodore requested W. S. Robinson, of the Collins House Group, to discuss the matter with some directors of the Bank of England. Robinson met with two directors, who provided the following advice:

Inform your government to pay to the last shilling. When, and only when, they have done that can we give them any help. Then they will not ask in vain. London will be generous.44

This move towards some form of negotiated financial settlement concluded with the visit to Australia of Sir Otto Niemeyer, the Bank of England envoy, between August and September 1930. He gave the Federal and State Governments the same advice. However, the advantage of Niemeyer saying these things in Australia was that he provided Australians with someone to blame. This issue affected the conservatives, with the Country Party and the National Party arguing first about tariffs, then internally to defeat a range of radical monetary solutions being touted by both political parties. Nonetheless, by the second half of 1931, each of the external factors, increased tariffs, currency devaluation and the fall in steel imports, were having some effect, with the NIH assuming something of dominance in the domestic steel market. The second half of 1932, by virtue of the increases in steel production rates, demonstrated that a weak economic recovery was underway.45

45 Schedvin, Australia and the Great Depression, p. 145
So far as the NIH was concerned, the combination of increased tariffs and devaluation were the key external factors contributing most towards its survival during the Depression. Government action to control gold and the currency movement, which made importation transactions of all manufactured goods more difficult, was a contributing factor. This encouraged more Australian manufacturers to adopt import replacement manufacturing strategies. As demand for these products continued, import/export merchants were obliged to purchase and distribute Australian goods in place of imported products. Lowering the basic wage did not help the NIH all that much, for the New South Wales Labor Government under Jack Lang did not allow the State basic wage to be reduced in line with the federal basic wage. After the September 1932 State election, the incoming Bernard Stevens United Australia Party Government left the State basic wage unchanged.46

The last factor contributing to survival was the advantage of having British branch houses operating in the NIH. As the selling price of imported British steel rose, British manufacturers positioned their Australian operations to take up the bulk of lost Australian export sales volume. Table 4.4 demonstrates the increased production in the Australian market by the Lysaght and Ryland Bros. branch houses after 1931. This clearly vindicated the British companies' decisions to establish themselves in Australia and BHP's efforts to encourage them to do so, providing it with a steady demand for its steel.

The internal factors which contributed to the survival of the NIH during the Depression were the capital investments made in new manufacturing technology and equipment during the 1920s. These new technologies progressively contributed to lowering the selling price for steel products and increasing the market competitiveness of Australian manufactured steel products against imports. Examples of this increasing steel price competitiveness are detailed in Table 4.5 below. Even as the domestic demand for steel and production economies of scale fell, increased operational efficiency, coupled with reduced competition from imports, enabled the steelworks and the subsidiaries to remain viable commercial operations.

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46 Schedvin, *Australia and the Great Depression*, p. 317
During the 1930/31 financial year, capital investments in Newcastle were not only confined to the steel and heavy engineering companies. In that year, a new and very different industrial plant commenced the manufacture of electric light globes in Newcastle. In 1931, this was the only electric lamp manufacturing plant in Australia. The company which operated the plant was made up from a consortium of British and European electric lamp companies, operating under the name ELMA, or Electric Lamp Manufacturers of Australia. This company had no direct commercial or logistic links to the Newcastle steel industry. While the products produced were used by all elements of the NIH, this new entrant is not considered as part of the NIH. This new entrant to Newcastle was located at Hamilton North and had access to both road and rail movement. The first electric lamp was produced in March 1931.\(^47\) From a Newcastle perspective this new plant was very different to those from the NIH, for the plant largely employed women and in early 1932 more than 300 were employed there. Initially, because of the wage disparity between male and female workers, this factor concerned local organised labour but, given the number of women who were also unemployed at the time, it was accepted.

However, the new works were unbalanced, for all of the glass components in the electric lamp were imported from the Phillips works at Eindhoven in the Netherlands. In order to overcome this logistic and cost problem, in 1938 it was decided to manufacture all of the glass components in Newcastle. The required manufacturing equipment was ordered in 1939 and, along with some specialist management and maintenance workers, was shipped from the Netherlands in early 1940. ELMA formed a wholly owned subsidiary named the Newcastle Glass Works, to manage and operate the new plant. The Newcastle Glass Works was operational in 1940. The raw materials required to manufacture the glass were sourced locally.\(^48\)

In 1941, both parts of ELMA employed 1040 people and, with about 60 per cent being female, it quickly became the largest employer of females in Newcastle. This development provided more than just an immediate boost to female factory employment; it also provided opportunities for female workers to adopt a career path. In 1942, three high-speed machines were manufacturing 3600 electric lamp globes per 24-hour day and the

\(^{47}\) ‘Lamp Works: Hamilton Enterprise; Inspection by Builders’, *Newcastle Morning Herald and Miners’ Advocate* (Newcastle, NSW), 19 November 1931, p. 3

\(^{48}\) ELMA and the Newcastle Glass Company Records, P54-55, University of Newcastle Archives
whole of the ELMA plant, which now employed 1040 women and men, was working seven
days per week. In 1950 the ELMA plant manufactured 22 million globes.49

Construction of the first battery of the Wilputte coke ovens began in 1928 and the
battery commenced operations at the end of 1929. The key advantage this type of oven
provided over the existing Semit Solvay type was its fuel efficiency. They used 40 per cent
less gas to heat the ovens and their by-product recovery capability increased.50 These
changes, combined with the other technological improvements, were discussed earlier, but
in the 1930s they had a significant impact on lowering the manufacturing cost of steel. This
technology played a major part in reducing the amount of coal required to manufacture one
ton of ingot steel: from 3.5 tons in 1917 to 1.5 tons in 1938. Fuel efficiency in Newcastle
steelworks were now on par with the most efficient American and European steel plants.51

An additional opportunity to lower materials cost came in September 1932, when
BHP Collieries organised the purchase of the Burwood and Lambton B. Collieries on the
northern field.52 This purchase made BHP independent, in terms of having control of all
necessary raw materials iron ore, limestone and coal materials for the manufacture of steel.
Other internal factors contributing to success included the benefit of the company’s vertically
integrated organisational structure, which provided closer control of transport costs through
its shipping and stevedoring subsidiaries. Using these organisations, BHP was able to
minimise logistic supply interruptions, the result of poorly coordinated ship movement, as
well as expediting cargo handling in all Australian ports. Another internal factor that affected
success concerned the development of an educated workforce in every component of the
NIH. This factor was initiated in the NIH during 1927, with the introduction of the BHP Staff
Training Scheme. With more highly qualified technical staff available to supervise
manufacturing processes, every opportunity was taken to improve the product standard at
minimum cost. While few new cadets, trainees or apprentices were started between 1930
and 1934, the training of the workforce did not cease.

49 ELMA and the Newcastle Glass Company Records, P54-55, University of Newcastle Archives
50 Wills, Economic Development of the Australian Iron and Steel Industry, p. 116
51 Letter from Quincy Bent, Vice President of Bethlehem Steel, concerning production cost
comparisons between the Newcastle and Bethlehem Steel plants, A.1972.0038 (Box 8 of 41),
Essington Lewis Papers, Melbourne University Archives
52 Hughes, The Australian Iron and Steel Industry, p. 113
Guiding these decisions was the conservative approach from Darling and Lewis to economic management within the companies that made up the NIH. Throughout the 1920s, growth and technological change had been funded out of earnings, not borrowings. As a consequence, when the Depression arrived in Australia, none of the companies making up the NIH carried any debt. Through the whole period of the Depression, BHP remained profitable. However, in spite of having a reserve fund of £1.5 million held over from the 1920s, it paid no dividends between 1930 and 1932.53

As steel sales declined, various iron and steel production departments and their associated maintenance elements in the Newcastle steelworks were progressively shut down. By 1932, only the new battery of Wilputte coke ovens, one blast furnace and two open hearth furnaces remained in production. The maintenance of steel production provided sufficient raw steel product for each of the downstream steel fabricating subsidiaries of Lysaght, Ryland Bros., Commonwealth Steel and John Lysaght Bros.

In terms of employment, Table 4.3 shows that the steelworks was the only plant in the NIH to suffer a significant drop in production and a substantial reduction in its workforce. The workforce fell from 2992 in 1929 to just 1672 in 1932. Amongst this workforce were employees who were provided with just five days of work in each standard two-week pay period. In order to maintain business activity, but also to maintain employment for key staff, many enterprises required their employees to work fewer days in each pay period during the Depression years. This enabled BHP to maintain production on a scale that ensured that key elements of the steelworks remained operational and the majority of its workforce was retained, thus enabling the plant to return to full production in as short a time as possible. The advantage of maintaining production capacity was seen by the end of 1934, when steel production had returned to 1929 levels. 54

53 Hughes, *The Australian Iron and Steel Industry*, p. 113
54 ‘Newcastle Steel Works: Improved Results’, *The Advocate* (Burnie, Tas), 22 August 1932, p. 6
Table 4.3: Steel Production and Employment Variability between 1929 and 1934

<table>
<thead>
<tr>
<th>Year</th>
<th>Steel Production Tons</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>374,000</td>
<td>2992</td>
</tr>
<tr>
<td>1930</td>
<td>266,000</td>
<td>2715</td>
</tr>
<tr>
<td>1931</td>
<td>210,000</td>
<td>1708</td>
</tr>
<tr>
<td>1932</td>
<td>179,312</td>
<td>1672</td>
</tr>
<tr>
<td>1933</td>
<td>321,000</td>
<td>2537</td>
</tr>
<tr>
<td>1934</td>
<td>414,000</td>
<td>3082</td>
</tr>
</tbody>
</table>

Source: Jay, A Future More Prosperous, p. 254

Table 4.4 details the production and employment in the Newcastle-based steel fabrication associates and subsidiaries. This table identifies that the variability in production by the subsidiaries was relatively small and that employment was remarkably steady. Indeed, as Gray points out, for this period Ryland Bros. maintained an average annual workforce of approximately 700 and the Lysaght workforce grew from 500 in 1929 to 1257 in 1934. The average annual workforce at the Commonwealth Steel Co. in this period was 260 and even the heavy engineers maintained a significant manufacturing capability, with an average of 200 men working at Goninan and approximately 125 working at Morison and Bearby across the four year period. As an example of business recognising the changing economic circumstances for the NIH, in 1932 Stewarts and Lloyds commenced construction of a new tube plant in Newcastle. This plant was operational in December 1934, when it employed 325 production workers.

55 Sheilah R. Gray, ‘Social Aspects of the Depression in Newcastle, 1929–1934’, unpublished M.A. diss. (University of Newcastle, 1981), Figure 1
<table>
<thead>
<tr>
<th>Year</th>
<th>Lysaght</th>
<th>Ryland Bros</th>
<th>Commonwealth Steel</th>
<th>Stewarts and Lloyds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employment (Tons)</td>
<td>Prod. (Tons)</td>
<td>Employment (Tons)</td>
<td>Prod. (Tons)</td>
</tr>
<tr>
<td>1929</td>
<td>500</td>
<td>25,000</td>
<td>750</td>
<td>62,500</td>
</tr>
<tr>
<td>1930</td>
<td>400</td>
<td>30,000</td>
<td>850</td>
<td>63,000</td>
</tr>
<tr>
<td>1931</td>
<td>919</td>
<td>25,000</td>
<td>470</td>
<td>57,000</td>
</tr>
<tr>
<td>1932</td>
<td>1001</td>
<td>52,000</td>
<td>628</td>
<td>50,000</td>
</tr>
<tr>
<td>1933</td>
<td>1125</td>
<td>60,000</td>
<td>1125</td>
<td>57,000</td>
</tr>
<tr>
<td>1934</td>
<td>1257</td>
<td>58,000</td>
<td>881</td>
<td>60,000</td>
</tr>
</tbody>
</table>

Sources: Newcastle Chamber of Commerce, *Annual Reports*, 1929–1934 (employment tables)

While the Australian steel market was weak during the Depression, based on the production figures the demand for fabricated steel products remained steady. Consumers were still able to purchase familiar brand-named goods, now from their Australian branch offices rather than the imported product. While the branch office operations were effective and protected through the tariff, another reason for their success was the continuing fall in the prices of their products. There is little doubt that the bulk of unemployment in Newcastle was the result of a collapse in the housing and construction industry. But, as Schedvin observed, the system of relief from the surge in unemployment, either through the provision of relief work or direct sustenance payments was totally inadequate. Much of this inadequacy was due to multiple conflicts between the Loan Council, the Commonwealth Bank and the private banks.

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60 Tubemakers of Australia Limited, *Manufacturing in Newcastle Proudly Reviewed*, p. 8
61 Cochrane, *Industrialization and Dependence*, p. 43
62 Schedvin, *Australia and the Great Depression*, p. 329
63 Schedvin, *Australia and the Great Depression*, p. 329
Table 4.5 shows the increasing price competitiveness between Australian and British iron and steel between March 1930 and March 1937. NIH companies made use of the readily available casual or day labour during the Depression to conduct a range of maintenance and construction tasks, but casual labour was largely non-unionised and therefore was not counted as unemployed. The considerable amount of maintenance and construction achieved required a large workforce. At BHP, this work included building the No. 5 Soaking Pits and a second battery of 53 Otto Wilputte coke ovens.

Table 4.5: Prices of Australian and British Iron and Steel (Sterling per Ton)

<table>
<thead>
<tr>
<th>Item</th>
<th>Australian Production</th>
<th>British Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1930</td>
<td>1937</td>
</tr>
<tr>
<td>Pig Iron</td>
<td>£6/10/0</td>
<td>£3/8/0</td>
</tr>
<tr>
<td>Steel Joists</td>
<td>£12/12/6</td>
<td>£7/14/5</td>
</tr>
<tr>
<td>Bar Steel</td>
<td>£12/12/6</td>
<td>£7/14/5</td>
</tr>
<tr>
<td>Spring Steel</td>
<td>£24/0/0</td>
<td>£14/5/0</td>
</tr>
</tbody>
</table>


Trengrove noted that Lewis’s son, who was an executive officer at the Newcastle steelworks in this period, made the following statement regarding the Depression period: ‘We actually took advantage of the Depression years. Labour was cheap, and materials were cheap and available. We sold the cheapest steel. We even built our No 2 battery of coke ovens during that time.’64 Careful management by Lewis, combined with continued investment in targeted plant improvements and staff training, provided a long-term advantage.65 BHP’s relationship with Collins House Group operatives such as W. S. Robinson and the policy of sending senior managers to visit steel plants in North America and Europe also provided regular intelligence and assessments of what was really happening in Europe, the United States and the British Empire.

64 Alan Trengove, *What’s Good for Australia..!: The Story of BHP* (Stanmore: Cassell Australia, 1975), p. 139
65 Trengove, *What’s Good for Australia..!*, p. 145
The Ottawa Conference of 1932 marked a high-water mark for the concept of a self-contained Empire. This conference established a series of trade agreements giving preferential access to the markets of each member country. Australia undertook to give British manufacturers access to the dominion’s market, but still sought to protect its own manufacturing industry by raising tariffs on non-British goods, rather than lowering the tariffs on British goods. This left Britain only partially satisfied, while at the same time antagonising foreign competitors such as Japan and the United States, who reacted in kind against Australian goods. This revealed a rather blinkered Australian view of the world, in that it seemed incapable of foreseeing the repercussions that were likely to flow from such decisions. This offence was compounded in 1936 with the trade diversion policy which sought to restrict the import of Japanese textiles and substitute them for British goods. These decisions ignored the fact that Japan and the United States were now the dominant Pacific powers.

By the end of 1932, the consumption of fabricated steel products was showing signs of growth, particularly from the rural sector as commodity prices first stabilised, then slowly increased. This required the additional production of iron and steel to satisfy the fabricated steel supply demands. Some manufacturing processes can be varied to suit demand, but the activation of a continuous manufacturing process, as required by steel manufacture, demands that all of the equipment and trained labour required to operate the entire system be available and work together. This was a complex task, demanding all of the skills of management, professional technical staff, skilled and operative labour. It also demanded the commitment of adequate funding by the business. Given the uncertain times the world had just been through, and an undefined future, decisions to increase steel production should be recognised as bold commercial moves. Steel production grew rapidly from its nadir of 179,312 tons in May 1932 to 321,000 tons in May 1933 and then to 414,000 tons in May 1934, an increase which took the steelworks close to its production capacity of 450,000 tons. Details of this growth are set out in Table 4.3 above. In addition, the reactivation of plant to meet the increasing demand required the public utilities, whose activities were closely related to the commercial elements, to increase the tempo of their work.

68 Hughes, The Australian Iron and Steel Industry, p. 197 (Appendix, Table III)
In March 1934, BHP’s No. 10 open hearth furnace was tapped for the first time. This furnace had been under construction during the whole of 1933, at the same time as the refurbishment and enlargement of the other seven open hearth furnaces which had been progressively shut down since 1930. Lewis, in a letter sent to Darling in August 1934, confirmed the desirability of having the No. 10 furnace operational, in order to provide steel for the new tube plant being built by Stewarts and Lloyds. An agreement between BHP and Stewarts and Lloyds concerning the construction of the new tube plant had been signed in 1933. A new plate and bar mill came into operation and a combined merchant bar and skelp mill replaced the original 8-inch mill. In addition, during 1934 a decision was made that the company should manufacture its own rolls for the steel mills, rather than continuing to rely on imports. The building and equipping of the roll shop, together with assembling the necessary technical information, was undertaken. Such investment in an additional non-revenue generating plant was a clear indication that the BHP board and its senior management considered that the company, together with its investments in the steel fabricating subsidiaries, had survived the worst of the economic depression. It was also another demonstration of the company’s autarky objective.

With increasing stabilisation of production in the NIH during 1932 and the future showing some promise, the unemployment rates of the period are worth examining. The volumes of the NSW Official Year Book for 1931 to 1933 show that the number of unemployed in the state ranged from 23.3 per cent in the September quarter of 1930 to 28.8 per cent in the September quarter of 1933. The number of unemployed reported was based on returns provided by the secretaries of nominated unions. But these reports only constituted a sample, rather than a comprehensive accounting of unemployment. They did not cover those whose employment was regarded as casual, such as wharf labourers and the construction workers used at the steelworks, and so were likely to underestimate real unemployment.

Even for those areas for which data was collected, the statistician responsible for preparing the Yearbook identified that much of the data was deficient, due to poor reporting or a lack of records. Another source of information concerning unemployment was the

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69 Essington Lewis Papers, University of Melbourne Archives
census of 1933, which identified that during the twelve months ending in June 1933, 29 per cent of Newcastle’s workforce was unemployed at some time throughout the year. Whether they had a few days or weeks of idleness, or the whole year was not recorded. It is highly likely that both of these sources overstated the actual rate of mid- to long-term joblessness.

While some historians have accepted the contemporary statistics and accept that up to 30 per cent of the workforce was unemployed during 1932, others have challenged this assumption. Mauldon argues that collection of unemployment data was faulty and that this claim is based on the faulty collection of unemployment data.\(^72\) Dyster and Meredith, using data developed by Barnard, Butlin and Pincus, found that the unemployment rate in 1931/32 was just 21.46 per cent.\(^73\)

Schedvin argues that, in 1932, the scope and expansion in the Australian economy, by way of import replacement, made the iron and steel industry the driving force behind Australia’s economic recovery from the Great Depression.\(^74\) Few historians have acknowledged that argument. In 1932, the great bulk of the Australian iron and steel industry was located in Newcastle and the industry’s size and growth was a key factor in the progressive reduction in unemployment in Newcastle and ultimately in capital city unemployment rates.

Looking to employment rather than unemployment, Table 4.4 identifies the production and employment in each of the companies in the commercial component of the NIH. Given that industry still required operations from the public utilities, such as the water, electricity and port authority, to remain working, the idea of large reductions of state government employees, outside of the closure of the Walsh Island Dockyard and Engineering Works is fanciful. There is no doubt that there were unemployed men and women in Newcastle. In the steel and heavy engineering industry between 1929 and 1932, BHP alone shed 1320 workers. In the same period, the Walsh Island Dockyard and Engineering Works shed 1540 workers when the state government-owned operation was shut down, but on the whole heavy industry was not as affected as other sectors of the

\(^{72}\) F. R. E. Mauldon, *The Use and Abuse of Statistics, with Special Reference to Australian Economic and Social Statistics in Peace and War*, 3rd edn (Crawley: University of Western Australia, 1949), p. 110

\(^{73}\) Dyster and Meredith, *Australia in the International Economy in the Twentieth Century*, p. 128, Table 6.4

\(^{74}\) Schedvin, *Australia and the Great Depression*, p. 11
economy. The NSW Yearbook of 1938–1939 suggests that the industry most affected in the period between 1929 and 1932 was the house building and construction industry.

During the 1920s, housing construction had boomed in Newcastle as the Australian Agricultural Company sold off land in Hamilton and other suburban areas for development. The growing use of cars and improved public transport aided this development trend. New house construction rapidly fell away after 1929, a factor which contributed towards falls in steel and fabricated steel product output. The 1938–1939 State Yearbook identified that the number of building permits issued in Newcastle and suburbs fell from 373 in 1929 to just 27 in 1932. The level of casual work was not included in unemployment calculations, largely because few casual workers were members of a union.

In the publicly owned elements of the Hub, relief work schemes created varying degrees of employment generation during the Depression. As conditions improved, the rapid increase in electricity loading and consumption necessitated major expansion work at the Zaara Street Power Station, commenced in 1935. The new Tighes Hill Technical College — built at a cost of £462,625, partly funded by BHP and the steel fabricators — was built between 1934 and 1942. All of this work was over and above what was being done to provide work for the unemployed through relief work schemes. These facts bring into question the claims concerning the number of unemployed men in Newcastle. Based on work by F. R. E. Mauldon, when acting as the Commonwealth Statistician, on the accuracy of the unemployment numbers argued above, questions must be raised concerning the accuracy of the claim that 30 per cent of the workforce was unemployed.

The unemployment rate was calculated on information provided by union secretaries concerning the number of union members who were unemployed. Mauldon points out that in 1947, when the same system to collect unemployment data was being employed for Australia as a whole, the membership of the 381 unions which provided the data was 734,489. The adult membership of all trade unions at the end of 1946 was 1,263,658 and the estimated number of all members of the adult wage- and salary-earning group was

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2,121,180. In addition, 469,200 juniors needed to be added to this group, giving a total wage and salary earning population of 2,590,380.78

The published unemployment percentages refer to 58 per cent of all trade unionists, to about 35 per cent of all adult wage and salary earners, and to about 30 per cent of wage and salary earners of all ages. As Mauldon and others have noted, this method of calculation brings into serious question the claims concerning the number of unemployed, particularly in a regional centre such as Newcastle. However, recent work has been conducted regarding the causes of unemployment in Australia. By the year 1934, it was clear that the commercial component of the NIH had survived the Great Depression and the public utility component had revived. As Table 4.6 demonstrates, BHP continued its capital investment in Newcastle; this was another factor which helped to minimise unemployment. Government enterprise has always been a prominent feature in Australian economic development and, as has been detailed in the previous chapters, it was an important factor in the development of the NIH.

This development included the building of the Zaara Street Power Station in Newcastle’s east end rail yards and its interconnection with the NESCA Power Station at the nearby Sydney Street. This interconnection included the development of improved high-voltage connections to the larger industrial customers and some of the outlying towns such as Gosford in the south and Dungog in the north. In 1930, the installed generation capacity of Zaara Street and the NESCA Power Station was 34.5 mW. But no attempt had been made to integrate the Newcastle distribution system with the various colliery-operated systems in the South Maitland Coalfields or to interconnect it with the much larger Sydney County Council system.

78 Mauldon, The Use and Abuse of Statistics, p. 110
Table 4.6: Equipment Installed at the BHP Steelworks between 1930 and 1934

<table>
<thead>
<tr>
<th>Date</th>
<th>Equipment Installed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>• Open Hearth Building extended</td>
</tr>
<tr>
<td>1932</td>
<td>• No. 5 Soaking Pit</td>
</tr>
<tr>
<td>1933</td>
<td>• 80-inch Plate Mill operational</td>
</tr>
<tr>
<td></td>
<td>• Extension to the Fabrication Shop</td>
</tr>
<tr>
<td>1934</td>
<td>• No. 1 Blast Furnace rebuilt — capacity increased by 40 per cent</td>
</tr>
<tr>
<td></td>
<td>• No. 10 Open Hearth Furnace fist tap</td>
</tr>
<tr>
<td></td>
<td>• Second Battery of 53 Wilputte Coke Ovens operational</td>
</tr>
<tr>
<td></td>
<td>• Nos 6 and 7 Soaking Pits</td>
</tr>
<tr>
<td></td>
<td>• New Tar Distillery</td>
</tr>
<tr>
<td></td>
<td>• 150-metre extension to Coal Storage Yard</td>
</tr>
<tr>
<td></td>
<td>• Plate Finishing Plant</td>
</tr>
<tr>
<td></td>
<td>• Merchant Mills Loading Yard Warehouse Building</td>
</tr>
</tbody>
</table>

Source: Jay, A Future More Prosperous, p. 264

With the improvement in the national economy after 1932, together with the demand forecasts from industry and from Hunter Valley towns seeking connection to reliable electric power, the Railways Electrical Branch made plans to expand. The financial year 1934/35 saw power loadings increase and detailed planning commence to expand the generation capacity in order to meet the projected growth in the NIH and in Newcastle’s urban area. Construction of the increased generation system commenced in 1936 and by 1940 the generation capacity of Zaara Street Power Station had grown by 80 per cent to 57 mW. The great bulk of this growth was aimed at satisfying industry’s demand for reliable electric energy.

In 1932, a second NIH public utility component, the Hunter District Water and Sewerage Board (HDWSB) was still conducting minor work on the Chichester Water

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80 Mark Fetscher, Power Stations of the N.S.W.G.R. (Charleston: the author, 2002), p. 66
Scheme and was busy managing the construction of major sewerage and stormwater projects in the Newcastle region. The Chichester Water Scheme’s gravitational main linked the dam with major reservoirs at Waratah and their associated piping systems, which serviced the city’s urban areas as well as Newcastle’s industry. The construction of a new amplified sewerage system in Newcastle and its suburbs, linking the various existing original municipal schemes, was a major project that had begun in 1928. Projects such as these kept the HDWSB busy, but its permanent workforce did not grow significantly. These projects were largely funded under relief work arrangements and the casual workforce engaged to construct the sewer and stormwater projects was significant.\(^81\) By 1935, more than half of Newcastle and its suburbs were connected to the new sewerage scheme and the stormwater system had been significantly improved.

The Depression years in Newcastle had also been accompanied by a severe drought. However, the reduced industrial activity had not impacted on industrial water availability or consumption rates. The rapid recovery in the steel market during 1933 required industry growth plans to be made and water consumption forecast. Pumping rates were developed to meet planned industrial and urban growth during 1934 and 1935.\(^82\) In 1934, testing of the sand beds at the Tomago site intensified and in 1938 it was decided to proceed with the development of the Tomago sand beds water scheme as a backup to the Chichester scheme.\(^83\) More will be said about the development of this scheme in Chapter 5.

The NIH’s public utility electric power and water supply components survived the Depression intact in parallel with the commercial component, but generally on a lean financial basis. The engineering and project management elements of the HDWSB were used to plan and to supervise a range of relief work programmes such as storm water drainage, and sewerage extensions to some areas. As a consequence of the ongoing industrial and urban area’s need for their products and services, these elements did not experience the same level of financial stress or uncertainty as had some other state government agencies or the commercial elements of the NIH. However, what the Depression period had ensured for the NIH was the need for an increased degree of interdependence between all NIH elements.

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\(^81\) Price V. Fishback, ‘Relief During the Great Depression in Australia and America’, *Australian Economic History Review* 52 (2012), pp. 221–49  
During 1933, the construction of a new branch office steel fabrication plant commenced on 40 acres of land west of the Lysaght works. This new plant was being built by the British steel tube manufacturer Stewarts and Lloyds on land provided by BHP. The new tube plant employed the latest Fretz-Moon technology from the United States to manufacture CW tube and was the same type of mill as had just been installed in Stewarts and Lloyds's new tube plant at Corby in Britain. This tube plant would consume 35,000 tons of steel in its first year of operation. Plans were underway for a major expansion of the Lysaght flat and corrugated steel plant which would see annual production climb to 120,000 tons by 1936. While steel wire production at Ryland Bros. or the Lysaght Bros. plant in Parramatta did not grow as spectacularly, they both maintained high production rates that satisfied the whole of the Australian market. At the end of 1934, the NIH had completed its recovery, with production and employment in both the commercial and public utility components returning to their 1929 levels. The commencement of operations at the new Buttweld Pty. Ltd. tube works, soon to change its name to Stewarts and Lloyds (Australia) Pty. Ltd., promised additional employment opportunities. This event was reported in a number of newspapers.

This chapter has examined how Newcastle's relatively small and regionally based steel manufacturing centre managed to survive, recover and prosper during the Great Depression. From a national point of view, the Great Depression was a climax in the conversion of the structure of the Australian economy away from the creation of rural assets to the creation of urban assets. The growth of the NIH and the Newcastle urban area was a key component of this shift. Just as the growth of the NIH became the dominant influence in Newcastle's economic development during the 1920s, so it was a driving force in the recovery from the Great Depression in Newcastle during the second half of the 1930s. Employment in the commercial component of the NIH grew from 6770 in June 1933 to 13,565 in 1940. This growth in employment also greatly influenced industrial, commercial and residential construction between 1933 and 1942 in Newcastle. Examples of commercial and educational construction growth in this period included the building of twenty-nine city and suburban hotels in the distinctive art deco style, together with a large technical college at Tighes Hill. In addition, between 1932 and 1938 something of a housing boom took place.

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84 Tubemakers of Australia Limited, *Manufacturing in Newcastle Proudly Reviewed*, p. 6
86 ‘New Industry at Newcastle’, Singleton Argus, (Singleton, NSW), 10 October 1934, p. 2
87 Newcastle Chamber of Commerce, *Annual Reports*, 1933 to 1940, Newcastle Industries Employment Tables
in Newcastle, with the twenty-seven permits for a residential building issued in 1932 growing to 204 permits in 1934 and to 582 permits in 1938.\(^8^8\)

In turn, growth in the NIH made a significant contribution to the national economy for, as demand increased during 1933–34, the centre of Australian industrial expansion shifted decisively to the metals industry. Schedvin states that, while the recovery began in the textile industry, the greatest contribution to the national recovery was made by Australia’s iron and steel industry.\(^8^9\) What he does not say is that, at that time, the great bulk of the iron and steel industry was located in Newcastle. The major stimulant in this contribution was the continued fall in the selling price of Australian steel products. These lower prices were made possible through the application of appropriate technologies, manufacturing economies of scale, cheap raw materials, low transport costs and the fall in wage rates.\(^9^0\) These were the long-term characteristics that enabled this regional industrial centre to bourgeon.

\(^8^8\) Carver, *Official Year Book of New South Wales, 1938–39*, p. 195 (Table 183)
\(^8^9\) Schedvin, *Australia and the Great Depression*, p. 11
\(^9^0\) Schedvin, *Australia and the Great Depression*, p. 307
CHAPTER 5:
EXPANSION OF THE NEWCASTLE INDUSTRIAL HUB
AND THE PREPARATION FOR WAR, 1933–1940

The period between 1933 and 1940 witnessed the greatest change in Newcastle’s steel industry since its establishment in 1915. Initially, this change occurred for economic reasons for, as Boris Schedvin observed, during this period the importation of steel products, apart from tinplate, were largely eliminated.\(^1\) Steel production capacity in Newcastle expanded rapidly and, by 1934, output exceeded the peak of the 1920s. Two factors provided the major stimulation for this growth. Firstly, the assistance provided by government during the Great Depression through higher tariffs, a devalued currency and the fall in wage rates remained in place after the Ottawa Imperial Conference established the sterling trade bloc in 1932.\(^2\) Secondly, the benefits of production economies of scale confirmed the investment decisions made in new technologies during the 1920s. These factors encouraged BHP to aggressively adopt import-replacement manufacturing strategies, which progressively increased steel product sales by each of the Newcastle-based steel fabricators and other downstream manufacturers. This chapter is concerned with the combination of factors that determined the scope and velocity of expansion in the NIH between 1933 and 1940.

The Decision Makers

Geoffrey Blainey noted that the anatomy of power in a large public company often seemed mysterious.\(^3\) At the Broken Hill Proprietary Co. Ltd. in 1933, there were two boards, one in London and the other in Melbourne. As previously discussed, after 1922 it was through the Melbourne board that the high-level strategic management of the NIH was effectively driven by two men, Chairman of the BHP board Harold Darling and the Chief General Manager Essington Lewis. Both of these men were Melbourne-based but were frequent visitors to Newcastle. Figure 5.1 shows Lewis and Darling at a Newcastle Club Dinner in 1935. The decision-making scope for Newcastle-based management was limited to the technical, manufacturing and operational management spheres. But given that in 1933 key elements of

the Federal Government bureaucracy were based in Melbourne, it was useful having BHP’s senior management based in that city, as it eased liaison and company lobbying activities. As the NIH emerged from the Great Depression during 1933 other anxieties began to impact on the decisions being made in Melbourne. The change in international relations in Asia and about the Horn of Africa during 1932 convinced Darling and Lewis that Australia could be cut off from Europe and access to much of the technology and finance that BHP relied upon.

In September 1931, on the pretext of local disorders, Japanese forces occupied Murkden in China and in 1932 they made a series of demands on China for greater access to the Chinese economy. China refused these demands and in 1932 Japan invaded and occupied Manchuria, a minerals-rich area which bordered on the Korean peninsula. China complained to the League of Nations, which in response prepared a report which refused to recognise the Japanese aggression. As a consequence, Japan resigned from the League in March 1933. In response to these actions by Japan, the British Government reviewed its economic and defence position in the Far East and on 23 March 1932 abandoned its ten-year defence rule. The only effect of this move in the Far East was to recommence construction of the British naval base in Singapore; Australia’s contribution was to build additional oil storage tanks in Darwin between 1933 and 1935.

Nationally, the outlook from 1933 onwards was vastly different from the outlook ten years earlier, when the foundations of Australia’s defence had been laid. Indeed, as Paul Hasluck argues, from 1933 the changes in the international situation placed the British Commonwealth in crisis. These events had a major impact concerning the development of British industrial policies capable of supporting a defined national objective. In November 1933, the British Cabinet created the Defence Requirements Committee which had the immediate task of identifying the gaps in British defence. A gap quickly identified concerned the industrial support required by the British armed forces should Britain be involved in another European war. Industrial mobilisation experts forecast that British industry would not be in a position to fully support the expanding British defence programmes until the end of

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It is not clear if these government decisions had been passed to the Australian government at that time but, given the trans-national relationships with the British steel industry, it is possible that Darling and Lewis would also have known.

Figure 5.1: The Two Figures on the Left, Lewis and Darling at a Newcastle Club Dinner in 1935

In respect to the NIH, 1933 was the year when construction of the Stewarts and Lloyds steel pipe mill commenced. This new pipe mill would manufacture galvanised steel tube up to 50 millimetre bore using the new Fretz-Moon process. This method was known as a continuous butt weld process, which used long coils of skelp provided by the BHP steelworks. These coils were flash-welded together to give a continuous feed of strip, which then passed through a long tunnel furnace heated with coke oven gas. On exiting the furnace, the heated strip entered a six-stand forming and welding mill. The first pair of rolls formed the strip into a circular section with a slight gap between the edges. The second pair of rolls forced the edges of the strip together with considerable pressure to form a weld. The

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8 Maiolo, *Cry Havoc*, p. 97
third set of rolls reduced the pipe to the finished size and a flying saw, directly downstream of the mill, cut the pipes to the required length.\(^9\)

This new steel pipe mill commenced operations in December 1934, employing 327 men and in its first calendar year of operation produced 30,136 tons of galvanised pipe.\(^{10}\) The building of this pipe mill encouraged BHP to commission the No. 10 open hearth furnace during 1934 — the first built since 1925. The other steel fabricators also commenced expansion programmes, the most successful being Lysaght. During 1935, mechanical mills were installed in order to increase the rolling capacity at the Lysaght works. By 1937, the production of black iron sheets had increased from 67,000 tons per year to more than 100,000 tons; galvanised iron output increased by more than 12,000 tons to 82,000 tons per year.\(^{11}\)

**Figure 5.2: Stewarts and Lloyds Continuous Weld Tube Mill in 1935**


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\(^{10}\) Tubemakers of Australia Limited, *Manufacturing in Newcastle Proudly Reviewed*, p. 9  
In a similar vein, during 1934 Ryland Bros. began to use tungsten carbide wire-drawing tools. This enabled wire-drawing speed to be increased from 12.5 metres per second to 22 metres per second. In 1935, the Ryland Bros. plant in Newcastle was drawing equivalent wires twice as fast as the best American mills and three times as fast as in Britain.¹²

**Preparation for War**

It was regular overseas visits, together with information received through transnational partners and the obvious changes in international relations between 1931 and 1933, which impressed upon Lewis and Darling the need to prepare Australia’s steel industry, firstly, to make Australia an independent steel maker and, secondly, to prepare for war. The thought of Australian involvement in another war had concerned Lewis for some time. Blainey records that in April 1924, with the world at peace, Lewis told a gathering at Newcastle: ‘Much as we dislike to think of it, the day will come when Australia will find itself involved in another war.’¹³ This need, coupled with the desire of both men to increase the level of self-reliance in the Australian steel industry, provided the direction for any expansion in Newcastle. The preparation of the NIH for war involved each component of the NIH. For the steel manufacturing and heavy engineering components, this involvement included four major timeline decision points.

The industrial transition to war demanded two key considerations. As military operations tended to proliferate in the use of munitions and ordnance products, the first action to be taken must be to increase the quantity of steel being produced. To achieve this, four new open hearth furnaces were commissioned between 1934 and 1937. This increased steelmaking capacity in Newcastle to 1,000,000 tons per year. The second action taken at the steelworks was to purchase additional machine tools for the maintenance workshops and the munitions plant.¹⁴ As the official history states, Lewis and Darling were well ahead of contemporary public opinion, as the country was still attending to problems relating to the

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¹³ Blainey, *The Steel Master*, p. 120
economic depression. Nevertheless, in December 1934, Lewis wrote to A. E. Leighton, Manager of the Munitions Supply Department:

I do feel that if our relations with the Department of Defence were closer, that there are lots of valuable things we could do and at least work intelligently towards a common goal ... We spend about £500,000 annually on extending and enlarging BHP and I feel sure that if the Defence department visited us and placed some confidence in us, a lot of work being done could be erected to become readily available for munitions if and when it was wanted. This would cost nobody anything.16

During the first quarter of 1935, Leighton visited Lewis in Newcastle where they discussed the establishment of a munitions plant in Newcastle. The Munitions Supply Board’s position on civil industry manufacturing munitions or ordnance products was clear, as their general plan was to enable Australia to supply her own armed forces. Government factories would form the nucleus to work out the techniques of making munitions, so that in times of emergency the industrial resources of the country could be fully exploited for defence.17 In 1936, the BHP board allocated £20,000 to purchase machines and precision tools for a pilot munitions plant at Newcastle.18 The plant was complete and ready to manufacture munitions at the beginning of 1938 and in receipt of an order to commence manufacturing an educational batch of eighteen-pounder artillery shells in May of that year. D. P. Mellor argues that it was difficult to say how far the rapid rise in the industry from its very low ebb during the Depression was due to purely economic factors, or how far it was the result of a deliberate policy aimed at self-sufficiency. The upward trend had begun before 1935.19

With the Stewarts and Lloyds new Fretz-Moon pipe mill running successfully, attention was given to the manufacture of pipe fittings such as elbows, tees, sockets and unions. With the increasing industrialisation of Australia, it became apparent that a superior

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17 Mellor, *The Role of Science and Industry*, p. 28
19 Mellor, *The Role of Science and Industry*, p. 70
product capable of withstanding higher pressures and temperatures to the continuous weld tube was needed. In 1936, it was decided to install a seamless-tube plant that would manufacture tube up to seven inches’ diameter (178 mm).20 The seamless tube was manufactured using the push bench method. Steel blooms supplied by the steelworks were cut to length, to form a billet, and heated in a rotary furnace. On extraction, the heated billet was first squeezed to change the billet’s external square shape to round, then loaded into a large die where, by using a hydraulic ram, the billet was pierced and made into a bottle. After more heating, the bottle was loaded onto a bench, to be pushed through a series of roller dies successively mounted in the bench. A mandrel was used to push the heated bottle through each successive roller die. The size of the mandrel controlled the bore size of the tube, as the dies evenly spread the steel over the mandrel to form the external size of the seamless tube. At the conclusion of the push, the mandrel was extracted and the ends cut from the tube.

Seamless tube was capable of operating at higher pressures and temperatures than the continuous welded pipe. Work began in June 1936 to fill the site, drive piles build roads and drainage. Machinery for the new mill arrived in early 1938 and the new push bench mill commenced operations in June 1939.21

In 1938, the management of Stewarts and Lloyds (Aust) were advised about the new munitions manufacturing technology that had been developed by the parent company in Britain. In 1936, the British Government requested the company to investigate possible methods of mass-manufacturing artillery shell forgings.22 Little investigation into the methods of manufacturing shell forgings had been conducted in Britain since the First World War; however, since that time industrial techniques had been revolutionised. After an industrial engineering investigation, a plant was designed to produce shell forgings for the 25-pound (11.36 kg) gun and the 3.7-inch (94 mm) anti-aircraft gun. A major advantage of this plant was that the forging of the shell was so accurate that internal machining of the shell forging was not required, a major manufacturing advantage. In November 1938, Stewarts and Lloyds (Aust.) placed an order for this plant, which was supplied and installed in Newcastle.

20 Tubemakers of Australia Limited, Manufacturing in Newcastle Proudly Reviewed, p. 10
21 Tubemakers of Australia Limited, Manufacturing in Newcastle Proudly Reviewed, p. 12
at no cost to the government. The Special Purpose Plant, as it was commonly called, commenced production in February 1940.23

**Lysaght**

In 1927, production output at Lysaght had grown to 27,000 tons. However, since this output remained well below imports, plans had been drawn up to lift production to more than 100,000 tons. Additional mechanical mills were installed between 1935 and 1937 and the production of sheet increased to 110,000 tons. By 1940, production had climbed to 150,000 tons. However, in April 1938 a strike at the Lysaght plant occurred which closed the plant for fourteen weeks.24 Union membership had fallen during the Great Depression but, after 1936, militant unionists influenced the Lysaght workforce and the strike was maintained until May 1938.25

**Ryland Bros.**

The first initiative for Ryland Bros. (Aust) was to build on the work done in the late 1920s, where a small team under James MacDougall developed the concept of using a four-hole ‘electric control machine’. The first multi-hole machine was operational in 1931, projecting Australian Wire Industry technology into the front rank for the first time. The procurement of tungsten carbide dies from Krupps of Germany in 1934, together with the addition of watercooling at the die and block, and refined cleaning, coating and die profiles, increased wire-drawing speeds to 12.5 metres per second. By 1935, the Newcastle plant was drawing equivalent wires at twice the speeds of American mills, and with further improvement wire-drawing speed increased to between 22 and 23 metres per second.26

The Lysaght Bros. wire plant in Parramatta (purchased by BHP in 1929) concentrated on strategies that would enable it to dominate the Australian wire mesh market. At the Australian Wire Rope Works, in 1933, the production of wire rope in Australia

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24 ‘Lysaght's Strike “May Last Six Months”: Effect on Industry’, *Sydney Morning Herald* (Sydney, NSW), 1 February 1938, p. 8
25 ‘Strike Ends: Lysaght’s Works; Men to Appeal to Court: “Dispute Not Over”’, *Sydney Morning Herald* (Sydney, NSW), 17 May 1938, p. 11
exceeded imports for the first time. This increase in Australian manufacturing capacity led to lower returns for the British shareholders and, during Lewis’s 1934 overseas trip, while in Britain he negotiated the sale of the British interests to BHP. Included in this sale was the ropery’s distributor, Bullivants Australia, which had played a large part in establishing the Australian-made product since 1923.27

Prior to the outbreak of war, the Australian Wire Rope Works (AWRW) were able to supply most, but not all, strategic wire requirements. The areas where technology was lacking concerned valve-spring wire, tyre-bead wire, mine mooring lines and aircraft control cables.

The Commonwealth Steel Company

BHP first became a shareholder in Vickers-Commonwealth Steel in 1929 and in March 1931 the English Steel Corporation acquired the Vickers shareholding. This share purchase formed a link that provided the company with access to a vast amount of research and experience in the manufacture of special steels. However, some British steel producers sought to divest themselves of overseas investments, in order to fund the redevelopment of the steel industry in Britain. In April 1933, BHP took up the opportunity to purchase all of the shares held by the English Steel Corporation and Taylor Bros. With this sale, the company changed its name to the Commonwealth Steel Company Ltd.28

In 1936, a new, universal tyre mill, capable of rolling the one-piece solid wheels that were increasingly being used in both heavy and light rail applications, was installed. Then, in the wake of the 1937 Imperial Conference, plans were made to increase the manufacture of a range of special and alloy steels. This conference identified the supply limitations for these steels there would be on Australia if Britain became involved in another European war. As a consequence, the equipment required to manufacture these special steels on a continuous production basis was acquired and installed. The first alloy steel required was known as high-speed steel. Its supply as the cutting tool material was critical for all machine tools; in addition, many other varieties of special and alloy steels would be required by the Australian

28 Hughes, *The Australian Iron and Steel Industry*, p. 127
market. The initial batch of high-speed steel was manufactured during the third quarter of 1937.

But as the Commonwealth Steel Co. Ltd. had the largest capacity in Australia to manufacture the range of special and alloy steels that would normally have been imported, the expansion of the plant was accelerated. In addition to the requirement to manufacture special steels, plans were made for the company to manufacture munitions of various types. A munitions annexe was established and equipped late in 1938. The construction of a 50-ton open hearth furnace commenced in 1940, but it would not be operational until January 1942.

The Heavy Engineers

In 1930, the Walsh Island Dockyard was the largest heavy engineering operation in Newcastle, employing 1500 men, but in 1932 it was announced that the Dockyard would close. The only service that would still be provided was the floating dock that had been built with financial assistance from the Commonwealth Government. It had been launched in 1928. With the exception of this item of equipment, and the small crew required to operate it, the whole site was abandoned in 1933. The other heavy engineers, A. Goninan & Co. Ltd. and Morison and Bearby, survived the Great Depression with difficulty, but with the burst of industrial activity which began in Newcastle during 1933 both companies began to prosper.

Mutual Investment

BHP was able to use its sound financial basis to diversify its investments horizontally and vertically into steel fabrication during the 1920s through its purchase of Ryland Bros. (Aust) in 1925 and by contributing to the establishment of the Australian Wire Rope Works during 1923. It would extend this investment portfolio during 1929, initially through its agreement to fund 49 per cent of the establishment of Stewarts and Lloyds in Australia and then by taking a 5 per cent share in Vickers-Commonwealth Steel Co. Ltd. in the same year. Both investments would see BHP representatives on those company boards. Each of these steel fabricators relied on BHP for the steel feed for downstream steel fabrication. During the 1930s, these investments grew to include: Titan Manufacturing of Melbourne in 1933; a total ownership of the Australian Wire Rope Works in 1935 and Bullivants Australia Co. Pty. Ltd., a wire rope distributor, in 1935. Figure 5.3 shows, in diagrammatic form, the makeup of the Newcastle Industrial Hub in 1935. With the purchase of the bulk of the shares in the
Commonwealth Steel Co. Ltd. during 1933 and 1934, the extent of NIH commercial relationships in the NIH had changed since the 1920s. Additionally, during the post-Great Depression period the steel fabricators had acted as one with BHP in its efforts to enhance technical education in Newcastle. In 1939, BHP would also make investments to encourage two American companies to establish manufacturing operations in Australia, Rheem Australia Pty. Ltd., which manufactured steel oil drums, and the Wiltshire File Co. Pty. Ltd., which manufactured files. 29

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29 Alan Trengove, What’s Good for Australia..!: The Story of BHP (Stanmore: Cassell Australia, 1975), p. 158
The Public Utilities

Electricity

After 1934, as the Great Depression faded, there were rapid increases in the Zaara Street Power Station loading. The reason for this change was not just the increased use of electricity by the urban population, but its increasing use by industry. At this time, all elements of the NIH relied on the output of electricity from this power station, for the only other electricity generation capacity lay with the 2.5 mW output from NESCA's Tyrell Street power station. The 10 mW output from the BHP power plant was totally absorbed by the increasing use of electric traction in the plant. This placed a limitation on the steel industry's plans to expand electric traction in all operations. During 1935, BHP made a decision to install a ferroalloy plant, together with a 36 mW power station to power the electric furnaces. Two 18.75 mW turbo alternators were ordered from Britain in 1936, with a plan to have the first unit operational by August 1938 and the second to be operational by 1940. At the same time, the NSW Railways Electricity Branch recognised the electricity generation limitations in Newcastle and decided to extend the Zaara Street station. An expansion of the boiler house commenced in 1939, to provide steam for new generation plant, and by 1941 the total generation capacity of the power station had grown to 57.5 mW, or by 80 per cent since 1933.

Water

The supply of fresh water was vital for both the steel industry and the urban population which worked in that industry. Water from the new Chichester scheme was first delivered to Newcastle in November 1923. While this was adequate during the bulk of the 1920s, the onset of the Great Depression in 1929 was also accompanied by a period of drought. This factor initiated renewed interest in the water potential available from the sand beds located at Tomago, just north of the Hunter River estuary. This water source had been investigated since before the First World War, initially by BHP, which at one stage wanted to use those sand beds to supply their own water, but throughout the 1920s by the Hunter Water Supply Board. At the conclusion of the Great Depression, the industrial expansion forecasts indicated that an additional water scheme would be required to meet the water needs of

30 ‘Power Plant Extensions: Two 18.75 mW Turbo Alternators ordered in 1936 from Parsons in Britain. First commissioned August 1938’, BHP Review 16 (4), (1939)
industry. For example, in 1935 the Hunter Water Supply Board supplied the steelworks with 13,500,000 gallons (61,364 cubic metres) of fresh water a week.\textsuperscript{32}

Initially, there was some prejudice against the use of ground water to provide drinking water, but in 1926 the Hunter Water and Supply Board’s Chief Engineer submitted a report recommending that the sand beds be tested on a practical working scale as a source of a second water supply. Testing was conducted to determine the full extent of the sand beds, as well as how much water it was possible to extract on a consistent basis. In addition, the location of additional reservoirs was determined. Beginning in the last quarter of 1937, a pipeline was built which went from Tomago across the north arm of the river to connect with the Chichester pipeline. The Tomago Water Scheme was operational at the end of 1939. There was no chance that the steel industries’ expansion, or the growing urban population, would suffer from a lack of fresh water.\textsuperscript{33}

\section*{Technical Education}

Mellor argued that few factors caused more anxiety to those directing the nation’s industrial war effort than the fear that there might not be enough professional and skilled men to carry it through.\textsuperscript{34} The steel industry had regarded the delivery of technical education in Newcastle as unsatisfactory since the early 1920s. The provision of technical education was the responsibility of the State Government; however, in terms of the delivery of education, the Government placed more emphasis and provided more assets to the delivery of general education for all children. In terms of the educational budget, technical education was a distant last. Diploma level teaching developed slowly, with most subjects being taught part-time by engineering staff from the steel industry. Cobb noted that in 1935 only 11 per cent of the technical education budget was expended on Newcastle, while 71 per cent was absorbed by Sydney.\textsuperscript{35}

The state election of 1932 brought David Drummond to the role of Minister for Education in NSW. He was alarmed at the trend away from technical education, which was

\begin{thebibliography}{99}
\bibitem{32}BHP Review: Jubilee Number, (1935), p. 63
\bibitem{34}Mellor, \textit{The Role of Science and Industry}, p. 176
\bibitem{35}Joan Cobb, \textit{Sweet Road to Progress: The History of State Technical Education in New South Wales to 1949} (Sydney: NSW Department of Education and Training, 2000), p. 293
\end{thebibliography}
perhaps more marked in NSW than in any other state. At a conference of Ministers and Directors of Education in 1936, he urged the Commonwealth to make a grant to the states to fund a reorganisation and equipment for technical education. However, as education under the constitution was a state responsibility, the Commonwealth took no action. In 1936, Drummond made a tour of inspection of technical training systems in Europe and North America, and returned even more convinced of the urgent need to improve the Australian system of technical education. During this period, a number of meetings had been held between BHP’s Sydney agent and Drummond, with a view to establishing a method of sharing the cost of improving the technical education facilities in Newcastle. Ultimately, Drummond was able to persuade the NSW Government to increase expenditure on technical education from the 1936 figure of £230,943 to £450,376 in 1937. Some of this money went towards the erection of a large, modern technical college in Newcastle, on land at Tighes Hill that had been donated by BHP. The Sir Edgeworth David Science Building was opened in 1938 and the Harold Darling Engineering Building was opened in 1940. The third and much larger trade training building opened in 1942 as the W. E. Clegg Building. The citizens of Newcastle and the whole of the steel industry created a precedent by contributing £80,000 out of a total cost of £479,000.

**House Construction**

In terms of building construction, the period between 1933 and 1940 was a boom time in Newcastle. In addition to the construction of new plant in the steel industry and in the public utilities, the New South Wales Year Book of 1938–1939 identified that between 1934 and 1939, 2384 permits for new house construction had been issued in the Newcastle area. This was a significant increase on the years of the Great Depression, but it also meant that, for these houses to be built, appropriate supplies of building materials such as bricks, timber and roofing tiles would be required.

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36 Mellor, *The Role of Science and Industry*, p. 177
38 ‘Mr Drummond in Newcastle’, *Newcastle Sun* (Newcastle, NSW), 2 June 1938, p. 12
39 ‘Celebrations at Newcastle Technical College’, *Newcastle Morning Herald and Miners’ Advocate* (Newcastle, NSW), 26 September 1938, p. 5
The External Influences and Mobilising Industry for War

From a steelmaking and fabricated steel product manufacturing point of view, 1932 represented the nadir of the Great Depression for Australia. At this point, the primary thoughts of many people and organisations in the nation tended to be internally focused. Escaping from the grip of the Great Depression obtaining relief from the burden of unemployment, and personal and business economic uncertainty, concentrated most minds. On assuming government in September 1931, the Lyons Government, in the face of protests from Britain, largely maintained the protective tariff and currency devaluation policies that had been put in place under the Scullin Government. This was done not only to minimise competition from imports, it also recognised that the Australian manufacturing sector was rapidly overtaking the primary industry sector and becoming the largest employment division in the Australian economy.

Industrial problems, particularly those in the black coal industry, appeared to be in decline and the Australian manufacturing industry looked forward to the establishment of some form of economic and commercial certainty. Likely international trade outcomes, based on negotiations conducted at the Imperial Conference in Ottawa during June and July 1932, promised to bring some stability to international trade, at least in the British Empire and its associates, through the development of the sterling trade bloc. However, some nations adopted a more aggressive attitude regarding their achievement of success in international markets, an attitude that was in line with their desire for national autarky. On 12 October 1933, Germany withdrew from the European disarmament conference, then joined Japan by resigning from the League of Nations. A significant change was underway in Europe and it was obvious to some that German industry was being encouraged to accelerate its path towards industrial autarky, a path it had broadly followed since the mid-1920s.

These events had a major impact in a number of countries concerning the development of national industrial policies, capable of supporting a defined defence

42 Schedvin, *Australia in the Great Depression*, p. 56
43 Schedvin, *Australia in the Great Depression*, p. 290 (Table 30)
45 Ferguson, *Empire*, p. 326
objective. In response to this problem, during November 1933, the British Cabinet created the Defence Requirements Committee.\textsuperscript{47} This committee was made up of the Chiefs of Staff from the armed services and top level civil servants from the Foreign Office and the Treasury. The committee’s immediate task was to identify the gaps in British defence. A gap quickly identified concerned the preparation of industry that could provide the support required by the British armed forces if Britain were involved in another European war. Industrial mobilisation experts forecast that British industry in all respects would not be in a position to fully support the expanding British defence programmes until the end of 1939.\textsuperscript{48}

At this time, much of this industrial preparation concerned the rebuilding of the British steel industry. The steel industry in Britain was in need of significant capital investment, in order to introduce and develop new manufacturing technologies, some of which came from the United States. Both Lysaght Ltd. and Stewarts and Lloyds Ltd. provide good examples of investment in new technology and additional capacity at this time. Lysaght built a new steel rolling mill encompassing the newer American manufacturing technologies at Newport, and Stewart and Lloyd Ltd. built a new steelworks and tube plant at Corby between 1929 and 1936.\textsuperscript{49} As discussed in the previous chapter, these technological improvements were mirrored by each company’s operations in Australia.

In March 1933, the Australian Council of Defence, a body authorised under the Australian Defence Act, after some prodding by the British Government, determined to establish an Australian Principal Supply Officer’s Committee (PSOC).\textsuperscript{50} The objective of this committee was to manage and coordinate each of the armed service’s equipment supply requirements for munitions and ordnance products. This committee was organised along the lines of the corresponding British organisation and consisted of supply members of the Military, Naval and Air Boards, the Financial Secretary of the Department of Defence and the Controller-General of Munitions Supply, who was the chairman. One function of the committee was to advise the Council of Defence concerning measures designed to ensure that both government and commercial industry would be able to provide munitions on a scale adequate for the country’s defence. With the NIH having the most complete and most

\textsuperscript{47} Maiolo, Cry Havoc, pp. 96, 97
\textsuperscript{48} Maiolo, Cry Havoc, p. 97
\textsuperscript{50} Mellor, The Role of Science and Industry, p. 27
mature steel manufacturing capability in Australia at that time, it is clear that it would have a significant role to play in any domestic defence manufacturing programme.51

At a meeting on 5 September 1935, the Australian Defence Committee, a sub-committee of the Council of Defence, made up of the Prime Minister, the Treasurer, the Minister of Defence and the Secretary of the Department of Defence, directed that the PSOC should have all of its industrial investigation and preparation complete by the end of 1939, or within four years. Information supplied by Britain judged that it was highly probable that war would break out in Europe, and possibly the Far East, about that time.52 It is difficult to confirm if anyone in Australian secondary industry had ever been directly consulted on these matters. However, given the centralised nature of both the Australian ferrous and non-ferrous industries in Australia, it would be impossible for any realistic estimate of industrial preparation time to be made by the government without very senior management being consulted, or requested to provide information.

Additionally, given the depth of commercial relationships that Australia’s largest steel fabricators had with their British counterparts and shareholders, it is possible that the Australian ‘branch houses’ may have already known of the British warning on an informal basis. It is also obvious, from the velocity and type of growth in the NIH after 1934 that the industrial preparation for war in the NIH, was occurring in line with a general Australian steel industry expansion plan. But, as Hasluck points out, given the political changes occurring in Europe, together with the aggressive behaviour of the Japanese in the Pacific, from 1933 the British Commonwealth was in crisis.53 The changes in Europe potentially provided a direct threat to the United Kingdom, while the Japanese actions threatened the Empire in the Pacific and the Indian Oceans. These aggressive actions in Europe and the Pacific Ocean completely changed the British and Australian outlook concerning defence. The view in 1935 was vastly different from the plans made in the wake of the First World War, when the foundations of Australian defence, together with the industrial support that it required, had been laid.54 Nevertheless, it was evident that Australian industrialists, with their knowledge of international markets, were well in advance of the government in planning for war.

51 Mellor, The Role of Science and Industry, p. 70
52 Mellor, The Role of Science and Industry, p. 28
53 Hasluck, The Government and the People, 1939–1941, pp. 47
However, the scope and frequency of Lewis’s international travel between the wars, together with the industrial elites with whom he mixed and corresponded, provided him with a deep knowledge of the industrial strengths and weaknesses of industrialised nations. He, more than most, recognised that survival in the First World War had ultimately relied on a nation’s steel industry for success. During the war, manufacturing industry was required not only to provide the weapons and the munitions required by the armies and navies doing the fighting but also, through the earnings of manufacturing workers, to assist in maintaining a viable home economy.

Few people familiar with the problem of national defence in Australia doubted that in the event of war a large part of the burden of arming the nation would fall on commercial industry.\(^55\) In terms of mobilising commercial industry for war, the government’s outline plan for enabling Australia to arm her own forces was for a nucleus of government factories to have access to appropriate technologies and munitions manufacturing techniques during peace.\(^56\) The manufacturing information assembled, together with advice concerning the appropriate machine tools and manufacturing standards to be applied, would be available to instruct and guide commercial industry in munitions manufacturing processes. Government factories equipped to manufacture ordnance products and munitions were all located in Melbourne; Australia’s only small arms factory was located at Lithgow. Accordingly, in times of emergency, all of the industrial resources of the nation could be fully mobilised and exploited for defence needs.\(^57\) However, in order to make the most effective use of commercial industry in war, industrial workers at every level — management, inspection, skilled and unskilled labour — would need to be trained, in order to expedite the necessary transfers of technology and manufacturing knowledge. Accordingly, munitions production needed to be extended to commercial industry during peace through the progressive placement of what could be termed educational manufacturing orders. This would allow industry to have appropriate machine tools in place, train their staff and gain manufacturing experience before an emergency occurred. However, this scheme relied on the government being prepared to fund the placement of educational orders for munitions during peacetime.

\(^{55}\) Mellor, *The Role of Science and Industry*, p. 7
\(^{56}\) Mellor, *The Role of Science and Industry*, p. 30
\(^{57}\) Mellor, *The Role of Science and Industry*, p. 27
Managing the Mobilisation of the NIH

In Australia during 1938 and 1939, there were only a small number of suppliers of steel, base metals and heavy chemicals, or those supplies which are classed as fundamental industrial products. After October 1935, and its absorption of Australian Iron and Steel, BHP had a monopoly on the Australian iron and steel industry and was also a major supplier of heavy chemicals from the by-products of each steelwork’s coke oven operations.\footnote{Hughes, \textit{The Australian Iron and Steel Industry}, p. 114} As portrayed in an \textit{Argus} newspaper article, the 1930s was the age of steel in Australia.\footnote{Herbert Richmond, ‘Age of Steel: Metal the Backbone of Industry’, \textit{The Argus}, (Melbourne, Vic), 10 February 1938, p. 20} The industry operated from two manufacturing sites, Port Kembla and Newcastle, but at that time the Newcastle site was the largest, most diverse, best equipped and most capable industrial steel site in Australia.

At this time, the Port Kembla works required additional capital investment in a new plant in the form of new coke ovens, a second blast furnace and additional open hearth furnaces. In Newcastle at the end of 1939, as discussed in the previous chapter, apart from the Commonwealth Steel Company the building of new plants in each of the subsidiary companies in Newcastle was essentially complete. However, at the Commonwealth Steel Company, construction of a special steel plant capable of manufacturing special and alloy steels did not begin until the beginning of 1939, and it would not be operational until 1941. Steelmaking capacity at this plant was increased by the installation of a third electric arc furnace and a 35 ton open hearth furnace which tapped its first heat in January 1942.\footnote{Mellor, \textit{The Role of Science and Industry}, p. 78}

The last major work of the 1930s at the Newcastle steelworks was the building of the new ferroalloy plant, together with its associated power station. The building of this new plant would make Australia’s steel industry largely independent of raw and processed steel ingredients. Raw materials, in the form of manganese and chromium ore, would still need to be imported, but the quantities of these raw materials were not large and could easily be stockpiled. While a ferroalloy plant was desirable for the manufacture of steel in peacetime, it was vital for the manufacture of steel for war. Before discussing the issues associated with, and cost of, installing a ferroalloy plant in Newcastle, it is necessary to identify what ferroalloys are and to demonstrate why they were vital to the manufacture of the range of steels required for both ordnance and munitions manufacture.
In Newcastle, ferroalloys were manufactured as major and lesser categories. The major ferroalloys were manufactured in three 3500-kVA stationary electric arc furnaces, one tilting electric arc furnace of the Héroult type and one 200 kVA induction furnace. All of the major ferroalloys were made by the thermo-electric reduction process, using metallurgical coke or silicon as the reducing agent. Ferroalloy production details are set out in the Appendix. In addition to the building of a new ferroalloy plant, in order to make the new plant totally self-contained in Newcastle a special plant was constructed for the manufacture of the Soderberg electrodes used in the electric arc furnaces. Helen Hughes claimed that investment in a ferroalloy plant to manufacture manganese alloys that had been previously imported could not be justified on financial grounds. This comment by Hughes might have been valid if steel production had been confined to a peacetime commercial environment, where occasional import delays could be tolerated; however, it was not valid when viewed against a war crisis. It was planned to have this new plant operational by the end of 1940.

The ferroalloy plant, together with the associated power station built by BHP, represented the largest single investment in technology and equipment made in the NIH during the preparation for war. It should also be understood that all of the staff and workers manning this plant had to be recruited, then trained to operate and maintain this new plant. The manufacture of a large range of complex metallurgical products, never manufactured in Australia before, all had to be completed in parallel with the plant's construction.

Rearmament, Manufacturing Objectives and Milestones

Figure 5.4 shows the project milestones for the preparation of the NIH for war. The first milestone directly related to the NIH's preparation for war occurred in May 1933, when the Melbourne board of BHP agreed to a proposal made by Darling and Lewis to fund the establishment of a strategic materials and spares stockpile in Newcastle. The stockpile was comprised of certain critical long lead-time imported spare parts and quantities of imported materials such as chromium, aluminium, nickel ores and ferroalloys, sufficient to last for two years of normal consumption. This stockpile represented an expenditure of £100,000, a

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62 Hughes, The Australian Iron and Steel Industry, p. 117
substantial outlay for what was fundamentally a non-revenue-earning insurance investment. To place this expenditure into the financial context of the period, BHP’s profit for the year ending May 1933 was £314,000. Outside of company documents, details of this stockpile are rarely, if ever, mentioned by scholars, but an unsigned document found in the company archives and obviously written by a senior company officer, titled A Story of Endeavour, describes the contents of the stockpile. The stockpile’s existence is confirmed by two other documents. Firstly, Essington Lewis, in Letter no. 1 of his 1934 report, mentions the £100,000 spent on ensuring the company’s position for two years ahead, regarding ferro manganese and similar materials. Secondly, it is noted in the Jubilee Edition of the BHP Review of June 1935.

It is clear that, in 1933, both Darling and Lewis had judged that the deterioration of the international situation in the Far East required that serious consideration should be given to what would happen to BHP, or Australia itself, regarding steel production in the event of overseas or coastal shipping being interfered with. The second critical decision point milestone concerns a report submitted by Lewis to the BHP board on 3 November 1934. This report detailed observations that Lewis had made of the steel industries in Japan, Germany and Britain during his overseas tour of 1934. Lewis had left Australia in May 1934, visiting the Dutch East Indies, Japan, Malaya, India, Britain and Germany. He returned home via the United States of America in late October 1934. Blainey is one of the few scholars to discuss this journey in any detail, or comment on its significance. Lewis spent some time in England on this journey, exchanging information and renewing contacts with members of BHP’s London board. In addition, he met with the senior management of British companies, such as Ryland Bros., Lysaght, and Stewarts and Lloyds, that had established branch house operations in Australia. However, it was Lewis’s observation during visits to Japan and Germany that heightened his concerns.

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68 n.a., ‘A Story of Endeavour’, n.d, n.p, BHP Archives, Melbourne
70 ‘Crisis in China’, Sydney Morning Herald (Sydney, NSW), 29 January 1932, p. 10
71 Blainey, The Steel Master, p. 120
72 Essington Lewis, ‘Report of my Journey to Japan, Malaya, Britain, Germany and the United States of America, November 1938’, Letter No. 1, BHP Archives. (Note that a copy of this letter was obtained from the BHP Archive prior to their closure in 2016.)
Figure 5.4: Timeline of the Preparation of the Newcastle Industrial Hub for War, 1933 – 1940.

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<td>Lewis’s Report</td>
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<td>Lysaght Expansion</td>
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In Letter no. 1 of his report, in addition to mentioning the material stockpile described earlier, Lewis also laments on the lack of cooperation between the Australian Defence Department and industry. Lewis makes the point that Australian industry is ‘left in the dark’, a factor which made ‘industry’s usefulness negligible’.73 In Japan, Lewis complained that his plant inspections had been restricted, but he collected enough information to further increase his concern regarding Japan’s industrial preparations for war.74 He wrote, ‘Japan may be described as a big gun-powder magazine and the people as fanatics and any day the two might connect and there will be an explosion’.75

Lewis was in Japan at the same time as an Australian Trade Mission, led by Australian Minister for External Affairs John Latham. Lewis, who knew Latham, expressed his unease concerning Japan to Latham and he was advised not to send his report from Japan. It should be sent when he reached Singapore. Latham added that he should include a note to the Chairman, Harold Darling, to pass it directly on to the Australian Government.76 It was no surprise that Darling could do this, for it was not unusual for Australia’s industrial, political and bureaucratic elites to meet socially or at private and business functions in Melbourne. At this time, in many practical respects Melbourne remained the nation’s bureaucratic and financial capital. Canberra was used mainly by the politicians and senior bureaucrats when the parliament was sitting. Even by 1939, few departments of state had totally relocated their operations from Sydney or Melbourne to the new capital.

In his biography of Lewis, Blainey relates that, on his way home to Australia Lewis stopped in New York, hosting a dinner for some of the senior management of the Bethlehem Steel Company, an organisation with which BHP maintained close relations. Lewis recalled that at the dinner he forecast that Germany was preparing its steel industry for another war and observed that the audience probably thought that he was ‘cracked.’77 The point made here is that some Australian industrialists, often working hand in hand with their British counterparts, were convinced that there was a real danger of war and that Australian industry must be prepared for it.

74 Jay, A Future More Prosperous, p. 131
75 Jay, A Future More Prosperous, p. 131
76 Blainey, The Steel Master, p. 123
77 Blainey, The Steel Master, p. 125
It should also be noted that it had been in September 1933, when Winston Churchill made the first of his somewhat regular warnings to the House of Commons concerning the preparation of German industry for war. Much of Churchill’s information had come from another Australian industrialist, W. S. Robinson, a senior manager in the Collins House Group who moved in high British, European and Australian industrial and political circles. Robinson and Lewis knew each other well, working closely together on a range of projects throughout the interwar period. One project included the two companies’ arranging to share the operating costs of Australia’s first corporate aircraft, a Lockheed model 12 named Silver City, in 1936. Another example of this level of cooperation concerned the formation of a consortium to fund the establishment of the Commonwealth Aircraft Corporation (CAC) in 1936. The manufacture of aircraft in Australia was high on the government’s defence wish list. The CAC commenced the production of aircraft based on American technology late in 1939.

The third critical decision point concerned the range of industrial and technological decisions made as a consequence of the 1937 Imperial Conference. This conference was conducted in London during May and June of 1937. Imperial Conferences were conducted every four years in order to give both the Dominions and the Colonies an opportunity to discuss a range of political, economic, trade and related defence matters. The Australian delegation sought from the British a definition of the strategic objectives concerning the application of Empire resources that would be available for the defence of members of the British Commonwealth. Considerable discussion revolved around the likely Middle East deployment areas for the Australian Defence Force, together with the protection of the Suez Canal, a critical part of Australia’s shipping link to Europe. However, from an industrial and technological standpoint, it was conference paper No. 3 that summarised the defence risks that needed to be managed by Australia with the following statement:

Article IV. Behind our forces must exist:

Adequate reserves of munitions:

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78 Churchill, *The Gathering Storm*, p. 69
80 Robinson, *If I Remember Rightly*, p. 168
81 Mellor, *The Role of Science and Industry*, p. 381
Establishments for the local production of special types of munitions not produced by industry:

An aircraft industry:

A plan for the organisation of industry for the supply of services in time of war;

A plan for the organisation of the resources of civil aviation as an adjunct to air defence.\(^{83}\)

The British also warned Australia that in a time of European war it should not rely on the ability of Britain to maintain supplies of munitions, ordnance products and a wide range of industrial products such as machine tools, and tool and alloy steels. The Committee of Empire Defence, which sat as a separate committee of the Imperial Defence Committee, paid particular attention to the question of Australia’s self-sufficiency in the manufacture of special steels.\(^{84}\) In February 1937, the Australian Secondary Industries Research and Testing Committee had also sounded similar warnings to the government.\(^{85}\) This committee had been appointed by the Federal Government in July 1936 and was principally concerned with the development of secondary industry, the provision of materials and the development of national engineering and manufacturing standards. The committee’s warning highlighted that any interruption to the supplies of these types of steels, particularly tool and high speed steels, would see the greater part of the engineering industry brought to a halt. At that time none of these steel products were made in Australia on a continuous manufacturing basis.

In Newcastle, small but essentially experimental quantities of these products had been made by the Vickers-Commonwealth Steel Company during the late 1920s, but full-scale manufacture had not been proceeded with. The continued dependence on imported sources of high-speed steel for machine-cutting tools and stamping presses increased Australia’s engineering and industrial vulnerability. In recognition of this problem, shortly after the conference, discussions were conducted with British suppliers, Vickers and the English Steel Corporation. Both of these companies were familiar with Australia, having been

\(^{83}\) Hasluck, *The Government and the People 1939–1941*, p. 64


\(^{85}\) ‘Mobilising Industry. Empire Plan: Australia’s Part in Emergency; Moves Already Made,’ *Sydney Morning Herald* (Sydney, NSW), 27 May 1937, p. 9. The Secondary Industries Committee was appointed in July 1936 and was concerned with the development of industries and the provision of materials and national standards.
shareholders in the Commonwealth Steel Company during the 1920s and early 1930s. These discussions were fruitful and arrangements for the transfer of technology made. The first batches of high-speed steel were made at the Commonwealth Steel Company’s Waratah plant during the last quarter of 1937.  

From this point, it is evident that for the NIH one of the outcomes of the 1937 Imperial Conference was the acceleration in the growth of special and alloy steel manufacturing capability at the Commonwealth Steel Company plant at Waratah. This plant would, by the end of 1940, grow to be the largest special steel and alloy steelworks of its type in Australia, and one of the largest in the British Empire of the day. Throughout the whole period of the Second World War, the Commonwealth Steel Company plant, together with two smaller plants, one in Melbourne and another at Port Kembla, combined to make Australia self-sufficient in the manufacture of special and alloy steels.

In addition to tool steels, a wide range of alloy steels for gun forgings, armour piercing shells, armour plate and for the chemical industry were required. Existing plans for growth of the Commonwealth Steel plant were enlarged and additional arrangements made for technology transfers made, once again, from the company’s former British shareholders. Construction of new buildings and installation of the rolling mills commenced in April 1939 and the special steel plant was fully operational by August 1940. However, some special electric furnaces were not operational until February 1941 and a new 50 ton open hearth furnace did not function until February 1942. In terms of financing the growth at the Commonwealth Steel Company, the money came from the company’s profit margins and contributions from its sole shareholder, the Broken Hill Proprietary Company Limited. With the exception of BHP itself, and Stewarts and Lloyds, the financing of growth was primarily concerned with satisfying the commercial imperative.

Financing the Expansion

After 1934 the NIH had an expansion impetus that nothing short of another nation-wide slump could stop. The Great Economic Depression had left a considerable amount of commercial and human wreckage behind, but economic recovery was rapid, particularly in

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86 Mellor, *The Role of Science and Industry*, p. 77
87 Mellor, *The Role of Science and Industry*, p. 78
Newcastle’s steel industry. In addition to the domestic market, BHP enjoyed export sales to New Zealand, the Dutch East Indies, Malaya, India and, as Alan Trengrove notes, even Japan.88 By the mid-1930s, the NIH had largely overcome the problems of geographic isolation and a small domestic market, to the point where BHP was becoming the producer of the world’s cheapest steel.89

In 1937, BHP was Australia’s largest company, with a net profit of £1,183,000, the company’s first million-pound profit since 1892.90 The question now was: how could expansion of the NIH, to meet the demands of the domestic market and an embryonic export market, and the need to prepare for war, be funded? Not only must expansion of the Newcastle steelworks be funded but, as BHP was now the owner of all steel wire companies in Australia, owned 65 per cent of the Commonwealth Steel Co. and 49 per cent of Stewarts and Lloyds, financing the expansion of these plants must also be made.

BHP made a number of capital reconstructions to fund the expansion. The first was in 1935, when 1,482,663 one-pound shares were issued to existing shareholders and others at 30s. a share. This raised £2,250,000 and authorised capital was increased to £7.5 million. In 1937, another 1,730,707 shares were issued on the same basis, which raised £2,610,184, increasing the authorised capital to £15 million. By issuing shares at a premium, the company was able to show that its paid-up capital exceeded subscribed capital by £4,445,859. In 1940, this amount was capitalised by a bonus issue of 64 one-pound shares for every 100 shares that investors held. Authorised capital was increased to £25 million. Trengrove states that in less than five years it had risen from £3 million, while subscribed capital had jumped from £2.9 million to £11.3 million. The same capital-raising technique was used in 1941 with a further issue of 2,488,076 shares, 22 shares being offered at par for every 100 shares investors held. This issue realised another £2.5 million for capital works.91

By using the share market to raise the capital required to fund its expansion plans, BHP avoided borrowing money. Between 1933 and 1940, £5 million had been set aside for depreciation; this reflected Darling and Lewis’s concerns to maintain its technological edge and their desire for autarky. Trengrove also states that BHP’s investments in other

88 Trengrove, *What’s Good for Australia..!* , p. 159
89 Hughes, *The Australian Iron and Steel Industry*, p. 131
90 Hughes, *The Australian Iron and Steel Industry*, p. 193
91 Trengove, *What’s Good for Australia..!* , p. 159
companies rose in value by £5.5 million. It should also be recognised that in 1937 BHP fell into line with South Australian Government desires and agreed to build a blast furnace and coke ovens at Whyalla. This new blast furnace was a copy of the No. 3 blast furnace in Newcastle. The new furnace was manufactured in the Newcastle steelwork's maintenance workshops and by heavy engineers from Newcastle.

The fourth critical decision point in the preparation of the NIH for war occurred on 10 March 1938, when, on a recommendation of the Principle Supply Officers Committee, the Lyons government formed an Advisory Panel on Industrial Organisation in Australia, under the chairmanship of Lewis. Lewis was joined on this panel by other Australian industrialists, Sir Colin Fraser, Alexander Stewart, T. W. Eady and F. P. Kneeshaw. Within seven days it had compiled a report, concerning the problems they saw, and on the proposals that had been submitted to it. The primary task given to this panel was to study and recommend the measures necessary to mobilise commercial industry, in order to achieve the two key objectives of the Munitions Supply Board (MSB), the government's defence manufacturing organisation. These objectives were, firstly, to build in the shortest possible time sufficient stock to provide six months' reserves of ammunition for the army and the air force. Secondly, it was to develop sufficient manufacturing capacity to meet the ammunition expenditure likely to occur in war. In 1938, the main responsibility for building up stocks clearly fell to the existing government factories and the Panel recommended that, initially, these factories should immediately work to their full manufacturing capacity. At that time, the Panel did not consider it practical to manufacture munitions in existing engineering workshops. However, it did recommend the establishment of stocks of machine tools and raw materials, together with the establishment of twenty-four munitions annexes it had identified earlier.

In terms of the second objective, to create a munitions manufacturing capacity in the commercial industry, the way was not so clear. At that time, the only commercial plant equipped to manufacture munitions in Australia was located in the BHP steelworks at Newcastle, the development of which BHP had funded during 1936 and 1937. In the absence of funding for the manufacture of munitions in the form of educational orders, this plant did not commence munitions manufacturing operations until May 1938. Nonetheless,

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92 Trengove, *What's Good for Australia...!,* p. 159
93 Mellor, *The Role of Science and Industry,* p. 31
94 Mellor, *The Role of Science and Industry,* p. 31
95 Mellor, *The Role of Science and Industry,* p. 31
96 Hughes, *The Australian Iron and Steel Industry,* p. 136
this early start gave the company invaluable manufacturing experience that put it in good stead during the war years. Ross observed that this initiative by BHP provided the most successful pre-war munitions annexe in Australia.97

The panel’s report acknowledged the difficulties that commercial industry would face in manufacturing munitions and ordnance products. In addition to increasing production at the MSB factories, the panel also strongly supported the concept of building up stocks of raw materials and machine tools, recommending that annexes be established at existing industrial organisations as the preferred way forward. The government accepted the recommendations and during 1939 twenty-four annexes were established across Australia. Table 5.1 identifies the five annexes established in Newcastle during 1939. The organisation to control each new facility was largely left in the hands of the company to which the annexe was attached. Higher management of the munitions annexes employed area boards, reporting to the Department of Supply, but, generally, government control was based on the British shadow factory model.

### Table 5.1: Munitions Annexes Established in Newcastle, 1939

<table>
<thead>
<tr>
<th>Establishment</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broken Hill Proprietary Co. Ltd.</td>
<td>18 and 25 pdr shell forgings</td>
</tr>
<tr>
<td></td>
<td>Magnesium powder manufacture</td>
</tr>
<tr>
<td></td>
<td>Machining jigs and gauges</td>
</tr>
<tr>
<td>Stewarts and Lloyds (Aust) Pty. Ltd.</td>
<td>25 pdr shell forgings</td>
</tr>
<tr>
<td></td>
<td>3.7-inch shell forgings</td>
</tr>
<tr>
<td></td>
<td>5.5-inch shell forgings</td>
</tr>
<tr>
<td>Commonwealth Steel Co. Ltd.</td>
<td>Shell and 4.2-inch mortar bombs</td>
</tr>
<tr>
<td></td>
<td>Gun forgings</td>
</tr>
<tr>
<td>Ryland Bros. (Aust) Pty. Ltd.</td>
<td>2 pdr link and Bren gun magazines</td>
</tr>
<tr>
<td>Sulphide Corp. Ltd.</td>
<td>Nickel matte roasting</td>
</tr>
</tbody>
</table>

Source: D. P. Mellor, *The Role of Science and Industry*, p. 50

The British model revolved around a trade-off between the increased efficiency of using fixed-price contracts and the decreasing administrative expenses and transaction costs of using cost-plus contracts. In Britain, the generally overheated boom created initially by rearmament, followed by a war economy, caused governments to rely on bilateral

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97 Ross, *Armed and Ready*, p. 251
negotiations with single armaments manufacturers, rather than use a competitive bidding process to award armament contracts. In addition to gaining administrative and commercial cost savings, a shadow factory was only concerned with the manufacture of a product designed by someone else. In the British case, the use of motor car factories to manufacture and assemble complex items of equipment, such as aircraft, permitted the rapid application of standardised industrial engineering methods to achieve high production outputs. David Edgerton provides a good case study concerning the benefits and limitations of the British system, regarding ammunition filling factories. This system was very flexible and did not attempt to employ the ‘one size fits all’ bureaucratic approach to contract management used during peacetime. Edgerton noted that similar shadow factory systems were employed by Germany and the United States during the war period.

In a letter sent to the Prime Minister in November 1938, the Industrial Advisory Panel advised that both Stewarts and Lloyds, and the Commonwealth Steel Company would provide plant and buildings for their respective munitions annexes, at no cost to the Commonwealth Government. Once the war commenced, a number of other companies in the NIH developed munitions annexes of their own, again at no cost to the government. Ross observed that this BHP initiative, of building and equipping its own munitions plant before 1938, allowed it to be not only the first commercial industry annexe to begin production but that it also provided the most successful example of pre-war munitions annexe production in Australia. At a Council of Defence meeting in 1937, Prime Minister Lyons noted that:

The industrialists were even prepared to add, at their own expense, to their establishment and to install equipment and machinery, so that they might be in a position in the event of an emergency to throw in their weight to add to the present sources of supply for Defence requirements.

During the 1930s decade, the commercial elements of the NIH also concentrated on manufacturing their own standard products, corrugated iron, steel wire and steel tubes,

99 Edgerton, Britain’s War Machine, p. 200
100 Essington Lewis Papers, CTSM276, Item 5, 1938 microfilm letter and spreadsheet, University of Melbourne Archives
101 Ross, Armed and Ready, p. 152
102 Ross, Armed and Ready, p. 152
increasing their manufacturing efficiency and lowering manufacturing costs. This degree of manufacturing efficiency is demonstrated with the first export of fabricated steel product to Britain in April 1939. With the war not unexpected, one of Britain's defensive measures was the development of the Anderson Shelter. This shelter was an air-raid shelter designed to be partially buried, and the first order for 400,000 of these shelters required 120,000 tons of galvanised corrugated steel sheet. John Lysaght Australia was asked to assist with the programme and, beginning in April 1939, orders for 500 tons per week were placed, rising to 1000 tons per week.\textsuperscript{103} Altogether, Lysaght exported 41,000 tons of this product to England during 1939.\textsuperscript{104} Figure 5.2 provides a diagram of an assembled Anderson Shelter.

**Conclusions**

In terms of the industrial preparation for war, each of the critical decision milestones had been acted on and championed by the industrialists. Increased capital investment in science and technology saw progressive increases in industrial capability across each of the manufacturing elements of the NIH. These changes, introduced during peacetime, allowed the NIH to transition its production from peace to war relatively seamlessly. It is difficult to definitively say how far the rapid rise in the NIH from its very low ebb during the Depression was due to purely economic factors, or how far it was a deliberate policy aimed at achieving industrial autarky in Australia. The upward trend had begun in 1933 but, as Mellor noted, without the extraordinary expansion in production capacity and technological capability that took place in the NIH after 1933, Australia might not have met the industrial challenges set by the Second World War as successfully as it did.\textsuperscript{105} Some of the industrial preparations for war would not be complete until the end of 1940 or early 1942, but without the work done during the 1930s, little of lasting benefit would have been achieved. At the end of 1939, the NIH was ready to go to war.

\begin{footnotes}
\item[103] ‘Increase in Export of Iron and Steel’, *The Newcastle Sun* (Newcastle, NSW), 11 May 1939, p. 1
\item[104] Lysaght Australia, *Lysaght’s Silver Jubilee*, p. 78
\item[105] Mellor, *The Role of Science and Industry*, p. 71
\end{footnotes}
Figure 5.5: Assembled Anderson Shelter

This type of shelter has been used extensively in England, and has proved satisfactory. It is sunk partially into the ground, and it is constructed of a steel frame and heavy corrugated galvanised iron, and should be covered with earth. Particulars can be supplied by the various supply firms.
CHAPTER 6:
THE NEWCASTLE INDUSTRIAL HUB AT WAR, 1939–1941

The first stage in Newcastle’s transition to total war culminated in 1940 with the Newcastle steelwork’s production capacity growing to 1,000,000 tons per annum, a factor which made the Newcastle steelworks one of the largest in the British Empire. Production capacities in each of the steel fabrication companies co-located with the steelworks grew in parallel. The second stage of the NIH industrial transition to total war began with the declaration of war in September 1939 and ended with the John Curtin Labor Government taking office on 3 October 1941. The aim of this chapter is to discuss those factors which underwrote this development between September 1939 and the change of government in October 1941. The manufacturing components, including the establishment of munitions annexe, had been largely formed between 1938 and 1939.

Australia and Newcastle generally swung into war production slowly. The existing munitions plant at the BHP steelworks was now working seven twenty-four hour days a week. A larger munitions annexe that would manufacture 25-pounder shells was still being equipped. Other plants with a munitions annexe accelerated their preparation for the manufacture of munitions or ordnance products. But on a national level there appeared to be some confusion and no little uncertainty as to just what the government wanted the steel industry to manufacture. Ross observed that there was an apparent inability of the Department of Supply to get on with the job of fulfilling the munitions demands of the armed services. This perceived failure of supply gradually saw a lack of confidence develop in the Department’s performance. This lack of confidence spread into the political arena, much to the discomfort of the War Cabinet.¹ This level of discomfort became more acute in light of the military debacles that occurred in Europe between April and June 1940. Even though Australia had had no involvement in these operations, the defeats impacted on national morale. People began to realise, particularly after France requested an armistice in June 1940, what total war might mean.²

Henderson asserts that Australia, led by Menzies, had reluctantly gone to war in September 1939. The change to war on a national scale largely followed the high-level management plans prepared by Department of Defence and Treasury bureaucrats during the late 1930s. These plans were encompassed in a document known as the War Book, which had been largely prepared by and under the auspices of the Secretary of the Department of Defence, Frederick Shedden. The objective of the War Book was to coordinate the mobilisation activities of Federal and State Government departments and to establish some form of bureaucratic control over the national mobilisation process. Issues with this document's shortcomings and limitations were highlighted in January 1940 by the economist Brigden, who made the somewhat acerbic comment that, 'while the document had been prepared with considerable academic excellence, it did not fulfil the whole purpose for which it had been prepared'. D. P. Mellor notes that, through the National Security Act, the Government already had the power to issue regulations that would enable it to effect the total mobilisation of the country's resources. Yet, in the first few months of the war, the situation had arisen whereby some government munitions factories were faced with the problem of having insufficient orders from the fighting services to maintain their production potential.

In some respects, this unplanned period of bureaucratic inertia was useful, as it allowed additional time for annexe management to finalise equipment installation, organise an annexe's labour force and confirm its manufacturing processes. Another factor that must be considered in the mobilisation of each munitions annexe is its manufacturing learning curve. Negotiating a difficult manufacturing learning curve using a combination of new equipment, sometimes with an inexperienced labour force, is a complex issue to manage. Apart from the relatively small BHP munitions plant, which Ross acknowledged as one of the most successful annexes in the early war period, no other munitions annexes had manufactured such products before. The Stewarts and Lloyds munitions annexe provides a good example of the benefits of this delay, for, while equipment installation commenced in the first half of 1939, the annexe was not declared operational until February 1940.

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4 Ross, *Armed and Ready*, p. 225
5 Ross, *Armed and Ready*, p. 225
7 Ross, *Armed and Ready*, p. 153
On 21 May 1940, in response to increasing levels of public and political disquiet and departmental uncertainty regarding the problems concerning the manufacture of munitions and ordnance products, Prime Minister Robert Menzies asked Essington Lewis to accept the office of Director of Munitions. This appointment, along with the extensive authority that Lewis was granted, was approved by the War Cabinet the following day. Lewis was given direct access to the War Cabinet, in the same way as the Chiefs of Staff from the armed forces. As Ross noted, at last the industrialists were in charge and, while the confusion and the bureaucratic circumlocution did not immediately disappear, it quickly became obvious that a new hand was at the helm. The charter given to Lewis is detailed in Appendix E.

When compared with the standard products manufactured for peacetime, the programmes and products assigned to the NIH munitions annexes were unique. Often the munitions required the use of special or alloy steels in their manufacture, a factor which significantly increased the degree of quality assurance inspection and administration. In a number of cases, this required the development of totally new manufacturing processes and administration. During the whole period of the war, the Newcastle steelworks produced 5,328,699 tons of steel and 4,040,698 tons of pig iron. Of the five million tons of steel produced by the BHP steelworks, 587,000 tons was alloy, or other special quality steels. Approximately 90 per cent of the total steel production went into applications directly concerned with the war. Besides providing the raw materials for wire, tube, sheet and other elements, the NIH directly engaged in munitions production and the steelworks supplied material for the manufacture of ships, armoured fighting vehicles, guns, shells and machine tools.

BHP’s efforts were not confined to the manufacture of iron and steel. Furnaces were designed and built for the manufacture of magnesium and ferroalloys, a modern tool room was built and equipped with the most up-to-date machines. After 1943, tugs and barges were constructed in some numbers. The foundries, machine and fabrication shops, initially established for plant maintenance, undertook the manufacture of machine tools of many

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9 Mellor, *The Role of Science and Industry*, p. 35
10 Ross, *Armed and Ready*, p. 227
types, ships’ engines and numerous heavy engineering tasks. To meet essential wartime demands, two additional 125-ton capacity open hearth furnaces were constructed and brought into operation, the first in 1942 and the second in 1944. A new cold rolling mill was installed for the manufacture of cold rolled strip for use in the manufacture of automatic weapons.

In the context of Australia’s industrial development at the end of the 1930s, several factors that relate to Newcastle’s transition to total war must be considered. After June 1940, it was clear that, apart from providing access to weapon and munitions manufacturing technology, Britain would be unable to provide Australia and its industries with much of its machine tool requirements. In essence, the warnings concerning equipment supply from Britain, made during the Imperial Conference of 1937, had come to pass. Accordingly, if a particular product was required, the need urgent enough and no substitute available, then Australian industry would have to make it themselves. Given the size, maturity and skill of its workforce, and its manufacturing capability, many of the products normally sourced from Britain could only be satisfied by the NIH. In many respects, the development of import-replacement product solutions from the NIH was an obvious solution, for there was no other secondary industry equivalent in Australia at that time. Conversely, in the Australian context of the period, this situation was in some respects a paradox. Solutions to complex technological and manufacturing problems were not usually expected to be found in Australian regional locations. Yet the urgency of war, coupled with minimal financial restrictions, initiated a burst of controlled industrial energy that would see, in the space of just a few months, a range of new products and manufacturing processes developed. This burst of energy would see products ranging from the development of sintered tungsten carbide to the manufacture of sophisticated machine tools. By the end of 1941, this revolution would also see additional commercial elements in the form of a chemical company and a new dockyard joining the NIH.

13 Jay, A Future More Prosperous, p. 163
15 W. A. Carroll, Chicago Tribune Press Services, 10 August 1940, ‘Australia Spurs its Production of Arms, Planes’, Essington Lewis Papers, University of Melbourne Archives
New Members of the Newcastle Industrial Hub

In addition to commencing munitions production and manufacturing standard products, between September 1939 and January 1942 the NIH gained two new members. In 1939–40, the Newcastle Chemical Company Pty. Ltd. commenced operations and in 1941–42 a State Dockyard was opened in Newcastle. The Newcastle Chemical Company Pty. Ltd. was formed in 1940 as a joint venture between BHP and Imperial Chemical Industries Australia New Zealand Pty. Ltd. This company would manufacture chemicals essential to the steel industry and Australia’s emerging organic chemical industry, using the by-products from the steelwork’s coke ovens. In many respects, the Newcastle State Dockyard was the resurrection of the former Walsh Island Dockyard and Engineering Works.16

The Newcastle Chemical Company

The Newcastle Chemical plant was built at the then western edge of the BHP property in Mayfield West. It was operational by the end of 1940.17 Of the chemicals extracted from coke ovens by-products, naphthalene was among the first to be exploited; some was converted to phthalic anhydride, and much of the remainder into B-naphthol. The manufacture of phthalic anhydride was undertaken as a war measure because of its importance as a plasticiser for nitrocellulose lacquers used in aircraft. It was also used for making glyptal resins and the mosquito repellent dimethyl phthalate. B-naphthol was also used as a fungicide, but more importantly as the source of the chemical (a-nitroso B-naphthol), which was vital to the electrolytic zinc refining process, as operated at Risdon in Tasmania. B-naphthol had been previously imported from Germany and supply was forecast to be dangerously low by 1942 without an investment to make the chemical locally. Any failure of supply would have seriously impacted on the production of refined zinc at Risdon in Tasmania.18

The second chemical processed in volume by the Newcastle Chemical Company was phenol. The importance of this chemical lay in the fact that it was one of the raw materials used to manufacture phenol-formaldehyde resin or plastic (Bakelite) which was

17 Mellor, The Role of Science and Industry, pp. 127–28
18 Mellor, The Role of Science and Industry, p. 129
used to manufacture bullet tips, hand grenades and electrical fittings.\textsuperscript{19} Bakelite was also useful when used as a substitute for scarce metals such as copper, aluminium and tinplate.

Only one other company in Australia, Timbrol Ltd. in Sydney, was recovering phenol from coal tar, but its output was not sufficient to meet the complete domestic market demand.

Coal tar is a complex material, containing a range of substances of interest to the chemical industry, in addition to benzene and toluene. Details of the range of chemical derivatives that may be extracted from coke ovens by-products are outlined in Chapter 3, Figure 3.2. This chart shows four of the five so-called primary products (benzene, toluene, phenol and naphthalene) that came into prominence for the Australian chemical industry during the period of the war; it also indicates how various explosives, drugs and plastics were derived from these basic raw materials.\textsuperscript{20}

**The Newcastle State Dockyard**

In 1941, the construction of merchant ships was not regarded as a new venture for Newcastle’s industry. Just nine years before, the Walsh Island Dockyard and Engineering Works had been abandoned, leaving a scene of abandoned buildings and industrial desolation. The only item of equipment that remained operational after 1933 was the floating dock which had been built during 1928, in partnership with the Federal Government.\textsuperscript{21} Consequently, the NSW Government was obliged to maintain the dock in an operational condition. From time to time throughout the 1930s, the floating dock had been used for ship repair. At the beginning of the war, this piece of what could only be assumed to be a vital item of ship-repair equipment, was not in regular use and there did not appear to be any plan for its use. The dock had been designed and constructed at the Walsh Island Dockyard in two parts and, when assembled, was capable of lifting 15,000 tons deadweight. In 1940, this floating dock was the largest dock of its type in the Commonwealth, with only the graving docks at Cockatoo Island in Sydney able to service larger vessels. The floating dock was moored in a dredged mooring area located in a channel between Walsh and Ash Islands in the Hunter River estuary.\textsuperscript{22}

\textsuperscript{19} Mellor, *The Role of Science and Industry*, p. 128
\textsuperscript{20} Mellor, *The Role of Science and Industry*, p. 127
\textsuperscript{21} New South Wales Government, 'Government Dockyard, Newcastle (Floating Dock Agreement Ratification) Act, 1927, No. 24
\textsuperscript{22} Imashev, 'The Shipbuilders', p. 39
After some public and political agitation, aimed at re-activating the Walsh Island Dockyard and Engineering Works, in June 1939 the Tariff Board had reported to the government regarding the establishment of a bounty that could be paid to subsidise merchant shipbuilding in Australia. In August 1940, the War Cabinet requested another report concerning the Walsh Island Dockyard, this time from an engineer from the Royal Australian Navy. S. J. Butlin notes that the McNeil Report echoed many of the comments made in the earlier Townsend Report regarding financial and skilled manpower issues, but once again there is little evidence of any definitive decision by government being made.23 Then, in August 1941, it was announced that a new dockyard and engineering works would be established in Newcastle and that a Director, D. Lyon McLarty, had been appointed. The new dockyard’s location was a nine-hectare site at the Carrington Dyke End, where dredge-maintenance and repair workshops, and some wharfage, already existed.24 Construction commenced in April 1942 and one year later, after extensive dredging and the construction of the necessary anchorages, the floating dock was relocated from the Hunter Estuary to a new home in the Throsby Basin.25 Here, on a three-hectare site, the new dockyard’s ship repair facility was established. The remains of the old Walsh Island site were now gutted, the buildings dismantled, structurally refurbished and re-erected on the Dyke End site to provide the structures for the new workshops, and clad to make them weather tight. In March 1943, five months after construction commenced, the engineering shops were complete and equipping the shipyard workshops was well advanced. Nonetheless, a real issue the new dockyard had to deal with was the non-availability of professional and skilled labour.26 However, by one means or another people were recruited and by 1945 the total workforce numbered 1329.27

The productive work output of the new dockyard and engineering works between January 1942 and December 1945 was significant. Not only were the works established, but twenty-three vessels were built, six triple-expansion reciprocating steam engines constructed and 600 vessels of varying types, ranging in size up to 16,000 tons, had been docked and repaired.28 At the outbreak of the war in 1939, the Royal Australian Navy initiated a naval building programme based on making maximum use of all available shipbuilding resources.

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25 Imashev, ‘The Shipbuilders’, p. 29
27 State Dockyard, *The State Dockyard*, p. 20
28 Imashev, ‘The Shipbuilders’, p. 36
and, nationally, by December 1940 a total of forty-eight corvettes and frigates had been ordered. The Newcastle Dockyard would build and launch two frigates by 1945.

**The Newcastle Industrial Hub Innovation**

Many of the products manufactured in Britain, home to the great bulk of the munitions technology used by Australia, often relied on using machines or alloy ingredients not readily available in Australia. In these cases, the product manufacturing process or the product itself had to go through a re-invention challenge process. Three examples of the different products — the manufacture of bullet-proof steel, the manufacture of magnesium and the manufacture of tungsten carbide tools — during this period are now discussed. Throughout the whole period of the war, the NIH used its innovation capability to manufacture its standard products and, in some cases, to reinvent products in Australia. This had been a feature of Australian manufacturing since the late nineteenth century when the importation of manufactured products from Britain or Europe became difficult or too expensive, or when the specified materials were not available in Australia. Table 6.1 lists the products manufactured in the NIH throughout the whole period of the war. In 1947, D. O. Morris, the Assistant Steel Superintendent at the steelworks, prepared an article which described each project in detail for the Australasian Institute of Mining and Metallurgy. Of the forty-two discrete projects that had been undertaken, two projects stand out: the development of bullet-proof steel and the manufacture of tungsten carbide tools. The scope of these activities had been noted in newspaper articles designed to boost national morale. Likewise, *The Argus* reported Harold Darling’s address to BHP shareholders, where he again committed all of the company’s resources and manpower to the war effort.

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29 Butlin, *War Economy, 1939–1942*, p. 169
30 Special Representative, ‘Australian City Of Steel: Newcastle’s Part in War Effort’, *The Age* (Melbourne, Vic), 29 August 1942, p. 2
31 ‘B.H.P.’s Resources Behind the War Effort: Mr. H. G. Darling Reviews Year’s Work’, *The Argus* (Melbourne, Vic), 31 August 1940, p. 8
<table>
<thead>
<tr>
<th>Product</th>
<th>Company</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>Steel Making Departments</td>
<td>BHP</td>
<td></td>
</tr>
<tr>
<td>Steel for Shot and Shell</td>
<td>BHP</td>
<td></td>
</tr>
<tr>
<td>Coke Ovens By-Products</td>
<td>BHP</td>
<td></td>
</tr>
<tr>
<td>Bullet-Proof Plate</td>
<td>BHP</td>
<td>Not manufactured in Australia previously</td>
</tr>
<tr>
<td>Rolling and Forming Bullet-Proof Steel</td>
<td>Lysaght</td>
<td>Not manufactured in Australia previously</td>
</tr>
<tr>
<td>Aircraft Cylinder Barrel Steel</td>
<td>BHP</td>
<td>Not manufactured in Australia previously</td>
</tr>
<tr>
<td>Gas Bottle Steel</td>
<td>BHP</td>
<td>Not manufactured in Australia previously</td>
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<tr>
<td>Cold Rolled Strip Department</td>
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<td>Alloy Steel and Cold Drawing Department</td>
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<td>Shell and Shot Manufacture</td>
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<tr>
<td>Magnesium Department</td>
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<td>Research Department</td>
<td>BHP</td>
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<td>Drawing Office and Engineering Design</td>
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<td>Submarine Anti-Torpedo Nets</td>
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<td>Mine Mooring Steel Wire Rope</td>
<td>Ryland Bros. and Aust. Wire Rope</td>
<td>Not manufactured in Australia previously</td>
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<tr>
<td>Field Telephone Cable</td>
<td>Ryland Bros. and Aust. Wire Rope</td>
<td>Various types not manufactured in Australia previously</td>
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<tr>
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<td>Lysaght</td>
<td>Supplied to Britain from the 1st Quarter 1939</td>
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<tr>
<td>Rolling Austenitic Manganese Steel Sheets for Steel Helmets</td>
<td>Lysaght</td>
<td>Not manufactured in Australia previously</td>
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<tr>
<td>Rolling Special Silicon Steels for Electricity Transformers and Motors</td>
<td>Lysaght</td>
<td>Not manufactured in Australia previously</td>
</tr>
<tr>
<td>Rolling and Forming Non-Magnetic Armour Plate</td>
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<td>Not manufactured in Australia previously</td>
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<td>Manufacture of Small Arms – Owen Gun</td>
<td>Lysaght</td>
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<tr>
<td>Manufacture of Aircraft Engine Spinners</td>
<td>Lysaght</td>
<td>Not manufactured in Australia previously</td>
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<td>Manufacture of Bellman Prefabricated Aircraft Hangers</td>
<td>Lysaght</td>
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<td>Stewarts &amp; Lloyds</td>
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</tr>
<tr>
<td>Solid Drawn Tube</td>
<td>Stewarts &amp; Lloyds</td>
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<tr>
<td>Artillery Shell Manufacture</td>
<td>Stewarts &amp; Lloyds</td>
<td>Not manufactured in Australia previously</td>
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<tr>
<td>Aircraft Engine Cylinder Manufacture</td>
<td>Stewarts &amp; Lloyds</td>
<td>Not manufactured in Australia previously</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Pipework Design, Fabrication and Erection</td>
<td>Stewarts &amp; Lloyds</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous Fabrication Tasks</td>
<td>Stewarts &amp; Lloyds</td>
<td></td>
</tr>
<tr>
<td>Railway Rolling Stock Wheels, Tyres and Axles</td>
<td>Commonwealth Steel Co.</td>
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<td>Special and Alloy Steels</td>
<td>Commonwealth Steel Co.</td>
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<td>Armour Piercing and Semi-Armour Piercing Shells</td>
<td>Commonwealth Steel Co.</td>
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<td>Ordnance Forgings for Gun Barrels</td>
<td>Commonwealth Steel Co.</td>
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<td>Aircraft Engine Cylinder Barrels</td>
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<td>Ship Forgings and Castings</td>
<td>Commonwealth Steel Co.</td>
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<td>Hollow Forgings</td>
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<td>Torpedo Components</td>
<td>Commonwealth Steel Co.</td>
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<td>Crane Hooks for the US Army</td>
<td>Commonwealth Steel Co.</td>
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<tr>
<td>Field Telephone Steel Strand</td>
<td>Aust. Wire Rope Works</td>
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</tr>
<tr>
<td><strong>Aircraft Control Wire Rope</strong></td>
<td><strong>Steel Wire Rope for the RAN</strong></td>
<td><strong>Electric Light Globes</strong></td>
</tr>
<tr>
<td>--------------------------------</td>
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<td><strong>Aust. Wire Rope Works</strong></td>
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<td><strong>Refractory Bricks and Furnace Lining</strong></td>
<td><strong>Newbold Refractories</strong></td>
<td><strong>Steel Wire Rope for the RAN</strong></td>
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<tr>
<td><strong>Heavy Engineering Tasks</strong></td>
<td><strong>Goninan</strong></td>
<td><strong>Goninan</strong></td>
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<td><strong>Refrigeration Barges</strong></td>
<td><strong>Goninan</strong></td>
<td><strong>Goninan</strong></td>
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<tr>
<td><strong>Heavy Engineering Tasks</strong></td>
<td><strong>Miron &amp; Bearby</strong></td>
<td><strong>Miron &amp; Bearby</strong></td>
</tr>
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<td><strong>Electricity System</strong></td>
<td><strong>Railway System – Zaara Street</strong></td>
<td><strong>Expansion of Zaara St Power Station</strong></td>
</tr>
<tr>
<td><strong>Electricity System</strong></td>
<td><strong>Railway System – Zaara Street</strong></td>
<td><strong>Expansion of Zaara St Power Station</strong></td>
</tr>
<tr>
<td><strong>Water Supply to Newcastle Urban Area Industry &amp; Civil Engr. Construction Tasks</strong></td>
<td><strong>Hunter District Water Board</strong></td>
<td><strong>Dept. of Defence &amp; Dept. of Munitions</strong></td>
</tr>
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<td><strong>Chemical Processing</strong></td>
<td><strong>Newcastle Chemical Co.</strong></td>
<td><strong>Not manufactured in Australia previously</strong></td>
</tr>
<tr>
<td><strong>Ship Building &amp; Heavy Engineering Tasks</strong></td>
<td><strong>Newcastle State Dockyard</strong></td>
<td><strong>Not manufactured in Australia previously</strong></td>
</tr>
<tr>
<td><strong>Zinc and Lead Processing – Sulphuric Acid</strong></td>
<td><strong>Sulphide Corp.</strong></td>
<td><strong>Not manufactured in Australia previously</strong></td>
</tr>
<tr>
<td><strong>Tool Room – Gauges and Jigs</strong></td>
<td><strong>Cardiff Railway Workshop.</strong></td>
<td><strong>Not manufactured in Australia previously</strong></td>
</tr>
</tbody>
</table>

The Development of Australian Bullet-Proof Plate

Early in the war, the new Director of Munitions, Essington Lewis, was advised that the Army had developed a requirement for 30,000 tons of bullet-proof plate. The specification for this plate was based on the British Army specification for ‘Resista’ armoured steel. This material had been developed by the British company Hadfield; its manufacture required the alloys chromium, nickel and molybdenum. However, the combination of these alloys made the material intractable and made it difficult to conduct any downstream fabrication or machining.

Unfortunately, an analysis of the position identified that these particular alloys were not available in Australia and could not be obtained from overseas. As the problem was primarily a steelmaking one, the position was given to the BHP steel works in Newcastle and company metallurgists were asked to study the possibility of developing a substitute material. Within three months, the problem had been solved and the first heat was made and rolled into plates without using nickel or molybdenum, the two strategic alloys which almost all steelmakers had previously used in the manufacture of armoured plate.

In addition to its bullet-proof specification, the material was also required to be suitable to be welded using standard electric welding technology. It was also found that the new material was more suitable to downstream fabrication and machining, and did not require the costly and elaborate heat treatment process which the ‘Resista’ product required. It was also found that, by using a special rolling procedure, the ballistic characteristics could be developed without recourse to annealing, quenching and tempering. The rolling and preparation of the bullet-proof plate components was developed by Lysaght. Figure 6.1 shows the bullet-proof plate being cut by oxy-acetylene profile cutting machines and stacked before despatch to the armoured vehicle manufacturers in Melbourne. The development of Australian bullet-proof steel plate, from the initiation of the programme in July 1940, was complete by October 1940, or within three months. The short time taken to produce ABP3 product as a replacement to the Resista product does not reflect the difficulty or the uncertainty of the work done.32 After laboratory testing, pieces were taken at random and subjected to a ballistic test, the

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nature of which varied according to the thickness of the plate. Additional details are in Appendix B.

**Figure 6.1: Cutting and Stacking Bullet-Proof Plate Components, Lysaght 1941**

Source: *Lysaght’s Silver Jubilee, 1921–1946 ([Sydney], 1946), 80

**The Manufacture of Magnesium**

Magnesium is the lightest of all commercial alloys. Its density is only one quarter that of steel and its excellent machinability is not equalled by any other metal. Because of these qualities, this metal found an important place in the aircraft industry. Prior to the war, very little magnesium was used in Australia and the small quantities required were readily imported from Britain or Germany. However, in 1936 Australia had launched itself into the aircraft manufacturing world with the establishment of the Commonwealth Aircraft Corporation, a company in which the Broken Hill Pty. Co. Ltd. was a substantial shareholder. With the commencement of hostilities and the resultant increase in the demand for this metal from overseas, it quickly became apparent that the continued importation of the metal was at risk.
Australia needed magnesium for aeroplane components, for flares, star shells, tracer ammunition and other purposes connected to the war effort. In early 1940, the Directors of the Broken Hill Pty. Co. Ltd. decided to finance the manufacture of magnesium in Australia. After preliminary negotiations with Murex Limited in Britain, two company officers were sent to England to decide on which manufacturing process to adopt, to purchase access to the technology and whatever equipment was required, and to learn the manufacturing methods and production techniques. The method of manufacture consisted of the thermal reduction, in a high vacuum, of magnesium oxide with calcium carbide. This was conducted inside steel retorts at a temperature of 1150°C using gas-fired furnaces. The two company officers returned to Australia, the specialised equipment was delivered and the plant constructed, and the magnesium plant was operational in May 1941. During the war, 2,582,000 pounds (1,173,636 kg or 1,173.63 tons) were produced. This amount made Australia independent of imported magnesium for the period of the war.

The Manufacture of Tungsten Carbide Tools

Turning, milling and drilling are among the most important and basic operations conducted in the engineering industry. A cutting tool must be harder than the material upon which it is used. It must retain its cutting edge even when red hot, it must not break under moderate impact and the cutting edge must be capable of being reground after it is worn. Tungsten carbide was developed in Germany by the Osram Lamp Company, initially to provide the filament in electric light globes. In the early 1920s, they sold the patent to Krupps, which then developed the product to manufacture a cutting tool for use in machine tools. Launching the new product at an engineering fair in 1927, Krupps sold these tools under the trade name Widia. The demonstrated performance of the tool generated a lot of attention from manufacturing and engineering companies around the world. Wire-drawing dies were imported by Ryland Bros. in 1934, where they provided significant increases in wire-drawing speeds and product quality. When tungsten carbide dies were combined with a four-hole ‘electric control machine’ during

34 ‘BHP’s Magnesium Plant Now in Full Production’, The Argus (Melbourne, Vic) 30 December, p. 4 (first batch produced 21 July 1941)
35 ‘BHP’s Magnesium Plant Now in Full Production’, p. 4
36 Morris, ‘A Review’, p. 31
1931, the Australian wire industry technology led the world. When used as the cutting tool in a lathe, tungsten carbide tools could reduce the time required to machine an artillery shell by as much as 25 per cent. Recognising the benefits of this material for mass-manufacture tasks during 1939, BHP attempted to negotiate with overseas firms in order to gain access to the manufacturing technology, but these negotiations were unsuccessful.39

In December 1940, the company determined to work on its own initiative. A small team of technicians were selected at the Newcastle steelworks to conduct research on tungsten carbide-manufacturing methods. In January 1941, a pilot plant was built which allowed experimental work to proceed on a laboratory scale. Success was almost immediate and the first wire-drawing die was produced on 15 January 1941. In February, a few tips for cutting-tools were made, but it was not until April 1941 that a tool tip capable of cutting steel at high speed was available. To make this cutting tool, the investigation team had to incorporate titanium carbide into the sintering matrix. Cobalt, the cementing component of tungsten carbide, was supplied by the Electrolytic Zinc Company from Risdon in Tasmania, a plant owned and operated by the Collins House Group, a BHP associate.40

The pilot plant work was complete by September 1941 and the development work required to take the prototype process out of the laboratory and into a manufacturing process commenced. In early October 1941, the first successful steel cutting tips were produced and by December 1941, only twelve months after the research and development effort had commenced, the secrets of the manufacturing process had been mastered.41 To put the development of tungsten carbide tools in Australia into context: in 1941, this product was only manufactured in quantity in three other countries — Germany, the United States of America and Sweden. Britain imported the bulk of its tungsten carbide tools from Sweden or from the United States. In view of the technical intricacy of the operations involved, the successful development of tungsten carbide tools in Newcastle, a regional city rarely recognised for its high technology capability, in such a short time should be regarded as a major triumph.42 Mellor notes that the Melbourne-based company Hard Metals Pty. Ltd. also developed a process for making tungsten carbide during the same period.43

40 Mellor, *The Role of Science and Industry*, p. 172
43 Mellor, *The Role of Science and Industry*, p. 172
The Defence of Newcastle 1939–1945

By 1935, it was clear that, in the event of a Pacific war, the Newcastle industrial area, together with the Northern Coalfields and the Port of Newcastle, had become one of the critically important locations requiring a significant local defence capability. The Newcastle Defended Area extended from Port Stephens in the north, south to the entrance of the Tuggerah Lakes and west to Muswellbrook. The key points to be defended were the entrance to Port Stephens itself, the whole of the Stockton Bight beach between Anna Bay and the entrance to the Newcastle Harbour, and the beach areas south to the entrance of Lake Macquarie. In December 1941, this area was defended by four fixed coastal defence forts, two major air bases and four army accommodation and training camps. Three of the forts — Tomaree at the entrance to Port Stephens, Fort Scratchley at the entrance to Newcastle Harbour, and the Park Battery, located on the high ground at the southern end of King Edward Park in the city — were armed with two six-inch (150 mm) calibre guns. This weapon fired a round which weighed 80 pounds (36 kg) to a range of 17 miles (27.3 km).44

The fourth fixed defence point was Fort Wallace.45 Fort Wallace was positioned between Fort Tomaree and Fort Scratchley, immediately north of the Stockton urban area. This fort was armed with two 9.2-inch (240 mm) calibre guns. These guns fired a round weighing 280 pounds (130 kg) to a range of 35 miles (56.36 km). The guns at all forts, except those at Fort Tomaree, were capable of firing inland as well. A much smaller fortified position, located on the Breakwater at Nobby’s, was armed with a six-pounder (2.72 kg) gun to control the entrance to Newcastle Harbour. Each fort was equipped with modern fire-control apparatus, and radar stations were positioned on the summit of the Tomaree Headland and above the Park Battery in Newcastle, to provide electronic surveillance over the sea and air approaches to the Newcastle Defended Area. The Tomaree Fort also included a torpedo-launching system that could cover the whole of the entrance to Port Stephens. In addition, to provide electronic surveillance for the control of defensive and offensive air operations, the Royal Australian Air Force operated radar stations to the north of the Williamtown Air Base at Anna Bay, on Ash Island and at Middle Camp, a position just to the north of the Catherine Hill Bay township.

44 War Office (Great Britain), Handbook of the 9.2–inch B.L. Guns, Land Service (London: His Majesty’s Stationery Office, 1902)
With the outbreak of war in the Pacific imminent, the Royal Australian Navy established a port examination service in Newcastle Harbour to check arrivals and departures of all shipping. On 1 August 1940, HMAS Maitland was commissioned and served as a naval transit station, manning the port’s war signal station, harbour defences and general security, and providing convoy support. Boom nets were installed at the entrance to the harbour for its defence and, in June 1942, a controlled minefield was laid across the harbour approximately 1300 metres west of Nobby’s. In August 1942, an indicator loop was laid seawards from the minefield with the indicator loop and minefield controlled from a building located on the Stockton foreshore. The last item contributed by the Royal Australian Navy to Newcastle’s defence was the construction and filling of a 5000-ton oil fuel tank on Elizabeth Street in Tighes Hill, together with the installation of the necessary oil-loading pipework connection. From March 1943, this tank provided a fuelling capability for naval ships based at or visiting Newcastle Harbour.46

Army accommodation and training camps were located at Rutherford, Largs, Greta and Singleton. Each of these camps, built progressively from mid-1940, provided accommodation and a training area for three to four thousand men. Each camp was positioned to make the best use of available rail- and road-movement facilities, but in an emergency the troops were no more than two days’ march from the sea and likely operational areas. Anti-aircraft batteries were positioned at a number of locations in the city suburbs, but were very mobile, easily relocated in and about the approaches to Newcastle and its industries.

On the night 7/8 June 1942, Newcastle itself came under attack from the Japanese submarine I-21. The submarine fired twenty-seven rounds into Newcastle and its industrial area, but no real damage was done from what was just a nuisance raid. Fort Scratchley returned the fire, consequently achieving the honour of being the only fort in Australia to have fired its guns in anger.47 However, this incident, relatively minor in the larger Pacific War theatre, did reinforce the need for the populace to accept the need for a higher level of sacrifice and the newly imposed national austerity and manpower regulations.

The Public Utilities

The key tasks of the public utilities, together with the services provided by local government, in time of war or public emergency, were, firstly, to maintain the availability and reliability of those services and products which allowed industry to maintain production and the associated urban area to continue functioning. Secondly, in times of emergency, public utilities also provided a reservoir of engineering design and construction management capability.

The Hunter District Water Supply and Sewerage Board

The Board’s initial war work involved the provision of water and sewage systems to the new army camps at Rutherford, Largs, Greta and Singleton, and the new air force bases at Rathmines and Williamtown. Table 6.2 details the size of the Water Board’s workforce between 1939 and 1944. Other wartime tasks included treating an enemy invasion as a positive threat and undertaking a range of passive safeguards for vulnerable equipment, such as sandbagging and camouflaging, to the provision of security watches and mobile maintenance teams. In addition, by working with NESCA, arrangements were made for the provision of alternative or redundant systems to supply electricity to pumping stations should the normal supply from the Railway System be interrupted.

Table 6.2: Hunter District Water Board Workforce 1939–1944

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<thead>
<tr>
<th>Year</th>
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<tbody>
<tr>
<td>1939</td>
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<tr>
<td>1940</td>
<td>2240</td>
</tr>
<tr>
<td>1941</td>
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</tr>
<tr>
<td>1942</td>
<td>1248</td>
</tr>
<tr>
<td>1943</td>
<td>744</td>
</tr>
<tr>
<td>1944</td>
<td>750</td>
</tr>
</tbody>
</table>


After December 1941, the Board’s Annual Reports show that a considerable amount of construction work on behalf of the Department of Defence was undertaken. This construction
work varied from being for the construction of fixed anti-aircraft emplacements in a number of locations, for the design and construction of command and observation posts on cliffs and beaches, to the manufacture of thousands of tetrahedrons. The tetrahedrons were designed to obstruct the movement of enemy tracked or wheeled vehicles as they crossed beaches. Some of these tetrahedrons may still be seen in the twenty-first century providing wave erosion protection to the sea-wall below King Edward Park.\textsuperscript{48}

With the coming of significant numbers of American troops during 1942, the Board’s construction teams erected camps at Tomaree, Gan Gan, Bob’s Farm, Nelson’s Bay and at Shoal Bay in the Port Stephens area. The largest defence project the Board undertook was the construction of the foundations of the Rutherford Munitions Works during 1941 and 1942. Also as a consequence of the increased industrial activity necessary to provide the tools of war, work was undertaken to enlarge the Tomago Water Scheme. This water scheme had been built immediately before the war to supplement the water supply from Chichester Dam, but it increasingly became the main source of water for the NIH.\textsuperscript{49}

**Electricity Supply and Distribution**

The electricity supply and distribution system in Newcastle was a story of growth in both the public and the private generation and distribution of the systems between 1935 and 1940. The decision to build a ferroalloy plant in the Newcastle steelworks in 1935 saw the electricity generation capacity of the steelwork’s power station grow from 10 mW in 1935 to 46 mW in 1940. The steelworks was now able to provide electric power directly to all of its subsidiaries. The newer BHP system remained interconnected with the Railway and NESCA systems, but this was the only form of interconnection Newcastle’s electricity system had. It remained an orphan, with little or no capability to recover from any major equipment failure. By 1939, all of the manufacturing and heavy engineering companies in the NIH relied on electric energy for both power and lighting. The change to electric power had begun during the First World War, had accelerated through the 1920s and 1930s, up to 1938, when all of the rolling mills in the steelworks were electrically powered.


\textsuperscript{49} Armstrong, *Pipelines and People*, p. 118
Growth of the Zaara Street Power Station

The construction of a second boiler house at Zaara Street had commenced in 1935, with two new boilers installed and commissioned by June 1939. These large high-pressure boilers supplied steam to a Brush-Ljungstrom turbo-alternator which was capable of generating 15,000 kW on a continuous basis. With the commissioning of this unit, the Zaara Street Power Station’s total installed capacity had grown to 57.5 mW. Late in 1940, serious problems emerged with the No. 4 turbo-alternator and repairs saw the unit out of service until May 1941. In June 1941, the electrical rotating parts burst and at one end the stator disintegrated, the debris killing a turbine attendant.50 The failure of this generating unit saw generation capacity at the power station fall by 26 per cent. It was now that the problem of Newcastle’s electrical orphan status was brought home.

Desperate measures were now required to interconnect the Railways system with Caledonian Colliery Power Station at Cockle Creek and the J. & A. Brown & Abermain Seaham Collieries’ Richmond Main Power Station in order to make up the supply of much-needed electric energy. Approval was given for the construction of a second 66 kV transmission line between the Hamilton substation and Gosford and the existing 33 kV transmission link between St Leonards and Gosford was upgraded to 66kV. By mid-1942, the Newcastle system was interconnected with the much larger Sydney system, this interconnection increasing both the availability and reliability of electric energy. As Mark Fetscher notes, in many respects this interconnection was the beginning of a state-wide power grid. The commissioning of the second turbo-alternator at BHP in April 1939 provided significant backup relief across the whole of the now fully integrated system. The Zaara Street Power Station continued to grow throughout the war period, making use of much second-hand plant and, together with the smoke from the steam trains, polluting Newcastle long after the war finished.

Industrial Relations

In the early months of 1940, it was becoming more obvious that Australia’s manpower problem was also being transformed into an industrial relations problem. In Newcastle, the early 1930s had seen not only a fall in industrial disputation, it had also been accompanied by a dramatic fall in union members. Nonetheless, during the final years of the decade, a growing communist influence saw membership in the FIA begin to grow, very much in line with the fall in the number

50 Mark Fetscher, Power Stations of the N.S.W.G.R. (Charleston: the author, 2002), p. 67
of unemployed. Unions which represented skilled workers, such as the AEU and the ETU, did not have the same trouble maintaining their membership.

In 1939, a new award for Newcastle’s steel industry reflected both the industry’s prosperity and the changes in working conditions through the introduction of newer technology which had taken place since the last award in 1925. Justice Cantor remarked on the reduction in the arduousness of the production work, but, to some extent, this had been offset by increased complexity and greater responsibility for the safety of fellow-workers and for the quality of the product. Helen Hughes comments that the award saw many margins increased, in accordance with the greater variety of skills employed. The basic wage of 1938 had fallen from the £4 4s. 0d. of 1925 to £4 2s. 0d. and the margins had fallen from 14s. 3d. in 1925 to 10s. 6d. a week due to increased mechanisation. The unions had also filed a claim for annual paid holidays. In response, Justice Cantor awarded paid leave of one week for day workers and for six-day-shift workers, together with penalty rates of double time for Sundays and holidays such as Christmas Day and Good Friday and time-and-a-half for other holidays.

The increased mechanisation of many semi-skilled production jobs had grown at the expense of skilled ones. These changes in the working environment tended to be more pronounced at the BHP steelworks, for the downstream steel fabrication subsidiaries had generally commenced operations with highly automated plant, organised to manufacture their standard product. The degree of product standardisation enhanced the opportunities for mechanisation. Nevertheless, BHP’s attitude to the union movement had not changed from its generally negative and sometimes aggressive approach. Generally speaking, this attitude was not always reflected in the downstream subsidiaries, but academic comment regarding industrial relations tended to concentrate on the BHP circumstance.

However, the black coal industry remained a wellspring of industrial disputation. A forty hour week was a long-standing objective of the union movement and the unions were disposed to see the conditions of war strengthening their bargaining position. Butlin comments that, in spite of constant minor friction, the trade union movement had a general suspicion of the

51 Helen Hughes, 'Industrial Relations in the Australian Iron and Steel Industry, 1876−1962', *Journal of Industrial Relations* 4 (1962), p. 129
52 Hughes, *The Australian Iron and Steel Industry*, p. 125
53 Hughes, *The Australian Iron and Steel Industry*, p. 127
54 Hughes, *The Australian Iron and Steel Industry*, p. 124
Federal Government as it introduced manpower controls. Nonetheless, the major industrial problem area was in the coal industry. The reasons for this attitude were not difficult to fathom, particularly given the industrial disputation of 1929 and 1930 in the South Maitland Coalfields. In the 1940s, Australia was a nation driven by steam and the great bulk of that steam was created by burning black coal. Only in Victoria was brown coal used and, even there, was only used to heat houses in the form of briquettes and to generate electricity. Tasmania was fortunate and used Hydro power exclusively to generate electricity. At the time, 70 per cent of all the black coal mined in Australia came from the South Maitland Coalfields.

Between March and May 1940, the collieries on the South Maitland Coalfields and the Northern Coalfield went on strike for ten weeks. The central issue in the dispute was hours of work, an award having conceded a forty hour week to all underground workers while setting the working hours for the surface workers not in direct contact with coal at 86 hours a fortnight. By 4 April 1940, some 35,000 workers were idle as a consequence of the coal strike. This strike was exacerbated by a range of waterfront stoppages and a number of minor stoppages in the NIH. Yet the ongoing impact of the coal dispute saw Prime Minister Menzies travel to Kurri Kurri to directly address the miners on 20 April 1940. The meeting was to no avail and the strike continued into May 1940. From the NIH perspective, the strike had little immediate impact, as BHP maintained a twenty-six week stockpile of coal on the site, although gradually the shortage of coal did begin to impact operations. The only real outcome of the strike was that after the defeat of the allied armies in France and the Dunkirk evacuation a compromise was agreed where both sides reverted to the status quo, subject to a re-examination of the issue by the Arbitration Court. The government did begin a serious investigation regarding the activities of the Communist Party of Australia (CPA), but little appeared to be achieved.

Industrial disputes continued, but on a national scale were heavily weighted against the black coal industry as compared with other industries. Butlin notes that in 1941 black coal mining suffered 395 disputes compared with only 172 disputes in all other industries. It is also apparent that with the German invasion of Soviet Russia in June 1941, the frequency of strike action fell away.

55 Butlin, War Economy, 1939−1942, p. 241
56 Mellor, The Role of Science and Industry, p. 210
57 ‘Miners Boycott Prime Minister: Mr. Menzies Meets Men on Own Ground’, The Canberra Times (Canberra, ACT), 20 April 1940, p. 1; ‘Mr. Menzies’ Talk to Miners. Reply: “Strike to Go On”’, The Argus (Melbourne, Vic), 20 April 1940, p. 1
58 Henderson, Menzies at War, p. 69
59 Butlin, War Economy, 1939−1942, p. 241
60 Henderson, Menzies at War, p. 70
61 Butlin, War Economy, 1939−1942, p. 240
Conclusions

From a manufacturing point of view, by the end of 1941 production in the munitions annexes had matured and it was obvious that the Department of Munitions and its Director General were in control. Some shortages of machine tools remained, although this was being overcome as Australian companies explored the intricacies of machine tool manufacture. The NIH had had a number of manufacturing successes, had developed new products and manufacturing systems and had seen its membership grow. Also, west of Newcastle a new ammunition filling plant was under construction at Rutherford, courtesy of the civil engineering design and project management skills of teams from the Hunter District Water Supply Board. In this way, the NIH was demonstrating its capacity for the design and development of products and engineering capability.

Nationally, the largest cloud on the horizon loomed over the Pacific Ocean, concerning the attitudes and intentions of Japan. This was the great unknown, not made any easier by the degree of political uncertainty and lack of direction from the national government. Menzies had been toppled in August 1941 and Arthur Fadden became the Prime Minister; a move that only heightened the perception of political instability. Then, on 3 October 1941, the two independents on whom Menzies, and now Fadden, relied deserted the Federal Government and John Curtin became the Prime Minister. From a Newcastle perspective, there was little immediate change. The changes that would affect the NIH most would come in the first quarter of 1942, with the impact of the level of Japanese naval and military success and a profound change in Labor Party policy.
At the Annual Meeting of BHP, conducted in August 1943, the chairman Harold Darling, in his report to the shareholders, made the following point regarding steel production:

Without steel a country today is as helpless as a stone-age Aborigine against a modern gangster. Australia before 1914 was just such a country. Separated from her sources of steel by 7,000 to 11,000 miles …. Since 1914, Australia has survived nearly eight years of war. She was saved in her first war by the miracle of having Japan at her side and by the second miracle of opening the great BHP steel-works in 1915. By 1939 that steel plant, under private management had grown to be a significant force in world steel production …. Within this short period of twenty-five years Australia has become self-sufficient in steel. Her production per capita is roughly equal to that of Great Britain, more than double that of Soviet Russia, and five times that of Japan. Only Germany and the United States can claim a higher per capita production. Thus in the period between the two wars, Australia has moved from her Stone Age to a point where she could make a ferocious ultra-modern defence of herself against any country attacking her.¹

Largely as the result of the expansion of the NIH over the previous twenty-five years, Newcastle had become the hard core of Australia’s steel industry. As Table 7.1 shows, the bulk of iron and steel production between 1939 and 1945 occurred in Newcastle. The NIH also contained the four largest steel fabrication plants in Australia and together with the new State Dockyard was also a major centre of heavy engineering.

This chapter will discuss the influence that the adoption of a total war economy had on industrial relations, technical education and training in the NIH. In the period between December 1941 and August 1942, there was a real fear that Australia, or parts of it, might be invaded and occupied by Japan. This circumstance had a real impact on the more radical and militant in organised labour, with the result that for the great bulk of 1942 industrial disputation, never far below the surface in Australia in normal times, declined significantly. To some extent this was helped by having a Labor Government in power, which in 1942 was

¹ Alan Trengove, *What’s Good for Australia..!: The Story of BHP* (Stanmore: Cassell Australia, 1975), p. 172
able to convince organised labour of the direct danger to the country. The Curtin Government had gained sufficient trust to introduce regulations for the control of labour that few had considered possible just six months before. Table 7.1 outlines the production of steel in Australia between 1939 and 1945.

Table 7.1: Australian Steel Ingot Production 1938/39 to 1944/45

<table>
<thead>
<tr>
<th>Year</th>
<th>Ingot Steel Newcastle</th>
<th>Ingot Steel Port Kembla</th>
<th>Total Ingot Steel Aust.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1938/39</td>
<td>884,649</td>
<td>287,138</td>
<td>1,171,787</td>
</tr>
<tr>
<td>1940/41</td>
<td>1,040,272</td>
<td>606,836</td>
<td>1,647,108</td>
</tr>
<tr>
<td>1941/42</td>
<td>1,030,361</td>
<td>669,434</td>
<td>1,699,795</td>
</tr>
<tr>
<td>1942/43</td>
<td>955,940</td>
<td>676,885</td>
<td>1,632,825</td>
</tr>
<tr>
<td>1943/44</td>
<td>906,822</td>
<td>620,742</td>
<td>1,527,564</td>
</tr>
<tr>
<td>1944/45</td>
<td>847,109</td>
<td>388,000</td>
<td>1,235,109</td>
</tr>
</tbody>
</table>

Sources: D. P. Mellor: The Role of Science and Industry (Canberra, 1958), p. 75; Christopher Jay, A Future More Prosperous (Newcastle, 1999), p. 254

In the first six months after taking office in October 1941, the new Curtin Labor Government saw Australia’s war situation change from a distant European and Middle Eastern war to a close-at-hand Pacific war. This dramatic change in the war situation demanded instant changes through the adoption of total war strategies in the management of the war and of the Australian economy. For the NIH, in parallel with the advances in the application of new technologies, and as a result of the naval victories in the Pacific won by the United States Navy by July 1942, it became clear that the direct danger of an invasion had lessened or passed. With the obvious decline from the danger of an invasion, some in organised labour saw an opportunity. During the 1920s and 1930s, union membership in the NIH steel companies was barely maintained at 50 per cent of the production labour force. On the other hand, union membership among the skilled workers had been as high as

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100 per cent of a particular skill set. The Fitters and Turners in the AEU and the electrical tradesmen in the ETU provide good examples of such.\(^4\)

Throughout the 1920s and 1930s, BHP had ruthlessly dominated the industrial struggle, vigorously discouraging union membership through the repeated dismissal of active unionists from its production workforce. This action, when coupled to the high and persistent unemployment of unskilled labour outside of the steel industry throughout the 1920s and early 1930s, contributed to the maintenance of a docile workforce.\(^5\) The onset of war in 1939 saw little immediate change in this situation. However, aided by a conservative government and early wartime paranoia, in mid-1940 BHP was able to dismiss twenty-eight workers who were either active trade unionists or officials of the FIA steelwork’s Newcastle sub-branch.\(^6\) This sub-branch was suspected of having communist cadres in its ranks and progressively purged, but after this dismissal the union quietly made strong gains in membership.

**Industrial Disputes in the NIH**

As the war rolled on, the forty-four hour week, combined with the compulsory overtime that men were required to work, absenteeism and the frequency of essentially minor industrial disputes, became an increasing frustration. However, in the 1941/42 production year, despite these minor disputes, Newcastle’s steel production peaked at more than one million ingot tons. In turn, the parallel growth in union membership encouraged the union militants. This militancy had a history which reached back into the closure of the steelworks in the 1920s, breeding an increased level of organised labour determination and inflexibility, a feature that was matched and sometimes exceeded by BHP itself. The appointment of operative workers to staff positions was a real industrial issue for production workers. Nevertheless, BHP persisted in making these appointments in an effort to safeguard itself against the growing union strength and to maintain management prerogatives.\(^7\) Operative staff were production workers employed under the same conditions as a foreman, but without supervisory authority. They were employed on a fortnightly basis and could have access to the staff superannuation scheme, but to enjoy these advantages they had to leave the union.

\(^5\) Warwick Eather, ‘BHP, the Intransigent Rank and File and the 1943 Lockout at the Newcastle Steelworks’, *Labour History* 59 (1990), pp. 28-44, p. 30
\(^6\) Eather, ‘BHP, the Intransigent Rank and File and the 1943 Lockout’, p. 30
\(^7\) Hughes, *The Australian Iron and Steel Industry*, p. 6
Total War and Manpower Regulations

The outbreak of war in the Pacific ushered in a condition of total war in Australia. This meant that the Federal Government needed to mobilise the total resources of the nation; the fall of Singapore on 19 February 1942 brought some urgency to this mobilisation. Government controls were imposed to control profits and wages, and on capital, but stringent controls were placed on the nation’s most scarce resource, manpower. A new system of compulsory registration, which required all citizens to apply for a national identity card, was introduced and an additional number of men were made liable for military service. All married men between 35 and 45 years of age and single men from 45 to 60 years of age were required to present for a medical examination. If found fit and not reserved for essential services they were drafted into the Australian Military Forces.8

Under this mobilisation order, regulations were made to compel men and to encourage women to work in the steel industry. There was considerable opposition from some in the Labor Party and from organised labour, but, on a national basis, the number of persons engaged in war work in February 1942 increased from 554,000 men and boys, and 74,800 women and girls, to 1,172,000 and 184,500 in March 1943. In Newcastle, this meant that some men who had retired returned to work and many who had worked in a non-essential industry now worked in the steel industry, but more significantly it meant that women could now be directly employed as production workers in the steel industry. Women were quickly employed and trained to operate machines and to conduct a range of production-work tasks. The total number of women employed in the NIH is difficult to confirm but Warwick Eather identified that 2000 women were employed in the NIH between 1942 and 1945.9

Women were employed at BHP in the tool room, at Ryland Bros., manufacturing sub-assemblies for barges and tugs, and at Lysaght manufacturing Owen sub-machine guns; at Stewarts and Lloyds, women worked in a number of departments. Figure 7.1 shows a woman machinist operating an automatic vertical lathe to machine artillery shells. The prospect of female employment alarmed the Newcastle unions, due to the differences in

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8 Hasluck, The Government and the People, 1942–1945, p. 116
wages, but the government undertook to ensure that women would only be employed for the duration of the war.\textsuperscript{10}

\textbf{Figure 7.1: Woman Machinist at Stewarts and Lloyds in 1942}

\begin{center}
\includegraphics[width=\textwidth]{image}
\end{center}


While the number of industrial disputes that resulted in work stoppages was low during 1942, the attitude of the employers and the manpower authority intensified a deteriorating labour relations environment in the steel industry. Beginning in the last quarter of 1942, industrial disputation in the NIH, particularly at the BHP steelworks progressively

\begin{flushend}
\textsuperscript{10} Eather, ‘The Trenches at Home’, p. 117
\end{flushend}
became increasingly serious. These industrial disputes have been investigated in detail by Warwick Eather, in both *Labour History* articles and in a Ph.D. dissertation.\(^{11}\) To illustrate these points of increasing union militancy in the NIH, two industrial disputes and a rather bizarre black ban that was applied to the drinking of beer, which occurred during 1943, will be discussed.

**Ryland Bros. and the Employment of Women**

The first industrial dispute examined occurred at Ryland Bros., a company that normally manufactured steel wire products and in line with government directives had begun to employ women in early 1942. Eather observed that the rank and file reaction from men to the employment of women in the steel industry was sometimes difficult to judge.\(^{12}\) However, during March 1943, there was one instance of men striking over the work that women performed during the war at Ryland Bros. This dispute was between Ryland Bros. and the FBSA. It arose when the company began employing women as welders in the fabrication of sub-assembly components for barges, then being built by BHP. The women were initially paid 90 per cent of the second-class welder’s award rate, as specified by the Women’s Employment Board (WEB) — the male basic wage plus a 14s. per week margin. To see the impact of this claim by the FBSA, Table 7.2 details the nominal average wage paid to men and women between 1939 and 1946.

After further training, management decided to employ women in welding stiffeners for bulkheads, another sub-assembly used in the barge building project. This was a repetitive job, with each component assembled in a jig with the weld locations marked. Management determined to pay the women the same rate as previously awarded by the WEB, instead of the first-class rate demanded by the FBSA. The difference between the two rates was approximately 8s. per week.\(^{13}\)

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\(^{11}\) Eather, ‘The Trenches at Home’, p. 126
\(^{12}\) Eather, ‘The Trenches at Home’, p. 126
\(^{13}\) Eather, ‘The Trenches at Home’, p. 128
Table 7.2: Nominal Real Wages 1939 to 1946

<table>
<thead>
<tr>
<th>Year</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>s. d.</td>
<td>s. d.</td>
</tr>
<tr>
<td>Aug 1939</td>
<td>95s. 0d.</td>
<td>51s. 0d.</td>
</tr>
<tr>
<td>March 1941</td>
<td>118s. 3d.</td>
<td>63s. 10d.</td>
</tr>
<tr>
<td>May 1942</td>
<td>121s. 3d.</td>
<td>67s. 11d.</td>
</tr>
<tr>
<td>Dec. 1946</td>
<td>130s. 11d.</td>
<td>78s. 6d.</td>
</tr>
</tbody>
</table>

Source: Commonwealth Year Book, 1946/47, pp. 466–68

The FBSA objected to the proposed limitation in re-numeration, claiming that the women should have been elevated as added tradesmen under the dilution regulations. Ryland Bros. notified the Commonwealth Court of the dispute, the case was heard, but the judge disallowed the FBSA's claim.\(^{14}\) Accordingly, management directed the women to continue with the work, but six men refused to work with the women. On 30 June 1943, after again refusing to work with the women, the men were dismissed and the matter again referred to the Commonwealth Court. The court ruled that its original decision stood and prescribed a £10 penalty for each man on every occasion a boilermaker or boilermaker's assistant refused to work with women.\(^{15}\) This action by the Commonwealth Court was condemned by many in the union movement, but the ruling was maintained. The women continued with the sub-assembly work and the BHP barge project proceeded as detailed above until the project was completed in October 1944. This dispute demonstrated two points: firstly, the scope and immediacy of authority that could be exercised under the manpower regulations; secondly, it also exhibited the degree of obstinacy and poor judgement that some in the union movement were capable of.

BHP, the 1943 Lockout and an Intransigent Workforce at the Newcastle Steelworks

The second industrial relations dispute discussed occurred on 15 December 1943, when BHP began to retrench employees from its Newcastle steelworks. Three days later, it ignored an order from the NSW Industrial Commission to re-employ all workers and

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\(^{14}\) Eather, 'The Trenches at Home', pp. 127–29

\(^{15}\) Eather, 'The Trenches at Home', p. 130
commenced a lockout, an almost standard company response to union disputation. Eather observed that the company had chosen this path in an attempt to regain total control of the workplace.\textsuperscript{16} He also noted that, since 1941, BHP had seen its powerful position as an employer progressively eroded. This occurred through a combination of wartime legislation, ongoing manpower shortages and a new-found confidence in the organised labour movement, together with the commitment of the Curtin Government to provide qualified support for the unions.

Eather maintains that this whole industrial issue was the result of a series of interrelated and complex events. These events were made more volatile by the actions of a militant section of the FIA rank-and-file union members, together with the obstinacy of BHP as it sought to re-establish control over its workforce. The obstinate attitude of both parties to this dispute was aggravated by the inability of the industrial and, in some cases, the union management, to curb the recalcitrant attitude of the workers directly involved in the dispute. A fact that contributed to the increased industrial disputation was that, under the new manpower regulations, BHP, as the employer, had lost the right to hire and dismiss those workers it wished. This gave some militant unionists encouragement to struggle.\textsuperscript{17}

The events that culminated in the lockout of December 1943 had originated twelve months before, during the last quarter of 1942. On 1 October 1942, the government amended the National Security (Holiday and Annual Leave) Regulations, to restrict public holidays between 1 December 1942 and 28 February 1943 to just three days: 25, 26 and 28 December.\textsuperscript{18} Employees were forbidden to absent themselves and employers were forbidden to close their works on any other day. Under the provisions of the Steelworks Employees (Broken Hill Pty. Co. Ltd.) Conciliation Committee Award (BHP Award), employees directed by the steelwork’s management to work on these days were expected to do so. Workers not required to work on this public holiday were paid a day’s wage at ordinary rates for each day not worked.\textsuperscript{19} Maintenance employees were required to work on all or part of these three days in accordance with the maintenance programme. The maintenance employees required for the period were mostly bricklayers, bricklayer’s

\textsuperscript{16} Eather, ‘BHP, the Intransigent Rank and File and the 1943 Lockout’, pp. 28–44
\textsuperscript{17} Eather, ‘BHP, the Intransigent Rank and File and the 1943 Lockout’, pp. 28–44
\textsuperscript{18} Eather, ‘BHP, the Intransigent Rank and File and the 1943 Lockout’, pp. 28-44
\textsuperscript{19} P. McHenry, General President, Federated Ironworkers’ Association (FIA) to D. Morrison, Deputy Industrial Officer, Commonwealth Court of Conciliation and Arbitration (CCCA), 5 February 1943, FIA/E170/9/49, Newcastle Trades Hall Records, University of Newcastle Archives
labourers, riggers and construction men. For each day worked, they would be paid the award rate of time and a half, but the unions contended that the rate should be double time and a half. On 22 December, this claim by the unions was reviewed by the Industrial Commission, but no increase in pay was authorised, as the National Security (Economic Organisation) Regulations forbade any increase.  

Protesting against this ruling and against the wishes of their unions, the bricklayers, bricklayer’s labourers and the riggers absented themselves and did not work on any of the public holidays. Consequently, management refused to pay the eight hours’ single time they would normally have been paid for the public holiday. In retaliation, the bricklayers, bricklayers’ labourers and riggers imposed an overtime ban, which stayed in place for a month. Once the overtime ban was lifted, the Industrial Court heard the complaints and claims from both parties, but ruled that the men were not entitled to payment. In response to this ruling, the men involved in the dispute immediately reimposed the overtime ban. This, in turn, had a ripple effect on various other planned maintenance programmes: sixteen production hours were lost in the shot and shell annexes because of maintenance delay and the relining of the No. 1 blast furnace was delayed during May. Union officials were unable to convince the men to lift the overtime bans and the dispute moved into uncharted waters. Also during May, the FIA and the Building Workers Industrial Union of Australia (BWIUA) met with the BHP Industrial Officer and demanded that BHP pay the workers for the three days not worked during the previous Christmas holiday period. BHP rejected the union’s demand and the matter was referred to the Industrial Commission. Conferences were held throughout the year and, on 23 November 1943, the BHP Award was varied to allow the worker to be either paid the appropriate penalty rate or have an additional day without pay added to their annual leave.  

During the period covered by these hearings, BHP attempted to have the standard working week increased from forty-four to forty-eight hours. The aim of this proposed change was seemingly to offset a worsening labour shortage at the Lysaght Works and at the new NSW Government Dockyard. Eather states that about 600 men were to be relocated; 200 would be employed at new positions in the steelworks and its subsidiary companies, while the remaining 400 would be referred to the Manpower Office for relocation.

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20 Eather, ‘BHP, the Intransigent Rank and File and the 1943 Lockout’, p. 31
21 Eather, ‘BHP, the Intransigent Rank and File and the 1943 Lockout’, p. 33
22 Eather, ‘BHP, the Intransigent Rank and File and the 1943 Lockout’, p. 33
to either Lysaght or the new State Dockyard. Employees remaining at BHP would be paid overtime rates, or time and a half, for the additional four hours worked. Eather makes the point that management suspected that the proposal would induce widespread condemnation from the unions and sought support from the Director General of Manpower, W. C. Wurth. Wurth and Justice Cantor of the Industrial Commission agreed with BHP's proposal and convened a conference in an effort to overcome opposition from the unions.

The conference began in June 1943, and after the initial discussion the unions agreed to recommend acceptance subject to BHP accepting six additional conditions. In turn, BHP rejected the union's proposals and threatened to drop the whole proposal. In the meantime, the continuing overtime bans imposed by the bricklayers, bricklayer's labourers and riggers were now delaying the start of a partial reline of the No. 2 blast furnace. BHP intended that the furnace repairs would be conducted on a shift-work basis, but the repair teams then widened their overtime ban to include shift work. The furnace was blown out on 19 August and the repairs took twenty-eight days to complete — twelve more than if the work had been conducted on a shift-work roster. A full bench of the Industrial Commission heard the case, informing the parties a refusal to work shift work could not be countenanced. The union, even after a directive from the union Management Committee, were unable to have their members lift the bans.

The results of all of these manoeuvres led to the combined unions conducting on 18 October 1943 a twenty-four hour stop-work meeting for the whole plant. Given that only 1500 men out of a total union workforce of 5100 actually attended the meeting, it is difficult to see how the secretary of the Newcastle Trades Hall Council (NTHC) could describe the meeting as 'a triumph for unity.' However, the stoppage alarmed BHP management and, of a total workforce of 7162, only 2074 reported for work. This total included 1056 staff employees (all non-union members), 680 apprentices, 52 trainees, and 154 employees whose classification was unknown. The stoppage halted all production at the steelworks and resulted in the loss of 4000 tons of steel. Given the success of the strike, BHP was concerned that the unions

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23 Eather, 'BHP, the Intransigent Rank and File and the 1943 Lockout', p. 33
24 Eather, 'BHP, the Intransigent Rank and File and the 1943 Lockout', p. 31
25 Federated Ironworkers' Association of Australia, Newcastle, Branch Management Committee minutes, 30 August 1943, FIA/E128/147, Newcastle Trades Hall Records, University of Newcastle Archives
26 Louden to all Union Secretaries, 19 August 1943, NTHC /A5062/1943, Newcastle Trades Hall Records, University of Newcastle Archives
27 Eather, 'BHP, the Intransigent Rank and File and the 1943 Lockout', p. 37
would repeat the action and appealed to the Federal Government for assistance, but the Minister for Labour and National Service, E. J. Holloway, was not impressed. Ultimately, all employees who stood down or were suspended were to be paid for all time not worked and the Minister could now specify a date from which these employees were to be re-employed.

At this point, it is important to assess how the lockout had affected the FIA. An industrial lightweight before the war, the union now believed that it had come of age. On 15 December 1943, as the consequence of absenteeism, a seniority issue occurred in the No. 3 blast furnace, which led to a sit-down strike by one shift. BHP determined to bring the men to heel by employing its standard lockout strategy and retrenched all of the blast furnace workers involved. This move incensed production workers across the plant and over the next three days the company retrenched 1700 men and began to close the works down. Both the men and BHP were at fault and at a compulsory conference, held on 17–18 December 1943, Justice Cantor ordered that the plant be totally reopened from midnight on 18 December. The plant reopened as specified, although the dispute rolled on into February 1944, specifically concerning pay for the men who had been illegally retrenched. Ultimately, the men received payment and the FIA union stated that BHP had suffered an ignominious defeat, with the Government backing the union to the limit. However, in most respects the whole outcome of these relatively minor disputes was not victory for the union or the company, but it did demonstrate that the big end of town now had a labour-based rival who could be equally obstinate.

**Schooners versus Middies**

The third industrial dispute discussed was not really an industrial dispute at all, but a somewhat bizarre attempt by the union movement to assert its influence over the community as a whole. For six weeks from 1 March 1943, Newcastle unions and local branches of the Australian Labor Party (ALP) placed a black ban on publicans who restricted the sale of schooners (15 oz. glasses) of draught beer between 4.00 p.m. and 6.00 p.m. The publicans were acting in accordance with directions issued by the NSW Branch of the United Licensed Victuallers’ Association (ULVA) and the Commonwealth Labor Government.

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28 Eather, ‘BHP, the Intransigent Rank and File and the 1943 Lockout’, p. 38
29 Eather, ‘BHP, the Intransigent Rank and File and the 1943 Lockout’, p. 44
In early 1942, the brewers had been directed by the Commonwealth Government to reduce the manufacture of beer by one-third in order to save sugar. As a result, beer supply quotas were placed on all hotels. At this point, the William McKell ALP government in NSW reduced hotel trading hours to between 11.00 a.m. and 6.00 p.m., a reduction of two hours. McKell also banned the delivery of liquor to any location except to licenced premises, at the same time banning the sale of alcohol to women in hotel public and saloon bars. In parallel with these actions, the Commonwealth Government increased the excise on beer twice over a nine month period during 1942. These were increasingly hard times for Newcastle beer drinkers.

The increased cost of beer and the reduction of supply resulted in consumers’ switching to schooners (15 oz.) rather than the smaller middy (10 oz.). In the interest of equitable distribution, some Newcastle publicans began restricting the sale of schooners between 4.00 p.m. and 6.00 p.m., a standard after-work drinking period if you were a day worker. The NTHC and some ALP branches believed that this restriction had more to do with the publicans’ profit margins, rather than the equitable distribution of beer. Over a three-week period, meetings were held and many words uttered, which resulted in a black ban being placed on a number of hotels in Hamilton and Wallsend. Union members who ignored the ban could be fined between £2 and £5 by the union. Irrespective of this restriction, the ban was largely ignored and men drank beer where they pleased.

The Government did not support the actions of the NTHC and this eventually forced the NTHC to accept reality. On 12 April 1943, Newcastle unionists ended their campaign to purchase schooners of beer during all hotel trading hours. It was possible that this dispute was not about equity in the distribution of beer, but it was really a way of Newcastle’s union movement laying a claim to be able to influence or direct the community over any issue it wished to. What did these three disputes really mean in the NIH? Fundamentally, they meant that after more than twenty years of accepting the threat of unemployment or dismissal if a person was a union member, the union would now protest and strike if necessary. This, together with what the unions believed to be low pay and poor conditions of

31 ‘Seek Basis for Beer Strike Settlement: Dr. Evatt and Senator Keane to Confer’, *Newcastle Morning Herald and Miners’ Advocate* (Newcastle, NSW), 4 March 1943, p. 2; ‘Unions Await Reply on Beer Issue’, *Newcastle Morning Herald and Miners’ Advocate* (Newcastle, NSW), 31 March 1943, p. 2
32 Eather and Cottle, ‘Middies, Schooners and Pints’, pp. 7–17
work, provided organised labour in the NIH with opportunities to flex their industrial and political muscles. Many in organised labour believed that with the growth in numbers they now had the financial strength to deal with BHP and the steel fabrication companies. They believed that organised labour in Newcastle was now a factor which could no longer be ignored.

Black Coal

Industrial disputes in the NIH did not usually result in serious or extended strike action. However, the great bulk of working days lost to strike action in Australia were due to industrial disputes in the black coal industry. In 1942, 82 per cent of the black coal mined in Australia came from NSW. Black coal mining in Victoria and Tasmania was principally for the use of the state railways. In Western Australia, black coal was reserved for the state railways and electric power generation plants. The black coal mining industry had only been developed in these states due to what they believed to be the high price and unreliability of coal deliveries from NSW. On occasion, Western Australia had imported black coal from India and South Africa in an effort to defeat the unreliable nature of coal deliveries from NSW. Table 7.3 outlines the production of black coal in Australia in 1942.

For the whole period of the war, 80 per cent of the black coal mined in NSW was produced by the Northern Coalfields, all of which were located in the lower Hunter Valley or in and around Newcastle. As this area also produced the best gas-making coal, it was in high demand in both the intrastate and interstate coal markets. However, for a number of reasons the Northern Coalfields, particularly those mining the South Maitland and Greta seams, had a particularly militant workforce, as well as being home to the coal owners’ vend or cartel. During this first period of total war, this militancy was exacerbated by two factors, firstly the relative isolation and insularity of the towns of the South Maitland Coalfields and, secondly, coal mining’s long-term industrial history. This history was particularly aggravated by the failure of a sixteen month long strike during 1929 and 1930.
Table 7.3: Black Coal Production in Australia in 1942

<table>
<thead>
<tr>
<th>State</th>
<th>Tons Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>New South Wales</td>
<td>12,236,219</td>
</tr>
<tr>
<td>Victoria</td>
<td>312,854</td>
</tr>
<tr>
<td>Queensland</td>
<td>1,637,148</td>
</tr>
<tr>
<td>South Australia</td>
<td>1650</td>
</tr>
<tr>
<td>Western Australia</td>
<td>581,176</td>
</tr>
<tr>
<td>Tasmania</td>
<td>134,442</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14,903,489</strong></td>
</tr>
</tbody>
</table>


Another factor was the opposition by the mining unions to the introduction of any form of mechanisation in the mines. The miners believed that when the machine came into the mine the man went out.33 Apart from the mines operated by BHP Collieries, which were highly mechanised, few mines had any significant levels of mechanisation.34 This was not helped by what can only be described as the grossly inefficient logistics system used to move the coal from the mine to either the end customer or to the shipping point at the Port of Newcastle. A good example of this logistic mess concerned the wagons used to move the coal from the mine to the shipping point in Newcastle. The wagons were known as ‘four-wheel, non-air, hopper wagons’.35 For emptying, the hopper was fitted with a bottom trapdoor which was opened over the hold of a ship, or open-air stockpile, by a man known as the 'pin boss'. The non-air feature referred to the lack of air brakes fitted to the wagon, a factor which limited the speed of a loaded coal train to little more than 15 km per hour. This was a logistic movement system that had been in place since the 1880s.36

34 Hughes, *The Australian Iron and Steel Industry*, 99
35 A four-wheel non-air hopper rail wagon was used to carry coal from the Newcastle and South Maitland Coalfield collieries to the ship loading point in the Port of Newcastle; engineering description: a four-wheel non-air hopper wagon is of timber-framed construction, mounted on a steel underframe, and discharges through a bottom door. Load capacity ten to twelve tons. The wagon is equipped with a hand-operated ratchet brake, chain draw gear, buffers and spoked wheels.
36 Ian Stewart, ‘Taming the River and the Sea’, in Armstrong, John (ed.), *Shaping the Hunter: A Story of Engineers, and the Engineering Contribution to the Development of the Present Shape of the...
The mine owned all of the wagons used to move coal to the shipping point. End customers, such as BHP or the power stations, maintained their own stockpiles of coal; BHP kept up to twenty-six weeks of supply in its own stockpile. If, because of a shipping delay, the mine had used all of its wagons to move coal to the port, no coal could be mined until sufficient empty wagons had been returned to the mine for loading. The collieries had very limited stockpiling capacity at the mine. Any shipping delay caused the loaded wagons to be held at the Morandoo rail sidings at Carrington. This railyard could hold up to 5000 wagons, holding 50,000 tons of coal, which in effect became a just-in-time rolling stockpile. This logistic problem, when added to the frequency of industrial action at the mine and sometimes at the coal loading point, caused significant cumulative problems for all downstream coal users. Table 7.4 details the number of working days lost in industrial disputes on the coalfields and compares them with the time lost in all other industries in Australia between 1939 and 1943. The table clearly shows the preponderance of lost time in the coal industry when compared with all other industries.

Table 7.4: Working Days Lost
in Industrial Disputes 1939–1943 (‘000)

<table>
<thead>
<tr>
<th>Year</th>
<th>Coal Mining</th>
<th>All other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1939</td>
<td>291</td>
<td>168</td>
<td>459</td>
</tr>
<tr>
<td>1940</td>
<td>1371</td>
<td>136</td>
<td>1507</td>
</tr>
<tr>
<td>1941</td>
<td>276</td>
<td>708</td>
<td>984</td>
</tr>
<tr>
<td>1942</td>
<td>178</td>
<td>200</td>
<td>378</td>
</tr>
<tr>
<td>1943</td>
<td>326</td>
<td>664</td>
<td>990</td>
</tr>
</tbody>
</table>


After the ten-week strike on the South Maitland Coalfields during early 1940, the number of working days lost through industrial action fell during 1941, then, under the psychological impact of the threat of invasion, the number of lost working days fell further in

*Hunter Region, its River, Cities, Industries and Transport Arteries* (Newcastle: Institution of Engineers, Australia, 1983), 19

165
However, with regard to the critical need for reliable coal supplies and the spate of totally unpredictable strikes across the Northern Coalfields in February 1942, Curtin, in an address made at the Melbourne Trades Hall made the point that:

I am not going to allow the activities of a few malcontents to stultify the activities of my Government. I do not intend to apologise to anybody for having used the National Security Regulations against the coal miners ... while men are dying and making sacrifices for the security of Australia, other people are trying to hold up essential war materials such as coal.38

These were strong words, but they were spoken from afar and might have been better spoken direct to the coal miners, as Menzies had done in 1940.39 The industrial problems with the miners working in the coalfield were not solved until alternative supplies became available with the development of large-scale open cut mining in the early 1960s.

**Technical Training**

During the first two years of total war, technical education in Newcastle continued at each of the technical college sites, Tighes Hill, Wood Street and at the original college site in Hunter Street. In 1942, the W. E. Clegg Building, a facility dedicated to skilled trade training was opened at the Tighes Hill site. With the completion and equipping of this building, the Tighes Hill College was now one of the largest and best-equipped technical training facilities in Australia. The background to the building of the Tighes Hill Technical College during the 1930s was discussed in Chapters 4 and 5. The science and engineering buildings were completed in 1938 and 1940 respectively and skilled trade enrolment in Newcastle during 1942 totalled 3285.40 The bulk of these student enrolments were by those who had been employed under the standard trainee or apprenticeship system.

In mid-1940, with the war going badly for the British Empire and its allies, the Federal Government addressed the shortage of skilled workers in Australia by adopting a British plan...
to train skilled workers under an accelerated skill-dilution training scheme. Negotiations were conducted with the Amalgamated Engineering Union and other skilled unions, with a view to reducing the scope of training required for each trade. Training arrangements were made in each state, but the training was conducted in parallel to meet the needs of the defence force and industry through the standard apprenticeship intake. The men and women who undertook this training were known as dilutees. Newcastle, because of the makeup of the steel, heavy engineering and public utility industries, had long had a system of annual apprenticeship intakes large enough to satisfy the turnover and wastage of professional workers and skilled tradesmen. Nevertheless, the training of dilutee tradesmen for the defence forces and industry commenced in late 1940. By the end of 1944, approximately 800 dilution tradesmen, together with a small number of women, had been trained as fitters and machinists, tool makers and welders at the Tighes Hill and Wood Street Technical Colleges.

As the NIH grew in size and technological complexity during the 1920s and 1930s, the requirement to train engineers, industrial chemists and metallurgists increased. Table 7.5 details the progressive growth in enrolments in diploma courses at the Newcastle Technical College between 1918 and 1944. This table demonstrates the steady growth in the number of diploma students required and being trained in the NIH. Initially, this was done to meet a growing industry requirement, in order to man the laboratories and drawing offices.

<table>
<thead>
<tr>
<th>Year</th>
<th>1918</th>
<th>1922</th>
<th>1926</th>
<th>1930</th>
<th>1934</th>
<th>1938</th>
<th>1944</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrolments</td>
<td>5</td>
<td>44</td>
<td>65</td>
<td>150</td>
<td>194</td>
<td>225</td>
<td>485</td>
</tr>
</tbody>
</table>


After BHP introduced its staff training scheme in 1926, the growth in the number and quality of professional staff was decidedly unusual in comparison to any other Australian regional area in this period. A point that should be considered here is that, in 1943, BHP alone was employing a total of 680 apprentices and 52 trainees, or about 9 per cent of its whole workforce. It

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41 Mellor, *The Role of Science and Industry*, 181
42 Olsen, 'Technical Education and Industry', 74
should also be noted that, during 1943, 355 apprentices were issued with their indentures across the NIH.43

Table 7.5 also provides an example of how the size of the professional employee component of the workforce progressively grew in size and importance. It represented a growth in the system of in-house training by industry of its own engineers, production and executive management. To some extent, particularly given BHP’s preference, as well as other NIH employers’, to train and promote from within their own workforce, it also provides a reason for the success enjoyed in the development of new products and improved manufacturing processes between 1920 and 1945. As Olsen noted, to a lesser extent this constant training of local youth through apprenticeships and diplomas gradually began to influence the educational structure of the Newcastle community.44 This confirmed the concept promoted by Kerr, that education is the handmaiden of industrialisation.45

Manufacturing Intensifies

Manufacturing continued to intensify in the NIH throughout 1942 and early 1943. Munitions production planning in 1942 had been based on the concept that major military campaigns would be conducted on the Australian mainland and that there would be little support from other countries.46 On a national basis, Butlin and Schedvin make the point that the ad hoc approach of 1942 to manufacturing was neither necessary nor desirable for the second year of the Pacific War. On a national scale, significant confusion reigned as the Department of Defence, in its urgency to arm the fighting forces, laid claim to everything. The production rolled on under these ad hoc planning conditions until a revised consolidated munitions programme was released in April 1943.47 Munitions output and employment reached a peak in that month; nationally, however, the impact of the April 1943 munitions production plan was slow to take effect, as few of the munitions consumers were prepared to admit that ‘we have enough’.48 From a NIH perspective, manpower was the first area to feel some relief. However, this relief was only temporary, as BHP’s barge and tugboat programme gathered way and the new State Dockyard continued to expand into ship repair tasks. Overall, it was generally recognised that the emergency period of 1942 was over and that manufacturing priorities should now reflect a more

43 Eather, ‘BHP, the Intransigent Rank and File and the 1943 Lockout’, 41
46 Butlin and Schedvin, War Economy, 1942–1945, 391
47 Butlin and Schedvin, War Economy, 1942–1945, 393
48 Butlin and Schedvin, War Economy, 1942–1945, 394
planned approach to the demands of war. In many respects, this revised national production plan was also the recognition of the manpower limitations that applied to the Australian war effort.

In November 1943, the War Cabinet redefined the Defence Committee’s responsibility for the determination of the munitions programme. This required each of the services to prepare their requirements based on their existing organisational structures coupled to likely future operational commitments. Butlin and Schedvin note that in February 1944, very large stocks of most ammunition types were held. In addition to the usage rates during 1942, this would still see existing stocks remaining high in a year’s time. Consequently, the manufacture of standard ammunition was forecast to fall in the private munitions annexes. This would leave the government factories to resume full responsibility for ammunition and ordnance product manufacture. The urgency of early 1942 had evaporated and in the not-too-distant future decisions would need to be made concerning all facets of manufacturing.

The Volunteer Defence Corps

In addition to an involvement in long hours of work, and occasionally in industrial disputes and union movement activities, many workers also found time to be involved in the active protection of their industry via the Volunteer Defence Corps (VDC). In addition to the increased presence of the Australian Army in Newcastle, in July 1940 the Government authorised the raising of a VDC across Australia. The origins of the VDC go back to the Twenty-Second Annual Congress of the Returned Sailors, Soldiers and Airmen’s Imperial League of Australia (RSSAILA), now the Returned Servicemen’s League (RSL), conducted in November 1937. At this conference, a resolution was made and forwarded to the Minister of Defence suggesting that a national volunteer defence force be raised from ex-servicemen and other men, between the ages of forty-one and sixty years, for local defence purposes. In Newcastle, the VDC was under the command of Brigadier J. M. C. Corlette, who was also the Chief Engineer at the Hunter District Water Supply and Sewerage Board. Units and sub-units were ultimately formed in each of the elements of the NIH. Figure 7.5 shows the Stewarts and Lloyds VDC sub-unit on parade in 1943.

Conclusions

This chapter has outlined how, in the face of industrial disputation, the maintenance of manufacturing capability, production volumes and training was maintained by all members of the NIH in a total war environment. It also argues that, even in a war emergency, industrial disputes did not disappear and that the memories of the hard times and unemployment in the 1920s and early 1930s had not been forgotten, nor in some cases forgiven. From an industrial relations point of view, many in organised labour saw that they now had the advantage and the power. While the manufacture of these unique products were great technological achievements, the manufacture of standard steel products, alongside the products made for war, continued in volumes once thought impossible. The emphasis on technology and production as the NIH moved into a total war environment would have been impossible without the capital investments made between 1934 and 1940, which provided the necessary tools for the job. But all of the production achieved was only made possible through and by the degree of the formal and informal integration and cooperation achieved between all members of the NIH.
CHAPTER 8:  
MUNITIONS IN RETREAT IN THE NEWCASTLE INDUSTRIAL HUB, 1944–1945

The wartime manufacturing effort of the NIH climaxed at the end of 1943. Munitions manufacturing had become somewhat frantic during 1942. As noted in Chapter 7, in some instances munitions had been produced well in excess of requirements. Nonetheless, in most respects the challenge to manufacture the full range of munitions and their associated ordnance products had been met. In addition, the NIH had been able to maintain the manufacture of sufficient standard products to satisfy the civilian market demand.

Given the complexity involved in the manufacture of some products, particularly bullet-proof steel and tungsten carbide tools, this challenge had been well and truly met. The advantage of having a Newcastle-based tungsten carbide plant was most evident for Ryland Bros., where the local product was now exclusively used for drawing steel wire. The Ryland Bros. wire plant had pioneered the use of tungsten carbide wire-drawing tools to speed the production of wire since 1934, when they had imported the tools from Germany. The NIH productive machine had gathered momentum slowly after 1933 but, once in motion, it could not be stopped suddenly without the probability of significant dislocation. Since June 1943 orders for munitions had been slowing, as the government sought to balance munitions supply against future manpower limitations.

The federal election held on 21 August 1943 provided the Curtin Labor Government with an electoral triumph. It was returned with an increased majority in the House of Representatives, also gaining a majority in the Senate, its first in this chamber since 1913. Curtin had, as Paul Hasluck observed, called the election victory the most momentous in the history of Australia, going on to give three reasons for this call. Firstly, it gave the Curtin Government the responsibility to direct the coming Australian offensive against Japan; secondly, it would be responsible for negotiating Australia’s part in the future peace

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conference; and, finally, it would be responsible for the demobilisation of industry and the armed forces, and for post-war reconstruction.  

During the last quarter of 1943, no-one could accurately forecast precisely when the war would end, but the Allied invasion of Italy on 3 September 1943, followed by Italy’s surrender in October, was a portent of the future. In the Pacific theatre, during September 1943 the Australian Army captured Lae in Papua and the US Army invaded New Britain, and Bougainville in the Northern Solomon Islands. From an Australian perspective, surely the end of the war must be close.

This was a national question at the end of 1943, but this chapter will discuss what for the NIH turned out to be the last twenty months of hostilities and the beginning of international peace until the end of 1945. The successful management of the demobilisation of industry from war production was, in many respects, comparable to the demobilisation of the armed forces after the fighting had finished. In moving from war to peace the manufacture of one category of products had to be stopped at minimum cost and the selection and manufacture of new products had to commence — again at minimum cost and disruption to both manufacturer and consumer. The onset of a near-at-hand war in the South West Pacific between December 1941 and December 1943 had seen steel and steel product manufacture in the NIH become, in some respects, frantic. Munitions and special ordnance products had been ordered and produced in a quantity and quality, and at a speed, once considered impossible in Australia. During these two years of crisis, as Hasluck observed, the ordering of munitions and associated ordnance products by the Department of Defence had become somewhat uncoordinated and increasingly ad hoc. But now the impact of the production study that had been made during April 1943 sought to bring a clearer direction to Australian industrial production and the management of manpower for war.

When the Australian War Cabinet met on 1 October 1943, it was realised that a number of fundamentally important decisions regarding the future shape of the Australian war effort had to be made. As David Horner noted, throughout 1942 the question had a

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4 Hasluck, The Government and the People, 1942–1945, 370
6 David Horner, Inside the War Cabinet: Directing Australia’s War Effort, 1939–1945 (St Leonards, NSW: Allen & Unwin, 1996), 150
simple answer, with just two objectives: firstly, the survival of Australia by the prevention of invasion and, secondly, the energetic resistance of invasion if one occurred. However, by the end of January 1943 it was clear that any direct threat to Australia had been prevented. Australian and American troops had largely destroyed a Japanese army in Papua, with the remnants of this force now withdrawing westwards towards Wewak. On the national canvas, it was now time to pause and identify the next strategic military objectives, together with the manpower and material support required to achieve them. From an industrial point of view, it was now critical for the government to identify a series of national strategic objectives that would enable the development of consolidated and coordinated production plans for industry. In addition, from the beginning of 1943 it became clear that Australia’s role in the Pacific War would change. It was possibly at this point that the Curtin Government began to understand that, in a world at war, Australia was but a minnow, swimming in a sea of much larger fish. The decision made by British Prime Minister Winston Churchill and United States President Franklin D. Roosevelt at the Allied strategy conference in Casablanca during January 1943, which gave priority to defeating Germany first, emphasises this point. However, it also provided Australia with a number of strategic options to consider.

The first option considered by the Federal Government was to maintain the level of national mobilisation achieved during 1942. This would mean a greater degree of economic regimentation for the community and a further decline in civilian living standards. The already tight manpower position also ran the risk of failure in meeting a large proportion of the reciprocal aid requisitions of the United States, or the maintenance of agreed food exports to Britain. In addition, the Curtin Government faced strong pressure to maintain the authorised strength of the armed forces and the associated munitions production programme required to allow the Australian Army to follow up its earlier military success. This factor, as S. J. Butlin and Boris Schedvin have noted, together with the insistence of the US General Douglas MacArthur that the government provide him with the largest forces possible, was also the desire of the Australian military.

Nonetheless, based on the recent military successes in the Papua New Guinea campaign, many in the community anticipated some relief from the imposed austerity measures and the relative economic hardship that had been largely accepted during the first

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7 Horner, *Inside the War Cabinet*, 150
8 Hasluck, *The Government and the People, 1942–1945*, 151
9 Butlin and Schedvin, *War Economy, 1942–1945*, 343
two years of the Pacific War. The contrary view held that the nation's manpower resources were exhausted and that there was a strong case for altering the balance of the war economy by eliminating excessive claims on total resources by the armed forces.\textsuperscript{10}

The first two years of total war had seen some dramatic changes to manufacturing in the NIH. Not only were women working in the steel industry for the first time, but many previously retired men had returned to work in the steel industry. Men, from factories and occupations such as the house construction industry, whose goods and services were not required for war, had also been 'manpowered' into the steel industry.\textsuperscript{11} On a national basis, it has been claimed that, due to the ongoing perceived harshness, this period of austerity was beginning to affect the efficiency of the civilian workforce. However, Butlin and Schedvin observed that this perceived decline in efficiency increased, as the threat of invasion or defeat receded.\textsuperscript{12} In some areas of industry, the fall in efficiency was also due to the increased average age of some workers, together with the gradual deterioration in the available manufacturing equipment. Nevertheless, on a national basis, given existing political and military commitments, the concept of 'economic rebalancing' at best represented no more than a slight shift in emphasis, rather than a change of direction.

After the Curtin Government’s emphatic election victory, what was the immediate effect on the Newcastle Industrial Hub? Late in 1943, with the idea of peace becoming something more than just an esoteric view, Harold Darling, the Chairman of BHP, wrote a piece for \textit{Rydge’s Journal}:

\begin{quote}
Foolish people are saying that the peace will be more perilous than war. This statement is the most unspeakable nonsense. So far as Australia is concerned, her new civilisation founded on cheap and good steel is going to make her a hive of industry when the war is over … If the Australian soldier comes back with the determination to work as well as he is fighting, he is going to find that he can make and sell everything in competition with the best equipped countries in the world.\textsuperscript{13}
\end{quote}

\textsuperscript{10} Butlin and Schedvin, \textit{War Economy, 1942–1945}, 366
\textsuperscript{11} Hasluck, \textit{The Government and the People}, pp. 375–76 NO DATES PROVIDED: 1942-45??
\textsuperscript{12} Butlin and Schedvin, \textit{War Economy 1942–1945}, 400
\textsuperscript{13} Alan Trengove, \textit{What’s Good for Australia..!: The Story of BHP} (Stanmore: Cassell Australia, 1975), 184
With respect to the steel companies that made up the NIH, Darling was certainly correct. Table 8.1 provides a comparison of the prices of Australian, British and American steel, which provides the reasons for Darling’s confidence. At the same time, by the end of the war there was a considerable level of uncertainty in the world economy, a factor which provided rich grounds for political chicanery. Some in the Federal Government, such as Labor members Arthur Caldwell and Eddie Ward, felt that the idea of the still-new Keynesian economic doctrines, as portrayed in the Bretton Woods Agreements, should be treated with extreme caution. Others believed that Australia was in for a long post-war boom. But at BHP, after the technological and manufacturing exertions of war, the accountants had temporarily taken over. Economic caution was in vogue, with only £9 million pounds invested in new plant across three iron and steel plants and multiple mine sites between 1943 and 1946. In 1948, Essington Lewis gave the Fisher Lecture in Commerce at the University of Adelaide. His presentation was titled ‘The Importance of the Iron and Steel Industry to Australia’. In relation to world prices, the price of Australian steel products was extremely competitive and Lewis saw an opportunity presented by a growing South East Asian export market.

Table 8.1: Prices of Australian, British and United States Iron and Steel 1938 and 1946

<table>
<thead>
<tr>
<th>Product</th>
<th>Year</th>
<th>Australia £A per long ton</th>
<th>UK £A per long ton</th>
<th>USA £A per long ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig Iron</td>
<td>1938</td>
<td>4.5</td>
<td>8.0</td>
<td>5.08</td>
</tr>
<tr>
<td></td>
<td>1946</td>
<td>5.75</td>
<td>10.53</td>
<td>8.23</td>
</tr>
<tr>
<td>Steel Merchant Bars</td>
<td>1938</td>
<td>10.13</td>
<td>14.31</td>
<td>12.81</td>
</tr>
<tr>
<td></td>
<td>1946</td>
<td>12.63</td>
<td>22.09</td>
<td>17.51</td>
</tr>
<tr>
<td>Structural Steel</td>
<td>1938</td>
<td>10.13</td>
<td>12.85</td>
<td>11.96</td>
</tr>
<tr>
<td></td>
<td>1946</td>
<td>12.63</td>
<td>19.34</td>
<td>15.54</td>
</tr>
</tbody>
</table>


Prices are in Australian currency at the current rates of exchange net c.i.f. State Capital ports for Australia; delivered to consumers work (net) for United Kingdom and f.o.b. United States.

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16 Hughes, *The Australian Iron and Steel Industry*, 150
In this sense, Lewis appeared to be at one with Darling. However, as Helen Hughes identified, his was a lone voice for, by not being able to supply export markets, the steel industry’s failure to expand became a serious brake on the development of the Australian steel industry. Table 8.2 compares Australian steel production against imported steel, but it should be noted that the great bulk of imported steel was tin plate, a product not manufactured in Australia until 1959. In Newcastle, new capital expenditure had been limited to a new coal washery, which was commissioned in February 1944, the installation of two Luffing cranes in 1950, and the beginning of reclamation and realignment work on Platt’s Channel which commenced in the same year.

Table 8.2: Principal Imports of Iron and Steel into Australia 1944–1950 vs Australian Production (‘000 Tons)

<table>
<thead>
<tr>
<th>Year Ending 30 June</th>
<th>Angles, Tees &amp; Channels</th>
<th>Bars &amp; Rods</th>
<th>Structural Steel</th>
<th>Hoop, Band and Strip</th>
<th>Rails and Railway Material</th>
<th>Tinplate</th>
<th>Total Steel Imported</th>
<th>Total Australian Steel Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1944</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>114</td>
<td>118</td>
<td>1305</td>
</tr>
<tr>
<td>1945</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>133</td>
<td>137</td>
<td>1118</td>
</tr>
<tr>
<td>1946</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>64</td>
<td>66</td>
<td>906</td>
</tr>
<tr>
<td>1947</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>94</td>
<td>98</td>
<td>1143</td>
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<td>1948</td>
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<td>99</td>
<td>104</td>
<td>1236</td>
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<td>1949</td>
<td>5</td>
<td>9</td>
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<td>112</td>
<td>131</td>
<td>1045</td>
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<tr>
<td>1950</td>
<td>37</td>
<td>144</td>
<td>42</td>
<td>7</td>
<td>43</td>
<td>96</td>
<td>369</td>
<td>1098</td>
</tr>
</tbody>
</table>


In a technical and manufacturing sense, the achievements of the NIH in the ten years between 1934 and 1945 had been considerable. A high degree of industrial autarky had been achieved. Munition annexes had been erected and the output of each of these units, together with the integrated logistic support provided by the public utilities, had been vital to the nation. In addition, large numbers of engineers and downstream workers had been trained and had acquired a broader range of new skills at high speed. This was a key factor in the development of the range of technical innovations that had resulted from the urgency of the defence emergency. In the Australian context, which generally emphasised state capital city predominance in technological sophistication and capability, the ability of a

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17 Hughes, *The Australian Iron and Steel Industry*, 148
regional centre such as Newcastle to have the technological competence to design and manufacture such a range of ordnance products was unusual.

However, the need for the close control of labour in the economy remained. As Butlin and Schedvin remark, there were increasing degrees of aggravation between the Directors of Munitions and Manpower. The claims by the Manpower Directorate that the production of some items had been continued for the sake of retaining labour had to be balanced against the Munitions Directorate’s need to balance the structure of the total munitions programme. During 1943, as labour productivity began to fall, munitions had to deal with the substitution of additional women and older men into the workforce, in order to compensate for the loss of young men to the armed forces. As Butlin and Schedvin observed, this was perhaps a little less applicable in the NIH than in many other manufacturing areas, largely because manufacturing in the NIH relied on professional and skilled labour.

In some quarters, there remained a lack of understanding of what the meaning of continuous production or flow manufacture really meant. Flow manufacturing is not a start-and-stop type operation. The total flow of materials through the manufacturing process, beginning with raw materials and extending through each stage of the manufacturing cycle of the product to the delivery to the final customer, must be considered. Continuous or flow manufacturing requires detailed planning and control in order to eliminate the occurrence of unplanned events. This inevitably caused problems for both downstream and upstream manufacturing activities. This was particularly the case in respect to orders received from the Australian Army. The Army struggled to develop and maintain well structured and coordinated munitions and ordnance product requirement plans, then refused to accept responsibility for the resultant manufacturing confusion. This did not engender a high degree of confidence in the Army’s forecast requirements from the manufacturers.

Throughout January 1944, orders for munitions and ordnance products slowed, as the Munitions Directorate continued to apply the high-level plans that had been developed during 1943. While each munitions annexe was affected by reduced orders, the effects

19 Butlin and Schedvin, War Economy, 1942–1945, 400  
20 Benjamin S. Blanchard, Logistics Engineering and Management, 4th edn (Englewood Cliffs: Prentice-Hall, 1992), 305  
21 Blanchard, Logistics Engineering and Management, 296  
22 Butlin and Schedvin, War Economy 1942–1945, 52
varied in accordance with the products they were producing. At Stewarts and Lloyds, and BHP the manufacture of 25-pounder and 5.5-inch high explosive shell forgings slowed significantly to meet the current lower usage rates. On the other hand, as the operational hours for aircraft engines continued to grow, the production of aero engine cylinder liner forgings at Stewarts and Lloyds continued at the same rate. Likewise, at the BHP Barge and Tug building annexe, barge construction continued until the end of 1944 and tug construction rolled through until June 1945, but the annexe was not closed until February 1946.23

With the potential imminent cessation of orders for munitions, an issue for companies housing a munitions annexe concerned the disposal and storage of classified design and manufacturing data and specialist equipment or machines. This was particularly so if that equipment had been supplied on loan by the Commonwealth Government. This was not so much an issue in the NIH as it might have been elsewhere, for the bulk of the buildings and machines used in the BHP, Stewarts and Lloyds, Lysaght, Ryland Bros. and the Commonwealth Steel annexes had been supplied by each company, usually at no cost to the Commonwealth Government.24 Nevertheless, where practical, some machine tools were modified to manufacture goods for the civilian market and, along with buildings, put to work manufacturing standard steel fabrication products or other duties. For example, in the case of the BHP shell annexe, after its closure in 1945 it was converted into an apprentice training centre. On the other hand, machines that were of no use in peacetime manufacturing, such as the special furnaces that BHP designed and built for the 17-pounder anti-armour round project, were scrapped. Likewise, the production of magnesium at the steelworks ceased altogether in September 1944 and the plant was scrapped.25

In April 1944, a fourteenth open hearth furnace was tapped for the first time in Newcastle. This furnace had been built primarily to use the additional pig iron being produced by the Whyalla iron plant, rather than for pig iron produced in Newcastle.26 Two additional open hearth furnaces were built during 1943 and 1944 at Port Kembla for the same reason. Contrary to what had been expected, the slow ending of the war did not bring a recovery in steel production or the logistics of raw material supply. Restrictions on the movement of coal and the shipping of iron ore and limestone from South Australia placed real limitations on what the NIH could manufacture. Hughes makes the point that crew

23 Jay, A Future More Prosperous, 267
24 Table dated 1939, Essington Lewis Papers, University of Melbourne Archives
25 Jay, A Future More Prosperous, 267
26 Jay, A Future More Prosperous, 267
shortages and stoppages due to petty disputes disrupted shipping. In the immediate post-war years the size of the BHP fleet, in deadweight tonnage terms, had increased from 60,000 tons to 100,000 tons, but its ships were carrying less freight than they had before the war.\textsuperscript{27} Coal and labour shortages, accentuated by trivial industrial disputes, were the key reasons for the falls in production levels. The coal shortage reduced the amount of coke ovens gas produced at the steelworks. The lack of gas restricted manufacturing capacity at Lysaght and Stewarts and Lloyds, for both of these companies relied on coke ovens gas to fuel their production furnaces.

Nationally, during 1946 the coal shortage reached a crisis point, forcing the Federal Government, acting through the Coal Board, to take control of all coal supplies in order to prevent a breakdown of essential services. As a consequence of this degree of control, the steel industry, unable to supplement the supply of coal from its own mines, was penalised for being the most efficient colliery operator, having 22 per cent of its coal output allocated to other consumers.\textsuperscript{28} The coal mining industry’s general inefficiency and low productivity, coupled with its technical backwardness, was aggravated by the militant attitudes and resistance to change by the Miners’ Federation. This led to considerable lost coal production due to minor industrial disputes. While BHP had the reputation of being a hard employer, a key reason for the level of industrial disputation in its collieries was largely due to its leadership in the introduction of mechanisation to the collieries it owned. BHP had led the mechanisation change since 1927 with its development of the Elrington Colliery and, in 1932, after it had taken over the Burwood and Lambton Collieries.\textsuperscript{29}

In 1947, the Lambton Colliery was regarded as the most modern in Australia, with the coal cut and loaded using mechanical means rising from 10 to 37 per cent of the coal mined. To slow the introduction of mechanisation, the Miners’ Union fell back on the issue of safety in the mines. But resistance to mechanical mining had more to with the protection of livelihoods that were progressively becoming obsolete and the maintenance of influence in the development of the mine. Beginning in 1945, BHP, together with other colliery owners, accelerated the introduction of pit-head amenities such as change rooms equipped with showers and lockers, as well as fast-tracking the introduction of mechanisation in its mines. BHP also established a training school at its Lambton Colliery to introduce miners and new

\textsuperscript{27} Hughes, \textit{The Australian Iron and Steel Industry}, 144
\textsuperscript{28} Hughes, \textit{The Australian Iron and Steel Industry}, 145
\textsuperscript{29} Hughes, \textit{The Australian Iron and Steel Industry}, 122
entrants into the industry to mechanical mining and loading operations; however, union
resistance to mechanisation remained a hurdle.\textsuperscript{30} To increase its coal supplies, in 1949 BHP
acquired a new colliery, Stockton Borehole on the Northern Coalfield.\textsuperscript{31}

In terms of the production of iron and steel, this peaked in 1941 and 1942 when more
than one million tons was produced in Newcastle, but production declined in each of the
following years. Table 8.3 provides the steel production details and the falls in employment at
the steelworks between 1942 and 1950. The manufacture of munitions and ordnance
products declined throughout 1944 and 1945, but steel production rates fell to reflect the
reducing orders for munitions until, in February 1945, the munitions orders ceased. The issue
now was to determine what to do with the workers who had manned the munitions annexes.

It is difficult to confirm, but it does not appear as though there was a rush to retrench
all of the female workers immediately. Due to an increasing labour shortage in the NIH, it
seems that some were retained until the late 1940s. One reason for this labour shortage was
due to the relaxing of the manpower regulations, which had allowed men who had been
manpowered into the NIH to now choose their own employment.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|}
\hline
Year & Number of Employees & Raw Steel Tons \\
\hline
1942 & 8860 & 1,030,361 \\
1943 & 8217 & 955,940 \\
1944 & 7397 & 906,822 \\
1945 & 6844 & 847,109 \\
1946 & 6675 & 714,469 \\
1947 & 6729 & 816,961 \\
1948 & 6588 & 819,574 \\
1949 & 6516 & 723,121 \\
1950 & 6606 & 694,202 \\
\hline
\end{tabular}
\caption{Steel Production and Employment, Newcastle Steelworks 1942–1950}
\end{table}

\textsuperscript{30} Hughes, \textit{The Australian Iron and Steel Industry}, p. 146
\textsuperscript{31} Hughes, \textit{The Australian Iron and Steel Industry}, p. 145
The conditions of work at the steelworks and in the steel fabrication factories had been much improved, but working in the heavy industries was still seen by many as a most arduous, dirty and disagreeable occupation. Many of the improvements at the steelworks had been achieved through the increased use of electric traction and control which allowed the mechanisation and automation of many production tasks. Increasing fuel efficiency and new technology kept heat inside the furnaces and soaking pits. This greatly reduced the strenuous nature of much of the work, but the bulk of the production jobs were still regarded as heavy, hot and noisy. But enhanced automation emphasised the need for increased operator training and constant attention to detail. As Marx had maintained, the worker increasingly became just an appendage to the machine.32 This factor was even more pronounced in some of the downstream steel fabrication operations, as automation increasingly replaced human skill.

The drift away from the industry, particularly by skilled labour, was accentuated by labour disputes and the uneasy peace between BHP and the FIA. In addition, given the continuous production operations, work was conducted on a 24-hour, seven-day basis, a feature which sometimes made work and family activities difficult. Scholars such as Sheila Gray, in her study of Newcastle during the Depression, have taken issue with this feature of work in the steel industry, emphasising its debilitating effects on families.33 But it was really not any different from working conditions in public utilities such as power stations, gas works, the railways, or ship operation, where continuous operations had always been required to maintain production on a 24/7 basis.

In addition, safety had progressively been recognised as a significant factor in the development of a continuous work environment. Since the mid-1920s, all of the manufacturing plants in the NIH had increased their attention to safety requirements, with a view to seeing each man or woman return home uninjured at the end of every shift. All workers on hot or dusty jobs were issued with protective clothing and equipment. But some jobs, such as the relining of ladles or the re-bricking of furnaces, still required men to

sometimes work in extreme heat and sometimes the only protection they had was sacking. All of these issues contributed to the shortage of all types of labour and the unattractiveness of working at the steelworks, particularly if alternative employment was available.

With orders for munitions and ordnance products coming to an end by the end of 1944, the munitions annexe at Lysaght, which had manufactured bullet-proof plate and Owen Machine Carbines (OMC), was progressively closed down. Likewise, as the BHP barge programme was wound up during the first quarter of 1945, the Ryland Bros. annexe, which had manufactured components for both barges and the tugs, was closed. Staff were reassigned, but women were not dismissed if their labour could still be utilised, for during the last year of the war the dominating problem for the Government continued to be the shortage of manpower. On a national basis, the priority now was to grow or manufacture food. Still required were rations and facilities to support American forces in the Pacific under reverse lend-lease arrangements, as well as maintaining food production for domestic consumption and to support Britain. Australia also had to find the manpower to provide logistic support to a British Pacific Fleet, to be based in Australia from December 1944. These national manpower problems did not directly impact the NIH, but they were an influence on the local manpower management.

Orders for the forged shells manufactured at the Stewarts and Lloyds annexe had fallen away and during the first quarter of 1945 the annexe was closed. It was much the same story at the Commonwealth Steel Co., but, due to this company’s steel forging and casting capability, defence ordnance work was still required. The Commonwealth Steel Co. was also required to provide direct support to the State Dockyard’s shipbuilding and ship repair programme. Between 1942 and 1945, the State Dockyard and Engineering Works at the Carrington Dyke End had launched two frigates for the Royal Australian Navy, HMAS Strahan in 1943 and HMAS Condamine in 1944. In the same period, the dockyard’s ship repair centre had repaired 600 vessels, as well as conducting work for the United States Army. In the midst of this replanning process, the Axis countries surrendered, Germany in May 1945 and Japan in August. These two events just confirmed the military and naval

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34 Hughes, *The Australian Iron and Steel Industry*, p. 146
victories and, while the nation cheered, after seventy-one months of war many felt that it was time to relax.

The Public Utilities

With the end of the war in sight, what role would the public utilities continue to play? Industry and the community would still need the supply of fresh water, coal gas and electric power in quantity, but until industry provided updated forecasts on its production plans, no plans could be prepared regarding the need for new plant or any likely upgrade requirements. Accordingly, the Hunter Water Supply and Sewerage Board adopted a wait-and-see approach which emphasised repairs and maintenance. Much the same approach was taken by the Railways Electrical Branch regarding Newcastle’s electricity generation capacity. With the emergency interconnection to the Sydney County Council system and the Hunter Valley Colliery power stations made during 1942, the total generation and distribution system in the NIH had matured and was no longer an orphan system. This was a factor that improved overall availability and reliability of electricity for all consumers. However, the scope and urgency of wartime usage had, in some cases, delayed planned maintenance programmes and repairs were becoming an increasing concern. A major issue for all electricity generator maintenance concerned the availability of spare parts, all of which had to come from British manufacturers.

Short-term repair and maintenance was conducted, but the conduct of deep maintenance programmes, which would potentially see major units out of production for extended periods of time, was avoided. In terms of the Port of Newcastle, the ongoing efficient operation of the port was the only priority. This meant that the channels and wharfage had to be maintained, together with the maintenance of the coal-loading system. With almost five million tons of coal leaving the Port of Newcastle annually, and with interstate gas companies and railway clients relying on those coal supplies, the maintenance of this material flow was critical.

Technical Training

During February 1944, technical training saw the beginnings of major change. The first change came with the reduction in the trade dilution training scheme, which saw the final students accepted into the scheme at the end of 1944. The second major change had begun
as early as March 1943, when plans were developed to assist in the rehabilitation of returned servicemen. The Commonwealth Reconstruction Training Scheme commenced operations on a limited scale before the war ended.\textsuperscript{38} Initially, this was done by offering correspondence courses to those who wanted them. The main aim of this scheme was to offer to all servicemen and women who had missed or interrupted their education, owing to war service, the opportunity to take their place in civil life once more. Newcastle, with its large new technical college at Tighes Hill, plus its facilities at Wood and Hunter Streets in the city, would obviously be deeply involved in the delivery of this scheme.

On 18 February 1944, it was announced that university training would commence at the Newcastle Technical College, with first-year engineering and science courses being offered.\textsuperscript{39} The same day, it was announced that apprentices from BHP and Ryland Bros. would be able to complete their practical training during the day, rather than at night.\textsuperscript{40} As Olsen commented, this outcome had been a long-time ambition of technical educators and students in Newcastle.\textsuperscript{41}

\textbf{The Rationing of Electricity and Gas}

The NSW Government’s contribution to solving the ongoing shortage of coal in all urban areas of the state occurred in June 1945, with the introduction of a coal gas and electricity rationing system across the state. Rationing commenced on 22 June, in response to demand outstripping the available supply.\textsuperscript{42} A number of factors influenced the decision to ration energy. With the war’s end now only a signature away, a combination of coal shortages, and worn and obsolete plant and infrastructure, the energy generation system had become inefficient. During the years of war there had been a considerable amount of ‘make do’ maintenance conducted just to keep existing plant operating. This was particularly so in the electricity generation industry. Spare parts were difficult to obtain from Britain, the source of virtually all of the generating and distribution equipment.

\textsuperscript{38} Mellon, \textit{The Role of Science and Industry}, p. 674
\textsuperscript{39} ‘University Courses to Begin in Newcastle’, \textit{Newcastle Morning Herald and Miners’ Advocate}, (Newcastle, NSW), 18 February 1944, p. 2
\textsuperscript{40} ‘Day Training for B.H.P, Rylands Apprentices’, \textit{Newcastle Morning Herald and Miners’ Advocate}, (Newcastle, NSW), 18 February 1944, p. 2
Adding to this problem, on 27 June the coal miners went on strike again, with the bulk of the mines idle for seven weeks. The pent-up demand for electricity was largely brought about by the lifting of restrictions on new home building, the marketing of a large range of electrical appliances coupled with a cashed-up community. Nonetheless, the rationing of energy commenced in Newcastle and, to some extent, this energy rationing extended to the steel industry in the NIH. The action by the NSW Government to ration coal gas and electric power was not expected but, given the problems of coal production, was probably justified. Nonetheless, it was also seen by many as just another unwelcome burden to carry.

**Industrial Relations**

During 1944, the union movement continued to increase its strength in the NIH. The number and concentration of union members in only a few large plants in the NIH was an important factor in this growth of the total union movement throughout NSW. The concentration of the steel industry in Newcastle provided the unions with a ready stage to demonstrate their ability to influence as well as to disrupt. However, it should be noted that not all of the steel fabricators were as anti-organised labour as was BHP, and companies such as Stewarts and Lloyds managed their workforce somewhat less aggressively. Stuart Macintyre observed that J. B. Chifley (who had succeeded Curtin as Prime Minister) and his advisors were well aware that a shortage of labour during the transition to peace would make it difficult to avoid industrial problems. The unions had their own post-war agenda which included wage rises and a forty-hour week, but the Chifley Government was concerned about the inflation risks and the potential of a post-war slump similar to that which had followed the First World War. The ending of the war saw the labour difficulties encountered during the war years become more pressing. This was particularly so with the progressive ending of the manpower regulations during 1945. Workers were once again able to choose their own employment. After being virtually closed down to meet the needs of total war in 1942, the resurgence of the house building industry saw skilled and unskilled workers return to work, now with more agreeable and often better-paid working conditions. But the drift away from the steel industry also had as much to do with the frequency and scope of the industrial disputes. A prime example of this factor occurred during and after the 1945 steel strike.

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43 Macintyre, *Australia’s Boldest Experiment*, p. 347
In September 1945, a dispute between the FIA and BHP erupted at Port Kembla when an FIA shop delegate was ordered to fill a vacancy on the coke oven lids. He refused, claiming that the job should have been done by a more junior worker. After refusing to do the job three times he was dismissed; the coke ovens men struck and the company used staff men to carry on coke production. The blast furnace workers declared the coke ‘black’, the dispute then spreading throughout the whole works.\(^4^4\) As far as BHP was concerned, this dispute concerned management’s prerogative to assign available labour to any task it saw fit. Conversely, the union expected that the task of cleaning the ovens should be determined by seniority within each work team.\(^4^5\)

As Hughes noted, at the time of this dispute the FIA had been deregistered by the NSW Industrial Commission. The deregistration occurred because some of its members, who were employees of Imperial Chemical Industries of Australia and New Zealand and the Newcastle Chemical Company, had struck in protest against a Conciliation Commissioner inspecting plants in the course of a dispute.\(^4^6\) Consequently, AIS and BHP officials refused to negotiate with the FIA while the union was deregistered. The FIA refused to apply for registration and the other unions involved in the dispute would not negotiate with the company without the FIA. The outcome was that by 6 November 1945 a total of 13,000 steel workers at both Port Kembla and Newcastle were on strike.

Industrial disputes such as the 1945 steel strike had a larger footprint than just at the Newcastle steelworks. As a consequence of the NIH having the largest number of downstream steel fabricators, these companies were also affected. Not only did the BHP steelworks provide the raw material to each steel fabricator but, as in the case of Stewarts and Lloyds, Lysaght and Ryland Bros., the steelworks also provided the coke ovens gas to fire their furnaces. Consequently, these steel fabrication operations were progressively closed down, the workers assigned other tasks or retrenched. This in turn affected a large number of lower tier suppliers and the local economy.

The NSW Labour Council took over the management of the dispute, which had now widened to involve the maritime unions and the miners. Chifley lacked the wartime powers to

\(^4^4\) Hughes, *The Australian Iron and Steel Industry*, p. 147
\(^4^5\) Tom Sheridan, *Division of Labour: Industrial Relations in the Chifley Years, 1945–49* (Melbourne: Oxford University Press, 1989), p. 86
\(^4^6\) Hughes, *The Australian Iron and Steel Industry*, p. 147
intervene, but also favoured the maintenance of industrial law. He supported the moderate view that the FIA should apply for registration as a prelude to any settlement. However, the union militants, led by the Communists, refused and political considerations by all parties came into play.

The Federal Government refused to take any action to settle the issue and the growing length of the dispute, coupled with the loss of earnings to workers, ultimately forced the FIA to apply for re-registration. The union’s application for registration was successful, the Industrial Court heard the case and negotiations between both parties were conducted. The dismissed Port Kembla FIA shop legate was eventually reinstated, but management retained its prerogative to hire, dismiss and allocate work as it saw fit. In Newcastle, after seven weeks on strike, union members and other workers enjoyed a financially bleak Christmas and New Year, for the unions did not return to work until 7 January 1946.47

The strike did not settle the wider issues, but it did underline the changes brought about by the war. The professed communist Ernest Thornton, the national secretary of the Federated Ironworkers’ Union, declared that as soon as the war was over his union would attack BHP and everything associated with it.48 The NSW and the Federal Governments — both Labor — refused to lend their support and both the President of the ACTU and the President of the Australian Railways Union publically attacked the strike.49 Both Warwick Eather and Helen Hughes noted that the workers were tired of the political pressures. For with the stress of potential long-term unemployment now regarded as a thing of the past, and with a regular pay packet, most workers just wanted to enjoy a comfortable life.50

In addition to the shortages of coal, shipping remained short. Two ships from the BHP fleet had been lost to enemy action during the war, reducing the deadweight tonnage from 100,000 tons in 1941 to 60,000 tons in 1944, a shortage that was not corrected until 1951. In addition, as the consequence of coal shortages and industrial disputes, the available fleet carried less freight than it had before the war.51 These factors all led to low production levels that were exacerbated by the long-run problem of lagging investment. Some improvement

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47 Macintyre, *Australia’s Boldest Experiment*, p. 349
50 Hughes, *The Australian Iron and Steel Industry*, p. 148
51 Hughes, *The Australian Iron and Steel Industry*, p. 144
occurred in Newcastle during 1945, after the commissioning of a new coal washing plant, but coal production still fell short of the industry’s needs. Hughes states that BHP’s own mines were now only producing 85 per cent of the industry needs, a factor which forced the company to supplement its supply by purchases from other mines.

The retreat of munitions production and the changeover to production of standard steel products for peacetime consumption was achieved by the end of 1945, but considerable economic uncertainty ruled the decision-making process. Both Darling and Lewis had returned to their old offices in Little Collins Street, in Melbourne, but until the economic uncertainty was relieved few decisions were made. In the NIH, with government approval, the munitions annexes were gradually dismantled and plans made to either scrap or modify machines to manufacture standard products.
In late 1944, with victory over the Axis countries just a matter of time, the Australian Government sent the economist Douglas Copland to the United States, Canada and Britain to assess the success of their wartime price controls and to discuss each country’s future economic plans. His report, tabled in the Federal Parliament in April 1945, emphasised the need to hold down consumer demand until the supply of goods and services was sufficient to warrant dispensing with rationing and manpower controls. However, Copland also warned against maintaining wartime controls and restrictions on the civilian economy for too long, where the desire for freedom would lead to their hasty abandonment.¹

A potential post-war problem that many in the Australian Government and bureaucracy were concerned about was the fear that a brief post-war boom, through the return to manufacturing products for a peace economy, would be followed by a world-wide recession. These fears were underlined by the Labor Government’s pessimistic views of the world’s potential economic development, attitudes that to some extent were reflected in Copland’s report. This chapter will examine the activities that occurred during the first five years after the war ended and contrast earlier investment aims with those that applied in the immediate post-war period. In Newcastle, the most significant restrictions concerned manpower and house building controls. With the bulk of men in the armed forces or assigned to work in industry, few men were available to build new homes, even if the materials to build them had been available.

On 5 July 1945, John Curtin died and, seven days later, Labor MPs massed in Parliament House to select his successor. Before the day was out, Ben Chifley was selected as leader of the Australian Federal Labor Party and Prime Minister of Australia.² With his memory of the unemployment and hardship suffered by many across the previous two decades, Chifley regarded defensive measures against an almost certain post-war depression as his government’s prime responsibility. This, along with a commitment to full employment without inflation, was for the Labor Party the organising principle of post-war economic planning.

reconstruction in Australia. This commitment was promulgated on 30 May 1945 in a White Paper on Full Employment which had been prepared for the government by H. C. Coombs.

Demobilisation after 1918 had been followed by considerable economic dislocation which had included rises in unemployment coupled with bursts of inflation. The dislocation experienced in dismantling of a commodity-based war economy after 1918 had been part of the country’s transition from war to peace. The transition from war to peace after 1945 promised even greater dislocation, for in an industrialised economy in 1945, such as Newcastle’s, there was significantly more to dismantle and Chifley was determined that there would be no repeat of the past. The presentation of the White Paper on Employment to Parliament showed that full employment was a fundamental aim of the Commonwealth Government.

In terms of industrial transition in the Newcastle of 1918, there had been comparatively little to dismantle or demobilise. The Walsh Island Dockyard had forged and machined some munitions during the war, but the great bulk of Newcastle’s manufacturing effort during the First World War had been the manufacture of steel to construct and maintain the railways in Australia. After another world war, the steel industry in Newcastle had grown into a giant manufacturing octopus, with tentacles that reached into many manufacturing and distribution organisations across Australia and overseas. The transition to peace had the potential to be a rocky road.

Industrially, the ten years between 1932 and 1942 had been good years for the NIH. Investment to increase manufacturing capacity and capability had seen the NIH develop into the nation’s premier steel manufacturing centre. It also had the potential to be important internationally, should the industry choose to enter the export arena. Proof of this development could be found in the volume and variety of products manufactured for peace and for war, together with the number and depth of trans-national relationships established.

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5 Day, *Chifley*, p. 407
6 Dyster and Meredith, *Australia in the International Economy in the Twentieth Century*, p. 183
Christopher Jay describes the years between 1945 and 1950 as a period where BHP and the steel fabricators missed an opportunity to become a centre for exporting steel and steel products. He notes that after his industrial management efforts during the war Essington Lewis was tired. For five years he had effectively managed Australia’s secondary industry, engaging in a punishing travel regime, ignoring pleas from close acquaintances to slow down. He was now in his early sixties, the age when his predecessor had stepped down, having reached a similar career point. Lewis had stepped down as the Director of Munitions, on 28 May 1945, into a post-war world that was full of economic uncertainty, a condition that complicated forward industrial planning. He resumed his role as Chief General Manager of BHP, reoccupying his old office in Little Collins Street, Melbourne. With considerable residual authority, he remained in this office until 1950 but, as Jay noted, ‘the watch spring had lost much of its tension’.

With two operational and profitable steelworks, and an iron works in South Australia, that were more than capable of providing all of the iron and steel demanded by the Australian market, it is unclear why the industry failed to become a large-scale steel exporter. While existing British trans-national relationships, together with the US dollar shortage, may have been some influence, Jay and Helen Hughes provide a glimmer of the reasons behind the reluctance of BHP, at least, to enter the export market. At a half-yearly general meeting in 1954, the then Chairman of Directors at BHP, C. Y. Syme, made a statement to justify the company’s sluggish approach with regard to exports. He stated that he could not quite believe that prosperity had come to stay. However, the opportunity was accepted by steelmakers in Japan and, later, by the Koreans, both countries using a combination of Australian iron ore, coking coal and American finance. Given the history of

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11 Jay, *A Future More Prosperous*, p. 177
the previous thirty years, it is hard to accept that Darling and Lewis would not have taken up the export challenge.

Instead of developing an export market, the Newcastle steelworks management focused on the transition to peacetime conditions and the increasing frequency of industrial disputation. After 1945, BHP was largely relying on the downstream steel fabricators in Newcastle to absorb the bulk of the steel it produced. Given that the steelworks had commissioned its last open hearth furnace in April 1944, and was busy continuing the development of the Port Kembla steelworks, there was little incentive for additional investment to increase manufacturing capacity in Newcastle. Countering militant union activities occupied much of the company management’s time.

Unionists such as Ernie Thornton and his deputy, Jack McPhillips, encouraged a seemingly endless range of minor industrial disputes and stoppages, not just at the Newcastle steelworks, but also at the steel fabricators and the heavy engineers. After the 1945 steel strike, few of these disputes became major stoppages in the NIH, but on top of a continuing shortage of coal and other materials they did become a source of constant aggravation, not only for the companies, but also on the part of many workers. Nevertheless, 1946 was to be an election year and, as the union movement as a whole wanted the Chifley Government re-elected, to some extent higher union management attempted to dampen some of the industrial disputation. A federal election was conducted on 28 September 1946 and the Labor Government was returned, albeit with a loss of six seats. Australians had generally registered their approval of Labor’s wartime administration and their confidence in Chifley’s plan for the peacetime transition12.

The end of the war did not bring a recovery in steel output in Newcastle. Steel production in 1945/46 was the lowest since 1938/39 and the reason for this low production largely concerned material supply. The shipment of iron ore and limestone to Newcastle had become a problem of having sufficient crews to man the company’s fleet, where the deadweight tonnage had grown, but the ships were carrying less freight than before the war.13 Coal and labour shortages, heightened and swelled by industrial disputes, led to low production and, as Hughes states, this obscured and complicated the problem of lagging

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12 Day, Chifley, p. 436
The BHP-owned coal mines were only delivering about 85 per cent of the steelwork’s requirements, a position that was complicated by actions by the Federal Government. The general shortage of coal caused the Federal Government to require that 22 per cent of the coal mined by BHP and other large miners be set aside to maintain essential services.

In the BHP-owned collieries, some industrial issues still revolved around mechanisation. From its first foray into coal mining during the 1920s, BHP had championed the application of mechanisation in its collieries along American lines, in order to lower the cost of extraction. This initiative had caused industrial trouble in its collieries from that time. Nevertheless, between 1945 and 1950 BHP persisted with its mechanisation programme. In order to increase the reliability of supply, as well as increasing its coal supplies, the company acquired the Stockton Borehole mine on the Northern Field in 1949. By 1950, all of the BHP collieries on the Northern Coalfield were mechanised.

Expansion at the steelworks was hampered by coal and manpower shortages, which had grown more serious with the ending of the manpower regulations and the lifting of austerity measures for housing. In 1947, this labour shortage at the Newcastle steelworks led to some rolling mills being shut down. In order to combat this labour shortage, the Federal Government launched an assisted migration scheme in 1945, but migrants were not generally absorbed into the NIH until 1947. Industrial disputes remained a sore point, not made any easier by BHP’s consistent anti-organised-labour attitude. From the perspective of many workers, they were the ones that had suffered poor working conditions, the constant threat of unemployment from the 1920s, the actual unemployment throughout much of the 1930s, followed by the heavy demands of war. Many felt that it should now be their turn. The communist leaders of the FIA had failed to learn the lessons of the 1945 steel strike, not seeing that the labour movement would not continue to blindly follow a communist lead. In response to union criticisms concerning the excessive legalism of the Commonwealth Arbitration Court, the Chifley Government developed changes which were contained in the Conciliation and Arbitration Act 1947. An industrial summit meeting of employers and

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17 Hughes, *The Australian Iron and Steel Industry*, p. 145
18 Hughes, *The Australian Iron and Steel Industry*, p. 146
employees was convened by Chifley in August 1947, where he called for a ‘new spirit’ of common effort.\textsuperscript{19}

Unfortunately, this call went unheeded by some. The FIA, the largest union operating in Newcastle’s steel industry, had fallen into the grip of militants from the Communist Party of Australia. Jay relates the history of the seemingly endless minor stoppages at the steelworks. These militants had been duly elected by the union members, but many of their actions, as well as the frequency of the stoppages, were condemned by the ACTU and other union leaders.\textsuperscript{20} Minor though these disputes were, they caused production disruption and hostile militancy, which characterised industrial relations across the NIH between 1945 and 1951 when the militant and largely communist element was disposed.\textsuperscript{21}

The biggest problem to be solved continued to be in the coal industry. After years of threatened unemployment, combined with poor working conditions in a technologically backward and generally inefficiently managed industry, the coal miners were determined to improve their working conditions and pay. However, they would not tolerate mechanisation in the mines. A large factor that complicated the coal problem for Newcastle was that, combined, the Northern Coalfield and the nearby South Maitland Coalfield produced about 70 per cent of all the black coal mined in Australia.\textsuperscript{22} This provided both the owners’ Coal Mining Vend and the union with a high degree of economic influence. As mentioned in earlier chapters, not only was the extraction of the coal inefficient, but the system of movement of the coal from the mine to the end customer, or to a ship loading point, had not changed since the 1880s. Frequent stoppages at the collieries were common, which meant that major consumers of coal were forced to maintain stockpiles large enough to cover for the failure to deliver coal. This situation continued until 27 July 1949, when the coal miners began a ‘short, sharp strike’ in support of their claim for long service leave, a thirty-five hour week, improved amenities and a 30s. a week pay rise.\textsuperscript{23} If nothing else, this claim was bold.

Not knowing just how long this strike would last, the steelworks used its stockpile to cushion any potential shortage. However, the shortage of coal also affected a number of

\textsuperscript{19} Macintyre, \textit{Australia’s Boldest Experiment}, p. 442
\textsuperscript{20} Susanna Short, \textit{Laurie Short: A Political Life} (North Sydney: Allen & Unwin, 1992), p. 79
\textsuperscript{21} Short, \textit{Laurie Short}, pp. 121–22
\textsuperscript{23} Macintyre, \textit{Australia’s Boldest Experiment}, p. 445
industries which did not have large stockpiles to draw on. Within a few weeks, production at the steelworks ceased, due to the lack of coal. This meant that each of the downstream steel fabricators, who relied on the steelworks for the supply of coke ovens gas and electricity, also ceased production. Many steelworkers lost up to six weeks’ work, while electric power and town gas shortages directly affected their families. Jay observed that, although Newcastle’s heavy industries provided a natural support base for militant industrial action, a majority of the city’s unionists opposed unqualified support for the strike by the FIA and attacked union management for their support of it. Due to the impact of the strike on the whole community, at the end of July 1949 the Prime Minister authorised the use of military personnel to operate the few open cut mines in the Hunter Valley, an action that further incensed many in the organised labour movement.

Macintyre makes the point that this strike became a fratricidal conflict, which set unionist against unionist, and considerable amounts of anti-communist propaganda were used by all sides in the political debate. Some union leaders were gaol ed, for, unexpectedly, they had met a formidable adversary in the form of a Labor Prime Minister who stated that, ‘if it is the intention of union leaders to wage an unnecessary and callous war on the community, then it will be a case of boots and all’. Chifley’s threats of further measures broke the resistance of the miners, when, against the recommendations of their union leaders, they voted to return to work on 9 and 10 August 1949. This return to work by the miners meant that the steelworks could recommence working, and the steel fabricators, which relied on the steelworks for the supply of steel, gas and electricity, could also start manufacturing again.

With the crisis of war ended, the workers and their families were tired of political pressures and looked forward to a more comfortable life. These desires for stability aside, the steel industry’s operations fell to 60 per cent of capacity in 1945/46, recovered to 75 per cent in 1946/47, but fell again in 1948/49 to 65 per cent of capacity as a consequence of the national coal strike.

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24 Jay, A Future More Prosperous, p. 173
25 Macintyre, Australia’s Boldest Experiment, p. 4
26 Macintyre, Australia’s Boldest Experiment, p. 456
27 Macintyre, Australia’s Boldest Experiment, p. 456
28 Hughes, The Australian Iron and Steel Industry, p. 148
The lifting of manpower regulations in 1945, together with the reopening of businesses that had been closed under regulations during the war, caused the steel industry a level of confusion and some uncertainty reigned concerning the immediate future. The orders for munitions had gone, but the austerity regulations remained in place. Of particular concern to many were the ongoing restrictions regarding house building and construction. The restriction was more often due to the lack of materials such as roofing tiles, fibrous plaster for lining house internals, and appliances that lasted until about 1950.29

In 1949, with signs of an increasing demand for steel becoming apparent a somewhat overcrowded Newcastle steelworks occupied just 330 acres of land. Plans for the expansion of the steelworks and the steel fabricators required more land. There was only one direction in which the plant could expand and that was westward along the Hunter River. During 1947, a decision was made to increase the available land by reclaiming part of the south arm of the Hunter River. In 1950, BHP and the NSW Government made an agreement to transfer 337 acres (136.4 hectares) of land owned by the company to the State Government, in exchange for 257 acres (104 hectares) of Crown land and the right to reclaim Platt’s Channel,30 a narrow strip of the Hunter River’s south arm which separated Spit Island from the mainland. Figure 9.1 provides a view of Platt’s Channel and Spit Island in 1950, at the beginning of the reclamation project.

As Spit Island was already owned by BHP, work began immediately to enclose the whole area to be reclaimed and to modify the alignment of the Hunter River south arm. When completely reclaimed, this area would provide additional land for future plant expansion. The No. 3 blast furnace was relined and its capacity was increased by 10 per cent in 1950.

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29 Macintyre, *Australia’s Boldest Experiment*, p. 401
30 Hughes, *The Australian Iron and Steel Industry*, pp. 159–60
Christopher Jay describes the period between 1945 and 1950 as one of a lost opportunity, but his focus on history is confined to the Newcastle steelworks.\textsuperscript{31} Jay, much like Neville Wills, and E. M. Johnson-Liik, George Liik and R. G. Ward, each commissioned to write on BHP, overlooked the importance and size of the steel fabrication industry in Newcastle, as well as ignoring the integration of the public utilities.\textsuperscript{32} When combined, the workforce employed by the steel fabricators was as large as the one working at the steelworks and was its largest customer, buying steel and power. By 1950, the steelworks had reached the point predicted by Delprat in 1920, of being the mother industry, surrounded by her chicks.\textsuperscript{33}

The Steel Fabricators

The changeover to peacetime manufacture of flat steel products at Lysaght was mixed. In 1938 to 1939, using American technology, the company had built a cold strip rolling mill at

\textsuperscript{31} Hughes, The Australian Iron and Steel Industry, p. 148


\textsuperscript{33} Alan Trengove, What’s Good for Australia...?: The Story of BHP (Stanmore: Cassell Australia, 1975), p. 122
Port Kembla. This new mill used a new continuous strip rolling technology to manufacture flat steel products, rather than rolling individual sheets. The equipment to manufacture this steel strip had been developed during the 1920s, largely to meet the needs of the automobile industry in America. Steel strip manufactured by this method was more suitable for the pressing and stamping of car body components, as well as those parts required for household appliances, such as refrigerators and washing machines. This material was critical to successful manufacture of cars and some household appliances in Australia. However, the Newcastle plant was equipped with manpower-intensive technology and was not suitable for a technological upgrade of this nature. On the other hand, the Newcastle plant was more suitable for the manufacture of products such as terne plate, a lead-coated steel product, and electrical steels that were required for the manufacture of electric motors and transformers. These products were not required in the same volumes as those required for Australia’s new car industry.

Electrical steels had high silicon content, tailored to produce the specific magnetic properties required for use in the manufacture of electric motors and transformers. Until the late 1930s, when the manufacture of electric transformers and motors commenced in Australia, all of this material had been imported. But, as the manufacture of electric motors and transformers grew to meet the needs of war, it made sense to manufacture all of the silicon steels required in Australia. The manufacture of electrical steels had been pioneered in Britain by the Lysaght Sankey organisation. However, the fabrication of these steels presented significant manufacturing difficulties in achieving consistent product metallurgical and surface finish quality. In 1940, as part of a wartime import-replacement programme, Lysaght commenced to manufacture dynamo and electrical-motor grades using the manual mills in Newcastle. The following year, the company commenced the manufacture of higher-grade silicon steel sheets for the manufacture of transformers. In addition to overcoming the manufacturing problems, drawing on technology from the British parent, Lysaght in Newcastle manufactured and installed the electrical and magnetic testing equipment required to control the quality and grade the sheets.34

At the Commonwealth Steel Company, apart from the closing of the munitions annexe, after 1945 there was little change in the range of products manufactured. Forged and cast steel components for rolling stock were still required by the railways and tramways

in each state. Industry maintained its demand for the manufacture of special and alloy steels including high-speed steel, which had been manufactured since 1937.

**Figure 9.2: 5100-ton Schloemann Forging Press**

However, the big news for the Commonwealth Steel Company came in 1947, when it was announced that, as part of the 38 million pounds of war reparations that Germany would be forced to pay Australia, the company would also receive a 5100-ton capacity Schloemann hydraulic forging press.
The press would remain the property of the Commonwealth of Australia, but would be installed at the Commonwealth Steel Co. works at Waratah and would be available to any company wanting to use it. This machine had been built in 1939 and was regarded as one of the most valuable reparation items received by Australia at that time, for it was capable of forging steel items weighing up to fifty tons. Due to a number of problems encountered in dismantling, transporting and installing the press, it was not operational at its new Waratah home until the third quarter of 1955.35

The post-war period also brought new developments for Stewarts and Lloyds. In order to meet these new requirements and to maintain its dominant position in the Australian market after 1946, it was decided that a new holding company, Tubemakers of Australia Ltd., was to be formed. This holding company merged the interests of Stewarts and Lloyds (UK) Ltd., BHP and Tube Investments (UK) Ltd. These three companies held shares in either Stewarts and Lloyds (Australia) Pty. Ltd. or British Tube Mills (Australia) Pty. Ltd. and upon incorporation these two companies became fully-owned subsidiaries of Tubemakers of Australia Ltd. The shareholdings in the new holding company were: Stewarts and Lloyds (UK) Ltd., 43.84 per cent; BHP, 42.12 per cent; and Tube Investments (UK) Ltd., 14.04 per cent.36

In addition, during 1946 the decision was made to install a second continuous weld (CW) mill at the Newcastle plant.37 With the post-war reconstruction programme and house construction in Australia receiving additional political and funding priority, the industrial and domestic demand for galvanised gas and water pipes was forecast to grow significantly. The existing CW mill and furnace, which had been installed in 1934, was now judged unable to meet the forecast demand for galvanised steel pipe, even working twenty shifts per week. The new CW mill was planned to be considerably larger than the original mill, being able to manufacture pipe up to three-inch (75 mm) internal diameter. Construction commenced in early 1948 and the new mill, together with a new galvanising unit, was commissioned in 1950.38

35 *Australian Manufacturing*, 3 June 1953, p. 1
37 *Tubemakers of Australia Limited, Manufacturing in Newcastle Proudly Reviewed*, p. 17
38 *Tubemakers of Australia Limited, Manufacturing in Newcastle Proudly Reviewed*, p. 18
This change also affected the BHP skelp mill, which had to be modified to manufacture the larger skelp strip required to manufacture the larger pipe. A second galvanising plant was installed to handle the increased production quantities. The increase in pipe size from the new CW mill also required additional pipe finishing and screwing equipment.

The post-war period also saw planning for significant growth in the electric power generation and chemical industries in Australia. This led to a requirement to have the capacity to manufacture boiler and other specialist tubes in the sizes and lengths required by modern boilers and chemical plants in Australia. To meet this requirement, Tubemakers of Australia installed equipment capable of manufacturing a range of the specialist tubes required. In addition, the company decided to grow its pipe fabrication capability, which in a small way had become operational during the war, to fabricate high-pressure pipework and vessels. Drawing on fabrication and welding technology developed by the parent company in Britain, this pipe fabrication facility provided an Australian-based capability to design and manufacture a wider range of high-pressure vessels and high-pressure piping systems.39

At the State Dockyard in 1946, the three shipbuilding slipways installed during the war were now supported by a number of on-site workshops. The enterprise now employed a workforce of 1329 men, most of whom were skilled. The new dockyard now occupied a total area of 25 acres on the Carrington Dyke and had 3000 ft. (915 m) of wharf.40 The dockyard launched its first peacetime merchant ship, the Dorrigo, on 27 October 1945. The relocation of the Walsh Island-built floating dock to a ship repair site in the Throsby Basin in early 1943 pointed the dockyard towards ship repair and, from the end of the war, ship repair work became a major feature the dockyard’s work.

As it had been for its predecessor, the Walsh Island Dockyard and Engineering Works, the State Dockyard was also a major heavy engineering facility that was directly tasked to design and fabricate steel components for specific projects for the NSW Government. Examples of this work included the fabrication of components for some of the

39 Tubemakers of Australia Limited, Manufacturing in Newcastle Proudly Reviewed, p. 7
bridges that eventually provided an uninterrupted road journey on the NSW north coast route between Newcastle and Brisbane. The Hexham steel truss and opening span bridge was one of the first bridges designed and fabricated at the dockyard. This bridge was erected by the Department of Main Roads during 1950 and opened to road traffic in 1952.\textsuperscript{41} Throughout the 1950s, the dockyard also designed and fabricated power station components such as the turbine condensers for the new Wallerawang Power Station.\textsuperscript{42} This heavy engineering capability not only consumed large amounts of the carbon and alloy steels manufactured in Newcastle, it added to the NIH’s knowledge and skill base, encouraging potential customers to purchase additional heavy engineering services in Newcastle.

Based on the employment records, all of Newcastle’s heavy engineers maintained healthy workloads in the post-war period.\textsuperscript{43} The bulk of this work came from long-term traditional clients and this enabled each company to maintain its operations with minimum interruption. However, they relied primarily on jobbing work, for few large-scale projects were available from the State Government, and both competition and, as always, keen lobbying for work from Sydney-based heavy engineers was to keep work away from Newcastle. They would have to survive until the State Government and large companies, such as BHP, felt confident enough to once again invest in large scale projects.

In the Goninan case, the company received a significant amount of work when Stewarts and Lloyds decided to install a second continuous weld mill in Newcastle after 1946. Using the original continuous weld mill as a model, Goninan designed, manufactured and installed major components for the second continuous weld pipe mill. Beginning in the late 1940s, by establishing licences to manufacture specific products Goninan began to move away from industrial jobbing work. During the 1950s, this move was successful, when the company began the manufacture of GEC (USA) designed diesel electric locomotives.\textsuperscript{44}

The engineering capability of a region relies not only on the capability to design and build, it also requires both knowledge and depth across a range of related areas. The ability to design and manufacture the refractories products provides an example of this knowledge.

\begin{itemize}
  \item \textsuperscript{41} Arvo Tinni, ‘A Tale of the Trails’, in Armstrong (ed.), \textit{Shaping the Hunter}, p. 72
  \item \textsuperscript{42} Imashev, ‘The Shipbuilders’, p. 35
  \item \textsuperscript{43} Newcastle Chamber of Commerce, \textit{Annual Reports}, 1945 to 1950 inclusive
  \item \textsuperscript{44} Deera Phong-anant and Ian Stewart, ‘Perseverance Will Command Success’, in Armstrong (ed.), \textit{Shaping the Hunter}, p. 106
\end{itemize}
and its depth. Refractories are materials capable of resisting the action of corrosive solids, liquids or gases at high temperature. The NIH had included the Newbold Refractories company as a member since 1920 and, while the design and manufacture of refractory materials was done in Newcastle, the company’s work teams designed and installed refractory systems across Australia.

The Newbold refractory company had ended the war in excellent shape, with plans in place to increase production. The expansion programme began in earnest in 1947 with a major share issue to raise the capital required. By the end of 1948, the planned extensions had cost £200,000, doubling the company’s technical and production capacity. During the immediate post-war period, Newbold had developed to become the largest refractory operation in Australia and was a good example of the diversity of engineering capability available in the NIH.

The Public Utilities

As the private companies in the NIH coped with the uncertainties of the immediate post-war period, the public utilities also struggled with new demands. The Port of Newcastle had struggled throughout the whole of the war with limitations to wharfage, ship loading and unloading, and cargo-handling equipment. The immediate post-war period did not bring any relief from this struggle. Ship unloading and loading relied on the ship's equipment; this, coupled with poor cargo-handling equipment, demanded a large workforce. Aside from iron ore imports and coal exports, few cargos were handled in bulk, with grain imports and exports handled in bags. BHP met some of this problem by installing two ‘luffing’ cranes on their wharves during 1950, but this still left the shipping channels and turning basin to be enlarged and continually maintained. The maintenance of these channels was made increasingly difficult by the Hunter River flood of 1949. A Port Development Committee was established to prepare plans for the development of the port, but plans for an upgrade were not submitted until 1954.

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45 Michelle Watson, ‘In the Shadow of BHP: Newbold General Refractories’, unpublished B.A. hons diss. (University of Newcastle, 1994), Ch. 4, p. 2
46 Jay, A Future More Prosperous, p. 267
With the end of the war, the main task of the Hunter District Water Supply and Sewerage Board was to continue expanding and maintaining the water and sewerage system in the Newcastle, Lake Macquarie and Lower Hunter urban areas. With few large-scale projects underway, aside from repairs and maintenance to the existing system, the period between 1945 and 1950 was generally a quiet one for the Board. But urbanisation in Newcastle and the Hunter Valley towns was not static and, given existing and forecast population and industrial growth, thoughts turned towards new water supply schemes. This eventuated in the Grahamstown Water Scheme, which was developed during the late 1950s.

During the war, electricity generation equipment had been hard worked and in the immediate post-war period the demand for electric energy from both industrial and urban consumers could not be met. The reliance on already-overburdened British generation equipment manufacturers for the supply of equipment, and the shortage of the US dollars required to purchase American plant, meant that the building of new, large power stations had to be delayed. On a statewide basis, by 1949 the supply situation was acute and electricity rationed to industry, the railways and to urban consumers. In May 1950, the Electricity Commission of NSW was formed, with the immediate task of increasing power generation capacity as quickly as possible. The new Electricity Commission was tasked to install base-load generating plant in industrial organisations to avoid production shutdowns and arrangements were made for parallel operation with the public supply. This arrangement allowed the public system to draw up to 8 per cent of their demand from private generation systems to meet peak demand. From BHP’s point of view, not only were they being penalised by being forced to supply coal from their mines, but their electric generation system was to be purloined to meet peak urban demand requirements. Eventually seven 533 kW diesel electric units were installed in Newcastle’s civic area to boost generation capacity.

During the war, technical training was recognised as being essential for the whole community, in addition to conducting the training of professional and skilled labour required by the NIH. During the late 1930s, the delivery of technical education had been to some

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49 Mal Hindley, ‘From Weirs, Dams and Sand, Water Resources and Water Supply’, in Armstrong (ed.), *Shaping the Hunter*, p. 113
50 Terry Wall, ‘Power for the Twentieth Century’, in Armstrong (ed.), *Shaping the Hunter*, p. 142
extent decentralised, through the establishment of area councils, which had considerable independence from head office in Sydney. Yet from 1941, a combination of the new William McKell State Labor Government and departmental bureaucracy worked to recentralise the management of the technical education service in Sydney. Men such as W. E. Clegg, the manager of the Commonwealth Steel Company, argued to maintain the idea of area technical education councils, but the forces of centralisation were too strong. In 1949, this issue was finally resolved when the *Technical Education and University of Technology Act* was passed.\(^{51}\) This Act created a separate Department of Technical Education, whose Director had direct access to the NSW Minister for Education and, once again, the Sydney-based bureaucracy was in charge.

The Federal Government also had some influence on decisions relating to technical education. For instance, in 1944 the Commonwealth Reconstruction Training Scheme was introduced, as noted in the previous chapter. The objective of this scheme was similar to the Commonwealth Training Scheme introduced at the end of the First World War to provide trade and professional training for ex-service personnel. Joan Cobb observed that the states were scarcely better prepared for this post Second World War influx of students, after 1945, than they had been in 1919.\(^{52}\)

There was a need not only for facilities to train students, but also for the staff to train them. In terms of facilities, the Newcastle Technical College was fortunate, as the W. E. Clegg Trade Training building had been completed in 1942. This facility had numerous classrooms and well equipped workshops for the conduct of detailed apprentice training for each of the NIH organisations, as well the ex-service students. On establishment of the New South Wales University College of Technology at the Tighes Hill Technical College in 1951, diploma-training staff transferred from the technical college to this new organisation.

### Industrial Disputes

During this post-war transition period, in addition to the economic uncertainty that concerned the private companies in the NIH, there was considerable uncertainty concerning industrial relations. During the war, in spite of a union non-strike policy in Newcastle, there had been


\(^{52}\) Cobb, *Sweet Road to Progress*, p. 341
numerous disputes which invariably led to lost time. As a consequence of BHP being chastised by the Government concerning a dispute in 1943, the overriding factor of strike action had been predominately defensive. As Warwick Eather observed, the strike was rarely used as an offensive weapon.\textsuperscript{53} However, a constant complaint regarding the communist militancy was that it usurped the authority of moderate union officials.\textsuperscript{54} It is difficult to confirm just how much influence the communists had over organised labour in the NIH, but the influence was sufficient to contribute to the frequency of minor industrial disputes across the whole of the NIH.

In 1946, Ernie Thornton, the national secretary of the Ironworkers’ Union, stated ‘that now with the war over his union would attack BHP and everything associated with it.’\textsuperscript{55} Jay makes the point that Thornton’s confidence was illustrated in statements made at the first national post-war Communist Party Conference that were obligingly published by the party.\textsuperscript{56} According to Jay, the FIA only had allegiance to the Communist Party. Susanna Short commented on the industrial disputes which followed the gaoling of Jack McPhillips, an FIA official, for disparaging remarks he had made about the Arbitration Commission. Among the immediate wave of strikes organised in response to McPhillips’ gaoling, the Newcastle FIA sub-branch officials called an immediate twenty-four hour stoppage, with a follow-up meeting scheduled for the following Friday.\textsuperscript{57} Jay observed that this choice of date was unfortunate, for that Friday was a pay day at the steelworks. Many union members were irate at having to miss out on collecting their pay envelopes and the meeting ended in something of a riot.\textsuperscript{58}

On 27 July 1949, the coal miners in the South Maitland and the Northern Coalfields initiated an industrial dispute in support of a log of claims which included long service leave, a thirty-five hour week, improved amenities and a 30s. per week pay rise.\textsuperscript{59} With production already curtailed by coal shortages, the steelworks were closed and many steel workers, and workers from the steel fabricators and associated steel distributors lost up to six weeks’ work. In addition, their families were beset with electric power and coal gas shortages. For the NIH, the shortage of coal not only caused the steelworks to cease operations, it also

\begin{flushleft}
\textsuperscript{54} Macintyre, Australia’s Boldest Experiment, p. 379
\textsuperscript{55} Short, Laurie Short, p. 178
\textsuperscript{56} Jay, A Future More Prosperous, p. 173
\textsuperscript{57} Short, Laurie Short, p. 103
\textsuperscript{58} Jay, A Future More Prosperous, p. 173
\textsuperscript{59} Macintyre, Australia’s Boldest Experiment, p. 455
\end{flushleft}
ensured that the BHP fleet was tied up in Newcastle. It was not only unable to deliver the raw materials required to manufacture steel, but was also unable to transport the finished products from the steel fabricators to the national markets in each state. Figure 9.3 shows the fleet alongside in Newcastle and the idle steelworks during August 1949, providing a glimpse of just how few men were working at the blast furnaces.\textsuperscript{60}

Jay observed that while Newcastle, as a heavy industrial centre, could be expected to be a support base for the miners’ strike, the majority of ironworkers and skilled workers were actually opposed to providing unqualified support for the miners.\textsuperscript{61} Chifley appealed to the miners and their union not to strike, but the union and the men chose to ignore him.\textsuperscript{62} Macintyre observed that the Federal Government responded to the strike immediately with emergency legislation, freezing union funds, and had some union officials jailed. On 28 July 1949, troops were sent into the coalfields to operate open cut mines in order to provide some coal for essential consumption.\textsuperscript{63} Then, at the federal election held on 10 December 1949, the Labor Party was defeated and a Liberal/Country Party government, led by Robert Menzies, assumed office.

\textsuperscript{60} Jay, \textit{A Future More Prosperous}, p. 172
\textsuperscript{61} Jay, \textit{A Future More Prosperous}, p. 173
\textsuperscript{62} Day, \textit{Chifley}, p. 489
\textsuperscript{63} Macintyre, \textit{Australia’s Boldest Experiment}, p. 456
Figure 9.3: BHP Fleet Tied up at Newcastle in 1949

Source: Jay, A Future More Prosperous. p. 171
CHAPTER 10: CONCLUSION

This thesis has outlined Newcastle’s change from a commodity-based society, before 1915, to an industrialised society by 1950. In many respects, this change had been driven by the development of the steel industry in Newcastle throughout the 1920s and the 1930s. After 1935, Newcastle was joined in driving this national economic change through the development of the steel industry in Port Kembla. While the Newcastle Industrial Hub had led Australia into a manufacturing economy by 1950, it had not moved into the financial or governmental control of core influences. These aspects were firmly controlled by Melbourne and Sydney interests.

By 1950, the first years of the NIH’s post-war transition had been navigated, but on 27 January of that year Harold Darling, Chairman of BHP, died. Essington Lewis retired as the company’s Chief General Manager and succeeded Darling as Chairman of the Board. Under the stewardship of these two men the NIH had grown to be the largest integrated steel manufacturing centre in the Southern Hemisphere. They had driven the development of the steel industry in Newcastle and, after 1935, in Port Kembla since their respective appointments in 1920 and in 1922, through the application of deliberate commercial, organisational and technical policies.

As this thesis has argued, their consistent and deliberate policy measures were overwhelmingly important in influencing the establishment and growth of steel fabrication industries between 1920 and 1950. In addition, through a combination of technical integration and cooperation, the NIH had been robust enough to survive the Great Depression, an event immediately followed by an industrial expansion boom combined with the transition for war during the 1930s. Sometimes overlooked in this journey was the influence of the government assistance provided, particularly that delivered by Newcastle-based public utilities. Without their support and cooperation, the NIH could not have developed in the way that it did. This support enabled the NIH to mature during the 1920s, to grow exponentially during the 1930s and to meet the nation’s greatly expanded need for steel during wartime.
Rather than fostering the establishment of entirely new Australian steel fabricators, BHP favoured developing close relationships with British companies which could bring developed technology and reputations with them. The formation of BHP’s London board in 1920 confirmed BHP’s relationships with the British steel fabricators, Ryland Bros. and Lysaght, both of which had enjoyed a considerable share of the Australian fabricated steel market since the 1890s. During Essington Lewis’s visit to Britain in 1925, negotiations conducted led to an agreement being signed between BHP and the British tube maker Stewarts and Lloyds, in 1929, to establish a steel tube plant in Australia.

BHP did not exclusively support international partners, but also invested in Australian steel fabricators as consumers of its products. Newcastle’s fourth steel fabricator, the Commonwealth Steel Co. Ltd., was a locally formed company. Through the 1920s and 1930s, BHP and British companies purchased shares in Commonwealth Steel, broadening its manufacturing knowledge and capability, with BHP gaining a controlling interest by 1934. By fostering and, ultimately, taking over the steel fabricators, BHP ensured that the industrial elements of the NIH worked together in a coherent way.

Darling and Lewis were strategic in seeking government assistance for their industry. They successfully lobbied State and Federal Governments for protective tariffs, bounties for Australian manufacture, purchasing preferences and freight concessions. These protectionist policies were also important in encouraging the British steel fabricators to set up operations in Newcastle, enabling them to sell locally made products within the tariff imposts. All the while maintaining an image of their company as a great example of Australian free enterprise, the component companies of the NIH benefited from a range of taxpayer subsidies, to weather the challenges of the introduction of new manufacturing technologies in the 1920s.

The NIH, and BHP in particular, also exhibited the quality so highly praised in the twenty-first century: innovation. Regular investment was made in new technologies to achieve lower production costs and control over the cost of all raw materials and shipping, even when it required the temporary shutdown of the steelworks in 1922–23. Within BHP,
organisational change was undertaken in the form of vertical integration on American lines. By 1938, Hughes found, Australia was manufacturing the least expensive steel in the world.¹

The growth in Newcastle’s manufacturing capacity and profitability throughout the interwar period was all the more remarkable when contrasted with the massive economic contraction in Australia’s commodity-based economy between 1928 and 1933. Due largely to the failure of many British steel companies to invest in new technologies, the importation of steel products from Britain fell heavily at this time and this retreat encouraged an economic shift towards the domestic manufacturing sector, in order to satisfy local demand. Once again, this was encouraged by government policy, with a view to encouraging employment. Measures including increased tariff protection, currency devaluation and reduction in award wages provided considerable assistance to the NIH. Consequently, import replacement of manufactured product increased and became the basis for a national recovery. Schedvin observed that the steel industry, the bulk of which formed the Newcastle Industrial Hub, was in the forefront of the national economic recovery after 1932.

War posed a new challenge for the NIH, but it was one for which BHP and its subsidiary and associate companies had led a long and careful preparation. Well before other entities had accepted that war was approaching, the sharing of information between steelmakers in Britain, Germany, Japan and the NIH had persuaded Lewis that preparations had to be made. Assuming correctly that Australia would be cut off from imported materials and specialist steels, he arranged for the construction of a ferroalloy plant and a new power station in the steelworks, to provide power for it, during 1937. Surplus electric power was used to power the co-located steel fabricators. During 1940, a magnesium plant was built in the steelworks to cater for Australia’s new aircraft industry.

Through its subsidiary BHP Collieries, BHP expanded the mechanisation of its coal mines in the Northern Coalfields, which enabled these collieries to provide all of the coal required by the steelworks and the steel fabricators.

The increase in manufacturing growth between 1920 and 1940 was built on the logistic support foundation provided by Newcastle’s public utilities. This included the supply of water, electric power and port services, and the provision of technical education. Between 1934 and 1940, the electricity generation capacity of the Railway Commissioner’s Zaara Street Power Station was expanded by 80 per cent, primarily in order to meet industry’s forecast needs. To ensure that the industries and Newcastle’s growing population had adequate supplies of water, the development of the Tomago Water Scheme was undertaken in 1939. This new scheme supplemented the water supplied by the Chichester Water Scheme. The growth of capacity in both of these services facilitated the smooth functioning of the NIH.

In terms of technical education, the industrial components of the NIH were both major employers of graduates, and investors in the educational infrastructure. A concrete outcome was the building and equipping of a new technical college in the suburb of Tighes Hill between 1936 and 1942. This institution advanced Newcastle towards the ultimate goal of being home to an autonomous university, a goal achieved in 1965.

Lewis became an even more pivotal figure during the war, when he was made Director General of Munitions. This was a national brief, but the Newcastle steelworks played a central role in producing, along with the smaller AIS steelworks in Port Kembla, all of the raw material that would be fashioned into munitions. Lewis had started to move into munitions manufacture in 1935 and by 1940 a number of munitions annexes were operational in the NIH, producing munitions, special steels and a range of products required for war.

Then, late in 1941, a new member joined the Newcastle Industrial Hub, with the establishment of the State Dockyard in Newcastle. Collectively, these plants, together with a number of large heavy engineers, provided the equipment and the professional and skilled labour which enabled the NIH to manufacture the products required for war, as well as to manufacture the standard steel products demanded by the civilian economy. However, manufacture for war often required that new products, or manufacturing systems or processes, be developed. Two of these developments stand out, the manufacture of bullet-proof steel and bullet-proof steel components, and tungsten carbide tools. Before 1940 the
notion that such products could be developed by Australian industry seemed fanciful. That the research and development of these products could occur in Newcastle, a regional Australian city, was regarded by many as impossible. Nonetheless, it was achieved and it could be argued that the impetus came from the continuous demand made since the 1920s through the improvements made in the education of professionals and skilled labour.

While the NIH enjoyed considerable success in manufacturing steel products, the record concerning industrial relations was not so illuminating. From its very beginning in Newcastle, BHP and organised labour had been opposed to each other. BHP demanded absolute control of its workforce; the workforce responded to this demand negatively. Until the late 1930s, ongoing high unemployment provided the BHP group of companies with a weapon to control organised labour. But as the national economy climbed out of the abyss of the Great Depression, progressing to the manpower shortages of total war, unemployment declined and organised labour regained its strength.

The three decades under the guidance of Darling and Lewis, during which they oversaw the development of the NIH from infancy, through a stormy adolescence and on to manufacturing maturity, ended with the death of Darling in January 1950. Lewis succeeded him in the role of chairman of the BHP board, but he only held the reins until June 1953, when he voluntarily stepped down. Throughout this period, the NIH achieved an astonishing number of technical and manufacturing successes and this period of industrial and economic history is still relevant to current issues concerning manufacturing self-sufficiency.

Aside from Darling and Lewis, the people who were responsible for industrialisation in the Newcastle Industrial Hub are largely unknown. The period of history covered by this thesis is still relevant: while technologies may have changed, knowledge of previous experiences in industrialisation provides something of a model which can be used for solving future problems. As striking as the development of the steel industry and its technological innovation had become between 1915 and 1950, it was not matched by comparable changes to the city’s economic structure. But perhaps the change which fostered the progressive advancements in steel technology came with the development and the delivery

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of technical education in Newcastle. The scope of this development in technical education confirms Kerr’s comment that education is the handmaiden of industrialisation.\(^3\) This development took additional steps in 1947, when a university college was established on the Tighes Hill Technical College site, and when in 1949 a teachers college was established in the City of Newcastle. By 1965, Newcastle would have its own university.

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THE MAKING OF THE NEWCASTLE INDUSTRIAL HUB

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APPENDICES

Appendix A

Coke Ovens and BHP By-products

The use, weekly, of about 30,000 tons of coal in the Company's by-product coke ovens for the manufacture of blast furnace coke, resulted in the production of a number of by-products, including tar, benzol, toluol, zylol, solvent naphtha, naphthalene, ammonia, and ammonium sulphate, all of which had war-time applications.

Tar, of which 12,000,000 gallons were sold for defence purposes during the war, was extensively used in the building of strategic roads and aerodromes all over Australia. The crude tar produced in the coke ovens was refined by the BHP by-products company and was made available wherever needed in New South Wales and, where practicable, in that company's ten 6500-gallon capacity rail cars, and for the actual spraying, their entire fleet of thirteen modern mechanical motor sprayers, each of 800 gallons' capacity, was made available to the defence authorities.

Specifically prepared tar paint, used for combatting corrosion, and Colcrete (a bituminous emulsion) were used for coating concrete-lined pipes for water services and other purposes. In addition, a considerable quantity of Colvenac (bituminous emulsion) was manufactured and supplied for surfacing aerodrome runways, hangar floors, and aprons.

Limited quantities of tar oil were made available for producing creosote, which provides excellent protection for timber against borers and other pests, and was of value for making disinfectants and deodorants for use in military camps.
A special pitch of high melting point, previously imported, was also developed for use in the manufacture of electrical resistances for wireless sets, etc., required by the forces in the field, and in tanks and aeroplanes.

Considerable amounts of sublimed naphthalene were produced and supplied to the Middle East and India. It was also extensively utilised in Australia, not only for packing for skins and hides for export and for combatting silver-fish and moths, but was also required for producing sprays to destroy blowfly and other vermin in military camps.

Specifically prepared naphthalene was also made for the manufacture by the Newcastle Chemical Company of beta naphthol and phthalic anhydride. The former was required for the production of a chemical used for the extraction of cobalt and the latter for the preparation of special varnishes and lacquers which were in heavy demand by the defence authorities.

During the war, 21,576,000 gallons of benzol were produced, of which 1,246,000 gallons were of specially high-grade quality with a distillation range of 0.5°.

While the bulk of the benzol produced went into the common pool for use as a motor fuel, the special high-grade product was utilised for the manufacture of synthetic phenols, aniline, aspirin, etc.

Production of toluol was 1,578,000 gallons, of which 1,298,000 gallons were an especially high-grade 0.5° range spirit. This latter grade was not manufactured in large quantities prior to the war, but its production during the war was necessary because of its use by the defence authorities for the manufacture of the high explosive TNT.

The lower grade material was required for the manufacture of lacquers and as a solvent.

A total of 320,215 gallons of solvent naphtha and xylol were made available for special insulating varnishes required for the protection of shells, mortar bombs, land mines and suchlike applications.

Sulphate of ammonia is normally employed as a fertiliser, but during the war was utilised for the production of nitric acid, which was required for the manufacture of explosives and for other war purposes; during the war period, 78,940 tons of this material was made. All sulphate of ammonia was marketed under government control.
Appendix B

The Manufacture of Bullet-Proof Plate

The manufacture of bullet-proof plate provides one of the best examples of product reinvention in Australia during the Second World War. Until 1939, the knowledge of how to manufacture bullet-proof steel and armour plate, in the British Commonwealth at least, was confined to just a few British firms, the best known of which was Hadfields Ltd. During the post-1937 Imperial Conference period, Australian metallurgists gained some knowledge of processing the famous Hadfield ‘Resista’ product. Resista was a complex nickel-chromium-molybdenum steel formulated to meet a British Army specification. During 1938 and 1939, small quantities of this product had been made by the Commonwealth Steel Company, for light armoured fighting vehicles being manufactured in Australia. Because the Resista product contained substantial quantities of these alloys, this steel was difficult to fabricate in downstream manufacturing processes.

Downstream manufacturing relied on annealing the Resista steel after it had been rolled into sheets, in order to put it into a condition where machining and forming operations could be conducted. After these operations were complete, the shaped components were hardened and tempered through a process of heating and oil quenching, in order to achieve the specified finished physical properties. After laboratory testing, pieces were taken at random and subjected to a ballistic test, the nature of which varied according to the thickness of the plate. If a piece failed the ballistic test, the whole batch was likely to be condemned and all of the manufacturing effort expended to that point wasted.¹

In July 1940, requirements for the manufacture of 30,000 tons of bullet-proof plate were made known to Lewis, now in the position of Director of Munitions. After consulting with his chief metallurgical advisor, Mr Clark from the Commonwealth Steel Company, he was advised that there was insufficient nickel, molybdenum and chromium in Australia to manufacture the quantity of Resista steel required and it was imperative that a substitute be found. The task was given to George Bishop of the BHP steelworks to solve. On forming his team, from within the ranks of the available metallurgists at the steelworks, Bishop was told that not only must a substitute bullet-proof plate be developed to meet the British Army

performance standard, but that it must also be capable of being welded using standard electric welding techniques.

Resista steel owed its extreme toughness to the presence of nickel, which caused the steel to assume a fine-grained structure which provided the steel with a desired depth hardness characteristic. Bishop quickly identified two possible alternatives, aluminium and vanadium, but both of these options involved undesirable issues. Aluminium could cause unpredictable spot weaknesses in the plate and vanadium was rare, as it had to be imported from Africa. Finally, it was decided to trial zirconium, a mineral not normally used for this purpose, but which had the advantage of being indigenous to beach sand in NSW. Trial batches which included higher quantities of chromium to provide surface hardness, and additional manganese in order to increase its weldability were quickly prepared. After rolling into plate form, it was subjected to laboratory and ballistic testing. It was found that not only did the rolled plate have the required surface and depth hardness required, but that it was also able to be welded using standard electric welding equipment. Unfortunately, given the quantities of plate components required, the Newcastle steelworks was unable to provide sufficient rolling capacity. Accordingly, arrangements were made with Lysaght to roll and fabricate the finished plate components from slabs produced by BHP. This new material was now assigned a name, Australian Bullet Proof 3, or ABP3.²

In order to ensure that the completed plate components maintained their ballistic properties after rolling, Lysaght undertook a short but intensive experimental process, which included designing a cutting and forming process. Rolling was transferred to the Lewis Mill and a flexible heat treatment process devised which enabled plates to be delivered from the Lewis Mill and to be tested prior to any cutting and forming being conducted. Ballistic testing was conducted on a miniature range located within the Lysaght plant. After testing, the plates processed to a plate cutting and forming section. Here, through the use of automatic profile oxy-acetylene machines, designed by Lysaght, the raw plates were cut into components for light armoured vehicles, gun shields for artillery pieces or, to a smaller extent, for ships or aircraft.³ Plate thickness varied from one-sixth of an inch (4.3 mm) to 1.25 inches (33 mm). Depending on thickness, the plates were immune from 0.303-inch (7.7 mm), 0.5-inch (12.57 mm) or 0.55-inch (12.8 mm) anti-tank ammunition.

³ John Lysaght (Australia) Ltd., Lysaght’s Silver Jubilee, pp. 81–87
Appendix C

The Manufacture of Tungsten Carbide

Tungsten carbide can well be described as the ‘mighty atom’ of the engineering industries. Its production in Australia necessitated the development of a complex series of rigidly controlled operations, as the secrets of overseas manufacturing technique have never been made public.

Tungsten carbide is sold by the ounce under many trade names and is used in small prescribed shapes, which are usually brazed on to steel mounts. Its main uses are as cutting tools and as dies for drawing wire and tubes, although its general applications are many and varied. It is one of the hardest materials known, and in service also exhibits the invaluable characteristic of retaining its cutting edge even although heated to redness by friction.

Just prior to World War 2, the necessity for making Australia independent of overseas supplies of tungsten carbide products was realised. With this object in view, the Broken Hill Pty. Co. Ltd. negotiated with overseas manufacturers to obtain the necessary technical information for tungsten carbide production. However, this information was not forthcoming, and in December 1940 a small team of technicians was selected to carry out research on methods of production.

Approval for the building of a pilot plant was given in January 1941 and erection commenced immediately. In the meantime, experimental work on a laboratory scale was proceeding, and the first wire drawing die was produced on January 15, 1941. In February, a few tips for cutting cast iron were made but it was not until the middle of April 1941 that a tool tip capable of cutting steel at high speeds was available.

The pilot plant was completed in September 1941 and the developmental work necessary to evolve a satisfactory large-scale production technique commenced.

Early in October 1941, the first successful steel cutting tips were produced, and by the middle of December 1941 — only twelve months after research began — secrets of the process had been mastered and the Company’s 25-pounder HE shell annexe was using 100 per cent BHP tips and, in January 1942, the Rylands Bros. (Aust) Pty. Ltd. wire mills changed over to 100 per cent locally made tungsten carbide wire drawing dies.

In view of the intricate and very technical nature of the operations involved, the successful development of tungsten carbide manufacture in this country in such a short time is regarded as a major triumph.
Appendix D

The Manufacture of Magnesium

Magnesium is the lightest of all commercial metals, its density being two-thirds that of aluminium. The chief uses of the pure metal are for alloying with aluminium or as a deoxidiser in casting bronze or nickel. As magnesium powder, its great combustibility and intense emission of light render it most useful for the manufacture of flares, star shells, and for ignition mixtures.

Magnesium rich alloys of the Elektron series, containing aluminium and copper, &c., are of great importance in the aircraft industry in view of their combination of strength and lightness.

Aluminium alloys of the Duralumin type, containing magnesium, together with small amounts of other elements, also possess exceptional strength in proportion to their weight, besides exhibiting very satisfactory ductility.

Magnesium and most magnesium alloys are also particularly easily machinable.

In view of these facts it is easy to understand why magnesium is regarded as a strategic metal of great importance, particularly in the aircraft industry.

Because of the great impetus in the manufacture of aircraft at the outbreak of war, and a consequent world shortage of magnesium, the company decided in July, 1940, to construct a plant for the manufacture of the metal in this country, two officers were sent abroad to investigate plant and manufacturing methods.

It is indeed a creditable performance that just over one year from the date of the departure of these officers for England, buildings and plant were so far advanced as to enable production of magnesium to commence.

The building consisted of a main structure with a 30ft. lean-to on each side, the overall dimension being 336ft. 3in. x 134ft. (102 m x 40.8 m)

The method of manufacture was fundamentally the same as that used by Murex Ltd., England, with whom an agreement was contracted, and consisted of the thermal reduction in

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high vacuum of magnesium oxide with calcium carbide, in steel retorts at a temperature of about 1,150°C. in gas-fired furnaces.

In order that the retorts should be reasonably able to withstand the exceptionally high furnace temperatures, they had to be protected with high alloy heat resistant sheaths. The sheet used for the construction of the latter was initially imported, but was later made and supplied by the Commonwealth Steel Company.

The calcium carbide used for the process was at first obtained from the Australian Commonwealth Carbide Co. Ltd., Tasmania, but the manufacture of this essential was later undertaken and successfully produced in one of the ferroalloy electric arc furnaces.

At the conclusion of the war, the reduction in Australian aircraft manufacture and the ready availability of supplies from overseas rendered further production unnecessary and undesirable, and the plant was closed down and later demolished.

During the war 2,582,000 lb. of magnesium crystals were produced (1,173,636 kg).

All magnesium crystals were remelted in a special furnace and about 90% was alloyed with aluminium and other metals and cast into ingots for use in the aircraft industry.

The remainder was cast into cheeses for the manufacture of magnesium powder.

For this latter purpose a special building was constructed which, due to the combustible and, under certain circumstances, explosive properties of magnesium dust, was designed to prevent the lodgement of dust particles. Special pneumatic cleaning devices had also to be installed to prevent dust accumulating on floors and walls.

Production figures for the three years in which the magnesium powder plants operated were as follows:-

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As a matter of interest it may be mentioned that 5,088 tons of calcium carbide were produced for use in magnesium manufacture.
Appendix E

The Charter given to the Director General of Munitions, Essington Lewis,

22 May 1940

In order to give Mr Essington Lewis the greatest possible degree of authority, subject only to
the policy and approval of the War Cabinet and to ministerial direction from myself, there will
be established a Department of Munitions, with myself as Minister and Mr Lewis as Director-
General. Mr. Lewis will have access to the War Cabinet, in the same way as the Chiefs of
Staff, on matters which relate to his work.

This new Department of Munitions will deal with all ordnance, small arms, explosives and
ammunition, together with such ancillary matters as gas masks, and will have a supervisory
jurisdiction over aircraft supply. It will also include related materials.

The Director-General will be given a complete power of delegating authority. He will be a
member of the Defence Committee. Through his Minister he will have the right of initiating
matters for consideration by the War Cabinet. The new department will, as far as possible,
use the existing machinery of the Supply Department, including the Contracts Board.

Instead of securing specific approvals from time to time, one of the earliest duties of the new
Director-General will be to confer with other members of the Defence Committee in an
endeavour to formulate a series of objectives which it is desirable to achieve during some
prescribed period. If these objectives are then approved by the War Cabinet, the mandate to
the Director-General will be a perfectly simple one. It will be: Go ahead in your own way and
achieve these objectives in the shortest possible time.

We will take power by regulation, to the extent to which it does not already exist, to
requisition all private resources of plant and equipment. The Director-General will be
authorised to make purchases direct without tenders or circumlocution. A standing order will
be issued by the Government that no factory may provide for any new tooling-up without
authority.... The Director-General will not be limited by Public Service regulations or
otherwise in the employment of personnel.

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5 Mellor, The Role of Science and Industry, p. 36