

Introduction

1. This chapter gives an overview of the characteristics of the coal resource and the coal mining industry in New Zealand and in Australia.

New Zealand coal fields

Main characteristics

2. New Zealand's coal resources are estimated to be over 15 billion tonnes, 80 to 85% of which are South Island lignites. The recoverable quantities of the 10 largest deposits are estimated at over 6 billion tonnes. Sub-bituminous and bituminous resources are estimated to be 3.5 billion tonnes; the recoverable quantity is uncertain.¹ The coal basins generally range in size from 150km² to 1500km². They often contain small coal fields.
3. New Zealand straddles the Pacific and Indo-Australian tectonic plates. Consequently coal seam geology can be complex, with changes in thickness and dipping over short distances. There can be marked structural disturbance, including multiple partings or splits, normal and reverse faulting and overfolding. The quality, thickness, structure and integrity of the seams can vary significantly over short distances. The faulting and complexity at the Pike River mine are not unusual.
4. The coals vary from lignite to semi-anthracite. They can be prone to spontaneous combustion and gas outburst. Gas content can vary within and between mines and ranges from non-gassy to highly gassy. The coals can have high water content. Some fields are located in areas of high rainfall. Inundation can occur, sometimes from old workings.
5. Many coal fields lie near regions of high ecological significance. Rock may be sulphur bearing, with potential for acid mine drainage and subsequent environmental damage. Streams and other natural resources require protection in accordance with environmental legislation.² Additional protections and consents are required to mine in land administered by the Department of Conservation (DOC).
6. The topography is often difficult, making access challenging and requiring mines to have relatively self-contained infrastructure and rescue facilities. The weather is variable, with many areas prone to high rainfall, fog and cloud cover. The weather can impede search and rescue operations, as was the case at the Pike River mine.
7. The complex geology, especially faulting and steep dipping, means that conventional mechanised mining methods are sometimes not very effective. Solid Energy New Zealand Ltd, the largest New Zealand underground coal mine operator, has responded by using hydro mining on the West Coast. This method was also used at the Pike River mine. A technique uncommon in most of the world, it requires specialised equipment and training. Combined with the geological conditions of the West Coast, hydro mining provides challenges for safety management.³
8. Some countries, especially those on the Pacific Rim, have coal fields similar to those in New Zealand. But those distant from tectonic plate boundaries, including Australia, South Africa, India, Western Europe and the eastern United States, are often of much greater lateral extent, and have simpler and more predictable geology.

Production

9. The large lateral seams found overseas can accommodate substantial underground coal mines with high production rates. By contrast, underground coal mines in New Zealand are small and have not been able to sustain

high production rates. The highest reported production by a New Zealand underground coal mine in one year was 500,000 tonnes, from the Spring Creek mine. Initial expectations had been up to 1.8 million tonnes per annum.⁴ Production at Pike River was initially estimated to be up to 1.3 million tonnes per annum,⁵ but that was revised downwards. By October 2010 the production forecast to June 2011 was 320,000–360,000 tonnes.⁶

10. Difficult geology, low production rates and New Zealand's distance from international markets make mining here economically challenging. Two factors offset these problems: the high quality of some New Zealand coal, especially that from the West Coast, and the commodities boom over the last decade and consequent increase in international coal prices.⁷

Planning

11. Great care is needed when planning, developing and operating underground coal mines. Detailed exploration is required. Insufficient resource definition has resulted in many mines being uneconomic or facing unforeseen health and safety risks. Three of the six large underground coal mines commissioned in New Zealand in the last 35 years have failed.⁸
12. Even successful mines have had problems. Solid Energy gave the example of its Spring Creek mine, situated about 20km as the crow flies from the Pike River mine. There was exploration in the 1980s and 1990s but the joint venture partners were not prepared to commit the major capital required to develop a large mine. Instead they adopted the less costly option of accessing a high-quality seam nearer the surface. The preliminary plan and budget were approved in 1999, 'under time pressures, with too little geological and resource investigation completed and with only a short-term view of the future mine plan. These combined decisions compromised the mine for the next 12 years, resulting in challenges for safe and economic mining that have had to be overcome with difficulty ever since and are still felt today.'⁹
13. Spring Creek did not achieve its initial production targets. Costs escalated. By 2001 the mine was placed on care and maintenance. This means that production is halted but the site is managed so that it remains safe and stable, ready to be reopened if circumstances alter.
14. In 2002 Solid Energy became the sole owner. It reopened the mine and carried out further drilling to improve the resource information. As Dr Donald Elder, chief executive officer of Solid Energy, said, '[i]n mining, where certainty of geological information is the key to good mine planning and operations, the unexpected only ever has negative consequences. So it was with Spring Creek. For the next six years the mine struggled and repeatedly failed to meet its production and financial plans.'¹⁰

Observations

15. This leads to three observations. First, the economics, the timeframe from design to production, and the technical and legal requirements of underground coal mining in New Zealand cannot be directly determined by overseas experience.
16. Second, New Zealand operators may require knowledge and expertise, including in hydro mining, that overseas operators may not have. Everyone involved – miners, supervisors, management, the board, training institutions, advisers and regulators – must possess this specific and specialised background. Similarly, particular mining equipment may be required. Some overseas equipment may not be suitable.
17. Third, the principles underlying safe mining in New Zealand are the same as those overseas. Mine operators need to control the risks of the unforgiving underground environment by comprehensive measures including hazard identification and safety management, strata control, ventilation and gas management systems and equipment. Suitable equipment, trained workers and expert advisers are essential.

New Zealand coal mining industry

18. New Zealand has produced coal since the late 1840s. It was a major energy source, but from the 1950s to the 1970s hydro power, cheap imported oil and then gas from the Taranaki region became significant energy sources. There was a general decline in demand for coal and many small and inefficient mines began to close.¹¹ The number of coal mines reduced from 216 in 1952 to 78 in 1973. Currently there are approximately 22 coal mines, five of which are underground. Production has been suspended at two underground mines, including Pike River, and two open cast mines.¹² The industry is dominated by Solid Energy and otherwise comprises very small operators.
19. Correspondingly, the number of people employed in the industry decreased from approximately 5000 in the 1950s to 1500 by the 1970s. In 2010 coal mining employed between 1030 and 1700 people,¹³ of a total New Zealand workforce of approximately 2 million.
20. Over the last few decades annual coal production has grown, to about 5 million tonnes in 2011 (see Figure 19.1). That trend is predicted to continue.

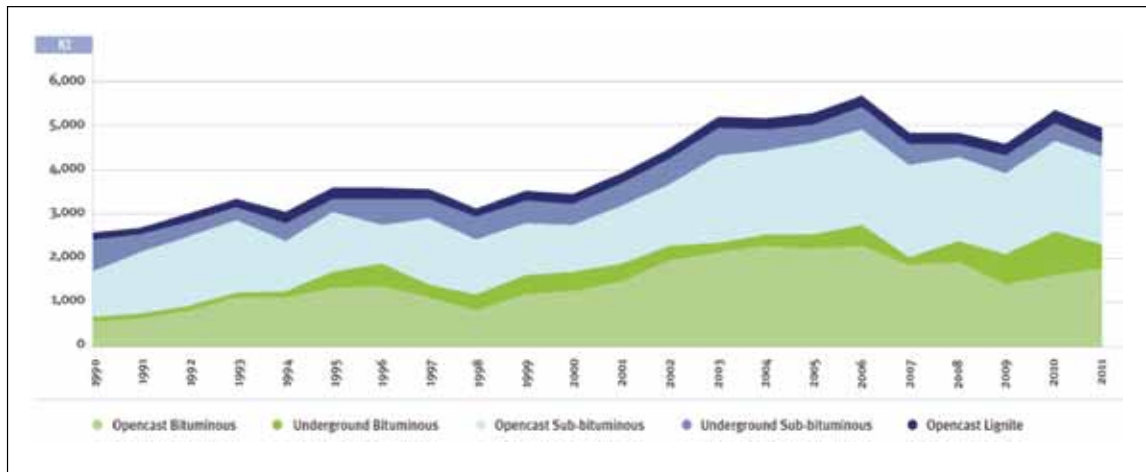


Figure 19.1: New Zealand coal production¹⁴

21. There have been significant changes in the way in which coal is mined in New Zealand. Up to the 1940s coal was mined almost exclusively using underground methods. Since the Second World War open cast mining has been in the ascendancy (see Figure 19.2). By the 2000s only about 20% of annual coal production came from underground mines.



Figure 19.2: Open versus underground mining¹⁵

22. Underground coal mining still has a place in New Zealand. It is practised by several operators, including Solid Energy at its Huntly East mine in the North Island and at Spring Creek.

Australian coal mining industry

23. New Zealand's largest coal mining neighbour is Australia. It is one of the largest producers in the world and has the fourth largest coal reserves. In 2010–11, Australia produced 347.6 million tonnes of saleable coal, approximately 22% (76.1 million tonnes) of which was produced by underground methods and approximately 72% (271.5 million tonnes) by open cast methods. New Zealand's total coal production represents less than 2% of Australian coal production.
24. Approximately 97% of Australian saleable coal is produced in Queensland and New South Wales.¹⁶ In the 2010–11 year Queensland produced 179.8 million tonnes from 59 mines, 15 of which were underground. The industry directly employed 32,453 people. New South Wales produced 156.9 million tonnes from 61 mines, 30 of which were underground. The industry directly employed 21,126 people. Western Australia, South Australia and Tasmania produced approximately 11 million tonnes in seven mines employing about 1000 people. The Northern Territory does not produce coal.¹⁷
25. The industry includes large multinationals, some of which own several mines. Many mines are large scale, using high production methods such as longwall mining. Hydro mining is not used.
26. Australian coal industry workers tend to be paid more than their New Zealand counterparts. That attracts New Zealand workers, contributing to a shortage of experienced coal mine workers on this side of the Tasman. As a result New Zealand operators may be required to train workers or source them from overseas.

Conclusions

27. Coal mining in New Zealand has some unique characteristics, which must be accommodated at all stages of mine design, development and operation. But the need for careful health and safety management, and the systems required to achieve this, are the same as overseas.
28. Despite the differences in scale, New Zealand can benefit from close co-operation with Australia, especially the main mining states of Queensland and New South Wales. That theme is reflected in this report.

ENDNOTES

¹ Ministry of Economic Development, New Zealand Petroleum and Minerals, Coal Resources, 14 March 2012, <http://www.nzpam.govt.nz/cms/coal/coal-resources>

² See the Resource Management Act 1991.

³ Donald Elder, transcript, p. 6.

⁴ Ministry of Economic Development, Phase Four, 16 March 2012, MED4000010001/29, para. 101.

⁵ *Ibid.* This was to come from a combination of production and roadway development.

⁶ Pike River Coal Ltd, Activities Report: Quarter ended 30 September 2010*, DAO.007.11332/2.

⁷ Donald Elder, witness statement, 8 June 2011, SOL306956_1/16, para. 32.

⁸ Huntly West mine exploded in 1992, producing little further coal before being closed. Mount Davy suffered rock, coal and gas outbursts and fatalities before closing three years after first development and the Pike River mine exploded before any significant production. Ministry of Economic Development, Phase Four Paper, 16 March 2012, MED4000010001/26, para. 91.

⁹ Donald Elder, witness statement, 8 June 2011, SOL306956_1/19, para. 44.

¹⁰ *Ibid.*, SOL306956_1/21, para. 52.

¹¹ Ministry of Economic Development, Tier Two Paper, 6 May 2011, MED0000010001/10–11, paras 18–19.

¹² Ministry of Economic Development, New Zealand Petroleum and Minerals, Operating Coal Mines, 16 March 2012, <http://www.nzpam.govt.nz/cms/coal/coal-resources/operating-coal-mines>

¹³ It has not been possible to ascertain the exact number of people employed in the industry, in part due to conflicting data and, it is assumed, different definitions of the categories of people that should be included, e.g. whether contractors should be included.

¹⁴ Ministry of Economic Development, New Zealand Petroleum and Minerals, graph, http://www.med.govt.nz/sectors-industries/energy/image-library/energy-data-and-modelling/coal/Coal-1.gif/image_view_fullscreen

¹⁵ Alan Sherwood and Jock Phillips. 'Coal and Coal Mining', Te Ara: The Encyclopaedia of New Zealand, 24 September 2011, <http://www.TeAra.govt.nz/en/coal-and-coal-mining/6/5>

¹⁶ Australian Coal Association, Coal Production, <http://www.australiancoal.com.au/coal-production.html>

¹⁷ Data sourced from the Queensland Department of Natural Resources and Mines and Coal Services Pty Ltd.