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Final Report | July 2009

Coal Prices in New Zealand Markets

Prepared for

Ministry of Economic Development

economics | research | forecasting | public policy

Authorship
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We help organisations to solve problems and make decisions using our core skills of economics, forecasting, research and public policy.

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Executive Summary

Background

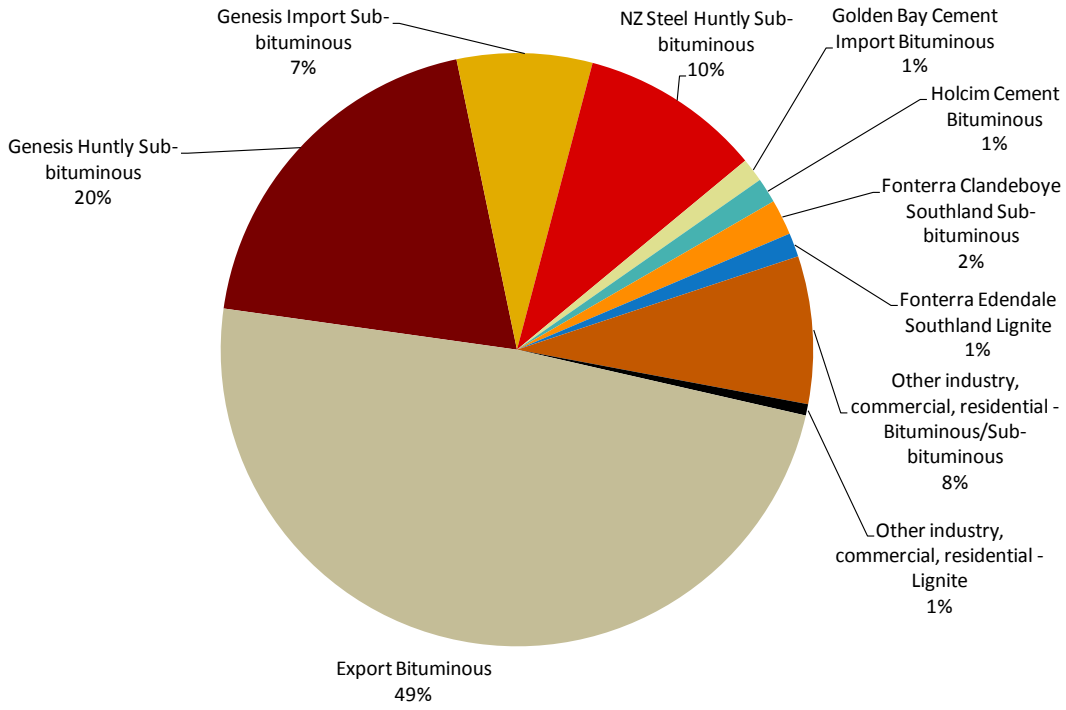
This report examines the current and expected future prices of coal in New Zealand for domestic and export markets. It is produced to provide data as input to forecasting and other modelling work by MED and other government agencies.

The work has been based on industry interviews and analysis of published price data. Interviews have been held with coal producers, distributors and major users.

Coal Markets

The key coal markets in New Zealand are set out in Figure E1. These are defined by end use and type of coal. The largest market is the export market for West Coast bituminous coals; at 78.5 PJ (c.2.6 million tonnes) this amounted to 49% of coal trade in and from New Zealand in 2008.

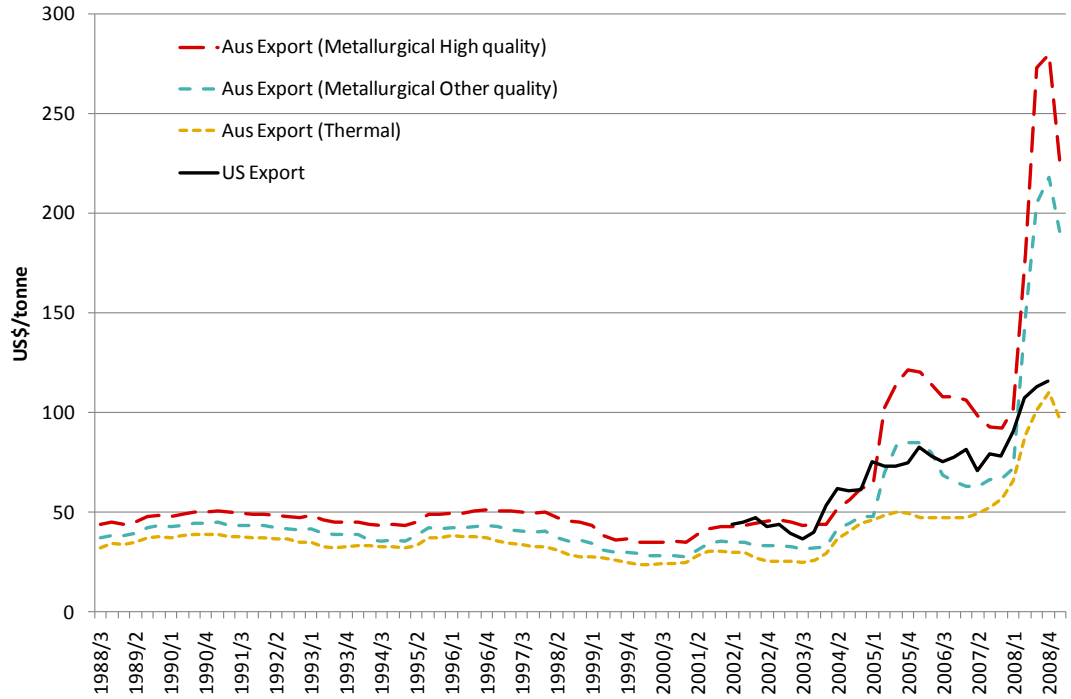
Figure E1 Markets for Coal in New Zealand (2008 data, proportions by energy content)



International Prices

International prices have ben relatively stable historically through to approximately 2004 but have risen recently (Figure E2). Prices rises have been because of a global imbalance of supply and demand, particularly as a result of growth in demand in China. The current global recession has reduced demand and price, but prices are expected to rise again following the end of the recession and a resumption of economic growth in China and India.

Figure E2 International Coal Prices



In the longer run international prices are expected to settle at a higher price than historically, largely because of higher costs of mining as new reserves being opened up are deeper in the ground. Projected future prices are shown in Table E1.

Table E1 International Price Forecasts

	Coking		Thermal	
	US$/tonne	US$/GJ	US$/tonne	US$/GJ
2010	128	4.41	72	2.67
2015	200	6.90	100	3.70
2020	125	4.31	60	2.22
2025	125	4.31	60	2.22
2030	125	4.31	60	2.22

Domestic Prices

Domestic prices are influenced by international prices to some extent; the effects differ by region in New Zealand. Within New Zealand there are three main regional markets:

1. Lower South Island (below Timaru) served mainly from Southland with lignite and/or sub-bituminous.
2. Upper South Island served mainly from the West Coast with bituminous/sub-bituminous blends
3. North Island sub-bituminous

The lower South Island is dominated by lignite coals that are not traded internationally. Prices are set by local competition and extraction costs. West Coast coals are exported and receive international benchmark prices, free on board in Lyttelton; both coking and

thermal coals are exported. The export value of thermal coals sets a lower limit on the local price for thermal coals. Import costs for coal are not a significant determinant of prices in the South Island as, with the exception of two large dairy plants and Holcim cement, no individual user is large enough to import coal given the size of ships used for international coal trade (typically 40,000 tonne vessels).[1]

In the North Island there are several large users of coal including NZ Steel, Genesis Energy's Huntly coal-fired electricity plant, Golden Bay Cement (located at Portland, near Whangarei) and McDonald Lime. Both Genesis Energy and Golden Bay Cement import coal, from Indonesia and Australia respectively. Genesis Energy also purchases coal from the Waikato.

Current and estimated future prices, for these large users, are presented in Table E2.

Table E2 Summary of Future Prices - Large Users

Market	Coal type[1]		GJ/t	Current volume (PJ)	Current Price ($/GJ)	2010 ($/GJ)	2015 ($/GJ)	Long run ($/GJ)
Exports - coking	B	West Coast	30.5	64	7	7	10.9	6.8
Exports - thermal	B	West Coast	30.5	13	4.4	4.4	6.2	3.7
Genesis Huntly	SB	Waikato	22	31	4.5	4.5	5.25	5.25
	SB	Imported (Indonesia)	22	12	5.2	5.2	7.4	4.6
NZ Steel	SB	Waikato	22.4	18	6.5	6.5	6.5	6.5
Gloden Bay Cement	B	Imported (Asutralia)	27	2.1	5.7	5.7	7.9	5.1
Holcim cement	B	West Coast	27	2.2	4.5	4.5	-	-
	SB	Otago	20	2.5	-	-	4.5	4.5
Fonterra Clandeboye	SB	Southland	19	3.1	5.4	5.4	5.4	5.4
Fonterra Edendale	L	Southland	15	2.1	1.8	1.8	2.7	2.7

[1] B = bituminous; SB = sub-bituminous; L = lignite

Table E3 shows estimated future prices for coal for new electricity generation in different regions of New Zealand and Table E4 summarises current and expected future prices for other smaller users of coal in the different regional markets.

[1] There is the possibility for a wholesaler to import coal to supply local markets, but this has not occurred to date.

Table E3 Estimated Coal Costs for New Electricity Generation ($/GJ)

	Lower South Island Lignite/sub-bituminous	Upper South Island Blended sub-bituminous	North Island Sub-bituminous
GJ/t	15-20[1]	22-25[2]	22-27[3]
2010	2.5 – 3.0	5.0-6.0	5.0 – 6.0
2015	2.5 – 3.0	5.0-6.0	5.0 – 6.0
2020	2.5 – 3.0	5.0-5.5	5.0 – 6.0
2025	2.5 – 3.0	5.0-5.5	5.0 – 6.0
2030	2.5 – 3.0	5.0-5.5	5.0 – 6.0
2035	2.5 – 3.0	5.0-5.5	5.0 – 6.0

[1] Lignite (15GJ/t) or sub-bituminous (20GJ/t); [2] Blended sub-bituminous; [3] Waikato sub-bituminous (22GJ/t) or imported thermal (22-27GJ/t)

Table E4 Projections of coal prices in different markets

	Large Industrial		Industrial/commercial		Other	
	Lower SI[1]	Upper SI/NI[2]	Lower SI[1]	Upper SI/NI[2]	Lower SI[1]	Upper SI/NI[2]
GJ/t	15-20	22-27	15-20	22-27	15-20	22-27
Current	4.5-5.0	6.0-7.0	4.5-7.5	7.0-7.5	5.5-9.0	7.8-8.5
2010	4.5-5.0	6.0-7.0	4.5-7.5	7.0-7.5	5.5-9.0	7.8-8.5
2015	4.5-5.0	6.0-7.0	4.5-7.5	7.5-8.0	5.5-9.0	8.0-9.0
2020	4.5-5.0	6.0-7.0	4.5-7.5	7.5-8.0	5.5-9.0	8.0-9.0
2025	4.5-5.0	6.0-7.0	4.5-7.5	7.5-8.0	5.5-9.0	8.0-9.0
2030	4.5-5.0	6.0-7.0	4.5-7.5	7.5-8.0	5.5-9.0	8.0-9.0
2035	4.5-5.0	6.0-7.0	4.5-7.5	7.5-8.0	5.5-9.0	8.0-9.0

[1] Location assumed to be Dunedin; [2] Location assumed to be Christchurch or Waikato

1. Introduction

1.1. Background

This report examines the current and expected future prices of coal in New Zealand for domestic and export markets. It is produced to provide data as input to forecasting and other modelling work by MED and other government agencies.

The work has been based on industry interviews and analysis of published price data. Interviews have been held with coal producers, distributors and major users.

Much of the information was supplied on a confidential basis and this means some of what is presented is in a reasonably generic format to maintain confidentiality. In a number of instances we have identified prices for specific users where these data are in the public domain; for some markets we have estimated prices for specific users.

1.2. Acknowledgements

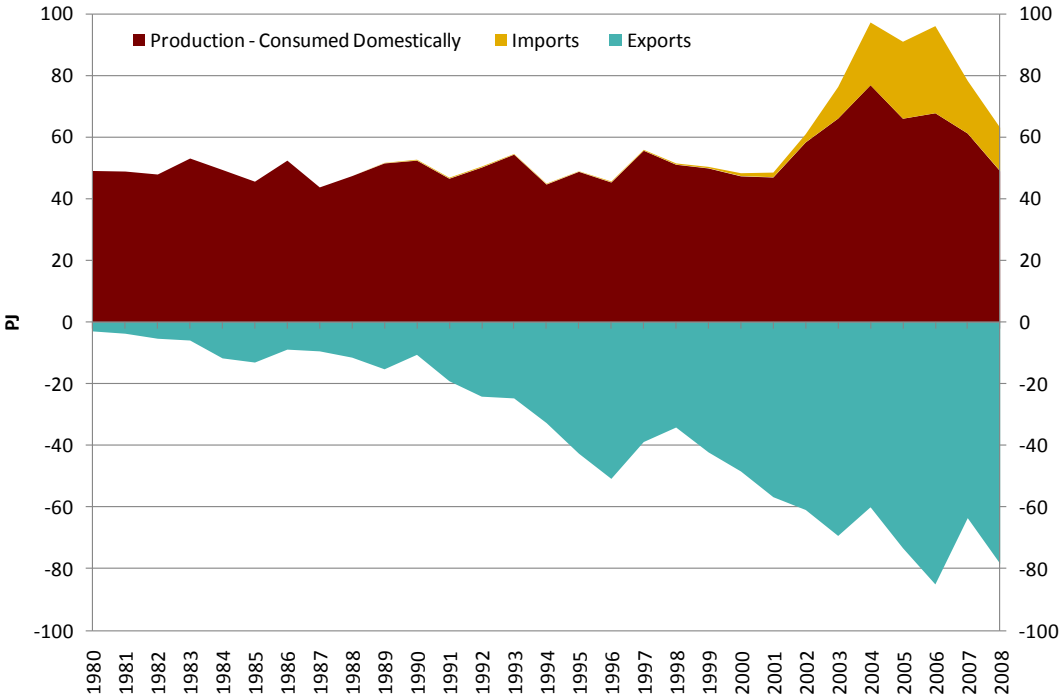
The report was produced with the assistance of CRL Energy Ltd. CRL Energy provided the descriptions of the individual markets in Section 2 and comments on drafts of the report.

2. Coal Markets

2.1. Overview

Overall coal use in New Zealand is pictured in Figure 1. Production has increased steadily over time, largely for export. Domestic consumption was relatively steady over time (average 51PJ) from 1980 to 2002, but increased after that, very largely because of the conversion of Huntly power station from natural gas to coal-firing from 2003.

Figure 1 Coal in New Zealand

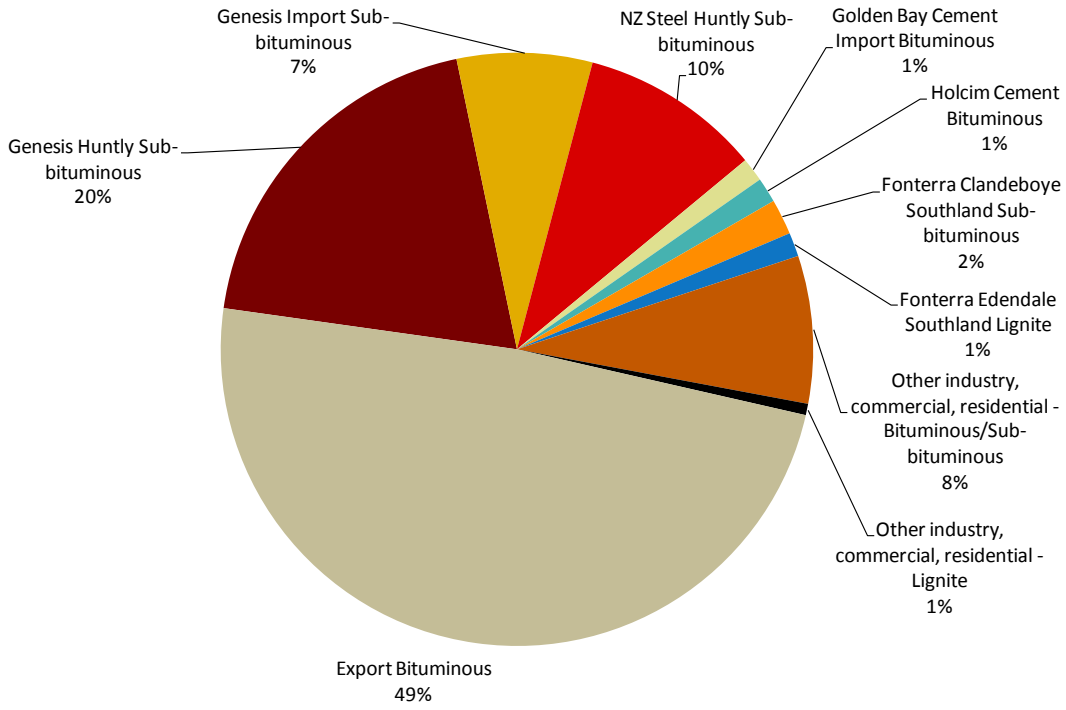


The key coal markets in New Zealand are set out in Figure 2. These are defined by end use and type of coal. The largest market is the export market for West Coast bituminous coals; at 78.5 PJ (c.2.6 million tonnes) this amounted to 49% of coal trade in and from New Zealand in 2008. Major user markets include:

- Genesis coal-fired electricity generation plant at Huntly;
- NZ Steel;
- the two cement plants—Golden Bay Cement near Whangarei and Holcim's plant at Westport;
- dairy factories, particularly those at Clandeboye in South Canterbury and Edendale in Southland.

Demand by Genesis Huntly plant is the most variable over time. It consumed 52PJ in 2006, 26PJ in2007 and 43PJ in 2008.

Figure 2 Markets for Coal in New Zealand (2008 data, proportions by energy content)



Source: MED Energy Data File 2009; MED Crown Minerals; Industry interviews

Markets and market prices are defined by:

- end use, particularly market size;
- coal type, although for some markets there is some flexibility; and
- location.

Within New Zealand there are three main regional markets:

4. Lower South Island (below Timaru) served mainly from Southland with lignite and/or sub-bituminous.

5. Upper South Island served mainly from the West Coast with bituminous/sub-bituminous blends

6. North Island sub-bituminous

There are also individual customers for bituminous coal in the North Island: Golden Bay Cement imports from Australia.

2.2. Export coal

Solid Energy produces about 95% of exported coal currently, with the remainder produced by Francis Mining from the Roa Mine (exported partly in conjunction with Solid Energy). Solid Energy's Annual Report to June 2008 shows 82% of its exports

were for coking coal, 17% for thermal coal and <1% for specialist uses (such as activated carbon and silicon metal processes).

The company stated that its main coking coal (steelmaking) customers were in Japan, South Africa, India, China and Australia. Chile appears to be one of the main markets for thermal coal and other customers are in the USA, Europe and Brazil.

Pike River Coal has started to mine coal for export and is expected to be operating at full capacity by the end of 2009. It will export approximately 1 million tonnes (c.3.3 PJ) per annum of hard coking coal and has contracts for 55% of its production over the next 18 years to India.

New Zealand's high swelling bituminous coals are highly valued for their ability to be blended with lower grade coking coals in steelmaking furnaces. Some of the lower swelling coals (weathered coals adjacent to the high swelling ones or from lower grade bituminous mines) could still be utilised for steelmaking blends but are more valuable as thermal coals for their high heating value.

2.3. Steelmaking

NZ Steel uses a direct reduction kiln for its steelmaking process unlike the vast majority of steelmaking processes around the world that utilise coking coals in their blast furnaces. Consequently, NZ Steel does not require the coking properties of a bituminous coal, but rather the reactivity properties of a high grade sub-bituminous coal in its multi-hearth furnaces. The carbon content of the coal is mainly required for the reduction of ironsand but it also helps supply the heat for the process (and the waste heat is utilised for cogeneration of electricity). Higher heat content and lower moisture content (relative to other sub-bituminous coals) are currently obtained by blending Huntly East and Rotowaro coals. The requirement for lower sulphur content is readily met by these Huntly coals.

2.4. Electricity generation

Apart from the cogeneration plant at NZ Steel, the only coal-fired electricity generation in New Zealand is from Huntly Power Station, which was designed to operate on either natural gas or on Waikato coal. This is a coal market distinct from others because it uses pulverised coal and can therefore utilise coal fines (lower cost than sized coal). Genesis Energy purchases coal from Solid Energy and at least three other Waikato coal companies for its major coal stockpile.

In recent years of high electricity demand, there was insufficient coal supply from North Island mines and it proved economic to import sub-bituminous coals from a range of Indonesian mines. Genesis invested in coal handling facilities at the Port of Tauranga in 2003 and signed a 15 year lease. Quantities imported, consumption and domestically-sourced coal are shown in Table 1.

Table 1 Source of Genesis Energy Coal

Year ended 30 Dec	Imported (tonnes)	Imported (PJ)	Domestic (PJ)	Consumption (PJ)
2003	329,424	7.2	25.9	33.1
2004	770,806	17.0	26.2	43.2
2005	1,021,808	22.5	32.1	54.6
2006	1,181,748	26.0	26.5	52.5
2007	608,987	13.4	13.0	26.4
2008	509,274	11.2	32.2	43.4

Source: Tonnes imported from NZ Stats Infoshare; Import PJs assume 22GJ/tonne. Consumption data from MED Energy Data File 2009. Domestic PJs calculated as Consumption less imports; note this ignores changes in stockpiles

2.5. Cement and lime kilns

Cement and lime calcining kilns operate at relatively high temperatures so operators prefer to use coals with a high heat content and low moisture content. Low heat content coals can be used if they are pre-dried so that the amount of high temperature steam is not carried through the process (reducing efficiency). These kilns can also take waste materials and fine coal, which is cheaper because it cannot be used in most boiler plants.

The manufacture of burnt lime is sensitive to the ash content of the coal because the product (sometimes for food grade purposes) must contain minimal contamination. The process is also highly sensitive to the sulphur content of the coal (and sulphate in the raw material) because sulphates can deposit in the kiln and cause blockages (or require more frequent maintenance). Cement kilns are also somewhat sensitive to sulphur content (less than for lime) for the same reason but they have a major advantage that high ash coals (if consistent quality) provide an additional source of inorganic material in cement manufacture.

Golden Bay Cement has imported bituminous coal from Australia for eight years and also uses wood waste. Holcim buys bituminous coal from at least three sources (some coals are cheaper because of their very high moisture before the company dries them) and also uses waste oil. McDonald Lime (Waikato) has barged coal from the West Coast, imported from Australia and Indonesia but currently uses only Waikato coal, while its Taylor Lime operation (Oamaru) uses coal trucked from the West Coast. Perry Lime and Websters Lime use Waikato coal for their burnt lime manufacture.

2.6. Industrial and commercial boilers

Industrial and commercial coal boilers are spread across a wide range of sizes from 0.1 to 30MW, mostly for steam raising but in some cases for hot water supply. Nevertheless, some generalisations can be made about the firing systems and their dependence on coal quality.

Some of the largest boilers (10-30MW) are designed for continuous high steam operation, others are designed for easy ramping up and down for periods of high steam

loads and others have been designed for high steam loads but are now used for only light loads or for backup use. Firing systems are typically chain grate, low ram or spreader stokers. Chain grate stokers may be sensitive to ash composition because low ash softening temperatures can cause excessive clinkering problems. Spreader stokers can be more sensitive to high fines content in the coal because they emit higher levels of fine particulate matter.

At the other extreme, smaller boilers such as Vekos (overfeed) and various underfeed boilers (used in a wide variety of commercial, school, small industrial and horticultural situations) are unable to deal with finer coal grades and they require larger, consistently sized coals, such as "nuts".

Because of air quality problems, coal boiler air discharge consents in Canterbury (metropolitan Christchurch in particular) have a sulphur content limit - usually 1% but sometimes levels as low as 0.5% have been proposed. Other South Island regional councils are starting to follow the Canterbury example (especially Otago/Dunedin).

Some coal customers require a high level of consistency in their coal supply to ensure they can plan their heating requirements and to ensure optimum boiler operation. This is usually achieved by coal blending and there are even examples where different blends are required for different seasons (higher heat content for the heavier heating loads in winter).

Another purpose for blending is to avoid overheating boilers, which can lead to excessive clinkering (from melted ash or swelling coals) or burning out the boiler grates. Coal suppliers often warn customers to check with their boiler manufacturers before they try to burn straight bituminous coal – it is usually safer to blend that coal with a lower heat content coal.

2.7. Home heating

The supply of coal for open fires and enclosed burners in homes has similar requirements to small boilers. Fine coal tends to limit the air flow and kill the fire (or cause it to smoulder inefficiently) so larger sized coal (such as "lumps") are favoured for efficient burning. Again there are sulphur content limits in Canterbury and unblended bituminous coals can burn so hot they melt the firing grate.

3. International Prices

International coal prices have an influence on New Zealand coal prices in a number of ways.

- Bituminous coal is exported from the West Coast, South Island into international coking and thermal markets.
- Bituminous coal is imported by Golden Bay Cement for its plant at Portland in Whangarei.
- Sub-bituminous coal is imported by Genesis for its Huntly coal-fired electricity generation plant.

Although there is domestic competition in coal markets, international prices provide a benchmark price; we examine below the extent to which prices in international markets affect domestic prices.

3.1. International Markets

3.1.1. Chief Trading Nations

New Zealand is located close to some of the main coal trading nations. Australia is the largest exporter of coal, followed by Indonesia (Table 2). The largest importer is Japan (Table 3). These trades set world prices.

Table 2 Top Coal Exporters (2007 estimates, millions of tonnes)

	Total	Steam	Coking
Australia	244	112	132
Indonesia	202	171	31
Russia	100	85	15
Colombia	67	67	-
South Africa	67	66	1
PR China	54	51	3
USA	53	24	29

Source: World Coal Institute (http://www.worldcoal.org/resources/coal-statistics/)

Table 3 Top Coal Importers (2007 estimates, millions of tonnes)

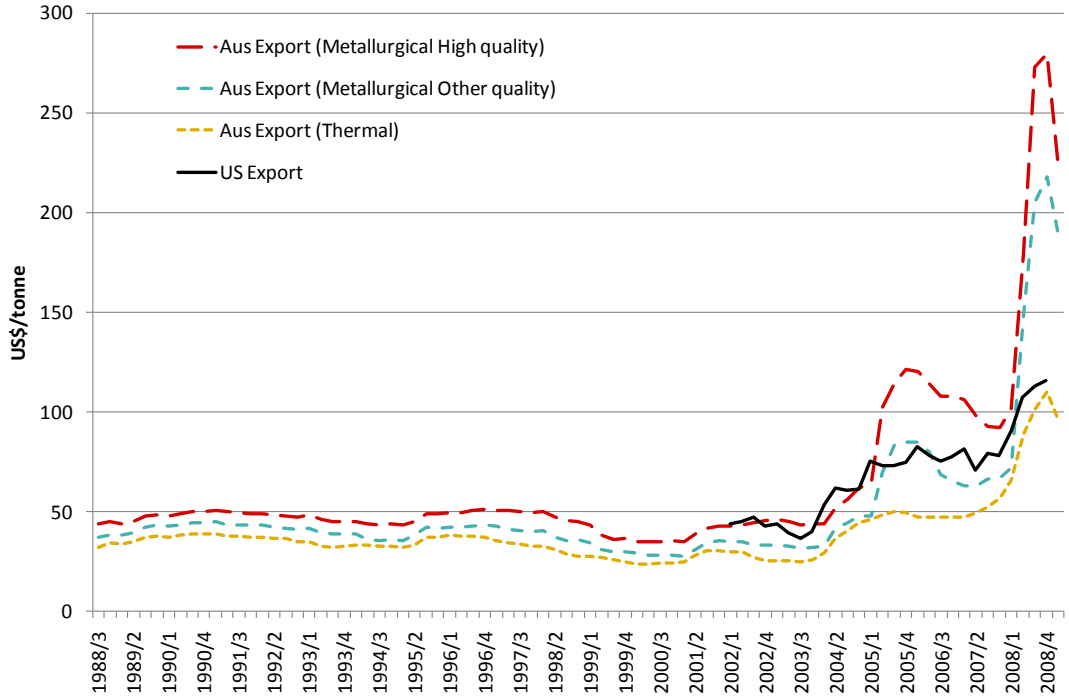
	Total	Steam	Coking
Japan	182	128	54
Korea	88	65	23
Chinese Taipei	69	61	8
India	54	31	23
UK	50	43	7
PR China	48	42	6
Germany	46	36	10

Source: World Coal Institute (http://www.worldcoal.org/resources/coal-statistics/)

3.1.2. Market Prices

Figure 3 shows export prices from Australia in comparison with US export prices using readily available historical prices series. The prices are similar and show similar trends; in 2008 metallurgical coal prices spiked more than thermal coal prices, and Australian coal prices spiked more than US prices.

Figure 3 International Coal Prices

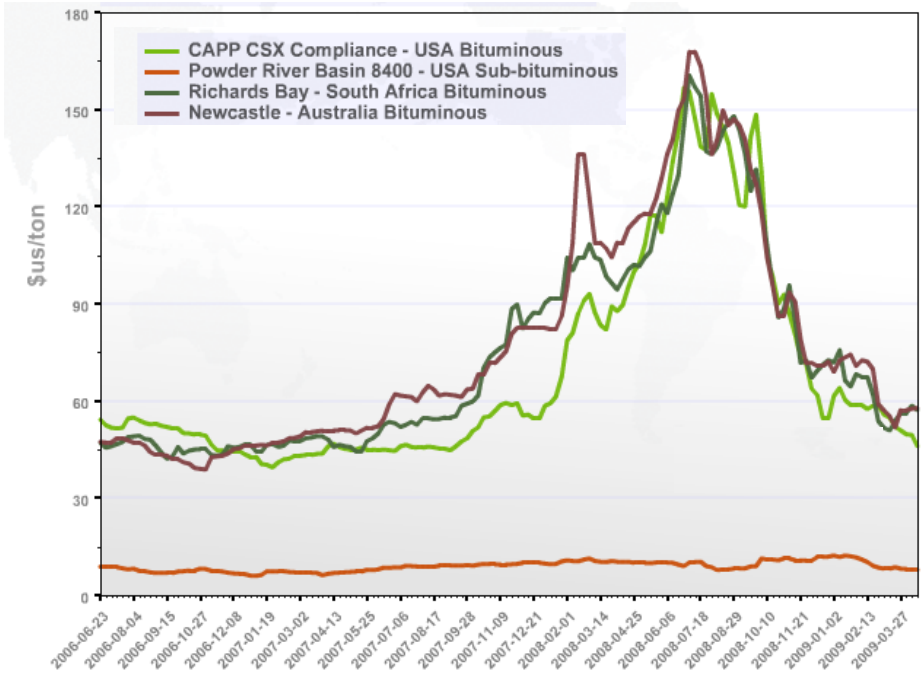


Source: Australian prices from ABARE Mineral Statistics (available at www.abare.gov.au/publications_html/data/data/data.html#) – these are converted to US$ values using exchange rates from the Australian Reserve Bank (http://www.rba.gov.au/Statistics/HistoricalExchangeRates/index.html); US average prices from US Energy Information Administration (EIA) Average Price of U.S. Coal Exports and Imports (http://www.eia.doe.gov/cneaf/coal/quarterly/html/t5p01p1.html) Coking Coal Export prices from www.steelonthenet.com/files/metallurgical_coal.html

Figure 4 shows the relationship between prices in US, South African and Australian markets. With the exception of Powder River Basin coal, all prices show the same trends.

The similarity is useful because the US Energy Information Administration (EIA) publishes a series of projected future export prices that might be used as the basis for future NZ prices. First we explore the market links further.

Figure 4 Relationship between coal prices in different international markets



Source: White Energy Company (http://www.whiteenergyco.com/world-coal-market-outlook/historical-prices.php)

3.1.3. Drivers of Market Prices

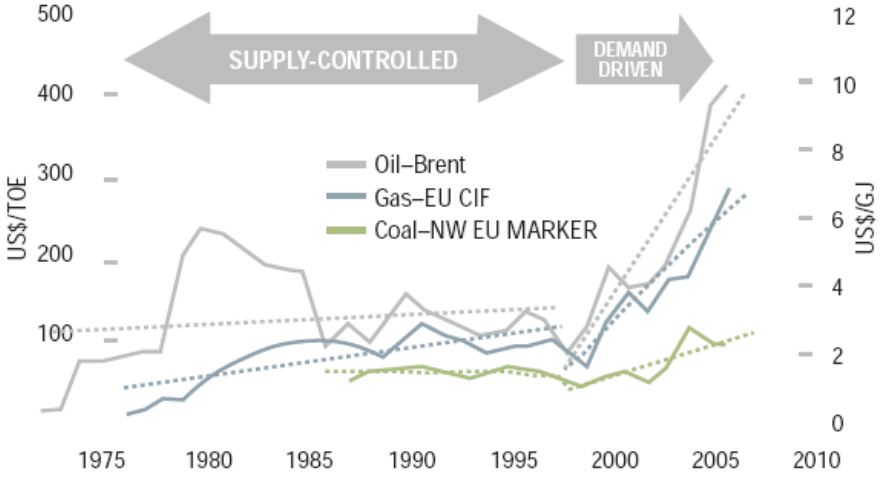
World coal prices have been relatively constant in absolute terms for many years, through to about 2004, at which stage prices have risen sharply. Analysts suggest that this has been largely because of demand, particularly from China, outstripping supply. There has also been a shift to higher cost sources of supply, both because of infrastructure constraints in Australia (ports and rail) and because, increasingly, supplies are being obtained from deeper mines. Higher extraction costs applies especially to hard coking coals.

A relationship has been noted between the price of coal and the price of other energy fuels, particularly oil. **Figure 5** shows an analysis by Solid Energy in its 2006 Annual Report. It also notes the transition between a period during which the cost of supply has set price t one in which demand has outstripped supply and willingness to pay on the demand side has been the main factor determining price.

In **Figure 6** we show historical trends in coal price, oil price and world GDP. World GDP has grown steadily over time, whereas coal and oil prices were relatively constant in nominal terms for many years, followed by a period rapid price growth. There is a statistically significant relationship between oil and coal prices ($p = 2x10^{-15}$) and we used a *Granger causality* test to understand whether there is a causal relationship. This suggests that there is a strong positive correlation between oil price and coal price, but not in the other direction. However, this relationship, while strong up until about 2004, is weaker since then. However, the tests also suggested that this is a spurious regression, ie the statistically significant relationship is as a result of these two factors trending

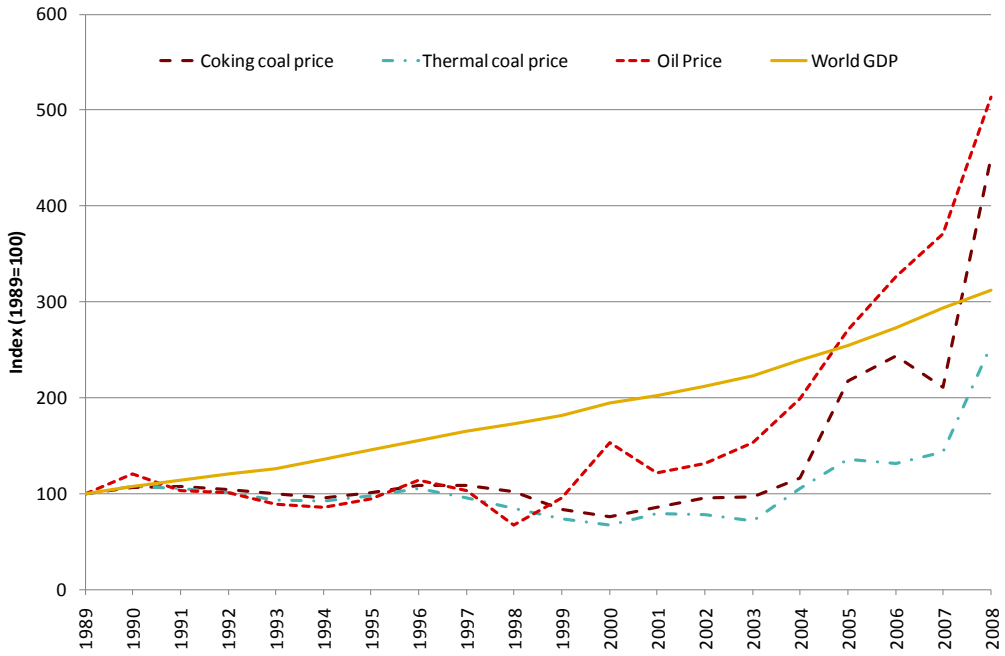
together, but it is driven by something else. We do not suggest using oil price projections as a predictor of future coal prices.

Figure 5 World Fossil Fuel Prices (1987-2005)



Source: Solid Energy Annual Report 2006

Figure 6 Relationship between coal price, oil price and world GDP



Source: Coal prices from ABARE;
Oil price from US Energy Information Administration Refiner Acquisition cost for imported crude oil (http://tonto.eia.doe.gov/dnav/pet/pet_pri_rac2_dcu_nus_m.htm);
world GDP from USDA (http://www.ers.usda.gov/Data/Macroeconomics/)

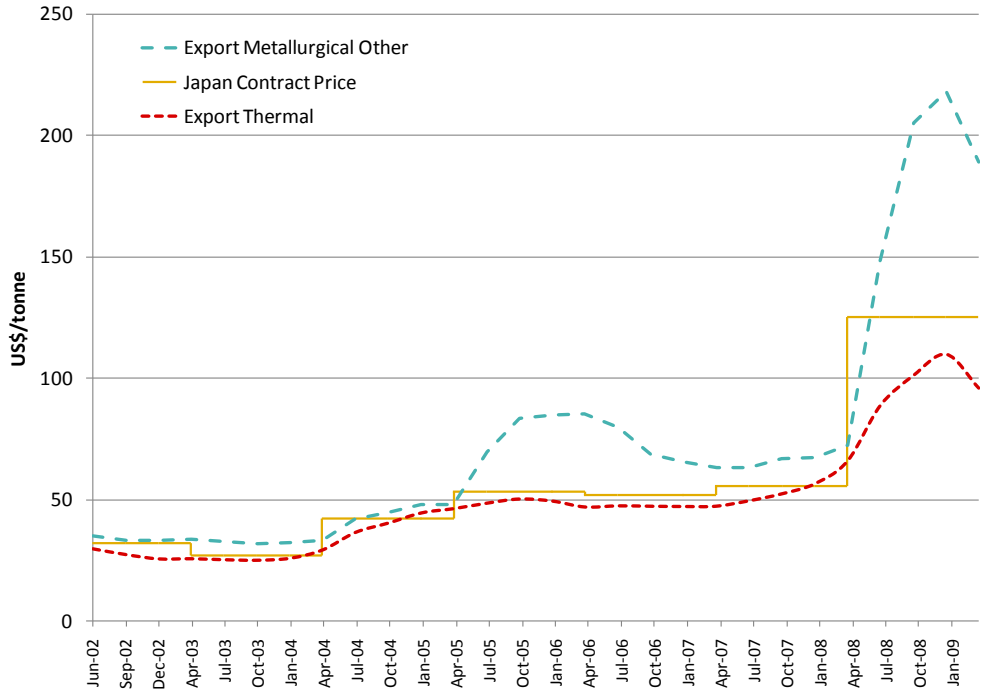
A number of coal industry analysts have examined the fundamentals driving price, including costs of extraction. We examine these in Section 3.4 below.

3.2. Influence on NZ Prices

3.2.1. Export and Import Prices

New Zealand export and import prices are set with reference to the annual settlement price for Australian exports to Japanese steel (coking coal) and electricity (thermal coal) markets. Annual settlement prices are closely linked to spot prices; we show the comparison with ABARE published export prices in **Figure 7**, and in **Figure 8** we show a similar comparison published by Reuters. The annual contract prices appear to link closely to year start spot prices.

Figure 7 Spot prices versus Japanese contract prices



Source: Spot prices from ABARE; Contract prices from Reuters
http://in.reuters.com/article/rbssIndustryMaterialsUtilitiesNews/idINSP14475120090310

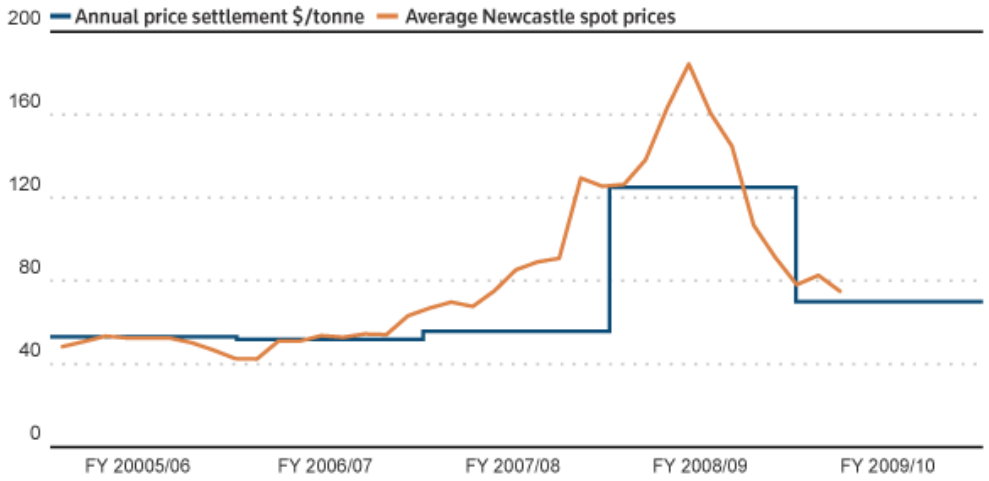
This means that there is a historical series of prices that can be used to approximate New Zealand import and export prices in the following way:

- Exports from New Zealand obtain a price free on board (fob) in NZ ports that approximates the Australia (Newcastle) export free on board (fob) price;
- Imports to New Zealand are priced at a level that approximates the Newcastle fob price, plus freight.

Recent high prices, particularly for coking coal have been related to supply shortfalls in world markets. Hard coking coal producing regions that were previously self-sufficient

in coking coal supply (China and to a lesser extent India) were not able to expand supply quickly enough to meet demand.[2]

Figure 8 Annual settlement and spot prices



Source :Reuters

McDouall Stuart (using McCloskey data) report settlement prices for thermal and coking coals for Japanese financial years 2003-08 and estimates for 2009 (Table 4). Since these estimates, 2009 settlements have been reached at US$128/tonne for coking coal.

Table 4 Coal benchmark settlements (By Japanese Financial Year – years starting 1 April 2003-)

Coal	2003	2004	2005	2006	2007	2008	2009 (estimate)
Coking	46	56	125	114	96	300	120-130
Thermal	27	38	52	52	57	125	70-75

Source: McDouall Stuart (12 March 2009) Coal Sector Down But Not Out. Available at: www.pike.co.nz/reports/analyst-reports

3.2.2. Transport and Freight Costs

Exports of coal from New Zealand face a cost for transport to the deepwater port at Lyttelton. The cost of transport is approximately $35-40/tonne ($1.1-1.3/GJ) from the West Coast.[3]

Freight costs to New Zealand for coal imports have varied in recent years both with the price of oil and with demand for freight, leading to a shortage of freight vessels. When oil prices and Chinese demand were high, prices approximated US$25/tonne for

[2] Pike River Coal Ltd New Zealand Prospectus 2007 (http://www.pike.co.nz/reports/other-documents/new-zealand-prospectus.pdf)

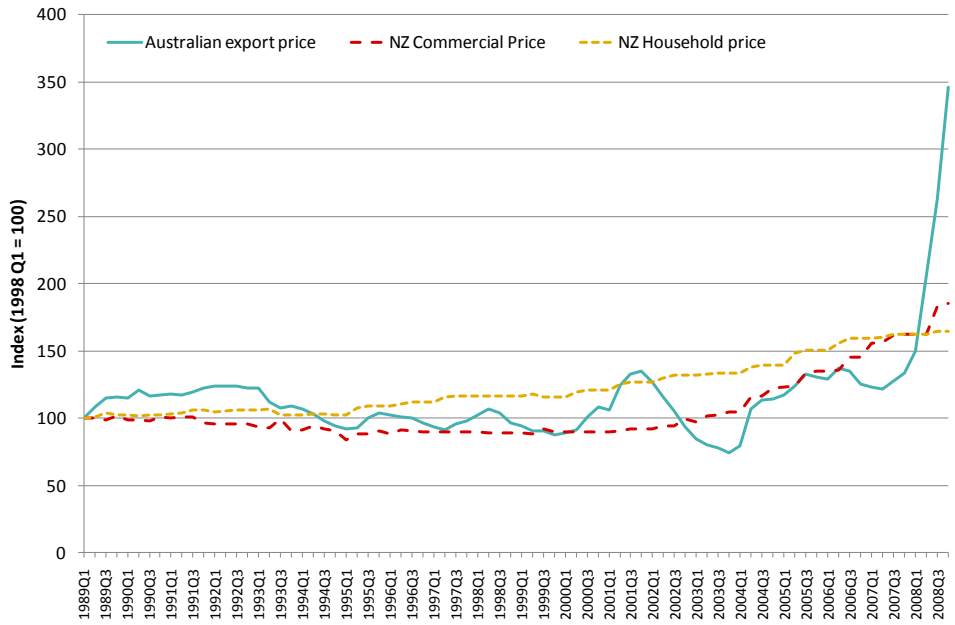
[3] The Pike River Coal Ltd IPO Prospectus (www.pike.co.nz/reports/other-documents/new-zealand-prospectus.pdf) lists a cost of $40/t, although at that time they were envisaging barging coal to Taranaki for export. Subsequently they have contracted with Solid Energy to use some of their rail capacity to transport coal to Lyttelton. We assume that the cost is less than the barging option.

shipments from Newcastle; currently (and historically) prices are closer to US$17.50/tonne.

3.3. Impact of International Prices on New Zealand Domestic Prices

We are not aware of any published series of historical prices in New Zealand. However, Stats NZ publishes a price index for commercial and household coal prices.[4] We compare these with historical prices in international markets. **Figure 9** shows the relationship between domestic and international prices using the ABARE export price for thermal coal converted to NZ$ and the NZ Stats commercial coal index; both are expressed as an index relative to prices at the beginning of 1998. NZ commercial coal prices have increased with increasing international coal prices, but the volatility of the international price has not been reflected in domestic prices. This is consistent with the comments made by the coal industry.

Figure 9 Relative changes between NZ domestic and international coal prices



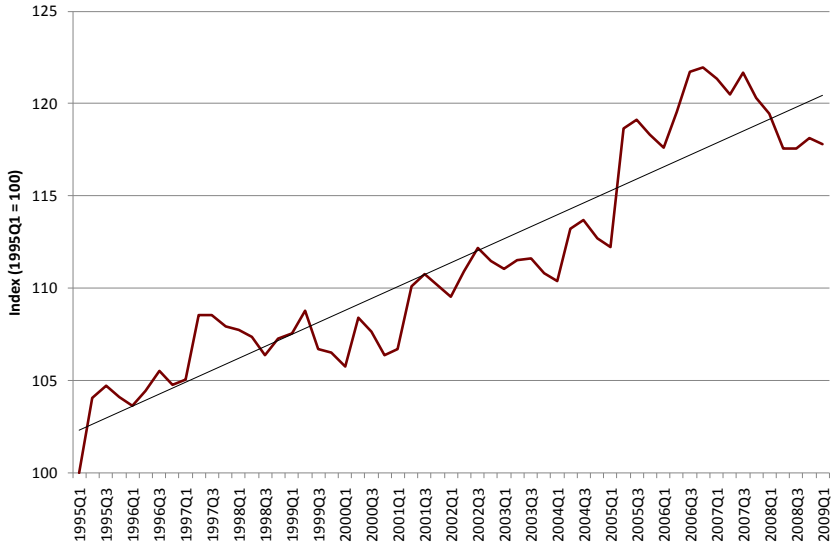
Source: NZ indexes – NZ Stats Infoshare (http://www.stats.govt.nz/infoshare/); Australian index created from ABARE data converted to NZ$ values using Reserve Bank NZ exchange rates; *Note the graph is an index and is not a reflection of relative prices, but a description of relative price changes.*

Any effect of international coal prices on domestic prices would be expected to be limited somewhat by the size of ships used for coal trade. Typically the smallest vessel used for coal movements is 40,000 tonnes. With the exception of the largest users (Genesis, NZ Steel, cement and possibly lime plants), very few firms consume this much in New Zealand. While it is possible to import such a quantity to sell in New Zealand markets, there is a high cost (40,000 tonnes at US$70/tonne for thermal coal would cost approximately NZ$4.7 million) and no one is doing this. Most individual coal consumers do not have this option to constrain market prices.

[4] The household price index is for coal and wood combined; since September 2006 it is for wood only

Nevertheless, there is a statistically significant relationship between changes in international prices and changes in commercial prices, although not between international prices and household coal and wood prices. Rather there is a significant relationship between the household price and the consumer price index (CPI). **Figure 10** shows StatsNZ's index of household prices converted to real terms and a fitted trendline. Prices have been increasing in real terms since the beginning of 1995, although note these data are for wood only from September 2006.

Figure 10 Index of Household Prices in Real Terms



Source: Stats NZ data (Infoshare) converted to real terms using CPI published by Reserve Bank of NZ

3.4. Projections of International Prices

3.4.1. Short Run

Prices for the next year are obtained from the annual settlement prices with Japanese steelmakers and electric utilities. The benchmark price for hard coking coal settled at US$128 per tonne for this coming year.[5]

Reuters report that thermal coal contracts have been struck at prices of US$70-72/tonne,[6] Although they also note (June 2009) that a Korean electric utility has settled a price for the next year at US$63/tonne for a 25.4MJ/kg thermal coal (6,080kcal/kg).[7]

3.4.2. Long Run

Figure 11 shows projections of international coal prices estimated from EIA projections and Citibank.

[5] Pike River Coal Quarterly Report to March 31 2009

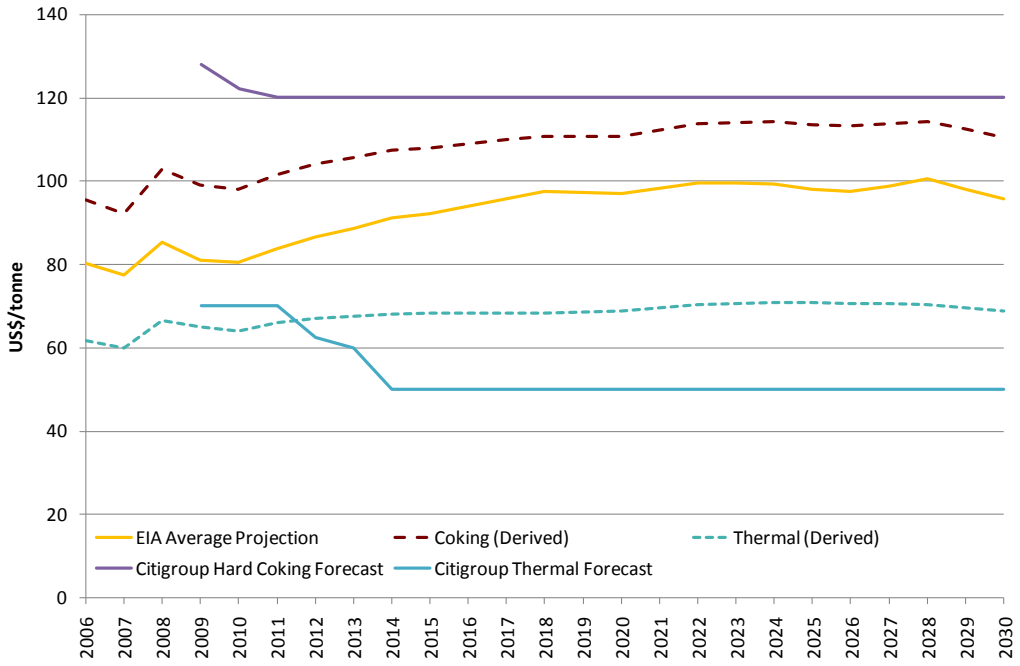
[6] http://steelguru.com/

[7] http://www.reuters.com/article/rbssIndustryMaterialsUtilitiesNews/idUSSYD48103920090603

The US Energy Information Administration (EIA) provides projections of an average coal price, based on a mix of coking and thermal coal exports. We estimate projections for the individual coal classes in the following way:

- We use the proportion of coking and thermal coals in projected US exports—the value changes over time;
- We use these proportions to produce a weighted average price from the ABARE historical series for this mix (eg 55% times the ABARE high quality metallurgical plus 45% times the ABARE thermal price);
- We use least squares regression to compare the metallurgical and thermal coal prices with the weighted average price;
- We use the EIA projected average price with these relationships between weighted average and individual prices to derive coking and thermal coal price forecasts (**Figure 11**).

Figure 11 US EIA Coal Price Projection (2007 constant dollars)



Source: Average coal price forecasts from US Energy Information Administration (2009) Annual Energy Outlook 2009 with Projections to 2030 Updated Reference Case (www.eia.doe.gov/oiaf/aeo/); Covec analysis; Citigroup forecasts from Citi (2009) Commodity Heap, 22 June 2009, (https://www.citigroupgeo.com/pdf/SGL00664.pdf)

In the EIA's reference case, the bulk of the increase in delivered prices for exported coal is due to projections of rising mine mouth prices. This is largely the result of declining productivity assumptions as a result of greater difficulty in extracting coal.[8] The Appalachian region is where the bulk of US exports come from, and this is the region that has seen the largest declines in productivity in the last few years; the Appalachian region is assumed to see additional declines in productivity going forward.

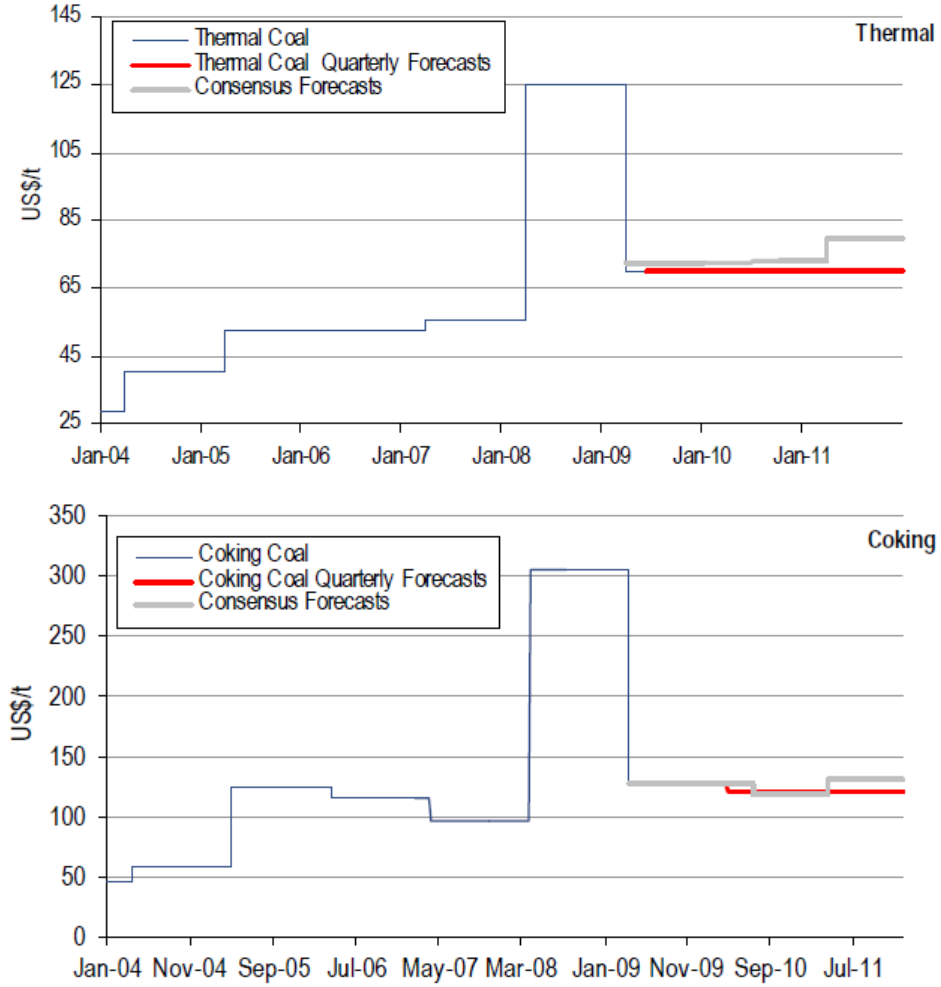
[8] Diane Kearney, US EIA, personal communication

Coking coal is produced primarily from underground mines; these prices are projected to rise at a proportionately higher rate than thermal coal. This contributes to the overall increase in average pricing.

The long run projections for coking coal prices are US$110-115/tonne and for thermal coal, approximately US$70/tonne.

Citigroup Global Markets projects global prices to normalise in the medium to longer term and supply-side constraints to become evident again as demand returns following the global recession; they also identify infrastructure constraints in Australia, South Africa, Russia and Indonesia.[9] Citigroup forecasts a long run price of US$120/t for coking coal and US$50/t for thermal coal. Citi also compiles medium term forecasts from other analysts and present a consensus forecast; these are shown in **Figure 12**. The consensus forecasts are slightly higher than Citigroup's.

Figure 12 Citigroup and Consensus Forecasts



Source: Citi Investment Research and Analysis (2009) Commodity Heap, 22 June 2009, (https://www.citigroupgeo.com/pdf/SGL00664.pdf)

[9] Citi (2009) Commodity Heap, 22 June 2009, (https://www.citigroupgeo.com/pdf/SGL00664.pdf)

The IEA World Energy Outlook 2008 forecasts coal prices at $120/t for 2010-15 and $110/t for 2030.[10] McDouall Stuart in a March 2009 report for Pike River Coal suggests a long term price for coking coal in excess of $100/tonne. [11]

There appears to be a growing consensus about the long run expected price of coal. Forecast prices are higher than historical prices largely because of a shift to higher costs of mining from deeper mines.

In the shorter term however there may still be upward pressure on prices. The ABARE data to 2008 shows the peak of the coal price which has since dropped considerably to contract values of US$128/t for coking coal and US$72/t for thermal coal. With the worldwide recession we do not expect coal prices to change or production to increase in the short term. As we come out of the recession it is likely that prices will rise again as demand from China and India again grows faster than supply. A supply response would be expected in time, but the consensus is that this is from increasingly expensive sources.

The derived forecast prices are shown in Table 5 in $/tonne and $/GJ. Converting these to $/GJ prices we use the Australian export values published by ABARE: 29GJ/tonne for coking coal and 27GJ/tonne for thermal coal.[12]

Table 5 International Price Forecasts

	Coking		Thermal	
	US$/tonne	US$/GJ	US$/tonne	US$/GJ
2010	128	4.41	72	2.67
2015	200	6.90	100	3.70
2020	125	4.31	60	2.22
2025	125	4.31	60	2.22
2030	125	4.31	60	2.22

3.5. Export Bituminous

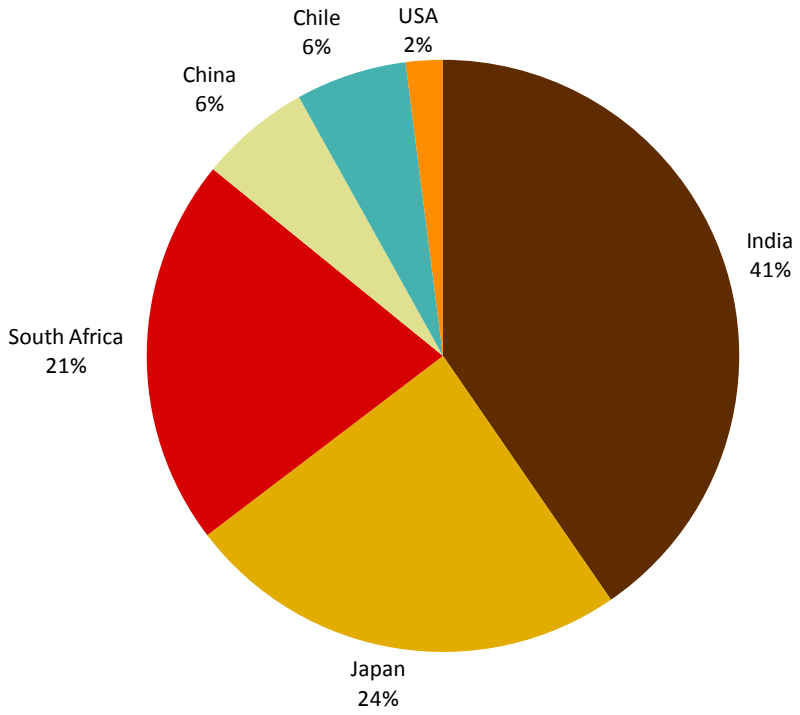
New Zealand exports bituminous coal largely into international coking coal markets (82% of 2008 exports). It also exports some thermal coals (17%). The main destinations are India, Japan and South Africa (Figure 13).

[10] Buchner B (2009) World Energy Outlook 2008: Implications for Post 2012 climate scenarios. Presentation to University College Dublin Seminar, March 2009. Available at: http://www.comharsdc.ie/_files/20090318%20Buchner%20presentation.pdf

[11] McDoull Stuart (12 March 2009) Coal Sector Down But Not Out. Available at: http://www.pike.co.nz/reports/analyst-reports

[12] ABARE (2009) Energy in Australia 2009. Appendix 2. Available at: www.abareconomics.com/interactive/09_auEnergy/htm/appTWO.htm

Figure 13 Export destination of NZ Coal



Source: Solid Energy (2008) Annual Report 2008

The price received fob in New Zealand is approximately the same as prices fob in Australia.

Most coal exported from NZ is from Solid Energy's Stockton and Spring Creek mines. There are also exports from the Francis Mining Company's Roa Mine. The Pike River mine has started to operate and is expecting to be exporting approximately 1 million tonnes per annum of hard coking coal by 2010.

Most NZ exports are of coking coal (82% in year to June 2008) that sells on a tonnage basis; thermal energy values of NZ coal exports are approximately 30.5GJ/t (7300kcal/kg).

The export prices currently are in line with the benchmark contract prices: approximately US$72/tonne for thermal coal and US$128/tonne for coking coal.

Future projections are taken from Table 5 above; we convert these to NZ$ using an assumed exchange rate of US$0.6:NZ$1. The resulting forecasts are shown in Table 6. The values are converted slightly differently; coking coal is a tonnage market and we have translated the per tonne values to NZ$ and then produced $/GJ values using a typical export value from New Zealand of 27GJ/tonne. Thermal coal prices have been converted using the US$/GJ price; we have retained the 27GJ/t energy value for conversion.

Table 6 Export Price Forecasts

	Coking (NZ$/t)	Coking (NZ$/GJ)	Thermal (NZ$/t)	Thermal (NZ$/GJ)
2010	213	6.99	120	4.44
2015	333	10.93	167	6.17
2020	208	6.83	100	3.70
2025	208	6.83	100	3.70
2030	208	6.83	100	3.70
2035	208	6.83	100	3.70

Assumptions: US$0.6:NZ$1; Coking coal = 30.5GJ/t; thermal coal = 27GJ/t

4. Industrial Coal Prices

In this section we note the prices of coal for general industrial users in a number of regional markets. These are the expected prices for new industrial users and for coal not sold on contract. This covers most industrial users; there appear to be very few long run contracts for coal anywhere.

Prices for large users are discussed separately in Section 5 below. The separate regional markets are:

- Lignite and some sub-bituminous in the lower South Island (Timaru and below);
- Blended bituminous/sub-bituminous in the upper South Island;
- Sub-bituminous in the North Island.

4.1. Lower South Island

Prices in the lower South Island are similar for both lignite and sub-bituminous coals. Eastern Corporation publish the sales revenues and quantities for their Takitimu mine from which an ex-mine price of $2.74/GJ ($52/tonne) can be estimated (Table 7) for this sub-bituminous coal. Most of this coal is sold under contract to Fonterra's Clandeboye plant (see Section 5.3). Others have suggested prices of approximately $40/tonne for lignite ($2.67/GJ at 15GJ/t) as ex-mine prices for large industrial users.

Large users appear to be obtaining an approximate 15% reduction on typical spot prices and this would suggest a typical price of approximately $3.25/GJ for smaller customers. Industry sources confirmed a range of ex-mine prices for both sub-bituminous and lignite coal in Southland of $3-3.50/GJ.

Table 7 Price of Coal from Takitimu Mine, Southland

Item	Value
Coal Sales (tonnes)	107,761
Sales Value (NZ$)	5,620,123
Gross energy value (GJ/t)	19
$/t	52
$/GJ	2.74

Source: Sales and Sales Values from Eastern Corporation Ltd Quarterly report for the Period Ended 31 March 2009; Eastern Corporation Ltd Interim financial report for the half-year ended 31 December 2008. Energy value from Eastern Corporation

There are significant reserves in the region[13] and extraction costs are not expected to rise significantly. There is domestic competition between supplies, including some equilibration of prices at about Timaru, taking account of transport costs. Prices appear to be set largely by local mining costs rather than competition from import substitutes.

[13] Approximately 74,000 PJ of recoverable lignite in Southland and Otago (MED Crown Minerals. New Zealand Coal Resources. South Island Lignite)

Delivered prices will reflect transport costs and retail margins. Most Southland coal is used in the lower part of the South Island, up to Timaru, with transport costs to Timaru estimated at approximately $50/tonne and costs to Dunedin of approximately $30/tonne. For lignite (~15GJ/t) this is an additional cost of $2/GJ to Dunedin and $3.33/GJ to Timaru.

In Table 8 we suggest prices for a number of types of user. The large industrial category is a firm purchasing direct from a mine company rather than via a merchant. Margins apply to sales via merchants.

Table 8 Coal price estimates—Southland Coal

	Lignite			Sub-bituminous		
Energy value (GJ/t)		15			20	
Ex-Mine Price		2.67			3	
Transport	**Invercargill**	**Dunedin**	**Timaru**	**Invercargill**	**Dunedin**	**Timaru**
$/t	10	30	50	10	30	50
$/GJ	0.67	2.00	3.33	0.50	1.50	2.50
Delivered to Merchant ($/GJ)	3.34	4.67	6.00	3.50	4.50	5.50
Margins ($/t)						
Large Industrial	0	0	0	0	0	0
Institutional/industrial	20	20	20	20	20	20
Other	40	40	40	40	40	40
Consumer Prices ($/t)						
Large Industrial	70	90	110	90	110	110
Institutional/small	90	110	130	110	130	130
Other	50	70	90	70	90	150
Consumer Prices ($/GJ)						
Large Industrial	3.34	4.67	6.00	5.50	4.50	5.50
Institutional/industrial	4.67	6.00	7.34	6.50	5.50	6.50
Other	6.00	7.34	8.67	7.50	6.50	7.50

4.2. Upper South Island

North of Timaru, most coal is sourced from the West Coast. All coal coming from the West Coast is blended to some degree—a mix of bituminous and sub-bituminous coals, typically with an energy value in the range of 22-27 GJ/tonne.

Eastern Corporation publishes data that can be used to estimate a price of $3.36/GJ (approx $100/t) for their Cascade mine which produces a bituminous coal that is sold largely to Holcim Cement (see Section 5.5). This price appears to be at the low end of West Coast prices, with most in the range of $4.00-6.00/GJ. Some high quality bituminous coals are selling for prices up to $250/t or $8/GJ.

Delivered prices, typically in Canterbury, vary from under $6/GJ for the largest users to $7-7.50/GJ for large institutions (eg hospitals, government departments), with higher prices for smaller customers. Our estimates of the range of prices is given in Table 10.

Table 9 Price of Coal from Cascade Mine, Westport

Item	Value
Coal Sales (tonnes)	34,732
Sales Value (NZ$)	3,494,906
Gross energy value (GJ/t)	29.96
$/t	100.62
$/GJ	3.36

Source: Sales and Sales Values from Eastern Corporation Ltd Quarterly report for the Period Ended 31 March 2009; Eastern Corporation Ltd Interim financial report for the half-year ended 31 December 2008. Energy value from CRL (2004) Analysis of New Zealand Industrial Coals. Analysis Update 2004.

Table 10 Coal price estimates—West Coast/Canterbury Markets

Energy value (GJ/t)	Sub-bituminous 19	Bituminous 29	Blend 24
Ex-Mine Price			
$/t	80	160	120
$/GJ	4.21	5.52	5.00
Transport (to Christchurch)			
$/t	35	35	35
$/GJ	1.84	1.21	1.46
Delivered to Merchant			
$/t	115	195	155
$/GJ	6.05	6.72	6.46
Margins ($/t)			
Large Industrial	0	0	0
Institutional/ industrial	20	20	20
Other	40	40	40
Consumer Prices ($/GJ)			
Large Industrial	6.05	6.72	6.46
Institutional/industrial	7.11	7.41	7.29
Other	8.16	8.10	8.13

Ex-mine prices for bituminous coals are less than the export value, eg the current export price is US$128/tonne (NZ$213/t) for coking coal, less approximately $35/tonne for transport to Lyttelton, ie approximately $178/tonne ex-mine, and last year when prices hit US$300/t, this was equivalent to NZ$465/tonne ex-mine. However, not all bituminous coals are suitable for coking purposes and Solid Energy is exporting thermal coals also (approximately 17% of exports in the year to June 2008). Thermal coal exports

are currently achieving US$72/tonne which is equivalent to NZ$85/tonne ex-mine, similar to the current ex-mine price for sub-bituminous coal on the West Coast.

A limit on price increases for thermal coal from the West Coast will be substitution from Southland lignites. As noted above, currently prices are approximately equivalent at Timaru for coals from Southland and the West Coast. Shipping coal an additional 160km to Christchurch would cost approximately $15/tonne ($1/GJ for lignite) and this limits the potential increase in thermal coal prices in Christchurch and elsewhere.

Costs of coal extraction on the West Coast are increasing and this will place some upward pressure on prices, but substitution from Southland lignites limits the potential increase in price. Price projections are discussed in Section 6.

4.3. North Island

In the North Island the largest users are NZ Steel, Genesis Energy and Golden Bay Cement. These users are all discussed in the next section. Other coal users include dairy factories, meat processing, timber processing, horticulture, schools and hospitals.

There is some use of coal for burnt lime production; McDonald Lime purchases its coal currently from the Waikato.

A reasonable proxy for Waikato coal price is the import substitution benchmark. Table 11 uses the current benchmark thermal coal price (cUS$72/t) for high thermal value coals (~27GJ/t) which would suggest a delivered coal price of close to $6/GJ.

Table 11 North Island Coal Costs

Item	Value
Coal price (Newcastle thermal) (US$/t)	72
Freight to Tauranga (US$/t)	17.5
Landed price (US$/t)	89.5
Landed price (NZ$/t)	149
Gross energy value (GJ/t)	27
Transport cost	15
Total ($/t)	164
$/GJ	6.08

Estimate of consumer prices are given in Table 12. Transport costs are additional.

Table 12 Estimated Consumer Prices—North Island

	Margin ($/tonne)	Margin ($/GJ)	Value
GJ/t			22
Coal price ($/GJ)			6
Large Industrial	0	0	$6.0/GJ
Institutional/small industrial	25	1.14	$7.1/GJ
Other	40	1.82	$7.8/GJ

5. Large Users

There are a number of significant industrial users of coal for which information can be obtained on individual contract prices.

5.1. Genesis Huntly Coal-Fired Generation

Coal is supplied to Genesis' Huntly thermal coal-fired electricity generation plant under a contract that runs for ten years from 2003. Prices are commercially confidential but we estimate them here through a variety of sources.

5.1.1. Historical Prices Escalated

A 2004 Solid Energy report noted a then Huntly coal price of $3-4/GJ.[14] This was shortly after the plant had changed from burning gas to coal, and it might reasonably be expected that it did so at a time when the price of coal was at an advantage over gas. This was shortly after the Maui gas redetermination when gas prices rose; industrial gas prices in 2003 as published by MED in its Energy Data File were at a nominal price of $3.45/GJ. Together with the Solid Energy report, this suggests a 2003 Huntly coal price of approximately $3.50/GJ.

The contract price is inflated using a producer price index (PPI). Using an all industries input-based producer price index to inflate this to 2009 dollars suggests a current price of $4.38/GJ and a peak price in 2008 of $4.59/GJ. We might assume a current price within this range, ie $4.40-4.60/GJ.

5.1.2. Import Prices

The Huntly plant also imports Indonesian coal. **Table 13** shows estimated costs for coal imported by Genesis for its Huntly plant. These are derived from the import quantities and values of Indonesian coal, as published by StatsNZ. We have added an additional freight cost estimated at $15/tonne.

Table 13 Estimated price paid for Genesis Energy Imports

	Tonnes	Cost ($million cif)[1]	Price ($/t)	Price ($/GJ)	Delivered Price ($/GJ)
2003	329,436	17.5	53.26	2.42	3.10
2004	822,156	47.1	57.23	2.60	3.28
2005	1,021,872	58.5	57.27	2.60	3.28
2006	1,181,748	76.0	64.27	2.92	3.60
2007	609,057	40.9	67.12	3.05	3.73
2008	509,418	36.6	71.90	3.27	3.95

[1] Cost, insurance and freight

Source: Stats NZ Infoshare for tonnes and value; Covec calculations

[14] Solid Energy (2004) Energy Options; Securing Supply in New Zealand. Available at: www.coalnz.com/index.cfm/3,138,370/nzier1-40.pdf

These imports appear to be at a price advantage over the Huntly coal.

5.1.3. Offer Behaviour

Price offers by Huntly are made every half hour for each of four 250 MW units; the plant offers electricity in different price bands. An analysis of these offer prices did not provide any insights into possible coal prices.

5.2. NZ Steel

NZ Steel has a five year contract for coal supply. Prices can be derived from the annual report of Tasman Steel Holdings Ltd.[15] Its 2008 report includes the estimated future coal purchases for the next financial year.

NZ Steel coal comes from a 50:50 mix of sub-bituminous coal from the Huntly coal-field underground and open-cast mines. The energy value is approximately 22.4GJ/t.

The estimated price is shown in Table 14. It has recently risen significantly.

Table 14 Coal price for NZ Steel

Year ended 30 June	2008	2009
Estimated future coal purchases ($'000)	74,551	111,650
Assumed coal consumption (tonnes)	750,000	750,000
Gross energy value (GJ/t)	22.4	22.4
Assumed coal consumption (PJ)	16.80	16.80
Coal price ($/t)	99	149
Coal price ($/GJ)	4.44	6.65

Source: Future coal purchases from: Tasman Steel Holdings Limited and Subsidiaries 2008 Annual Report.

The contract price is linked to a price escalator based on a number of industrial prices, that we might assume will broadly move with inflation. The current contract runs for another four years, ie until June 2013.

5.3. Fonterra Clandeboye Dairy Factory

Clandeboye dairy factory has a contract with Eastern Corporation for the supply of 130,000 tonnes per annum from 1 September 2008. The coal is transported by rail to the plant at Temuka, near Timaru.

Ex-mine prices can be obtained from the Eastern Corporation financial reports (Table 15). We have used industry estimates of transport costs ($0.10/tonne/km) to estimate a delivered price.

[15] New Zealand Steel Ltd is the steel finishing business and the "front end" of the Glenbrook plant. It is owned by New Zealand Steel Holdings Ltd, which is, in turn, owned 100% by Tasman Steel Holdings Ltd, which is owned 100% by Glenbrook Holdings Pty Ltd, registered in Australia. Glenbrook Holdings is owned by BluescopeSteel Ltd.

Table 15 Price of Coal delivered to Clandeboye Dairy Factory

Item	Value
Coal Sales (tonnes)	107,761
Sales Value (NZ$)	5,620,123
Gross energy value (GJ/t)	19
$/t	52.15
$/GJ	2.74
Transport ($/t)	50
Delivered ($/t)	102.15
Delivered ($/GJ)	5.38

Source: Sales and Sales Values from Eastern Corporation Ltd Quarterly report for the Period Ended 31 March 2009; Eastern Corporation Ltd Interim financial report for the half-year ended 31 December 2008. Energy value from Eastern Corporation. Transport costs are industry estimates

5.4. Edendale

The Edendale dairy factory has a contract for coal supply through to 2025. This is an existing contract at a low price. The coal is sourced from the Solid Energy-owned New Vale Mine located on the Waimumu lignite coal field east of Mataura, Southland. We understand that the price is below $2/GJ; however the plant is looking to expand and would be expected to pay a more commercial rate for these new coal purchases. These are likely to be close to the $2.67/GJ price suggested in Table 8 for ex-mine prices (the factory is close to the mine).

5.5. Holcim Cement

Holcim cement purchases coal as an input to cement manufacture at its Westport plant. Coal is used as a fuel to provide heat in clinker manufacture and the ash is incorporated into the clinker as part of the recipe. Holcim purchases coal from at least three sources, including Solid Energy and Eastern Corporation.

Eastern Corporation publishes the coal prices in $/tonne that we use with energy values to estimate a $/GJ price (Table 16).

Table 16 Price of Coal from Cascade Mine, Westport

Item	Value
Coal Sales (tonnes)	34,732
Sales Value (NZ$)	3,494,906
Gross energy value (GJ/t)	29.96
$/t	100.62
$/GJ	3.36

Source: Sales and Sales Values from Eastern Corporation Ltd Quarterly report for the Period Ended 31 March 2009; Eastern Corporation Ltd Interim financial report for the half-year ended 31 December 2008. Energy value from Coal Association (2004) Analysis of New Zealand Industrial Coals. Analysis Update 2004.

We understand that the average energy value of coal used by Holcim is approximately 27GJ/tonne. Bituminous coal at the mine mouth in the West Coast to large users is priced at approximately $5.50/GJ. Combining these suggests an average price for a 50:50 mix of approximately $4.45/GJ.

5.6. Golden Bay Cement

Golden Bay Cement imports bituminous coal for which the benchmark price is currently Newcastle thermal coal exports. The price can be estimated from data published by Stats NZ using the quantity and cif cost of imports of bituminous coal from Australia (Table 17).

Table 17 Estimates of price paid for coal by Golden Bay Cement

	Tonnes	Cost ($ cif)	$/t	$/GJ
2003	92,253	6,703,778	72.7	2.69
2004	53,958	3,711,706	68.8	2.55
2005	61,792	4,343,554	70.3	2.60
2006	53,753	4,652,116	86.5	3.21
2007	111,622	9,018,621	80.8	2.99
2008	89,261	13,509,187	151.3	5.61

Source: StatsNZ Inforsource; quantity and value of bituminous coal imports from Australia

We can estimate these costs from fundamentals also; this is done in Table 18 using current data. Freight costs to New Zealand change over time with oil prices and global demand for freight; prices in recent years have been as high as $25/tonne from Australia, but currently have fallen closer to $17.50/tonne as used here. The estimates are very similar to the Stats NZ data for 2008.

Table 18 Golden Bay Cement Coal Costs - Estimate

	Value
Coal price (Newcastle thermal) (US$/t)	72
Freight to Whangarei/Marsden Point (US$/t)	17.5
Landed price (US$/t)	89.5
Landed price (NZ$/t)	149
Gross energy value (GJ/t)	27
Transport cost	5
Total ($/t)	154
$/GJ	5.71

6. Future Prices in New Zealand Markets

This section brings together the information in the different markets and what might be expected in future prices.

6.1. Export Prices

Export prices from New Zealand are expected to be the international benchmark prices for coking and thermal coals. Our estimates using an exchange rate of US$0.1:NZ$1 are given in Table 19.

Table 19 Export Price Forecasts

	Coking (NZ$/t)	Coking (NZ$/GJ)	Thermal (NZ$/t)	Thermal (NZ$/GJ)
2010	213	6.99	120	4.44
2015	333	10.93	167	6.17
2020	208	6.83	100	3.70
2025	208	6.83	100	3.70
2030	208	6.83	100	3.70
2035	208	6.83	100	3.70

Assumptions: US$0.6:NZ$1; Coking coal = 30.5GJ/t; thermal coal = 27GJ/t

6.2. Large Users

6.2.1. Genesis Energy

The Huntly coal-fired plant purchases coal under contract currently. This price will rise with inflation but would be expected to stay at the current price in real terms; our estimate is in the range of $4.40-4.60/GJ. This will continue through to 2012, after which it would be expected that prices would be similar to import substitutes. Huntly imports coal from Indonesia that typically is at a $10-15/tonne discount from Australian coal prices. Adjusting the international prices in Table 5, we estimate import costs in Table 20.

Table 20 Estimated Indonesian thermal coal price import costs

	2010	2015	2020-2035
Coal price (Newcastle thermal less $12/t) (US$/t)	60	88	48
Freight to New Zealand (US$/t)	17.5	25	20
US$:NZ$	0.6	0.6	0.6
Landed price (NZ$/t)	129	188	113
Landed price (NZ$/GJ)	4.8	7.0	4.2
Local transport ($/t)	10	10	10
Delivered price (NZ$/GJ)	5.15	7.35	4.57

We understand that the Huntly coal has a quality advantage over the Indonesian coal, and will retain a price premium, probably limited by the price of Australian imports (Table 21 below). Assuming that an additional ten year contract is agreed in the future,

this is likely to be at a long run price in the range of $5-5.50/GJ with the plant continuing to import Indonesian coal, depending on levels of utilisation at the plant.

6.2.2. NZ Steel

NZ Steel has a five year contract for coal from Solid Energy and has few substitutes. The price it pays currently is approximately $6.65/GJ. It is difficult to estimate a long term basis for a price; for Solid Energy, its options would be to export the coal into a thermal market – at a long term price of US$60/tonne, this is equivalent to approximately NZ$3.70/GJ less the costs of transport to n export port. Alternatively the coal might be sold for electricity generation purposes, competing with potential imports of thermal coal. These prices would be lower also. Thus the NZSteel price is relatively high and reflects Solid Energy's market power. We assume that the price will stay at this level in the long run.

6.2.3. Golden Bay Cement

Golden Bay Cement is assumed to continue to purchase imported thermal coal. The price it pays can be assumed to be equivalent to the international prices in Table 5 with local transport costs of about $5/tonne (Table 21).

Table 21 Estimated thermal coal price import costs (Golden Bay Cement)

	2010	2015	2020-2035
Coal price (Newcastle thermal) (US$/t)	72	100	60
Freight to New Zealand (US$/t)	17.5	25	20
US$:NZ$	0.6	0.6	0.6
Landed price (NZ$/t)	149	208	133
Landed price (NZ$/GJ)	5.5	7.7	4.9
Local transport ($/t)	5	5	5
Delivered price (NZ$/GJ)	5.7	7.9	5.1

6.2.4. Holcim

Holcim is currently obtaining significant quantities from the Cascade mine, but this is close to closure and the timing corresponds with the expected shift to a new plant near Oamaru. It is presumed that the new plant will be located near to a new sub-bituminous mine. We assume that the price will be slightly less than the costs of transporting coal from Southland to Oamaru; using the Dunedin costs in Table 8 would suggest a long run price of approximately $4.50/tonne.

6.2.5. Dairy Factories

The Fonterra dairy factories at Clandeboye and Edendale obtain coal from Southland. As noted above, we do not expect significant changes in the costs of extraction for these coals, although a significant change in the price of oil would be expected to raise mining costs and coal prices.

Edendale obtains coal at a very low price currently; however, it is likely that future prices will increase, including for plant expansion. We assume that costs will rise to approximately $2.70/GJ in the longer run.

6.2.6. Summary of Prices

The various prices discussed above are summarised in **Table 22**.

Table 22 Summary of Future Prices - Large Users

Market	Coal type[1]		GJ/t	Current volume (PJ)	Current Price ($/GJ)	2010 ($/GJ)	2015 ($/GJ)	Long run ($/GJ)
Exports - coking	B	West Coast	30.5	64	7	7	10.9	6.8
Exports - thermal	B	West Coast	30.5	13	4.4	4.4	6.2	3.7
Genesis Huntly	SB	Waikato	22	31	4.5	4.5	5.25	5.25
	SB	Imported (Indonesia)	22	12	5.2	5.2	7.4	4.6
NZ Steel	SB	Waikato	22.4	18	6.5	6.5	6.5	6.5
Gloden Bay Cement	B	Imported (Asutralia)	27	2.1	5.7	5.7	7.9	5.1
Holcim cement	B	West Coast	27	2.2	4.5	4.5	-	-
	SB	Otago	20	2.5	-	-	4.5	4.5
Fonterra Clandeboye	SB	Southland	19	3.1	5.4	5.4	5.4	5.4
Fonterra Edendale	L	Southland	15	2.1	1.8	1.8	2.7	2.7

[1] B = bituminous; SB = sub-bituminous; L = lignite

6.3. New Electricity Generation

The source of coal for electricity generation will differ with location. In the North Island it is likely that the source would be imported coal whereas, in the South Island, location next to a coal mine is more likely. Our estimates of prices in the different markets are given in Table 23. The explanations are given below.

In the lower South Island, we estimate a price of $2.50-3/GJ on the basis of recent prices for large users, eg the price paid by Fonterra's Clandeboye dairy factory ($2.74/GJ) (Table 7) and estimated future prices for expansions to the Edendale dairy factory. It is possible that an electricity generator will obtain a price lower than this, and it would be likely that it would locate close to a mine, but prices would not be expected to be significantly different.

Table 23 Estimated Coal Costs for New Electricity Generation ($/GJ)

	Lower South Island Lignite/sub-bituminous	Upper South Island Blended sub-bituminous	North Island Sub-bituminous
GJ/t	15-20[1]	22-27[2]	22-27[3]
2010	2.5 – 3.0	5.0-6.0	5.0 – 6.0
2015	2.5 – 3.0	5.0-6.0	5.0 – 6.0
2020	2.5 – 3.0	5.0-5.5	5.0 – 6.0
2025	2.5 – 3.0	5.0-5.5	5.0 – 6.0
2030	2.5 – 3.0	5.0-5.5	5.0 – 6.0
2035	2.5 – 3.0	5.0-5.5	5.0 – 6.0

[1] Lignite (15GJ/t) or sub-bituminous (20GJ/t); [2] Blended sub-bituminous; [3] Waikato sub-bituminous (22GJ/t) or imported thermal (22-27GJ/t)

For the upper South Island, prices will be based on costs for coal from the West Coast. Most of this is blended from a mixture of bituminous and low heating value sub-bituminous coals. Costs of extraction are higher than in Southland because the coal is deeper, and costs are expected to rise over time. However, prices are limited by the competing price of imported thermal coals. Currently the lowest cost coals from the West Coast are approximately $3.50/GJ at the mine, eg Cascade (see Table 9), plus costs of transport to Canterbury of approximately $1.50/GJ. This sets a lower bound price of $5/GJ. More typically ex-mine prices are approximately $5/GJ suggesting delivered prices of $6.50/GJ. Competing imports (to Lyttelton) will be similar to import prices for Golden Bay Cement (Table 18), ie c$5.70/GJ at current prices.

For the North Island, the costs of thermal coal will similarly be determined largely by the import costs. They will differ from the South Island costs to the extent that local transport costs are higher, particularly if power plants are located away from ports (and we assume that the Port of Auckland would not be used for bulk coal imports).

6.4. Other Industry

Other industry and other small users will pay a higher price for coal, because of the absence of competition from imports (each individual customer is too small to import their own coal). In addition, prices are increased as a result of sales going through a merchant rather than directly with a mine.

Table 24 Projections of coal prices in different markets

	Large Industrial		Industrial/commercial		Other	
	Lower SI[1]	Upper SI/NI[2]	Lower SI[1]	Upper SI/NI[2]	Lower SI[1]	Upper SI/NI[2]
2010	4.5-5.0	6.0-7.0	4.5-7.5	7.0-7.5	5.5-9.0	7.8-8.5
2015	4.5-5.0	6.0-7.0	4.5-7.5	7.5-8.0	5.5-9.0	8.0-9.0
2020	4.5-5.0	6.0-7.0	4.5-7.5	7.5-8.0	5.5-9.0	8.0-9.0
2025	4.5-5.0	6.0-7.0	4.5-7.5	7.5-8.0	5.5-9.0	8.0-9.0
2030	4.5-5.0	6.0-7.0	4.5-7.5	7.5-8.0	5.5-9.0	8.0-9.0
2035	4.5-5.0	6.0-7.0	4.5-7.5	7.5-8.0	5.5-9.0	8.0-9.0

[1] Location assumed to be Dunedin; [2] Location assumed to be Christchurch or Waikato