Expert Report to the Land Court by Andrew Offen

1. Expert's Details & Qualifications

1.1 Name

My name is Andrew Offen.

1.2 Address

My business address is 200 Tinarra Crescent Kenmore Hills Qld 4069.

1.3 Qualifications

I have 28 years experience in the resources industry. During this period, I spent 18 years directly involved in commercial activities in the coal sector, managing marketing programs and interacting with coal consumers in all sectors of the industry - the power generation industry, the steel industry, the coke manufacturing industry, the cement industry, large public companies, smaller private companies and government entities.

Annexure A to this report is my curriculum vitae, which sets out my professional experience and qualifications.

2. Instructions

I have been instructed by Allens on behalf of Hancock Coal Pty Ltd to provide a report in response to the following questions:

1. In your opinion, if coal from the proposed Alpha Coal Mine is not produced, is it reasonable to expect that coal from an alternate source will replace the proposed Alpha Coal Mine coal?
2. If your opinion in relation to question 1 is yes, is the coal from an alternate source likely to create a similar, lower or higher level of emissions to the proposed Alpha Coal Mine coal?
3. Based on your knowledge of the coal market, what is your opinion as to:
   (a) paragraph 62 of the objection by Coast and Country Association of Queensland Inc (***CCAQ***) dated 20 February 2013 and, in particular, the propositions that:
      (i) "There is no need for [the proposed Alpha Coal Mine] coal";
      (ii) "If this mine does not go ahead it will exert some upwards pressure on coal prices"; and

(iii) "This reduction in supply and increase in price of coal will push some consumers towards other energy sources which are already becoming cheaper",

and

(b) paragraphs 59, 60 and 61 of the objection by Fiorella Paola Cassoni dated 20 February 2013 and, in particular, the propositions that:

(i) "the world has many other coal mines and many other energy sources";

(ii) "Unsubsidised renewable energy is now cheaper than energy from new coal fired power stations in Australia, and no new coal or gas plants are likely to be required this decade"; and

(iii) "there are likely to be cheaper alternatives for energy production soon after the coal from this project reach [sic] the market which do not produce greenhouse gas emissions. Consequently there is not sufficient need for the project...".

In providing your opinion, you should have regard to the particulars provided at paragraph 27 of the CCAQ's response to the Applicant's Request for Particulars dated 29 April 2013.

3. Facts and Assumptions

In producing this report, I have relied on information I have gained over my 28 years of experience in the resources industry and through a long history of reading industry publications, attending industry conferences, competing with other suppliers and negotiating with customers.

I have also relied on a number of references which are identified in Section 4. My primary reference is the “Thermal Coal Supply and Demand Study" prepared by Salva and dated 28 May 2013 (***Study***). **Annexure B** to this report is a copy of the Study.

The Salva Report is a well regarded and experienced research organization with a deep knowledge of thermal coal markets, particularly in Asia. Salva has 14 specialist analysts in 3 research teams based in Australia, Indonesia and India and have been employed at various times to do bespoke research by all of the major mining companies in the Australian coal industry and a number of other industry participants such as Japanese trading companies.

In my previous experience with Salva, I have found them to be both knowledgeable and objective in their analysis. I also found them to have conducted their business and research activities to the highest professional standards.

The Study outlines the likely future global thermal coal supply and demand situation and draws on Salva's detailed knowledge of the global thermal coal industry and very specific granular analysis of the Asian (particularly Indonesian) coal supply capability in coming years. My understanding from the briefing I have received on the proposed Alpha Coal Mine and knowledge of the coal industry is that the target market for the product coal will be Asia – Japan, Korea, China, Taiwan and India. Accordingly, the Study is a particularly helpful source of information for an analysis of the proposed Alpha Coal Mine.

4. Opinion and Findings

4.1 In your opinion, if coal from the proposed Alpha Coal Mine is not produced, is it reasonable to expect that coal from an alternate source will replace the proposed Alpha Coal Mine coal?

(a) In my opinion, if the proposed Alpha Coal Mine did not proceed, the coal which would have been supplied from the proposed Alpha coal mine will readily be supplied by alternative suppliers.

(b) Whilst many potential supply sources exist, the most likely source to replace the coal from the proposed Alpha Coal Mine would be either Indonesian export coal or increased domestic supply from India and China. Other credible sources of long term coal supply also exist even if these likely alternates are not realized (such as Mongolia, Mozambique, USA, Colombia, Russia).

(c) The reasons for this view are as follows:

(i) The proposed Alpha Coal Mine will produce 30 million tonnes per annum of thermal coal for the export market shipped through the Abbot Point Coal Terminal (See, for example, SEIS, Vol 1, Section 2). In the overall scheme of the global thermal coal industry, the volume forecast to be produced by proposed Alpha Coal Mine is relatively insignificant. In 2011, the global thermal coal industry produced approximately 5.7 billion tonnes of thermal coal (Study, page 8), of which 818 million tonnes was traded internationally on the seaborne market (Study, page 8).

(ii) In this context, 30 million tonnes per annum from the proposed Alpha Coal Mine equates to 0.006% of global production and 3.6% of the current seaborne demand. As the thermal coal market is growing (Study, page 7, table 2), these figures will be even lower by the time the proposed Alpha Coal Mine is developed and its product reaches the market. The forecasts in the Study show by the year 2020 the exports from the proposed Alpha Coal Mine will represent only 2.3% of the total seaborne market demand and by 2030 only 1.5%.

(iii) Indonesia alone has increased its supply to the seaborne market by 184 million tonnes between 2008 and 2012 (Study, page 10, figure 7), demonstrating a significant capability to quickly develop and ship new capacity. The Indonesian industry still has access to significant known reserves of coal (over 28 billion tonnes) (Study, page 8; see also, for example, Indonesian Government, Ministry of Energy and Mineral Resources, 'Policy statement for Indonesia's coal industry' delivered at Coaltrans Asia Conference 2012, Bali (4-6 June 2012)) and should the market opportunity present itself, this sector has the demonstrated capability to replace the coal from the proposed Alpha Coal Mine in its entirety.

(iv) The Indian and Chinese coal sectors are huge global scale industries in their own right. China produced 2.8 billion tonnes of thermal coal in 2011 and India produced 467 million tonnes in the same year (Study, page 8, table 3). Both countries import only a minority of their total coal requirement (Study, page 5, figure 4) and based on my discussions with coal buyers from both countries, I understand they do so primarily because of quality, logistical or economic reasons, not because they cannot source coal domestically. I have observed in the past that when internationally traded coal prices increase substantially making the quality, logistical or economic calculations unattractive, power generators in both countries have demonstrated a willingness and capability to switch away from imports back to domestic supply. The domestic coal industries in both countries are of such a scale they generally have been easily capable of meeting this additional demand Accordingly, should Indonesia or other international supply sources be unable to meet the gap left by a decision not to proceed with the proposed Alpha Coal Mine, it would be a relatively simple matter for these power generators to source alternate domestic coal.

(v) Mongolia and Mozambique have also recently begun to develop their coal industries. From my experience of working on project feasibility studies for projects in both countries, I know both countries have large reserves of coal with relatively low production costs but both are challenged by limited logistical infrastructure, which makes large scale development of their coal provinces difficult. Both are, however, poor countries with a strong motivation to develop a resource export sector to sponsor economic development. This motivation is demonstrated by their current efforts to get projects such as Moatize (Mozambique) and Tavan Tolgoi (Mongolia) into operation, despite the difficulties. Even if Indonesia and the Chinese and Indian domestic coal industries were unable to provide the forecast increase in global coal demand, I believe the longer term development of infrastructure in these two countries will bring previously untapped sources of coal supply onto the international market, making the lack of supply from the proposed Alpha Coal Mine into the market largely irrelevant.

(vi) In addition to the above mentioned alternative supply sources, the USA, Colombia and Russia also have large coal industries competing in the export market. Additional supply is also potentially available from these sources if demand requires it. The USA alone increased coal exports by 18 million short tons in 2012 (US EIA Quarterly Coal Report, October - December 2012 available at http://www.eia.gov/coal/production/quarterly/pdf/qcr.pdf).

(vii) Further, it is my experience that power suppliers make their choice of fuel source at the earliest stage of development when designing the equipment to provide new power capacity. Once this choice is made and projects have commenced construction, fuel type is an irreversible decision. It is a statement of the obvious, but a coal fired power plant burns coal to generate power and cannot generally use alternate fuel sources. This means the design of power generating capacity is the primary determinant of the amount of coal consumed, rather than the availability of coal which is plentiful and cheaply available from multiple sources.

(viii) If a power generator commits large sums of capital to the construction of a coal fired power plant with a long lead time to completion, they will not allow the development or otherwise of a single project like the proposed Alpha Coal Mine to put their project and investment at risk. Unless they are relying on a captive source of fuel, generators will seek to mitigate their supply risk and pursue a balanced and diversified fuel sourcing strategy not relying wholly on any one supplier. During a visit to a Tohoku Electric Power Station in my time in BHP, I observed 15 different coal types on their stockpiles. I came to understand this practice of multi sourcing to be prevalent throughout the industry and that many generators rely on 10 or more suppliers to provide their fuel requirements. This means that the refusal of the proposed Alpha Coal Mine to supply coal to any one power generator will generally leave only a small hole in the total supply picture for that generator. This makes the task of replacing coal from the proposed Alpha Coal Mine with alternate coal sources relatively simple at an individual power plant level and would certainly not trigger a closure of the plant or a time consuming switch to alternate fuel types through new capacity investment.

4.2 If your opinion in relation to [the] question [above] is yes, is the coal from an alternate source likely to create a similar, lower or higher level of emissions to the proposed Alpha Coal Mine coal?

(a) The alternate supply sources to coal from the proposed Alpha Coal Mine are many and varied and it is therefore difficult to make generalized statements about the quality of alternate coal types and the emissions which would result from their use.

(b) In general, however, the following trends can be observed:

(i) Coal is classified by rank, which is a measure of the amount of alteration it has undergone during formation. Factors affecting the rank of coal include the length of time involved in its formation, as well as the temperature and amount of pressure exerted upon the material.

(ii) Consecutive stages in evolution of rank from an initial peat stage are:

(A) Lignite (or brown coal);

(B) Sub-bituminous;

(C) Bituminous coal; and

(D) Anthracite (the three latter together known as black coal).

Increase in rank is due to a gradual increase in temperature and pressure which results in a decrease in water content and increase in carbon content and energy (See, for example, NSW Minerals Council website, available at http://www.nswmin.com.au/Mining-in-NSW/About-the-Industry/What-we-mine/What-We-Mine-coal/default.aspx).

(iii) When burnt, a tonne of coal will generate CO_2, however different types of coal will generate different quantities of CO_2 emissions depending on the characteristics of the coal. If coal contains less energy (has a lower calorific value), then the amount of CO_2 released per unit of energy released becomes higher. The relationship between calorific value and CO_2 emissions behind these general statements is detailed in a recent paper published in Journal of Industrial Ecology (Whitaker, M. et al.,'Life Cycle Greenhouse Gas Emissions of Coal-Fired Electricity Generation', 2 April 2012, *Journal of Industrial Ecology*, Vol 16 No S1, Yale University).

(iv) Further, using coals with lower calorific value also means a larger transportation burden as more tonnes of coal are required to be transported to generate the same amount of energy. There are, therefore, higher associated emissions resulting from the transportation of the coal.

(v) The coal from the proposed Alpha coal mine will be a washed bituminous product with a gross calorific value of 5800 kcal GAR (as noted on the Hancock Coal website); GAR stands for Gross as Received and is a standard industry measure of the energy content of coal.

(vi) Indonesia produces a range of different coal types, but Indonesian coal is generally lower ranked than the coal from the proposed Alpha coal mine. This means that coal sourced from Indonesia will generally have a lower calorific value and a much higher moisture content than coal from the proposed Alpha Coal Mine. Typically, from my experience, the calorific values of the most common Indonesian coals are below 5,500 kcal GAR with an increasing quantity of lower ranked lignite type coal with even lower energy values entering the market over recent times. Consequently, if the alternate to coal from the proposed Alpha Coal Mine is primarily sourced from Indonesia, such coal is likely to create a higher net level of emissions.

(vii) Indian domestic coal is also generally much lower in calorific value than coal from the proposed Alpha Coal Mine, although mainly due to very high inherent ash content. From my experience, they typically have an energy content of less than 5000 kcal GAR. Published data on Indian coal specifications is difficult to access however research from the Indian Institute of Technology confirmed the typical specifications of Indian coal had lower energy content than coal from the proposed Alpha Coal Mine (Chandra, A., Chandra, H., 'Impact of Indian and imported coal on Indian thermal power plants', *Journal of Scientific & Industrial Research* (February

2004) Vol. 63, pp 156-162). This, again, means for the reasons detailed above, a higher volume of CO_2 emissions would likely result if Indian domestic coal was used as a replacement to the coal from the proposed Alpha Coal Mine.

(viii) The Chinese domestic coal industry produces a wide range of coal types with various calorific values. Some coal types have a higher energy content than coal from the proposed Alpha Coal Mine while others have lower energy values. Accordingly, it is difficult to draw any concrete conclusions about relative emission levels if Chinese coal was used as an alternate supply to coal from the proposed Alpha Coal Mine.

(c) In conclusion, it is reasonable to assume that if the proposed Alpha Coal Mine did not proceed, the use of coal from alternate sources that would replace it would produce a similar or higher level of emissions. In particular, should Indonesian and/or Indian domestic coals form the primary replacement for Alpha coal should the proposed Alpha Coal Mine not go ahead, it is reasonable to assume higher net emissions would result.

4.3 Based on your knowledge of the coal market, what is your opinion as to the propositions in paragraph 62 of CCAQ objection and paragraphs 59-61 of Cassoni objection.

(a) In response to the specific propositions raised in the objections by Coast and Country Association of Queensland Inc (***CCAQ***) and Fiorella Paola Cassoni in their objection documents dated 20 February 2013, my opinion is as follows:

(i) *“There is no need for the coal”* (paragraph 62, CCAQ objection).

Coal is the largest single source of fuel used in the production of electricity globally (Study, page 2, figure 1). To say there is no need for coal in general is incorrect unless you envisage an enormous reduction in global electricity production and a significant increase in the cost of that production which would remain.

To argue there is no need for the coal from the proposed Alpha Coal Mine specifically has more substance in that the coal that would be produced from the proposed Alpha Coal Mine is readily replaceable by alternate coal supply sources. In my opinion, an equivalent volume of coal would still be burnt if the proposed Alpha Coal Mine did not proceed.

(ii) *"If this mine does not go ahead it will exert some upwards pressure on coal prices"* (paragraph 62, CCAQ objection).

The relative size of the proposed Alpha Coal Mine in the context of the global coal industry (0.006% of global production) and even in the context of the seaborne market (3.6% of current seaborne demand) means that any price impact from the proposed Alpha Coal Mine not proceeding would, in my experience, be limited.

The global coal industry is a large and liquid market with many participants. The withdrawal of one supplier of the proposed Alpha coal mine's forecast volume would not cause a disruption to the market. In the case of the proposed Alpha Coal Mine specifically, as the proposed mine has not yet been developed and no power generator currently relies on its product, should the project not proceed, generators will have ample time to take whatever action would be necessary to cover their future requirements.

(iii) *"This reduction in supply and increase in price of coal will push some consumers towards other energy sources which are already becoming cheaper"* (paragraph 62, CCAQ objection).

I am not an expert on the cost structure of alternate power generation to coal, however in many countries coal remains the cheapest source of fuel for power generation by a considerable margin. According to the World Coal Institute, coal fired power generation is currently around one third of the cost of solar generation and one half of that of wind generation (see http://www.worldcoal.org/resources/ecoal-archive/ecoal-current-issue/costs-of-coal-fired-electricity/). It would therefore currently take a material increase in the price of coal to change this equation. Whilst this situation may change in the future as technology changes, forecasts of thermal coal demand such as in the Study point to the fact that the worlds' power generators still believe coal to be an economic fuel source for many years to come. If any price increase were to result from the relatively small reduction in overall supply caused by not developing the proposed Alpha Coal Mine it would not be anything near the scale which would be required to alter the economics of coal fired power generation.

(iv) *"the world has many other coal mines and many other energy sources"* (paragraph 59, Cassoni objection).

This is true. It is the reason that coal from the proposed Alpha Coal Mine could be readily supplied from alternative coal supply sources.

(v) *"Unsubsidised renewable energy is now cheaper than energy from new coal fired power stations in Australia, and no new coal or gas plants are likely to be required this decade*" (paragraph 60, Cassoni objection).

As mentioned above, I am not an expert on the cost structure of renewable energy. However, the choices made by power generators in their selection of technology and fuel source for new generation capacity has not yet indicated that this statement is correct.

Coal still holds a major share of global energy demand (Study, page 3, figure 1) and is forecast to grow (Study, page 2). The coal from the proposed Alpha Coal Mine is destined for export, particularly into Asia, and significant new coal fired capacity is currently being constructed in both India and China with even more capacity development being planned (Study, page 4).

In my experience, it is beyond the remit of coal mining companies to determine which power source generators will select. Their role is to fill the demand that results from the choices taken by their customers. The desire of power generators to use coal as a fuel source will be driven by the attractive economics of coal fired generation and the ready availability of coal supply.

(vi) *"there are likely to be cheaper alternatives for energy production soon after the coal from this project reach [sic] the market which do not produce greenhouse gas emissions. Consequently there is not sufficient need for the project..."* (paragraph 61, Cassoni objection).

As discussed in item (v) above, significant new demand for coal is forecast over coming years. The market risk for this project is taken by the shareholders. In undertaking their due diligence for this project they will have made the assessment on whether there will be sufficient volume of demand at a price which will allow them an economic return on the capital investment.

It is my opinion that there will be sufficient volume of demand, based on the amount of coal fired power generation currently under construction and that which is currently forecast to be built. The price will be determined by the market fundamentals.

5. Summary of Conclusions

Consumption of coal is driven by power generators and not determined by the coal mining sector. Should the proposed Alpha Coal Mine not proceed, it is reasonable to expect that alternative coal supply sources to the proposed Alpha Coal Mine will be readily and economically available and that global coal burn will not be reduced as a result. These alternative coals are of mixed but generally poorer quality and so would likely result in a similar, if not greater, volume of emissions to those which would have resulted if the proposed Alpha Coal Mine were to proceed. The specific propositions raised in the objection documents referred to in this report are unreasonable when examined with relation to the facts and likely outcomes.

6. Additional Information Required

No further information is required in reaching this conclusion.

7. Expert's Statement

I confirm the following:

(a) the factual matters stated in this report are, as far as I know, true;

(b) I have made all enquiries that I consider appropriate;

(c) the opinions stated in this report are genuinely held by me;

(d) the report contains reference to all matters I consider significant; and

(e) I understand my duty to the court and have complied with the duty.

Andrew Offen

30 May 2013

Appendix A - Curriculum vitae

RESUME

Name	**Andrew Offen**
Address	200 Tinarra Cr Kenmore Hills, Qld 4069 Australia
Telephone	Home 07 33785821 Mobile 0411 278655
Email	andrew.offen@gmail.com
Date of Birth	27th February, 1960
Nationality	Australian
Marital Status	Married, 2 children

Education

1979 - 1981 **Griffith University**
Bachelor of Arts in the School of Modern Asian Studies
Majoring in Economics and Japanese Language

Work Experience

Apr 1982 - Mar 1984 **Amagasaki Board of Education - English Teaching Supervisor**
Amagaski City, Japan
Worked in Japan on contract for 2 years in an English teaching advisory role.

Sep 1984 - Dec 1985 **Coal and Allied Industries Limited - Marketing Officer**
Sydney
Trainee position covering coal marketing administration, in particular all aspects of shipping and trade finance. Included acting as interpreter for Australian Maritime Industry mission to Japan.

Jan 1986 – Nov 2007 **BHP and BHP Billiton - In the following positions :**

1/86 - 12/88 **Non Ferrous Metals Marketing Dept. - Market Development Officer**
Melbourne
A marketing/sales administration and commodity and currency hedging role. Extensively involved in the initial approval, setting up and subsequent execution of the BHP Minerals non ferrous metal and gold hedging program, as well as contract administration, ship scheduling and customer liaison.

1/89 - 3/90 **Non Ferrous Metals Marketing Dept. - Sales Coordinator**
Melbourne
Similar duties to above but in a more senior role. Had primary responsibility for the BHP Gold Mines gold hedging program, covering sales of approximately A$150 mil pa. Supervised the marketing administration function and assisted in sales contract negotiations for aluminium ingot, lead and zinc concentrates and mineral sands

3/90 - 3/92 **Ok Tedi Mining Ltd. - Superintendent Marketing**
Tabubil, Papua New Guinea
The number two role in the Ok Tedi Marketing Dept. Had primary responsibility for Ok Tedi's copper and gold commodity hedging program, covering sales worth A$ 400 mil. Also supervised the marketing admin staff of 4 administrators and supported the Marketing Manager in the negotiation of terms for Ok Tedi's major copper concentrate sales contracts. Over the final 12 months at Ok Tedi took over the primary responsibility for negotiating sales contracts with the company's small and medium sized customers.

11/92 - 10/95 **BHP Japan Pty Ltd. - Manager Non Ferrous Marketing**
Tokyo, Japan
Provided local expertise and support for BHP's various Non Ferrous operations (Escondida, Ok Tedi, Island Copper, Cadjebut and later Cannington and Beenup) in their marketing efforts in Japan and Korea. BHP's Non Ferrous sales in the region total approximately one million tonnes of copper, lead and zinc concentrates worth US$600 mil. Responsibilities

included participating in and conducting contract negotiations and all aspects of customer liaison.

11/95 - 2/97 **BHP Japan Pty Ltd. - Manager Coking Coal Marketing**
Tokyo, Japan
Supported BHP's Coal operations in their marketing efforts in Japan (total BHP coking coal sales in the region total approximately 12 million tonnes pa). Responsibilities included participating in the negotiating team for the JSM joint purchase contract, conducting contract negotiations for all the non joint purchase coals sold in Japan (approximately 6 million tonnes), all aspects of customer liaison & communications and managing the contract admin function.

3/97 – 2/99 **BHP Coal Pty Ltd. - Manager Marketing, North Asia**
Brisbane
Responsible for all of BHP Coal's coal sales to Japan, Korea and later Taiwan, totaling approximately 20 million tonnes of coking and thermal coal worth US$700 million. Supported the General Manager in the JSM joint purchase negotiations, managed the non joint purchase sales component (15 million tonnes), managed the coal marketing activities of the Tokyo, Hong Kong and Seoul offices, liased with the operations to formulate production strategies and represent BHP on a number of industry bodies.

3/99 – 7/01 **BHP Coal Pty Ltd. – Vice President Marketing - Coal**
Brisbane
Promoted to head of the coal marketing group. Responsibility for conducting the annual Japanese coal benchmark negotiations and total revenue outcome for the BHP Queensland coal business totaling US$2bn. This position also entailed a more active role in the formulation and implementation of BHP's coal marketing strategies, joint venture relations and managing the departmental staff and marketing budget.

8/01 – 2/06 **BHPBilliton Marketing Asia Pte Ltd – Marketing Director, Carbon Steel Materials**
Singapore
Responsible for the creation and management of a new business unit in BHPB located in Singapore and responsible for the global marketing of all BHPB's steelmaking raw materials products. Total revenue responsibility US$15billion, total staff 170 spread across 12 international locations, reporting to the Chief Commercial Officer of BHPB and Group President Carbon Steel Materials. Senior member of the BHPB CSM executive team.

3/06 – 11/07 **BHPBilliton Ltd – Marketing Director, Special Projects**
Brisbane
Part time role as internal consultant, providing strategy guidance, mentoring and project marketing support for the BHPB marketing organization, reporting to the head of marketing BHPB

Feb 2008 – present **Independent Consultant**
Brisbane
Retained by BHPB to work on specific projects such as the BHP Rio Tinto takeover bid and a large insurance claim by BMA Coal. Have subsequently been retained by the Bluefield Group for commercial due diligence work and Salva Resources for client advisory work.

Jul 2009 – Jun 2011 **Salva Resources Pty Ltd - Member of Advisory Board**
Brisbane
Retained by Salva Resources as a member of their Corporate Advisory Board to give commercial and strategic advice to their commercial operations.

Jul 2011 – Apr 2013 **Salva Resources Pty Ltd – Non Executive Director**
Brisbane
Appointed to the Salva Resources Board as a Non Executive Director on the formation of the Board in 2011.

Other Training BHP Internal Management Courses - RMC 1, RMC 2, GLP 3, International Leadership program.
Other courses taken : "Effective Negotiations", "Effective Business Writing"

Other Skills Bilingual - Fluent in Japanese.

Hobbies Flying, military history, tennis, bridge.

Appendix B - Study

GVK Hancock Coal

Thermal Coal Supply and Demand Study

28 May 2013

Australia | India | Indonesia | United Kingdom

International Head Office
Level 11, 82 Eagle Street,
Brisbane, QLD 4000, Australia

For more information visit
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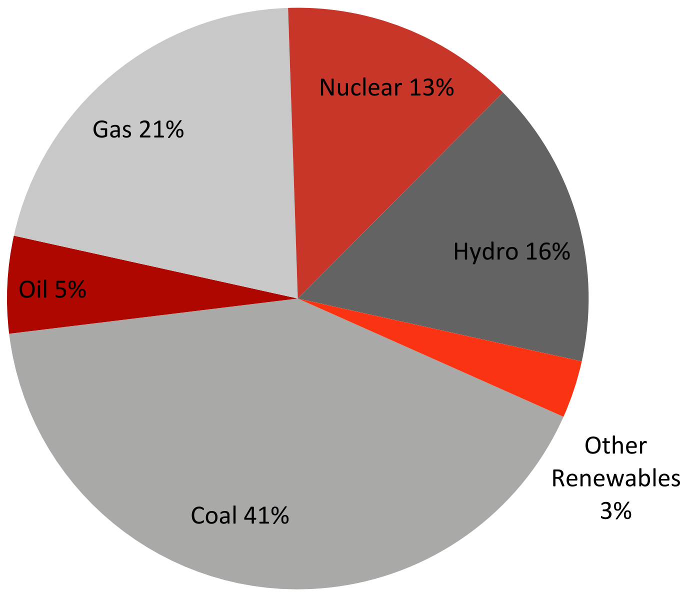
1 Introduction

Power Generation and Coal Demand

There are primarily two general classifications of coal – coking coal and thermal coal. These coal types are defined by differing quality characteristics, and have separate but vital uses. Coking coal is used primarily in the manufacturing of steel, while thermal coal is primarily used to generate electricity.

Coal is the predominate fuel source used globally in the generation of electricity. The International Energy Agency (IEA) found that in 2009, 41% of global electricity generation was fuelled by coal. As shown in Figure 1, this was almost twice that of the next fuel source - gas.

Figure 1: Total World Electricity Generation by Fuel (2009, %)



Source: IEA, 2011
Note: Other Renewables includes Solar, Wind, Combustible renewables, geothermal and water

There a number of reasons for coal being more widely used than other fuel sources:

- Coal is more widely dispersed than most other fuels, with global coal reserves estimated by BP in 2011 at 860 billion tonnes (Bt). Proven reserves (coal that may be economically recoverable) of thermal coal are estimated at 456 Bt. Coal reserves are available in almost every country in the world, with recoverable reserves found in approximately 79 countries.
- Coal is estimated to be more abundant than other fuels. BP's Statistical Review of World Energy, 2012, estimated at the current production to reserve ratio, there are enough proven thermal coal reserves for power generation for 112 years. In comparison, using current production to proven reserve ratio, there is sufficient natural gas to last 63 years, and sufficient oil reserves to last 54 years.

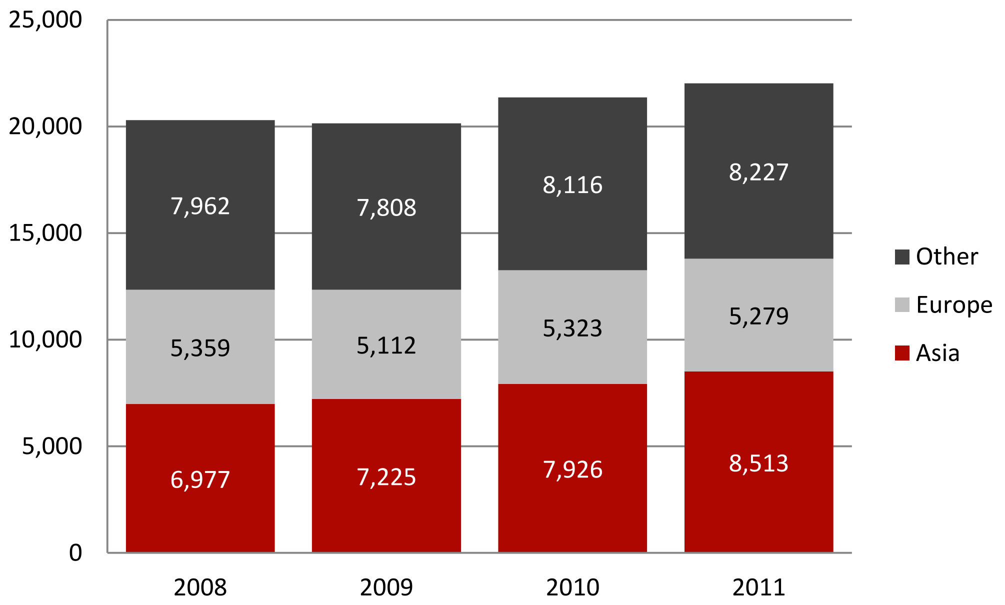
- Generally cheaper to use than oil.
- Considered more safe than current nuclear power generation technologies.
- More reliable and efficient than renewable sources such as hydro, which is important in maintaining electricity supply.

2 Demand

Overview

Global power demand is largely driven by the high growth Asian region, including China, India, Japan and Korea. Figure 2 highlights that Asian power generation has increased over 20% from 6,977 TWh in 2008 to 8,513 TWh in 2011, while European generation decreased 1.5% and the rest of the world increased 3.3%. Asia accounted for 39% of global power generation in 2011.

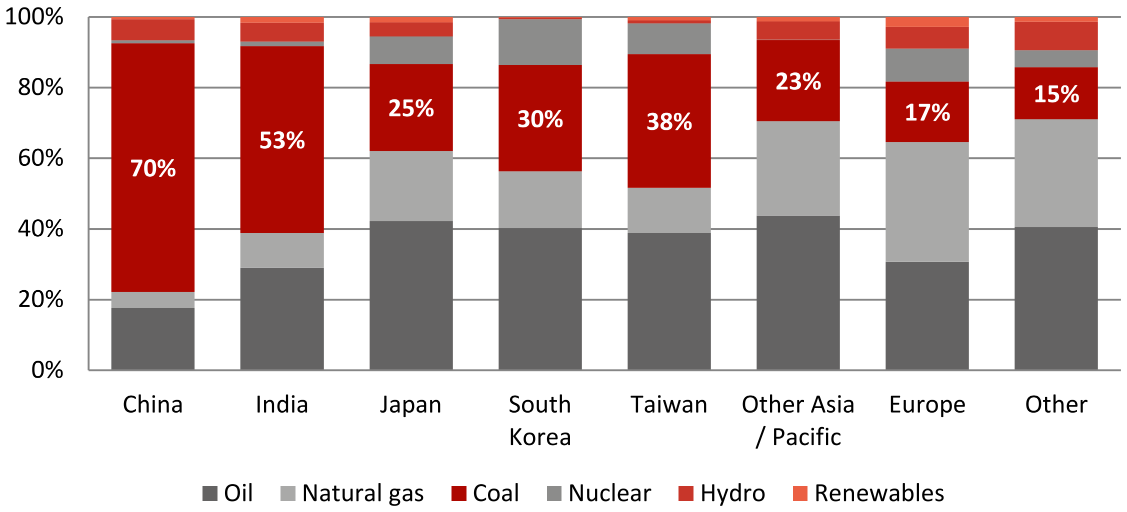
Figure 2: Global Power Generation (TWh)



Source: BP

High power demand in these countries is largely supported by coal-fired power generation. Figure 3 shows 70% of Chinese and over 50% of Indian power generation is accounted for by coal-fired plants.

Figure 3: Power Generation Fuel Consumption by Type (2011, %)



Source: BP

This high dependency on coal is representative of a continuing global, and particularly Asian, trend. Development of coal-fired power plants is becoming more commonplace, as a result of:

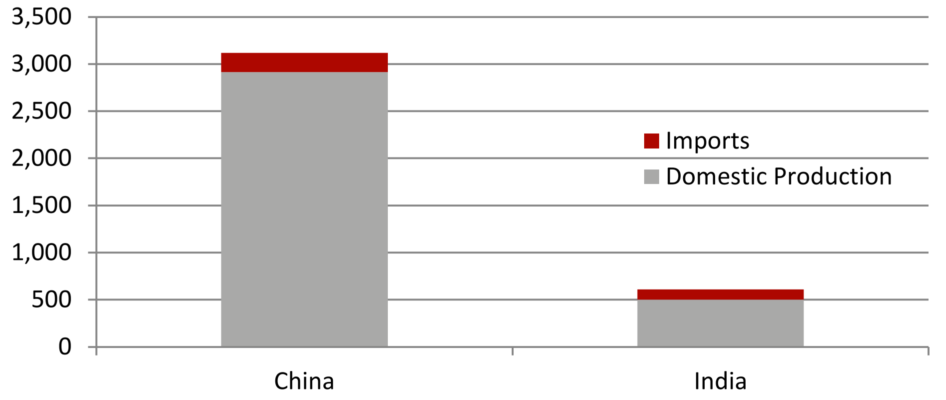
- Domestic supply – China and India, as shown previously, have large deposits and production capability for coal, making it cheap and readily available for use in domestic power generation.
- Close to other coal supply sources – with the close proximity of significant supply sources of Australia and Indonesia, and to some extent South Africa, Asian power plant development is able to economically justify the transportation cost and short delivery time of coal.
- Safety concerns following the Fukushima Nuclear Facility accident in 2011 have forced a move away from nuclear development in Japan and Europe.

To meet demand from the power sector, countries are often required to import fuel sources, including coal. Imported coal is used to provide coal supply for countries that have no domestic supply (such as Japan), or to supplement demand not met by domestic supply (such as India and China).

Many coal-fired power plants are now being built in countries around the world based on imported coal, regardless of domestic coal availability. These power plants, built near coastlines and coal ports, are able to source coal from a variety of sources including Australia and Indonesia. These power plants are often able to interchange supply sources (provided the coal is of similar characteristics) based on seaborne coal prices and availability. Often to mitigate supply risk, power generators will rely on multiple coal import sources.

As shown in Figure 4, India and China both produce significant amounts of thermal coal for use domestically; however coal is imported to meet demand within each country. 2012 imports for China, 201 million tonnes (Mt) and India (110 Mt) accounted for a minority of domestic demand, however together accounted for 28% of total global imports in 2012.

Figure 4: Chinese and Indian 2012 Thermal Coal Consumption by Source (Mt)



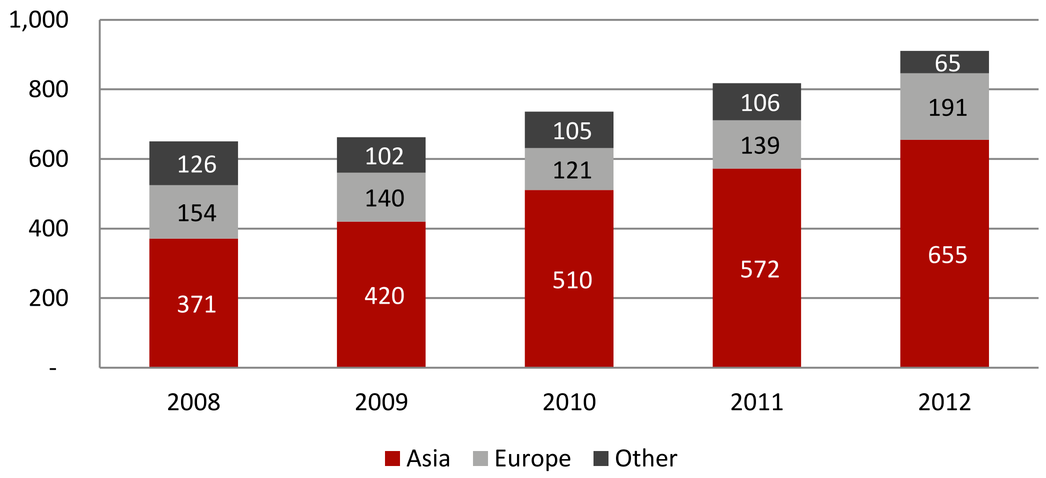
Note: China 2012 Domestic Production based on Salva estimates
Source: Salva, World Coal, McCloskey

Import demand is driven not just by domestic demand but also price. Countries such as China and India are extremely price sensitive, and often change import sources, or consume greater amounts of domestic coal, based on which source is cheaper.

Historical seaborne import demand

Sharp increases in thermal coal demand, particularly in Asia, have seen thermal coal seaborne imports grow to 911 Mt in 2012, from 651 Mt in 2008 at a CAGR of 8.8%. China and India have led this growth, with population increases, economic development, urbanisation and industrialisation resulting in a greater demand for electricity.

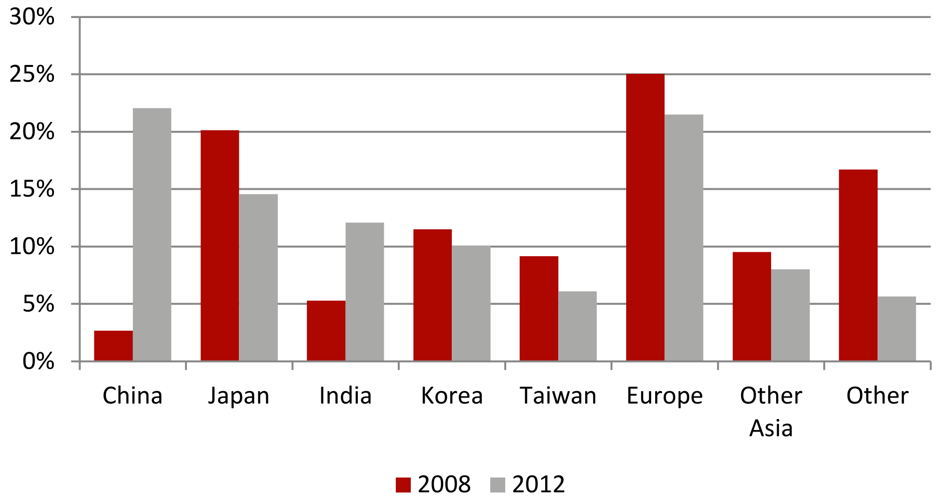
Figure 5: Seaborne Thermal Coal Trade (Mt)



Source: Salva, McCloskey

Despite being the world's largest thermal coal producer, Chinese demand has grown at a fast rate. As a result, Chinese imports have grown at a 84.2% CAGR from 2008 to 201 Mt in 2012 to become the world's largest thermal coal importer, as shown in Figure 6.

Figure 6: Share of Thermal Coal Imports (%)



Source: Salva, McCloskey

2012 import demand

Table 1 shows demand for seaborne coal imports during 2012 was concentrated predominately in Asia, which accounted for 73% of the 911 Mt coal traded on the seaborne market.

Table 1: 2012 Imports by Country (Mt)

Country	2012 Imports	Proportion of 2012 Global Imports
China	201	22%
Japan	133	15%
India	110	12%
Korea	92	10%
Taiwan	55	6%
Europe	196	21%
Other Asia	73	8%
Other	51	6%
Total	**911**	**100%**

Source: Salva, McCloskey

Indian thermal coal import demand has also increased significantly to meet growing demand from the power sector, growing 33% CAGR to 110 Mt in 2012.

Japanese import demand has remained steady at 133 Mt in 2012. This growth has not increased as significantly as other markets, due to the mature state of Japan's electricity sector.

Import demand forecast

Thermal coal import demand is expected to continue to grow strongly, driven by rapidly growing Chinese and Indian demand. Increasing demand will be on the back of significant capacity additions of coal-fired power plants. Table 2 outlines forecast global imports to 2020 are expected to grow to 1.3 Bt in 2020. Forward projections to 2035 show growth of over 2.5 Bt of thermal coal imports could potentially be required by the global market, a 4.5% CAGR.

Table 2: Import Demand Forecast (Mt)

Country	2012	2015	2020	2025	2030	2035	CAGR
China	201	257	342	430	535	670	5.4%
Japan	133	139	151	180	210	240	2.6%
India	110	166	249	400	460	630	7.9%
Korea	92	109	130	160	200	250	4.5%
Taiwan	55	56	80	100	130	130	3.7%
Europe	196	207	216	240	270	300	1.9%
Other Asia	73	89	100	125	160	200	4.5%
Other	51	45	52	60	75	95	2.6%
Total	**911**	**1,069**	**1,321**	**1,695**	**2,040**	**2,515**	**4.5%**

Source: Salva, Platts

Drivers of forecast growth in import demand include:

- Chinese thermal coal imports are forecast to increase from 201 Mt in 2012 to 670 Mt in 2035, an increase of 5.4% CAGR, driven by a significant increase in coal-fired power plants.
- Indian thermal coal imports are also forecast to grow significantly at a CAGR of 7.9% as a result of massive coal-fired power plant development, reaching 630 Mt in 2035.
- Korean thermal coal imports are forecast to pass that of Japan, reaching 250 Mt by 2035, as a result of strong coal-fired generation capacity.
- With a mature power network, a potential shift away from nuclear power generation to coal will be the primary driver for Japanese thermal coal imports to 240 Mt in 2035.
- With 62% of Taiwan's planned power generation coal-fired, Taiwanese thermal coal imports are forecast to rise to 130 Mt by 2035.

Salva have developed these forecasts through:

- 2012 to 2020: A bottom up assessment of current, planned and under construction coal-fired power plants, and the contribution of thermal coal imports to these power plants was used to forecast imports to 2020;

- 2020 to 2035: A high level growth rate applied to import quantities, developed through a top-down country-by-country review of potential electricity generation requirements, was used to forecast imports to 2035.

3 Supply

Historical thermal coal production and supply

Demand for electricity has grown significantly as nations develop and global population increases at a significant rate. This growth has seen a significant increase in the international production and demand for coal. World Coal estimated 5.7 Bt of thermal coal was produced globally in 2011, an increase of over 350 Mt from 2010.

Production growth has been driven by increasing domestic use of coal, along with an increase in coal exports to meet international demand. Table 3 below shows in 2011, exports accounted for 14% of production. Key export markets for the Asian demand centres – Australia, Indonesia, USA, and South Africa – accounted for 30% of 2011 global production, and 74% of 2011 exports.

Table 3: 2011 Thermal Coal Production and Exports (Mt)

Country	2011 Thermal Coal Production	2011 Thermal Coal Exports
China	2,831	-
USA	849	34
India	467	-
Indonesia	416	353
South Africa	250	69
Australia	199	148
Russia	178	92
Colombia	80	76
Other	400	46
Total	**5,670**	**818**

Source: Salva, World Coal, McCloskey

Coal export supply has increased as a result of global demand. This supply has been met by countries that have:

- Large coal reserves of export quality thermal coal;
- Production capacity that is greater than domestic demand for thermal coal; and
- Export infrastructure in the form of road, rail, barging, port and transshipment.

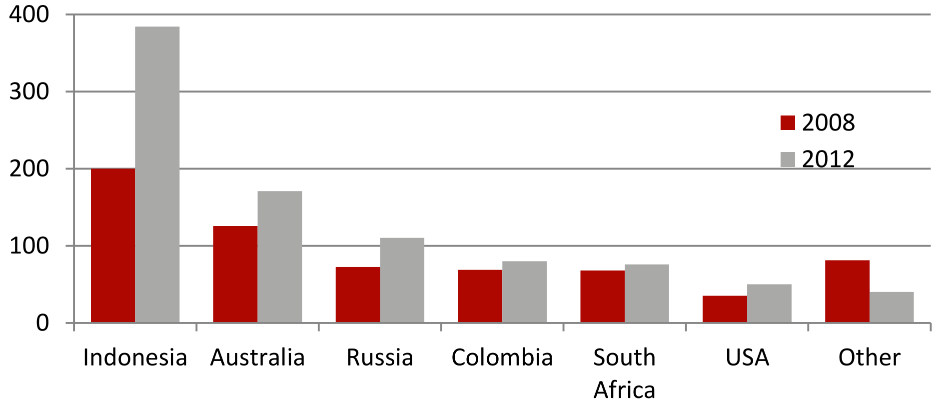
Indonesian coal reserves are 28 Bt, with proven reserves (economic recoverable) of 5.5 Bt. While this is less than 1% of global proven reserves, Indonesia's high production capacity, relativity low domestic demand by comparison, and river networks allowing barging of large amounts of coal to export have resulted in Indonesia becoming the largest seaborne exporter of thermal coal.

Export supply

To meet the steep increase in demand since 2008, export supply has grown 8.8% CAGR. Indonesia has seen a massive increase in export supply, increasing from 200 Mt in 2008 to 384 Mt in 2012.

Indonesia exports are over double that of the second largest exporter Australia, whose exports have grown from 125 Mt in 2008 to 171 Mt in 2012. As shown in Figure 7, Russia, Colombia and South Africa continue to be significant exporters, while USA exports have begun to rise as a result of increasing domestic use of shale gas.

Figure 7: Thermal Coal Export Growth (Mt)



Source: Salva, McCloskey

Export supply forecast

Based on Salva's forecasts, export supply is expected to increase significantly from 911 Mt in 2012 to 1,224 Mt in 2020. Table 4 outlines export supply could potentially reach 1,810 by 2035, a CAGR of 3.0%.

Table 4: Forecast Export Supply (Mt)

Country	2012	2015	2020	2025	2030	2035	CAGR
Indonesia	384	455	571	660	770	890	3.7%
Australia	171	230	267	360	460	510	4.9%
South Africa	76	79	86	90	90	90	0.7%
Russia	110	115	126	140	140	140	1.0%
Colombia	80	84	85	90	90	90	0.5%
USA	50	40	40	40	40	40	-1.0%
Other	40	40	49	50	50	50	1.0%
Total	**911**	**1,042**	**1,224**	**1,430**	**1,640**	**1,810**	**3.0%**

Source: Salva

Drivers of forecast growth in export supply include:

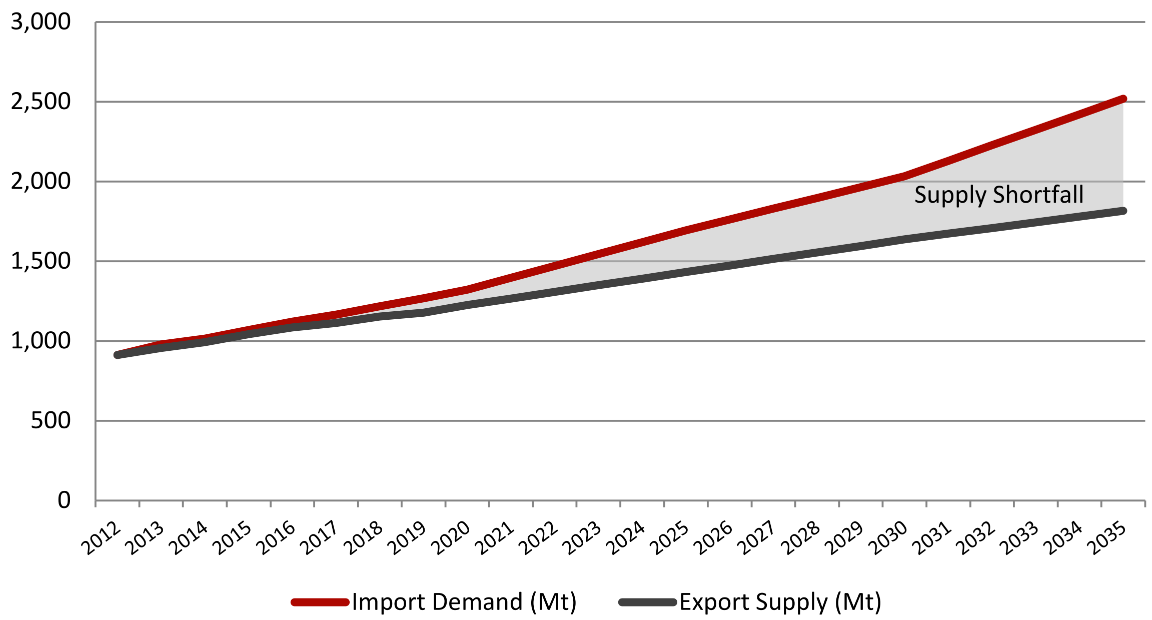
- Indonesia is expected to increase exports at a 3.8% CAGR to 570 Mt in 2020, due to Indonesia's proximity to key markets, relatively low development and mining costs, and readily available barging, road and transshipment infrastructure. Indonesian exports could potentially reach 890 Mt by 2035, provided infrastructure continues to develop.
- Australian thermal coal exports are forecast to grow, despite current infrastructure constraining exports from the Surat and Galilee Basins. Exports are forecast to reach 267 Mt by 2020, growing at a 5.7% CAGR. Based on potential developments in export facilities, exports could reach 510 Mt by 2035.
- South Africa's proximity to India provides an advantageous freight rate compared to other traditional supply centres. Port development will see exports rise to 90 Mt by 2020.
- Russian exports are expected to grow at a slower rate than Indonesia and Australia, due to expected slow demand growth in Europe, Russia's main supply region. Exports from Russia are forecast to grow to 126 Mt in 2020, reaching 140 Mt in 2035.
- Colombian exports will remain constrained by port and rail infrastructure. Significant distance from key Asian markets will slow development of Colombia's exports, which are expected to remain at around 90 Mt.
- The USA will continue to be a swing supplier of export thermal coal. 2012 saw historic levels of exports from the USA. However, this will most likely be a ceiling for the future with exports remaining at around 40 Mt per annum.

Salva have developed these forecasts through:

- 2012 to 2020: A bottom up assessment of mine production and export infrastructure current and forecast global export markets to forecast exports to 2020;
- 2020 to 2035: High level growth rate applied to export quantities, developed through a top-down country by country review of potential infrastructure and mine development.

As shown in Figure 8, export supply is expected to fall short of forecast demand, based on announced infrastructure developments and mine developments.

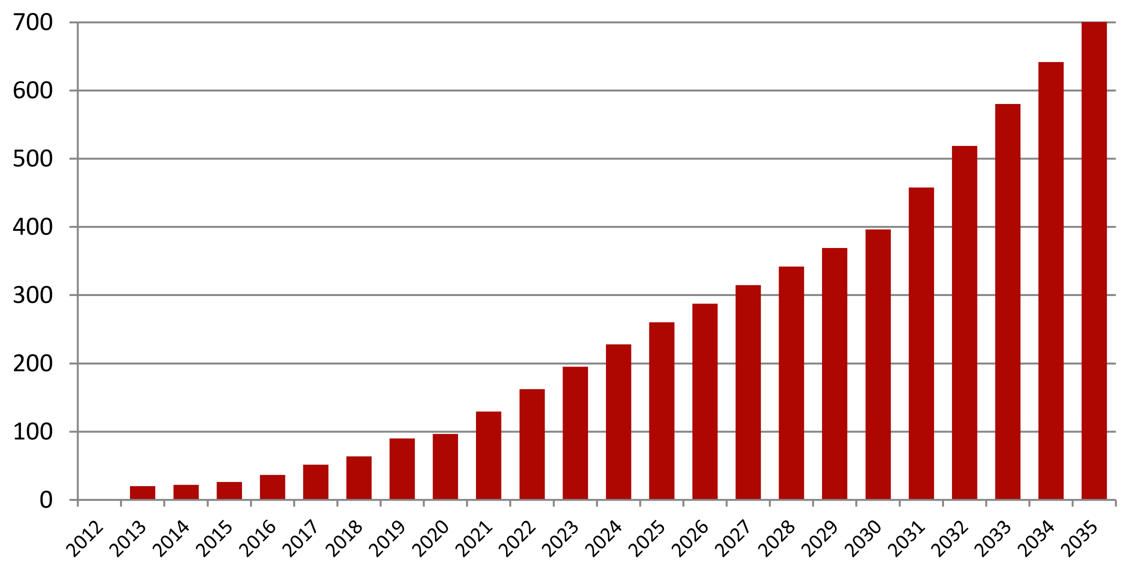
Figure 8: Forecast Import Demand and Export Supply (Mt)



Source: Salva

Figure 9 identifies that by 2020, an additional 97 Mt will be required to meet demand, extending to a potential 705 Mt shortfall by 2035.

Figure 9: Potential Global Forecast Supply Shortfall (Mt)



Source: Salva

How this shortfall will be supplied, through increases in production for domestic use or increased seaborne supply, remains to be seen.