

From Thermal Coal Production to Marketing and Trading

A Growth Opportunity for the Coal
Mining Industry in Asia Pacific

An aerial photograph of a large red-hulled cargo ship docked at a port. The ship's deck is filled with various structures, including a prominent white and red superstructure at the bow, several large rectangular hatches, and a helipad with a green and yellow landing pad. The ship is moored at a pier with complex metal structures and cranes. The water is a deep blue-green color.

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Executive Summary

The global coal market is becoming increasingly centred on Asia Pacific, with China alone accounting for more than 50 percent of total production and consumption¹ while the Asia Pacific region is expected to represent 80 percent of the global coal market by 2030.² In the meantime seaborne trading has grown at 5 percent per annum over the last 20 years³, far outpacing consumption in the same period that has grown at 2 percent per annum.⁴ Trade flows have shifted dramatically over the past decade, with China becoming the largest importer of coal, growing from near-zero imports in 2000 to 175 million tonnes in 2012. Furnishing this demand is Indonesia, which has become China's primary supplier of coal, driven by its low relative cost of supply, and is now the world's largest coal exporter, shipping 356 million tonnes in 2012, equivalent to more than 25 percent of global exports. However, marketplace dynamics may shift again, with new exports from the United States coming into the Asian market and multi sourcing strategies that blend coal from different locations to meet the calorific requirements of specific local markets.

In the past five years the market has seen supply increases arising from greater investment in response to strong energy demand. However, demand growth has recently faltered, leaving an estimated oversupply of 150 million tonnes in 2013.⁶ In the Western developed markets, energy feedstock switching in response to environmental regulation governing emissions and renewables has seen net coal power plant closure despite coal's relative low cost advantage compared to other energy sources. Nevertheless, coal power generators continue to benefit from their feedstock's cost competitiveness and are finding new ways to comply with more stringent regulations through, for example, co-firing coal with biomass.

Oversupply in the thermal coal market has placed downward pressure on prices. Consequently, mining companies in the Asia Pacific region now need to consider ways to reduce income volatility, secure growth and drive profitability. In a market characterised

by oversupply, marginal cost price is one of the key reference points. Our analysis indicates that the marginal production cost of the 85th percentile of coal export volumes (i.e. 85 percent of coal export volume is produced at or below this cost) is the level at which production shutdowns are anticipated and might provide a floor to the price. We estimate this level for Australian export producers at \$87/tonne and Indonesian producers at \$64/tonne and therefore anticipate that the market has reached a floor where capacity rationalisation would prevent further downward price movements.⁷

Accenture believes that within this cost competitive environment, coal producers can help improve their profitability and reduce earnings volatility by expanding their activities downstream into trading, marketing and logistics. Producers can enhance margins by blending lower and higher calorific-value coal and selling the mix in end markets, or by changing sourcing patterns by buying coal in slightly more depressed markets, such as the United States, and redirecting exports to higher value markets, such as China. Accenture's analysis suggests that in current market conditions, blending can increase margins achieved on end prices by upwards of 5 percent to 15 percent, while location arbitrage can lead to a 10 percent to 15 percent increase in margins on specific trade routes.⁸ As more spot volume is expected, APAC miners might look to seize this strategic opportunity as a means to expand into marketing and trading activities.

This strategy is particularly relevant to Indonesian miners, who have traditionally focused solely on upstream activities. However, the revised operating model used to execute this strategy depends on investments in capabilities such as origination, contract structuring, chartering, and market and credit

risk management among others, in order to help compete with global coal marketers and trading houses. Acquiring these capabilities might allow companies to capitalise on market arbitrage opportunities, in terms of both geographical and quality considerations, recover margins handed over to intermediaries and engage directly with end-customers to develop more structured sales.

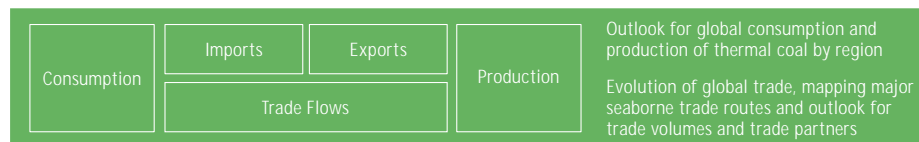
To understand the potential of these opportunities, Accenture has developed an analysis that highlights and calculates incremental margins that can be realised from arbitrage opportunities. We begin by reviewing coal market dynamics, both globally and in Asia Pacific, to assess the outlook for supply and demand drivers before highlighting market opportunities. Our conclusions highlight the capabilities coal miners could develop to execute an expansion strategy into trading and logistics that can deliver incremental value.

Accenture expects miners to face the imperative of executing this strategy in order to remain competitive and hedge themselves against future risks. Although we expect the price of coal might recover in the medium term, annual price volatility is likely to remain at current levels, having averaged c30 percent over the last five years.⁹ This volatility will remain driven by a number of factors, but primarily by uncertainty on mines' throughput and changes in consumption patterns in end markets, i.e., incremental shale gas supply in the United States, domestic coal infrastructure capacity expansion in China, or carbon price recovery in Europe.

Now is the time for coal producers to take early advantage of this strategy, as part of the overall effort to help enhance earnings, reduce income volatility and achieve long-term growth.

Figure 1: Summary of Report Analysis and Scope

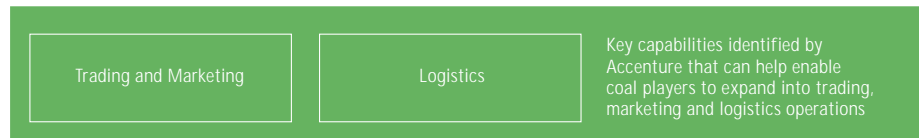
Market Supply and Demand Overview



Market Price Dynamics and Arbitrage Opportunities



Capabilities Development



Source: Accenture analysis

¹Accenture analysis. Data source: BP Statistical Review 2013. Used with permission.

²Accenture analysis. Data sources: BP Statistical Review 2013, IEA, World Coal Institute, IEA World Energy Outlook Bloomberg, Thomson Reuters, Deutsche Bank, IHS McCloskey, Wood Mackenzie, AWR Lloyd. Used with permission.

³Accenture analysis. Data source: IEA. Used with permission.

⁴Accenture analysis. Data source: BP Statistical Review 2013. Used with permission.

⁵Accenture analysis. Data sources: IEA, World Coal Institute, IEA World Energy Outlook Bloomberg, Thomson Reuters, Deutsche Bank, IHS McCloskey, Wood Mackenzie, AWR Lloyd. Used with permission.

⁶Deutsche Bank Report, "Thermal Coal: Coal at a Crossroads", 9 May 2013

⁷Accenture analysis. Data sources: Deutsche Bank, Wood Mackenzie, AME. Used with permission.

⁸Accenture analysis. Data sources: Thomson Reuters, Bloomberg. Used with permission.

⁹Accenture analysis. Data sources: Thomson Reuters. Used with permission.

Thermal Coal Market Overview

Global Evolution of Consumption, Production and Trade

Global consumption of coal has shifted towards Asia Pacific with the region expected to account for 80 percent of demand by 2030.¹⁰ Looking at the total consumption of all primary energy sources, coal will, along with oil, likely remain the world's primary source of energy until 2030, with only marginal challenges from alternative energy sources given coal's important cost competitiveness.

Within Asia Pacific, China is by a substantial margin the largest consumer of thermal coal, accounting for around 95 percent of the increase in consumption over the last decade.¹¹ The country's economic growth (7.8 percent GDP annual change in 2012), largely driven by its energy intensive manufacturing sector, has fuelled demand. Despite official moves towards alternative sources of energy or higher calorific-content thermal coal, demand growth from China is expected to be resilient. As the Chinese government's investment in energy sources that are alternatives to coal has largely been focused on coastal regions, the number of coal-fired power plants inland has increased significantly, with few other options available.

As well as increasing consumption, Asia Pacific is expanding its share of global coal production. China's share of production has more than doubled between 1990 and today, rising from 20 percent to 50 percent of the current world total.¹² A number of smaller countries have lost out to China as producers, owing to their relatively high production unit costs – highlighting the importance of achieving economies of scale. High levels of production in high consumption markets differentiate the coal market from the oil and gas market, limiting the extent of seaborne trade to 16.4 percent as a proportion of production. In contrast, trade flows in crude were 64.2 percent of production in 2012.

The expansion in China's consumption has been matched by the strong growth in its imports. In a little over a decade, China's total imports have risen from 2.4MT in 2000 to 192MT in 2011¹⁴, driven by the comparatively low price of imported coal relative to domestic supply. The increase means that China has now overtaken Japan as Asia's largest importer (Figure 3).

Exports of coal globally have increased nearly threefold over the last 20 years, from 470MT to 1,290MT, a compound annual growth rate of approximately 5 percent¹⁵, outstripping the 2 percent increase in consumption over the same period¹⁶ and indicating a greater reliance on global sourcing and international energy procurement. Of all exporting countries Indonesia has emerged as the global leader with exports rising from only 5MT in 1990 to 356MT in 2012¹⁷ – largely focused on the Asian market (Figure 3). Indonesia's rise

in the coal industry has been driven by a low cost of production and close proximity to key demand centres in Asia. Analysis of coal export volumes by major trade routes confirms that Indonesia to Asia is the busiest and looks set to continue carrying the highest volume of coal exports at c400 MT/yr by 2020.¹⁸ While Indonesia has limited deep-sea ports and lacks the associated infrastructure to handle the largest capesize and panamax vessels associated with coal exports, transshipment facilities that are based next to mining centres in Sumatra and Kalimantan offer flexible platforms for off-loading to large dry-bulk vessels. With 85 percent of all exports heading for Asia Pacific, and China in particular, Indonesian export demand and price will remain heavily dependent on China's appetite for imports.¹⁹



¹⁰Accenture analysis. Data sources: BP Statistical Review 2013, IEA, World Coal Institute, IEA World Energy Outlook Bloomberg, Thomson Reuters, Deutsche Bank, IHS McCloskey, Wood Mackenzie, AWR Lloyd. Used with permission.

¹¹Accenture analysis. Data sources: BP Statistical Review 2013, IEA. Used with permission.

¹²Accenture analysis. Data source: BP Statistical Review 2013. Used with permission.

¹³Data source: BP Statistical Review 2012. Used with permission.

¹⁴Accenture analysis. Data source: IEA. Used with permission.

¹⁵Accenture analysis. Data source: IEA. Used with permission.

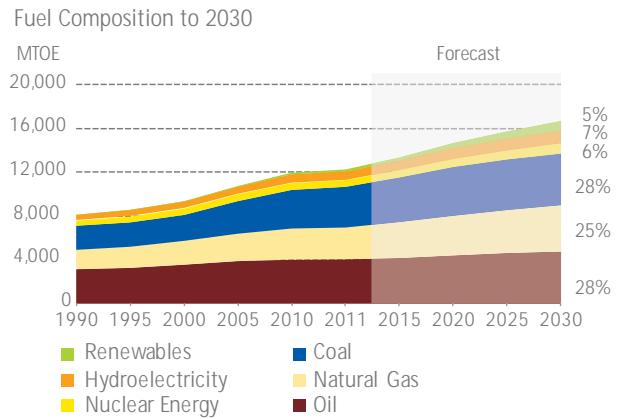
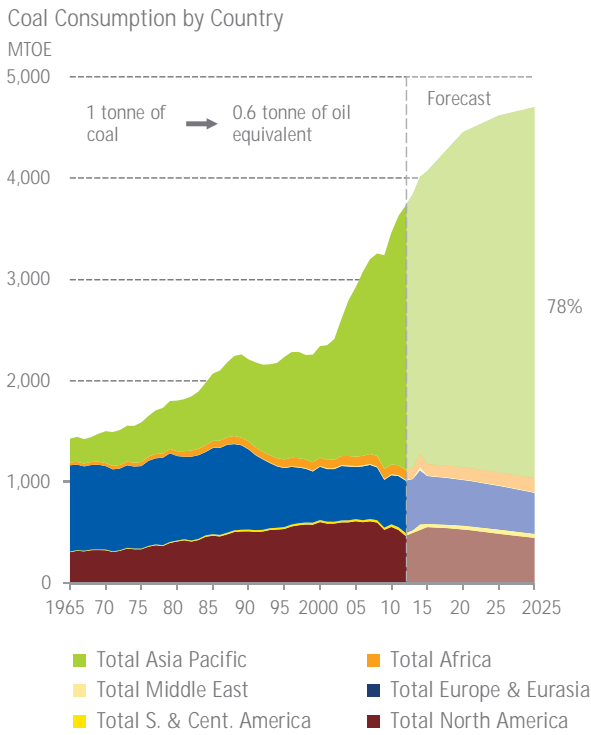
¹⁶Accenture analysis. Data source: BP Statistical Review 2013. Used with permission.

¹⁷Accenture analysis. Data sources: IEA, World Coal Institute, IEA World Energy Outlook, Bloomberg, Thomson Reuters, Deutsche Bank, IHS McCloskey, Wood Mackenzie, AWR Lloyd. Used with permission.

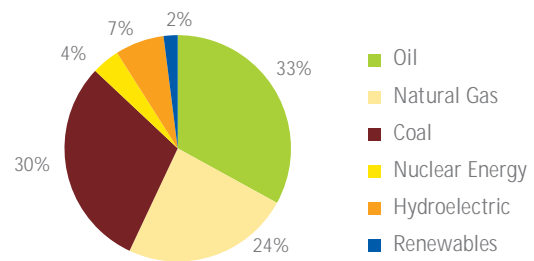
¹⁸Accenture analysis. Data source: BAU projections for Indonesia. Used with permission.

¹⁹Accenture analysis. Data source: IEA. Used with permission.

Figure 2: Coal Consumption by Region and Share of Coal Within Total Primary Energy Sources

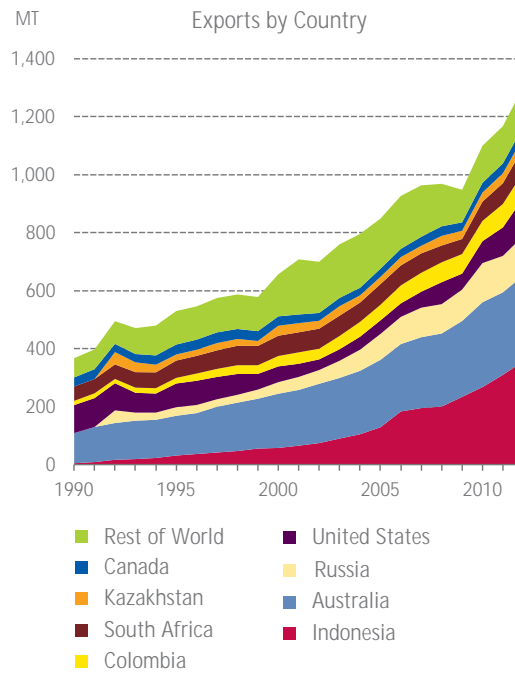
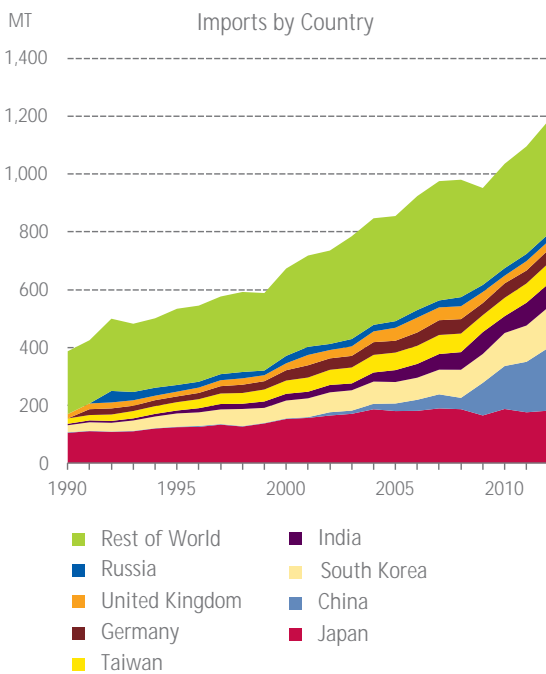


2012 Fuel Composition – (MTOE share)



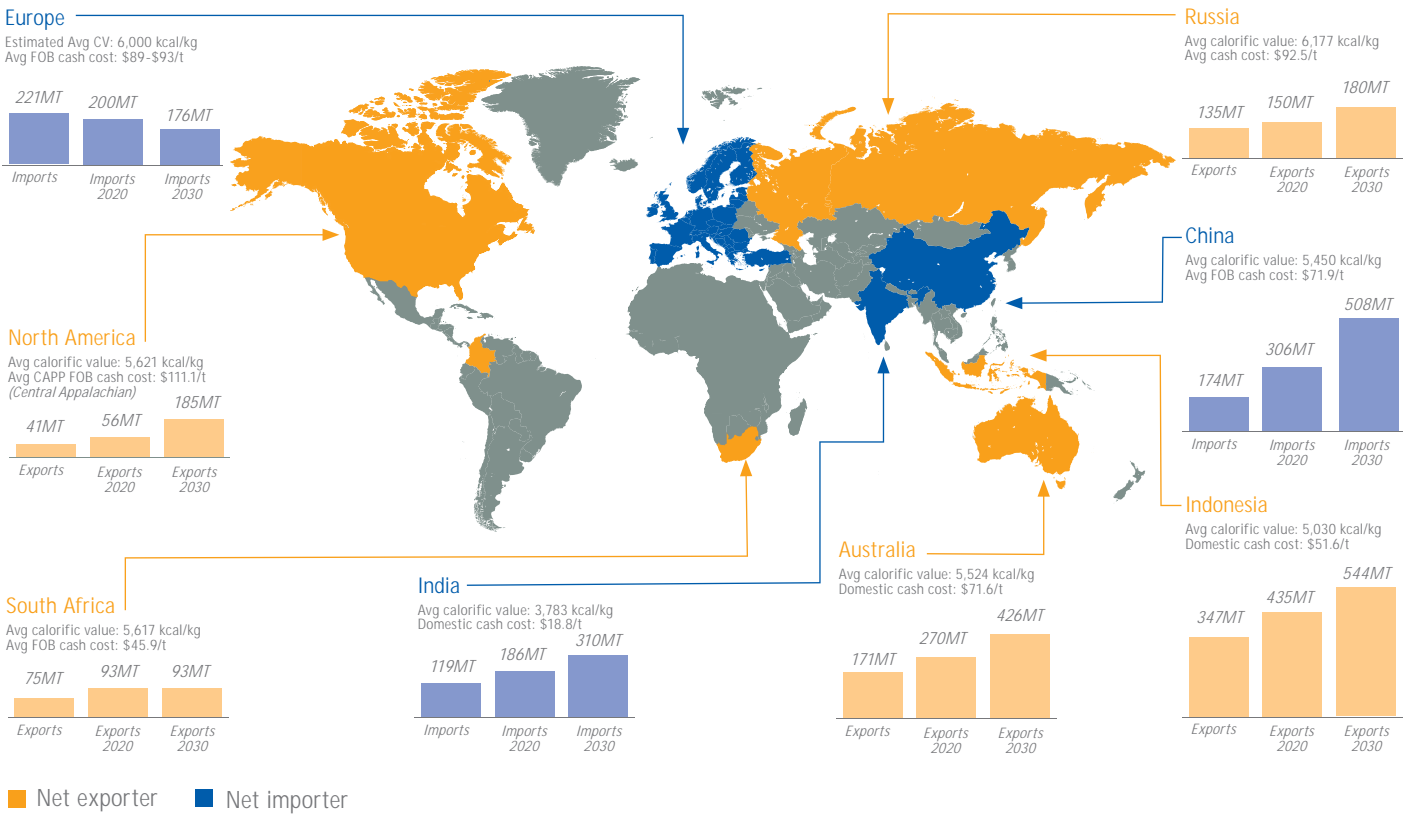
Source: Accenture analysis. Data source: BP Statistical Review 2013. Used with permission.

Figure 3: Imports and Exports by Country of Destination/Origin



Source: Accenture analysis. Data source: IEA - Export/Import differential due to inventories at sea, losses in logistics operations, upgrading, washing and blending operations. Used with permission.

Figure 4: Global Trade in Thermal Coal: Major Exporters, Importers and Market Highlights



Asia	Coal demand is expected to more than double in India and Southeast Asian countries with combined demand by 2035 exceeding that of the OECD as a whole
North America	As US domestic demand falls with natural gas substituting coal feedstock, there is an expectation to increase exports and slow down the decline of the coal production industry
South America	In the next 10 years more than \$12.2 billion is expected to be invested in the Colombian coal industry. This will add an additional 20 million tonnes to Colombian coal production, mostly available for exports
Africa	South Africa throughput growth will be limited due to high production and logistics costs. However, neighbouring countries have an untapped export potential. In Mozambique alone, if expected investment is carried out, capacity will increase from 10MT/pa at present to more than 50MT/pa by the early part of the next decade
Australia	Costs along the supply chain are expected to rise in the coming years, yet IEA projections suggest 25 percent growth of production by 2020, driven by Chinese imports growth mostly. Estimates might be revised down as current capacity rationalization and reduction in capital expenditure impact longer-term projections
Europe	Europe's position as a relatively large coal importer is going to decrease with a focus on clean energy sources. Very few new coal plants have come online in recent years while a number are following a decommissioning process (mostly in Germany). Biomass co-firing, coal upgrading and carbon capture storage offer opportunities to limit reduction in capacity and comply with more stringent environment regulation
CIS	Production is expected to increase slightly to 2020 thereafter, slowing down slightly with a 2010-2035 CAGR of -0.1 percent. Most mines in CIS face low production cost efficiency and have lacked investments over the past 20 years to remain competitive and grow throughput

Looking at the recent historical patterns of seaborne trade in coal shows a more complex picture emerging (see Figure 4). Multisourcing strategies are being developed to create the right calorific mix for specific markets by blending coal from different locations while leveraging new lower cost supplies compared to historical sources. These flows will tend to become more complex as new supplies from the United States are expected to enter the export mix, as the United States increasingly turns to its abundant supply of relatively cleaner and price-competitive natural gas for domestic use and offsets coal oversupply through exports.

Source: Accenture Analysis. Data sources: World Coal Institute, IEA World Energy Outlook, Bloomberg, Thomson Reuters, Deutsche Bank, IHS McCloskey, Wood Mackenzie, AWR Lloyd. Used with permission

Market Supply and Demand Dynamics Summary – Asia Pacific Focus

Demand

While Asia-Pacific Economic Cooperation (APAC) members have signed up to achieving a 45 percent reduction in energy intensity by 2035²⁰, there are other significant pressures that might make realising this target unlikely. Achieving economic growth (and the affordable power this requires) is likely to outweigh other demands. 190 GW of additional generating capacity is expected by 2030 in the region, alongside an accelerating shift towards coal (35 GW of committed coal-fired plants are planned and being developed in ASEAN alone). This is largely the result of increased urbanisation across China, India and Indonesia that translates into higher electrification and energy consumption per capita. Rising levels of GDP and population will also play their part to drive demand, with growth for the region expected to hit 5.7 percent in 2013 and 6 percent in 2014 while 4.6 billion people are expected in the region by 2040, up from 3.8 billion in 2010. And while globally there is pressure to move to cleaner energy sources, it is not expected to make a material difference in Asia Pacific over the next five years as governments focus on achieving higher living standards at an affordable cost.

China's demand growth in thermal coal achieved 7.4 percent per annum over the last decade, but this has dropped to 1.8 percent in the past year.²³ Regulations to limit emissions, increased natural gas and nuclear capacity and a lower target for GDP all serve to dampen demand. In India, the high cost differential between domestic and imported sources is the greatest limiting factor for demand. In addition, poor incentives for power generators to pass-through import costs to power prices also inhibit the development of new generation capacity. However, a recent focus on stimulating Independent Power Producer investments will likely lead to changes in Power Purchase Agreement price structures and further stimulate coal power investments across India. In Indonesia, growing domestic demand is being driven by the government's identification of thermal coal as a strategic power source and the demand for independent power producers to supply the state-owned utility PLN. Finally, Australia's demand is expected to decline in line with emissions targets set by the government, the introduction of the carbon tax as well as the development of a natural gas supply from conventional and coal-seam-gas sources that is exerting downward pressure on prices.

Supply

Asia Pacific mine utilisation rates are likely to decrease in line with an expected addition of 25MT of supply capacity to global seaborne markets in 2013²⁴, prompting concerns about overcapacity. With regional price benchmarks declining considerably from their recent highs in 2012, contracting margins will likely continue to force higher-cost producers to scale back throughput and expansion plans.

On the other hand, a recent push for mine consolidation in top-producing Chinese regions is increasing domestic production cost efficiency and investment in rail transport capacity will expand domestic supply availability to coastal regions. Meanwhile, India's coal production, characterised by

low calorific content, has been a preferred source of supply compared to imports, which are priced higher and do not benefit from domestic subsidy mechanisms. In this context, while only 12 percent of supply originates from imports, local production is expected to maintain its current level unless changes in regulation enable power feedstock costs pass-through.²⁵ Indonesia's increased productivity has significantly outweighed the declining quality of its coal, and production is expected to increase by 180MT over the next decade, driven by a lower relative cost of production.²⁶ Australia, on the other hand will find it harder to compete in international markets from a production marginal cost standpoint – a challenge compounded by the foreign exchange rate against the US dollar.



²⁰PWC-APAC's path to green growth, 2012 APEC CEO Summit, PwC issues spotlight <http://www.pwc.com/us/en/apec-ceo-summit/2012/assets/pwc-apec-2012-green-growth.pdf>

²¹Wood Mackenzie Press Release: Energy, 12th May 2011, "Wood Mackenzie says that Coal, not Gas, will Play the Dominant Role in Power Generation for South East Asia by 2030" <http://www.woodmacresearch.com/cgi-bin/vmprod/portal/corp/corpPressDetail.jsp?oid=2868122>

<http://www.woodmacresearch.com/cgi-bin/vmprod/portal/corp/corpPressDetail.jsp?oid=2868122>

²²Asian Development Bank, <http://www.adb.org/countries/Indonesia/economy>

²³Accenture analysis. Data source: BP Statistical Review 2013, IEA. Used with permission.

²⁴Deutsche Bank Report, "Thermal Coal: Coal at a Crossroads", 9 May 2013

²⁵Accenture analysis. Data source: BP Statistical Review 2013, IEA. Used with permission.

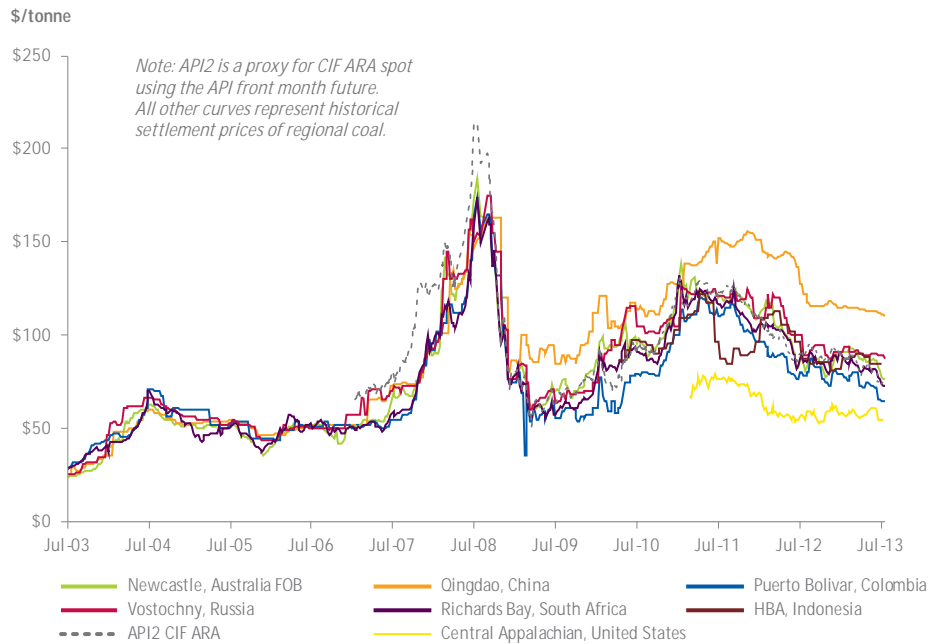
²⁶Accenture analysis. Data source: IEA. Used with permission.

Market Price Dynamics and Opportunities

Historical Price Evolution

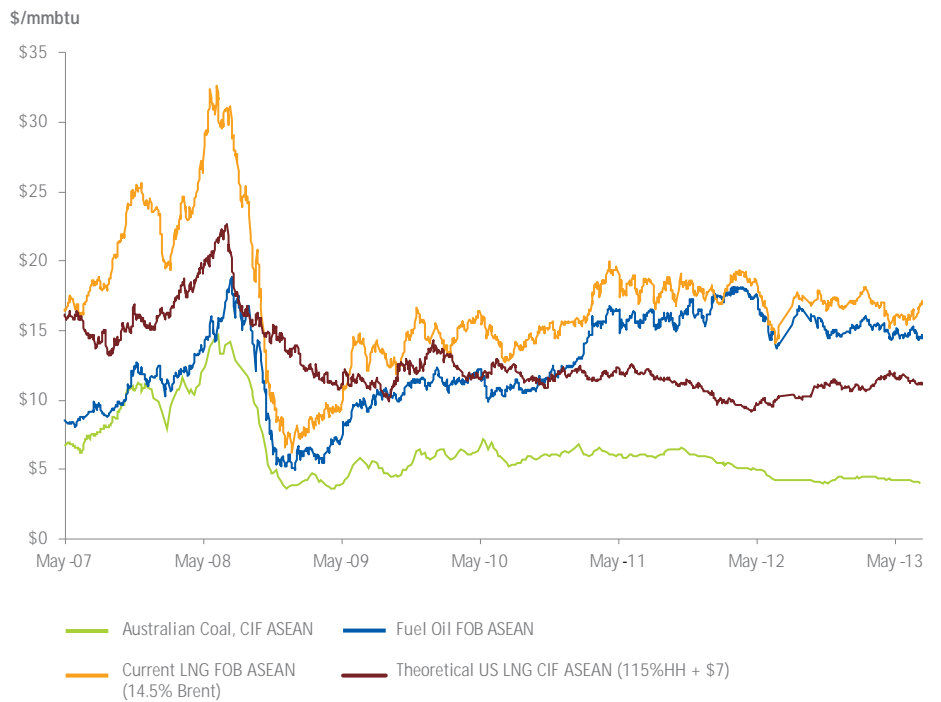
Prices rose considerably over the past decade (Figure 5), peaking in 2008, in line with the commodity super-cycle and China's import expansion. More recently, overcapacity has given rise to downward pressure on prices generally, with regional variations showing through, e.g., Chinese domestic production is relatively expensive while US production is relatively cheap. However, compared to any other feedstock, coal remains extremely competitive in the Asian market. The difference between coal and other fuels on a calorific equivalent basis was narrowing in the run-up to the financial crisis, but have subsequently been reestablished and thermal coal now trades at a considerable discount to other fuel types (Figure 6) – fuel oil prices at 3.5x more expensive than coal and LNG at 3.8x.²⁷

Figure 5: Historical Spot FOB Cash Prices



Source: Accenture analysis. Data source: Thomson Reuters. Used with permission.

Figure 6: Price Comparison of Major Energy Feedstock in ASEAN



- Fuel Oil – based on Singapore Fuel Oil 180 cst
- Coal – based on Newcastle Coal plus freight rates between Newcastle, Australia and Southeast Asia
- LNG – based on 14.5% Brent plus adjusted freight rates between Qatar, Japan and Singapore
- Natural Gas – based on 115% Henry Hub plus freight rate and canal fees

Source: Accenture analysis. Data sources: Bloomberg, Thomson Reuters. Used with permission.

²⁷Accenture analysis. Data sources: Bloomberg, Thomson Reuters. Used with permission.

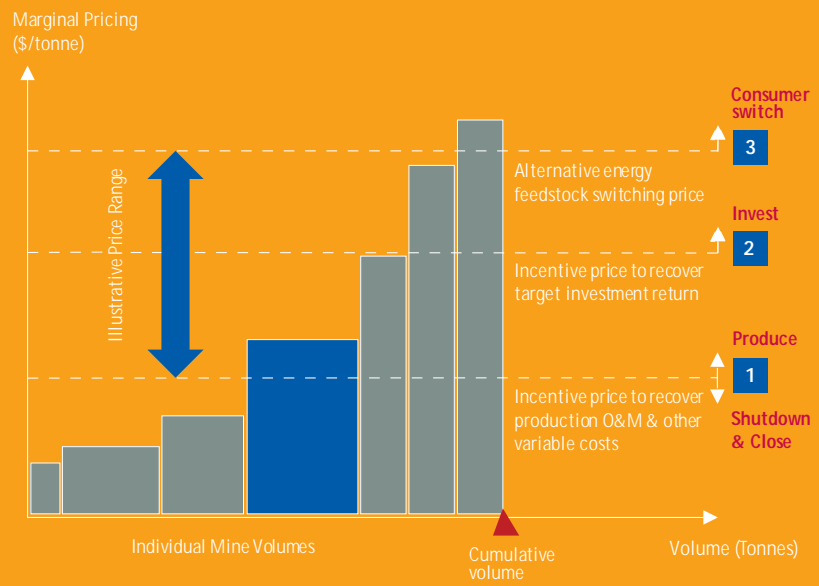
Marginal Cost Pricing

In a market characterised by oversupply, as is the case for coal today, marginal cost is the key driver for pricing. Marginal cost represents the minimum cash amount required to produce an additional tonne of coal. This has two dimensions: short and long run. When calculating the short-run marginal costs, OPEX and Royalties represent the main components of break-even cost decision making. Long-run marginal costs reflect all costs, including CAPEX, SG&A, working capital, debt servicing and other residual costs to arrive to a break-even internal rate of return target.

Given the fact that mines operate at different marginal costs, it is possible to create a cost profile of the cumulative mined volume from the lowest to the highest levels of marginal cost. Figure 7 illustrates the impact of marginal price changes and expected market responses from operators:

1. Short-run production decision – Prices below marginal costs imply producers stop producing, which removes supply from the market and provides a floor to the price.
2. Long-run investment decision – Prices above this level provide an incentive for producers to invest in fixed assets and increase supply.
3. Buyer substitution – Prices above this level provide an incentive to consumers to switch to an alternative energy source and provide a ceiling to the coal price.

Figure 7: Investments and Production Price Decision Framework [Illustrative]



Source: Accenture analysis

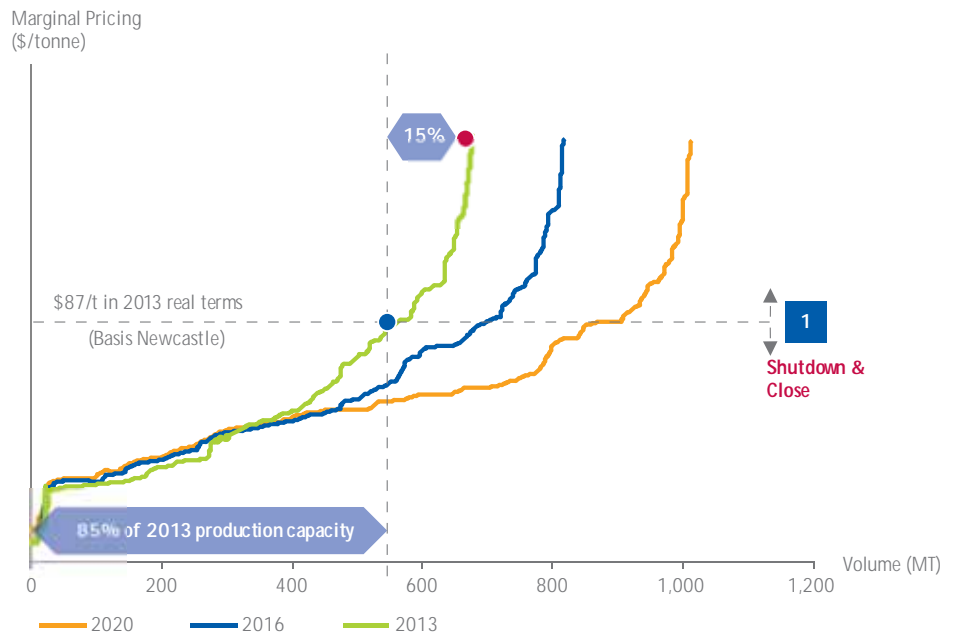


The 85th percentile of the global export marginal cost curve (Figure 8) is expected to provide the capacity floor in the market, with the least economical producers being removed from production. Given the pipeline of investments for additional export capacity, the cost curve is expected to shift to the right between 2013 and 2020. The 85th percentile of Indonesian export producers are profitable at \$63.6/tonne on an energy-adjusted basis²⁸ and as such offer a strong rationale for further investments. Hence production is likely to continue expanding in the next five to seven years. On the other hand, the 85th percentile of Australian export producers are profitable at \$87/tonne²⁹ – clearly current prices are creating a loss-making environment for some producers and justify the decisions for capacity rationalization.

Investment Incentivisation

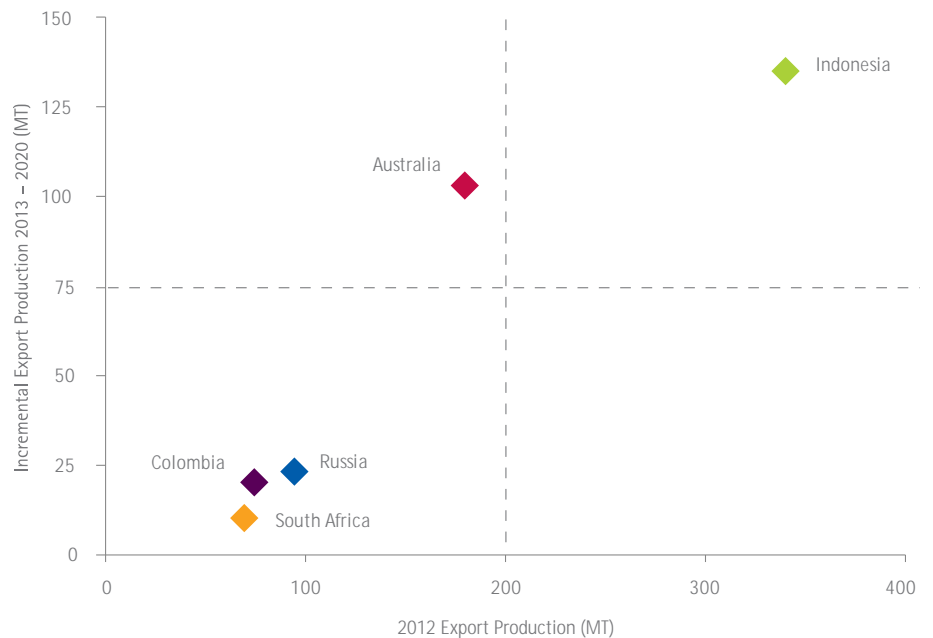
The pipeline of thermal coal incremental export volume production is shown in Figure 9. Indonesia is projected to have the largest absolute growth in exports, adding approximately 140MT by 2020 to its existing 350MT of export production.³⁰ Cost-efficient mining in Indonesia, which is partly offset by lower calorific-value coal yield, is stimulating investment and is the primary factor behind miners' large-scale expansion projects. In Australia, although costs remain high, existing coal assets, logistics infrastructure and experience in the coal industry are driving investments. These investments are more expensive given foreign exchange, inflation and high labour and equipment costs; but NPV discount factors in Australia are expected to be lower by c10 percent when compared to Indonesia.³¹ The current price levels in Australia look set to reduce the incentive to invest given the current high capital intensity and likely diminishing returns from additional investment in the region. Accenture expects that the pipeline of c100MT additional capacity (Figure 9) will probably be revised downward. Planned projects indicate that South Africa, Colombia and Russia will see minor increases in their export volumes.

Figure 8: Global Thermal Coal Export Cash Cost Curve



Source: Accenture analysis. Data source: Deutsche Bank, Wood Mackenzie, AME. Used with permission.

Figure 9: Incremental Export Volumes Production Outlook by Country (2020 Level Minus 2012 Level)



Source: Accenture analysis. Data source: IEA. Used with permission.

²⁷Accenture analysis, Bloomberg, Thomson Reuters

²⁸Accenture analysis. Data sources: Deutsche Bank, Wood Mackenzie, AME. Used with permission.

²⁹Accenture analysis. Data sources: Deutsche Bank, Wood Mackenzie, AME. Used with permission.

³⁰Accenture analysis. Data source: IEA. Used with permission.

³¹Accenture analysis. Data source: IEA. Used with permission.

Market Arbitrage Opportunities and Market Risks

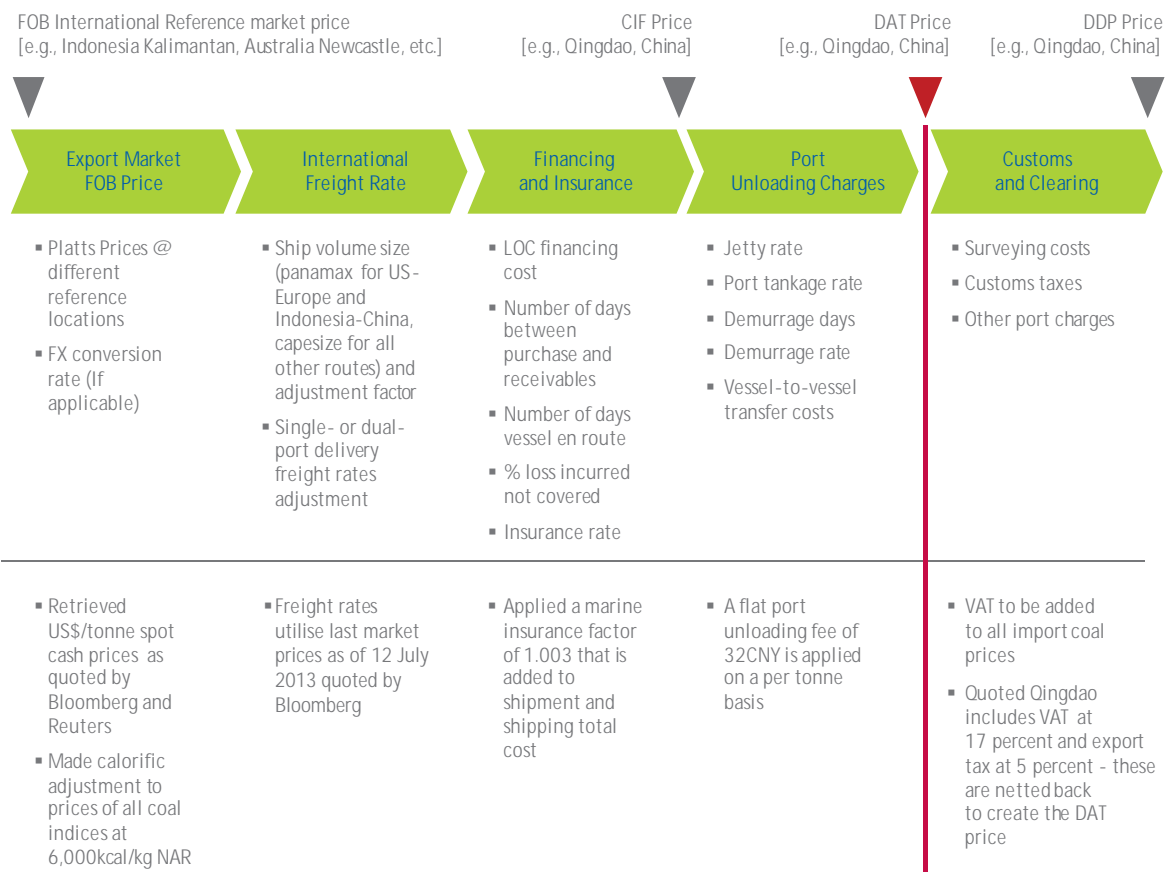
Although current coal prices may imply a reduced appetite from investors in this market, there are a number of potential opportunities for producers to undertake profitable arbitrage within a coal marketplace that is becoming more standardised and liquid. A number of producers have to date focused on the production element of the value chain, sending their coal to marketing intermediaries who in turn deploy sophisticated trading strategies to secure margin from the downstream coal value chain. Those producers who lack trading and marketing capabilities are therefore missing out on the possible gains from short-term

market dynamics and opportunities to capture market arbitrage. More specifically, Southeast Asian producers could benefit from extending their participation in the value chain, with key opportunities arising from upgrading, blending, multisourcing and end-customers' sales diversification. In the next sections, we examine two key areas of arbitrage opportunities: geographic and quality.

Geographic Arbitrage

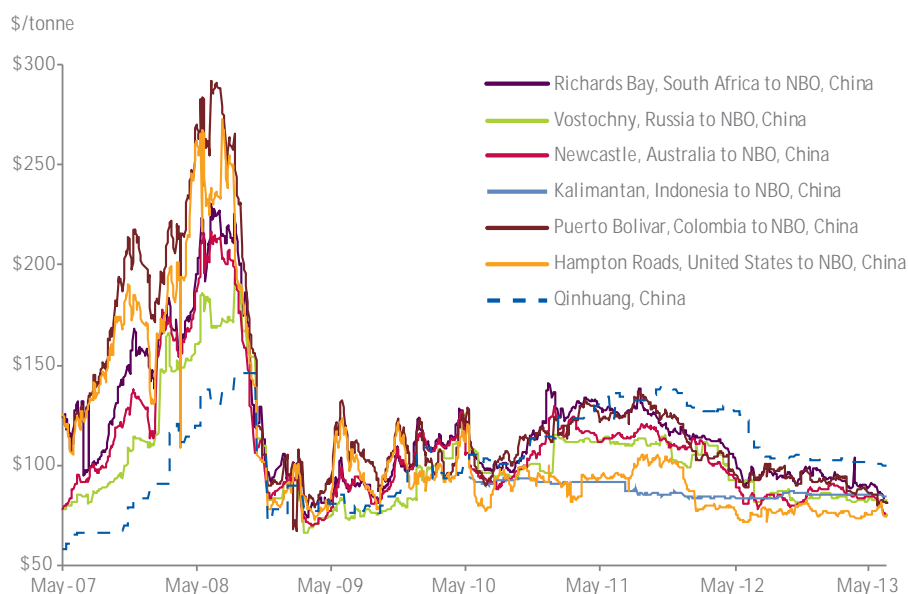
In the analysis set out next, we look at the arbitrage opportunities available in the market for delivering to China, India and Japan using a pricing framework developed by Accenture that is detailed in Figure 10.

Figure 10: Arbitrage Calculation Pricing Methodology



Source: Accenture analysis

Figure 11: Historical DAT Prices and DAT Price Load to Discharge Matrix Comparison



DAT Prices as of 1 July 2013

Differential to Local Price as of 1 July 2013

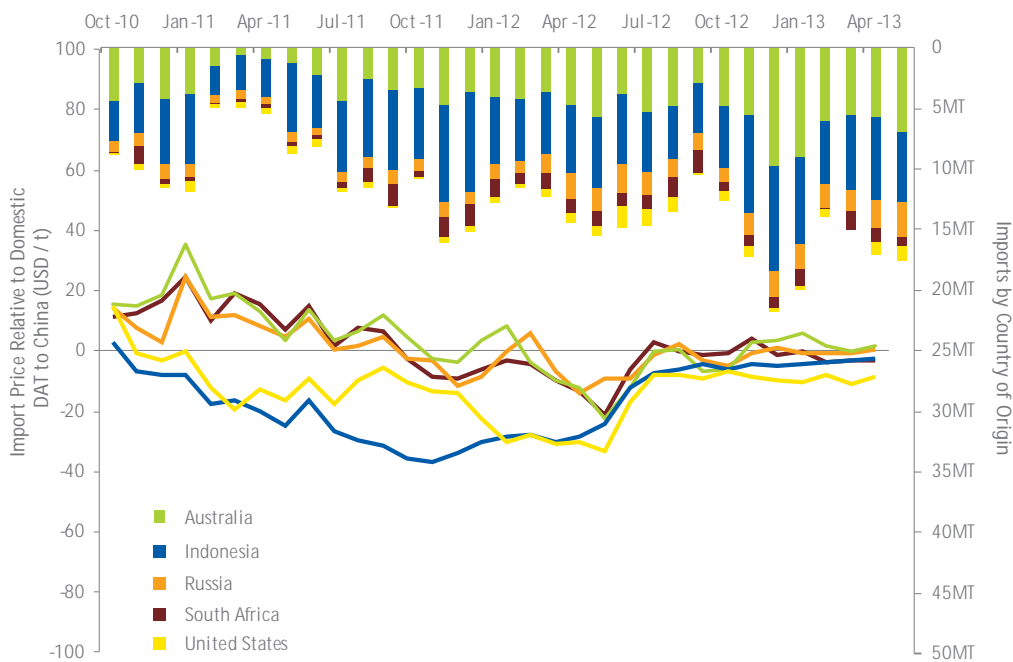
Load Port	Discharge Port		
	Qingdao, China	Mundra, India	ARA, Europe
Kalimantan/Tanjung Barat, Indonesia	\$88.23	\$90.84	\$83.80
Newcastle, Australia	\$88.05	\$94.49	\$84.38
Richards Bay, South Africa	\$88.40	\$84.17	\$84.10
Puerto Bolivar, Colombia	\$91.25	\$75.76	\$90.44
Hampton Roads, United States	\$85.83	\$71.65	-
Vostochny, Russia	\$92.32	\$89.70	\$92.29
Local Market Price	\$94.32	-	\$75.80

Load Port	Discharge Port		
	Qingdao, China	Mundra, India	ARA, Europe
Kalimantan/Tanjung Barat, Indonesia	\$6.09	-	\$-15.04
Newcastle, Australia	\$6.27	-	\$-18.69
Richards Bay, South Africa	\$5.92	-	\$-8.37
Puerto Bolivar, Colombia	\$3.07	-	\$0.04
Hampton Roads, United States	\$8.49	-	\$4.15
Vostochny, Russia	\$2.00	-	\$-13.90

Note: All prices adjusted for energy equivalence to 6,000kcal/kg; Indonesian freight costs were arrived at through scaling AUS freight to 50 percent. Analysis utilised FOB spot prices, market freight rates, insurance and port charges to arrive at DAT price. Chinese figures were adjusted ex-VAT @17 percent and ex-export-tax @5 percent. DAT deltas were calculated utilising domestic thermal coal price for Qinhuang, China. See Figure 10 for more details.

Source: Accenture analysis. Data sources: Bloomberg, Thomson Reuters. Used with permission.

Figure 12: Coal Import Pricing Differential to Chinese Domestic Price and Monthly Imports of Thermal Coal in China by Country of Origin



Source: Accenture analysis. Data sources: Bloomberg, Thomson Reuters. Used with permission.

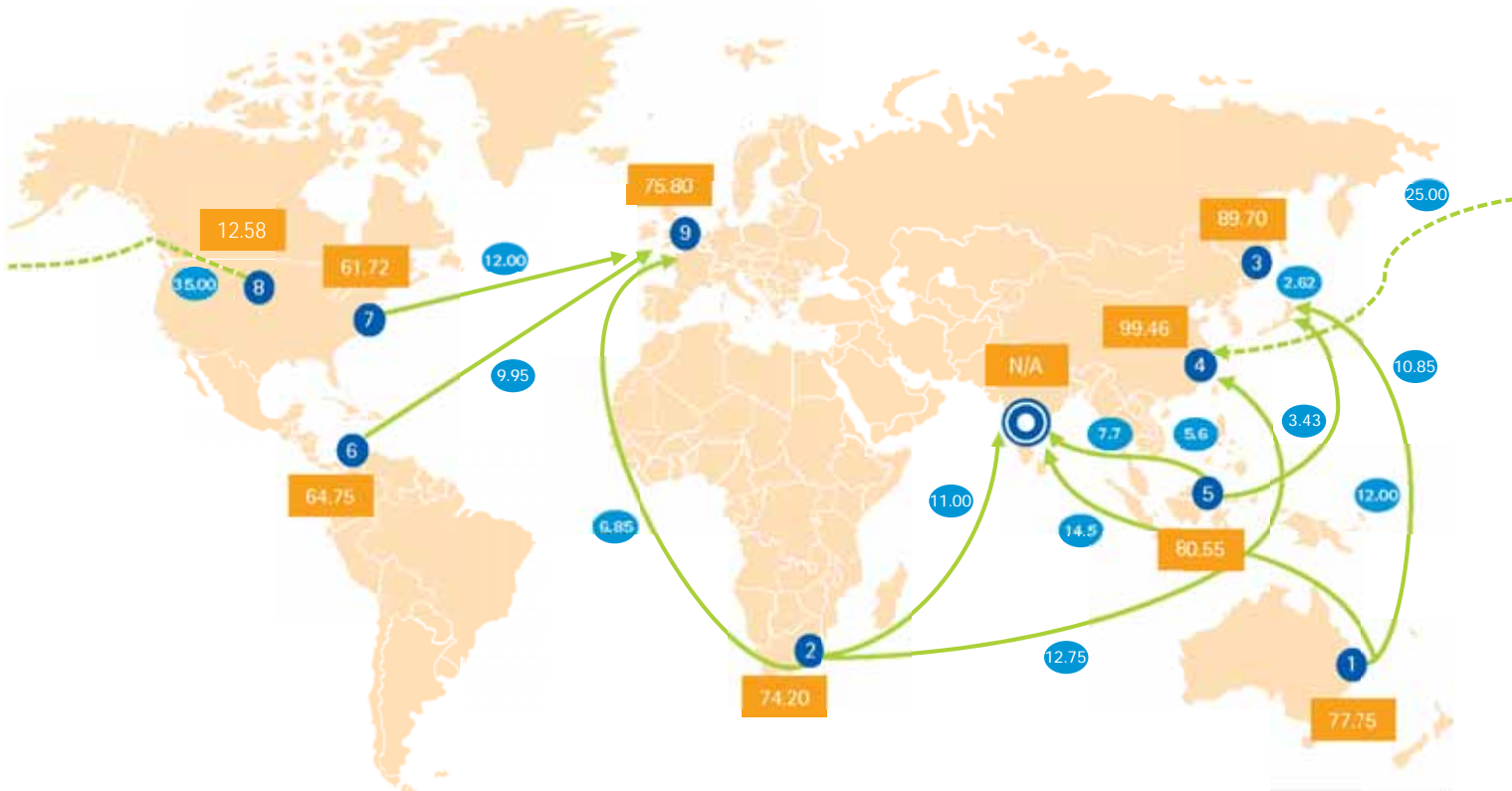


The results presented in Figure 11 show geographic arbitrage opportunities make it more favourable for Chinese users to buy seaborne imports rather than source from local markets whose product needs to be transported to the southern industrial regions from the north. This price arbitrage can explain the decade-long trend towards higher levels of imports into China from zero in 2000 to 175 million tonnes in 2012.³² Questions will arise when domestic producers become more competitive as rail infrastructure from north to south reduces capacity constraints.

As Figure 12 shows, Indonesia had previously supplied the lowest-priced coal relative to other exporting countries although the United States has recently emerged as the cheapest supplier of coal landed in China. However, the United States is expected to face important challenges in achieving greater scale given the limitations of its export infrastructure and logistics limitations from mine to port.

³²Accenture analysis. Data sources: Thomson Reuters, Bloomberg. Used with permission.

Figure 13: Thermal Coal FOB/EXW and Freight Rates (Prices as of 1 July 2013)



Note: Qingdao, China price includes netback adjustment for VAT at 17 percent and export tax at 5 percent; this allows more accurate comparison to the international price level. Prices adjusted for energy equivalence to 6,000kcal/kg.

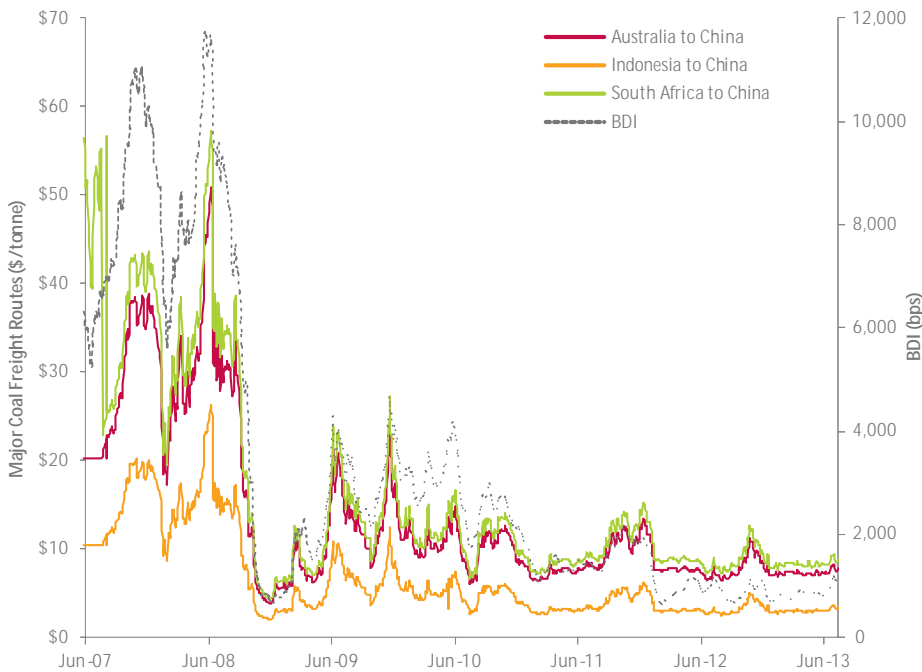
Source: Accenture analysis. Data sources: Bloomberg, Thomson Reuters. Used with permission.

Overall, global trade flows will increasingly be impacted by ongoing price arbitrage between the major price hubs, driven by lower liquidity where long-term contracts are still prevalent, regional regulation and absence of infrastructure to accommodate large-scale capesize vessels or mine-to-terminal logistics assets (Figure 13).

The decline in dry-bulk freight rates has also supported opportunities available to regional arbitrageurs to ship coal from more remote locations and benefit from FOB/CIF location arbitrage. As Figure 14 shows, dry-bulk freight rates have declined significantly from their peak in 2008. Given the weak forecast for shipping fundamentals, namely significant overcapacity, recovery is unlikely until 2015-2016, further supporting the case for more complex, multisource and remote coal trade strategies.



Figure 14: Major Coal Freight Route Pricing and Index

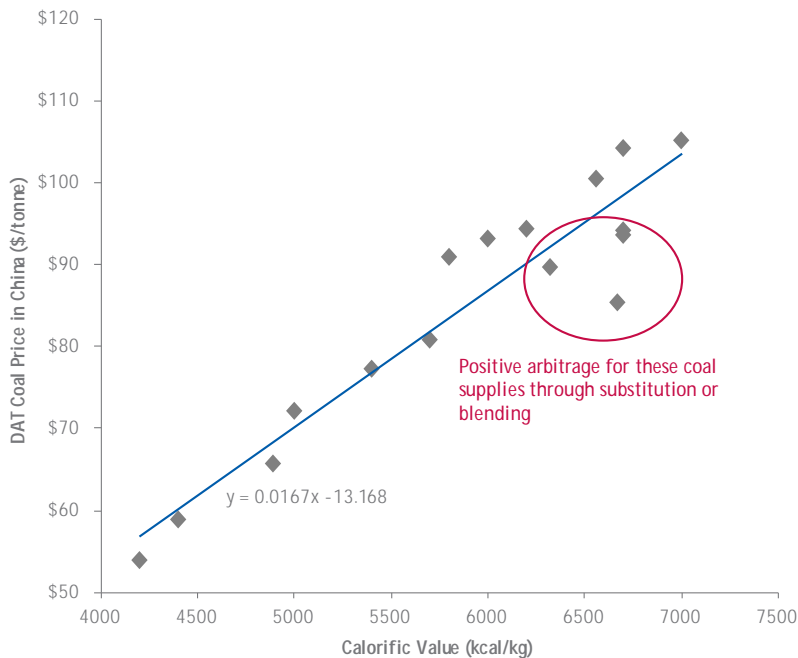


Source: Accenture analysis. Data source: Thomson Reuters. Used with permission.

Quality Arbitrage

When coal prices of varying energy content are location adjusted, pricing differentials indicate that an increase in calorific value by 100kcal/kg will provide a premium of \$1.67 in the marketplace (Figure 15) for China.³³ However, given a number of variables such as local supply and demand in export markets, costs associated with different logistics, other non-Chinese domestic factors and physical properties (e.g., ash and sulphur content), DAT prices for different coal supplies in China are not fully linearly correlated to calorific value. This creates the opportunity for arbitrage of a potential upside of \$10-\$15 per tonne for selected coal supplies through direct substitution, or a smaller share of the potential upside available from blending with other supplies of lower calorific value.³⁴

Figure 15: Coal Price Adjusted for Common Location vs. Energy Content



Note: FOB prices and freight costs were averaged over the prior 12-month period. Netback to China on a DAT pricing basis as the global demand hub provided the central point for equivalent global pricing on a quality basis.

Source: Accenture analysis. Data sources: Bloomberg, Thomson Reuters. Used with permission.

³³Accenture analysis. Data sources: Bloomberg, Thomson Reuters. Used with permission.

³⁴Accenture analysis. Data sources: Thomson Reuters, Bloomberg. Used with permission.

Market Risks

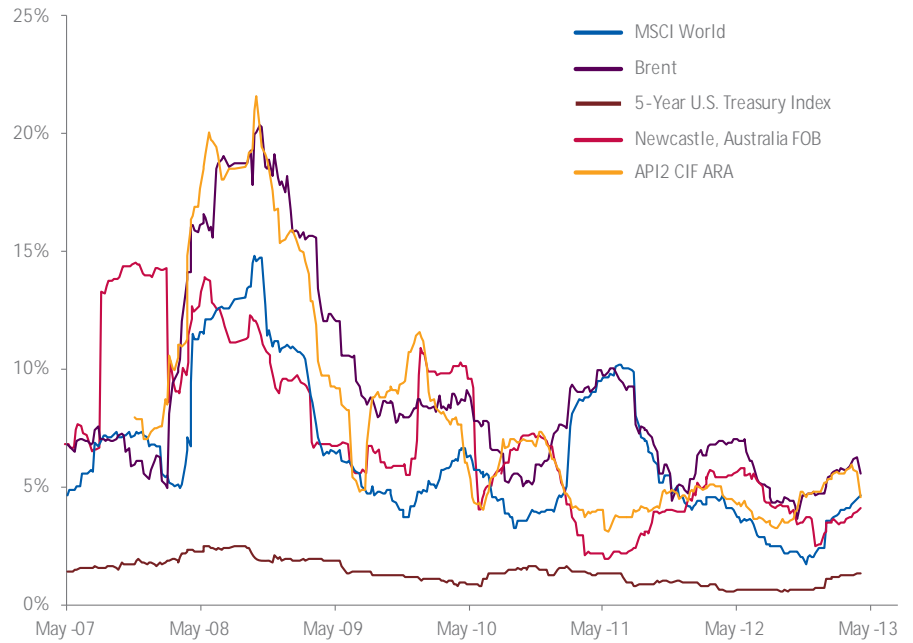
While trading and marketing a share of originated volumes is a potential source of incremental margin for producers who aim to realize arbitrage margins, market price volatility and liquidity risks need to be considered carefully.

Coal price experienced high levels of volatility during 2007-2008, peaking at 20 percent (five-day return volatility from historic 180-day rolling average), and equivalent to an average annual volatility of approximately 100 percent. While the degree of price volatility has been subsequently reduced, annual volatility remains at c30 percent to c35 percent.³⁵ As depicted in Figure 16, CIF ARA has exhibited similar volatility to Brent and global equity markets. Newcastle coal has shown relatively lower volatility over the past six years, largely as a result of relatively stable demand from Japan and China.

Investigating the correlation over time between different coal prices (Figure 17) shows that domestic market developments in China have often led to price developments that are decoupled from other global coal prices; this again supports arbitrage trading opportunities. Such periods of de-correlation are expected to continue in a market where country-specific regulations, long-term contracts, and diversity of coal types will limit price efficiency. However, taking advantage of such opportunities through trading and marketing activities will mean exposure to different market indices, creating spread market risk that will need to be actively managed.

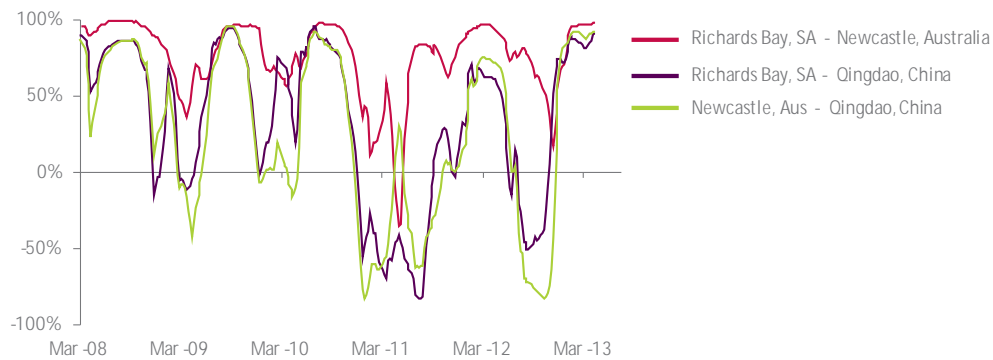
In addition to volatility and pricing dynamics, the relative lack of liquidity in coal compared to other energy markets (Figure 18) creates additional risks that producers moving into trading and marketing will need to manage as volumetric risks could lead to significant losses or high costs by relying on the short-term spot market to fulfil needs.

Figure 16: Coal Volatility Against Global Reference Indices



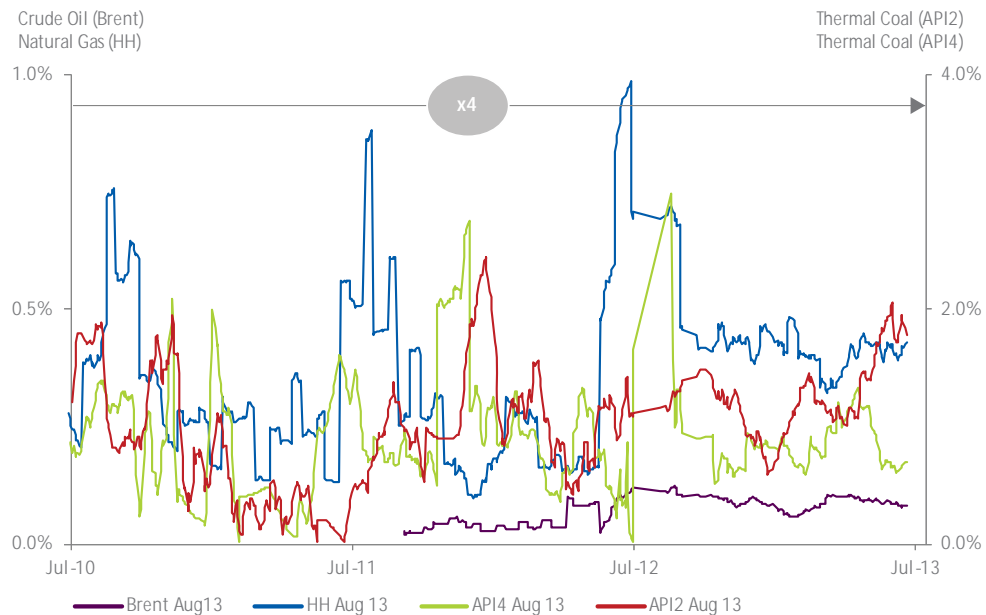
Note: 5-day volatility calculated from a 180-day rolling average
Source: Accenture analysis. Data source: Thomson Reuters. Used with permission.

Figure 17: Regional Coal Prices, 180-day Rolling Correlation Analysis



Source: Accenture analysis. Data source: Thomson Reuters. Used with permission.

Figure 18: Bid-Ask Spread Evolution-Crude Oil (Brent) and Natural Gas (HH) vs. Coal (API2 and API4)



Note: Bid-ask spread represented here as $(P_{Ask} - P_{Bid}) / P_{Ask}$ for the listed Futures contracts
Source: Accenture analysis. Data sources: Bloomberg, Thomson Reuters. Used with permission.

³⁵Accenture analysis. Data source: Thomson Reuters. Used with permission.



Expanding Into Trading, Marketing and Logistics

In order to seize the arbitrage opportunities identified and drive incremental margin, Accenture identified two major operating capabilities development areas that Asia Pacific coal miners should consider:

1. Expanding into trading and marketing activities
2. Development of end-to-end logistics capabilities

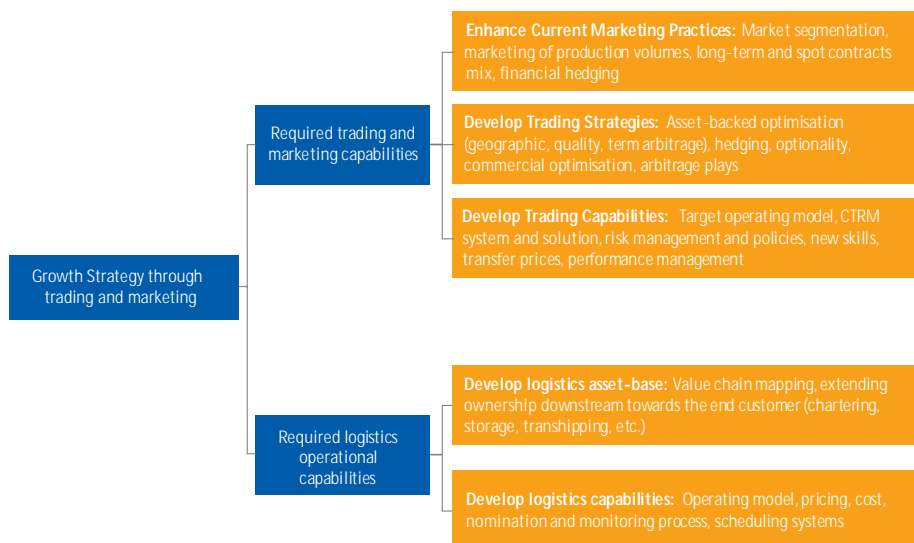
In the following section, we examine those two capability development areas.

Trading and Marketing

Asia Pacific coal producers' traditional marketing activities have been mainly limited to relationship-based interaction with intermediaries through FOB sales and in limited cases to end-customers through CIF sales. However, trading creates the opportunity to achieve higher margins across the end-to-end value chain through commercial optimisation. To understand the value of an asset-backed trading strategy, we can consider what happened in the Japanese energy markets following the earthquake and tsunami in 2011. In the wake of the nuclear shutdown, Asian coal prices rose significantly. Miners who had previously locked in to long-term supply agreements without the ability to sell coal on a delivered basis were unable to capitalise on the increased demand from Japan while traders realised an important arbitrage upside.

As depicted in Figure 20, there are a number of different trading strategies that players can aim to exploit and develop through trading and marketing capabilities.

Figure 19: Selected Capabilities Development for Asia Pacific Coal Producers



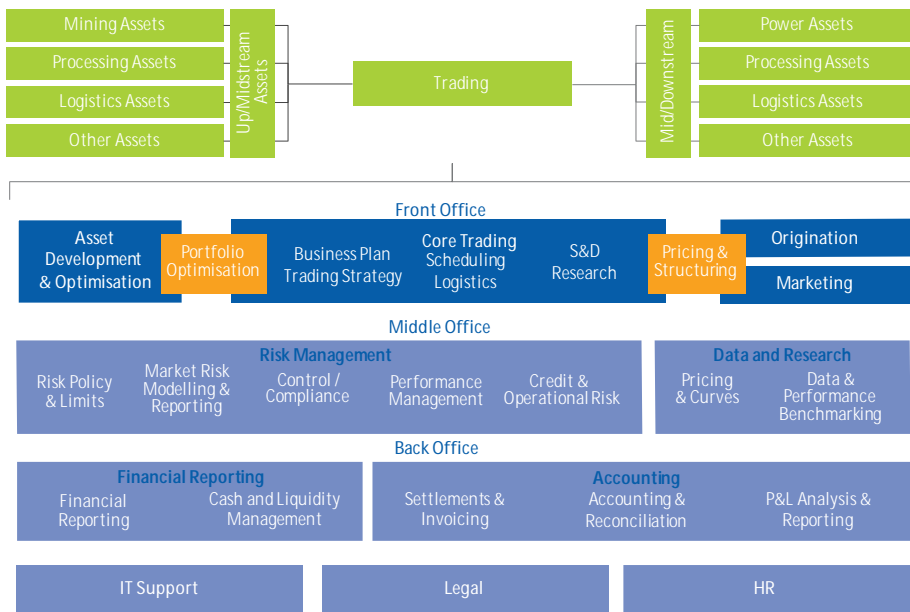
Source: Accenture analysis

Figure 20: Possible Trading Strategies

<p>Name: Quality Arbitrage</p> <p>Description: Combining different quality coal to take advantage of nonlinear pricing of quality in the market.</p> <p>Sub-strategies:</p> <ul style="list-style-type: none"> • Blending at load port • Blending at discharge port • Blending equity coal/third-party coal only/ equity and third-party mix • Substitution <p>Value Enablers: Nonlinearity in quality premiums</p>	<p>Name: Directional Trading</p> <p>Description: Taking a directional view in the market to mitigate long coal price exposure or to lower the price risk of the equity coal position.</p> <p>Sub-strategies:</p> <ul style="list-style-type: none"> • Selling futures (x percent of future production/term horizons) • Rolling short coverage • Buy a put option • Enter a swap floating to fix price <p>Key Assumptions: Trader ability, volatility, trending markets</p>
<p>Name: Geographic Arbitrage</p> <p>Description: Direct targeting and shipment to customers who are supply constrained relative to the rest of the market.</p> <p>Sub-strategies:</p> <ul style="list-style-type: none"> • Interregional price differentials • Inter-country price differentials • Intra-country price differentials <p>Value Enablers: Delivered price to customer, pricing power and margin capture</p>	<p>Name: Spread Trading</p> <p>Description: Relative trading between offsetting positions that are not anticipated to move in parallel with one another.</p> <p>Sub-strategies:</p> <ul style="list-style-type: none"> • Term spreads/calendar spread • Index spreads (location variation/quality variation/exchange variation) • Physical and financial spread <p>Key Assumptions: Volatility, trader ability, capital, leverage, risk lines available</p>
<p>Name: Term Arbitrage (Cash & Carry)</p> <p>Description: For a market in contango money can be made if cost of carry is less than the premium built into the curve term structure</p> <p>Sub-strategies:</p> <ul style="list-style-type: none"> • Sell forward and store covering volumes • Sell forward no storage (use future mine production to fulfil) <p>Value Enablers: Curve premium, cost of carry (working capital, storage, operational risk)</p>	<p>Name: Spot Trading</p> <p>Description: Purchasing physical coal on the global market in order to exploit supply constraints and surpluses.</p> <p>Sub-strategies:</p> <ul style="list-style-type: none"> • Short-term, third-party volumes • Organise freight from supply-constrained sites • Distressed cargo • Buying physical spot to store <p>Key Assumptions: Volatility, trader ability, capital, leverage, risk lines available</p>

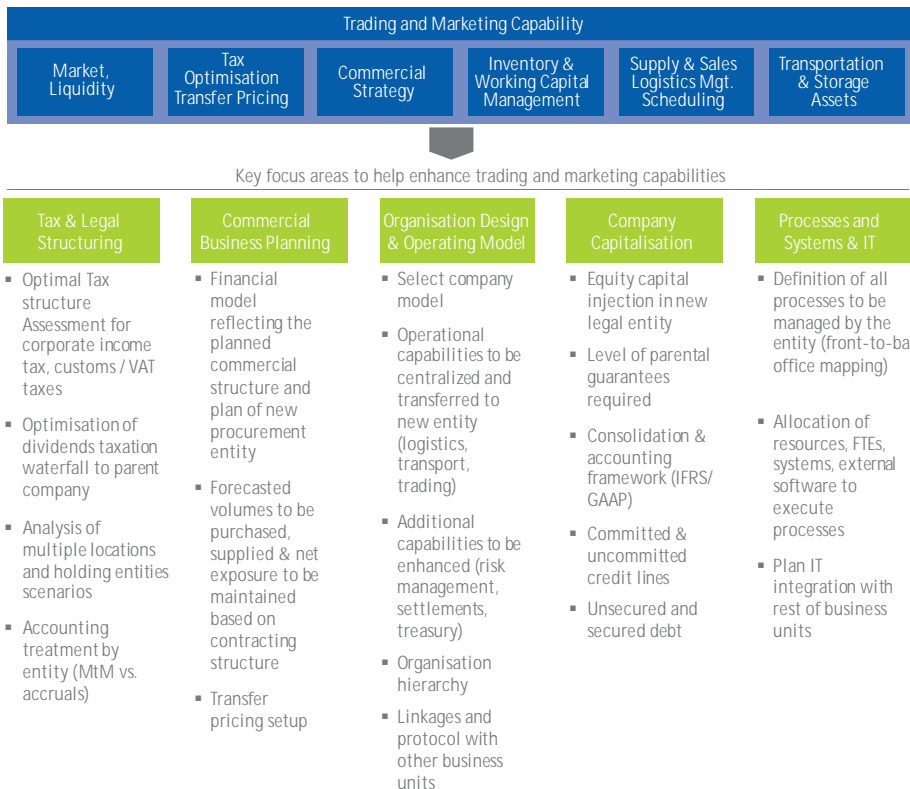
Source: Accenture analysis

Figure 21: Trading-Centric Operating Model and Selected Core Operating Capabilities of Trading Functions



Source: Accenture analysis

Figure 22: Key Activities Required for the Development of New Trading and Marketing Capabilities



Source: Accenture analysis

Achieving those trading strategies may depend in part on the development of a new operating model (Figure 21) with critical capabilities required from contract structuring and pricing through to support functions.

A lean operating model for a core trading function can require a strong framework in which integrated front, middle and back office work closely together. The asset development team could look to focus on optimising production while also providing traders with as much foresight and optionality as possible in order for them to extract a trading margin. Equally, in order to capture delivered economics, the trading function would need to be able to operate the logistics chain efficiently and also help protect the trading margin. Supply and demand research is a vital factor in coal trading where the market responds strongly to changes in fundamentals. Finally, a strong commitment to origination and marketing is important in order to realise market opportunities: Without a strong supplier and/or customer base, market opportunities remain theoretical with reliance on pure directional trading leading to very limited margins. Middle office, specifically risk management, is a critical component and would need to be independent from the front office in order to function effectively. Back-office operations would need to be efficient and knowledgeable to handle tasks such as trade confirmations, settlements, invoicing and broker reconciliations.

Developing such new capabilities may require important transformation activities targeting corporate structuring, commercial planning, organisation design, capitalisation and systems that need to be carefully planned, as shown in Figure 22.

Logistics

Being able to execute advanced marketing and trading strategies depends on the flexibility and control coal players can have on their logistics operations. Relying on third-party logistics assets can prove to be difficult in certain segments of the value chain, as is the case for example of pit-to-terminal logistics, while more manageable for other segments, for example chartering. As a result, optimising the logistics portfolio through a mix of owned and contracted-capacity assets can be key to managing costs and promoting sufficient flexibility for executing trading strategies. However, it may not be necessary to fully own all assets. Capacity off-take or tolling contracts can be combined with minority or zero-equity contributions to secure the required segments of logistics operations and therefore limit capital injections.

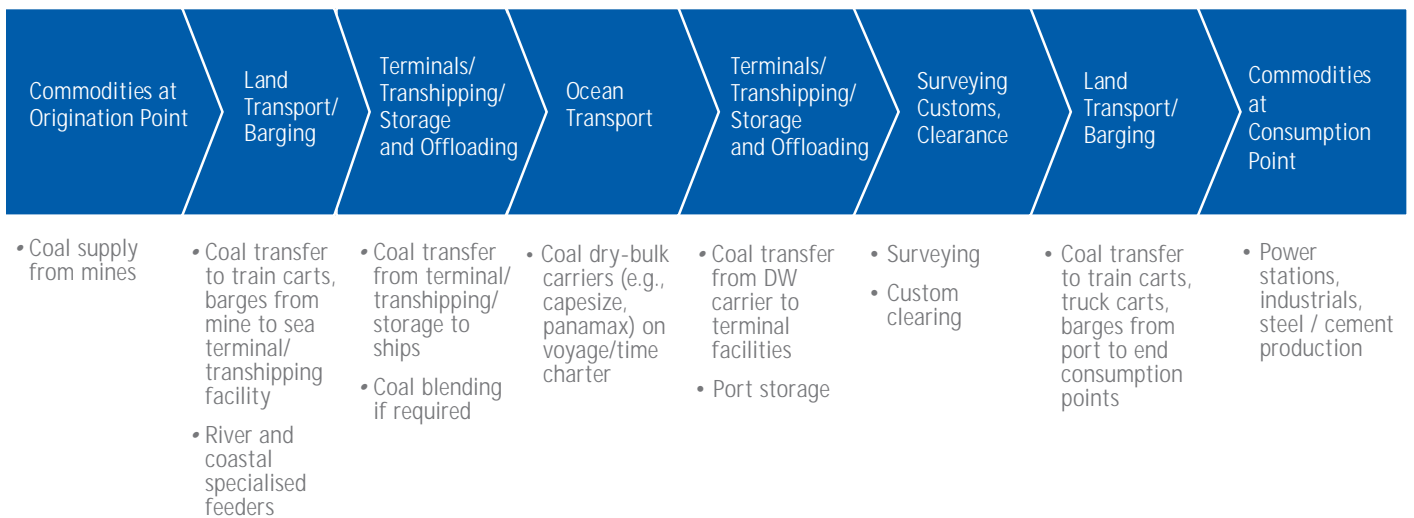
Coal players aiming to capture marketing and trading opportunities may therefore need to consider expanding their reach into offshore transshipment facilities, chartering, storage, blending and other logistics assets that can enable more complex trade strategies to be executed and supported by the end-to-end logistics value chain (Figure 23).

As well as providing support for marketing and trading, developing new logistics capabilities can offer opportunities for diversification from pure coal plays and create the possibility of new revenue streams such as by offering logistics services to third parties. Such a model can offer the opportunity to increase the utilisation rate of logistics assets, ensure they are operated in a cost-optimal configuration and support higher return on capital employed. Figure 24 highlights opportunities for coal players to expand their logistics operations into standalone

business activities that they can grow in their operating market, in new geographies, in new assets, in new commodities or new value-added services.

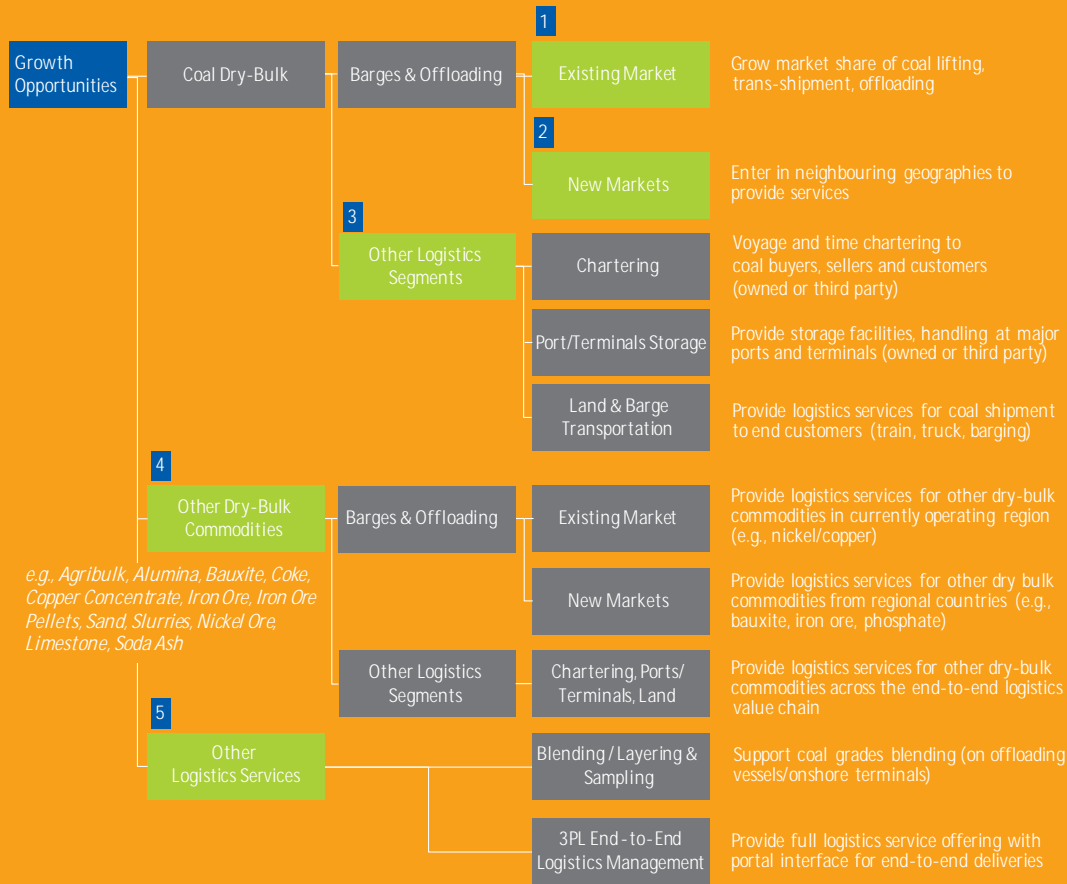
However, here again, the development of logistics can depend on the development of a new lean and efficient operating model supported with critical capabilities to manage such operations as scheduling, assets maintenance, bunkering, integration with commodities flow forecasts and others.

Figure 23: Logistics Value Chain for Thermal Coal from Pit to End-customer



Source: Accenture analysis

Figure 24: Logistics Growth Opportunities for Coal Producers



Source: Accenture analysis



Conclusion and Recommendations

Despite short- to medium-term oversupply creating a downward pressure on prices, Accenture estimates the market to be close to a price floor for thermal coal. With 85th percentile marginal cost prices of Australian export producers at \$87/tonne³⁶ and Indonesian producers at \$63.6/tonne³⁷, any market prices below these levels for sustained periods would lead to supply-side rationalisation and a consequent increase in coal price. As we expect demand for coal in Asia to be resilient, mainly owing to demand for a low-cost energy supply, our medium- to long-term coal price outlook is positive.

However, the current price environment is limiting thermal coal producers' margins. In response they should consider new sources of margin growth other than capacity expansion to help enhance return on capital and reduce earnings volatility. For mining companies to remain competitive, we see an important opportunity for them to expand their operations into trading, marketing and logistics in order to seize upside from market arbitrage. Today, multiple trade strategies exist by blending lower and higher calorific-value coal and selling the mix in end markets, or by changing sourcing patterns by buying

coal in slightly more depressed markets, such as the United States, and redirecting exports to higher-value markets, such as China. Accenture's analysis suggests that in current market conditions, blending can increase margins achieved on end-prices by upwards of 5 percent to 15 percent, while location arbitrage can lead to a 10 percent to 15 percent increase in margins.³⁸

For Asian Pacific coal companies, who have traditionally remained focused on upstream, this is a significant opportunity. Moreover, in specific countries such as Indonesia, the government is actively encouraging producers to shift from selling production offshore Indonesia (FOB) to selling directly to end markets (CIF).

But this type of expansion strategy will likely require an upfront investment at a time when coal mining revenues have contracted. Expanding into trading could require companies to hold more risk capital, while expanding into logistics will require asset purchases, such as storage and blending facilities, offshore terminals and chartering. This expansion into the downstream value chain can rapidly become a cost-intensive

business depending on the asset ownership structure and operational processes. A number of Asian Pacific miners could support these investments by tapping into their liquid assets, which are standing at relatively healthy levels compared to their global peers, or by diverting capital expenditure from planned mine expansions.

Those miners that can take early advantage of this expansion strategy may have an opportunity to enhance their long-term growth and reduce earnings volatility. Now is the time for Asian Pacific coal players to seize this opportunity.

³⁶Accenture analysis. Data sources: Deutsche Bank, Wood Mackenzie, AME. Used with permission.

³⁷Accenture analysis. Data sources: Deutsche Bank, Wood Mackenzie, AME. Used with permission.

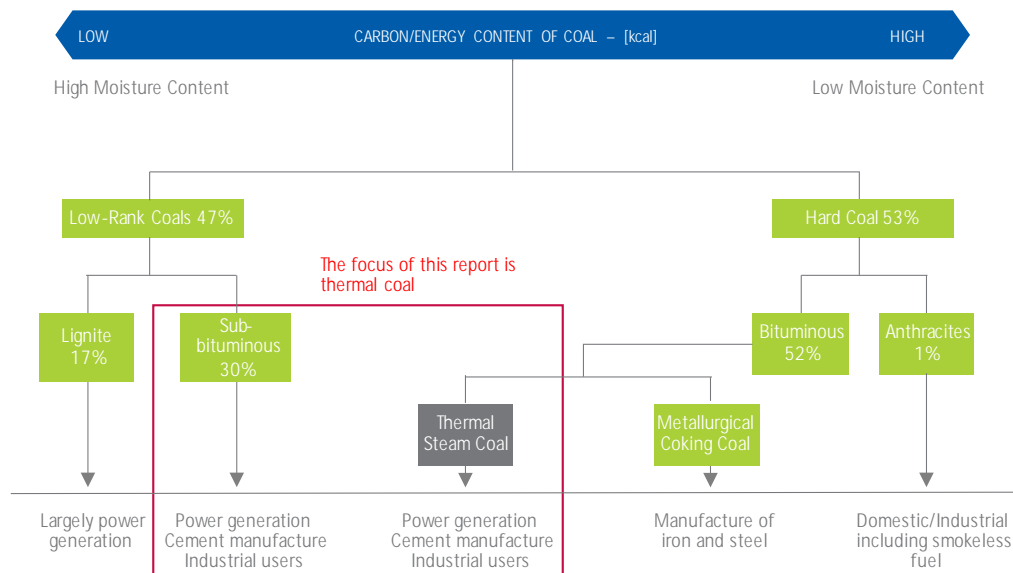
³⁸Accenture analysis. Data sources: Thomson Reuters, Bloomberg. Used with permission.

Appendix

Coal – Global Production Split

Figure 25 is a schematic that depicts the split of global coal production by type. The focus of this graphic is on bituminous coal – specifically thermal coal - used as a source of feedstock for power generation.

Figure 25: Coal Types (%) - Indicative of Global Production and Report Scope



Source: Accenture analysis. Data source: World Coal Institute. Used with permission.

Coal Indices

The following list of indices was used in the arbitrage analysis of thermal coal.

Figure 26: Coal Indices and Characteristics

Ref No:	Index	Port of Trade	Calorific Values	Ash (%)	Sulphur (%)	Incoterm
1 Newcastle	IHS McCloskey	Newcastle, Australia	6,000 kcal/kg NAR	1%	N/A	FOB
2 Richards Bay	IHS McCloskey	Richards Bay, South Africa	6,000 kcal/kg NAR	1%	18%	FOB
3 Vostochny	IHS McCloskey	Vostochny, Russia	6,000 kcal/kg NAR	N/A	N/A	FOB
4 Qingdao	IHS McCloskey	Qingdao, China	5,800 kcal/kg NAR	1%	N/A	FOB
5 HBA	IHS McCloskey	Kalimantan, Indonesia	6,322 kcal/kg NAR	0.4%	N/A	FOB
6 Puerto Bolivar	IHS McCloskey	Puerto Bolivar, Colombia	5,750 kcal/kg NAR	N/A	N/A	FOB
7 Central Appalachian	IHS McCloskey	Hampton Roads, United States	6,000 kcal/kg NAR	N/A	N/A	FOB
8 Powder River Basin	IHS McCloskey	Hampton Roads, United States	6,000 kcal/kg NAR	N/A	N/A	EXW
9 AP12 ARA	Argus/McCloskey Price Index	Rotterdam, Netherlands	6,000 kcal/kg NAR	N/A	10%	CIF

Source: Accenture analysis. Data source: Thomson Reuters, IHS McCloskey. Used with permission.

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