Commodity Insights

Final Report

# Market Demand Study: Australian Export Thermal Coal

## Minerals Council of Australia

13 June, 2018

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# 1. Executive Summary

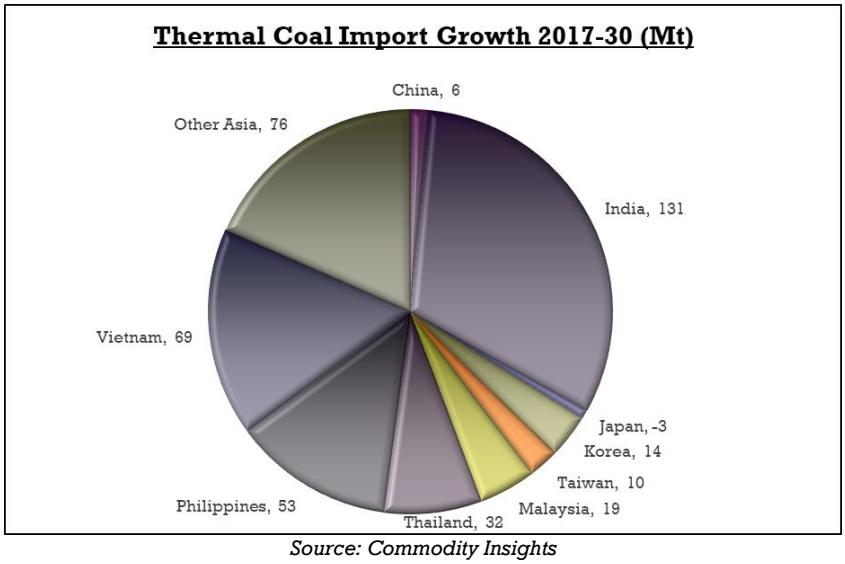
Australia is the world's fifth largest producer of black coal, producing over 430Mt in 2017, behind only China, India, the USA and Indonesia. Most of Australia's production, around 370Mt, is exported on the seaborne market, of which 200Mt was thermal coal in 2017. Australian thermal coal exports have grown from 112Mt in 2007 to 200Mt, in response to strong demand growth in Asia and higher coal prices. Japan is by far the major destination for Australian thermal coal, but China is a rapidly growing market while Korea and Taiwan are also important destinations.

Australia's major competitors in the Asian seaborne thermal coal market are Indonesia and South Africa. Indonesia is the world's largest exporter of thermal coal and exported nearly 400Mt in 2017. Its unique river system enables Indonesia to bring supply to the seaborne market very quickly and relatively cheaply. However, Indonesian coal is of lower quality than Australian thermal coal and is also more susceptible to price fluctuations due to lower margins. South Africa has taken a strong market share in the western Asian markets of India and Pakistan but has struggled to gain a foothold in the north Asian and southeast Asian markets due to a freight differential and strong competition from Indonesia and Australia.

The seaborne thermal coal market is highly competitive, with exporters competing against each other as well as domestic production in many countries. Despite this, Australian thermal coal is still highly desired in the seaborne market. This is driven by many factors, including the generally higher quality of Australian thermal coal (higher energy and lower impurities), power plant design dependency on Australian thermal coal in north Asia, end-user mine and infrastructure equity agreements, take or pay contracts which provide supply stability and visibility, and strong stability in the historically important markets of Japan, Korea and Taiwan.

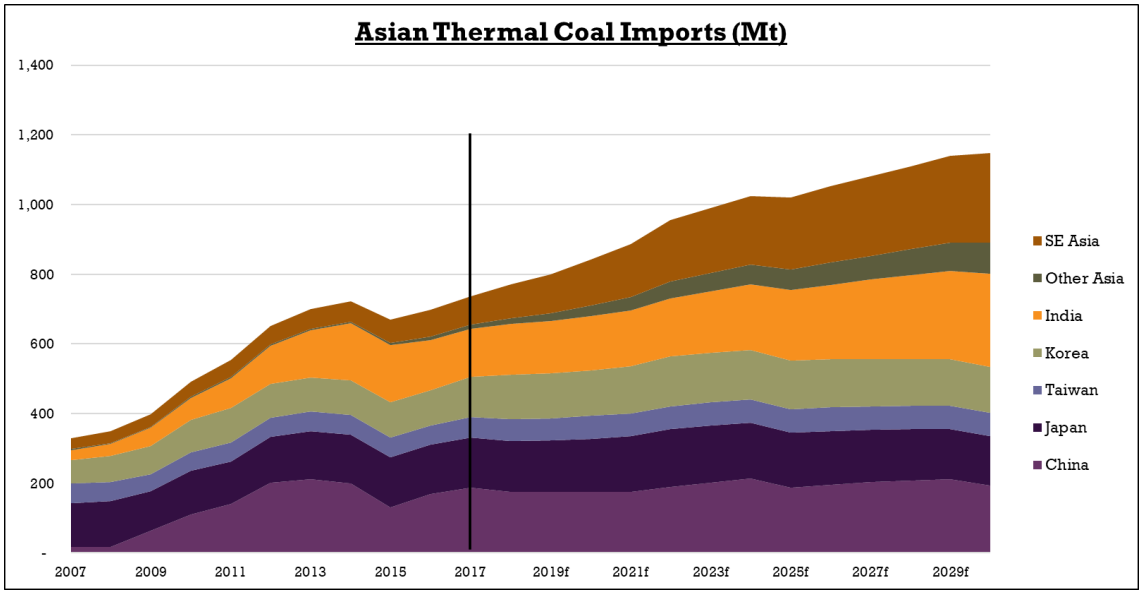
Commodity Insights has forecast thermal coal import demand from 2018-30. The short-term forecast was based on known additions of coal-fired power capacity across the region, less any growth in domestic coal production where applicable. Longer-term, population growth forecasts and electricity consumption patterns were used to forecast overall power demand, against which coal's share was estimated using official government policy documents for each country.

Asian thermal coal import demand is expected to grow over 400Mt over the period, from 740Mt in 2017 to 1147Mt in 2030. The demand growth is broad-based (see below), with all countries except Japan increasing imports across the period, and not dependent on China.




*Source: Commodity Insights*

This growth profile is not inconsistent with historical growth patterns, with the forecast import growth rate 2018-30 is less than the rate between 2007-17 (see chart below), but the growth is more evenly spread across the region and not so reliant on China.




*Source: Commodity Insights.*

Drivers of this growth include the following:

- Policy direction is moving away from nuclear power in north Asia (Japan, Korea and Taiwan) following the Fukushima incident in 2011.
- Strong electricity demand growth in southeast Asia and India driven by industrialisation and urbanisation.
- Solid or strong population growth across most regions, except for north Asia.
- A move to increase coal's share in the power generation mix in large parts of southeast Asia, to diversify away from gas or hydro.
- Indian imports will also increase as we expect domestic production will not be able to keep pace with demand growth, especially for coal-fired power plants built away from the domestic production centres.

Aside from this demand growth, the supply of thermal coal may also tighten due to Indonesia (like many of its southeast Asian neighbours) commissioning a significant volume of new coal-fired capacity over the next decade, which will divert potentially large volumes (possibly over 160Mt) from the export market to domestic use in Indonesia. Our view is that the market is overestimating the ability of Indonesia to keep supplying the thermal coal seaborne market with large volumes.

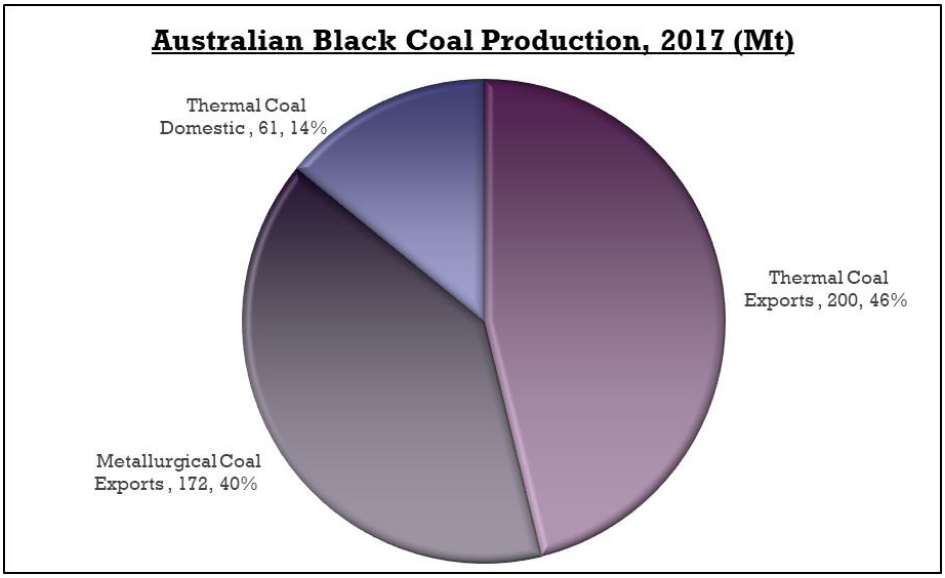
This strong Asian demand growth profile of around 400Mt potentially presents significant opportunities for Australian exporters, particularly if Indonesian exports decline or slow over the forecast period. Australian coal is ideally placed, in terms of coal quality, proximity to market, infrastructure availability and supplier reliability, to share in this Asian demand growth to 2030 and possibly beyond. However, given the competition from other suppliers, Australia will need to add or expand mines and infrastructure, particularly rail, in a timely fashion to support this growth.

## 2. Australian Thermal Coal Supply

In 2017, Australia produced 433Mt saleable black coal (source: ABS) making it the 5th largest producer of coal globally, behind China, India, the USA and Indonesia. Almost all this black coal (420Mt) was produced in the states of Queensland and New South Wales, with some minor volumes in Western Australia. Australia's black coal production has three key markets:

- Metallurgical coal that is exported for use in steel production.
- Thermal coal that is exported for use in power generation (generally in Asia).
- Thermal coal that is used domestically for power generation.

In 2017, the approximate split of black coal production by these categories was:

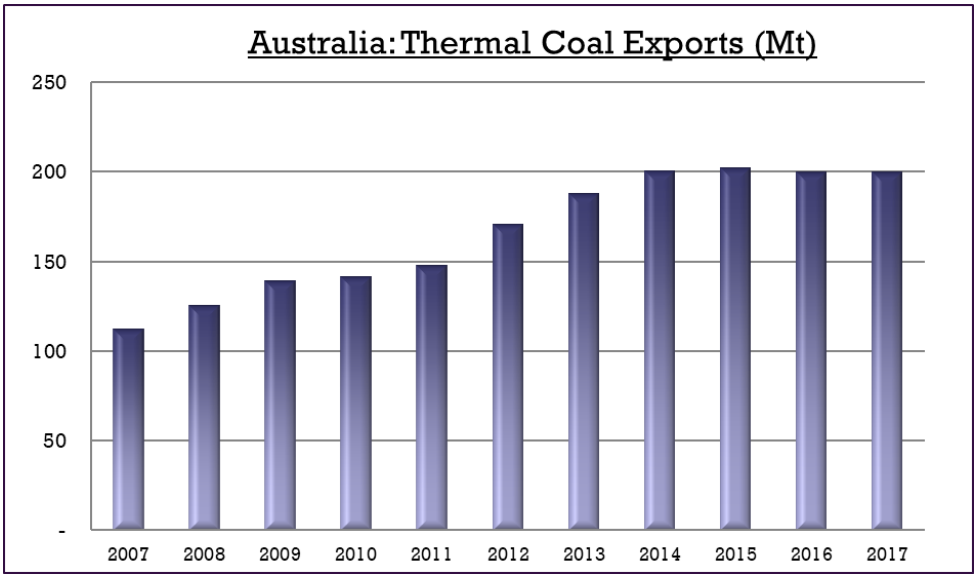



*Source: ABS, Commodity Insights*

Aside from black coal production, an estimated 50Mt of brown coal or lignite is produced and consumed by the power sector in Victoria. None of this brown coal is exported.

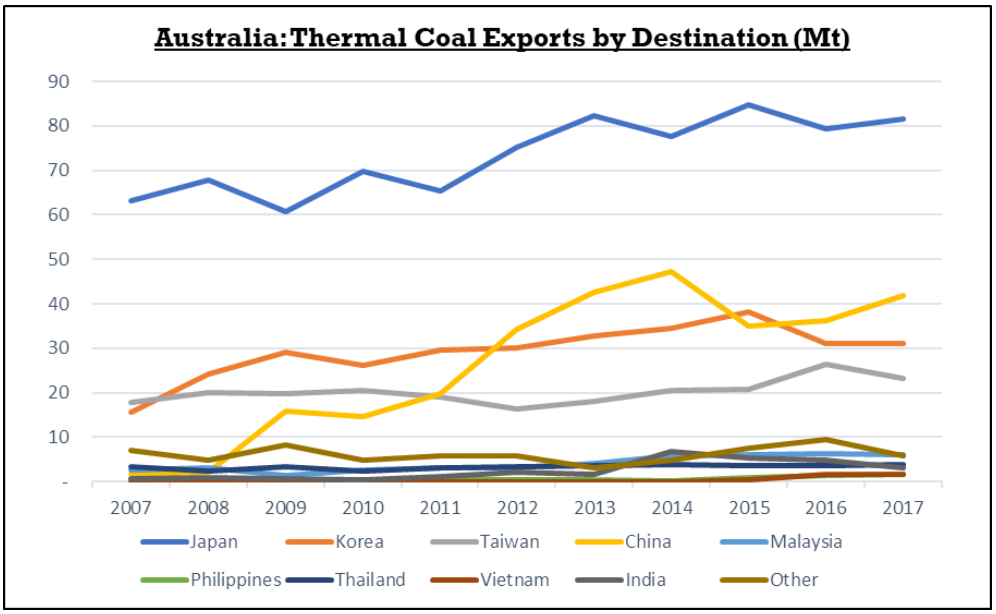
### 2.1. Australian Thermal Coal Exports

Australian thermal coal exports in 2017 were 200Mt, making Australia the second largest exporter of thermal coal globally behind Indonesia (392Mt). Australian thermal coal exports grew strongly from 112Mt in 2007 to 201Mt in 2014 in response to strong demand growth in China which increased coal prices. Australia and Indonesia have both expanded supply strongly since 2007 (see section 2.2 for more detail), but there has been no net growth from Australia since 2014 as shown below.




*Source: ABS, Commodity Insights*

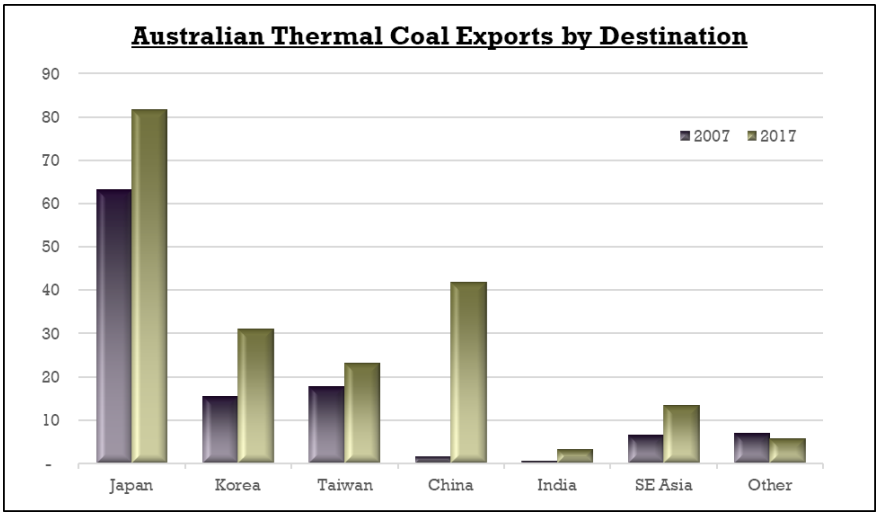
Australia's key export markets for thermal coal are predominantly in Asia, with small volumes also exported to South America (Mexico and Chile).




*Source: ABS, Commodity Insights*

Japan is by far the largest importer of Australian thermal coal, accounting for 82Mt or over 40% in 2017. However, it's market share of Australian exports has fallen since 2007, when it accounted for over half the volume (chart below left).

Over the last decade, China has emerged as a key market for Australian thermal coal, and in 2017 was the second largest market behind Japan. Korea and Taiwan remain key markets, with Korean imports of Australian thermal coal doubling over the last decade. Smaller markets include India, Malaysia, Philippines, Thailand and Vietnam.

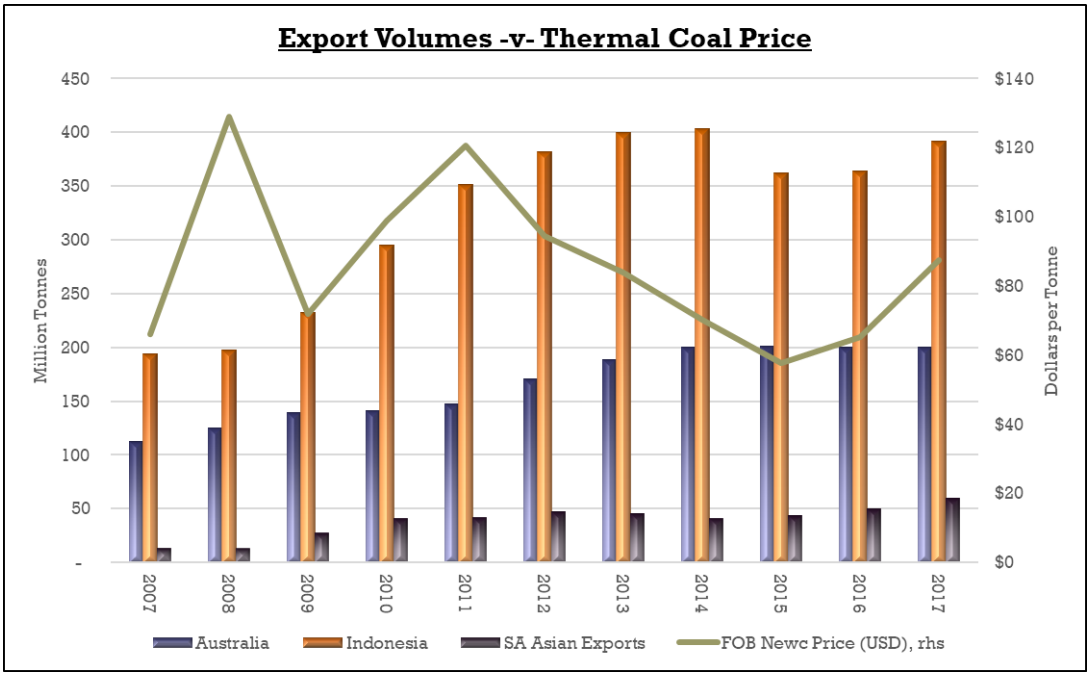



*Source: ABS, Commodity Insights*

More detail on each of these demand markets and their growth is provided in Section 3.

## 2.2. Competitors

Australian thermal coal exporters face several competitors into Asian markets, primarily Indonesia and to a lesser extent South Africa. The relative performance of various suppliers exporting thermal coal to Asia is demonstrated below, clearly showing the resilience of Australian exports against the various market cycles, relative to other suppliers.




*Source: Commodity Insights*

The extent of competitiveness of Australian thermal coal in the seaborne market is evidenced by the growth over the past 10 years as depicted above. While the global seaborne market has grown around 365Mt (63%) since 2007, Australian thermal coal exports have grown by 88Mt (79%). Indonesia has increased by 198Mt (88%) of essentially lower grade coals - primarily exporting to India and China – but also slumped severely in the 2015-16 downturn, and South

African exports to Asia have risen by 47Mt. Of the 60Mt of South Africa's exports into Asia, some three quarters (45Mt) were shipped into the sub-continent markets of India and Pakistan, which are significantly closer to South Africa than other areas of Asia.

The stable and continuous demand for Australian thermal exports is driven by several factors, including:

- Coal quality and power plant design dependency.
- End user mine equity.
- Take or pay contracts.
- Industry infrastructure ownership/control.
- Key off-take market stability.

Coal from Australia is typically of higher quality than that from the competing regions of Indonesia and South Africa – higher energy and lower impurities (ash/trace elements). With the advancement of high efficiency low emissions coal fired power generation technology (commonly referred to as HELE technology), and environmental constraints in end user markets, Australian thermal coals have reliable markets and high dependency from the key Asian demand regions of Japan, Korea and Taiwan. Proximity to Australia and therefore typical delivered cost competitiveness is also critical.

Key end users and foreign entities also maintain equity participation in various Australian mines and infrastructure, further cementing their aligned interest in production and export consistency.

Further underpinning the consistent Australian thermal coal export volumes are rolling take-or-pay contracts committing facility users to contracted annual rail and loading terminal throughput volumes, backed by security requirements (e.g. bank guarantees and/or performance guarantees). While the take-or-pay agreements allow variation of the forward year tonnage nominations, the very nature of the agreements provides long term supply visibility for customers. In addition, the various ownership structures of the coal loading terminals (e.g. producers and/or end users) provide an aligned interest for performance and transparency of operations. For example, a consortium of producers owns the NCIG terminal at Newcastle port, while a mix of coal producers and Japanese end users own PWCS (the other terminal at Newcastle port, the largest thermal coal export port in Australia).

The underlying demand stability from the key importers of Australian thermal coals (Japan, Korea and Taiwan), driven largely by significant coal-fired power generation in these regions, provides substantial underlying support for production security. The significance of their dependency on Australian coals is further evidenced by their mine equity participation and/or ownership as mentioned above. For Japan in particular, coal fired power generation plants were historically designed around Australian coal specifications, which resulted in long-term off-take contracts and equity participation between some Australian producers and Japanese consumers.

Thermal coal supply competition to Australia's key thermal coal export markets opportunistically arises from Canada, USA, Colombia and can also include Russia. Such "swing supply" is typically driven by delivered price competitiveness, mine ramp up capacity and infrastructure capacity, end user quality requirements, and their traditional regional market demand. While actual purchases are also influenced by quality, the key price driving "swing" supply to Asia is the delivered price from each supply region. Volumes of Canadian and US thermal coals to Japan, Korea, Taiwan and China have historically been low.

## *Indonesia*

Indonesia is by far the largest exporter of seaborne thermal coal, with exports of 392Mt in 2017 from a total global market of 930Mt (market share 42%). From 2007-14, Indonesian thermal coal exports more than doubled from 194Mt to 404Mt, before declining sharply in 2015 due to weak prices. They stabilised in 2016 at around 360Mt and recovered strongly in 2017 as export prices improved. Indonesian thermal coal exports are sold predominantly into Asia, with India and China being the largest markets.


*Source: Commodity Insights*

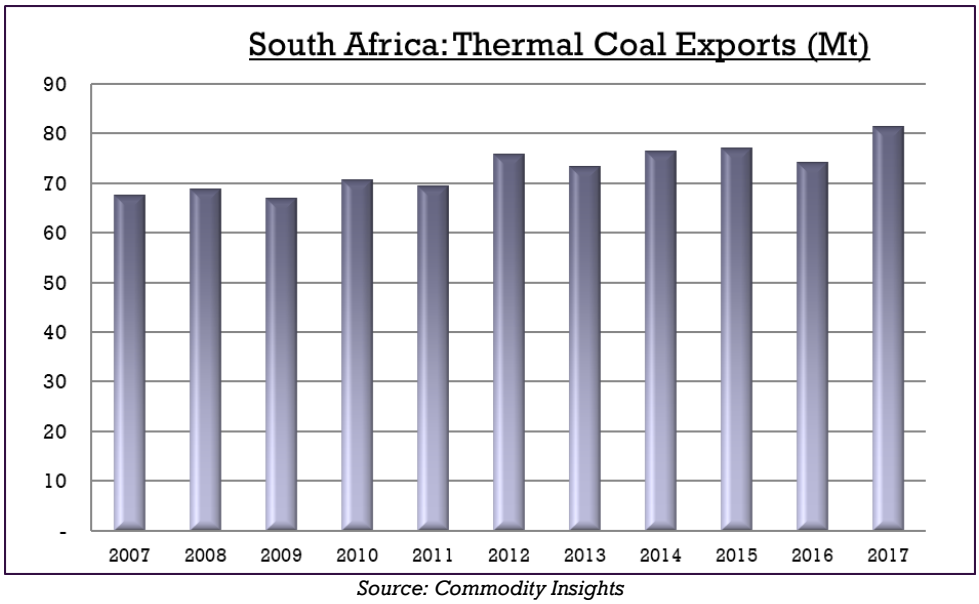
Despite its strong position in global export markets, Indonesia only holds around 3% of the world's known coal reserves (28 billion tonnes). Most of these reserves are on the islands of Kalimantan and Sumatra, with most production and exports coming from Kalimantan, which has several large river systems, enabling a relatively cheap and readily accessible infrastructure system to the seaborne market. Most coal exported from Indonesia is transported down rivers on barges to transhipment points on the coast, where it is loaded onto seagoing vessels for export. This infrastructure system is unique among coal producers globally (certainly on this scale) and has enabled Indonesia to increase exports far quicker than its competitors, particularly with growth markets (China, India, SE Asia) on its doorstep.

Indonesian thermal coal varies considerably in energy content, with the premium brands being comparable to the Newcastle 6,000 kcal/kg specification, but the majority having calorific values well below this, and as low as 4,000 kcal/kg. So, Indonesian export volumes do not substitute Australian thermal coals on a 1:1 basis, as less Australian coal is required per unit of power generated. Also, due to the lower energy content (and corresponding higher moisture content) of Indonesian coals, they are not the preferred thermal coal for power generation in some markets, notably Japan, Korea and Taiwan, who have built their boilers on Australian coal specifications and therefore prefer this coal. While Indonesia's coal exports accounted for 42% of the 2017 global export volumes, political risk and weak supply chains threaten consistent and reliable coal delivery to end users. While land side coal loading terminals are available to limited producers, the predominantly lower capital-intensive truck and shovel mining operations, combined with a significant dependency on barge transportation through the inland river systems of Kalimantan to mostly open sea loading anchorages are susceptible to weather impacts (specifically flooding and droughts) which can severely restrict mining and barge

movements. Whereas Australia's supply chain infrastructure is capital intensive, fixed, sunk costs and consequently slow to respond to short-medium term market movements, Indonesia's supply chain infrastructure is much less capital intensive and consequently able to respond in shorter time frames and accommodate short term market movements, both positive and negative. This is reflected in the (at times) sharp changes in Indonesian export volumes.

### *South Africa*

South Africa is the fifth largest supplier of seaborne thermal coal, in 2017 exporting 82Mt for a market share of 9%. South African exports are constrained by infrastructure (rail and port) and therefore have hardly grown in the last decade, increasing from 68Mt in 2007 to 82Mt in 2017 (see chart below). Due to its geographical location, South Africa is considered a 'swing supplier' as it can compete into both the Atlantic (Europe and Americas) and Pacific (Asia) markets under the right market conditions. In 2007, only 4% of South African thermal coal exports went to Asia, but the rise of Indian imports over the next decade has resulted in Asia now accounting for 74% of South African exports in 2017, with India accounting for 45% itself and significant volumes also being exported into Pakistan. While South Africa competes strongly with Indonesia into western Asian markets, it struggles to gain a foothold into southeast and north Asia due to the freight differential and competition from Australia and Indonesia, and therefore is likely to remain a marginal supplier into north Asia – Australia's strongest, traditional and logical market.




*Source: Commodity Insights*

South Africa's main export terminal, Richards Bay Coal Terminal (RBCT), has export capacity of 91Mtpa, however, actual exports have never approached these levels. This inefficiency stems primarily from rail deficiencies and political and civil unrest. While other export facilities provide options for export expansion (particularly for junior miners), achievement of these expansion plans has not been realised to date largely due to rail limitations, market prices, different quality demand from end users and the higher usage cost of these facilities. It was reported in July 2016 that Transnet, the sole coal freight rail haulage provider, is investing R21.8 billion over the next 7 years to increase system capacity to 81Mtpa. However, rail limitations are expected to still lag loading terminal capacity as the primary bottleneck to South African export growth.

# 3. Seaborne Thermal Coal Demand Forecast

This section provides detailed forecasts of thermal coal import demand for selected Asian markets out to 2030. The forecasting methodology is outlined below, followed by the detailed country sections and forecast for each country. The section concludes with a demand summary and commentary around the potential growth for Australian thermal coal exports.

## 3.1. Methodology

Commodity Insights' forecast methodology for the demand forecast is split into a bottom-up approach for the short-term (2018-22 inclusive) and a top-down approach for the long-term (2023-30 inclusive). The bottom-up methodology is preferred for the short-term as it provides a more accurate picture of real demand (i.e. new power stations). However, longer term, there is less transparency, hence a top-down methodology is applied. The methodology for each period is detailed below.

### *Short-Term Forecast*

The short-term is defined as 2018-22, inclusive. A bottom-up methodology is applied over this period as there is good transparency regarding the drivers of thermal coal demand (i.e. new coal-fired power station commencement).

For each demand country/region in the forecast, Commodity Insights utilised its proprietary data on new coal-fired power plants currently under construction and likely to be commissioned over the short-term. These forecasts are consolidated for each country/region into a total of new capacity being commissioned every year for the short-term forecast period. The new capacity figure is then converted into an incremental coal demand forecast.

India and China were treated slightly differently, as domestic coal production provides a significant proportion of their demand requirement. As a result, Commodity Insights forecast domestic production in these countries and took the difference between that and domestic demand as the import requirement.

The implicit assumptions using this methodology are as follows:

- All identified new capacity under construction is completed and commissioned within the timeframe. Where the timeframe is unclear, Commodity Insights has been conservative with the commissioning date estimate.
- The new capacity additions will operate at a relatively high (but not unrealistic) utilisation rate to support the conversion of new capacity to coal demand. Most of the demand centres have rapidly growing electricity demand, so this is a realistic assumption as the new capacity will be required to meet demand.
- Imported coal will be utilised rather than domestic coal. Outside of China and India, only Vietnam and the Philippines have domestic coal production of any volume. For these countries, Commodity Insights identified the new coal-fired capacity that is based on imported coal (rather than domestic) and only included this capacity in the forecast.

### *Long-Term Forecast*

The long-term is defined as the remainder of the forecast period, from 2023-30, inclusive. The approach for this period is top-down, using macro drivers to estimate electricity demand by

country and then estimate the proportion of electricity generated by coal, which is then converted into a coal demand requirement.

Population growth forecasts were sourced from the United Nations estimates for all countries/regions. Electricity consumption per capita was estimated using historical relationships between economic development and electricity consumption per capita. It has been shown, that over time and as economies develop, electricity consumption per capita grows slowly at first and then at an accelerated rate for a period before reaching a plateau, and even declining in some instances, as economies become less industrialised and energy efficiencies become a focus.

This long-term methodology provided the annual total electricity demand forecast for each country/region across the forecast period. The next step was to calculate the contribution of coal to the overall electricity supply. This was driven by a review of long-term electricity policies for each country/region, each of which generally specifies a target for coal-fired power generation at some future point in time (e.g. 2030). Commodity Insights assumes that all these government policy targets are met in the specified forecast period, including all definable climate-policy related targets that link to coal-fired power generation (this is a somewhat conservative assumption as generally governments have struggled to meet climate-related policy targets).

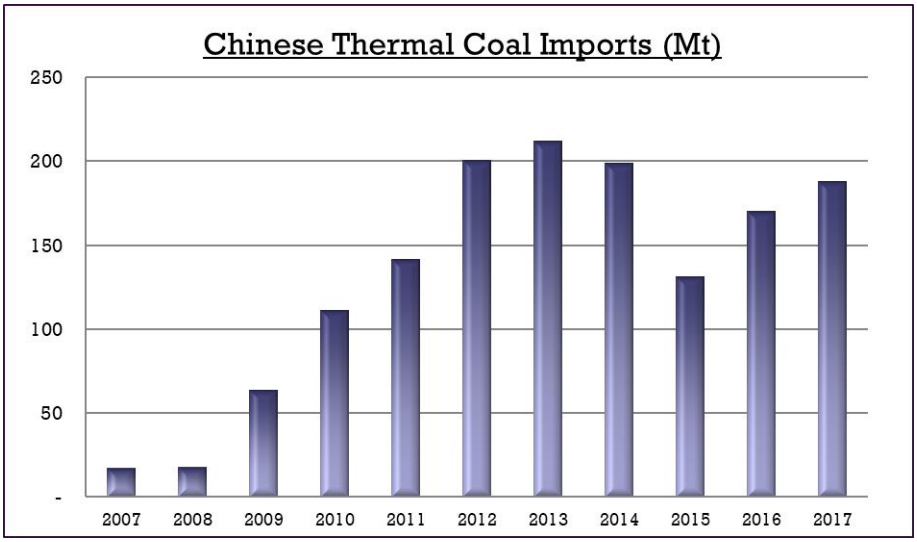
Multiplying the contribution of coal by the total electricity demand provided the total electricity demand for coal, which was then converted to a tonnage demand for coal.

Note that our demand forecast is based on electricity sector demand for thermal coal only and does not include demand in other sectors such as cement or paper.

The detailed assumptions behind this for each country/region are outlined in their respective sections below.

## 3.2. China

China is the world's largest thermal coal importer, with imports registering 188Mt in 2017, over 40Mt more than Japan, the next largest importer. China's thermal coal imports grew rapidly between 2006 (11Mt) and 2013 (212Mt), becoming the world's largest importer in 2011 and driving seaborne prices up strongly as a result. However, a slump in imports followed from 2013 to 2015, when levels dropped to 131Mt before recovering strongly in 2016 to 170Mt.

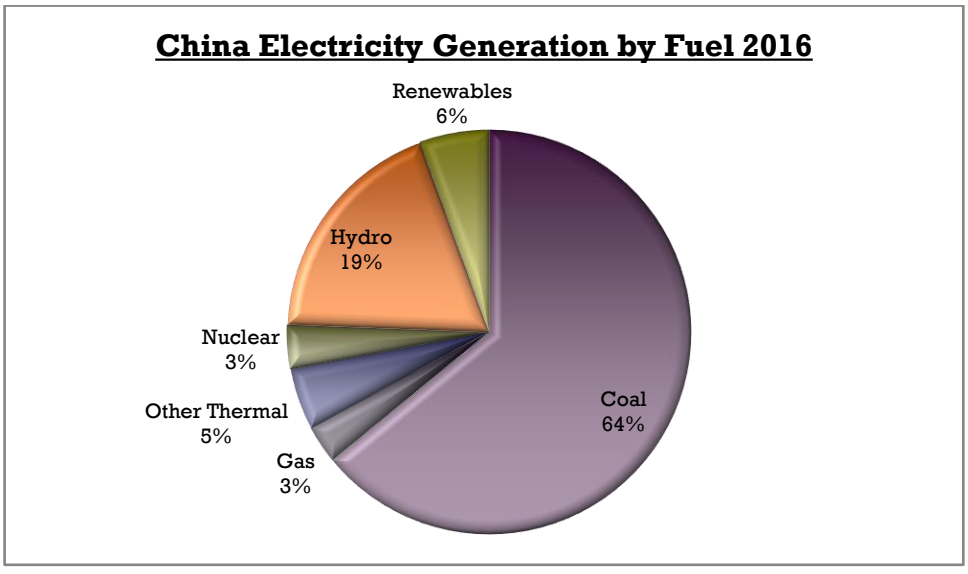



*Source: Commodity Insights*

China's imports are relatively volatilite, due to imports being a small proportion of overall consumption (5% in 2017). However, when domestic production is unable to keep pace with demand, the market quickly switches to coal imports. Chinese thermal coal imports are dominated by Indonesia, which accounts for 55-60%, while Australia accounts for 25-30%.

### *Current Electricity Mix*

China's electricity mix is heavily reliant on coal, which in 2016 accounted for just over 64% of all power generation. Hydro was next, at 19%, followed by renewables and other thermal.




*Source: National Energy Administration of China*

It is expected over time that China's reliance on coal will ease, with the Chinese government making massive investments in renewable generation capacity. In January 2017, the National Energy Administration (NEA) announced plans to spend more than US$360 billion on renewable energy sources by 2020. The NEA also noted that installed renewable capacity (which the NEA classifies as wind, hydro, solar and nuclear) would contribute about half of new electricity generation by 2020. The Chinese definition of renewables in this instance includes both nuclear and hydro, which are already well-established technologies in China, particularly hydro. Details on where and how the funds would be spent were not provided.

## *Domestic Coal Production*

China is the world's largest coal producer by a significant margin. In 2016, China produced an estimated 3.0Bn tonnes of thermal coal. For reference, the next largest producer globally was India, which produced approximately 640Mt. China is trying to reduce its level of coal consumption and domestic production. In early 2017, the National Development and Reform Commission (NDRC) released a plan to reduce China's coal production capacity by 500Mt by 2020. Details include:

- Some 800 million tonnes of 'out-dated' and inefficient capacity will be cut, largely among smaller mines in the northeast of China. This will be partially offset by the addition of 300 million tonnes of 'advanced' capacity by larger producers in the western regions.
- Total coal output of 3.9bn tonnes is being targeted in 2020, up from 3.75bn tonnes in 2015. Total coal consumption of 4.1bn tonnes is being targeted for 2020, up from 3.96bn tonnes in 2015.

The inference from the last two points above is that 2020 import levels will be around 2015 levels. More recently, the National Energy Administration (NEA) has forecast record coal production in 2018, up 7.3%. However, year to date figures show this is going to be difficult to achieve. Our estimate for Chinese thermal coal production is 3% growth in 2018, which will slow to 2% from 2019-25, and then 1% from 2026-2030.

Our domestic thermal coal production forecast for China is below.

| China | 2016 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Domestic Thermal Coal Production (Mt) | 2,970 | 3,246 | 3,584 | 3,767 |

*Source: Commodity Insights.*

## *Short-Term Outlook*

The short-term outlook for Chinese thermal coal imports is somewhat unclear, largely due to changes in government policy regarding domestic coal production. Throughout 2016, the government implemented a domestic production cap which resulted in output falling 9%. This has since been reversed and the government target is 7.3% growth for production in 2018, which in our view is unlikely to be achieved. In our view, however, imports will fall in 2018 as we expect domestic production to increase, although not by 7.3%.

In November 2016, a presentation by the NEA (National Energy Administration) forecast that coal-fired capacity could grow as much as 19% between 2015 (920GW) and 2020, but will remain below 1100GW, which is reflected in the forecast below. Note that the new capacity addition is less of a driver for Chinese imports than domestic production.

| China | 2017 | 2018f | 2019f | 2020f | 2021f | 2022f |
|---|---|---|---|---|---|---|
| Capacity Addition (MW) | 40,000 | 30,000 | 30,000 | 30,000 | 20,000 | 20,000 |
| Thermal Coal Imports (Mt) | 188 | 175 | 175 | 175 | 175 | 175 |

*Source: Commodity Insights.*

## *Energy and Emissions Policy*

In March 2016, China released its 13th Five-Year Plan for Economic and Social Development (2016-20). This was followed in November 2016 by the 13th Five-Year Plan to control greenhouse gas emissions, which reiterated the key climate goal for China: to peak its CO2 emissions by 2030 and make its best efforts to peak earlier. Between them, and to achieve the key climate goal, the plans have a set of climate and energy targets, including the following:

- A reduction in energy consumption per unit of GDP of 15% between 2015 and 2020.
- A reduction in carbon dioxide emissions per unit of GDP of 18% between 2015 and 2020.
- Increase non-fossil fuels contribution to primary energy consumption to 15% by 2020, up from 12% in 2015.
- A reduction in coal's share of power generation from 64% in 2015 to 58% in 2020.

The 13th Five-Year Plan for Energy was released in January 2017 by the National Energy Administration, but it primarily confirmed the goals above in relation to coal.

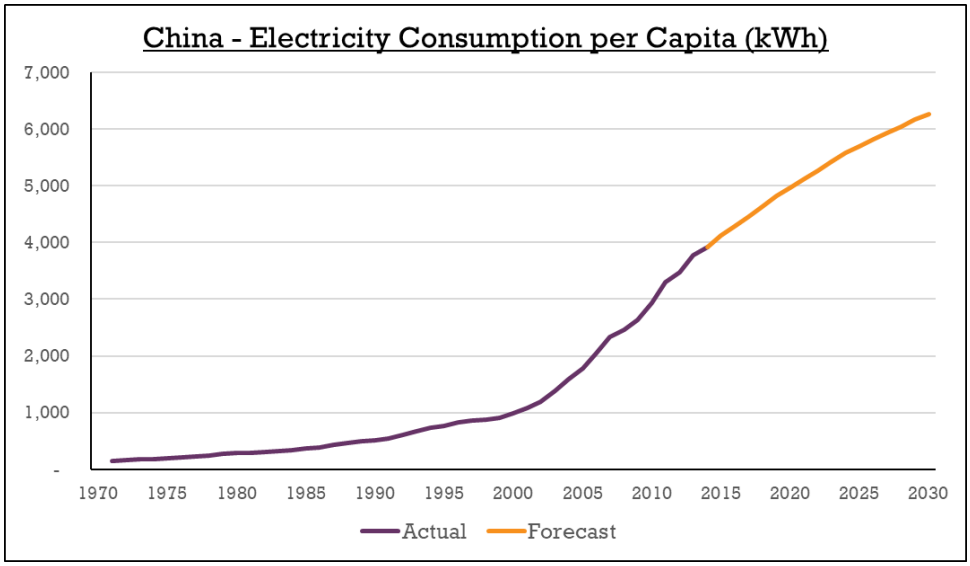
## *Long-Term Forecast*

China's population at the end of 2015 was 1,397 million and is forecast by the United Nations to rise to 1,441 million by 2030, as per the table below.

| China | 2015 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Population (Mill) | 1,397 | 1,425 | 1,439 | 1,441 |

*Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, Medium Variant.*

China's per capita electricity consumption has grown rapidly in recent decades, doubling from 500kWh in 1990 to 1,000kWh in 2000, and then tripling from 2000-10 to around 3,000kWh. It is now approaching 4,000kWh per capita, which is about the global average but well behind the consumption level of developed economies. Commodity Insight's forecast has electricity consumption per capita increasing steadily over the forecast period, from 4,000kWh to just over 6,000kWh, which will bring Chinese per capita consumption to about three-quarters of the current level in Japan (7,900kWh). This is charted below.




*Source: Commodity Insights, World Bank.*

Combining the population growth forecasts and the estimate of electricity consumption per capita growth results in the following electricity demand forecast for China.

| China | 2016 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Electricity Demand (TWh) | 5,800 | 6,815 | 7,902 | 8,696 |

*Source: Commodity Insights.*

This results in a CAGR for electricity demand of 2.9% over the period 2016-30.

In terms of the contribution of coal to electricity generation, the following assumptions have been made for the forecast:

- For the base year of 2016, the actual figure of 64.1% has been used, as reported by the National Energy Administration of China and the China Electricity Council.
- From 2016-20, a decline down to 58% is assumed. The 58% is a target from the Environmental Protection 13th Five Year Plan (see Energy and Emission Policy above).
- Longer-term, the IEA Outlook for 2016 provides a 2030 target of 53% for coal's share of power generation, which is consistent with the target in the Environmental Protection Five Year Plan, so a decline has been applied from 58% in 2020 to 53% in 2030.

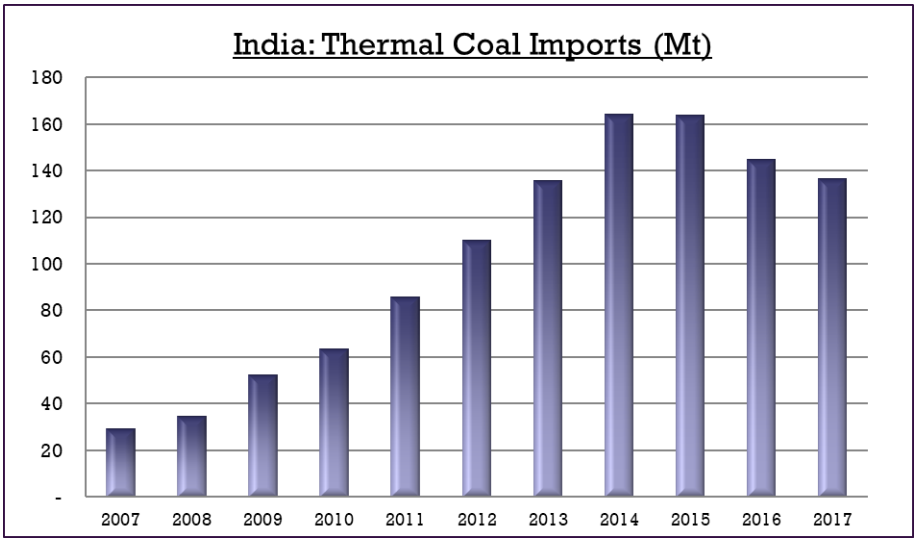
When combined with the short-term demand forecast and the domestic production forecast outlined earlier, this results in the following thermal coal import requirement for China.

| China | 2017 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Thermal Coal Imports (Mt) | 188 | 175 | 188 | 194 |
| Imports from Australia (Mt) | 42 | n/a | n/a | n/a |

*Source: Commodity Insights.*

## 3.3. India

India's thermal coal imports grew rapidly from 2006-14, rising from 23Mt to 164Mt, driven by new coal-fired generation capacity and the inability of domestic supply to meet demand growth. India briefly became the world's largest importer of thermal coal in 2015 before being overtaken by China in 2016. India was the 3rd largest importer of thermal coal in 2017, but imports have fallen for the last 3 years (see below) as domestic production has improved levels.

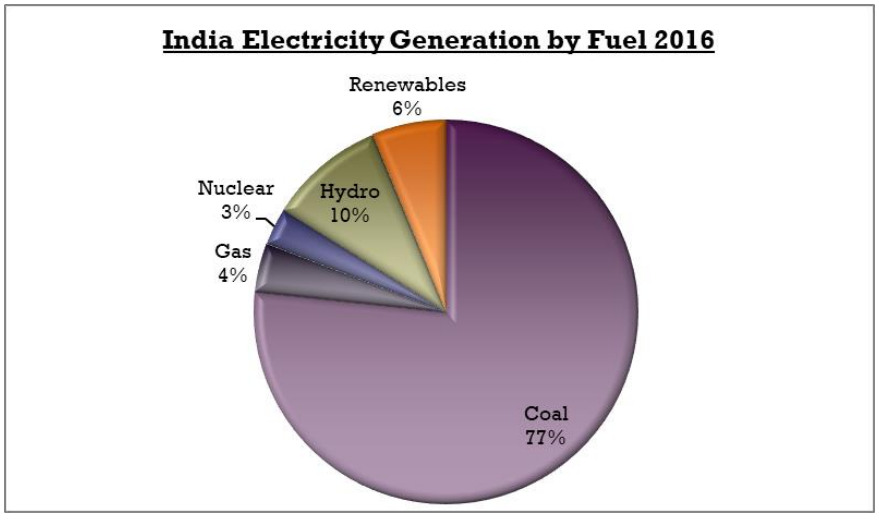



*Source: Commodity Insights*

India is a very price-sensitive market for thermal coal imports. Due to this, and the fact that Indian power generators have historically used low quality coal (high ash, low energy) from their domestic supply, Indian importers tend to consume lower quality coals from the seaborne market. A significant proportion of the high moisture, low energy LRC coal from Indonesia is exported to India. It is rare for Australian thermal coal to be exported to India.

### *Current Electricity Mix*

India is heavily reliant on coal-fired power generation, which accounted for over 75% of electricity generated in 2016, followed by hydro 10%, followed by renewables, gas and nuclear.




*Source: Central Electricity Authority, India.*

## Domestic Coal Production

India is the world's second largest producer of coal, behind China. In 2017, India produced approximately 685Mt of coal, of which approximately 640Mt was thermal coal. Indian production has grown strongly since 2012, increasing by an average annual growth rate of 5.1% to 2017.

Commodity Insights' expectation is that in the short-term, Indian domestic thermal coal production will continue to grow solidly, reaching 770 million tonnes by 2020 (tabled below). Beyond 2020, we have forecast an average annual growth of 5.0% to 2030, resulting in domestic thermal coal production reaching 1,253 million tonnes by 2030, which would represent almost a doubling of output from 2017 to 2030. This forecast may be considered ambitious, and therefore implies a conservative forecast for import volumes. We note that Coal India is notorious for missing targets set by government, as illustrated by recent years' results:

- Actual production in FY15-16 was 536Mt compared to a target of 550Mt.
- Actual production in FY14-15 was 494Mt compared to a target of 507Mt.
- Actual production in FY13-14 was 462Mt compared to a target of 482Mt.

Our domestic thermal coal production forecast for India is below.

| India | 2016 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Domestic Thermal Coal Production (Mt) | 598 | 769 | 981 | 1,253 |

*Source: Commodity Insights.*

## Short-Term Outlook

After several years of declining imports, the outlook for thermal coal import demand in India is improving due to strong demand growth and the inability of domestic supply to keep pace. Imports for both Q4'17 and Q1'18 were significantly higher year-on-year so we expect an increase in volumes in 2018, which we believe will be sustained.

Commodity Insights' forecast for India's thermal coal imports is presented below, based on the forecast of Indian coal demand and domestic production. Note that, as with China, the link between electricity generation capacity addition in India and thermal coal imports is not a direct relationship due to the impact of domestic coal production performance and government policy.

| India | 2017 | 2018f | 2019f | 2020f | 2021f | 2022f |
|---|---|---|---|---|---|---|
| Capacity Addition (MW) | 13,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| Thermal Coal Imports (Mt) | 137 | 145 | 150 | 155 | 160 | 165 |

*Source: Commodity Insights.*

## Energy and Emissions Policy

The Central Electricity Authority (CEA) released a National Electricity Plan for Generation in January 2018. While this document does not provide targets for the electricity generation mix over time, it does provide some insights to the new capacity being developed in India:

- It does expect that from 2017-22 (5-year period), some 47,855MW of new coal-fired capacity will be added to the Indian grid.
- From 2022-27 some 46,420 MW of new coal-fired capacity will be added.
- Part of India's energy platform will be a significant investment in renewable energy. The Indian government has set an installed capacity target of 175,000MW of renewable sources by 2022. The breakup of this is 100,000MW of solar, 60,000MW of wind, 10,000MW of biomass and 5000MW from small hydro projects. This will bring the installed capacity of renewables to around 33% of the entire installed capacity by 2022.

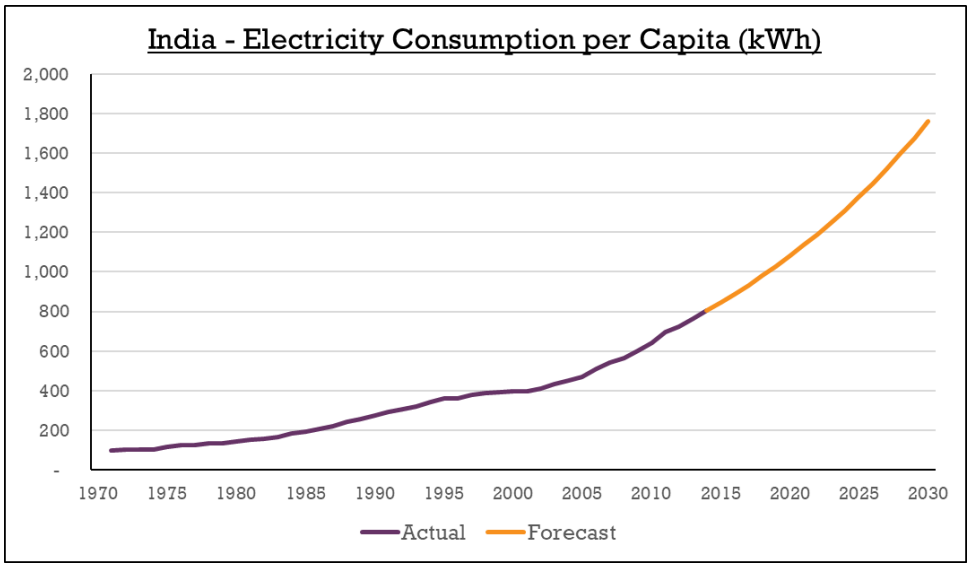
## *Long-Term Forecast*

India's population at the end of 2015 was 1,309 million and is forecast by the United Nations to rise significantly over the forecast period to 1,513 million by 2030, as per the table below.

| India | 2015 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Population (Mill) | 1,309 | 1,383 | 1,452 | 1,513 |

*Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, Medium Variant.*

India's per capita electricity consumption is still very low by global standards, at 800kWh in 2014, well behind China at almost 4000kWh. India is entering the phase where historically electricity consumption per capita grows rapidly, and this is reflected in the forecast, but the growth rate is lower than other countries have achieved, due to the 'India factor', where economic progress is hard-fought and often lower than expected. Note that the growth rates forecast are consistent with those estimated by the Central Electricity Authority. Indian electricity consumption per capita has grown at around 5.8% from 2008-14. Commodity Insights' forecast shows an increase in electricity consumption per capita from 800kWh in 2014 to nearly 1,800kWh in 2030, an average annual growth rate of 5.0%. For context, the consumption level in 2030 is just below Thailand's current electricity consumption per capita.




*Source: Commodity Insights, World Bank.*

Combining the population growth forecasts and the estimate of electricity consumption per capita growth results in the following electricity demand forecast for India.

| India | 2016 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Electricity Demand (TWh) | 1,219 | 1,548 | 2,073 | 2,758 |

*Source: Commodity Insights.*

This results in an average annual increase of 6.0% over the period 2016-30. For reference, this compares to 9.1% that China averaged from 1980-2010. Coincidentally, our electricity demand forecasts are very close to the CEA's National Electricity Plan forecasts.

In terms of the contribution of coal to electricity generation, the following assumptions have been made for the forecast:

- For the base year of 2016, the actual figure of 76.7% has been applied, as reported by the Central Electricity Authority.
- From 2017-30, coal's contribution has been gradually scaled down by 0.5% per annum. This is to account for the significant investment in renewable energy capacity (noting that there is significant coal-fired capacity being commissioned over the period also).
- By 2030, coal's contribution to electricity generation is down to 69.7%.

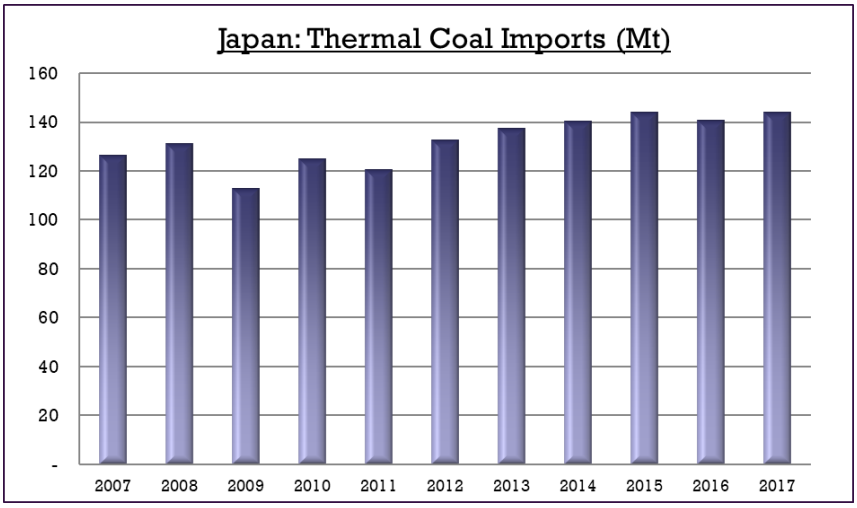
When combined with the short-term forecast outlined earlier and the electricity demand forecast, this results in the following thermal coal import requirement for India.

| India | 2017 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Thermal Coal Imports (Mt) | 137 | 155 | 201 | 268 |
| Imports from Australia (Mt) | 3 | n/a | n/a | n/a |

*Source: Commodity Insights.*

## 3.4. Japan

In 2017, Japan was the 2nd largest importer of thermal coal globally, importing 144Mt. Over the past decade, Japan's imports of thermal coal have ranged between 120-146Mt per annum, except for a global financial crisis-induced dip in 2009 to around 113Mt. Since the Fukushima nuclear disaster in early 2011, thermal coal imports have grown strongly.

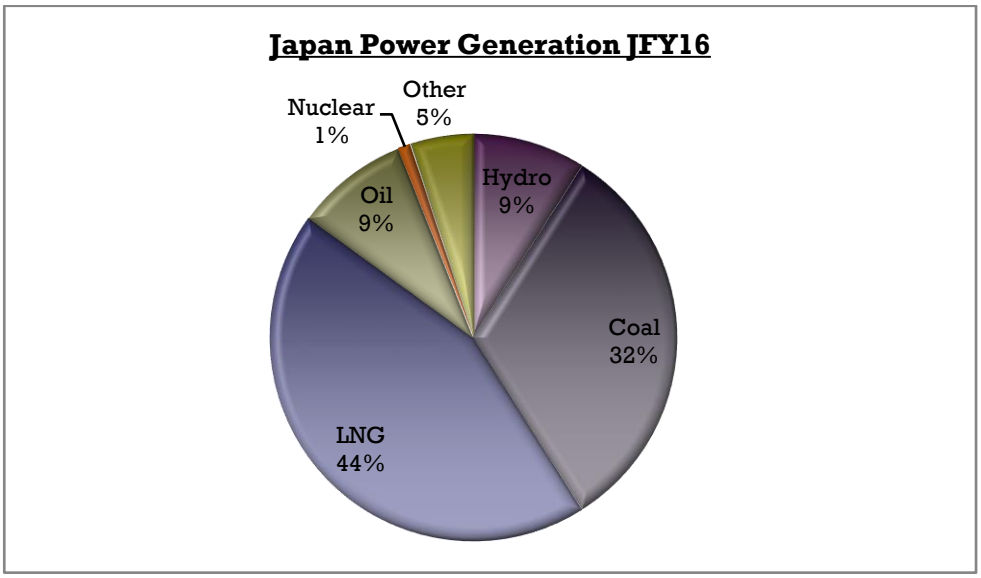



*Source: Commodity Insights*

Japan tends to import very high quality thermal coal, with typically 60-70% sourced from Australia, and around 20-25% from Indonesia. Japan has the most onerous green and carbon taxes in Asia.

### *Current Electricity Mix*

Japan's electricity generation mix underwent major changes following the Fukushima disaster of early 2011, when nuclear accounted for 29% of generation, with LNG at 29% and coal 25%. Fukushima resulted in the entire Japanese nuclear fleet being shut down for an extended period, and even today only a few units are operating. As a result, other fuels have increased output, particularly LNG and coal. In FY2016, Japan's power generation by fuel source was as follows:




*Source: Economic and Energy Outlook of Japan through FY2017, The Institute of Energy Economics, Japan.*

## *Domestic Coal Production*

Japan has no domestic coal production and therefore is entirely dependent on imports to meet its energy requirements.

## *Short-Term Outlook*

In recent years, as it has become more apparent that returning Japan's full nuclear fleet to operation will be extremely difficult due to political, environmental and public opposition, Japanese generators and industrial users have unveiled many proposed new coal-fired plants. Combined with those already under construction, some 18GW of new coal-fired capacity is at some form of planning or construction stage in Japan. The profile to 2022 reflects this, with only small additions through to 2018, but a strong and sustained increase thereafter, which will flow through to import demand as shown below. Note that there is often a lag between new plants being commissioned and their import demand being registered for a full year, which results in import growth slightly lagging new capacity growth (this applies across forecasts for all importing countries).

| Japan | 2017 | 2018f | 2019f | 2020f | 2021f | 2022f |
|---|---|---|---|---|---|---|
| Capacity Addition (MW) | 390 | 600 | 1450 | 2,250 | 2,250 | 2,720 |
| Thermal Coal Imports (Mt) | 144 | 145 | 148 | 153 | 160 | 167 |

*Source: Commodity Insights.*

Our underlying assumption behind all forecasts for Japan is that most of the nuclear fleet remains offline. For reference, it is expected that shortly two more units will recommence service, which will bring the total to 7 units operating (from a total of 52 pre-Fukushima). Since Fukushima, nine nuclear plants have been decommissioned.

## *Energy and Emissions Policy*

In 2015, Japan's Ministry of Economy, Trade and Industry (METI) released Japan's Energy Plan to 2030. This document outlined three energy targets for Japan by 2030:

- Raise the self-sufficient energy rate from a very low rate of 6.1% (2013) to 'close to 25%'. This would be achieved through leveraging renewable and nuclear energy;
- Lower energy costs from current levels. This would be achieved through utilising nuclear and coal-fired power generation;
- Set CO2 reduction targets comparable with the EU and the US, through utilising renewable and nuclear energy, optimising the efficiency of coal-fired power generation, and leveraging LNG power generation.

From these targets, METI has a projected energy mix in 2030 of gas 27%, coal 26%, renewables 24%, nuclear 20% and oil 3%. However, there are several challenges Japan faces in achieving these energy targets:

- It would need to run around 30-33GW of nuclear capacity to reach the 2030 power generation mix target of 20-22%. Prior to Fukushima, Japan had 54 nuclear reactors. Since Fukushima, 12 have been approved for decommissioning. Of the remaining 42, 7 are operating at present, accounting for around 6.5GW of capacity.

- The recent deregulation and entry of retail competition in the Japanese electricity market has resulted in an additional emphasis on costs of electricity, where coal has a competitive advantage in Japan. Along with uncertainty around the future of the nuclear fleet, this has resulted in a surge of investment into coal-fired power generation capacity.

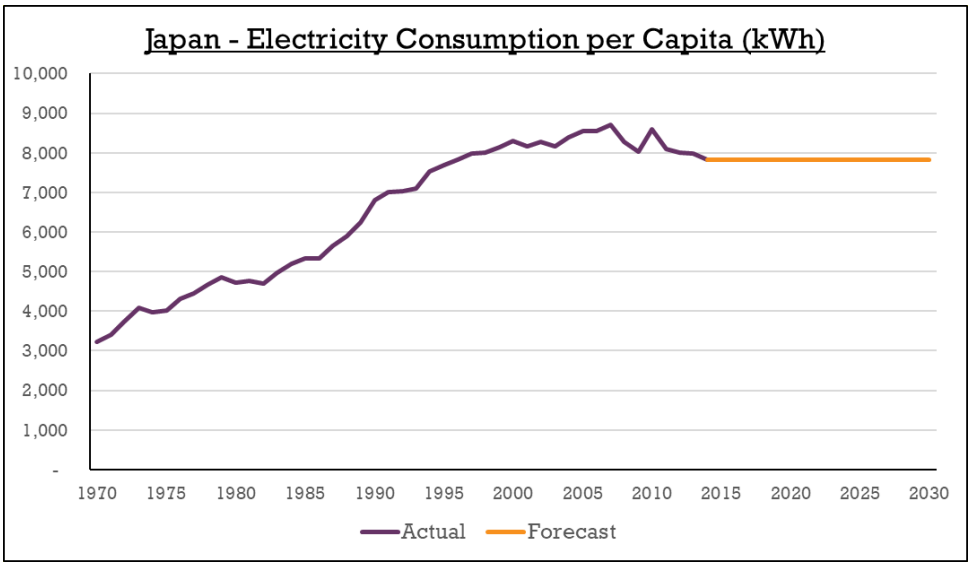
## *Long-Term Forecast*

According to the United Nations, Japan's population at the end of 2015 was 128 million and is forecast to fall over the forecast period to around 122 million, as per the table below.

| Japan | 2015 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Population (Mill) | 128.0 | 126.5 | 124.3 | 121.6 |

*Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, Medium Variant.*

Since the year 2000, Japan's electricity consumption per capita has largely been steady around 8000kWh per person, rising briefly in 2006-07 due to strong global economic growth, but falling since from a peak in 2007 to 7,820kWh in 2014 (last reported year available). The assumption is that as Japan has already achieved a level of electricity efficiency savings, forward consumption per capita will remain around the 2014 level of 7,820kWh per capita for the forecast period 2017-30. (Note: Japan is the only country/region in the study for which this assumption is made).




*Source: Commodity Insights, World Bank.*

Combining the population growth forecasts from the United Nations and the estimate of electricity consumption per capita growth above, results in the forecast electricity demand for Japan below.

| Japan | 2016 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Electricity Demand (TWh) | 1013 | 1003 | 986 | 964 |

*Source: Commodity Insights.*

In terms of the contribution of coal to electricity generation, the following assumptions have been applied:

- For the base year of 2016, the JFY15 actual figure of 32% has been applied.
- For 2017-19, the 32% has been retained, as while there are small coal-fired capacity additions to the grid, they are not significant overall.
- From 2020, the coal contribution to electricity output increases to 34% in 2020 and reaches a peak of 35% in 2022, based on the new capacity being commissioned.
- From the 35% in 2022, coal's contribution is scaled down to 30% in 2030. While we understand that the target for coal in the Japan Energy Plan released by METI is 26% by 2030, the target for nuclear in 2030 is 20-22%, which in our view will be almost impossible to achieve given the ongoing struggle to restart units. We expect that nuclear (currently less than 2% of generation) will struggle to reach 10%, and therefore another 10-12% will be required, which in our view will be split between renewables and coal.

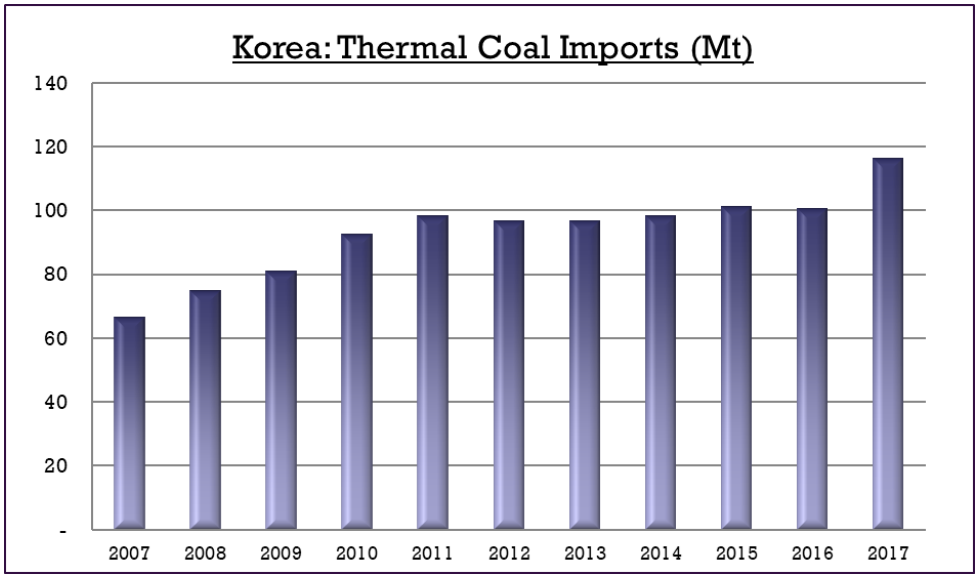
When combined with the short-term forecast outlined earlier and the electricity demand forecast, this results in a thermal coal import requirement for Japan as follows:

| Japan | 2017 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Thermal Coal Imports (Mt) | 144 | 153 | 157 | 141 |
| Imports from Australia (Mt) | 82 | n/a | n/a | n/a |

*Source: Commodity Insights.*

## 3.5. Korea

In 2017, South Korea (Korea) was the fourth largest importer of thermal coal globally, importing 115Mt. Korean imports have grown strongly from 66Mt in 2007, largely driven by new coal-fired capacity. Between 2011-16, imports levelled out between 97 and 101Mt, but then jumped again in 2017 due to a surge of new coal-fired capacity.

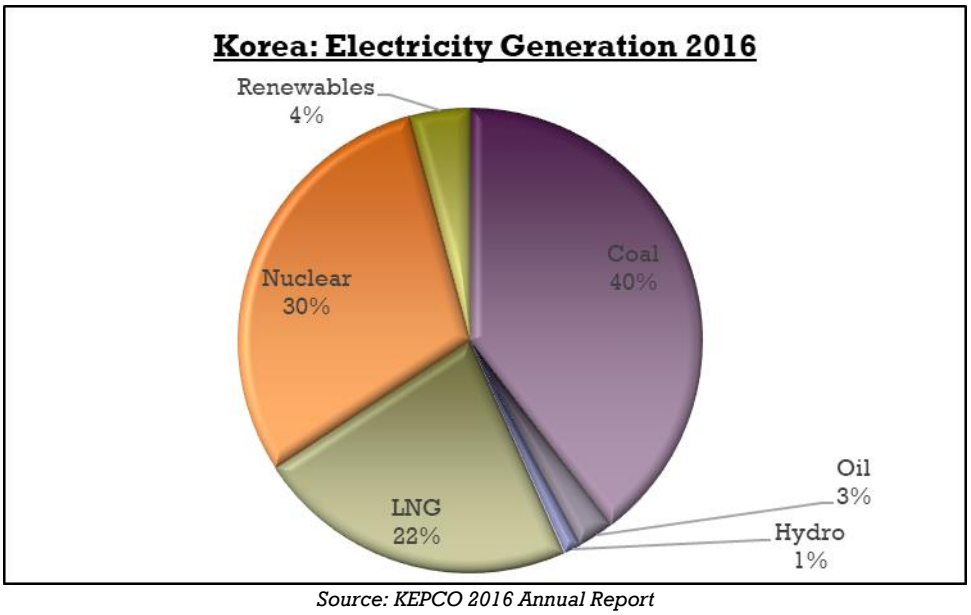



*Source: Commodity Insights*

Korea imports a higher proportion of Indonesian coals than Japan (typically 35-40%), and between 30-40% from Australia.

### *Current Electricity Mix*

Korea has significant installed capacity of LNG, coal and nuclear and smaller capacities for hydro, renewables and oil. In terms of power generation, coal is Korea's most important fuel source, accounting for 40% of output in 2016, followed by nuclear at 30% and LNG at 22%.




*Source: KEPCO 2016 Annual Report*

## Domestic Coal Production

Korea has no domestic coal production and therefore is entirely dependent on imports to meet its energy requirements.

## Short-Term Outlook

In the short-term (2017-22), despite some minor slippages in commissioning, Korea is adding a significant volume of new coal-fired generation capacity to its grid, with 6,500 MW added in 2017 and another 4,700 MW scheduled to commence operations by 2022. Because of these expansions, imports are forecast to rise solidly to 2019 before flattening out, as shown below, and then expand again in the early 2020's due to a further raft of new capacity.

| Korea | 2017 | 2018f | 2019f | 2020f | 2021f | 2022f |
|---|---|---|---|---|---|---|
| Capacity Addition (MW) | 6,560 | - | 600 | - | 4,160 | - |
| Thermal Coal Imports (Mt) | 116 | 129 | 130 | 131 | 135 | 144 |

*Source: Commodity Insights.*

## Energy and Emissions Policy

In December 2017, the Korean Ministry of Trade, Industry and Energy (MOTIE) released a Draft of the 8th Basic Plan for Long-term Electricity Supply and Demand. Under this plan, which in final form will supersede the 7th Basic Plan, Korea will produce more power from renewables and gas, while gradually reducing its reliance on coal and nuclear power. While comprehensive details are not yet available for the plan, some targets from the draft plan relevant to coal are as follows:

- The installed capacity of coal-fired generation is expected to grow from 36.8GW in 2017 to 39.9GW in 2030. There will be significant expansions of renewable and gas capacity, while nuclear capacity will fall.
- In terms of power generation, the target for coal by 2030 is 36.1%. Renewables are 20%, gas 18.8% and nuclear 23.9% respectively.

Commodity Insights has assumed that there will not be significant changes in the plan details between the Draft and Final Reports.

## Long-Term Forecast

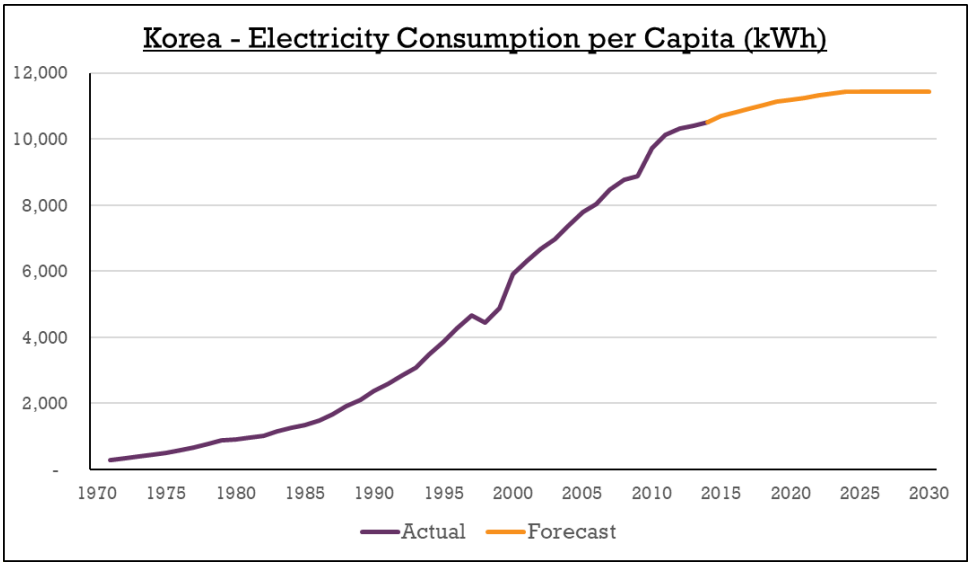
According to the United Nations, Korea's population at the end of 2015 was 50 million and is forecast to rise to around 53 million by 2030, as per the table below.

| Korea | 2015 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Population (Mill) | 50.6 | 51.5 | 52.2 | 52.7 |

*Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, Medium Variant.*

Korean electricity consumption per capita is among the highest in the world and the second highest in Asia, at over 10,700kWh in 2014 (latest reported figures available). It was also one of the fastest growing in history. This is largely due to a significant proportion of heavy industry (e.g. shipbuilding, steel) in the economy. And unlike Japan, Korea's electricity consumption per

capita is still growing, at an average of 3.5% from 2010-14, albeit at a slower rate in recent years. The growth is forecast to continue but at a slow rate until around 2025, when it will peak and remain at just over 11,400kWh per capita for the balance of the forecast period, as shown below.




*Source: Commodity Insights, World Bank.*

Combining the population growth forecasts from the United Nations and the estimate of electricity consumption, results in the forecast electricity demand for Korea below.

| Korea | 2016 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Electricity Demand (TWh) | 549 | 576 | 596 | 602 |

*Source: Commodity Insights.*

In terms of the contribution of coal to electricity generation, the following assumptions have been made for the forecast:

- For the base year of 2016, the actual figure of 39.5% is applied. From 2017-19, a ramp up to 44% is estimated, based on the large volume of new capacity being commissioned over 2016-18.
- From 2019 coal's contribution is gradually down from 44% to 36.1% in 2030, based on the target in the 8th Basic Plan Draft.

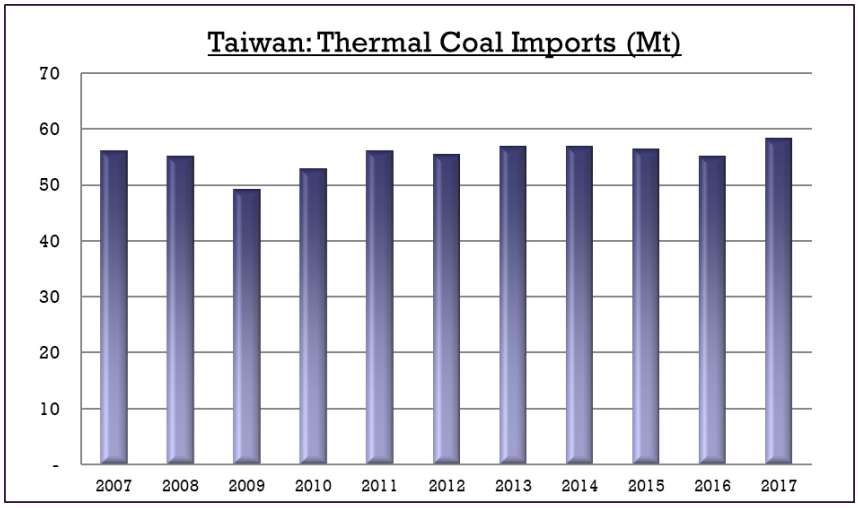
When combined with the short-term forecast outlined earlier and the electricity demand forecast, this results in a thermal coal import requirement for Korea as follows:

| Korea | 2017 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Thermal Coal Imports (Mt) | 116 | 131 | 140 | 131 |
| Imports from Australia (Mt) | 31 | n/a | n/a | n/a |

*Source: Commodity Insights.*

## 3.6. Taiwan

In 2017, Taiwan was the fifth largest importer of thermal coal globally, importing an estimated 58Mt. Over the past 10 years, Taiwanese imports have ranged between 49-58Mt, with very little new coal-fired capacity commencing over the period until 2017, when the commencement of several new units resulted in a jump in thermal coal imports.

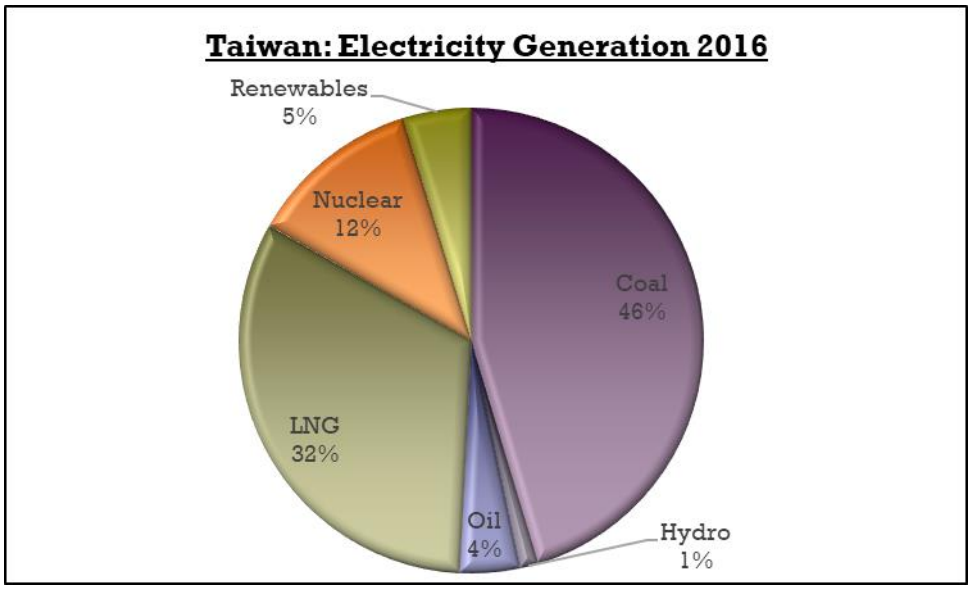



*Source: Commodity Insights*

Taiwan tends to import a similar blend of thermal coal to Korea, with both Indonesia and Australia generally accounting for over 40%.

### *Current Electricity Mix*

Coal is the dominant fuel in Taiwan's electricity generation mix, accounting for 46% of output in 2016, followed by LNG at 32% and nuclear at 12%.




*Source: Taiwan 2016 Energy Statistics Handbook, Bureau of Energy, MOEA*

## Domestic Coal Production

Taiwan has no domestic coal production and therefore is entirely dependent on imports to meet its energy requirements.

## Short-Term Outlook

Over the last 12 months, Taiwan's coal-fired expansion plans have been downgraded, with the EPA rejecting the Changgong 1and 2 units (1600 MW capacity), and the Taichung 11 and 12 units now being gas-fired rather than coal. Also, several longer-term plants such as Taipei Port 1 and 2 (2000MW) and Hsinta 1 and 2 (2000MW) are now less certain and may be cancelled or postponed. However, the short-term outlook remains steady, with four new 800MW units being commissioned between 2017-19, resulting in imports rising to 65Mt by 2021, as shown below.

| Taiwan | 2017 | 2018f | 2019f | 2020f | 2021f | 2022f |
|---|---|---|---|---|---|---|
| Capacity Addition (MW) | 2,400 | - | 800 | - | - | - |
| Thermal Coal Imports (Mt) | 58 | 63 | 64 | 65 | 65 | 65 |

*Source: Commodity Insights.*

## Energy and Emissions Policy

Soon after the election of a new government in May 2016, the Ministry of Economic Affairs (MOEA) announced the New Energy Policy. Its key goals include achieving a nuclear-free Taiwan by 2025 and increasing the share of renewables in total electricity to 20% by 2025. Currently nuclear accounts for around 12-14% of Taiwan's power output, so this may result in another resurgence in coal-fired power capacity. It should be noted that The MOEA is currently developing an Energy Transition White Paper.

## Long-Term Forecast

According to the United Nations, Taiwan's population at the end of 2015 was 23.5 million and is forecast to rise slightly to 24.2 million by 2030, as per the table below.

| Taiwan | 2015 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Population (Mill) | 23.5 | 23.8 | 24.0 | 24.2 |

*Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, Medium Variant.*

Taiwan electricity consumption per capita is very high by global standards, at over 11,000kWh in 2015. There is no long-term data series of Taiwan electricity consumption per capita, but recent years' figures show that demand growth has slowed to around 1% per annum. Commodity Insight's forecast assumes that by 2021, per capita electricity consumption in Taiwan will level out around 11,300 kWh, which continues for the balance of the forecast period.

Combining the population growth forecasts from the United Nations and the estimate of electricity consumption per capita growth, the electricity demand forecast for Taiwan over the period is as follows:

| Taiwan | 2016 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Electricity Demand (TWh) | 264 | 273 | 276 | 277 |

*Source: Commodity Insights.*

In terms of the contribution of coal to electricity generation, the following assumptions have been applied.

- For the base year of 2016, the actual figure of 45.4% was applied.
- From 2017-25, a ramp up to 0.5% per annum is estimated, based on the new coal-fired capacity being commissioned and the government's policy to reduce nuclear generation (12% of generation in 2015) to zero by 2025.
- This takes the contribution of coal-fired generation to 49.9% in 2025, which is then maintained for the balance of the forecast period (2026-30).

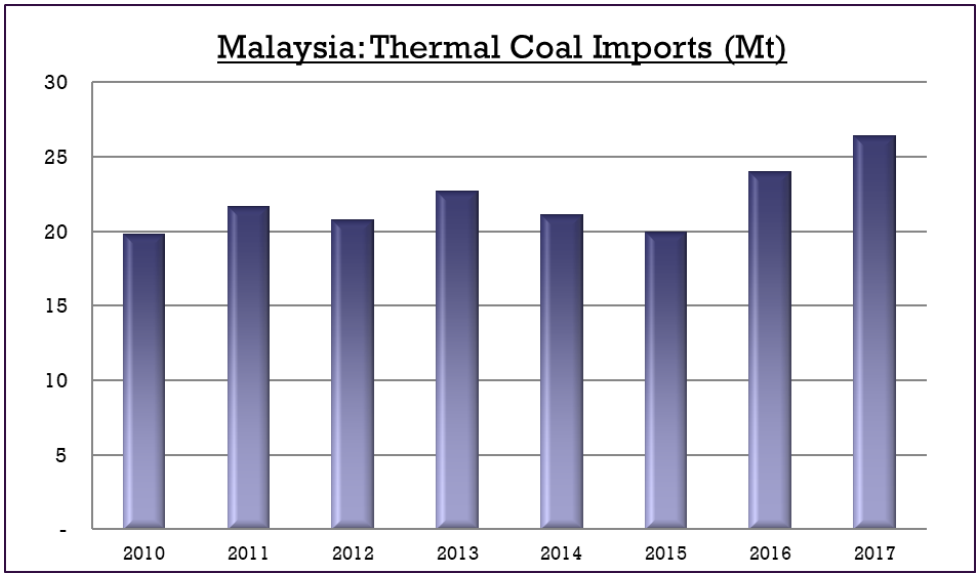
When combined with the short-term forecast outlined earlier and the electricity demand forecast, this results in a thermal coal import requirement for Taiwan as follows:

| Taiwan | 2017 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Thermal Coal Imports (Mt) | 58 | 65 | 67 | 68 |
| Imports from Australia (Mt) | 23 | n/a | n/a | n/a |

*Source: Commodity Insights.*

## 3.7. Malaysia

In 2017, Malaysia imported an estimated 26Mt of thermal coal. Since 2010, Malaysian imports have grown steadily from 20Mt, due to new coal-fired capacity being commissioned.

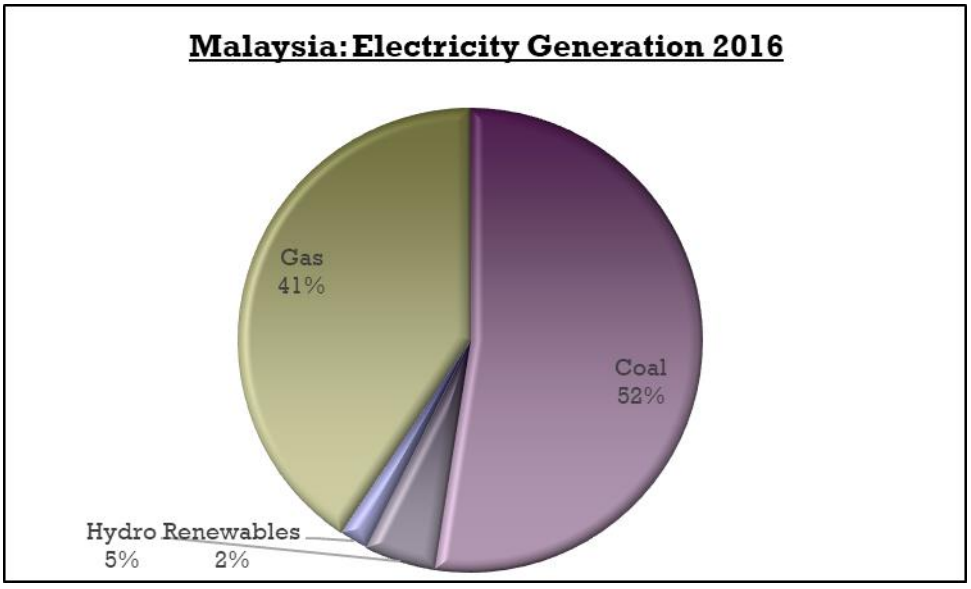



*Source: Commodity Insights*

Malaysian thermal coal imports are heavily Indonesian-focused, accounting for around two-thirds of the total volume, while Australian imports account for around 20%.

### *Current Electricity Mix*

Coal is the dominant fuel in Malaysia's electricity generation mix, accounting for 52% of output in 2016, followed by LNG at 41% and small volumes of hydro and renewables.




*Source: Malaysia Electricity Supply Outlook 2017, TNEB*

## Domestic Coal Production

Malaysia has small volumes of domestic coal production (less than 3Mtpa) which is not expected to grow, and therefore is dependent on imports to meet its incremental electricity requirements.

## Short-Term Outlook

Malaysia has a steady program of new coal-fired capacity being commissioned from 2017-2020, due to strong electricity demand growth and the retirement of several gas-fired units. Three 1,000MW units are planned for commissioning, with Janamanjung 5 starting operations in late 2017, and the two units at Jimah expected to commence in 2019 and 2020 respectively.

| Malaysia | 2017 | 2018f | 2019f | 2020f | 2021f | 2022f |
|---|---|---|---|---|---|---|
| Capacity Addition (MW) | 1,000 | - | 1,000 | 1,000 | - | - |
| Thermal Coal Imports (Mt) | 26 | 28 | 30 | 33 | 35 | 35 |

*Source: Commodity Insights.*

## Energy and Emissions Policy

The Malaysia Electricity Supply Outlook 2017was published by the Energy Commission of Malaysia. This document includes clear projections of generation mix for Malaysia out to 2026, including:

- A reduced dependency on natural gas, primarily due to the retirement of gas plants, will result in their share of generation falling from 41% in 2016 to 32% in 2026.
- Renewables will double their generation share from 2% in 2016 to 4% in 2026. Hydro will remain steady at around 5%, while 3% will be added to the grid due to an interconnection from 2024 onwards.
- In terms of power generation, the target for coal rises from 53% in 2016 to 56% in 2026 and peaking at 57% from 2018-23 inclusive. Renewables are 20%, gas 18.8% and nuclear 23.9% respectively.

Commodity Insights has based its estimates of coal's share in generation on these targets.

## Long-Term Forecast

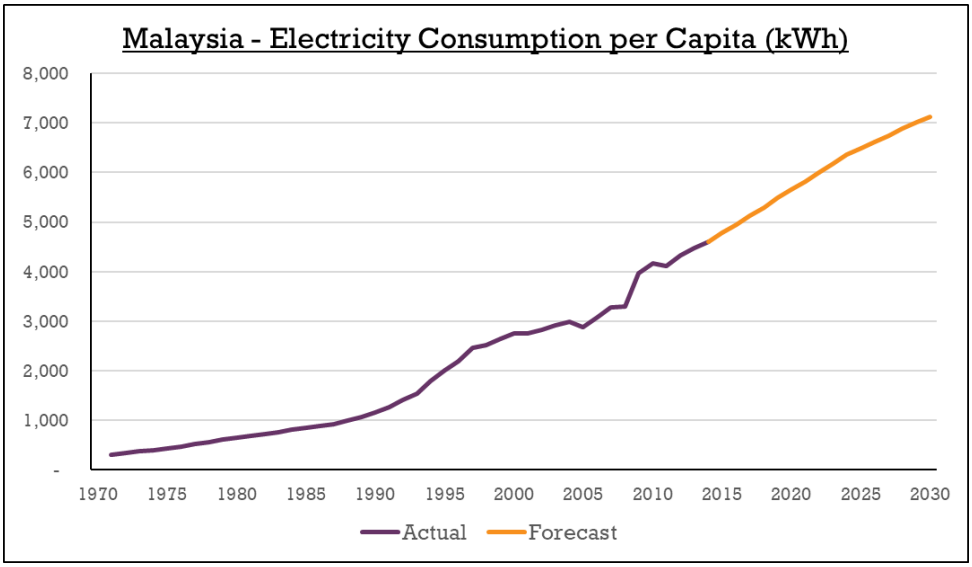
According to the United Nations, Malaysia's population at the end of 2015 was 30.7 million and is forecast to rise to around 36.8 million by 2030, as per the table below.

| Malaysia | 2015 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Population (Mill) | 30.7 | 32.9 | 35.0 | 36.8 |

*Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, Medium Variant.*

Malaysian electricity consumption per capita, while not to the level of a developed country, is the highest in the countries studied covered in this report outside the north Asian region (Japan, Korea and Taiwan). In 2014, consumption in Malaysia was just under 4,600kWh (latest reported figures available).

Malaysia's electricity consumption per capita is still growing, at an average of 5.1% from 2008-14. We have forecast growth to continue but at a slower rate, so by the end of the forecast period in 2030 Malaysia's consumption per capita is over 7,000kWh per capita (still below all the north Asian countries), but only growing at 1.5% per annum.




*Source: Commodity Insights, World Bank.*

Combining the population growth forecasts from the United Nations and the estimate of electricity consumption per capita growth above, results in the forecast electricity demand for Malaysia below.

| Malaysia | 2016 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Electricity Demand (TWh) | 155 | 187 | 228 | 264 |

*Source: Commodity Insights.*

In terms of the contribution of coal to electricity generation, the following assumptions have been made for the forecast:

- For the base year of 2016, the actual figure of 52% is applied.
- From 2017-26, the target figures from TNEB's Malaysia Electricity Supply 2017 are applied, which results in coal's share increasing to 57% in 2017, holding between 55% and 57% and ending the forecast period (2026) on 56%.
- From 2027 to 2030, coal's contribution is held at the 2026 level of 56%.

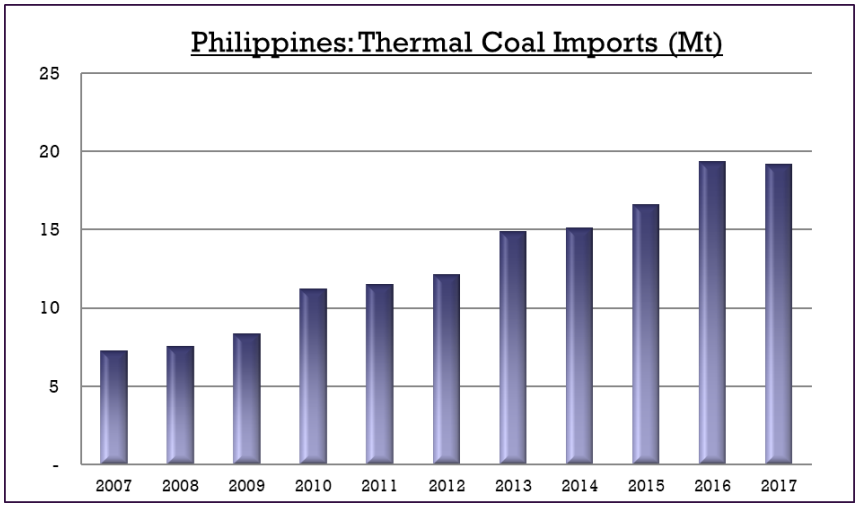
When combined with the short-term forecast outlined earlier and the estimated electricity demand, this results in the following thermal coal import requirement for Malaysia.

| Malaysia | 2017 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Thermal Coal Imports (Mt) | 26 | 33 | 38 | 45 |
| Imports from Australia (Mt) | 6 | n/a | n/a | n/a |

*Source: Commodity Insights.*

## 3.8. Philippines

The Philippines imported an estimated 19Mt of thermal coal in 2017. Philippine thermal coal imports have more than doubled from 7Mt in 2007.

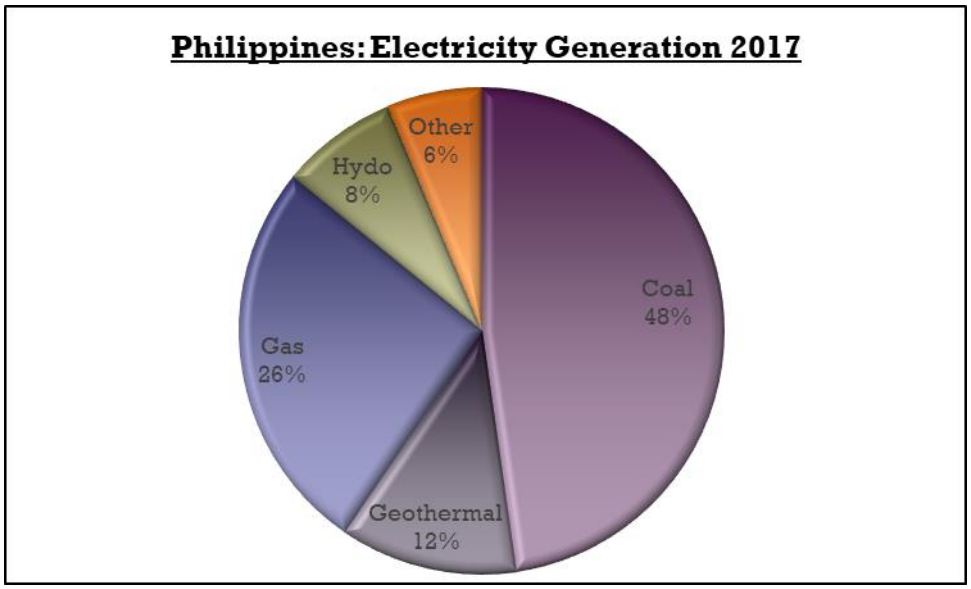



*Source: Commodity Insights*

Indonesian supply accounts for around 80% of Philippines thermal coal imports, with Australia accounting for around 10%.

### *Current Electricity Mix*

Coal is the dominant fuel in the Philippines electricity generation mix, accounting for 48% of output in 2017, followed by gas at 26%, geothermal at 12% and a small volume of hydro.




*Source: Philippine Electricity Market Corporation*

## Domestic Coal Production

The Philippines does have some domestic coal production, producing around 10Mt each year. However, the majority of this is exported, with only 3-4Mt used domestically at present. While there are some loose plans to expand the sector, details are unclear, and our understanding is that most domestic coal reserves are not suitable for use in the power generation sector.

## Short-Term Outlook

The Philippines has one of the most ambitious coal-fired power generation plans in Asia, with almost 10,000 MW of new capacity scheduled for commissioning by 2022, and a large program also scheduled further out. This program, which to our understanding will be completely met by imported coal, will drive Philippine imports up strongly by 2022, as tabled below.

| Philippines | 2017 | 2018f | 2019f | 2020f | 2021f | 2022f |
|---|---|---|---|---|---|---|
| Capacity Addition (MW) | 450 | 1,770 | 2,750 | 1,970 | 1,400 | 670 |
| Thermal Coal Imports (Mt) | 21 | 24 | 31 | 40 | 46 | 50 |

*Source: Commodity Insights.*

## Energy and Emissions Policy

The Power Development Plan 2016-40, developed by the Department of Energy, is the current policy document driving electricity developments in the Philippines. This is supported by the Transmission Development Plan 2016-40, which is developed by the National Grid Corporation of the Philippines (NGCP). The latter document is more prescriptive in terms of future energy mix in the Philippines, including the following targets for installed capacity mix:

- Coal's share of the capacity mix (not to be confused with the power generation mix) is expected to rise from 35% in 2016 to 43% in 2030.
- Also expected to increase their share of installed capacity are solar (from 3% to 7%), wind (from 2% to 6%). At the same time, the share of installed capacity will fall for natural gas (from 16% to 14%), geothermal (from 9% to 4%) diesel/oil (from 17% to 9%) while hydro will stay constant.

Note that at this stage, only the Consultation Draft of the Transmission Development Plan 2016-40 has been released, and provides the targets quoted above. Commodity Insights has assumed that there will not be significant changes in the plan details between the Draft and Final Reports.

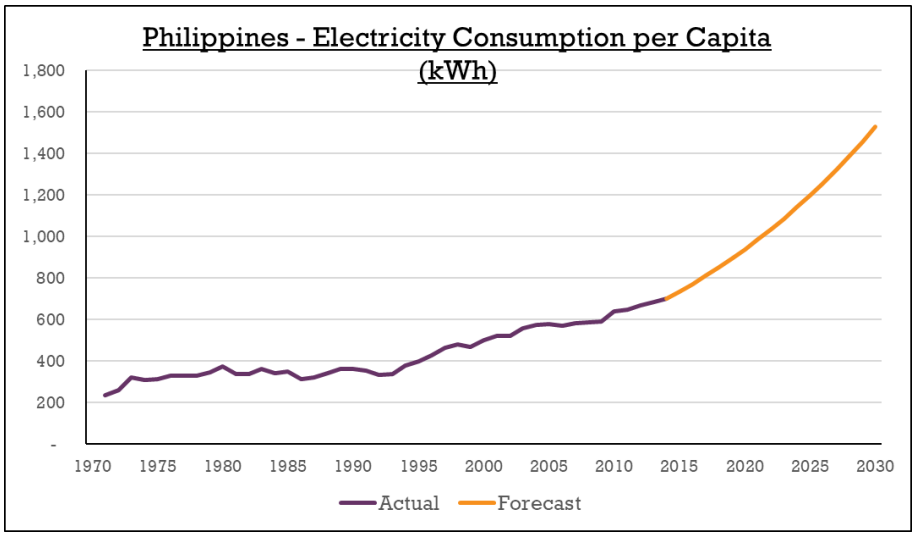
## Long-Term Forecast

According to the United Nations, the Philippines population at the end of 2015 was 102 million and is forecast to rise to around 125 million by 2030, as per the table below.

| Philippines | 2015 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Population (Mill) | 101.7 | 109.7 | 117.7 | 125.4 |

*Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, Medium Variant.*

The Philippines electricity consumption per capita is among the lower levels in Asia, at 700kWh per capita in 2014. This is half the level of Vietnam and a quarter the level of Thailand. Growth in per capita electricity consumption has also been quite slow, averaging 2.7% from 2008-14. However, given the large program on new capacity being commissioned, we expect to this to increase to around 5% across the forecast period. By 2030 the Philippines's consumption per capita is just over 1,500kWh per capita which is approximately Vietnam's current level.




*Source: Commodity Insights, World Bank.*

Combining the population growth forecasts from the United Nations and the estimate of electricity consumption growth, results in the forecast electricity demand below.

| Philippines | 2016 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Electricity Demand (TWh) | 91 | 117 | 160 | 218 |

*Source: Commodity Insights.*

In terms of the contribution of coal to electricity generation, the following assumptions have been made for the forecast:

- For the base year of 2016, the actual figure of 48% is applied.
- For 2030, we have estimated the contribution of coal to be 56%. In 2016, the installed capacity of coal was 35% but it accounted for 48% of total generation. As noted above, the installed capacity share of coal is forecast to be 43% by 2030, an increase of 8 percentage points. So, it could be conservatively expected that coal's share of power generation would also increase by eight percentage points, or 56% in 2030.

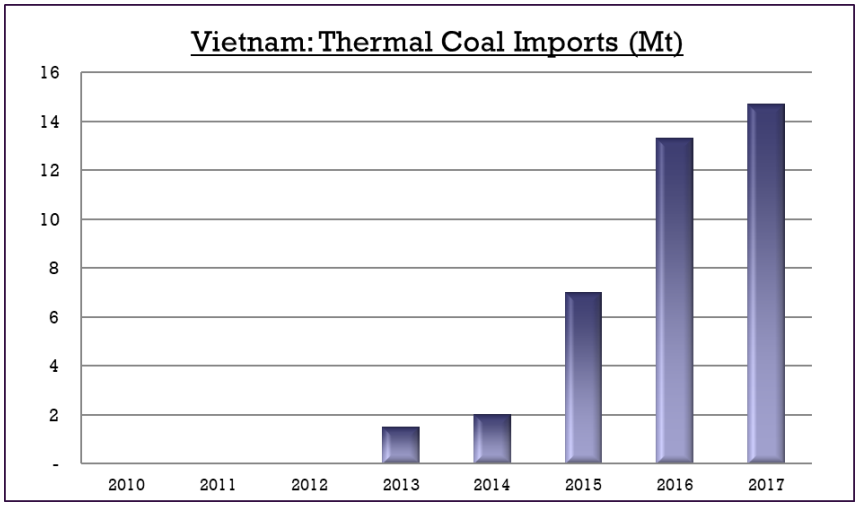
When combined with the short-term forecast outlined earlier and the electricity demand forecast, this results in the following thermal coal import requirement for the Philippines.

| Philippines | 2017 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Thermal Coal Imports (Mt) | 21 | 40 | 58 | 74 |
| Imports from Australia (Mt) | 1.5 | n/a | n/a | n/a |

*Source: Commodity Insights.*

## 3.9. Vietnam

Vietnam is a relative newcomer as an importer of thermal coal from the seaborne market, with its first cargoes delivered in 2013. However, since then imports have grown rapidly to 7Mt in 2015 and then 15Mt in 2017, as shown below.

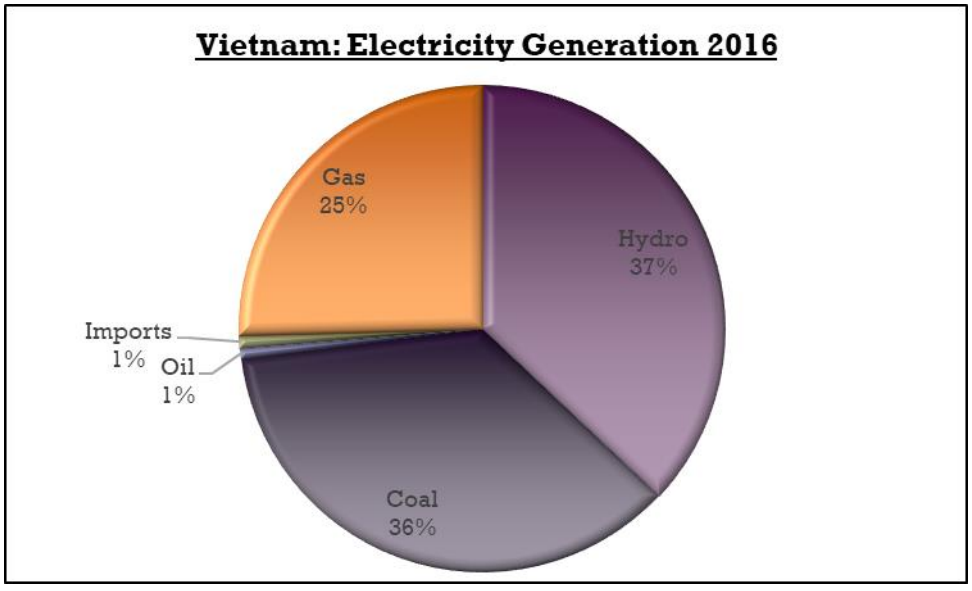



*Source: Commodity Insights*

Vietnam imports a mixture of thermal coals, with Indonesia (50%), Australia (25% and Russia (17%) its major suppliers.

### *Current Electricity Mix*

Power generation in Vietnam is currently dominated by hydro (37%), coal (36%) and gas (25%), which account for almost all output. A small amount of power is imported and there is some oil-fired generation.




*Source: Ministry of Industry and Trade, General Directorate of Energy*

## Domestic Coal Production

Vietnam is one of the more substantial coal producers in Southeast Asia, producing around 40Mt of coal that is generally used in the power generation sector. Vietnam was historically an exporter of up to 20Mtpa, but this has ceased now due to strong domestic demand.

## Short-Term Outlook

Of all the countries covered in this study outside of China and India, Vietnam has the most aggressive plan for additional coal-fired power generation in the short-term. Driven by rapidly growing electricity demand growth, Vietnam has almost 17,000 MW of new capacity scheduled for commissioning by 2022, with other plants in the pipeline beyond 2022. Our estimate of the new capacity commencement dates is tabled below, along with a resultant forecast of thermal coal import demand, which is expected to quadruple from 15Mt in 2017 to 60Mt in 2022.

| Vietnam | 2017 | 2018f | 2019f | 2020f | 2021f | 2022f |
|---|---|---|---|---|---|---|
| Capacity Addition (MW) | 1,840 | 1,200 | 1,860 | 1,920 | 4,720 | 5,260 |
| Thermal Coal Imports (Mt) | 15 | 21 | 26 | 33 | 43 | 60 |

*Source: Commodity Insights.*

## Energy and Emissions Policy

Energy Policy in Vietnam is currently driven by the Revised Power Development Plan version 7, which was issued by the Ministry of Industry and Trade. The plan is quite prescriptive in terms of targeted generation shares by fuel, including the following targets for coal-fired generation:

- By 2020, to reach 49% of total power generation. This is consistent with the considerable program of new generation capacity we see being developed in Vietnam.
- By 2025, coal is forecast to reach 55% of total power generation, which will then ease slightly to 53% by 2030.

Interestingly, the PDP7 (revised) also forecasts thermal coal imports for Vietnam to reach 102Mt by 2030, which is quite close to our forecast later in this section.

## Long-Term Forecast

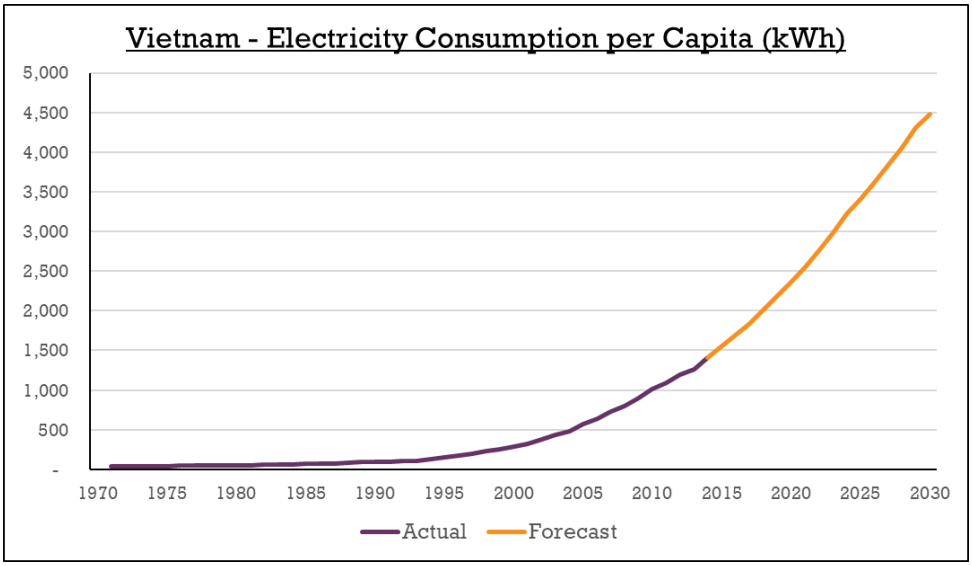
According to the United Nations, Vietnam's population at the end of 2015 was 93 million and is forecast to rise to around 106 million by 2030, as per the table below.

| Vietnam | 2015 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Population (Mill) | 93.6 | 98.4 | 102.8 | 106.3 |

*Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, Medium Variant.*

Vietnam's electricity consumption per capita is quite low but growing rapidly. In 2014, it was just over 1,400 kWh per capita, which was less than 20% the level of Japan by way of comparison. However, from 2008-14, growth averaged slightly over 10% per annum, so its power demand is one of the fastest growing in the world.

We forecast this growth to continue for some time (and so do the Ministry of Industry and Trade, which include overall power generation forecasts in their Power Development Plan, which are close to our estimates), so that by 2030, the average consumption per capita is 4,500 kWh, which is still well below the level of the North Asian countries today.




*Source: Commodity Insights, World Bank.*

Combining the population growth forecasts from the United Nations and the estimate of electricity consumption per capita growth above, results in the forecast electricity demand for Vietnam below.

| Vietnam | 2016 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Electricity Demand (TWh) | 177 | 258 | 389 | 528 |

*Source: Commodity Insights.*

In terms of the contribution of coal to electricity generation, the following assumptions have been made for the forecast:

- For the base year of 2016, the actual figure of 36% is applied.
- For the remainder of the forecast period, the targets from the revised Power Development Plan 7 are applied (i.e. 49% by 2020, 55% by 2025 and 53% by 2030).
- For years between these milestone years, a straight-line growth or decline is assumed between each of the milestone points.

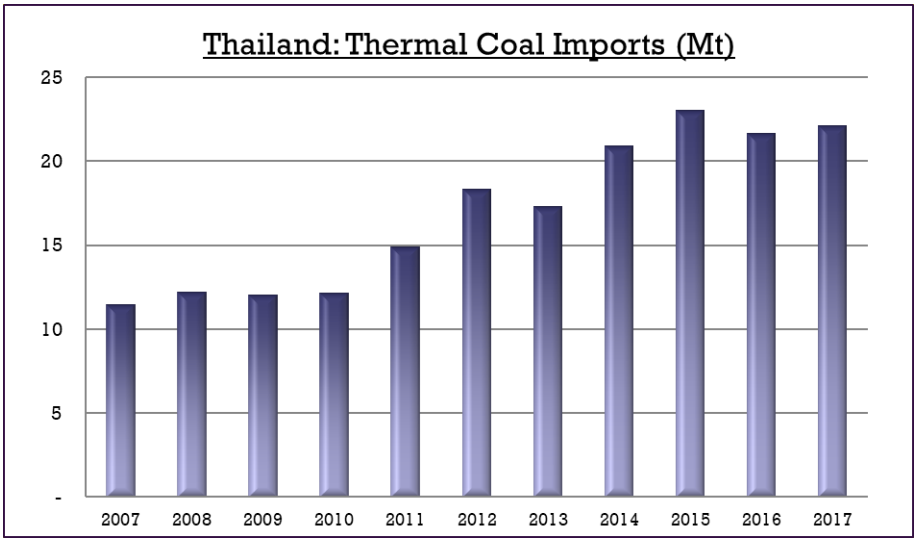
When combined with the short-term forecast outlined earlier and the electricity demand forecast, this results in the following thermal coal import requirement for Vietnam. Note that this forecast is more conservative than the government's, which forecasts imports of 102Mt in 2030.

| Vietnam | 2017 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Thermal Coal Imports (Mt) | 15 | 33 | 71 | 85 |
| Imports from Australia (Mt) | 1.7 | n/a | n/a | n/a |

*Source: Commodity Insights.*

## 3.10. Thailand

Thailand's imports of thermal coal have doubled in the last decade, from 11Mt in 2007 to 22Mt in 2017, although the peak level of 23Mt was achieved in 2015, as shown below.

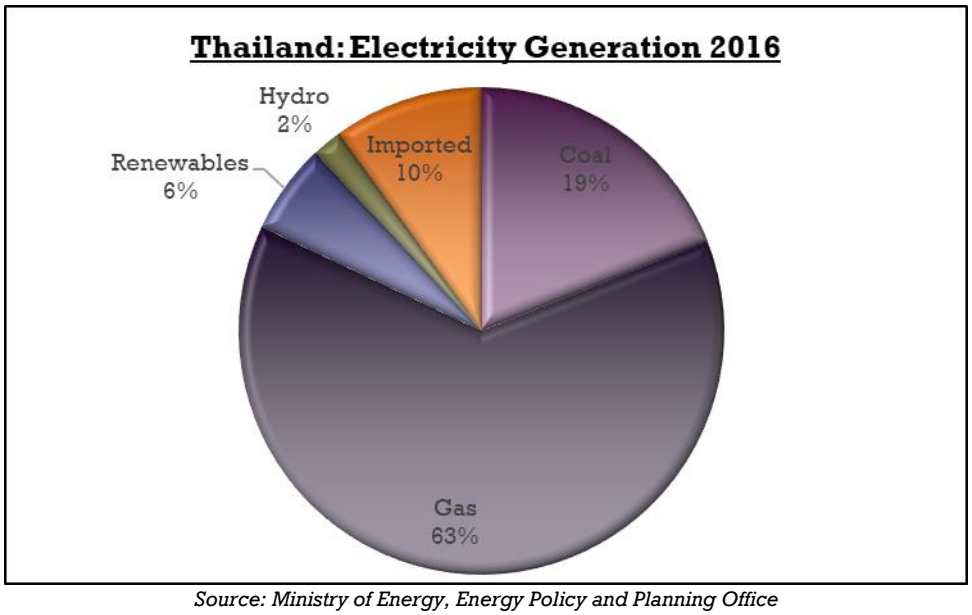



*Source: Commodity Insights*

Over 70% of Thailand's thermal coal imports are sourced from Indonesia, with the balance coming from Australia (17%) and Russia (7%).

### *Current Electricity Mix*

Gas is the dominant fuel in Thailand's electricity generation mix, accounting for 63% of output in 2016, followed by coal at 19% and small volumes of hydro and renewables. Thailand also imports around 10% of its power from other countries.




*Source: Ministry of Energy, Energy Policy and Planning Office*

## Domestic Coal Production

Thailand has a small domestic coal production sector whose output has consistently been around the 20Mt level since 2000. Note that any planned power plants that will utilise domestic coal production have been removed from our import forecast.

## Short-Term Outlook

Thailand's coal-fired expansion plans are more conservative than its southeast Asian neighbours, with around 2,300 MW scheduled for commissioning between 2017-22. Note that this figure excludes plants that will utilise domestic coal. However, the conservatism on coal-fired power may be about to change. In mid-April 2018, the Thai Energy Minister noted that the country needed to have more coal in its energy mix, as its reliance on gas (and declining domestic gas reserves) were resulting in gas being imported, which is quite expensive. The Minister also noted that new sites for several coal-fired power plants would be decided by the end of 2018.

| Thailand | 2017 | 2018f | 2019f | 2020f | 2021f | 2022f |
|---|---|---|---|---|---|---|
| Capacity Addition (MW) | 540 | - | 800 | - | 1,000 | - |
| Thermal Coal Imports (Mt) | 22 | 23 | 24 | 26 | 27 | 30 |

*Source: Commodity Insights.*

## Energy and Emissions Policy

In July 2015 the Thai Ministry of Energy published the Thailand Power Development Plan 2015-36, also known as PDP2015. An update of the PDP2015 is due to be published in 2018. Supporting headline goals around energy security, economy and ecology, the plan also outlined estimated fuel targets for power generation for both 2026 and 2036. These are as follows:

- Gas will fall to between 45-50% in 2026 and 30-40% in 2036.
- Renewables will rise to 10-20% in 2026 and 15-20%. Imported hydro power will also rise.
- Coal will rise to 20-25% in both 2026 and 2036.

## Long-Term Forecast

According to the United Nations, Thailand's population at the end of 2015 was 68.7 million and is forecast to rise slightly to 69.6 million by 2030, as per the table below.

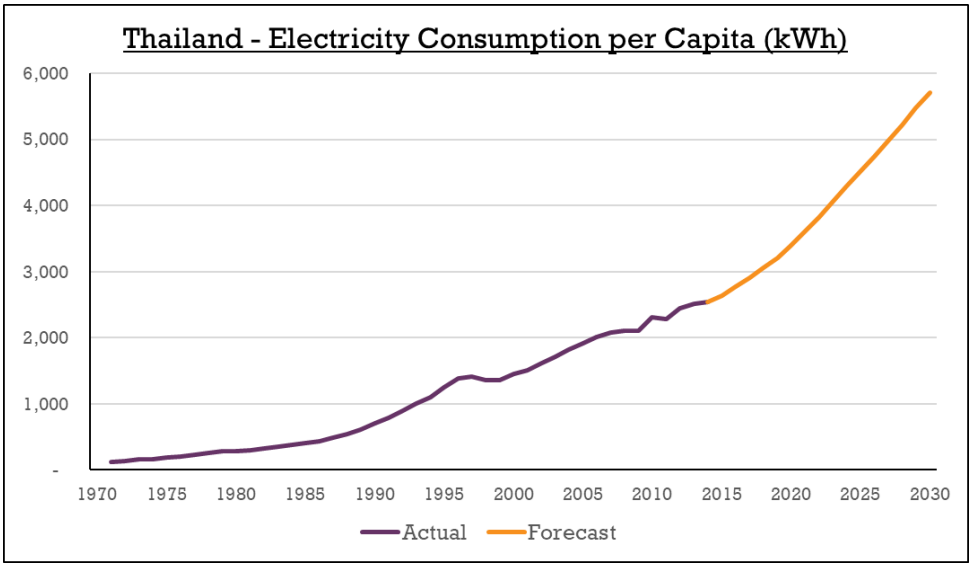
| Thailand | 2015 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Population (Mill) | 68.7 | 69.4 | 69.7 | 69.6 |

*Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, Medium Variant.*

Thailand's electricity consumption per capita is still quite low, at 2,540 kWh per capita in 2014. This is less than one third of Japan's consumption level and around one quarter of Korea's.

Thailand's electricity consumption per capita is still growing, at an average of 3.0% from 2008-14. We have forecast growth to continue but at a faster rate, based on the historical patterns of growth explained earlier in the report. Even so, the fastest growth rate we have forecast is 6%,

which is well below what some of Thailand's neighbours have already achieved. By the end of the forecast period in 2030 Thailand's consumption per capita is over 5,700kWh per capita (still below all the north Asian countries, China and Malaysia).




*Source: Commodity Insights, World Bank.*

Combining the population growth forecasts from the United Nations and the estimate of electricity consumption per capita growth, the electricity demand forecast for Thailand over the period is as follows:

| Thailand | 2016 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Electricity Demand (TWh) | 183 | 227 | 302 | 381 |

*Source: Commodity Insights.*

In terms of the contribution of coal to electricity generation, the following assumptions have been made:

- For the base year of 2016, the actual figure of 19% was applied.
- From 2017-26, a steady ramp up is forecast, reaching 25% in 2026, which is the upper limit of the target in the PDP2015. We have assumed the upper limit will be achieved due based on the Energy Minister's recent comments on the requirement for further coal investment in Thailand.
- Beyond 2026, we have assumed the contribution of coal-fired generation remains at 25% for the balance of the forecast period (2027-30).

When combined with the short-term forecast outlined earlier and the electricity demand forecast, this results in the following thermal coal import requirement for Thailand.

| Thailand | 2017 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Thermal Coal Imports (Mt) | 22 | 26 | 40 | 54 |
| Imports from Australia (Mt) | 4 | n/a | n/a | n/a |

*Source: Commodity Insights.*

## 3.11. Other Asia

For the purposes of this report, 'Other Asia' is defined as Bangladesh, Pakistan and Sri Lanka. All three countries have recently commenced importing thermal coal on the seaborne market, with estimated combined imports of 12Mt in 2017. They import from a variety of sources, but primarily South Africa (mainly to Pakistan) and Indonesia.

### *Short-Term Outlook*

This group of countries, and particularly Pakistan and Bangladesh, have significant programs of new-coal fired power generation capacity scheduled for commissioning over the next five years, with over 12,000 MW as shown below. This is being driven by energy shortages, and in Pakistan's case, supporting investment by the Chinese government in the power sector. As a result, we expect import from this region to increase strongly by 2022.

| Other Asia | 2017 | 2018f | 2019f | 2020f | 2021f | 2022f |
|---|---|---|---|---|---|---|
| Capacity Addition (MW) | 1,980 | 660 | 2,860 | 2,500 | 3,830 | 1,320 |
| Thermal Coal Imports (Mt) | 12 | 17 | 21 | 30 | 40 | 50 |

*Source: Commodity Insights.*

### *Energy and Emissions Policy*

Details regarding the energy and emissions policies of these countries are not particularly transparent or available, but we have sourced the following information regarding coal:

- The Pakistan Vision 2025 includes goals to double electricity generation capacity to 42,000 MW by 2025. Currently, coal accounts for less than 5% of power generation.
- Bangladesh's Power System Master Plan 2016 includes a target of 35% of power generation from coal (up from around 3% at present)

### *Long-Term Forecast*

According to the United Nations, Other Asia's population at the end of 2015 was 370 million and is forecast to rise to 450 million by 2030, as per the table below.

| Other Asia | 2015 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Population (Mill) | 370 | 400 | 426 | 450 |

*Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, Medium Variant.*

Combining the population growth forecasts from the United Nations and the estimate of electricity consumption per capita growth, the electricity demand forecast for the region over the period is as follows:

| Other Asia | 2016 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Electricity Demand (TWh) | 175 | 244 | 383 | 606 |

*Source: Commodity Insights.*

When combined with the short-term forecast outlined earlier and the electricity demand forecast, this results in the following thermal coal import requirement for Other Asia.

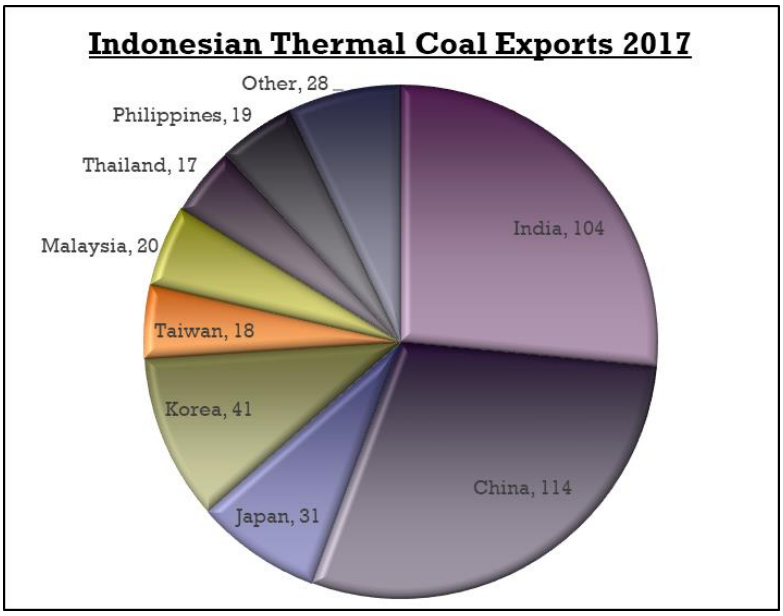
| Other Asia | 2017 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Thermal Coal Imports (Mt) | 12 | 30 | 60 | 88 |
| Imports from Australia (Mt) | 0.1 | n/a | n/a | n/a |

*Source: Commodity Insights.*

## 3.12. Indonesia

Indonesia is not an importer of thermal coal, but rather the world's largest exporter. We are reviewing Indonesia from the demand side, as per the other countries in this section, to assess the likely requirement for thermal coal domestically, which may impact Indonesia's ability to export large volumes of thermal coal across the forecast period.

Indonesia exported an estimated 392Mt of thermal coal in 2017, with China and India being the largest importers as charted below.




*Source: Commodity Insights.*

### *Short-Term Outlook*

Like many of its southeast Asian neighbours, Indonesia has a strong program of new coal-fired power capacity being commissioned in the near term. This includes over 18,000 MW of plants commencing operations from 2019-22.

In 2017, Indonesia consumed 83Mt of thermal coal in the power sector. All this coal was sourced domestically. Based on the new program of coal-fired capacity, Commodity Insights estimates that the domestic requirement for coal in the Indonesian power sector will rise to 141Mt by 2022, an increase of 58Mt.

We have assumed this coal will be sourced domestically. Not only does Indonesia have abundant coal resources, but the plants are being developed to consume an Indonesian specification of coal, and legally the Domestic Market Obligation (DMO) mechanism ensures that domestically-produced coal is diverted to the domestic market in sufficient volumes, even if market returns are higher in the export market.

| Indonesia | 2017 | 2018f | 2019f | 2020f | 2021f | 2022f |
|---|---|---|---|---|---|---|
| Capacity Addition (MW) | - | - | 4,000 | 7,400 | 3,400 | 3,800 |
| Coal Requirement (Mt) | 83 | 92 | 101 | 115 | 130 | 141 |

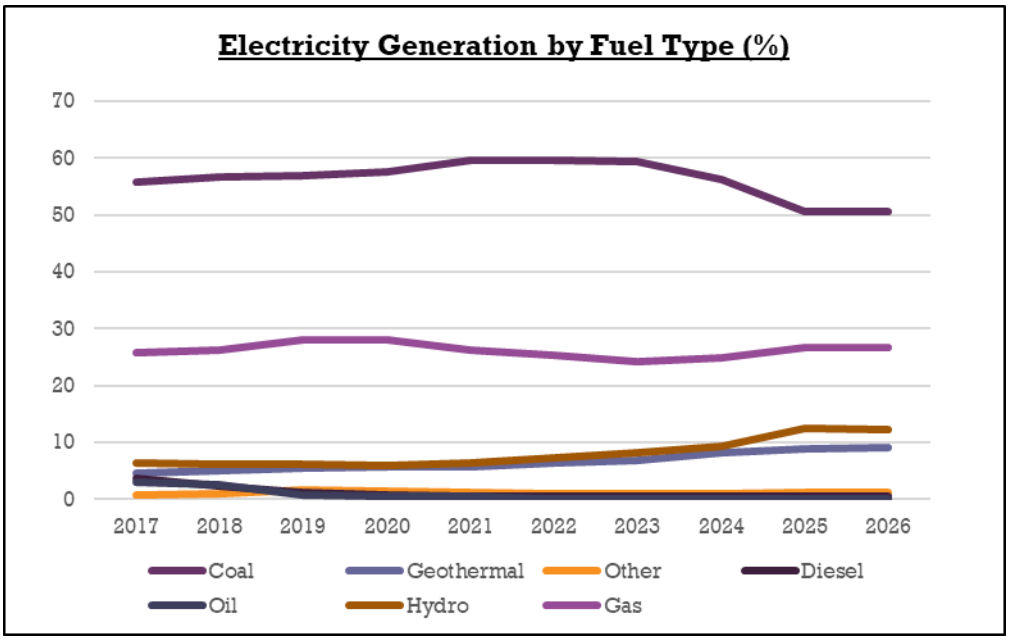
*Source: Commodity Insights.*

## *Energy and Emissions Policy*

Indonesia's Electricity Supply Business Plan (RUPTL) is prepared by the state-owned electricity company PT Perusahaan Listrik Negara (PLN). The most recent version, RUPTL 2017-26, was issued in 2017, and its key elements are below:

- It has raised the share of renewable energy target to 22.5% in the country's electricity mixed by 2025, up from 19.6% in the previous plan.
- The plan targets installed power capacity of 125GW by 2025, up from around 55GW at present.

PLN has also issued an energy mix forecast in its RUPTL 2017-26. According to the document, over the forecast period (i.e. to 2026), Indonesia plans to almost completely phase out diesel and oil generation as well as electricity imports. This will be offset by stronger contributions from hydro and geothermal, while coal and gas remain the backbone of the electricity generation sector over the period. The targeted electricity mix for Indonesia from the RUPTL 2017-26 is charted below.




*Source: RUPTL 2017-26 (PLN)*

Commodity Insights has some observations about PLN's targets for power generation by fuel:

- It appears extremely unusual that coal's share of generation falls from almost 60% in 2024 to just over 50% in 2026. In our view, this will be impossible to achieve. We believe these numbers are being driven by the government target of 50% of power generation to come from coal in 2025, rather than a realistic assessment.
- Conversely, the forecast assumes both hydro and geothermal will double their share of generation in a ten-year period while overall generation is growing strongly (which implies around a four-fold increase in actual generation). Geothermal in Indonesia particularly has a very chequered history and we are sceptical of these targets. Again, we believe they are idealistic rather than realistic.

## *Long-Term Forecast*

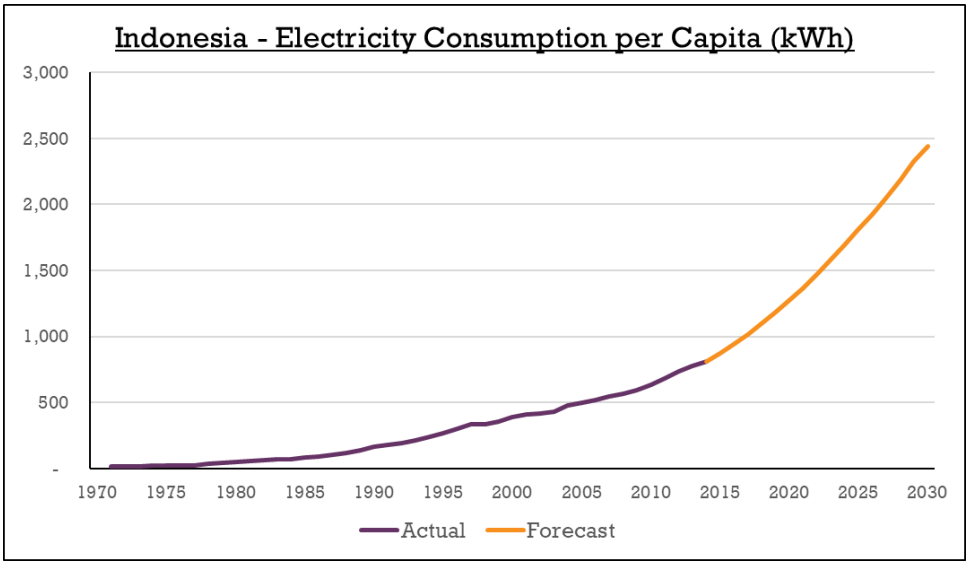
According to the United Nations, Indonesia's population at the end of 2015 was 257 million and is forecast to rise to 295 million by 2030, as per the table below.

| Indonesia | 2015 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Population (Mill) | 257 | 272 | 285 | 295 |

*Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, Medium Variant.*

Indonesia's electricity consumption per capita is still very low, at 800 kWh per capita in 2014. This is around one third of Thailand's consumption level and one tenth of Japan's.

Indonesia's electricity consumption per capita is growing strongly, at an average of 5.9% from 2008-14. We have forecast growth to continue at a fast rate, based on the historical patterns of growth explained earlier in the report. By the end of the forecast period in 2030 Indonesia's consumption per capita is 2,440kWh per capita, which is still less than Thailand's current level.




*Source: Commodity Insights, World Bank.*

Combining the population growth forecasts from the United Nations and the estimate of electricity consumption per capita growth, the electricity demand forecast for Indonesia over the period is as follows:

| Indonesia | 2016 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Electricity Demand (TWh) | 248 | 346 | 521 | 783 |

*Source: Commodity Insights.*

In terms of the contribution of coal to electricity generation, the following assumptions have been made:

- For the base year of 2016, the actual figure of 55.8% was applied.

- From 2018-23, the actual estimates from the RUPTL 2017-26 are applied. For 2024-30, we have assumed the contribution of coal-fired generation remains at 59.4% (the 2023 level) for reasons explained previously.

When combined with the short-term forecast outlined earlier and the electricity demand forecast, this results in a domestic power sector thermal coal requirement for Indonesia as follows:

| Indonesia | 2017 | 2020f | 2025f | 2030f |
|---|---|---|---|---|
| Domestic Coal Requirement (Mt) | 83 | 115 | 177 | 250 |

*Source: Commodity Insights.*

The inference from this is that an additional 167Mt per annum will be required in Indonesia by 2030 from 2017 to service the power sector requirements. This will obviously restrain Indonesia's ability to grow exports over the period and may even result (in our view) in a decline in Indonesian export volumes post-2020.

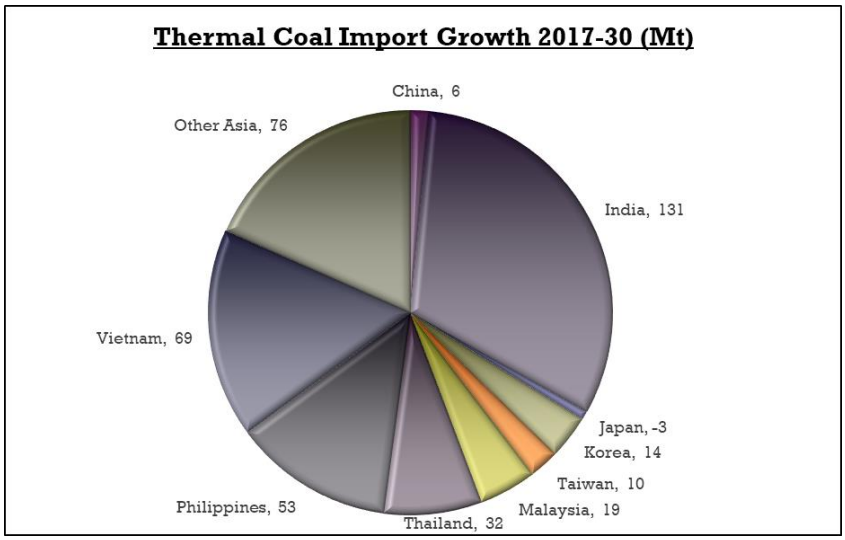
## 3.13. Demand Summary

Based on our forecasts in the preceding sections, our overall forecast of Asian thermal coal import demand is presented below. Imports are expected to grow just over 400Mt from 2017 to 2030, an average annual growth rate of 3.4% (which is below historical levels). This represents annual growth of around 32 Mt, which compares to annual growth of around 37Mt from 2007-17.

| Country (Imports Mt) | 2017 | 2020f | 2025f | 2030f | Growth |
|---|---|---|---|---|---|
| China | 188 | 175 | 188 | 194 | 6 |
| India | 137 | 155 | 201 | 268 | 131 |
| Japan | 144 | 153 | 157 | 141 | (3) |
| Korea | 116 | 131 | 140 | 131 | 15 |
| Taiwan | 58 | 65 | 67 | 68 | 10 |
| Malaysia | 26 | 33 | 38 | 45 | 19 |
| Philippines | 21 | 40 | 58 | 74 | 53 |
| Vietnam | 15 | 33 | 71 | 85 | 70 |
| Thailand | 22 | 26 | 40 | 54 | 32 |
| Other Asia | 12 | 30 | 60 | 88 | 76 |
| **Total** | **740** | **841** | **1,020** | **1,147** | **407** |

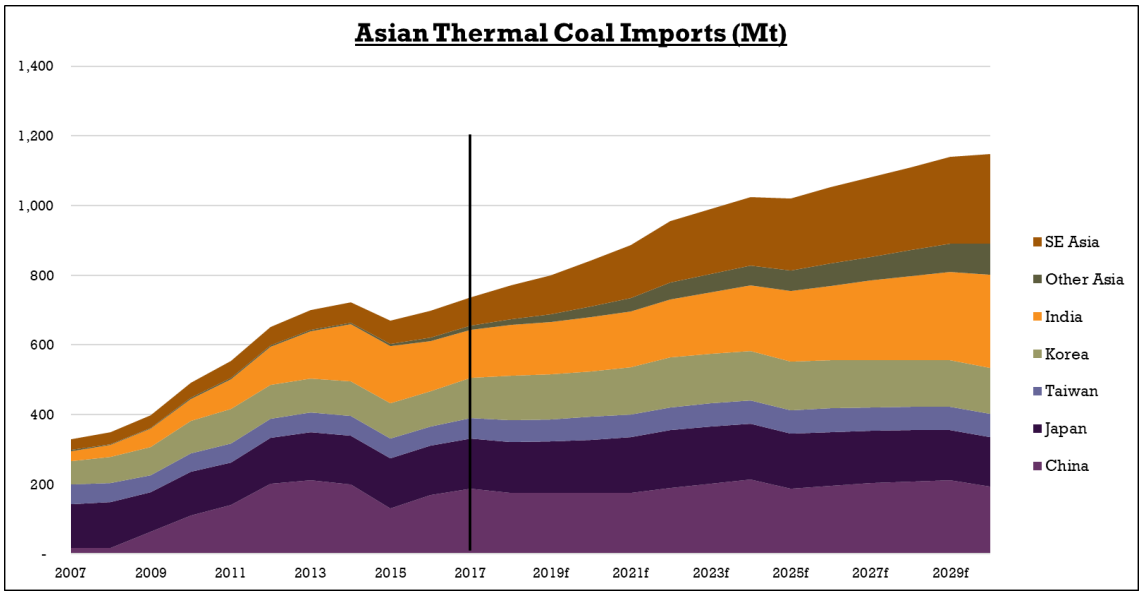
*Source: Commodity Insights.*

This growth represents a potentially significant opportunity for Australian thermal coal exporters, particularly if exports from Indonesia decline over the period by over 150Mt (which is our view). Importantly, the growth is not reliant on one or two importers but is widely spread across Asia, as charted below.




*Source: Commodity Insights.*

The forecast growth rate of Asian thermal coal import demand from 2018-30 is less than the rate between 2007-17 (see chart below), but the growth is more evenly spread across the region and not so reliant on China. Note that SE Asia in this instance includes Malaysia, Thailand, the Philippines and Vietnam.




*Source: Commodity Insights.*

## 3.14. The Outlook for Australian Thermal Coal

The demand growth profile presented in this report is a potentially significant opportunity for Australian thermal coal exporters. Even half the growth we have forecast, or 200Mt, is still significant and equivalent to the entire 2017 Australian thermal coal exports. The growth opportunities may be greater if Indonesian exports slow or decline (see section 3.12) due to domestic demand pressures, which would widen the demand-supply gap in Asia further.

Australian thermal coal is already very well positioned into the Asian seaborne market, for the reasons explained in section 2.2, which bear repeating below:

- Coal quality and end user design dependency.
- End user mine equity.
- Take or pay contracts.
- Industry infrastructure ownership/control.
- Key off-take market stability.

Australian thermal coal export supply is also very stable and dependable, regardless of the state of the market (unlike Indonesia, for example, which can experience large fluctuations in supply volumes based on market prices), which is very important for customers in the power sector who need long-term, stable supplies of thermal coal.

Australian infrastructure for both rail and port can support an expansion in thermal coal exports, thanks to a range of upgrades during the last export boom of 2010-12. We estimate there is currently over 100Mt of 'spare' capacity (difference between nameplate and throughput) at Australian east coast coal ports. While this may have to be shared with metallurgical coal exports, it is still a significant latent capacity for the industry. So, unlike the last boom, when infrastructure was the constraint (causing massive vessel queues at Newcastle and Mackay), the constraint at present is upstream at the coal mines, which have been slow to ramp up volumes.

It should be noted that this slow response is not unusual for Australian thermal coal exports. Commodity Insights research has shown that on average, it has historically taken a minimum of four years for Australian thermal coal exports to respond materially to higher price signals, which is probably much longer now. We believe that suppliers in Australia will respond, but the response will be slower than other exporters.

Longer term, Australia can participate and benefit from the significant opportunity presented by the growth in Asian thermal coal demand over the next decade, but there are challenges. For example, approval processes are long, involve numerous stakeholders and levels of government, and are becoming very costly. The sheer volume of red and green tape is extremely onerous, and possibly out of balance with other jurisdictions.

The ability of the Australian thermal coal sector to successfully manage these issues will be crucial in enabling them to participate in the significant growth opportunities forecast in Asia out to 2030.