Mineral Resources (Galilee Basin) Amendment Bill 2018

IEEFA's submission to the Queensland Parliament, State Development, Natural Resources and Agricultural Industry Development Committee

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Executive Summary

IEEFA supports the Mineral Resources (Galilee Basin) Amendment Bill 2018.

In IEEFA's view, there are many reasons to support the *Mineral Resources (Galilee Basin) Amendment Bill 2018* to introduce an Act to amend the *Mineral Resources Act 1989* to stop coal mining in the Galilee Basin. These include:

- The likely collateral damage to Australia's existing thermal coal mining basins.

  The very low quality of coal in the Galilee Basin is in direct contrast to Australia's coal export production from existing regions. The Basin's remote location compounds the adverse cost implications of having to transport long distances potentially unprecedentedly large volumes of low energy, high ash coal.

  Flooding the seaborne market with a huge new supply of low-grade thermal coal will lower the value of Australia's existing coal mining businesses and further erode the value of existing infrastructure investment in coal railways and coal ports.

- The need for an urgent planned transition away from thermal coal.

  Global financial institutions and key customers of Australian coal are increasingly divesting from thermal coal and/or raising coal taxes / carbon emission levies.

- Ever cheaper renewable energy technologies making thermal coal increasingly uncompetitive in Australia's key export markets.

  Thermal coal imports for power generation are now entirely uncompetitive in India – the world's second largest producer, consumer and importer of thermal coal – against ever lower cost, domestic renewable energy projects.

- The global market is now pricing low quality thermal coal exports at an unprecedented discount.

  Global forecasts showing the seaborne thermal coal market will more than halve within two decades as the world acts on the Paris Agreement.

  Any plan that could lead to a more than doubling of Australia's thermal coal export capacity is overtly contrary to our national interest.

  Developing the Galilee Basin is in direct contradiction to Australia's Paris commitment to reduce carbon emissions.

- Increased collateral damage to Queensland industries.

  Continuing and/or increasing coal mining will likely cause permanent collateral damage to Queensland industries like agriculture and tourism as extreme weather events become more regular, and more extreme.

- The likely stranded asset risks creating significant financial risks for Australia.

  IEEFA views India as a leading example how quickly stranded asset risks associated with new coal power proposals are rising. India's banking system is drowning under the burden of over US$100bn of non-performing loans to the coal power sector within India.

  The Galilee Basin cost-benefit equation is unambiguously skewed to the negative for Australia. The global scientific consensus suggests we need to act urgently on climate change. Mining the Basin is in direct opposition to that consensus.

  Prohibiting development of the Galilee Basin before any project has commenced construction is clearly in Australia's national interest.

IEEFA supports this Bill.

The Galilee Basin Mining Proposals

The Galilee Basin is the world's largest new thermal coal basin proposed for development, approaching 300 million tonnes per annum (Mtpa) of new thermal coal export capacity.

Mining proposals include but are not limited to:

- the Adani Carmichael proposal of up to 60Mtpa for 60 years;
- three Hancock Prospecting proposals, that being Alpha, Alpha West and Kevin's Corner, totalling up to 84Mtpa;
- Clive Palmer's long delayed Waratah Coal variously slated for up to 80Mtpa;
- China's MacMines China Stone proposal for up to 38Mtpa; and
- Resolve Coal's Hyde Park 10Mtpa product coal proposal.

In a carbon constrained world, the International Energy Agency (IEA) expects coal exports to drop two-thirds by 2040 under its Sustainable Development Scenario (SDS).

IEEFA notes that any attempt to develop up to 300Mtpa of new, isolated, low quality thermal coal export capacity four years post the peak of the global seaborne thermal coal market is *not* in Australia's national interest.

Combined, the Galilee Basin equates to a proposed near 30% expansion of global seaborne thermal coal capacity, while the International Energy Agency (IEA) estimates the global seaborne thermal coal market needs to shrink globally by over 60% to 2040 if the world is to have any chance of limiting global warming to a remotely acceptable level.

In this submission:

- We detail the IEA's coal forecasts under its scenarios, as detailed in its' World Energy Outlook 2018 (Section One).
- We then briefly examine global financial institutions' moves to exit thermal coal sector (Section Two).
- Following, we look at India which has seen a dramatic and unexpected onset of massive stranded asset losses - now running upwards of US$100bn – across the thermal power sector. The increasingly unviable profile of imported coal- and LNG-fired power plants in India is a clear lead example of what is likely to emerge across Asia within the next five to ten years (Section Three).
- We examine the high stranded asset risk associated with the remote location of the Galilee Basin combined with the very low quality of coal, in clear contrast to high quality coal from other Australian coal basins that are already in production and in close proximity to export ports using established, tax-payer funded rail infrastructure (Section Four).
- Finally, we briefly discuss additional risks of mining the Galilee Basin including water, carbon and sovereign risks (Section Five).

Section One: The IEA Sustainable Development Scenario - Coal's Collapse

The International Energy Agency's (IEA) central New Policy Scenario (NPS) as per its 2018 World Energy Outlook (WEO 2018) forecasts global coal demand rising marginally (+1.5%) by 2040 relative to 2017 levels but staying below the peak reached back in 2014. The IEA also estimates this will likely see global temperature rises averaging 2.7 °C by 2100.[1]

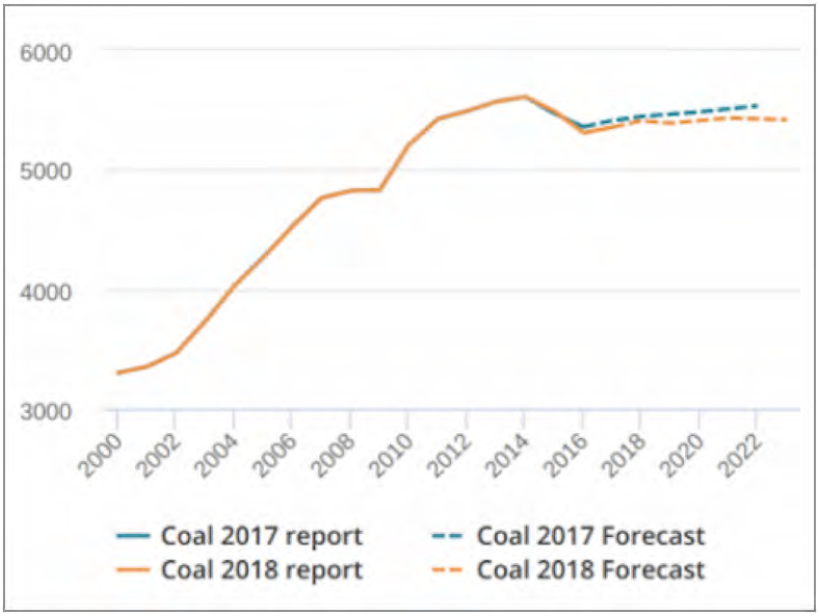
In stark contrast, the IEA estimates global coal demand will collapse (-57.4%) by 2040 should the world make the necessary efforts to limit climate change to just 2.0 °C. A moderate version of what this looks like is detailed in the IEA's Sustainable Development Scenario (SDS).

Limiting temperature increases to a 1.5 °C outcome requires the virtual cessation of coal use by 2050. The IEA does not release to the public its model for a successful Paris Agreement outcome.

The IEA has acknowledged that global coal use likely peaked five years back in 2014 while modelling a flat near-term outlook to 2022. (See Figure 1.1)

The IEA also estimates that seaborne thermal coal exports likely peaked in 2015. The global seaborne thermal coal market is a small sub-section of the global coal market.

Figure 1.1: IEA Global Coal Demand Actual and Estimates 2018 vs 2017 (Mtce)



Source: OECD / IEA

Before examining the IEA forecasts to 2040, we think it important to clarify this statement of coal being well past its peak, particularly in light of claims by coal lobbyists that South-East Asia will provide significant thermal coal demand into the future, despite it representing a small subset of the global seaborne thermal coal market. The idea that South East Asia will remain an isolated and untouched growth market to the benefit of Australian coal exporters is rather optimistic or even false hope, in IEEFA's view.

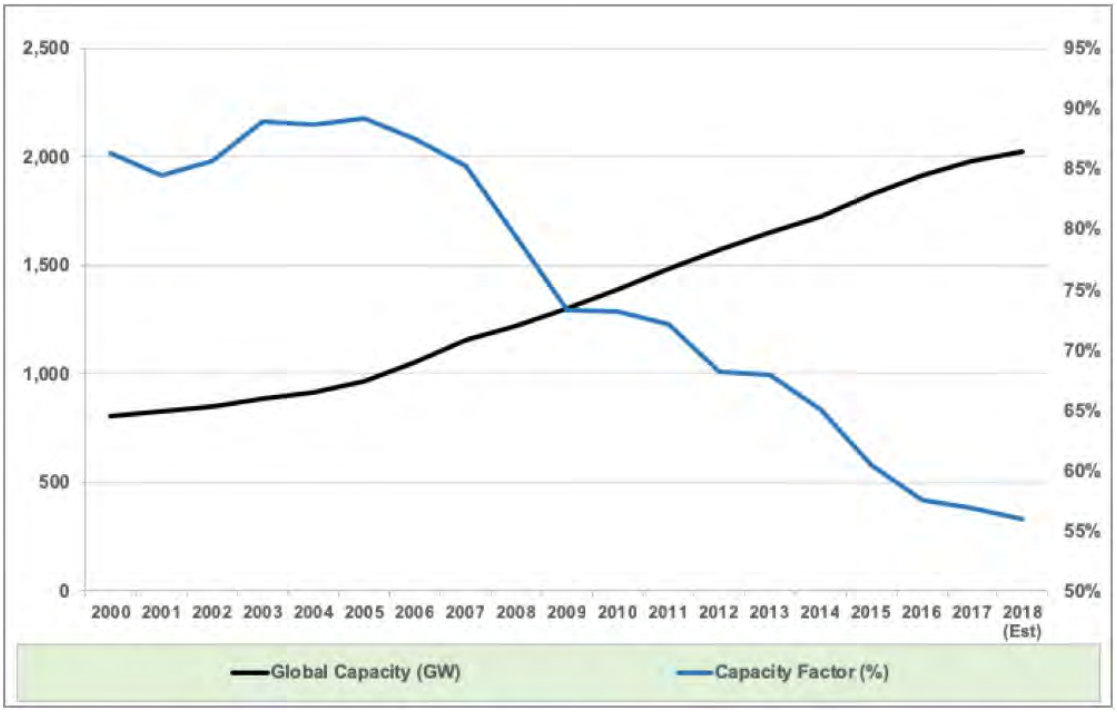
[1] IEA, Where are we on the road to c ean energy?, 4 May 2018

IEEFA notes the global seaborne thermal coal market is *not* likely to reverse the inevitable technology, cost and policy driven direction of a slow and steady decline in volumes. This is not going to happen overnight; it will likely take several decades, but the technology disruption of global energy markets is well entrenched and unstoppable. IEEFA notes this relatively categorically given the rate of decline of the cost of renewable energy and on the premise the world collectively makes further efforts to implement the Paris Agreement, and absent the long touted but increasingly unlikely development of ultra-low cost, carbon capture and storage (CCS) for coal-fired power plants.

Rather than sinking more capital into expanding capacity, Australia would be better placed by optimising existing ventures and investing in new low emissions industries of the future to best transition the Australian economy and limit our collective exposure to stranded assets.

Coal lobbyists often justify a positive outlook commentary by referencing the continued commissioning of new coal-fired power plants globally over the last decade – a trend confirmed in Figure 1.2, but which only tells the optimistic half of the story.

Figure 1.2: IEA Global Coal-fired-Power Plant Capacity, Generation and Utilisation Rate



Source: Global Coal Plant Tracker, BP Statistics, RMI, IEEFA estimates & calculations

The narrative misses several key globally entrenched developments:

- As coal plant capacity has risen, coal plant utilisation has declined.

  The capacity utilisation rate of the global coal-fired power plant fleet hit a new record low in 2018, exceeding the record low set in 2017, and that set previously in 2016, and in fact every year this past decade – Figure 1.2 (RHS in blue). Coal consumption is *not* linked to increased coal power plant capacity, but rather it is linked to the use of a coal plant. An idle new coal plant does *not* use any coal; it simply represents a stranded asset.

- Many coal lobbyists often cite new coal plant development pipelines while failing to mention the rate of coal plant retirements.

Commenting on only half the story gives a falsely optimistic perspective. Globally, coal power plant retirements are accelerating and by 2022 are forecast to exceed new plant completions.[2] In January 2019 Germany announced it would close 12 gigawatts (GW) by 2022 as part of its accelerated 100% coal phaseout of its remaining 42GW by 2038.[3]

- The global coal plant pipeline has shrunk by two-thirds; a cumulative US$1 trillion or 744GW in a small timeframe (the 30 months to July 2018).

  Stranded asset losses are rapidly rising as renewable energy competition gets increasingly competitive.

- New coal plant proposals moving to final investment decisions are slowing.

  The IEA identifies 2017 as a record low level of new coal plant proposals moving to a final investment decision as investors reassess coal's future. (Refer Figure 1.3).

- Coal plants are becoming on average more efficient.

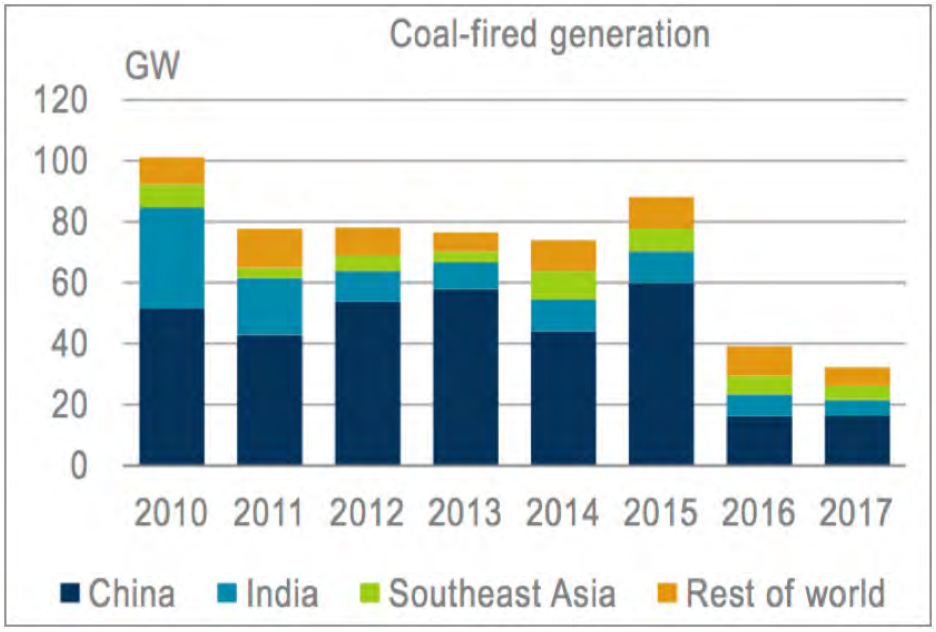
  They are generating 0.5-1.0% more electricity per tonne of coal used each year.

IEEFA concludes there has been a decade long over-investment in new coal-fired power generation capacity, in excess of demand.

The commercial viability of the global coal-fired power fleet on aggregate is technically challenged by collapsing utilisation rates down towards just 55%, suggesting they sit idle every second day on average. This is a long way below the optimal 75-85% assumption erroneously factored into optimistic projections made upwards of a decade ago.

Investors have responded by dramatically curtailing coal-fired power plant expansion plans. (Figure 1.3)

Figure 1.3: IEA Global Coal Power Plants Reaching Final Investment Decision Sign-off



Source: IEA, 2018

According to the IEA, if the world takes a sustainable development scenario (SDS) path consistent with limiting average warming to 2.0°C, total global coal demand will drop by

[2] Carbon Br ef, G oba Coa P ant Tracker, "Guest post: Peak coa s gett ng c oser, atest f gures show", Ju y 2018
[3] F nanc a T mes, "Germany p ans to phase out coa -f red power stat ons by 2038", 28 January 2019

more than halve by 2040 (-57.4%). The consequences for thermal coal would be even more dire with thermal coal consumption dropping in the realms of 61.1%.[4] (Figure 1.4).

Figure 1.4: IEA Global Coal Use 2014-16 vs Forecast 2040: NPS vs SDS (Mtce)

	2014	2015	2016	2017	NPS 2040	NPS Chg vs 2017	SDS 2040	SDS Chg vs 2017
Total Coal (Mtce)	5,680	5,531	5,225	5,360	5,441	1.5%	2,282	-57.4%
Coking Coal (Mtce)	1,016	994	956	960	806	-16.0%	579	-39.7%
Thermal Coal (Mtce)	4,374	4,254	3,979	4,134	4,412	6.7%	1,609	-61.1%
Coking Coal % of total Vol.	17.9%	18.0%	18.3%					

Source: IEA WEO 2017 page 644-645, WEO 2018 pages 520-521, IEEFA calculations

Under the New Policy Scenario (NPS), the IEA models an even worse outlook for seaborne traded thermal coal. Demand by 2040 drops a relatively benign -5.6% in volume terms. Under a possible 2.0 °C SDS outcome, demand declines 65.1% vs 2017 levels. (Figure 1.5.)

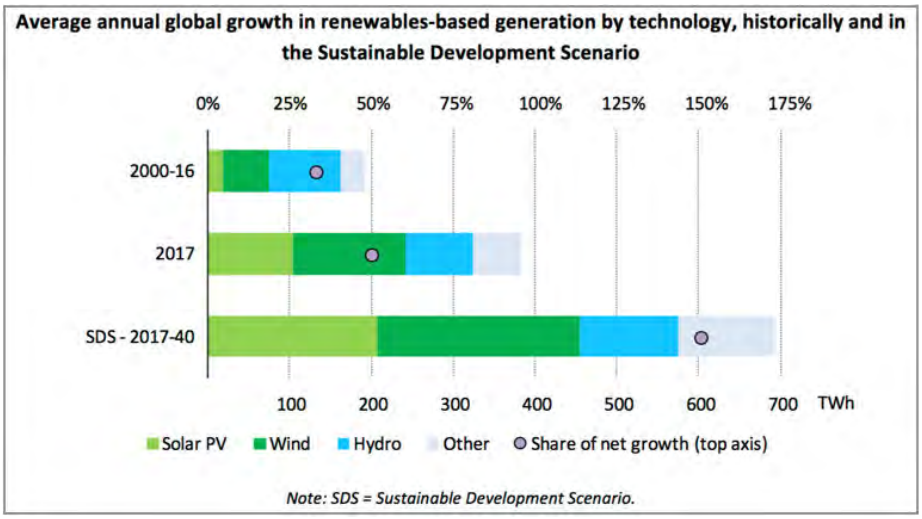
Figure 1.5: IEA Global Seaborne Coal 2014-17 vs 2040: NPS vs SDS (Million Tonnes coal equivalent)

Mtce	2014	2015	2016	2017	NPS 2025	NPS 2040	NPS Chg vs 2017	SDS 2040	SDS Chg vs 2017
Thermal	801	761	756	805	736	760	-5.6%	281	-65.1%
Coking	284	293	292	302	320	346	14.6%	250	-17.2%

Source: IEA WEO 2016 page 206, WEO 2017 page 207, COAL 2017, NPS page 134, WEO 2018 p.218

The IEA SDS models electricity generation from new zero emissions technologies more than doubling each year through to 2040 relative to the record high set in 2017. (Refer Figure 1.6)

Figure 1.6: The IEA SDS Forecasts Renewable Energy will supply 150% of net growth in electricity demand globally over 2017-2040, with installation rates doubling relative to 2017



Source: IEA WEO2018

[4] As measured in millions of tonnes of coal equivalent (Mtce), an adjustment to standard raw coal use by energy content.

Despite new coal plants still being planned across Asia, global finance is moving away from funding potential stranded fossil fuel assets. (Refer Section Two).

As we discuss in Section Three, India is already talking about a quadrupling of renewable energy installs annually in the next two years relative to the record high installs recorded in 2017/18.

Similar to the IEA, IEEFA sees India's shift to the lowest cost sources of electricity generation, that is wind and solar, as indicative of the likely shift across the greater Asian market over the coming decade.

Whether motivated by any or all of the energy security, economics, financial flows and/or polices to deal with rising fossil fuel pollution and other pressures, this trend is accelerating.

The implications are clear – the demand for seaborne thermal coal is past its peak and potentially entering terminal decline.

For more detail, please refer to IEEFA's major review of this trend released in November 2018.[5]

[5] IEEFA, "Past the r peak, NSW coa export vo umes head toward term na dec ne as markets trans t on", November 2018

Section Two: Financial Institutions Pivot Away from Coal

The single biggest pressure holding back the opening up of the Galilee Basin is the ongoing and accelerating global shift away from financing thermal coal and coal-fired power plants by the world's leading financial institutions.

The inability to find global financial sector support for these investment proposals stems from the rapid cost declines of renewable energy technology and the very clear message of the United Nation's Intergovernmental Panel on Climate Change (UN IPCC) highlighting the need to virtually cease global coal use by 2050.

Global investors managing US$32 trillion released a policy statement[6] in December 2018 calling for a global price on carbon and an accelerated coal phase-out:

> *"Expert analysis shows that to meet the Paris Agreement goals of limiting the increase in global temperatures by 2°C, while striving to limit the increase to 1.5°C, a coal phase-out is needed by 2030, in the OECD countries and in the European Union; by 2040, in China; and by 2050, in the rest of the world."*

Australian banks have all moved to recognise the global financial risks of climate change, making strong commitments to reduce funding for thermal coal mining and coal-fired power plants.

Westpac ruled out financing new thermal coal basins in April 2017.

Commonwealth Bank (CBA) reported in August 2018, as part of its 2017/18 financial results, substantial progress in measuring, reporting and acting on this commitment, with a substantial decarbonisation shift well underway. This includes "carbon foot-printing" its equity portfolio of Colonial First State, one of Australia's largest fund managers. CBA has also shifted its lending programs towards funding low emissions technologies. Direct exposure to coal mining was down 7% year on year (yoy) to $270m and coal infrastructure was down 30% yoy to $1,000m, while lending to renewable energy was +32% year-on-year to $3,700m.

In contrast, Macquarie Group has flown under the radar to-date and made no public commitment to exit coal. Yet its actions speak louder than words, and Macquarie has made renewable infrastructure investing one of its four global pillars of growth. Landmark renewable energy and storage deals across Europe and Asia show the momentum of global infrastructure investing towards decarbonisation.

Global coal divestment has been progressing, with global financial institutions pivoting to boost lending to renewable energy infrastructure and other low emissions alternatives.

In the last year alone, there are numerous examples of new policy restrictions specific to coal mining and/or coal-fired power plant financing by leading global financial institutions, including:

- February 2018 - Generali of Italy announced it would cease new investments in coal.[7]
- March 2018 - BBVA of Spain committed to US$100bn of renewables lending by 2025 as well as ceasing financing any new coal mines and coal-fired power stations or extensions to existing ones.
- April 2018 - HSBC committed to stop financing new coal-fired power stations in all countries except for Indonesia, Bangladesh and Vietnam.

[6] IGCC, "Br ef ng Paper on the 2018 G oba Investor Statement to Governments on C mate Change", Dec 2018
[7] Genera press re ease, "GENERALI APPROVES CLIMATE CHANGE STRATEGY. IT WILL DIVEST €2 BILLION FROM COAL", 21 February 2018

- June 2018 - the world's third largest reinsurer Hannover Re (US$64bn AUM), introduced a 25% coal revenue maximum for its investment universe.
- July 2018 - Swiss Re announced it would no longer provide insurance or reinsurance to businesses with more than 30% exposure to thermal coal.[8]
- August 2018 - Munich Re, the world's second largest reinsurer, committed to cease offering insurance for new coal-fired power plants and mines in industrialised countries. In addition, Munich Re will no longer invest in shares and bonds of coal companies that generate more than 30% of their revenues in the coal sector.
- September 2018 - the Chairman of Standard Chartered José Viñals announced the bank's coal exit strategy entitled "Here for good means saying no to coal: Why we're stopping our financing of new coal-fired power plants".
- September 2018 - the Netherlands' ING Bank announced it would assess its US$600bn lending book against alignment with a less than 2 °C global temperature change, consistent with the Paris Agreement. The bank had previously announced a phase-out of lending to coal and expects to have zero coal lending exposure by 2025.[9]
- September 2018 - Standard Bank of South Africa announced a withdrawal from new coal power plant financing.
- October 2018 - the World Bank exited underwriting of the Kosovo coal power plant, its last coal finance proposal.
- October 2018 - the International Finance Corporation (IFC) announced it would shift its indirect partner financing away from coal.
- October 2018 - the Asia Development Bank (ADB) acknowledged coal plants were becoming unviable investments. The ADB incorporates a US$36/t price on carbon on all lending decisions, has a strong bias to renewable energy (targeting US$3bn annual renewables lending by 2020), and last approved funding for an imported lignite plant back in February 2014 in Pakistan.
- November 2018 - the biggest public life insurer in Norway, the US$85bn manager Storebrand ASA announced a progress exit from coal to be completed by 2026.[10]
- November 2018 - Banco Santander of Spain committed to a new coal exclusion policy.
- November 2018 - Generali of Italy (US$581bn AUM) limited its coal insurance, having divested from coal in February 2018.
- December 2018 - The European Bank for Reconstruction and Development (EBRD) announced its even tighter policies under its Energy Strategy away from coal in "The Switch from Coal".
- December 2018 - Citi, the number one U.S. banker of coal power in 2017, announced an updated coal policy excluding project financing of new coal-fired power plants.
- January 2019 - Export Development Canada (EDC) revealed its new Climate Change Policy, including: "No new financing for coal-fired power plants, thermal coal mines or dedicated thermal coal-related infrastructure – regardless of geographic location."
- January 2019 - Barclays Bank UK expanded on its April 2018 exclusion of project finance for coal mining to also exclude coal plants.

Even China ruled out funding the Carmichael Galilee proposal in November 2017.

[8] AFR, "Screws t ghten on therma coa as Sw ss Re pu s p ug", 5 Ju y 2018
[9] F nanc a T mes, "ING w steer portfo o towards two-degree goa to he p combat c mate change", 16 September 2018
[10] B oomberg, "An $85 B on Asset Manager Is P ann ng a Tota Ex t From Coa ", 30 November 2018

Japan

The progressive coal-fired power divestment announcements from Japan (Australia's largest thermal coal export destination) over 2018 have been nothing short of staggering.

New thermal coal exits were announced by Dai-ichi Life in May 2018 and Nippon Life in July 2018. Japanese banks have also changed their lending standards to exclude all lending to out-dated coal-fired power plant technologies, reported in October 2018 for Sumitomo Mitsui Banking Corporation. IEEFA has written extensively about this emerging trend, most notably with respect to Marubeni Corp.[11]

In September 2018 Marubeni Corp announced a radical pivot, one reinforced by the opinion piece by Prime Minister of Japan Shinzo Abe acknowledging the rise of extreme weather events and need to act decisively to deal with global warming, noting "climate change can be life-threatening to all generations".

More recently, two of Marubeni's fellow sōgō shōsha (Mitsubishi Corp.[12] and Mitsui & Co.[13]) have divested their last remaining thermal coal mine holdings.

In December 2018 it was announced that another domestic coal-fired power proposal had been cancelled – JFE Steel and Chugoku Electric Power's 1GW project near Tokyo.[14]

In January 2019 Tokyo Gas announced its decision not to proceed with its proposed but long delayed 2,000 MW Chiba imported coal-fired power plant,[15] citing it is not commercially viable. In a separate development, a proposed 112 megawatt (MW) Able Company plant in Iwaki which was to be fuelled by coal with up to 30% biomass has been revised to operate as a biomass-only plant. The change represents the ninth proposed coal unit cancellation or modification in Japan since 2012.

Meanwhile Tokyo Electric Power Company (TEPCO) announced it would begin construction in January 2019 of its first commercial offshore wind plant in Japan.[16] TEPCO's aim is to achieve two to three gigawatts of offshore wind as part of its strategic move away from thermal and nuclear power and towards renewables, announcing a potential US$9bn Japanese offshore wind project in January 2019.

For more details on Japan, please refer to IEEFA's recent briefing note.[17]

South Korea

South Korea's position on investing in new thermal coal mines has also moved dramatically. For more than a decade South Korea was a key investor in new Australian coal mines and associated rail and port infrastructure. POSCO had even signed a non-binding EPC (engineering, procurement and construction) memorandum of understanding (MoU) to build Adani's 400km, $2.5bn Carmichael railway line back in 2014, including a commitment to procure South Korean government debt and equity funding support. By July 2015 POSCO had closed its Brisbane office and effectively withdrawn from the Carmichael proposal.

More recently the momentum in South Korea has changed considerably, primarily since the May 2017 election of President Moon Jae-in on an anti-pollution platform. There have

[11] IEEFA, "Maruben s Coa Prob em: A Japanese Mu t nat ona s Power Bus ness s at R sk", 30 Ju y 2018
[12] Reuters, "M tsub sh ex ts therma coa sector, se s stakes n Austra a m nes", 18 December 2018
[13] Reuters, "Japan's M tsu may se stake n Austra a therma coa m ne", 31 October 2018
[14] B oomberg, "JFE Stee , Chugoku E ectr c Scrap Coa -F red Power P ant P ans", 27 December 2018
[15] Reuters, "Japan's Idem tsu, Kyushu E ec, Tokyo Gas scrap coa -f red power p ant p an", 31 January 2019
[16] TEPCO, "TEPCO s F rst Commerc a Offshore W nd Power Fac ty to Launch January 2019", 27 November 2018
[17] IEEFA, "Ear y days, but momentum away from coa s bu d ng", 21 December 2018

been a growing range of government moves to reduce reliance on thermal coal and progressively decarbonise the South Korean economy.

In December 2017, South Korea announced plans to build 58.5 GW of renewables by 2030, sufficient to supply 20% of all electricity.

In July 2018 South Korea announced plans to increase its coal tax by 30% to US$40/t from April 2019, while lowering its tax on LNG by 70% as part of a strategic pivot away from coal and nuclear towards renewables and gas.

In October 2018 the province of South Chungcheong joined the Powering Past Coal Alliance, accelerating the closure of 14 coal-fired power units.

Finally, in October 2018 two major public investors investing a total of US$22bn, Korea's Teachers Pension and Government Employees Pension System, announced they would no longer finance new coal-fired power plants.

Financiers Are Pivoting to Clean Energy

IEEFA tracks zero emissions lending targets as the flip-side of global banks exiting thermal coal. Many of the same financial institutions that have historically financed coal are rapidly awakening to the enormous opportunities and growth in financing renewables.

To date, nine of the largest banks in the world have each committed to financing at least US$100bn of clean energy investments, a staggering US$1,388bn total. (Figure 2.1)

The largest commitment to low carbon solutions globally to-date has been from Morgan Stanley in April 2018 at US$250bn by 2030, having to-date already funded US$84bn since 2006. This is closely followed by Wells Fargo with US$200bn by 2030, building upon JPMorgan Chase's August 2017 commitment to lend US$200bn by 2025, in particular backing the development of the global green bond market.

In 2015 Citigroup announced a new US$100bn 2025 target, having already delivered on its US$50bn target by 2015 two years ahead of schedule. Goldman Sachs, Bank of America, Credit Agricole of France, BBVA of Spain and HSBC UK have all made similar pledges.

Figure 2.1: Global Private Financial Investing in Clean Energy Commitments (US$bn)

Morgan Stanley	Pledged US$250bn by 2030	Apr-18	250
Wells Fargo	Pledged US$200bn by 2030	Apr-18	200
JPM Chase	Pledged US$200bn by 2025	Aug-17	200
Goldman Sachs	Pledged US$150bn by 2025	Nov-15	150
Citigroup	Pledged US$100bn by 2025, US$50bn done by 2013	Feb-15	150
Bank of America	Pledged US$125bn by 2025	Jul-15	125
Credit Agricole SA	Euro100bn in green investments by 2020	May-18	113
BBVA	Pledged US$100bn by 2025	Mar-18	100
HSBC	Pledged US$100bn by 2025	Nov-17	100
	Total (US$ billion)		1,388

Source: Corporate websites, IEEFA Calculations

Section Three: India's Pivot to Renewables

Under Prime Minister Narendra Modi, India has accelerated its national pivot to lower cost, zero emissions renewable energy. In October 2018 Modi reconfirmed that by 2030, India seeks to generate 40% of its total electricity from non-fossil fuel sources.

India's Power Minister R. K. Singh has repeatedly talked up opportunities for India to lift the development of renewables to a massive 40GW annually, nearly triple the current run-rate. In January 2019 Power Minister R. K. Singh yet again lifted the level of renewables ambition, calling for India to install 500GW of renewables by 2028.[18]

The Indian Coal and Railways Minister Piyush Goyal has repeatedly stated his target for India to cease thermal coal imports, recognising the threat to India's energy security of India's excessive and unsustainable reliance on fossil fuel imports.

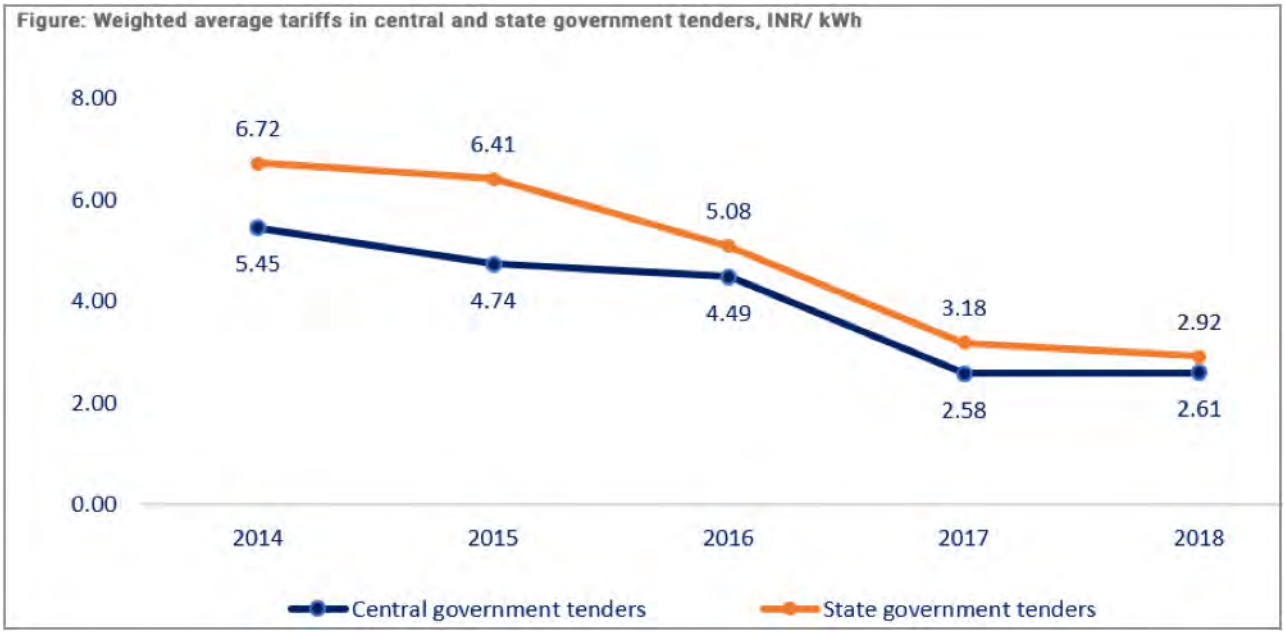
India's progress has been astonishing. With wind and solar tariffs regularly being tendered for Rs2.40-3.00/kilowatt hour (kWh) and averaging Rs2.61-2.92/kWh in 2018 (Figure 3.1), existing domestic thermal power generation is struggling to compete.

NTPC, India's largest power generator, had an average 2018/19 (year-to-date to December 2018) tariff of Rs3.47/kWh for existing domestic coal-fired power, up 6% year-on-year. Non-mine mouth coal requires tariffs of Rs4.00-5.00/kWh and new imported coal-fired power generation requires a tariff of Rs5.00-6.00/kWh.

In September 2018 Gujarat completed a 500MW solar tender at a record low of Rs2.44/kWh with zero indexation for 25 years. And this trend is set to accelerate, given global solar module prices fell by 30-38% over 2018, the biggest annual decline in a decade.

New coal cannot compete with the current deflationary tariffs that are contractually set to decline in real terms every year for the next 25 years.

Figure 3.1: Solar Tariff Declines Continue to Drive Deflation for India's Electricity Sector



Source: Bridge to India, January 2019

[18] ETEnergyWor d, "Ind a to b d out 500 GW renewab e energy capac ty by 2028", 7 January 2019

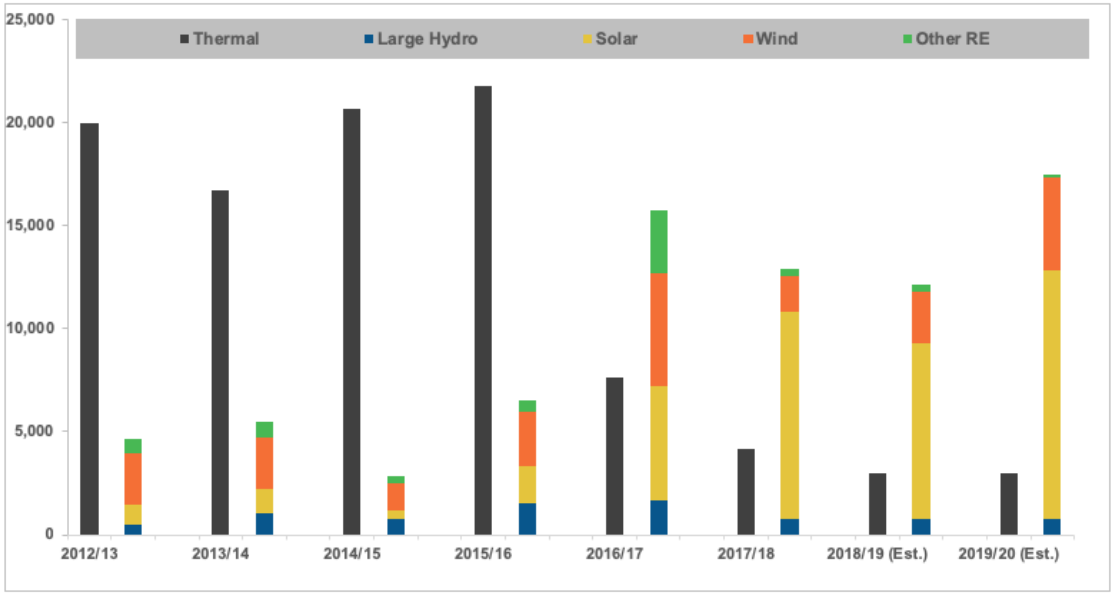
Major private power generator Tata Power has suspended all new coal-fired power plant developments. They instead are preferring to acquire financially distressed existing power plants which are selling at 40% of the face-value of debt, valuing completed projects at 30% of total investment value (Indian power projects generally carry 80:20 Debt: Equity ratios).[19] Newly appointed CEO Praveer Sinha announced a US$5bn renewable energy investment plan in May 2018.

NPTC Ltd has likewise commenced a pivot into renewables with a plan to facilitate or build upwards of 10-20GW over the coming decade. NTPC has also announced it has cancelled 10.5 GW of proposed new coal power plants to-date in 2018.

The Adani Group has expanded into renewable energy development, floating its renewable energy business (Adani Green Energy) on the Bombay Stock Exchange in June 2018. With 3GW of renewable energy infrastructure in operation and another 3GW in planning, it is one of the top corporate investors in Indian renewables. In Australia, Adani announced a 1,500MW solar investment program for Queensland and South Australia.

As a result, India's renewable energy installs have more than doubled to 12-15GW annually, while thermal power installs (net of closures) have dropped 80% to just 4GW annually vs the 20GW annual installs evidenced in 2012/13 to 2015/16. (Figure 3.2)

Figure 3.2: Indian Thermal and Renewable Power Capacity Additions (MW)



Source: Central Electricity Authority, MNRE, IEEFA Estimates

Note: The renewables estimates include large scale hydro

While not directly related to the stranded asset risks of coal-fired power plants, in January 2019 the Chairman of the State Bank of India Rajnish Kumar, the country's largest public sector lender, acknowledged there is no future for the 25GW of gas-based power plants in the country. Kumar concluded that the bank may have to write-off its investments in the sector.[20]

IEEFA references this to highlight the severity of the problem of stranded asset risk for fossil fuel projects in India. India is grappling with upwards of US$100bn of non-performing loans to the thermal power sector alone as a result of under-estimating the rate of technology change and renewable energy deflation.

[19] L veM nt, "Adan to w n 3 out of 7 power projects under Samadhan scheme", 10 January 2019
[20] ETEnergyWor d, "SBI cha rman says no future for gas-based power p ants n the country", 4 January, 2019

Section Four: Inferior Galilee Coal Quality

Higher Grade Thermal Coal (6,000 kcal) at US$100/t

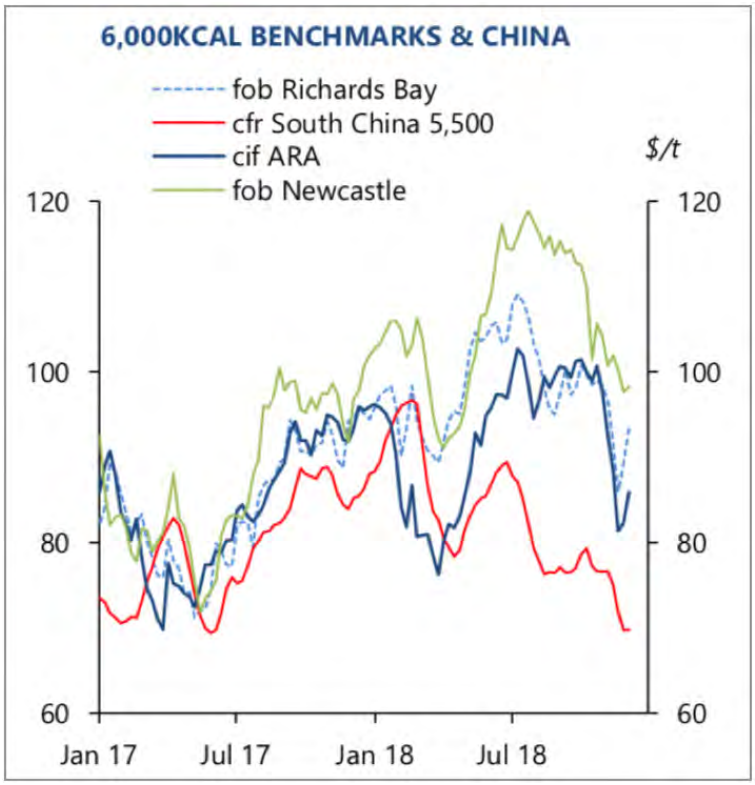
As per Figure 4.1 the Australian benchmark 6,000kcal (net as received) 12-14% ash content thermal coal export price ended the 2018 year at US$100t/free on board (fob) at Newcastle. This was a dramatic improvement, double the 2015/16 lows of US$50/t.

In justifying new investment proposals, coal lobbyists often refer to Australian export coal as higher quality than international competitors. The 6,000kcal benchmark thermal coal is definitely higher energy content than Indonesian export coal which has a range around a 5,000kcal average, 15-20% below the top Australian, South African, Columbian and Russian thermal coal exports. In contrast, Carmichael coal is significantly lower quality than the benchmark Australian export coal with an energy content below 5,000kcal and a high ash content (26%).

Coal quality is measured in terms of a number of attributes, with ash content the second most important determinant of pricing. Indonesian thermal coal has an average ash content of 5-6%, half the Australian top benchmark. On a third quality measure, Indonesian coal is also materially lower sulphur content than most Australian thermal coal.

IEEFA would argue the market prices the top Australian grades of coal at a premium to international seaborne markets, and this premium reflects a view of relative quality.

Figure 4.1: The 6,000kcal Newcastle Benchmark Thermal Coal Price 2017-2018 (US$/t)



Source: Argus Consulting, December 2018[21]

[21] Argus Consulting Services, "Thermal Coal Outlook 2019", 7 December 2018

Some coal lobbyists talk about Australian thermal coal being higher quality than domestic inland thermal coal in India, which is generally very low energy and high ash content. While the statement is correct, it is IEEFA's view that it is also entirely misleading.

Indian coal is located inland and is largely unconnected to any distant coal ports. As such, the vast majority of Indian coal power plants are unable to use imported coal, even if they could afford the significant premium price (mine-mouth coal in India wholesales for ~US$20/t). Further, the inland Indian coal plants are designed and engineered to use low energy, high ash thermal coal. That is why the low energy, high ash coal deposits of the Galilee were of interest to Indian coal promoters. It is nothing like the high energy, low ash coal found in the Hunter Valley in NSW or Surat/Bowen Basins of Queensland.

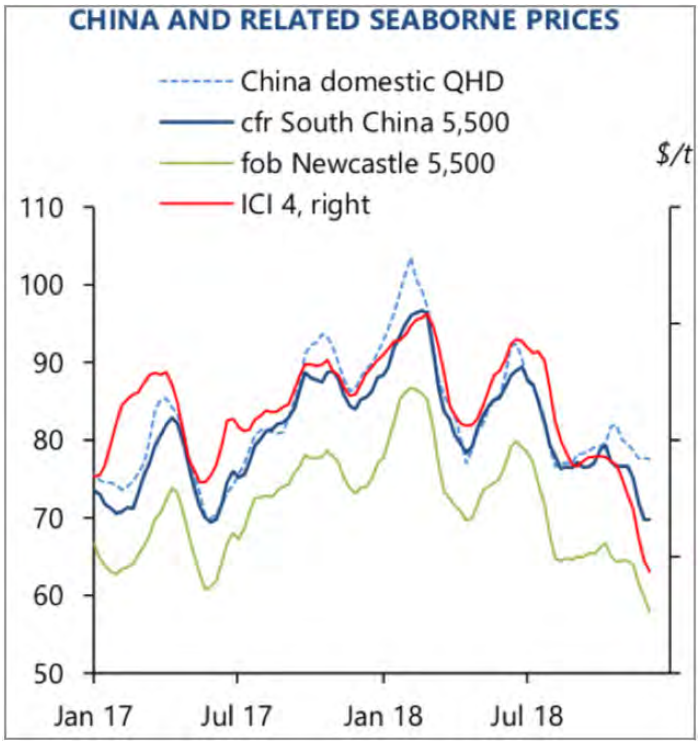
As a general rule, seaborne coal has to command a higher price given it has significantly higher all-in costs than mine-mouth coal, and given all the extra rail, port and shipping costs.

When comparing Australian export coal to its competitors, it is logical to compare it to Indonesia, Russia or South Africa, or coal mines in coastal China where there is direct port and rail access, rather than comparing it to the coal used by inland Indian coal power plants it cannot supply.

Low Grade Thermal Coal (5,500 kcal) at a 2018 Low

A very important divergence has emerged in the seaborne thermal coal market over 2018. During that year, the price differential between high quality 6,000kcal coal and the lower quality 5,500kcal coal also produced in Australia reached a record high. This is a critical issue for the Galilee Basin which is a high ash and low energy product compared to the Australian export market average.

Figure 4.2: The 6,000kcal Newcastle Benchmark Thermal Coal Price 2017-2018 (US$/t)



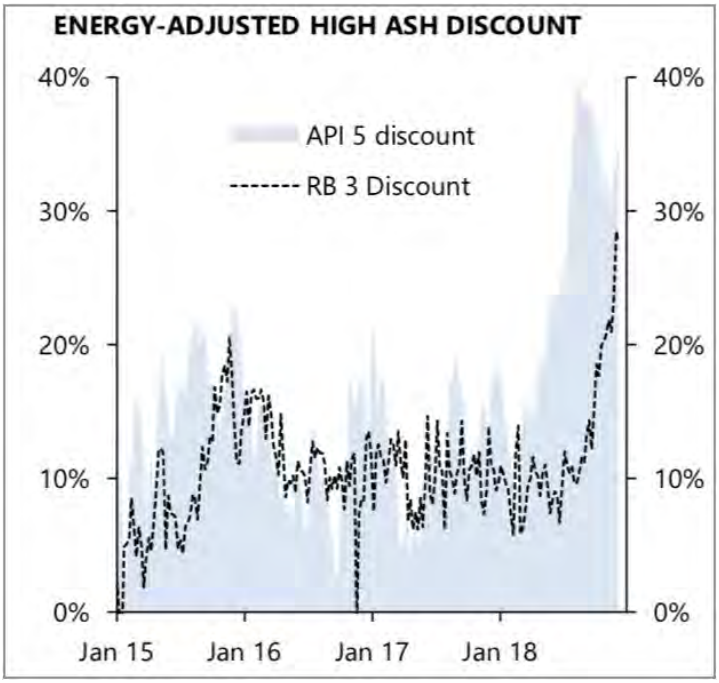
Source: Argus Consulting, December 2018

The Newcastle benchmark for 5,500kcal coal with 20% ash declined over 2018 and exited the year at just US$57/t. (See Figure 4.2 green).

As part of the ongoing push to deal with critically dangerous air pollution, China has joined Japan, Taiwan and South Korea in paying a record high price for low ash coal. (See Figure 4.3)

Argus has normalised coal pricing to calculate that on an equivalent energy content basis, high ash coal is now trading at a 30-40% discount to equivalent energy content coal of lower ash. This is double to triple the discount that applied in previous years.

Figure 4.3: The Price Discount for High Ash Coal Hit an Unprecedented High in 2018



Source: Argus Consulting, December 2018

To illustrate, IEEFA estimates that Carmichael coal with a 4,950kcal energy and 26% raw ash content would currently be valued at a 60.5% discount to the Newcastle 6,000kcal benchmark, putting a price of ~US$39.50/t at spot prices at the start of 2019. (Figure 4.4)

Figure 4.4: The Carmichael Coal Quality Discount is Now Extreme

		US$/t	Ash
Newcastle Benchmark (12-14% ash)	6,000	$100.00	13%
Newcastle Benchmark	5,500	$57.00	20%
Price discount (%)		-43.0%	
Carmichael Coal	4,950		26%
Discount vs 5,500kcal	-10.0%		
Implied Carmichael Price (US$/t)		$39.50	
Discount 5,500kcal vs 6,000kcal		-43.0%	
Discount vs 5,500kcal		-10.0%	
Discount 26% vs 20% ash		-7.5%	
Total Discount		-60.5%	

Source: Argus, IEEFA estimates

Mining operations could wash the raw coal and marginally reduce the ash content while boosting the energy content of product coal, subject to water availability, but this would significantly increase production costs.

As such, it is important to differentiate the remotely located, low quality thermal coal of the Galilee Basin from Australia's existing coal basins with premium priced coal. The latter have the major advantage of proximity to the coast, and all the sunk costs have been incurred to establish the required dedicated rail, port, power and road infrastructure. Additionally, the established coal basins have supported, generally locally-based coal miners. In contrast, any new Galilee Basin operation will be almost entirely fly-in, flyout. Any suggestion of local development merits should see a rigorous impartial cost-benefit analysis relative to alternative regional investment alternatives.

An example of this is evident in Adani Australia. While this company has explored the feasibility of a Galilee Basin operation for eight years without success, the company more recently has talked about building a multi-billion-dollar solar infrastructure business. Indeed, Adani has built and recently commissioned its first solar project at Moranbah. Despite this company's commitment to thermal coal mining, it has actually moved ahead and developed a successful solar business, a zero emissions industry of the future.

We note than any discussion of relative coal deposit merits ignores the obvious point that even if electricity is generated from a high energy low ash coal, it is still almost 100% more emissions intensive and 100% more polluting than a zero emissions, zero air / water / particulate pollution renewable energy project.

When referencing the relative merits of industry development for regional Australia, it is critically important to examine the growth prospects and associated risks.

A thermal coal export industry in Australia will cease to exist if customers decide that zero emissions, zero pollution, cheap and deflationary domestic-sourced renewable energy is their preferred source of electricity going forward. The argument that if Australia does not supply the coal, some other country will, is irrelevant if the IEA's SDS analysis is correct. The thermal seaborne coal market is in terminal decline. A viable market for new, low quality, high cost remote coal basins will cease to exist.

Rather than risking substantial capital developing the Galilee Basin in a vain attempt to prop up a dying industry of the past, Australia would be far better served directing new regional investment into growth industries of the future, be that wind, solar, pumped hydro storage or zero emissions hydrogen.

As Senator Matt Canavan said in December 2018, new markets like lithium mining and downstream manufacturing opportunities are growing exponentially, and Australia is set to be a world leader:[22]

> *"A new strategy commissioned by the Liberal-National Government will help to maximise Australia's potential as a world powerhouse in lithium-ion battery manufacturing."*

[22] Senator Matt Canavan, "Un ock ng Austra a s potent a n th um- on battery manufactur ng", 11 December 2018

Section Five: Additional Risks

There are numerous reasons why the *Mineral Resources (Galilee Basin) Amendment Bill 2018* makes economic, financial and environmental sense. IEEFA briefly touches on five major factors that suggest the financial risks for Australia far outweigh any short-term promise of gains from yet more thermal coal mine developments at a time of increasingly frequent, extreme weather events and record temperatures across Australia.[23]

Water Risk

The severe water draw-down risks of additional huge new coal mining activity are large. The financial risks of gaps in Australia's environmental approval analysis are clear.

A *cumulative* impact analysis on the implications of developing up to 300Mtpa of new thermal coal mines in the Galilee Basin has yet to be undertaken.

Any corporate funded water modelling of an individual coal mine proposal in isolation ought to be treated with significant scepticism. The vested interests in downplaying irreversible community risks are obvious.

This was well illustrated by the NSW Department of Planning and Environment's rejection of the Hume Coal mine proposal on groundwater fears.[24] Concurrently, the NSW government's expert panel concluded that the water loss from coal mining in a water catchment area was clearly evident, despite the corporate's extensive modelling suggesting this would not happen.[25]

The financial costs of the Adani Carmichael proposal alone are clear. Adani has asked for approval for hugely subsidised annual water use of up to 16-22 billion litres annually.[26] The adverse financial costs for Queensland and Australia are enormous. The impacts of mining on water often turn out to be much greater than expected.[27]

Carbon Risk

The severe, multiple climate risks to Queensland's critically important agriculture and tourism sectors are likewise in their own right significant enough to warrant the precautionary stance of leaving untapped the remote and isolated low-quality thermal coal / carbon reserves in the ground. Multiple economic experts have reported at length on this risk.[28]

Australia is a legal signatory to the Paris Agreement and have committed as part of a global effort to limit temperature rise to 1.5-2.0 °C above pre-industrial era levels.

Climate change experts like Professor Will Steffen have long testified in court and in the public domain[29] as to the challenges of delivering on this target while fossil fuels continue to burn:

> *"There is no way you will meet any of these targets if you continue to increase emissions and I think that's a clear and very robust outcome of*

[23] The Conversat on, "Austra a s 2018 n weather: drought, heat and f re". 10 January 2019
[24] ABC, Hume Coa m ne gets damn ng assessment from NSW Government department over groundwater fears, 12 December 2018
[25] The Sydney Morn ng Hera d, "'No p ace for m n ng': coa m nes dra n water from dams", 7 January 2019
[26] Lock the Gate, "Adan Water Factsheet", March 2018
[27] SMH, No p ace for m n ng : coa m nes dra n water from dams, 7 January 2019
[28] The Austra a Inst tute, "Great Barr er B eached: Cora b each ng, the Great Barr er Reef and potent a mpacts on tour sm", June 2016.
[29] The C mate Counc , "Unburnab e Carbon: Why we need to eave foss fue s n the ground", 2015

> *applying a carbon budget approach to the Paris targets ... So step number 1, if you're really serious about the Paris targets, is no new fossil fuel developments. I mean, it doesn't take an Einstein to work that out-that you cannot reduce emissions by increasing them."*

Opening a globally significant, new, low quality thermal coal basin is clearly moving in diametrically the opposite direction to Australia's Paris commitment.

Australia is already in the top three countries globally in terms of exported emissions. In November 2018 Australia overtook Qatar to become the world's largest exporter of liquid natural gas (LNG). Australia is already the world's largest exporter of coking coal (with a 60% global share of seaborne coking coal) and the world's second largest exporter of thermal coal with a seaborne share of 20% behind only Indonesia at 37%.[30] As a nation we continue to expand our export capacity of LNG, coking and thermal coal – all in direct contradiction to our Paris commitment.

Australia is likely to come under increasing international pressure to do more to reduce carbon emissions going forward. This will include calls for action to reduce Australia's major global role in the export of fossil fuels to other countries.

Sovereign Risk?

Coal lobbyists occasionally give the unsubstantiated opinion that banning new thermal coal basin developments would have a material adverse impact on Australia's global financial standing. This is the "Sovereign Risk" argument. In IEEFA's view, this is a hollow claim that has no standing.

At a time when our key global trading partners have already been discussing climate risks for many decades, any modernisation of the government approval process that takes into account the growing global financial market consensus on the need for a high price on carbon and the clear and rapid exit from the use of unabated coal within the 2030-2050 timeframe will be accepted as belated and entirely justified.

Back in 2017, the US$6.3 trillion asset manager BlackRock's global head of infrastructure, Jim Barry, made it very clear:[31]

> *"It's been amusing sitting back and watching Australia from afar because in effect it's been denying gravity… Coal is dead. That's not to say all the coal plants are going to shut tomorrow. But anyone who's looking to take beyond a 10-year view on coal is gambling very significantly."*

IEEFA would elaborate and say that allowing the development of the Galilee Basin actually raises a sovereign risk for Australia.

Australia is a signatory to the Paris Agreement, a global treaty ratified and entered into back in November 2016 with almost universal agreement. Should Australia now approve the development of one of the largest proposed but undeveloped carbon sinks globally, this clearly marks Australia as a hypocrite, a country that signs global treaties with no intent of adhering to them. It would identify Australia as heading in the wrong direction at a canter, out of step with the rest of the world. That is the definition of "Sovereign Risk".

IEEFA speaks with global financial institutions on a very regular basis, and not once has any of the world's largest investors, corporates or banks ever suggested the controversial discussion over the Galilee Basin would have any impact on Australia's credit rating.

Banning the development of an entirely undeveloped isolated new coal basin prior to the majority of mining licences being issued (Adani has been issued a mining lease, although

[30] Office of the Chief Economist, "Resources and Energy Quarterly", December 2018
[31] The Australian Financial Review, "BlackRock says coal is dead as it eyes renewable power surge", 26 May 2017

it is the only one) is entirely consistent with both the majority of Australians views on the subject, and also increasingly consistent with the stance of global financial institutions.

Corporate Tax Leakage Risks

New investment in regional Australia is important, but where coal mining is concerned, the benefits are short lived, illusionary and mostly privately gained and relatively tax free. Various planning approvals are predicated on the reported benefits that will accrue to the Australian Government from increased corporate taxes. Many approvals really on proponent-created "models" that assume 100% equity financing, yet in IEEFA's experience the standard industry practice is for maximum debt leverage at all times, particularly where the proponent is a foreign corporation.

We note over 80% of coal mines in Australia are foreign owned, with a very significant percent of the owners "residing" in tax havens. It has been well documented that Australia's largest coal mining and coal-fired power plant owners pay little if any corporate tax in Australia.[32]

Foreign companies operating in the Australian coal sector are masters at leveraging the gaping loop-holes in the thin-capitalisation, related party transactions and transfer pricing rules of the Australian tax system. BHP paid the Australian Taxation Office (ATO) A$529m in November 2018 in settlement of its Singapore tax haven marketing hub practice,[33] yet the 2018 Senate Inquiry into Multinational Tax Avoidance by mining companies highlighted BHP's actions as likely just the 'tip of the iceberg'.[34]

Mine Rehabilitation Risks

Coal lobbyists operate with a vested interest to promote the various merits of their corporate sponsors while concurrently downplaying or denying the externalities imposed on the environment and communities.

One of the largest externalities of coal mining relates to the issue of mine rehabilitation. Thermal coal mining is relatively unique even within the mining industry. For every tonne of product coal generated from an open cut mine, an average of 14-16 tonnes of overburden needs to also be moved.

The fuel costs alone are enormous in coal mining, hence why the diesel fuel rebate is such a key subsidy, worth A$1-2bn annually to the coal industry. It is more than ironic that foreign coal miners pay little if any corporate tax yet are the single biggest beneficiaries of this subsidy. At the same time, the Australian government claims (as part of our climate change commitments internationally) that Australia has no fossil fuel subsidies.

Coal mining companies claim their rehabilitation efforts are world-class. However, more than two hundred years of mining in Australia has left more than 50,000 abandoned, unrehabilitated mines,[35] many of which continue to leech toxic chemicals into the water system, while suffering ongoing subsidence. The proposed open cut mines for the Galilee Basin will be bigger than those underway in the Hunter Valley in New South Wales. The benefits largely accrue to private corporations, but the environmental implications will be evident for centuries. The rehabilitation risks for Australia are immeasurable, particularly with respect to the issue of massive final voids.[36]

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[32] M chae West.com.au, "Sneaky coa g ant G encore drops off the Top40 Tax Dodgers", 28 December 2018
[33] The Austra an F nanc a Rev ew, "BHP to pay ATO $529m n tax sett ement over S ngapore market ng hub", 19 November 2018
[34] Par ament of Austra a, "Corporate Tax Avo dance report - Part III: Much heat, tt e ght so far", 30 May 2018
[35] The Conversat on, Corr n Unger, "What shou d we do w th Austra a s 50,000 abandoned m nes?", 23 Ju y 2014
[36] Energy Resource Ins ghts, "The Ho e Truth: The mess coa compan es p an to eave n NSW", 8 June 2016

About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) conducts research and analyses on financial and economic issues related to energy and the environment. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy and to reduce dependence on coal and other non-renewable energy resources. More can be found at www.ieefa.org.

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Tim Buckley, IEEFA's director of energy finance research, Australasia, has over 25 years of financial market experience covering the Australian, Asian and global equity markets from both a buy and sell side perspective. Tim was a top-rated Equity Research Analyst and has covered most sectors of the Australian economy. Tim was a Managing Director, Head of Equity Research at Citigroup for many years, as well as co-Managing Director of Arkx Investment Management P/L, a global listed clean energy investment company that was jointly owned by management and Westpac Banking Group.

Important Information