

The background image shows a coal train with a blue locomotive numbered 9026 moving away from the viewer on a track. In the distance, a power plant with several cooling towers is visible through a hazy atmosphere. The train is carrying a long line of black coal wagons. A metal bridge crosses the tracks in the middle ground. The overall scene is somewhat desaturated and hazy, suggesting an industrial or environmental context.

BRIEFING NOTE

FOSSIL FUELS, ENERGY TRANSITION & RISK

July 2014



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IEEFA BRIEFING NOTE- Fossil Fuels, Energy Transition and Risk

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In this briefing note, the Institute for Energy Economics and Financial Analysis (IEEFA) explores regulatory, market, technology and reputational risks resulting from the transformation of global energy markets – with a focus on the implications for Australian fossil fuel investment. This report evaluates the rapidly emerging evidence showing China's consumption of thermal coal will peak in the next few years, and progressively decline thereafter. Secondly, in the face of negative policy developments in Australia, we note increasingly positive policy progress by Australia's key trading partners.

Executive Summary – China's Coal Demand Peaking; Coal Taxes Rising

- The release of China's 2013/14 electricity sector capacity figures gives a clear sign of the Chinese government's priority to expand efforts in solar, wind, hydro, nuclear, gas and energy efficiency. In all, 67% of all new power installations in the last year in China were non-coal.
- While China's electricity demand grew 5.4% year-on-year in the first half of 2014, China's domestic coal consumption was up only 1.6%, and coal imports were up only 0.9% year-on-year. This is the slowest rate of growth in the Chinese coal sector for many decades.
- A long term investment path should see Chinese thermal coal demand peak in absolute terms in 2016, and decline thereafter. We see no surprise in the collapse in thermal coal prices below US\$70/t in July 2014, down 50% from the 2011 peak.
- In the last month, India has doubled its tax on coal to US\$2/tonne and increased its customs duty on coal imports to 2.5%. Likewise, China has announced it will boost its tax on coal to 5% (US\$3/t at current prices), having last year doubled its tax on thermal electricity production. Korea this month implemented its US\$16-18/tonne coal tax, prompting analysts to wonder whether this might not be a pattern?
- China's National Development & Reform Commission (NRDC) flagged this month it is working to accelerate the development of a national carbon trading market by 2018-2020. All seven pilot emission trading schemes (ETS) are now operational, albeit plenty of compliance problems are yet to be resolved.
- July 2014 saw the Korean Ministry of Environment announce it would not change its 2015 implementation timetable for the commencement of the national ETS. Following on from US President Obama's Clean Energy Plan last month, this suggests almost all of Australia's major trading partners are progressing carbon reduction initiatives.
- Global markets continue to facilitate an increasing flow of financial capital to renewable energy. The growth of the U.S. "YieldCo" listed renewable equities sector with three initial public offerings in June 2014 alone, the issue of US\$20 billion of Green Bonds in the first half of 2014 and the creation of the "New Development Bank" with an initial equity capitalisation of \$50 billion illustrate this trend.

Key Developments in Energy Markets

Fossil Fuels - Coal

RIO Tinto – energy division is less than 1%

Rio Tinto's half to June 2014 production report highlights the declining relevance of the energy sector to Rio Tinto's enterprise. Rio's total coal production was 17.4Mt for the six months, up 3% year-on-year. Four factors have materially eroded Rio's Energy profile:

1. the sale of the Clermont Mine in Queensland for US\$1bn completed in May 2014;
2. Rio Tinto Coal Mozambique struggling to produce even 0.2Mt for the half year;
3. the 50% decline in coal prices; and
4. 68% owned Energy Resources of Australia's (ERA) uranium production ceased at the end of 2013.

Energy is forecast to contribute less than 1% of Rio Tinto's operating earnings before interest and tax (EBIT) over the 2014-2015 period after a negative contribution in 2013. By contrast, Rio Tinto's global iron ore shipments were up 20% year-on-year to 142Mt for the half, and represents 80-90% of total group EBIT.



Clermont Mine in Queensland. Source: www.miningglobal.com

Fossil Fuels - Gas

Gas – LNG prices down 26% year-on-year

The collapse of the Asian traded price for liquefied natural gas (LNG) over 2014 is rapidly changing the pricing relativity of coal vs imported gas. Prices of spot LNG to Asia are down 12% in the last month to be down 26.5% year-over-year to \$11.365 per million British thermal units (MMBtu), the lowest monthly average since April 2011.ⁱ PNG LNG's commissioning in the June 2014 quarter has boosted supply earlier than expected.

Gas – Germany bans fracking

Germany has announced a halt to shale gas drilling for the next seven years over concerns that exploration techniques could pollute groundwater. German Environment Minister Barbara Hendricks said "There won't be shale gas fracking in Germany for the foreseeable future."ⁱⁱ

Renewable Energy

Solar power – installs up 15-20% year-on-year and cost declines continue

The cost of solar has been decreasing dramatically over the last five years, with total module manufacturing costs down more than 80% in this period. After a price war in 2011/12 that saw prices drop 40% in a year, module prices have stabilized in the 12 months, settling in the US\$0.60-0.70/watt range. This has restored industry profit margins, given costs have continued to decline in the order of 10% pa.

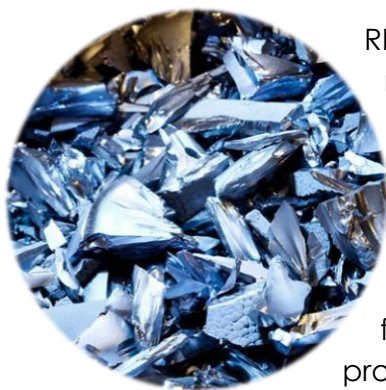
After this period of stability, we see increasing signs of a more sustainable period of solar industry expansion. After the record 38 gigawatt (GW) of installs in 2013, the global industry is expected to grow by 15-20% to 44-45GW in 2014.

Solar companies are now commencing manufacturing expansions to incorporate both capacity growth, but also the latest, lowest cost and highest efficiency solar technologies.

The cost of solar technology continues to decline. First Solar continues to project a 10% Compound Annual Growth Rate (CAGR) decline in total installed costs for utility scale solar. The company is on track to meet its US\$0.99/watt total cost target for 2017. In 2013, it achieved a cost of US\$1.59/watt. These economies are driven both by massive technology improvements and economies of scale.



First Solar. Source: the Australian



REC Silicon (one of the top six upstream solar firms globally) reported in July 2014 its target cash cost of production for polysilicon in the second half of 2014 at US\$11.10/kg, down 20% on the US\$14/kg at the start of 2013.ⁱⁱⁱ Polysilicon, the core feedstock for PV modules is currently trading at US\$21/kg. Either the polysilicon market is entering a period of 40% cash operating margins, or more likely, prices will commence a further sustained reduction into 2014/15 as this industry's production capacity steps up by 15-20% annually.

Polysilicon. Source: REC Silicon

China's electricity market – more of everything to dilute coal

China's coal imports in the first half of 2014 grew just 0.9%, compared with growth of 13.3% a year earlier.^{iv} China's total domestic coal production was 1.48 billion tonnes in the Jan-May 2014 period, up only 1.6% year-on-year year-to-date. While still modest growth relative to the 10% CAGR seen over 2000-2011, this is a dramatic slowdown and explains in large part the collapse in the global coal price over 2012-2014.

By comparison, the National Energy Administration reports that, for the first six months as a whole, power consumption in China increased 5.3% on the year to 2.63 trillion kilowatt hour (kWh).^v

The stalled demand for growth in coal in China is despite robust electricity demand, and runs in the face of a 9.4% year-on-year growth in total installed electricity capacity across China in the year to June 2014 – refer **Figure 1**. Given that thermal power generation is last on the merit order of priority i.e. thermal fuels have a high marginal cost of production relative to installed solar, wind, hydro or nuclear, this means that while new coal fired power capacity is still being installed in China, the utilisation rates for all coal-fired power plants has fallen materially over the last year.

Figure 1: Total Chinese Electricity Capacity, and New Installs 2013/14

GW Installed	Jun'2013	Jun'2014	Percent of total Installed	Change yoy	Change GW	Percent of new installs
Thermal	833.8	878.8		5.4%		
<i>Coal</i>	<i>793.6</i>	<i>829.1</i>	<i>66.3%</i>	<i>4.5%</i>	<i>35.5</i>	<i>33%</i>
<i>Gas</i>	<i>40.2</i>	<i>49.7</i>	<i>4.0%</i>	<i>23.8%</i>	<i>9.6</i>	<i>9%</i>
Hydro	221.8	253.7	20.3%	14.4%	31.9	30%
Nuclear	14.6	17.8	1.4%	21.7%	3.2	3%
Wind	67.5	82.8	6.6%	22.6%	15.3	14%
Other (Solar, EfW, CHP)	6.0	18.1	1.4%	202.3%	12.1	11%
Total	1,143.7	1,251.2		9.4%	107.5	100%

Source: Reuters, National Energy Administration.^{vi}

Figure 1 shows that net new coal-fired electricity capacity installed was 35 GW in the last twelve months. While we acknowledge this is still an enormous amount, the install rate is down almost 50% from the average of 50-70GW pa over 2009-2011 and now represents only 33% of total new installs. Renewable energy represented 55% of all additions in 2013/14.

With nuclear power installs expected to lift to 15-20GW per annum (pa) over the next few years, this will add to wind installs forecast by IEEFA at 18GW pa, solar installs of 12-14GW pa, hydro at 20GW pa and gas continuing at 5-10GW pa. Combined with a lower GDP growth rate and continued progress on energy efficiency, IEEFA forecasts China's thermal coal demand will peak in absolute terms by 2016, and decline thereafter.

Major Project Updates

Adani and POSCO reach agreement to build a rail line to the Galilee Basin

Adani Mining Pty Ltd announced it has signed an engineering, procurement and construction contract with POSCO Engineering and Construction of Korea to build the greenfield rail line from the proposed Carmichael Coal project to Abbot Point in Queensland, Australia. This Northern Link rail line is planned to be 388km and would have a construction cost approaching A\$3bn. We note this rail project is still subject to government approval and financial close.

Adani suggests a key aspect of this agreement is that POSCO will provide some equity financing for the rail project, and that POSCO's involvement should open up debt project financing from Korean banks.

IEEFA's financial analysis shows this project requires a thermal coal price well in excess of US\$100/t to be commercially viable – whereas the thermal price is currently sitting at US\$60-70/t. We note that adding 60 million-tonnes-per-annum (Mtpa) of additional supply will have a materially adverse impact on the global seaborne price of thermal coal. 60Mtpa equates to a 6% expansion of global supply, at a time when most coal mining companies are evaluating mine closures. Opening up the Carmichael project will help facilitate upwards of 200Mtpa of additional thermal coal supply. Combined, a 30% expansion of global supply over the medium term will see the global thermal coal remain under pressure, and could in isolation drive the long term coal price permanently down 20% from current commodity analysts' projections.^{vii}

The NSW Government recommends Newcastle's 70Mtpa T4 port expansion



Source: www.pwcs.com.au

Despite the existing 211Mtpa coal export facilities at Newcastle only operating at 70% of capacity in 2013, the NSW Planning Commission has recommended the NSW government approve a 30% expansion to add 70Mtpa of additional coal export capacity at an estimated cost of A\$4.8bn.

The NSW Planning department based their recommendation on the International Energy Agency (IEA)'s bullish for coal "Current Policies Scenario", failing even to acknowledge that the IEA even had a central "New Policies Scenario", let alone any consideration of the risk if the "450 Scenario" were to eventuate.^{viii}

Global Policy and Market Developments

The EIA forecasts a 15% reduction in US coal power over 2014-2030

The U.S. Energy Information Administration (EIA) released its Annual Energy Outlook in July 2014.^{ix} The EIA projects 0.9% CAGR in electricity demand in the US over the 2014-2040 period. To cater to this expansion in demand, the EIA forecasts a net 191GW or +20% of new power capacity will be added in this same period (287GW less 94GW of retirements). The EIA assumes only 2GW of new coal-fired power generation capacity is added in this 26 year forecast, against coal retirements of 51GW. This forecasts a 15% reduction in coal-fired capacity. Should the US step up its activities in energy efficiency, clean air standards, distributed solar and even maintain its current level of investment in utility scale solar, wind and hydro, the EIA forecasts a far more significant cut to the US coal-fired power sector.

California – to lift its 33% by 2020 Renewable Portfolio Standard target to 40% by 2030?



Source: www.energy.ca.gov

The State of California is well on its way to delivering on its 33% renewable energy target by 2020. The Californian Independent System Operator (CAISO) reports that as of June 2014, 21 GW of solar PV, solar thermal and wind projects are in its planning queue. With 15 GW of renewable energy capacity already operational in California, the target of 23 GW by 2020 looks to be well exceeded. The 33% Renewable Portfolio Standard (RPS) excludes distributed solar. There is increasing speculation that Governor Jerry Brown will announce a new 40% by 2030 target as part of his 2015 reelection campaign.^x The grid integration of 25% renewable power currently is being managed without major issue, but the move to 33%, and then potentially 40%, explains why California is leading the global development of both electricity storage and solar thermal with storage initiatives. ABC Four Corners recently aired an excellent comparison of Australian vs Californian thinking on the issues of energy sector transition.^{xi}

Global Regulatory Progress

India doubles the tax on coal

In its 2014/15 budget, India has doubled the “clean energy cess” (tax) on all coal consumed in India from 50 Rupees/tonne to Rs100/t (US\$1.66/t). Proceeds of over US\$1bn annually are to be used to fund the deployment of renewable energy in India. In addition, the customs duty on all imported tax was raised to 2.5%. Previously duties were nil for coking coal and 2.0% for thermal coal imports.^{xii}

This follows Korea's introduction of a US\$16-18/t import tax on coal in July 2014^{xiii}, and similar moves by Mexico and Chile earlier this year.

China boosts tax on coal

China will tax coal producers based on sales volume instead of production output, similar to taxes put on crude oil and natural gas in 2011, Lou Jiwei, Minister of Finance, announced on the Ministry of Finance website earlier this month. Other resource taxes would be adopted to better protect rivers, lakes, forests, grasslands and coastal areas, and environmental protection taxes would be introduced to replace administrative pollution discharge fees, Lou said.^{xiv}

In a separate interview published by *Xinhua* on July 3, Jia Kang, head of the Finance Ministry's Research Institute for Fiscal Science, said the changes would lead to a tax of around 5% of the sales value on coal, and would likely increase electricity prices overall due to a mechanism where the prices of coal and electricity would “move in tandem.”

China aims to raise scope of seven pilot emissions trading schemes

Sun Cuihua, deputy director of the Climate Change Department at the National Development and Reform Commission (NRDC), said at the Eco Forum Global in Guiyang on 11 July 2014 that China is working on steps that would guide eventual carbon trading throughout the country: “On the basis of the pilots we will be accelerating the building of a national carbon trading market”.^{xv} This is likely to involve unifying the seven different pilot schemes, improving enforcement and widening the scope of industry coverage. On the 18 July the NRDC announced the creation of a committee of experts to oversee this process.^{xvi} This is consistent with the suggestion in June 2014 by He Jiankun, Chair of China's climate advisory committee, that China would consider introducing a carbon dioxide emission control (something of a “CO2 Cap”) by 2018 as part of the upcoming 13th Five Year Plan.^{xvii}^{xviii}

Korea prepares for National ETS introduction in 2015

The Korean Ministry of Environment, which oversees the ETS program, announced, on the 15th July 2014, that it would not change the 2015 implementation timetable. “Another delay in ETS implementation will be detrimental to national interests because ETS can cut

the national greenhouse gas reduction cost by more than half," compared with the existing "cap-without-trade" scheme in place since 2012, the ministry said.^{xix}

Green Bonds Market Development

The global financial markets need to be unlocked to accelerate the deployment of renewable energy and energy efficiency. The development of the Green Climate Bond market in the last few years is a key positive trend. Green Bonds saw a record level of new issuance in the first half of 2014 of US\$20bn, putting this market on track for US\$40bn in 2014 overall, and at the current rate of growth in excess of US\$100bn of new issuance in 2015.^{xx} After GDF Suez completed a €2.5 billion green issue in May, the German State development bank KfW completed its first green issue of €1.5bn, 5 year, AAA rated bonds paying 0.375% pa.^{xxi} Given KfW can provide medium term residential household finance for rooftop solar with storage using funding of an exceptionally low 0.375% pa, the return metrics for self-generation look considerably more robust – even with Germany's low solar radiation.

Gunther Braunig, KfW's executive board member in charge of capital markets said: *"Our aim as a green bond issuer is to establish the same systematic dialogue with investors to get them engaged in climate protection finance. I am convinced that capital can provide very strong stimuli for sustainable development. The more capital market participants are committed to responsible investment, the bigger the effect."*

This follows Taiwanese solar cell manufacturer Neo Solar issuing a US\$120m, 3 year convertible bond^{xxii} and DC Water (US) issuing US\$350m of AA+ 100 year bonds at a 4.8% coupon,^{xxiii} both in July 2014.

YieldCo's have opened a new capital market for renewable energy equity in the US

The last month has also seen the successful initial public offerings (IPO) of a number of new listed equity vehicles (termed "YieldCos") owning and operating renewable energy infrastructure assets. With average power purchase agreements spanning 18-20 years, the companies are being heavily sought for their high dividend yield plus solid growth. Over June 2014 SunEdison has listed **TerraForm Power**, Abengoa SA of Spain listed **Abengoa Yield** on the New York Stock Exchange and Nextera Energy has listed **Nextera Energy Partners LP**. These have leveraged off the excellent performance of **NRG Yield** and **Pattern Energy** that was IPO'd in 2013. These five companies have an average of more than 1GW each of renewable energy infrastructure assets.

These vehicles could permanently lower the cost of capital for renewable energy, as Deutsche Bank's Vish Shah notes: "Enabling the Transition to Grid Parity Growth."^{xxiv} Deutsche Bank suggests the YieldCo valuations being attained have lowered the cost of equity for renewable assets from over 10% to less than 5%.

Global financial markets can leverage huge amounts of capital for products with the right structure. Green Bonds and YieldCos are two such examples. KfW's access in July 2014 of this global green bond market highlights the compelling strategic logic of the Clean Energy Finance Corp to leverage new, low carbon, long life strategic infrastructure investments for Australia.

Development of the BRICS Development Bank

July 2014 saw the agreement to form a new development bank equally owned and funded by Brazil, Russia, India, China and South Africa (BRICS) with initial capital of US\$50 billion.^{xxv} The bank's mandate is to enhance the joint financing on technological innovation projects, with an emphasis on renewable energy infrastructure and agriculture in developing countries.^{xxvi}

Australian Policy & Regulation

Repeal of the carbon tax

The repeal of the Australian carbon tax seeks to stimulate more investment in fossil fuels at a time when demand and prices around the world are directing capital in other directions in the energy sector. The repeal may have some short term stimulative impact but is unlikely to reverse the broader global market trends. The risk of continued investment leaves the country exposed to a portfolio of stranded assets.

Stepping up privatisation of power generation, grid and port assets at least is reducing the state governments' exposure to these potentially stranded asset risks.

Investor Responses - Global

UK Law Commission – fiduciary duties of intermediaries

Fund managers have a duty to take long term environmental and social risks to their investments into account, says a new report from the UK's advisory Law Commission.^{xxvii}^{xxviii} The Law Reform report's primary aim is to explain the nature of fiduciary and other duties to act in the best interests of savers, and to describe how these duties apply to investment intermediaries.

Aviva Investors talks of Investors' Fiduciary Duty

Colin Purdie, head of institutional credit at the £260bn UK fund manager Aviva Investors, in talking about the development of the Green Bond Market, made some clear comments about investors' duties with client monies:

"Fiduciary duty requires that when we are made aware of an issue we must act and in a manner that is in the best interests of our clients. Clearly, climate change is one such issue. Failing to acknowledge, address and mitigate the significant economic risks raised by climate change, I believe, means a failure to meet our fiduciary duty. As such, investment managers should be required to act in order to mitigate the consequences of climate change."^{xxix}

Important Information

This report is for information and educational purposes only. It is intended solely as a discussion piece focused on the topic of the Australian energy sector, with respect to investment, policy and regulatory trends and the risks of stranded assets. Under no circumstance is it to be considered as a financial promotion. It is not an offer to sell or a solicitation to buy any investment referred to in this document; nor is it an offer to provide any form of investment service.

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