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# **BRIEFING NOTE**

# **Global Energy Markets in Transition**

January 2015



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# IEEFA BRIEFING NOTE:

## GLOBAL ENERGY MARKETS IN TRANSITION

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*In this briefing paper, the Institute for Energy Economics and Financial Analysis (IEEFA) provides a summary of recent global electricity market trends that reinforce IEEFA's view that seaborne thermal coal markets have entered structural decline.*

*This position is reinforced by the more than 50 percent decline in coal prices and the 80 to 90 percent drop in the equity value of most listed coal companies globally in the last four years, an unprecedented underperformance against the equity market overall.*

*This trend has occurred as materially weaker-than-expected demand for thermal coal has combined with oversupply and the devaluation of exporter-nation currencies to undermine coal prices. Sustained weakness leaves the average export mine globally at little better cash breakeven, unable to fund sustaining capital expenditure or any excessive debt-service burden.*

*This brief covers some of the forces at work, including the expansion of renewable-energy installations, increasing energy-efficiency impacts, weak electricity demand, and policy initiatives that continue to move the world energy markets toward an inevitably lower carbon-intensive future. It examines developments across key electricity markets, from China and India to the Western markets of the U.S., Germany, the U.K. and Japan.*

### Executive Summary

#### Electricity Sector Transformations Accelerate Globally

In this brief, we examine developments across the largest electricity markets globally, from growth markets in China and India to mature Western markets in the U.S., Germany, the U.K. and Japan.

Some of our key findings:

- Surges in investment in offshore wind in Europe, and solar in China, Japan and the U.S. helped drive investment clean energy up 16 percent, to US\$310 billion, according to Bloomberg New Energy Finance.<sup>1</sup>
- 2014 global installs of solar capacity rose 20 percent to a record 46-48 gigawatts (GW).
- New global wind installs grew 40 percent to 46 GW in 2014, led by China and America.
- The Chinese electricity market was vividly transformed in 2014: While real economic growth exceeded 7 percent, electricity demand grew by less than 4 percent. Rapid supply diversification saw China's coal consumption decline 2 percent and coal imports fall by 11 percent to 291Mt in 2014.

- India Energy Minister Piyush Goyal surprised the world in 2014 by announcing a proposal for India to cease importing thermal coal within 2-3 years. In conjunction with this, Goyal announced plans for 100 GW of solar and 60GW of wind by 2022; including US\$100 billion of renewable energy infrastructure investment by 2019, plus US\$50bn of grid upgrades.
- U.S. coal demand increased 0.8 percent in 2014, but total U.S. coal exports fell 20 percent. U.S. thermal coal consumption in 2014 is down 18 percent from the 2008 peak.
- Germany's electricity demand fell a preliminary 3.8 percent in 2014, and electricity generated from coal declined by 4.7 percent.
- Japan installed record levels of 10 GW of solar energy capacity in 2014, part of a development pipeline of over 72 GW in planning. Combined with any restart of Japan's 49GW of idled nuclear capacity and a declining electricity consumption profile, Japanese fossil-fuel demand will increase at least until 2020.
- The China-U.S. Climate agreement announced in 2014 augers well for global renewable-energy policy momentum in 2015.
- The deflationary nature of renewables continues to drive new investment, undermining the viability of thermal power and increasing the risk of stranded assets. IEEFA views the IEA forecast of 5% annual solar cost deflation through to 2035<sup>1</sup> as conservative.

### **While Coal Prices Halved, Cutting Margins to Zero, Production Expansions Continue**

- Australian thermal export coal prices fell by 25 percent in 2014, and has gone on to a new low of US\$57/tonne in January 2015.<sup>2</sup> This has driven an 80 percent or more collapse in average global equity market values of listed coal companies in the last four years.<sup>3</sup>
- At US\$0.81, the Australian dollar is providing a cushion for Australian producers to falling U.S.-dollar-based commodity prices. However, all global coal-export majors saw major devaluations. The Russian ruble halved, dramatically improving Russia's cost position.
- Take-or-pay (ToP) contracts remain a key impediment to the global coal industry's need for export-supply curtailment.
- Some of the largest proposed coal proposals still continue along the development path.
- In Queensland, most prominent of these proposals is Adani's A\$15bn 40-60Mtpa Carmichael mine, plus its associated greenfield rail and port proposal. Financial close has been pushed out to the fourth quarter of 2015 and increasing levels of government subsidy are required.
- Glencore's US\$1.4bn 8Mtpa Ravensworth North thermal / coking and US\$1.2bn 8Mtpa Ulan West thermal coal expansions ramped up over 2014.
- Whitehaven's A\$1.2bn 10Mtpa greenfield Maules Creek, NSW coal mine is being progressively commissioned over 2015, despite objections and ICAC corruption inquiries.
- The New South Wales government continues to allow progression of major new mine developments from BHP's 10Mtpa Carroona thermal mine, Shenhua's Watermark proposal, Whitehaven's Vickery proposal to Rio Tinto's Warkworth expansion.
- Stranded coal mine and associated infrastructure assets remains a key financial risk.

<sup>1</sup> <http://www.iea.org/publications/freepublications/publication/technology-roadmap-solar-photovoltaic-energy---2014-edition.html>

<sup>2</sup> <http://www.businessinsider.com.au/chart-of-the-day-newcastle-coal-is-quietly-crashing-2015-1>

<sup>3</sup> <http://www.cnn.com/id/102318582#>

## Section 1: Electricity Sector Transformations Accelerate Globally

### China: Peak Coal Demand Is in View

China's November 2014 statistics show an acceleration of the trend that has emerged over 2012-2014, and the nexus between real gross domestic product (GDP) growth, electricity growth and coal demand has been broken.

China's coal demand grew 10 percent annually over the decade to 2011, then the rate of growth halved to 4-6 percent in 2012 and 2013. In 2014, China's coal demand has actually declined by 2.1 percent year-on-year. This is consistent with IEEFA's view that China's coal demand will permanently peak by 2016 (if not earlier), and gradually decline thereafter.

**Figure 1: China's Electricity Production (TWh) and Fuel Source**

Production (TWh)	YTD Nov'13		YTD Nov'14		YoY
	(TWh)	share	(TWh)	share	
Thermal (gas and coal combined)	3,818	79.7%	3,807	76.5%	-0.3%
Hydro	725	15.1%	887	17.8%	22.4%
Other	245	5.1%	281	5.6%	14.6%
<b>Electricity</b>	<b>4,788</b>		<b>4,975</b>		<b>3.9%</b>
China coal production (Mt)			3,513		-2.1%

Source: China Government Statistics<sup>4</sup>

China's GDP is expected to come in for 2014 overall around the 7.3 percent growth reported for the first nine months of 2014.

Against this backdrop, China's electricity demand has grown 3.9 percent year-on-year (yoy) through to November 2014. This reflects the combined impact of energy efficiency initiatives and structural economic changes toward less electricity-intensive service sectors. This has reduced the ratio of electricity demand growth to GDP from above 1.0x over the last 13 years to just over 0.5x in 2014. Further, in August 2014, Morgan Stanley halved its forecast for this ratio for 2014-2016, arguing it will be maintained at 0.3-0.5x, a downwards shift in China's economic growth electricity intensity. IEEFA forecasts a ratio of 0.6x for China for 2014-2020.

The second key shift in China is that the country's domestic coal production declined 2.1 percent in the year to November 2014,<sup>5</sup> and coal imports were down 10.9 percent yoy in 2014 overall to 291Mt.<sup>6</sup> This contrasts to electricity production being up 3.9 percent yoy. Meantime, coal has seen a rapid loss of market share in 2014 against all other sources of electricity generation across China – wind, solar, hydro, nuclear, biomass and natural gas.

IEEFA estimates that China installed 22 GW of hydro, 18 GW of wind, 13 GW of solar, 5-7 GW of nuclear and 4-6 GW of gas-fired electricity capacity in 2014 alone. Combined with another 22 GW of net new coal-fired capacity, China's total electricity capacity installs are forecast at 90 GW in 2014 (over 6 percent yoy total capacity growth). Coal-fired power

<sup>4</sup> [http://www.stats.gov.cn/english/PressRelease/201412/t20141216\\_653855.html](http://www.stats.gov.cn/english/PressRelease/201412/t20141216_653855.html)

<sup>5</sup> <http://af.reuters.com/article/energyOilNews/idAFB9N0T400220141217>

<sup>6</sup> <http://www.brecorder.com/markets/commodities/asia/216783.html>

plants average utilisation rates have declined from an estimated 60 percent in 2011 to around 56 percent in 2014. Given this excess capacity, new installations of coal power are expected to rapidly slow and China could well see net annual coal-fired power capacity reductions from 2016 onwards.

IEEFA forecasts that coal's share of electricity production in China dropped from an average over 2008-2011 of 78-79 percent to 72.5 percent in 2014. Further, IEEFA forecasts coal's share China's energy production declining to 60 percent by 2020 as its rapid diversification into all lower-carbon intensive alternatives accelerates. UBS and Citi's commodity research teams forecast a similar share loss for coal, to 62 percent by 2020.

### **Lower Export Tariffs, Higher Import Tariffs**

China has recently announced two major moves that combined signal a dramatic deterioration in the outlook for the global seaborne thermal coal market. First, China has moved to reduce coal export tariffs from 10 percent to 3 percent starting on Jan. 1, 2015.<sup>7</sup> This follows a move in October 2014 to impose a 6 percent import tariff on thermal coal (unless sourced from Indonesia under the Asian bilateral free trade agreement). China has since said it will remove this import tariff in two years, but in the meantime has also been enforcing strict new quality rules on imported coal.<sup>8</sup>

China's coal imports have declined 10.9 percent yoy over 2014, after five years of aggressive imported coal growth.<sup>9</sup> This decline has accelerated as 2014 has progressed, with second half 2014 coal imports down 23 percent yoy,<sup>10</sup> suggesting the peak in China's thermal coal imports passed in 2013. China was a net coal exporter prior to 2009, and IEEFA forecasts that a return to an opportunistic net coal export position is possible for China again before 2020.

### **A Pause in Coal-to-Gas and Coal-to-Liquids Programs**

Reports in the Chinese press in December 2014 suggest Beijing is considering an end to approvals for new coal-to-gas (CTG) and coal-to-oil (CTO) projects as part of its next five-year plan for the industry.<sup>12</sup> China had previously forecast massive CTG and CTO programs that would have required an additional 300 million tonnes of coal production annually. The issues driving a major re-think on this expansion relate to the very high capital intensity of the investments coupled with the process being excessively intensive in terms of both carbon emissions and water usage.

Dealing with water scarcity is a strategic priority in China. In January 2015, the government announced a 4 trillion yuan (US\$645bn) water infrastructure investment program that will last until 2020. With 20 percent of the world's population but only 7 percent of its available fresh water, water scarcity is a key government focus.<sup>13</sup> Coal mining and coal-fired power generation is very water intensive.

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<sup>7</sup> <http://www.reuters.com/article/2014/12/16/china-economy-tax-idUSL3N0U01YJ20141216>

<sup>8</sup> [http://www.afr.com/p/business/companies/coal\\_miners\\_fear\\_china\\_misusing\\_SK9wVvGeQLofXpR4p5xZJ](http://www.afr.com/p/business/companies/coal_miners_fear_china_misusing_SK9wVvGeQLofXpR4p5xZJ)

<sup>9</sup> <http://reneweconomy.com.au/2014/china-slashes-coal-imports-coal-generation-slumps-47396>

<sup>10</sup> <http://www.reuters.com/article/2014/12/08/china-economy-trade-coal-idUSL3N0TS21320141208>

<sup>11</sup> <http://daily.sightline.org/2014/12/08/chinese-coal-imports-falling-fast/>

<sup>12</sup> <http://energydesk.greenpeace.org/2014/12/16/lima-china-considers-coal-gas-ban/>

<sup>13</sup> <http://www.bloomberg.com/news/2015-01-07/sound-global-wins-bidding-for-sichuan-sewage-treatment-projects.html>



## India Cannot Afford Imported Coal

In May 2014, IEEFA released a financial analysis titled “India Power Prices”<sup>14</sup> that examined the cost of electricity generation from imported coal. The report’s conclusion was that imported coal for a typical new greenfield power plant in India would cost at least Rs5.40-5.70/kWh and that costs would rise 4 percent annually thereafter. By comparison, wind-generated electricity costs Rs4.60/kWh, and solar costs have been in free-fall and are now at Rs5.50/kWh, with no inflation impact over time. This makes it a straight commercial decision for India to aggressively expand renewables investment. Additional benefits reinforcing this commercial decision include: energy security; energy system diversity; reduced pressures on the massive current account deficit and hence exchange rate; plus the deflationary angle. These forces combined will increasingly undermine the to-date strong growth in seaborne thermal coal demand from India.

In November 2014, Indian Energy Minister Piyush Goyal’s gave a speech outlining his plans for the transformation of the entire electricity system with 100 GW of renewable energy installs by 2019. This involves trebling wind installs to 6-8 GW annually and lifting solar installs tenfold to 10 GW annually.<sup>15</sup> Accelerated depreciation tax incentives are now in place to motivate strongly capitalized Indian firms to diversify into renewable energy.

In December 2014, Goyal announced a solar subsidy adjustment to accelerate the first 21 GW of new installations. India will provide INR5050 crore (US\$800m) for two solar development schemes, one for at least 20 GW of “ultra mega” solar power parks, and another for 1 GW of on-grid solar.<sup>16</sup> The new solar projects will predominantly use Viability Gap Funding (VGF). VGF is available due to India’s “polluter pays” system, in which coal companies pay INR50 (US\$0.80) per tonne of domestically produced, and imported coal.

In January 2015, India cancelled a tender for two ultra mega power plants (UMPP) that was to add 8 GW of new coal-fired power generation capacity.<sup>17</sup> Nine private power companies withdrew from the tenders stating that the financial risks associated with this US\$8billion of new investment proposals were excessive, including coal supply fuel risks.

In February 2015, the Indian government plans to auction via a tender 74 coal mine deposits. This represents the first batch of the 214 coal deposit leases cancelled in September 2014 by the Indian Supreme Court after finding that US\$33 billion of government owned coal assets had been illegally allocated for free to select companies over the two decades to 2010.

Combined with a plan to significantly step up Coal India Limited’s domestic coal mine productivity and to quadruple India’s rate of installation of renewable energy capacity, these moves are integral parts of Goyal’s comprehensive plan aimed at ceasing thermal coal imports into India within 2-3 years.<sup>18</sup> The logic for this plan is compelling: imported coal is inflationary; it does nothing to improve India’s energy-system security; and the country’s more than US\$10 billion of annual thermal coal imports undermine the stability of India’s current account and hence currency.

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<sup>14</sup> <http://www.ieefa.org/briefing-note-india-power-prices/>

<sup>15</sup> <http://reneweconomy.com.au/2014/india-add-10gw-solar-year-spend-100bn-renewables-2020>

<sup>16</sup> [http://www.pv-tech.org/news/india\\_uses\\_coal\\_tax\\_to\\_help\\_fund\\_21gw\\_of\\_new\\_solar\\_development](http://www.pv-tech.org/news/india_uses_coal_tax_to_help_fund_21gw_of_new_solar_development)

<sup>17</sup> [http://www.business-standard.com/article/pti-stories/power-ministry-cancels-umpp-bidding-to-set-up-committee-soon-115010800505\\_1.html](http://www.business-standard.com/article/pti-stories/power-ministry-cancels-umpp-bidding-to-set-up-committee-soon-115010800505_1.html)

<sup>18</sup> <http://in.reuters.com/article/2014/11/12/india-coal-imports-idINL3N0T234F20141112>

## **NTPC Is Diversifying Into Renewables**

Energy Minister Goyal is also considering pushing the National Thermal Power Corporation (NTPC) into expanding rapidly into renewable power generation, including hydro, wind and solar.<sup>19</sup> NTPC is already developing the world's largest solar power project with 1,000 MW capacity, in Andhra Pradesh.

## **India Is Aiming for 100GW of Solar- and 60 GW of Wind-Generated Energy by 2022**

Recognising the extent of electricity industry policy shift underway in India, In January 2015 Adani Enterprises announced a US\$4 billion investment in construction of an integrated solar panel manufacturing complex in Gujarat through a joint venture with SunEdison Inc. (U.S.).<sup>20</sup>

"India has embarked on an ambitious program to become a world leader in power generation from renewable technologies, and sees solar as a key part in realizing that goal," said Vneet S. Jaain, CEO of Adani Power Ltd., in announcing the deal.

Adani has previously built and now operates a 40 MW solar electricity project in India, but the Gujarat project marks the first serious effort to transition the company toward lower-emissions-intensive projects.

Coverage of the announcement references the recent commitment by Minister Goyal to see 100 GW of solar and 60 GW of wind installed by 2022. Getting anywhere near that targets will dramatically erode India's need for imported thermal coal.

## **SunEdison to undertake 5GW of solar in Karnataka**

The day after committing to a Rs 25,000-crore investment in Gujarat, SunEdison in January 2015 followed on by announcing the signing of a memorandum of understanding with the Karnataka government for developing 5 GW of renewable energy over the next five years.<sup>21</sup> The developing solar boom in India is rapidly coming together.

## **India Has Cancelled an 8GW Coal-Fired Power Tender**

India just this month has cancelled a huge but already twice-delayed tender for the construction of 8 GW of new UMPP coal-fired power generation capacity in India.<sup>22</sup> No private firms were willing to tender for this project due to excessive financial risks.

To IEEFA, it is all but inevitable now that Adani will find that its Carmichael coal project in Australia is both financially unviable, and that the need for spending A\$15bn to develop expensive imported coal is no longer compelling nor financially bankable. There are significantly more profitable and lower-risk investment opportunities in the domestic Indian electricity sector, particularly in helping implement the government's strategy to invest US\$100bn in long-life, low-risk renewable-energy infrastructure.

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<sup>19</sup> [http://www.thehindubusinessline.com/companies/ntpc-must-diversify-into-hydro-alternative-resources-panel/article6772476.ece?utm\\_source=Vuuklemail&utm\\_medium=Email&utm\\_campaign=Newsletter](http://www.thehindubusinessline.com/companies/ntpc-must-diversify-into-hydro-alternative-resources-panel/article6772476.ece?utm_source=Vuuklemail&utm_medium=Email&utm_campaign=Newsletter)

<sup>20</sup> <http://www.livemint.com/Industry/hBLp1etYY06mPIRiZ5ElwM/SunEdison-Adani-to-build-4-bn-Gujarat-solar-facility.html>

<sup>21</sup> [http://www.business-standard.com/article/companies/sunedison-eyes-karnataka-with-5-gw-solar-projects-115011300950\\_1.html](http://www.business-standard.com/article/companies/sunedison-eyes-karnataka-with-5-gw-solar-projects-115011300950_1.html)

<sup>22</sup> <http://timesofindia.indiatimes.com/city/bhubaneswar/Fresh-tender-for-power-project-in-5-months-Piyush-Goyal/articleshow/45842145.cms>

## U.S. Coal-Fired Electricity Capacity Continues to Fall

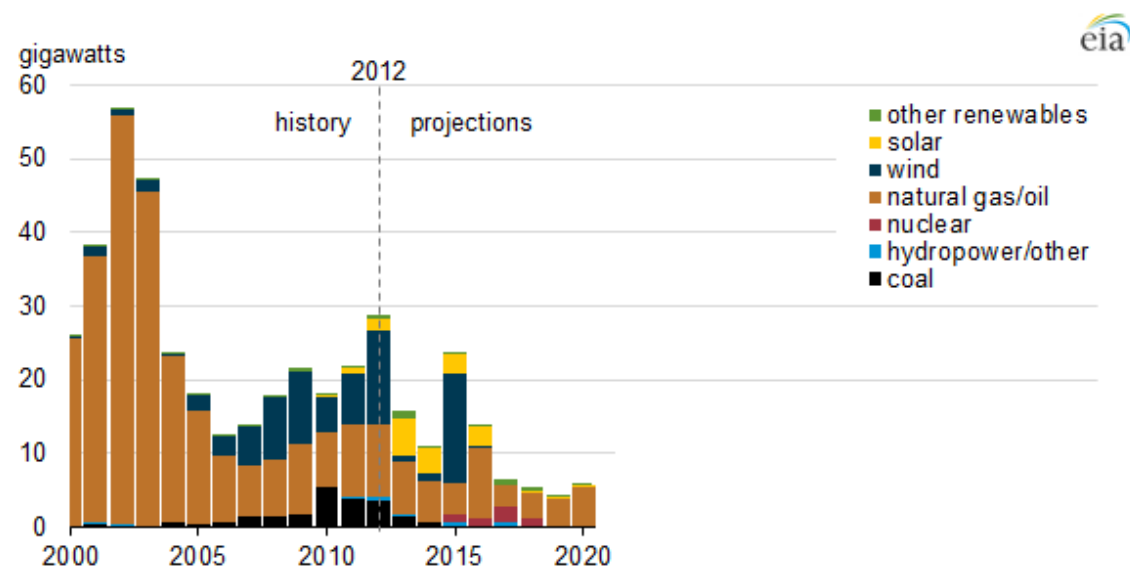
At the end of 2014, the 180<sup>th</sup> planned closure since 2010 of a U.S. coal-fired electricity plant was announced.

This is a reflection of a combination of factors:

1. Flat U.S. electricity-sector demand since 2007, driven by energy-efficiency gains and subdued economic growth;<sup>23</sup>
2. Increased coal-to-gas switching at both the dispatch and capital-expenditure level due to exceptionally low natural-gas prices;
3. The rapid uptake of new wind farms plus utility and distributed solar installations;
4. The increased effectiveness of Environmental Protection Agency (EPA) regulations, particularly implementation of the Mercury and Air Toxics Standards implantation and the Cross-State Air Pollution Rule; and
5. Rapidly growing public support and policy supporting of renewables and in opposition to coal.

Figure 2 shows the Energy Information Administration (EIA) estimate of gross capacity additions to the U.S. electricity system over 2000-2020. Low natural gas prices are key drivers of new capacity investment, as are strong state renewable portfolio standards and the continued impact of the Federal investment tax credits (ITC). IEEFA views the EIA as too conservative on the U.S. solar, wind and hydroelectricity uptake. While Figure 2 shows gross coal additions over 2010-2013, net coal and nuclear capacity has been closed in this period.

**Figure 2: US Electricity Plant Capacity Additions 2000-2020 (GW)**



Source: EIA July 2014<sup>24</sup> - truncated to show 2000-2020 only.

<sup>23</sup> <http://www.eia.gov/forecasts/steo/report/electricity.cfm>

<sup>24</sup> <http://www.eia.gov/todayinenergy/detail.cfm?id=17131>



The Energy Information Administration (EIA, 2014) has forecasts 51 GW of net U.S. coal-plant retirements from 2012-2025.<sup>25</sup> In Mid-2014, Citi Equity Research predicted that 61 GW of coal capacity would go off line. The Sierra Club predicts that 100 GW or 30 percent of coal-fired plants will retire over 2012-2020, with over 75 GW already announced as planned retirements.<sup>26</sup>

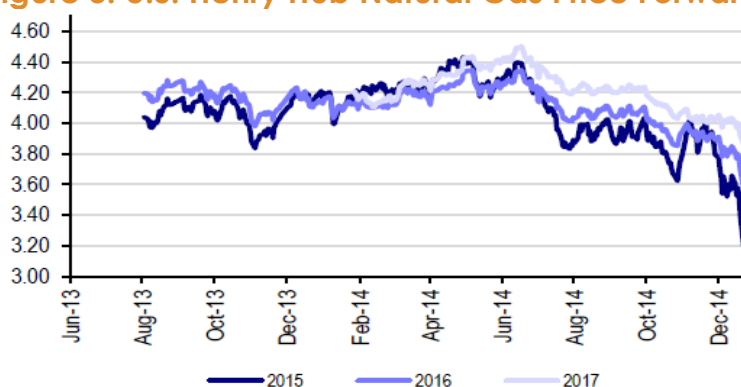
Despite higher gas prices and strong economic growth, demand for U.S. coal increased by only 0.8 percent in 2014<sup>27</sup> to 992 million short tons (Mst). Within this, U.S. exports declined 20 percent in 2014, and U.S. thermal coal production in 2014 was 18 percent below its 2008 peak of 1,172Mst.

The EIA (2014) reference case has U.S. non-hydro-renewables electricity production rising from 250 TWh in 2012 to 380 TWh by 2020, with strong growth in wind, solar and biomass capacity. However, given that this assumes only 1.3 GW of solar and 1.3 GW annually of wind are each added over 2012-2025 in the U.S., this forecast looks exceptionally conservative. The U.S. installed 7 GW per annum of wind in 2011-2013, a rate we expect to be maintained over 2014-2016, and we see 5 GW per year of solar additions in 2013-2016. Hydroelectricity is forecast to remain constant at 290 TWh per annum, but has significant upside potential.

In December 2014, the White House Council on Environmental Quality released a guidance document that advises federal agencies to consider "the effects of greenhouse gas (GHG) emissions and climate change in their evaluation of all proposed Federal actions." The Council of Environmental Quality is pointing to the social cost of carbon protocol as a way to disclose costs associated with federal actions.<sup>28</sup>

The U.S. forward pricing for 2015 to 2017 for natural gas slumped in 4Q2014, and entered 2015 at US\$2.94/MMBtu, a two-year low.<sup>29</sup> This suggests the switch from coal-fired to natural-gas-fired switching of electricity generation will accelerate in 2015, further undermining U.S. thermal coal demand.

**Figure 3: U.S. Henry Hub Natural Gas Price Forwards Slumped in 4Q2014**



Source: Platts, UBS Equity Research – US Utilities<sup>30</sup>

## Public Opinion and Public Policy Shifts

<sup>25</sup> [http://www.eia.gov/forecasts/aeo/pdf/0383\(2014\).pdf](http://www.eia.gov/forecasts/aeo/pdf/0383(2014).pdf)

<sup>26</sup> <http://content.sierraclub.org/coal/victories>

<sup>27</sup> <http://www.eia.gov/coal/production/weekly/?scr=email>

<sup>28</sup> <https://www.snl.com/InteractiveX/article.aspx?ID=30267931&KPLT=4>

<sup>29</sup> <http://www.bloomberg.com/news/2015-01-07/gas-price-drop-raises-risk-for-endangered-coal-and-nuclear-power.html>

<sup>30</sup> UBS US Equity Research, "Watching the Commodities Crack", 29 December 2014.

In January 2015, California Governor Jerry Brown was inaugurated to his fourth term in office, an occasion he used to announce that the state would embark on a rapid new path to a lower carbon future. Brown's new climate agenda includes:

- Increasing California's reliance on clean energy to 50 percent by 2030;
- Slashing oil use from cars and trucks by up to 50 percent; and
- Doubling the efficiency of existing buildings and making heating fuels cleaner.<sup>31</sup>

California has typically led the nation in support of renewable energy alternatives.

In 2014, Kentucky Governor Steve Beshear spearheaded an effort to revive the economy of eastern Kentucky, an area crippled by the decline in coal production in the United States. Some coal-industry leaders, while highly critical of regulations, have voiced concern that the financial collapse of the industry is based on a failure of executives to pay attention to market fundamentals and to prepare for a much smaller industry.

The success of public opposition to coal plants, new mining efforts and coal ports in the Northwest and along the Gulf of Mexico feed into the industry's declining financial fortunes. Media reports on industry financial weaknesses have been punctuated by other reports highlighting the industry's continued attempts to use political means to secure approvals for financially dysfunctional projects and to promote special-interest legislation and government rulings.

The recent criminal indictment of Don Blankenship, former CEO of Massey Energy, underscores the problematic history of mine safety in the U.S.

The federal government, in the wake of dramatic changes in the coal industry, is reconsidering long-standing rules on coal exports. The changes would require the industry to pay a fair share of profits to U.S. taxpayers from federally owned mines during periods of rising prices. As usual, the effort is strongly opposed by the coal industry.

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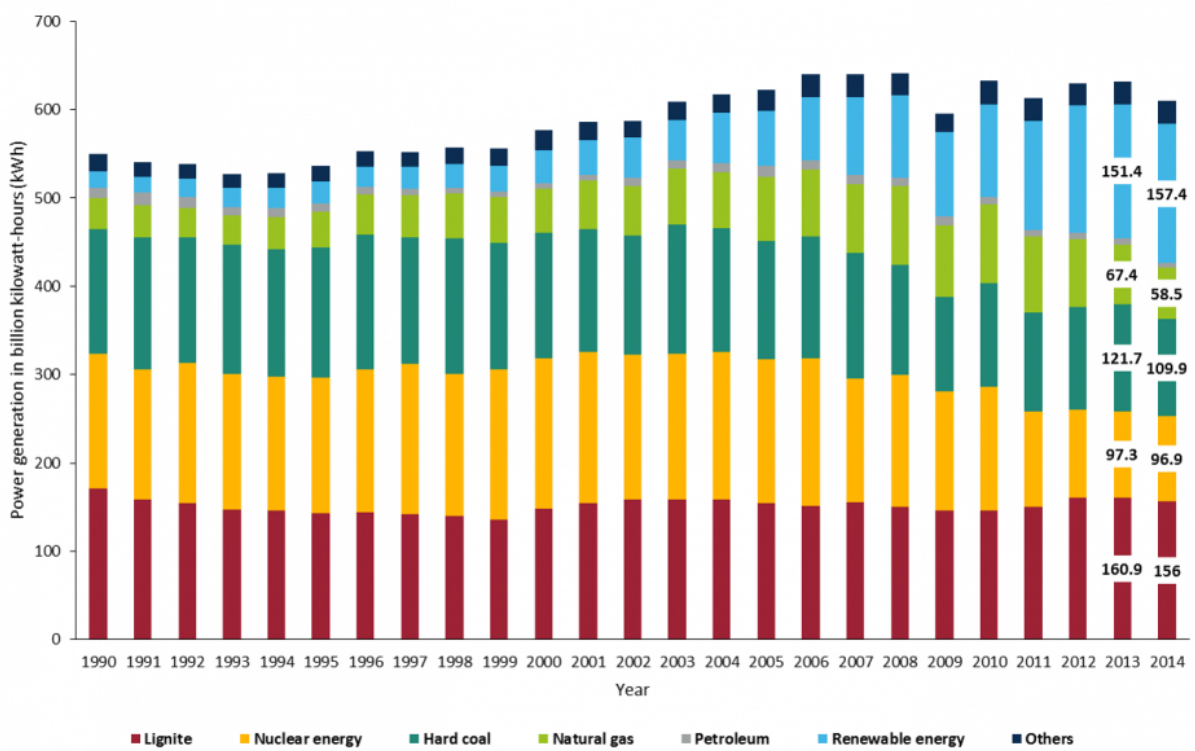
<sup>31</sup> <http://www.sierraclub.org/compass/2015/01/giant-step-toward-100-clean-energy-california>

## In, Germany, the Energiewende Powers On

Preliminary data for the German electricity market suggests that total electricity consumption fell by 3.8 percent year-on-year to 610 billion TWh in 2014. Electricity generated by renewables rose 4 percent to 157 TWh. By contrast, with nuclear and gas electricity generation flat, coal consumption fell materially. Electricity from lignite fell 2.3 percent to 156 TWh and black coal fell 7.9 percent year on year to 110TWh.

For all that Rio Tinto has trumpeted in 2013 and 2014 about the purported resurgence of coal and coal imports in Germany,<sup>32</sup> the evidence shows the exact opposite is true. Despite a 1.1 percent annual GDP growth over 2007-2014, German electricity demand has declined by 0.5 percent annually in this same period. Energy efficiency and the continued investment in renewables has eroded coal's market share in a permanently reduced overall electricity market (Figure 4).

**Figure 4: Gross Power Generation by Source in Germany 1990-2014 (TWh)**



Data: AGEB, 2014<sup>33</sup>

## In the U.K., Coal Demand Is Collapsing

In the U.K., DECC's Energy Trends shows coal-fired production down by 11.5 TWh in 3Q2014 over the same quarter in 2013, a reduction of 43 percent, with gas gaining 8.0 TWh and renewables 2.6 TWh. With half the country's remaining coal-fired power plants slated for closure due to the Large Combustion Plant Directive (LCPD, 2001/80/EC) requirements over the next 2-3 years, the outlook for coal demand in the U.K. is bleak.

<sup>32</sup> [http://www.riotinto.com/investors/presentations-91\\_12738.aspx](http://www.riotinto.com/investors/presentations-91_12738.aspx)

<sup>33</sup> <http://www.cleanenergywire.org/news/renewables-overtake-lignite-german-co2-emissions-fall-2014>

## In Japan, Electricity-Sector Transformation Continues

Japan's investment in renewable energy increased by 12 percent to US\$41.3bn in 2014, according to Bloomberg New Energy Finance.<sup>34</sup> The vast major of this was in the rapid rollout of solar electricity generation capacity. IEEFA estimates Japan has installed 10 GW of solar in 2014 alone, up from 7 GW in 2013.<sup>35</sup> Japan's Ministry of Economy, Trade and Industry (METI) has approved a pipeline of 72 GW of new solar projects since launching its feed-in-tariff program in July 2012.<sup>36</sup> While the major utilities are claiming grid congestion issues, their opposition to this solar program is rooted primarily in the cannibalisation of their existing fossil-fuel electricity market.

In October 2014, Orix Corp., the finance and leasing company with renewable energy investments, announced plans to increase its backing of large-scale solar projects in Japan regardless of grid-access constraints threatening to slow the industry. The Tokyo-based company is targeting 800 MWs of "megasolar" projects in operation by March 2018, as well as co-considering a 430 MW solar plant on the island of Ukujima in partnership with Kyocera Corp.<sup>37</sup>

In December 2014, Kyocera and Century Tokyo Leasing jointly announced the largest floating solar installation in the world to date in the 13 MW on the Yamakura Dam reservoir, built in conjunction with the Public Enterprises Agency of Chiba. Completion is scheduled for March 2016 and is forecast to produce 16 GWh of electricity annually.<sup>38</sup>

A progress restart of 20-50 percent of Japan's currently idled nuclear electricity generation fleet (with total idled capacity of 49 GW) is feasible over 2015-2020. This could add 70-170 TWh per year of electricity generation, equivalent to 10-20 percent of total Japanese electricity demand in 2013.

The installation of 60-70 GW of solar over 2013-2020 should also add 70-90 TWh of additional annual solar electricity generation by 2020.

With IEEFA forecasting that Japan's total electricity demand will decline 1 percent annually over 2014-2020, total demand is expected to decline a cumulative 60 TWh annually by 2020 relative to 2013's total demand of 819 TWh. The combination means some 200 TWh less coal, oil and LNG electricity generation from Japan by 2020. With the collapse in LNG and oil prices, this suggests Japan may consume 30-40 Mtpa less thermal coal by 2020 versus 2013 levels of 140 Mt.

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<sup>34</sup> <http://about.bnef.com/presentations/clean-energy-investment-q4-2014-fact-pack/content/uploads/sites/4/2015/01/Q4-investment-fact-pack.pdf>

<sup>35</sup> <http://www.renewableenergyworld.com/rea/news/article/2014/12/data-analysis-can-japan-exceed-10-gigawatts-of-solar-capacity-installation-in-2014>

<sup>36</sup> <http://www.bloomberg.com/news/2014-10-09/japan-solar-boom-fizzling-as-utilities-limit-grid-access.html>

<sup>37</sup> <http://www.bloomberg.com/news/2014-10-16/orix-presses-ahead-with-solar-in-japan-despite-grid-constraints.html>

<sup>38</sup> [http://global.kyocera.com/news/2014/1205\\_dfsp.html](http://global.kyocera.com/news/2014/1205_dfsp.html)

## Section 2: Renewable Energy Trends and Policy Action

### China: a National ETS by 2016?

China, the world's largest energy consumer, will open a nationwide carbon market in 2016 to help the government reduce emissions by 2030, the National Development and Reform Commission (NDRC) said during a press briefing in November 2014.<sup>39</sup>

### Egypt and India Have Reduced Subsidies for Fossil Fuels

In an unexpected turn of events, two of the countries providing some of the largest subsidies for the use of imported fossil fuels took advantage of the collapse of oil prices in late 2014 to significantly scale back support. Both India and Egypt are major importers of fossil fuels, and previous governments of both countries have maintained a significant level of fiscal subsidy in failed attempts to alleviate energy poverty. However, given the growing fiscal and current account deficits each country faces, these subsidies on oil, kerosene and diesel have been cut.

India estimates it will provide US\$12 billion of imported oil price subsidies in 2014/15 alone.<sup>40</sup> In November and December 2014, India lifted excise duties on petrol and diesel three times.<sup>41</sup>

In July 2014, Egypt cut imported fuel subsidies in by US\$4bn in 2014/15, raising prices at the time by up to 78 percent. The subsequent oil price decline is expected to cut the energy subsidy cost by 30 percent in 2014/15 to around US\$9 billion for the year.<sup>42</sup>

The IEA has long argued that the removal of fossil-fuel subsidies is a critical policy step toward an orderly global energy transition. Systemic global fossil-fuel subsidies are estimated to be many multiples of the temporary subsidies currently provided to help commercialize renewable energy.

### U.S. Equity Yields for Renewables Have Fallen to 8 Percent with the Advent of YieldCos

In January 2015, SunEdison Inc. announced the signing of wind-turbine contracts for an incremental 1.6 GW of \$0.023/kWh production-tax-credit (PTC)-eligible wind farms. Following on from its transformative acquisition of First Wind, which added a 1.6 GW of backlog solar and wind plants, this brings SunEdison's total PTC/ITC eligible backlog/pipeline to ~3.0 GW. As these projects are developed, SunEdison is likely to drop these projects into its recently created YieldCo, TerraForm Power Inc.<sup>43</sup>

The development of the U.S.-listed YieldCo market over 2014 has been transformational in terms of both expanding access to equity capital and lowering the cost of equity for renewable energy assets to 8 percent<sup>44</sup> relative to the equity market overall at 10-12 percent

<sup>39</sup> <http://en.sxcoal.com/165/110634/DataShow.html>

<sup>40</sup> <http://in.reuters.com/article/2015/01/09/india-oil-revenue-idINKBN0KI0H420150109?feedType=nl&feedName=inmoney>

<sup>41</sup> <http://in.reuters.com/article/2014/12/02/india-tax-diesel-petrol-factory-gate-idINKCN0JG0NF20141202?feedType=nl&feedName=inmoney>

<sup>42</sup> <http://www.reuters.com/article/2014/12/22/egypt-oil-subsidies-idUSL6N0U62T820141222>

<sup>43</sup> <http://www.bloomberg.com/news/2014-07-18/sunedison-s-terraform-yieldco-surges-in-trading-debut.html>

<sup>44</sup> UBS US Utilities Research, Julien Dumoulin-Smith, 9 January 2015, "SUNE: PTC Wind Turbine Purchase Highlights Aggressive 2015/2016 Development Plans."



per year. Global Green Bond issuance hit US\$38 billion in 2014 and similarly illustrates the opening of a new low emissions debt market.

### **A Brief Aside: Australian Politicians Continue to Buck Smarter Policy Trends by Expanding Public Support for Coal Developments**

Against trends toward cleaner energy globally, the Queensland government has announced plans to subsidize Adani's Carmichael thermal coal proposal in the Galilee Basin with offers of taxpayer subsidies, free water, royalty holidays and through the "purchase" of dredge spoil.

With growing investor concerns over the commercial viability of the project, Premier Campbell Newman had previously offered an open-ended royalty holiday to the first Galilee Coal project. In November 2014, he upped the ante by offering taxpayer financing to tune of A\$455m<sup>45</sup> to support the development of a dedicated rail-line proposal.

The government of Australia in a similarly misguided move announced in December 2014 that its Northern Water Infrastructure System would engage in a water-diversion program from the Campaspe and Cape Rivers through 63 kilometres of new channels and a new 123-kilometre pipeline aimed at diverting up to 35,000 megalitres per day for use in Galilee coal mines.<sup>46</sup> This follows an offer in November 2014 of free water allocations and changes to Queensland State water-allocation laws.<sup>47</sup>

Not to be outdone, West Australian Energy Minister Mike Nahan in 2014 announced an agreement to give Yancoal Australia's Premier Coal a reported A\$15m per annum price rise.<sup>48</sup> Despite the fact that the West Australian government was effectively bailing out a Chinese state-owned entity from a very expensive peak cycle acquisition of 2011 gone bad, few details have emerged as to the full terms.

IEEFA understands that under its prior owners, Wesfarmers Premier Coal entered into a new 20-year coal supply agreement with the West Australian government's power utility Synergy in 2005, with the contract starting in 2011. Due diligence would have meant that this contract was fully known at the time Yancoal Australia acquired Premier Coal. Over the remaining 16-year contract, if the press reports are correct, this appears to be a subsidy of potentially \$A240m that will be funded by all West Australian electricity users.

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<sup>45</sup> <http://www.livemint.com/Opinion/dp2yqrO0iSHMWgXFzcKu7J/1-billion-Adani-loan-Commercial-decision-or-politics-at-pl.html>

<sup>46</sup> [http://www.environment.gov.au/cgi-bin/epbc/epbc\\_ap.pl?name=referral\\_detail&proposal\\_id=7410](http://www.environment.gov.au/cgi-bin/epbc/epbc_ap.pl?name=referral_detail&proposal_id=7410)

<sup>47</sup> <http://theconversation.com/queensland-risks-running-the-well-dry-by-gifting-water-to-coal-34752>

<sup>48</sup> <http://www.abc.net.au/local/stories/2014/10/15/4107844.htm?site=southwestwa>

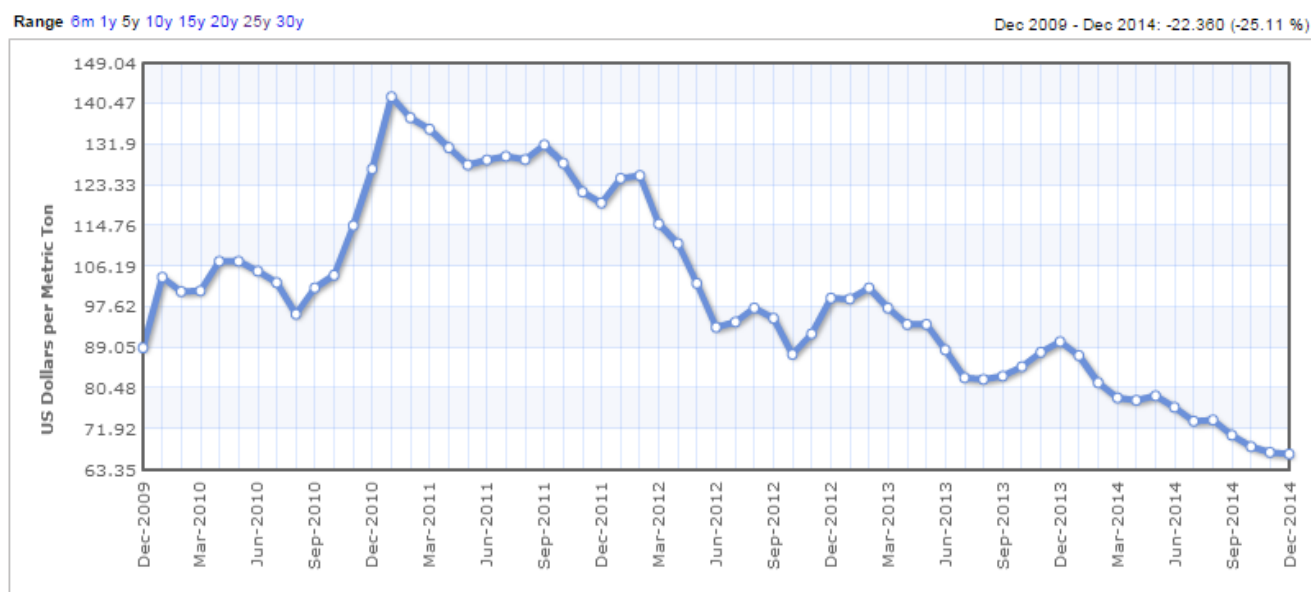
## Section 3: Pricing trends in Thermal Coal

### Thermal Coal Prices

Australian thermal export coal prices fell another 25 percent over 2014 to a low of US\$62/tonne for the 6,000kcal, 12-14 percent ash benchmark grades. Lower grade 5,500kcal/20 percent ash benchmark prices fell to US\$54/tonne by December 2014.<sup>ii</sup> Figure 5 details the five year view for Australian thermal coal.

We also note media reports that the Newcastle price has fallen another 10% to US\$57/t in January 2015.<sup>49</sup>

**Figure 5: Benchmark Australian Thermal Coal Hits Four Year Low in Dec'2014**



Source: <http://www.indexmundi.com/commodities/?commodity=coal-australian&months=60>

### Indonesian Produces Higher-Value Coal than Australia

Groups with vested interests claim that Australian coal is high quality. What do they mean by this? Are they suggesting that it is high energy, low-sulphur with low ash content?

A check of the Argus Coal Daily pricing sheets suggests that the market values Indonesian coal at a premium to equivalent Australian coal. In November 2014, Indonesian 5,500kcal coal was priced at US\$60.53/t. This is a US\$7/t or 14 premium to the equivalent Newcastle 5,500kcal benchmark price of US\$53.15/t.

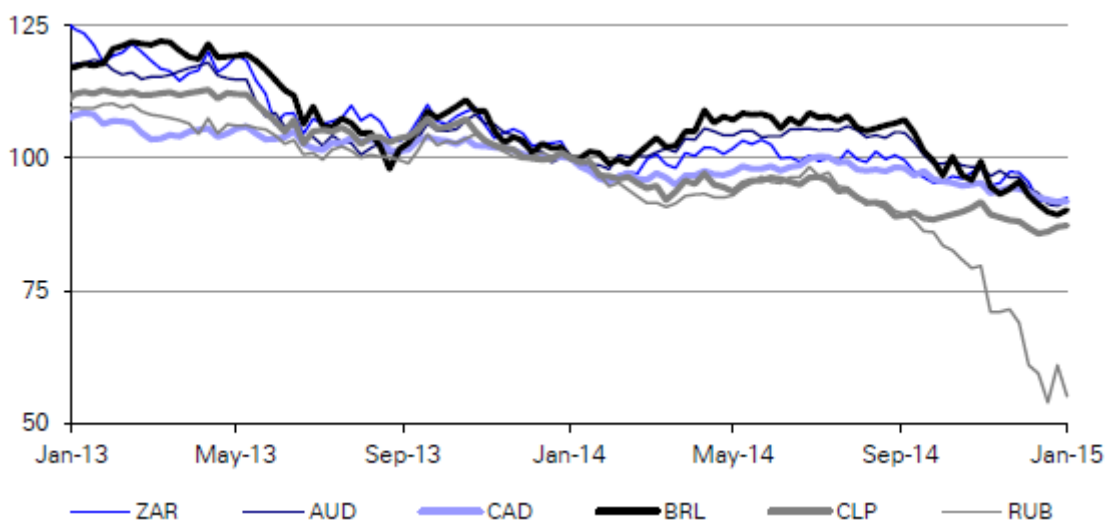
Adani's Carmichael Coal is high quality relative to Victorian lignite. But relative to the Newcastle 6,000kcal benchmark for Australian export coal, Carmichael coal's quality is decidedly inferior. Carmichael coal has an average energy content of below 5,000kcal, an ash content of 25-30 percent. So a 17.5 percent lower-energy content and an ash content double the Australian thermal-coal benchmark suggests the coal will be valued by the market at around a 30 percent discount to the Australian benchmark. Carmichael is low-quality export thermal coal, which compounds the exceptionally high transportation disadvantages (388km is more than double the Australian coal average distance from port).

<sup>49</sup> <http://www.businessinsider.com.au/chart-of-the-day-newcastle-coal-is-quietly-crashing-2015-1>

## Currency Devaluation of Coal Export Nations

The collapse in major coal-export nations' currencies will serve to significantly lower the cost of production for coal when denominated in U.S. dollars. The decline in the A\$/US\$ to US81c at the start of 2015 improves the cost position of Australian coal miners relative to U.S. exporters, but the free fall in the Russian ruble (down 40 percent over 2014 alone), plus the longer-term devaluation of the Indonesian rupiah and the South African rand (each down 30 percent in the last 3 years) means that Australian coal exporters have actually not improved their relative export competitiveness versus the three other major coal exporters globally (although all are strengthened against U.S. coal producer's efforts to gain a competitive foothold). Exporter currency declines will significantly lower the global seaborne cost curve, lowering the likely equilibrium pricing outcome materially into 2015.

**Figure 6: The Exchange Rate for Key Coal Exporters Vs. USD Since 1 Jan 2014**



Source: [Datastream](#), Deutsche Bank

## Important Information

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<sup>i</sup> <http://about.bnef.com/presentations/clean-energy-investment-q4-2014-fact-pack/content/uploads/sites/4/2015/01/Q4-investment-fact-pack.pdf>

<sup>ii</sup> <http://www.platts.com/latest-news/coal/perth/chinas-november-coal-offtake-from-australias-27884772>