

# Thermal coal reaches retirement age

Commodities Research

## Producers are unlikely to experience another bull market

### Regulatory risks undermine long term coal-fired generation

Just as a worker celebrating their 65<sup>th</sup> birthday can settle into a more sedate lifestyle while they look back on past achievements, we argue that thermal coal has reached its retirement age. Thermal coal accounted for nearly half of the incremental energy consumed by developing markets since 2000 and it supported the three-fold increase of Chinese GDP over that period, but its role in meeting the world's future needs and addressing energy poverty will become less prominent. We downgrade our long term price forecast to US\$65/t FOB Newcastle (down 18%) to reflect cost deflation and the prospect of peak demand post 2020.

The long term outlook for coal-fired power generation is challenged by greater competition in the fuel mix from cleaner sources such as natural gas and renewable energy. Progress in international negotiations on climate change has been slow, but regulatory risks for new coal plants are increasing. Meanwhile, demand growth in China has slowed down sharply after years of overinvestment in energy-intensive sectors of the economy. We believe demand for thermal coal will continue to grow at least until 2020, but the pace of growth will continue to moderate until both global and seaborne demand eventually peak — unless coal-fired generation with carbon capture exceeds expectations and becomes available at a competitive cost.

### Past investment is sufficient until demand peaks

Commodities usually go through a structural bull market every 25 to 30 years once previously built capacity has been completely absorbed, but we believe that thermal coal will not go through another full iteration of the commodity cycle; the high prices required to incentivize large-scale investment greenfield mines and infrastructure will not return. Instead, future demand growth will be met by exploiting existing assets more efficiently and by low cost expansions. This combination of falling prices and rising output over a sustained period of time has happened before: during the 1980s and 90s, global thermal coal supply increased by 40% and trade volumes expanded three-fold, in spite of a steady price decline. In our view, Tier 1 assets with low production costs and growth options with low capital intensity will remain attractive, but the value of greenfield resources requiring major investment in infrastructure is limited.

#### Christian Lelong

+61(2)9321-8635 christian.lelong@gs.com  
Goldman Sachs Australia Pty Ltd

#### Daniel Quigley

+44(20)7774-3470 daniel.quigley@gs.com  
Goldman Sachs International

#### Amber Cai

+852-2978-6602 amber.cai@gs.com  
Goldman Sachs (Asia) L.L.C.

#### Raquel Ohana

+44(20)7552-4055 raquel.ohana@gs.com  
Goldman Sachs International

Investors should consider this report as only a single factor in making their investment decision. For Reg AC certification and other important disclosures, see the Disclosure Appendix, or go to [www.gs.com/research/hedge.html](http://www.gs.com/research/hedge.html).

## Market roundup

US natural gas prices have fallen 18% mom after a strong ramp up of northeast production and mild December weather drove fears the market would be oversupplied by the end of winter. In Europe, weaknesses in oil prices affecting oil-linked contracts and a depreciating euro have weighed on NBP. Spot LNG prices in East Asia have fallen 15% ytd to US\$8.55/MMBtu. Meanwhile, thermal coal continued on a bearish note with the Newcastle index down 5% wow to US\$58.60/t amid uncertainty caused by quality controls in China; the spread with domestic coal widened to US\$15/t, well above the 5-year average of US\$1/t. On the supply side, the Indonesian government reversed its previous policy of restricting production and export volumes as a way to address low prices in the seaborne market.

### Exhibit 1: Heat Sensor snapshot

Prices, inventory levels and demand indicators for natural gas and thermal coal

			Latest	wow	mom	yoy	ytd
<b>US</b>							
<b>Spot prices</b>							
NYMEX natural gas	Henry hub	US\$/mmBtu	2.83	-4%	-18%	-35%	-2%
Thermal coal (12,000Btu)	FOB CAPP	US\$/st	53.06	-5%	-5%	-18%	-5%
Thermal coal (8,800Btu)	FOR PRB spot	US\$/st	11.55	-5%	0%	-4%	0%
<b>Power generation</b>							
HDD - deviation from mean	note 1	%	-7%	21%	-19%	-6%	n/a
Gas in underground storage		Bcf	2,853	-8%	-12%	18%	-11%
Gas demand - power		Bcf/d	23	-9%	17%	23%	14%
Gas demand - industrial		Bcf/d	23	-2%	6%	5%	2%
US weekly power generation		TWh	87.4	13%	13%	12%	22%
<b>Spreads</b>							
C2G: CAPP vs HH	note 2	US\$/MWh	10.61	9.86	7.61	5.25	11.45
<b>Europe</b>							
<b>Spot prices</b>							
Natural gas	NBP	GBP/therm	45	-8%	-17%	-33%	-11%
Natural gas	Zeebrugge	GBP/therm	43	-7%	-16%	-33%	-12%
Thermal coal (6,000kcal NAR)	CIF ARA	US\$/t	55.41	-9%	-23%	-33%	-20%
Thermal coal (6,000kcal NAR)	FOB RBCT	US\$/t	58.81	-4%	-11%	-29%	-7%
CO <sub>2</sub> emission allowance	ICE active contracts	€/t	7.25	-2%	1%	40%	-1%
<b>Power generation</b>							
HDD - deviation from mean	note 1	%	-11%	-7%	-19%	-5%	n/a
Gas in storage (NW Europe)	note 3	% full	64%	-7%	-20%	-4%	-15%
Nord Pool hydro storage		TWh	76.4	-3%	-8%	8%	-3%
<b>Spreads</b>							
C2G: API2 vs NBP	note 2	US\$/MWh	-7.53	-9.33	-11.90	-25.23	-8.82
Implied freight (API2-API4)		US\$/t	-3.40	-0.29	5.54	-0.09	5.74
<b>Asia</b>							
<b>Spot prices</b>							
LNG	JKM	US\$/mmBtu	8.55	-12%	-15%	-54%	-15%
Thermal coal (6,700kcal GAD)	FOB Newcastle	US\$/t	58.60	-5%	-5%	-29%	-6%
Thermal coal (5,500kcal NAR)	CFR China	US\$/t	60.10	0%	-4%	-26%	-3%
Thermal coal (5,500kcal NAR)	FOB QHD	Rmb/t	510	-1%	-2%	-14%	-2%
<b>Power generation</b>							
Japan monthly power generation	as of Dec 2014	TWh	84	n/a	20%	1%	-2%
incl. thermal generation	as of Dec 2014	TWh	63	n/a	21%	1%	-4%
China monthly power generation	as of Dec 2014	TWh	490	n/a	9%	3%	13%
incl. hydro generation	as of Dec 2014	TWh	60	n/a	-20%	10%	21%
China coal inventory at plants	as of 31 Dec 2014	day of use	24	-4%	-17%	17%	17%
<b>Spreads</b>							
Newcastle vs domestic coal (4)	CIF China	US\$/t	14.75	11.97	12.21	3.52	11.49
Newcastle versus RBCT	CIF India	US\$/t	-0.29	-1.00	5.08	-2.19	2.06

Notes: 1) HDD during Oct-Apr, CDD during May-Sept; deviation in % from the 10-year average of that week; the wow column shows last week's deviation from the 10-year average; 2) coal to gas spreads are based on efficiency ratings of 39% for coal-fired plants and 50% for gas-fired plants; a positive value implies an advantage for gas; 3) Storage facilities in Northwestern Europe include Germany, France, Denmark, Netherlands, UK and Belgium; 4) a 6% import tax is applied from October 15, 2014 onwards.

Source: Platts, Bentek, McCloskey, Bloomberg, SxCoal, FEPC, NBS, Goldman Sachs Global Investment Research

## Thermal coal reaches retirement age

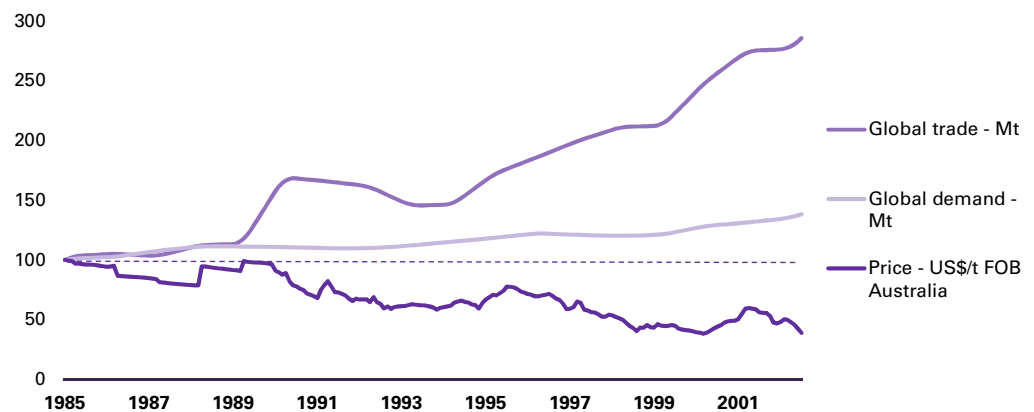
Just as a worker celebrating their 65th birthday can settle into a more sedate lifestyle while they look back on past achievements, we argue that thermal coal has reached its retirement age. Coal is the single largest source of energy for the power sector, and it remains the fuel of choice in many emerging markets and power plants have long operating lives, so changes in the fuel mix can only happen gradually. Nonetheless, the golden years for thermal coal demand and prices are clearly behind; we argue they are unlikely to return.

### We downgrade our price forecasts

Commodities usually go through a structural bull market every 25 to 30 years once previously built capacity has been completely absorbed. High prices are required to incentivize large scale investment in new basins, and there is a significant time lag before spending translates into new production capacity and a well-supplied market. Thermal coal experienced such a bull market over the period 2004-12 and has been grappling with excess capacity and cost deflation in the years since. We believe that thermal coal prices will remain under pressure in spite of growing demand. This combination of weak prices and growing output has happened before over sustained periods: during the 1980s and 90s, global thermal coal supply increased by 40% and trade volumes expanded three-fold in spite of a steady price decline (Exhibit 2).

#### Exhibit 2: It's happened before – supply increases in spite of falling prices

Thermal coal demand, trade and prices - indexed to 1985



Source: International Energy Agency, McCloskey

Regulation and technological innovation are undermining coal demand in the power sector, and the prospect of peak coal consumption post 2020 is real. Past experience in previous commodity cycles would suggest that spare capacity in the thermal coal industry will eventually be exhausted, giving way to another iteration of the commodity cycle and another bull market but we argue instead that the market will not require another investment surge in greenfield mines and infrastructure if exploiting existing assets more efficiently and low cost expansions are sufficient to satisfy demand until it peaks.

Thermal coal prices are likely to track marginal production costs for the foreseeable future, in our view. At the same time, production costs are falling as mining productivity starts to improve. Output per employee and per \$ of capital stock will increase, in our view, and previous cycles across different mining commodities show that productivity growth can be sustained over a long period of time. The depreciation of most commodity currencies

against the US\$ and the recent correction in oil adds to this downward pressure on costs. However, current spot prices have already undershot relative to marginal cost, and many producers in China and other supply regions are operating at a loss; the decline in prices has run ahead of cost deflation. In the medium term, we expect 1) prices and marginal costs to converge near the US\$65/t level FOB Newcastle and 2) China to remain the marginal buyer of imported coal, setting a ceiling on seaborne prices. We downgrade our 2015-17 forecasts to reflect a period of overcapacity in the Chinese domestic market that will gradually ease towards the end of our forecast period.

**We also downgrade our long term thermal coal forecast to US\$65/t FOB Newcastle**, down 18% (Exhibit 3). Under our revised methodology, the long term forecast is an average across a sustained period of cost deflation, followed by a return to cost inflation as other commodities experience the next investment phase but thermal coal prices remain at the marginal cost level. In other words, the next investment phase in the mining sector should pass thermal coal by, but input costs impact all commodities and cost deflation will not continue indefinitely.

However, we moderate our bearish forecast because of the role that China plays as the marginal consumer in the seaborne market. After a meteoric rise during 2009-12, import volumes crossed an inflection point and are now declining, but the domestic coal price of Chinese thermal coal still acts as a ceiling for seaborne prices. China is grappling with the aftermath of an investment super-cycle in the mining sector and sharply lower consumption, but the pace of new mining capacity is slowing over 2015-17 and we believe the potential for further cost deflation in the domestic coal sector (accounting for half of global output) will be relatively modest, partly because our economists expect the RMB to outperform other commodity currencies such as the A\$ and the IDR. Moreover, recent Chinese policies to support its domestic market have come at the expense of imports, and resulted in a wider price discount for seaborne coal. These measures contribute to the bearish price outlook in the short to medium term, but are unlikely to continue indefinitely.

### Exhibit 3: We downgrade our long term price forecasts

Coal Price Forecast Summary										Long Term
US\$/tonne		Q4 2014	Q1 2015E	Q2 2015E	Q3 2015E	2014	2015E	2016E	2017E	2015 real \$
<b>Thermal Coal</b>										
Spot 6,000 kcal/kg NAR	FOB Newc	\$ 66	\$ 61	\$ 60	\$ 59	\$ 71	\$ 60	\$ 65	\$ 66	\$ 65
<i>change vs previous</i>			-10%	-12%	-13%		-12%	-10%	-10%	-18%

Source: McCloskey, Goldman Sachs Global Investment Research

## The Golden Years: China's love affair with coal

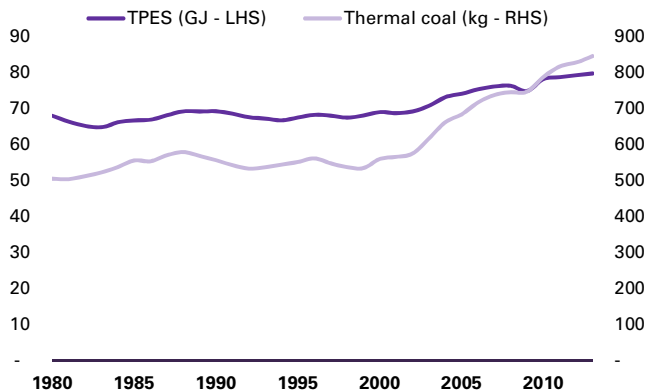
The bull market of 2004-12 is closely linked to a period of remarkable economic growth in China. Global energy demand was tracking population growth during the final decades of the 20<sup>th</sup> century, but that began to change at the turn of the century when demand for energy in general and thermal coal in particular accelerated sharply: since 2000, per capita consumption has grown by 16% and 51% respectively (Exhibit 4). China's growing appetite for coal is largely responsible for that inflection point. Abundant reserves of domestic coal supported a growth model that prioritized investment over consumption and resulted in a very energy-intensive economy.

Over the past 15 years, China has outpaced the rest of the world by a significant margin in terms of demand growth (Exhibit 5). From 2009 onwards, China became a net buyer of seaborne thermal coal, and by 2012 it had surpassed Japan to become the world's largest importer. At purchasing power parity, China consumes twice as much electricity as Europe does to generate the same amount of economic output. This divergence reflects both a lack

of efficiency in the way energy is used and a heavy skew towards the industrial sector. In the rest of the world, commercial and residential users account for nearly 60% of electricity demand; in China that figure is only 22%.

**Exhibit 4: Energy demand accelerated post 2000...**

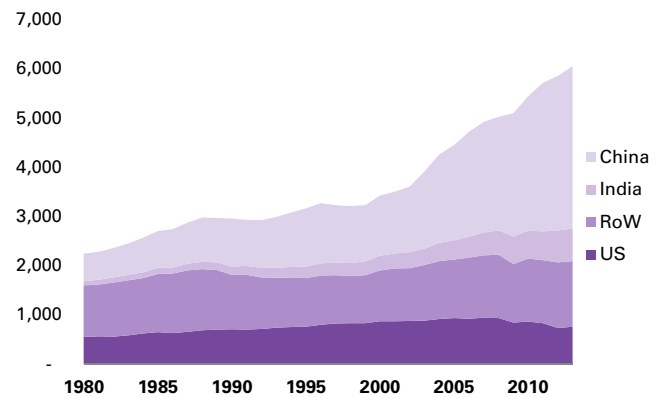
Per capital total primary energy supply (TPES) and thermal coal consumption



Source: International Energy Agency, World Bank

**Exhibit 5: ... largely as a result of China**

Thermal coal consumption by region



Source: International Energy Agency

In our view, rising living standards in China are compatible with moderate growth in energy demand as long as energy is used in a more balanced and efficient manner. Such a rebalancing is inevitable, and we therefore expect power generation to continue to lag GDP growth for the foreseeable future.

**The next decade will be different as regulatory risks increase**

Progress in international negotiations on climate change has been slow, but regulatory risks for new coal plants are increasing. The world's first emissions trading scheme (ETS) was launched in Europe ten years ago. Its impact on EU emissions to date may be debatable, but ETS as a way to regulate emissions have now spread to North America, Asia and Oceania; 27% of global electricity is generated in a market with a carbon price. The carbon intensity of coal-fired generation is roughly twice as high as that of gas-fired plants, so putting a price on CO<sub>2</sub> emissions penalizes coal in particular.

In addition to carbon pricing, policy makers have other options to shift the fuel mix towards cleaner energy sources. For example, regulations on NO<sub>x</sub> and SO<sub>2</sub> and other types of emissions have already forced the closure of dozens of power plants around the world. More recently, some countries have considered emission performance standards whereby new coal-fired plants are limited by the amount of CO<sub>2</sub> they can emit per unit of electricity generated; in the eyes of most power utilities, the technology to comply with strict emission standards is still unproven and/or far too expensive. Finally, policy makers can also provide direct support to alternative energy sources, for example via subsidies to solar and wind power. Variable renewable energy can be highly disruptive to the business model of conventional power plants not only because of its growing share of the fuel mix, but also because of the impact on power prices. When solar and wind power operate at times of peak power demand, the need for expensive generation (e.g. from oil-fired plants) is reduced and electricity prices drop accordingly; conventional plants that used to rely of those periods of high prices to boost their profitability will suffer as a result.

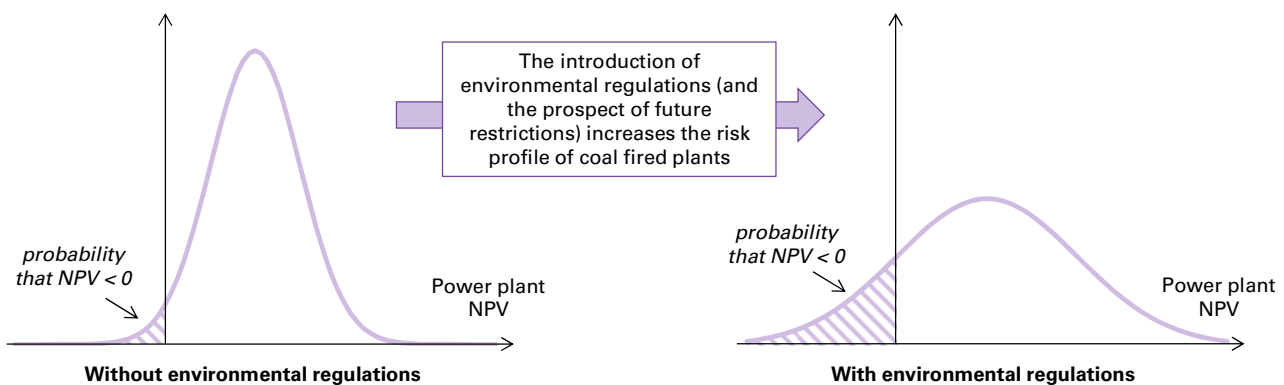
Power utilities considering how to allocate their capital spending across their energy portfolio are therefore faced with a conundrum. Coal plants are often profitable under

current market conditions, but the prospect of tighter regulations increases the risk profile of coal (Exhibit 6). More specifically, regulation can impact the business case for new coal-fired plants in the following ways:

- **Higher operating costs:** emission trading schemes and/or taxes increase the cost of generation; older, less efficient plants are penalized more than newer plants.
- **Higher capital costs:** plants unable to meet emission performance standards must invest in expensive equipment such as flue gas desulphurization and selective catalytic reduction, which also increase the operating costs of the plant.
- **Reduced operating life:** plants unable to meet new emission standards and unable to invest in new equipment must be decommissioned, sometimes well before the end of their expected operating life.
- **Lower revenue:** support for alternative energy sources and policies to improve energy efficiency result in lower demand and lower prices for conventional power generation.

#### Exhibit 6: Regulatory risks can undermine new coal-fired plants

Impact of environmental regulations on the investment decision for a new coal-fired power plant



Source: Goldman Sachs Global Investment Research

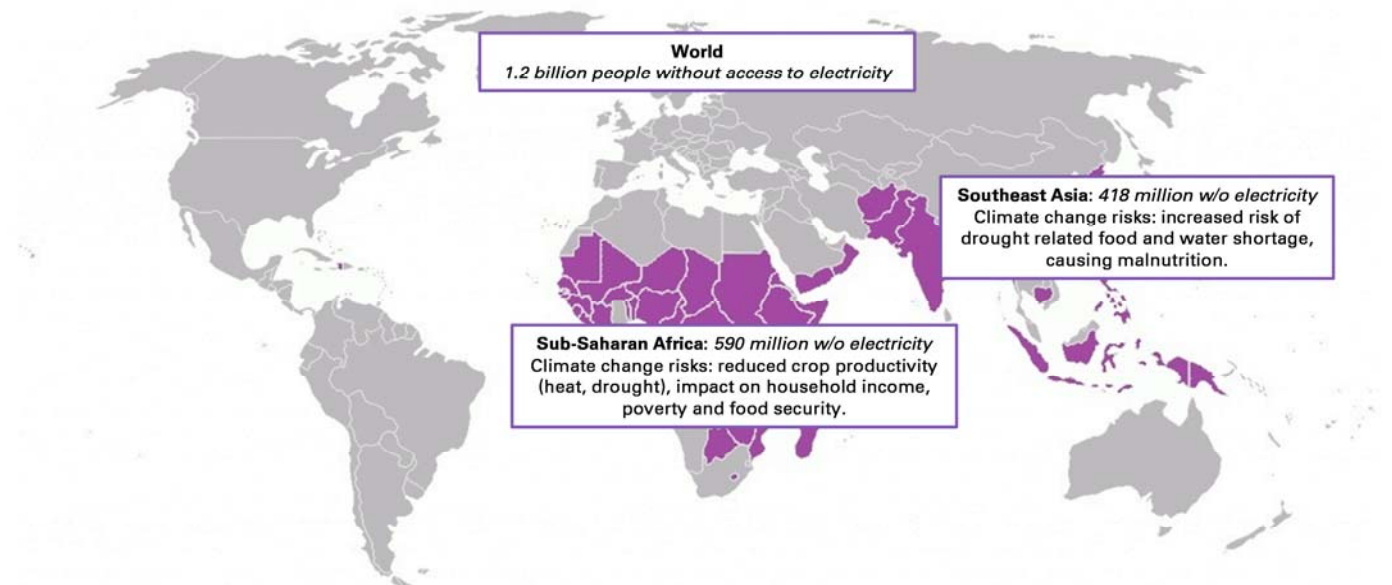
We believe that, at a minimum, regulatory risks are encouraging greater diversification in the fuel mix of many countries. The outcome of a major climate change conference due in Paris at the end of the year is uncertain, but the designation of **2014 as the warmest year on record** is likely to add some urgency to the negotiations; for the first time, all countries are expected to submit plans to reduce CO<sub>2</sub> emissions relative to business as usual. In our view, this is a significant development in itself in spite of the non-binding nature of these preliminary plans.

Partly due to environmental concerns, coal is likely to play a minor role in addressing energy poverty. Access to electricity is closely linked to better health, education and economic growth, so emerging markets have to balance the need to increase electricity supply with the need to minimize its environmental impact, including climate change risks to food security and health (Exhibit 7). In the meantime, competition from renewable energy continues. We note that China, in spite of its large endowment of thermal coal reserves, has recently started to commission more generating capacity from renewable energy than from coal. Global investment in clean energy increased by 16% to US\$310 billion according to Bloomberg New Energy Finance, and technological innovation is steadily reducing the cost per MWh of solar and wind energy.

---

**Exhibit 7: Emerging markets must address both energy poverty and climate change risks**

Countries where the lack of access to reliable electricity affects at least 20 million people and/or 40% of the population



Source: World Bank, IPCC, Goldman Sachs Global Investment Research

---

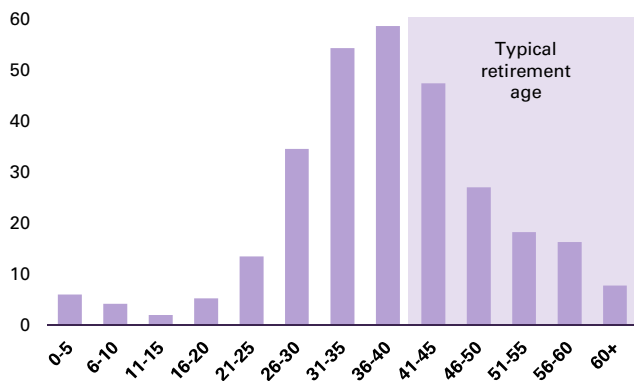
We believe demand for thermal coal will continue to grow at least until 2020 but the pace of growth will moderate until demand peaks — unless technological innovation delivers low-carbon coal-fired generation at a competitive cost. The world's first commercial-scale coal-fired plant fitted with carbon capture and storage (CCS) was commissioned last year in Canada, but there are few CCS projects in the pipeline and it is still unclear if the capital and operating costs can be reduced sufficiently. Based on our analysis, CCS is likely to account for less than 0.2% of the world's global coal-fired fleet in 2020. Meanwhile, technological innovation is making alternative energy sources more competitive, from natural gas (via hydraulic fracturing and horizontal drilling to access unconventional deposits) to wind power (e.g. larger turbine for offshore sites) and solar power (e.g. more efficient panels at lower cost).

So what would it take for coal demand to peak post 2020? In developed markets where the pressure to reduce emissions is at its greatest and where power consumption is stabilizing, a large share of the coal-fired fleet is reaching retirement age (Exhibit 8). Older plants tend to be less efficient, have higher operating costs and are more vulnerable to environmental regulations; spending US\$100 million on new equipment to comply with a NO<sub>x</sub> limit may not be justified if the book value of the power plant is low and the new investment has to be amortized over a compressed timeframe. A significant share of the coal-fired fleet in the US and in Europe will be decommissioned in response to regulations such as Mercury and Air Toxics Standards (MATS) in the US and the Large Combustion Plant Directive (LCPD) and Industrial Emissions Directive in Europe. We expect the installed capacity across the OECD to decline as plant retirements exceed the modest rate of new builds.

Therefore, demand will peak when the decline in developed markets offsets ongoing growth in emerging markets. In China, the government is actively seeking to diversify its fuel mix and the increase in generation capacity from other sources such as hydro, nuclear and wind power now exceeds the increase in coal-fired capacity. Meanwhile, a strong focus on energy efficiency (in MWh per unit of GDP) at a time when many emerging markets are cooling will see electricity demand grow at a slower pace. Power demand in China has slowed down sharply as overinvestment in industry and infrastructure gives way to a

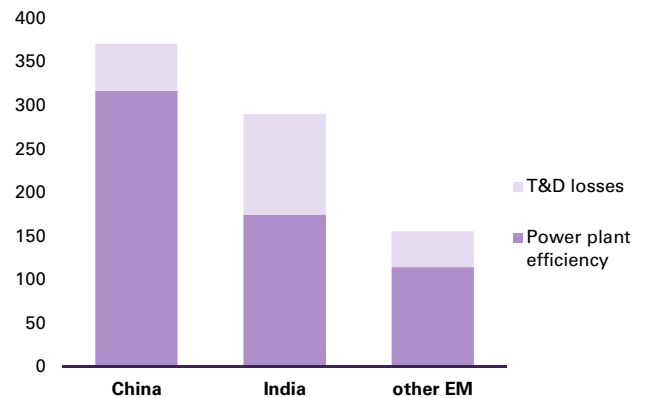
rebalancing towards less energy-intensive sectors (commercial and residential use account for only 22% of power consumption in China versus 58% in the rest of the world). Finally, as older plants are replaced and electricity grids are upgraded, the potential efficiency gain is significant; if emerging markets converged towards OECD levels in terms of new power plant efficiency and transmission/distribution losses, the same amount of power could be delivered with a 800Mt reduction in coal consumption (Exhibit 9). In our view, the combination of fuel mix diversification, slower power demand growth and rising efficiency will moderate the growth rate of thermal coal demand until it eventually matches the rate of demand destruction in the OECD.

**Exhibit 8: OECD coal plants reaching retirement age**  
Current age profile of coal-fired plants in the US - GW



Source: IEA, Goldman Sachs Global Investment Research

**Exhibit 9: Potential power sector efficiency gains**  
Efficiency gains from raising power plant efficiency and reducing grid losses to OECD levels – Mt



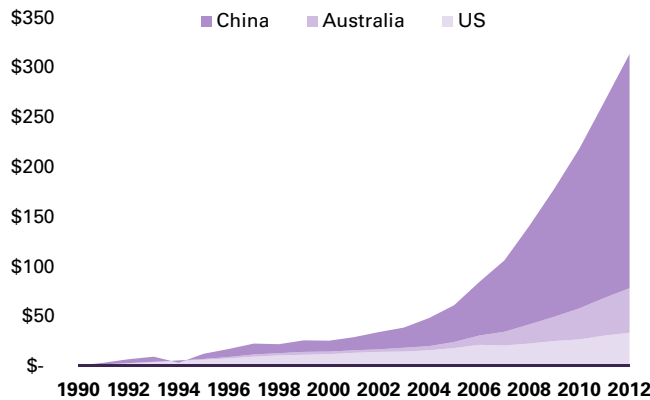
Source: IEA, Goldman Sachs Global Investment Research

### Past investment is enough to satisfy future demand

On the supply side, we believe that thermal coal output will continue to expand on the back of the recent period of overinvestment in production capacity (Exhibit 10). Just as output growth during the 1980s and 90s was possible in spite of falling prices because of previous investment, future supply growth will be supported by higher operational efficiency and by latent capacity along the supply chain. For example, mining productivity in the Australian coal sector has emerged from a lost decade during which output per employee declined by 46% and output per unit of capital stock declined by 67%. According to our estimates, total productivity has improved by 6% over the period 2013-14 (Exhibit 11). These trends are likely to be replicated in other supply regions, and past experience shows that productivity growth can be sustained over long periods. As a result, output can grow in spite of a reduction in total employment and a sharp slowdown in capital expenditure.

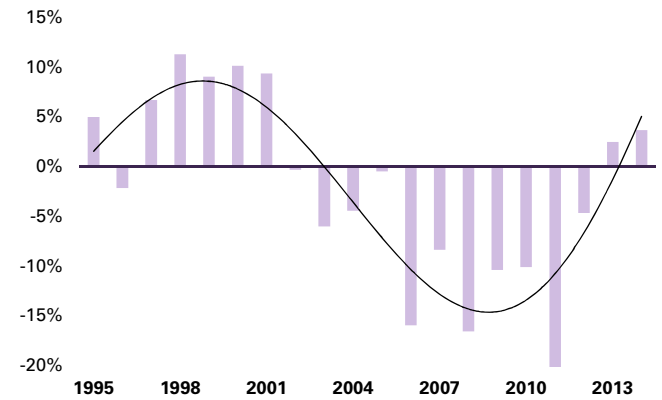


**Exhibit 10: After a decade of overinvestment ...**  
Increase in the capital stock of the coal industry – US\$ bn



Source: ABS, EIA, NBS, Goldman Sachs Global Investment Research

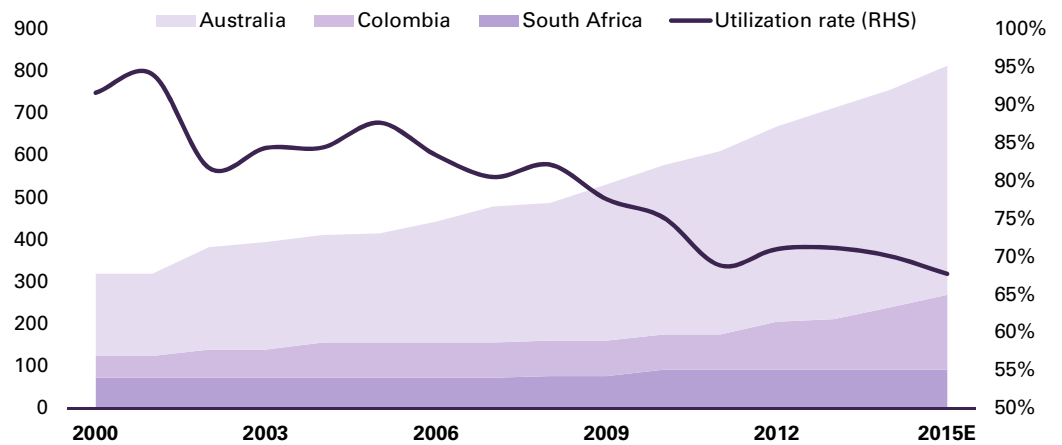
**Exhibit 11: ... an inflection point in mining productivity**  
Productivity in the Australian coal sector



Source: ABS, IEA, Goldman Sachs Global Investment Research

There is also significant latent capacity further down the supply chain. Rail and port infrastructure are critical components because of the high cost and lengthy development process, and the coal industry duly invested in significant expansions at the onset of the previous bull market. Now there is excess port capacity in many regions, and the average utilization rate of coal terminals in Australia, Colombia and South Africa has fallen below 70% (Exhibit 12). In our view, it will take many years of production growth at current rates before these countries will be short of port capacity.

**Exhibit 12: Existing infrastructure is sufficient to satisfy demand until coal use peaks**  
Coal port capacity and utilization rates in selected regions - Mtpa



Source: Company data, Goldman Sachs Global Investment Research

**Low prices are unlikely to hold production back.** In fact, commodity producers have an additional incentive to grow supply at a time when the outlook for emerging economies becomes more challenging. Indonesia has discarded its policy of restricting coal exports as a way to support domestic prices, and the forecast for domestic consumption was recently cut. Meanwhile, Glencore stopped production for three weeks at its Australian operations late in 2014 in the hope of alleviating the oversupply in the market; the Newcastle index fell nonetheless. Finally, a weaker Ruble has shifted Russian coal down from the top quartile of the cost curve, and we expect Russian exports to increase over our forecast period.

**Exhibit 13: As China fades away as a major importer, all eyes are on India to support future demand growth**

Thermal coal supply and demand model

Million tonnes	2010	2011	2012	2013	2014E	2015E	2016E	2017E	2018E
<b>Consumption - energy sector</b>									
US	829	783	684	713	759	730	705	678	659
Japan	97	95	102	115	114	115	116	117	117
OECD Europe	211	212	232	226	206	195	189	183	177
Other	208	209	204	200	212	216	221	226	231
<b>OECD total</b>	<b>1,346</b>	<b>1,299</b>	<b>1,222</b>	<b>1,254</b>	<b>1,291</b>	<b>1,256</b>	<b>1,231</b>	<b>1,203</b>	<b>1,184</b>
China	1,841	2,077	2,139	2,212	2,195	2,238	2,279	2,315	2,345
India	425	441	490	514	544	599	642	690	741
Other	472	485	510	520	524	531	541	553	568
<b>non-OECD total</b>	<b>2,739</b>	<b>3,003</b>	<b>3,139</b>	<b>3,247</b>	<b>3,262</b>	<b>3,368</b>	<b>3,462</b>	<b>3,558</b>	<b>3,654</b>
<b>Total - energy sector</b>	<b>4,084</b>	<b>4,302</b>	<b>4,361</b>	<b>4,501</b>	<b>4,553</b>	<b>4,624</b>	<b>4,693</b>	<b>4,761</b>	<b>4,838</b>
<b>Consumption - other sectors</b>									
US	33	43	45	41	41	40	40	40	40
Japan	30	26	29	27	28	28	28	28	28
OECD Europe	52	55	54	52	52	51	50	50	50
Other	20	17	18	20	20	21	21	21	21
<b>OECD total</b>	<b>136</b>	<b>142</b>	<b>147</b>	<b>140</b>	<b>140</b>	<b>139</b>	<b>139</b>	<b>139</b>	<b>138</b>
China	879	924	987	1,042	1,082	1,101	1,114	1,124	1,130
India	140	147	158	150	153	158	166	175	185
Other	198	192	198	208	211	215	220	225	230
<b>non-OECD total</b>	<b>1,217</b>	<b>1,262</b>	<b>1,343</b>	<b>1,399</b>	<b>1,445</b>	<b>1,474</b>	<b>1,500</b>	<b>1,524</b>	<b>1,545</b>
<b>Total - other sectors</b>	<b>1,352</b>	<b>1,404</b>	<b>1,490</b>	<b>1,539</b>	<b>1,585</b>	<b>1,614</b>	<b>1,639</b>	<b>1,663</b>	<b>1,683</b>
<b>Total demand</b>	<b>5,436</b>	<b>5,706</b>	<b>5,851</b>	<b>6,040</b>	<b>6,138</b>	<b>6,238</b>	<b>6,332</b>	<b>6,424</b>	<b>6,521</b>
<b>% growth</b>	<b>6.8%</b>	<b>5.0%</b>	<b>2.5%</b>	<b>3.2%</b>	<b>1.6%</b>	<b>1.6%</b>	<b>1.5%</b>	<b>1.5%</b>	<b>1.5%</b>
<b>Production</b>									
China	2,681	2,909	3,017	3,034	3,064	3,147	3,223	3,294	3,359
US	856	851	779	756	802	786	762	743	724
India	499	496	514	526	551	579	611	645	680
Indonesia	323	402	441	480	463	463	466	470	475
Australia	189	185	212	230	244	251	257	262	266
South Africa	252	251	257	255	259	263	267	269	272
Russia	179	180	206	201	209	216	223	228	233
OECD Europe	108	105	107	94	89	84	80	76	72
Colombia	71	82	85	82	87	91	94	97	100
Other	280	304	300	321	328	334	340	346	351
<b>Total Production</b>	<b>5,437</b>	<b>5,763</b>	<b>5,918</b>	<b>5,979</b>	<b>6,095</b>	<b>6,213</b>	<b>6,322</b>	<b>6,430</b>	<b>6,534</b>
<b>% growth</b>	<b>4.6%</b>	<b>6.0%</b>	<b>2.7%</b>	<b>1.0%</b>	<b>1.9%</b>	<b>1.9%</b>	<b>1.7%</b>	<b>1.7%</b>	<b>1.6%</b>
<b>Balancing item</b>									
<b>Stock changes</b>	<b>11</b>	<b>116</b>	<b>67</b>	<b>(61)</b>	<b>(43)</b>	<b>(25)</b>	<b>(10)</b>	<b>6</b>	<b>12</b>
<b>Seaborne exports</b>									
Indonesia	287	315	349	379	367	380	377	377	376
Australia	141	148	171	188	194	197	205	210	215
Russia	93	87	105	108	111	115	119	121	122
Colombia	68	74	80	74	75	89	92	95	98
South Africa	70	69	75	73	72	73	74	75	76
US	16	31	48	44	31	25	20	20	20
Other	22	15	13	15	15	17	18	19	20
<b>Total seaborne exports</b>	<b>697</b>	<b>738</b>	<b>841</b>	<b>880</b>	<b>865</b>	<b>896</b>	<b>905</b>	<b>917</b>	<b>927</b>
<b>Seaborne imports</b>									
Japan	123	120	133	138	141	142	144	144	145
China	92	102	144	150	123	105	85	70	60
India	81	98	126	147	155	180	195	210	225
South Korea	93	98	97	97	96	103	112	115	118
Taiwan	57	60	57	59	61	61	62	62	63
Other	78	87	87	94	98	107	115	123	130
<b>Total Pacific</b>	<b>524</b>	<b>566</b>	<b>644</b>	<b>685</b>	<b>673</b>	<b>698</b>	<b>713</b>	<b>724</b>	<b>741</b>
OECD Europe	130	138	160	156	150	148	145	143	140
US	16	10	7	7	9	9	9	8	7
Other	27	28	32	34	35	37	38	39	40
<b>Total Atlantic</b>	<b>172</b>	<b>176</b>	<b>199</b>	<b>197</b>	<b>194</b>	<b>194</b>	<b>192</b>	<b>190</b>	<b>187</b>
<b>Total seaborne imports</b>	<b>697</b>	<b>742</b>	<b>843</b>	<b>882</b>	<b>867</b>	<b>892</b>	<b>905</b>	<b>914</b>	<b>928</b>
<b>% growth</b>	<b>12.0%</b>	<b>6.5%</b>	<b>13.6%</b>	<b>4.6%</b>	<b>-1.6%</b>	<b>2.8%</b>	<b>1.5%</b>	<b>1.0%</b>	<b>1.5%</b>
<b>Seaborne surplus/(deficit)</b>	<b>0</b>	<b>(4)</b>	<b>(2)</b>	<b>(2)</b>	<b>(2)</b>	<b>3</b>	<b>(1)</b>	<b>2</b>	<b>(2)</b>
<b>Average CV - kcal/kg NAR basis</b>	<b>5,548</b>	<b>5,514</b>	<b>5,502</b>	<b>5,464</b>	<b>5,445</b>	<b>5,421</b>	<b>5,404</b>	<b>5,386</b>	<b>5,368</b>

Source: International Energy Agency, McCloskey, Goldman Sachs Global Investment Research

On the demand side, China will continue to impact seaborne prices but India will play a central role as the key driver of future demand (Exhibit 13). The growth potential in the world's 3<sup>rd</sup> largest consumer of thermal coal after China and the US is significant, with a significant share of its population still lacking adequate access to the electricity grid. In the medium to long term, import volumes will depend in large part on the success (or lack of) in increasing domestic coal production but we assume that imports grow on average by 15Mt per year over our forecast period. We note, however, that the list of growth markets has shrunk considerably now that Chinese imports are in decline, and seaborne demand growth is likely to grow at 1% to 2% per annum in the period to 2018.

India is the market to watch from a demand perspective but China retains considerable influence over seaborne prices given its role as the marginal consumer; import volumes are highly price-sensitive. We believe prices have been significantly affected by recent measures to support domestic coal producers; the introduction of an import tax increases the cost of importing coal, while the adoption of quality controls result a delay between the time of purchase and the time of delivery and introduces uncertainty regarding the liability for shipments that fail to meet Chinese standards. In our view, import volumes will face further downside and the price wedge between domestic and seaborne prices will remain wide as long as China faces oversupply in the domestic market.

### **Implications for producers and investors**

The challenging long term outlook for thermal coal has important implications for producers. Tier 1 assets at the bottom of the cost curve will remain attractive as cash cows, but diversified mining companies are unlikely to allocate fresh capex over and above the annual rate of depreciation. As thermal coal goes ex-growth we expect the capital stock of the industry to stabilize, much like in the 1980s and 90s. Management teams may also consider the divestment of Tier 2 thermal coal assets in order to deploy their capital and focus on more attractive commodities.

For pure-play producers, management teams may manage their risks by diversifying away from thermal coal mining. For instance, producers could seek a joint venture partner among power utilities seeking long term supply and use the proceeds to diversify downstream into the power sector, or sideways into other mining commodities.

For developers, the long term price outlook is sensitive to government regulation and the uncertainty around future energy policy is likely to persist, so any growth option will have some residual value. However, the value of undeveloped thermal coal resources requiring new infrastructure is limited.

# Disclosure Appendix

## Reg AC

We, Christian Lelong, Daniel Quigley, Amber Cai and Raquel Ohana, hereby certify that all of the views expressed in this report accurately reflect our personal views, which have not been influenced by considerations of the firm's business or client relationships.

Unless otherwise stated, the individuals listed on the cover page of this report are analysts in Goldman Sachs' Global Investment Research division.

## Disclosures

### Global product; distributing entities

The Global Investment Research Division of Goldman Sachs produces and distributes research products for clients of Goldman Sachs on a global basis. Analysts based in Goldman Sachs offices around the world produce equity research on industries and companies, and research on macroeconomics, currencies, commodities and portfolio strategy. This research is disseminated in Australia by Goldman Sachs Australia Pty Ltd (ABN 21 006 797 897); in Brazil by Goldman Sachs do Brasil Corretora de Títulos e Valores Mobiliários S.A.; in Canada by either Goldman Sachs Canada Inc. or Goldman, Sachs & Co.; in Hong Kong by Goldman Sachs (Asia) L.L.C.; in India by Goldman Sachs (India) Securities Private Ltd.; in Japan by Goldman Sachs Japan Co., Ltd.; in the Republic of Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch; in New Zealand by Goldman Sachs New Zealand Limited; in Russia by OOO Goldman Sachs; in Singapore by Goldman Sachs (Singapore) Pte. (Company Number: 198602165W); and in the United States of America by Goldman, Sachs & Co. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom and European Union.

**European Union:** Goldman Sachs International authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority, has approved this research in connection with its distribution in the European Union and United Kingdom; Goldman Sachs AG and Goldman Sachs International Zweigniederlassung Frankfurt, regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht, may also distribute research in Germany.

### General disclosures

This research is for our clients only. Other than disclosures relating to Goldman Sachs, this research is based on current public information that we consider reliable, but we do not represent it is accurate or complete, and it should not be relied on as such. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Other than certain industry reports published on a periodic basis, the large majority of reports are published at irregular intervals as appropriate in the analyst's judgment.

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by our Global Investment Research Division. Goldman, Sachs & Co., the United States broker dealer, is a member of SIPC (<http://www.sipc.org>).

Our salespeople, traders, and other professionals may provide oral or written market commentary or trading strategies to our clients and our proprietary trading desks that reflect opinions that are contrary to the opinions expressed in this research. Our asset management area, our proprietary trading desks and investing businesses may make investment decisions that are inconsistent with the recommendations or views expressed in this research.

The analysts named in this report may have from time to time discussed with our clients, including Goldman Sachs salespersons and traders, or may discuss in this report, trading strategies that reference catalysts or events that may have a near-term impact on the market price of the equity securities discussed in this report, which impact may be directionally counter to the analyst's published price target expectations for such stocks. Any such trading strategies are distinct from and do not affect the analyst's fundamental equity rating for such stocks, which rating reflects a stock's return potential relative to its coverage group as described herein.

We and our affiliates, officers, directors, and employees, excluding equity and credit analysts, will from time to time have long or short positions in, act as principal in, and buy or sell, the securities or derivatives, if any, referred to in this research.

The views attributed to third party presenters at Goldman Sachs arranged conferences, including individuals from other parts of Goldman Sachs, do not necessarily reflect those of Global Investment Research and are not an official view of Goldman Sachs.

Any third party referenced herein, including any salespeople, traders and other professionals or members of their household, may have positions in the products mentioned that are inconsistent with the views expressed by analysts named in this report.

This research is not an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Clients should consider whether any advice or recommendation in this research is suitable for their particular circumstances and, if appropriate, seek professional advice, including tax advice. The price and value of investments referred to in this research and the income from them may fluctuate. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. Fluctuations in exchange rates could have adverse effects on the value or price of, or income derived from, certain investments.

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Investors should review current options disclosure documents which are available from Goldman Sachs sales representatives or at <http://www.theocc.com/about/publications/character-risks.jsp>. Transaction costs may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

All research reports are disseminated and available to all clients simultaneously through electronic publication to our internal client websites. Not all research content is redistributed to our clients or available to third-party aggregators, nor is Goldman Sachs responsible for the redistribution of our research by third party aggregators. For research, models or other data available on a particular security, please contact your sales representative or go to <http://360.gs.com>.

Disclosure information is also available at <http://www.gs.com/research/hedge.html> or from Research Compliance, 200 West Street, New York, NY 10282.

© 2015 Goldman Sachs.

**No part of this material may be (i) copied, photocopied or duplicated in any form by any means or (ii) redistributed without the prior written consent of The Goldman Sachs Group, Inc.**