Coal's terminal decline

How a bad year for coal in 2014 has been followed by the biggest fall in consumption ever

November 2015

Executive summary

This year is on course to see the largest fall in coal consumption in history, a Greenpeace study has shown. There has been a drop of at least 2.3% and possibly as much as 4.6% in January-September 2015, compared to the same period a year ago.

It follows the levelling off of global coal use in 2014, and creates a nightmare scenario for the coal industry.

Renewable energy breakthroughs, war on pollution and China's transformation driving coal's decline

In China, which has been responsible for half of global demand, coal consumption levelled off in 2014 and has been falling rapidly in 2015, driven by economic rebalancing, a war on pollution and an astonishing growth in renewable energy.

China leads the world in investment in solar and wind power, prompting many to say the country has reached a green tipping point. This has huge implications for global CO2 emissions as the increase in China's power demand from 2013 to 2015 was equal to Australia's total power consumption.

US turning its back on coal

In the US, over 200 coal-fired power stations have been retired or scheduled for retirement and coal mines have been shut down, as a result of a powerful grassroots movement, unfavourable economics and increased environmental regulation. Coal's share of electricity generation will fall to 36% this year from 50% a decade ago, and coal production has fallen to the lowest in three decades. As a result, dozens of US coal mining companies have gone into bankruptcy, including once major producers such as Alpha Natural Resources, James River Coal and Patriot Coal Corporation.

No relief from new markets

The coal industry has talked up India and Southeast Asia as sources of new demand that could salvage the industry. South East Asia makes up 4% of global demand, and the fall in coal use in the US and China this year alone is larger than the region's entire consumption.

India has seen significant growth in recent years, but that growth seems to have petered out this year as an increasing number of coal plants sit idle, finding it uneconomic to operate. They were running at less than 60% of capacity earlier this year, down from 68% in the same period last year.

Europe's declining consumption

In Europe, the UK has taken the lead by committing to phasing out coal-fired power plants within the next 10-15 years. Since 2013, 17 UK coal-fired power plants with 5,400MW of capacity have closed as coal use fell by more than 10% in the first half of 2015. A further 12 units with a total capacity of 6,400 MW have been earmarked for closure in 2016. Almost half of UK's coal-fired capacity at the beginning of 2013 will be closed by 2016.

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Germany shows a 0.9% decline in thermal fuel generation in the year to date, despite a 2.6% increase in electricity consumption (a bit of a rebound from the rapid decline in 2014). The rapid increase in renewables (+29% year-on-year, excluding large hydro) & hydro (+15%) production is eating into coal and gas' market share.

In the European Union as a whole, coal consumption has been falling since mid-2012, after a short-lived re-bound following the 2009 economic shock. This year's consumption shows no sign of rebounding after a record fall in 2014. The decline of coal is being accelerated by the runaway success of the renewables sector in Europe.

For other countries, energy efficiency plans have led to lowering of overall demand for coal-powered electricity. In Japan, for example, electricity demand is down 2.5% year-on-year in 2015, leading to a 5.2% fall in thermal electricity.

These markets - the US, the EU, China and Japan - make up almost three quarters of global coal demand. So even though coal use is still growing in one key market - India, where coal use still grew but at a significantly lower rate - this is nowhere enough to offset the falls elsewhere. Even this growth could be threatened by India's ambitious renewable energy plans.

Decline in coal delivering green "tipping point"

The estimated 2.3% to 4.6% fall in global coal demand translates to 90 to 180 million tonnes standard coal in the first three quarters, roughly equal to the total consumption of Japan (140 million tonnes) over the same period.

"These trends show that the so-called global coal boom in the first decade of the 21st century was a mirage," said Lauri Myllyvirta, coal and energy campaigner for Greenpeace.

"There was a Chinese coal boom, but that disguised what was happening in the rest of the world."

"Coal is in terminal decline, and those countries investing in coal for export markets are making reckless decisions. They will be scarring the landscape and damaging the climate with little prospect of a return on their investment."

It's striking that the headwinds against coal are so strong that these falls are happening despite global coal prices falling to record lows, which would normally be expected to stimulate demand (http://uk.reuters.com/article/2015/09/15/coal-mining-idUKL5N11L02O20150915).

The coal industry likes to point to China adding a new coal-fired power plant every week as evidence that coal demand will pick up in the future, but the reality on the ground is rather different. China's electricity market and financial system is designed to deliver very large amounts of investment in power plants, with state-owned enterprises having favourable access to credit, and new coal-fired power plants enjoying largely guaranteed returns on investment. So Chinese companies have carried on building new coal-fired plants, even while coal-fired power generation declines. As a result the capacity utilization of the plants has been plummeting. China is now adding one IDLE coal-fired power plant per week.

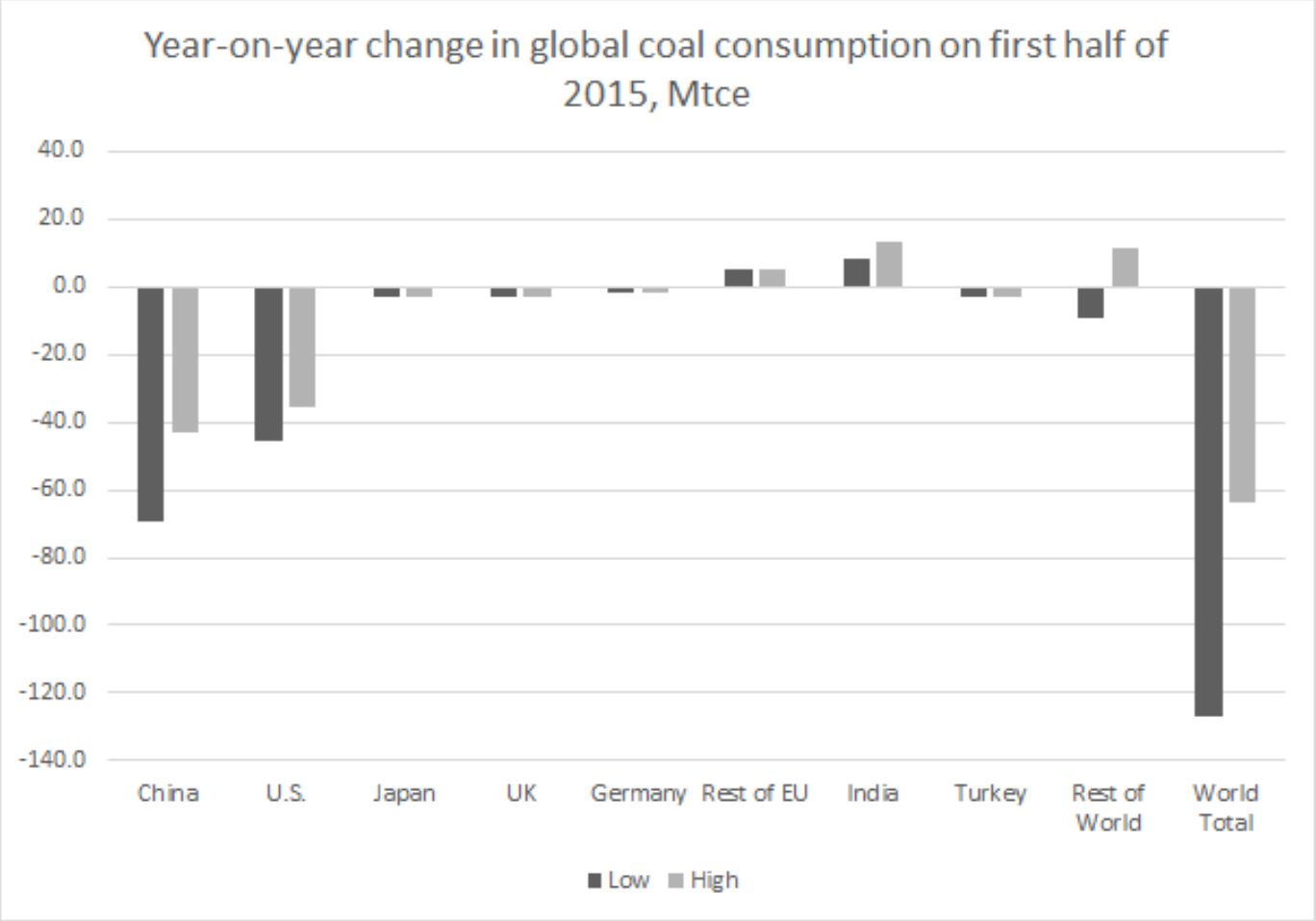
With the Paris climate summit approaching, these figures demonstrate an unprecedented opportunity to achieve a sustained, rapid decline in global emissions from coal. If global warming is to be kept below 2 degrees C, to avoid the worst impact of climate change, global CO2 emissions from coal must fall 4 percent a year between now and 2040.

Coal's terminal decline

How a bad year for coal in 2014 has been followed by the biggest fall in consumption ever

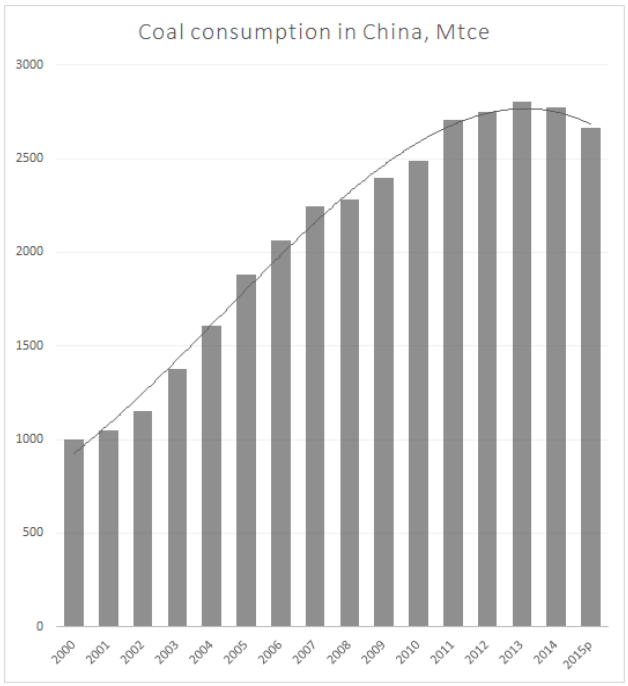
The levelling off of coal consumption in 2014 was one of the energy headlines earlier this year. The world economy had continued to grow, but coal consumption had not.

This study by Greenpeace suggests this was merely the start of a downward spiral for the coal industry. Last year's levelling off has been followed by what is set to be the largest fall in coal consumption in history, with a drop of as much 4.6% in January-September 2015, compared to the same period in 2014.



China's role

The decline has been driven by China, which has consumed half of the world's coal in recent years. After a decade of near double digit growth, coal use in the power sector was down more than 4% in the first nine months of this year. Imports dropped a staggering 31% in the same period.


Coal consumption in China, Mtce
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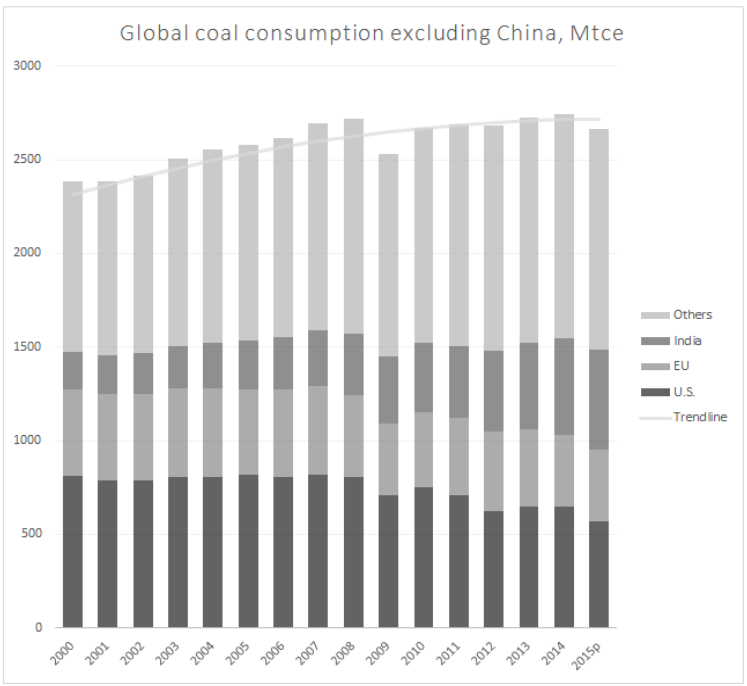
Global coal consumption excluding China, Mtce
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Others
India
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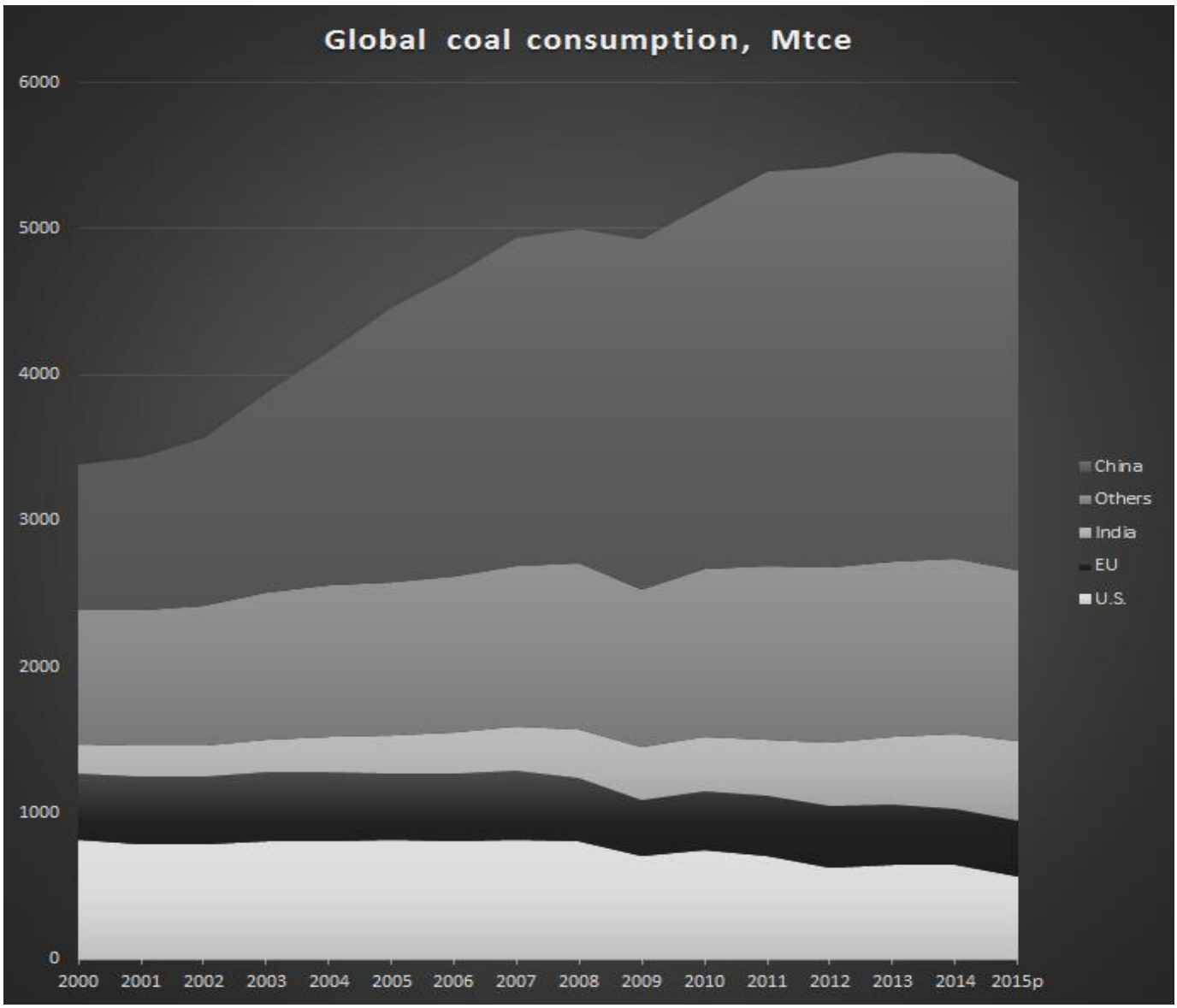
U.S.
Trendline


Global coal consumption, Mtce
6000
5000
4000
3000
2000
1000
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015p
China
Others
India
EU
U.S.

Overview of coal use trends and drivers in 2015

China: Bursting coal bubble and "green tipping point"

The facts on 2015 coal use: China's coal production fell by 5% in January-August[1], while imports plummeted by 31%[2]. Coal inventories were mounting last year but have been reportedly run down this year, which tempers the fall somewhat. This results in an estimated 4% fall in overall apparent coal consumption.

Industrial output volumes also fell in January-August on all key coal consuming sectors[3]. Thermal power generation shrank by 2.2%, coke output fell by 4.2%, pig iron and crude steel by 2.0% and 1.5%, and cement by a full 5.0%. Furthermore, coal consumption per unit of thermal power generated fell by 2.1%,[4] implying that power sector coal use declined by 4.3%.

What's going on

- China's power sector has reached a "green tipping point". Since the end of 2013, China's electricity consumption growth has been entirely covered by growth in power generation from renewable sources[5]. This is a substantial achievement, as the increase in power demand from 2013 to 2015 is roughly equal to Australia's total power consumption. Meeting the capacity targets set for different energy sources for 2020 will enable all of the projected new power demand to be covered from non-fossil energy growth.

  A recent projection by two Chinese government think tanks sees the country getting half of its electricity from renewable energy in 15 years, and almost phasing out fossil fuels in power generation by mid-century. Under these projections China in 2050 would produce half of the current electricity consumption of the entire world from wind and solar alone, or more than twice as much as as China currently does from coal.[6]

- The fall in heavy industry output is driven by a fundamental transformation of the economy away from government-engineered spending on factories, real estate and infrastructure towards services and high-end manufacturing, dubbed the "New Normal" by the government. This is both a necessity, as the economy rebalances after the biggest investment boom the world has ever seen, and the number one priority of the country's top leadership.[7]

- War on pollution will continue. One of the key factors driving China to reduce coal burning is concern over emergency level air pollution, responsible for an estimated 1.2 million premature deaths each year. Since the first national and provincial action plans came out in 2013, measures to curb coal consumption have been at the heart of China's fight against air pollution, with key economic regions mandated to make large absolute cuts in their coal use by 2017.[8] The critical 13th five-year plan is widely expected to introduce a national absolute cap on coal consumption for 2020.

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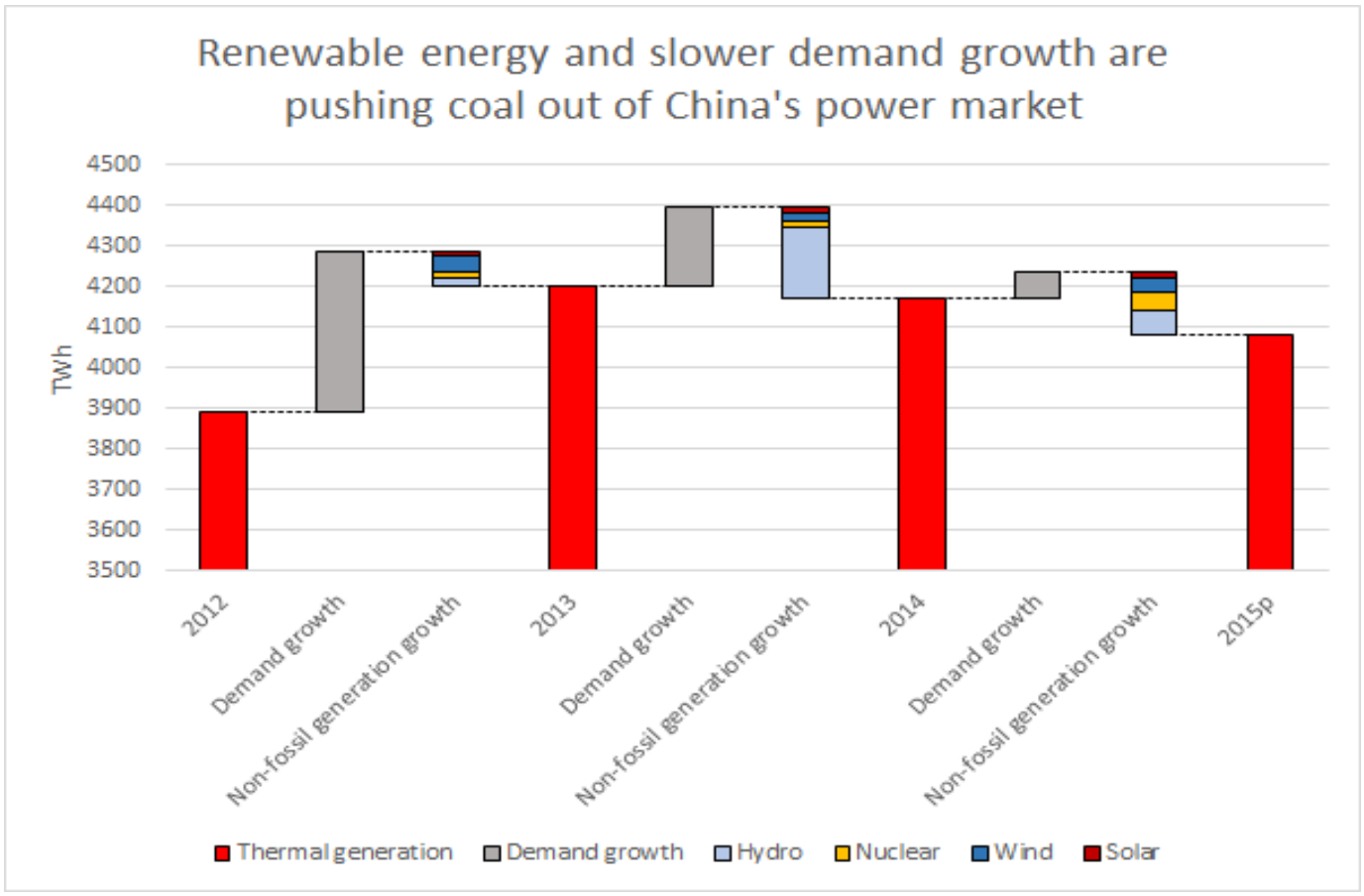
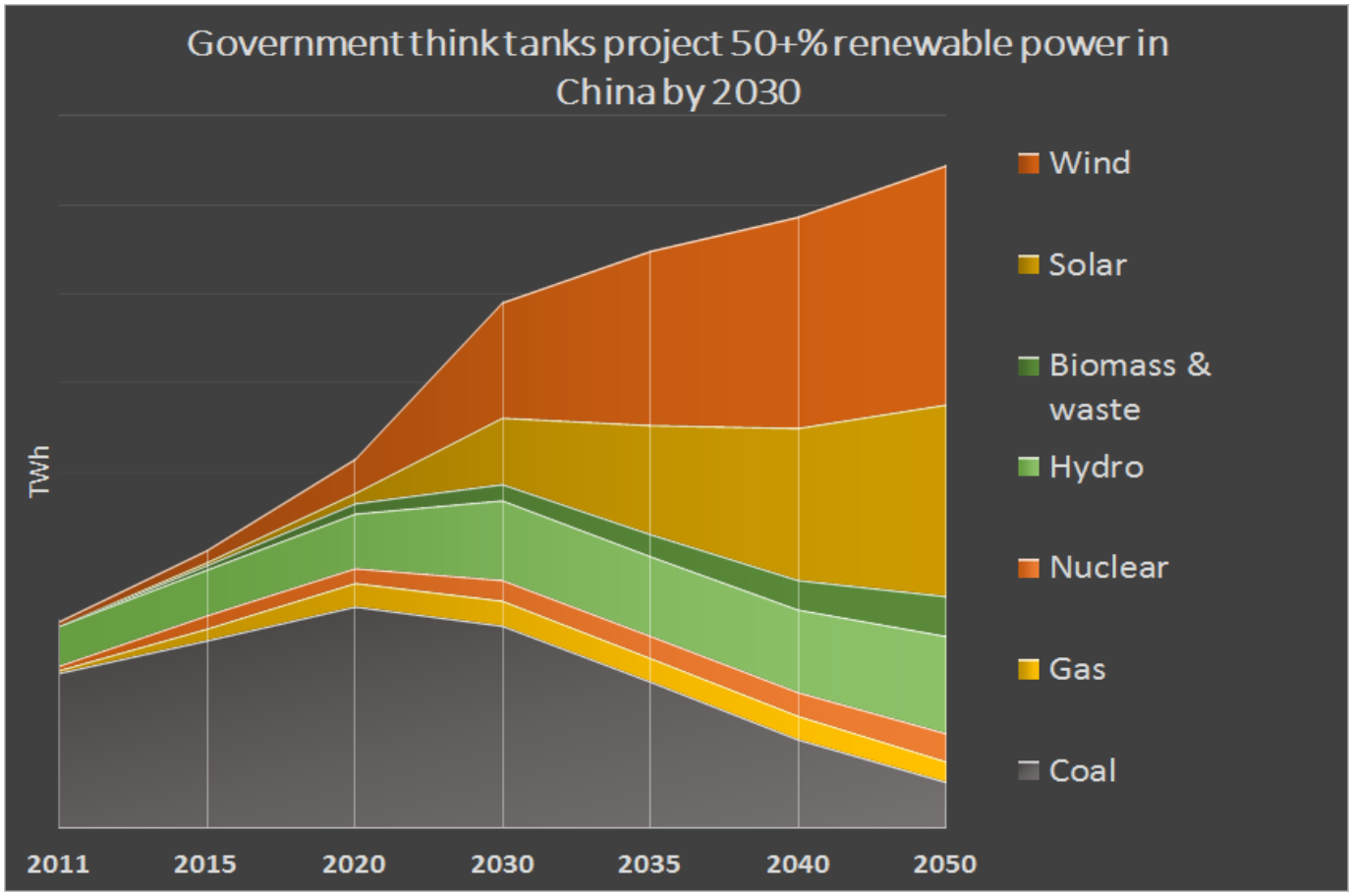
[1] http://www.stats.gov.cn/tjsj/zxfb/201509/t20150913_1243820.html
[2] http://www.customs.gov.cn/publish/portal0/tab49666/info772245.htm
[3] http://www.stats.gov.cn/tjsj/zxfb/201509/t20150913_1243820.html
[4] http://www.nea.gov.cn/2015-09/15/c_134625502.htm
[5] Calculated from National Energy Agency monthly and annual statistical releases; latest one is found at http://www.nea.gov.cn/2015-10/19/c_134727170.htm [in Chinese].
[6] http://www.efchina.org/Reports-en/china-2050-high-renewable-energy-penetration-scenario-and-roadmap-study-en
[7] See e.g. http://www.lse.ac.uk/GranthamInstitute/publication/chinas-new-normal-structural-change-better-growth-and-peak-emissions/
[8] http://www.greenpeace.org/international/Global/international/briefings/climate/2014/The-End-of-Chinas-Coal-Boom.pdf





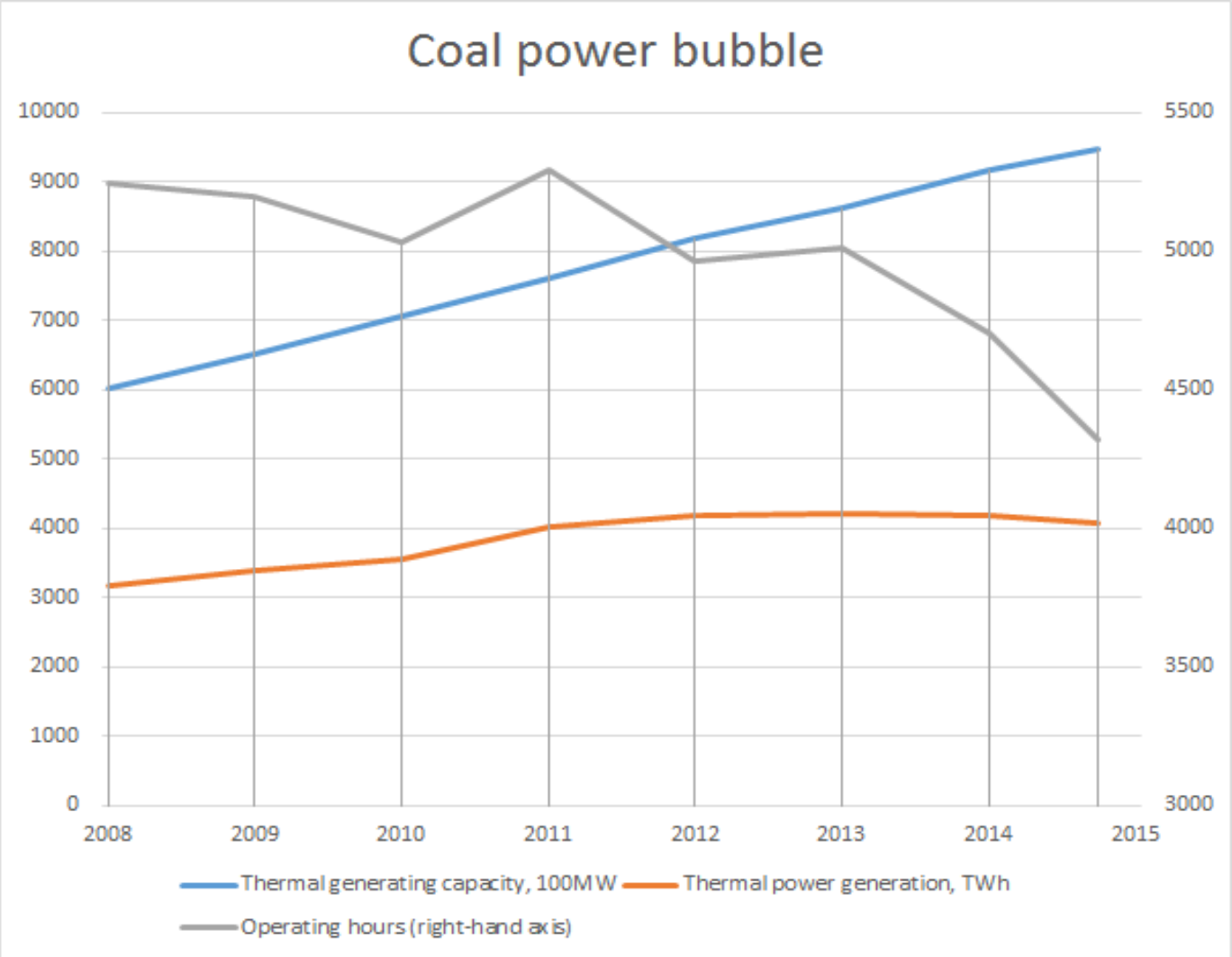
Source: http://www.efchina.org/Reports-en/china-2050-high-renewable-energy-penetration-scenario-and-roadmap-study-en

China adds one coal-fired power plant per week - but leaves one idle

China's electricity markets and financial system were purposely designed to deliver very large amounts of investment in new power plants, with state-owned enterprises having extremely favourable access to credit, with new coal-fired power plants enjoying largely guaranteed returns on investment. This has meant that even as demand for new coal-fired power generation levels off, Chinese companies have kept on building new coal-fired power plants at a fervent pace. As a result, the capacity utilization of China's coal-fired power plants has been plummeting. China is now adding one IDLE coal-fired power plant per week.

During the past year, 50 gigawatts of new thermal power capacity, mainly coal, was added to the grid, and approximately 80 gigawatts entered construction.

The feverish pace of coal-power plant construction is not translating into increased coal consumption in the short term, as there is no demand for coal-fired generation on the market, but the hundreds of billions of dollars spent on new coal power capacity represent not only economic waste on a massive scale, but a missed opportunity to invest in clean energy sources instead, and threaten to create a conflict between renewable energy and coal in the grid.



China's thermal power generation will be at 2011 level in 2015, while frantic construction of new coal-fired power plants has increased thermal generating capacity by 25%, leading to a precipitous fall in capacity utilization.

US coal plants closed at record pace on lack of competitiveness, grassroots opposition

The facts on 2015 coal use: Consumption of coal for power generation fell by 11% in January-July 2015[9], as renewable energy and gas displaced coal in power generation, and significant amounts of coal-fired capacity closed down. Pressure from grassroots clean energy advocates and unfavourable economics have led 200 coal-fired boilers, one third of total coal-fired capacity, to retire or announce a retirement date[10], and the impact can already be seen in 2015 power generation mix[11].

What's going on

Almost a decade ago, when utilities in the US were about to initiate a massive coal boom that would have seen the construction of more than a hundred new coal-fired power plants, a nationwide grassroots movement sprung up to call for clean energy. Widespread opposition to coal and deteriorating economics of coal-fired power plants killed the boom in its tracks, and the attention focused to closing down existing dirty power plants. By 2015, more than 200 coal-fired units, with a total generating capacity of 83GW, have been scheduled for retirement. These announcements are starting to materialize in 2015, with 13GW expected to retire this year. This already has an impact on power sector coal consumption which fell a whopping 11% in the first half of 2015.

The investment bank UBS projects that the share of coal-fired power generation will halve in the US by 2030, driven by economics rather than politics. If the US successfully boosts renewable energy deployment, the fall could be even faster.

While power generation from renewables has grown impressively in the US, in the short term natural gas is filling up a lot of the gap. Natural gas, especially natural gas from fracking, has significant greenhouse gas emissions due to methane leakage.

Renewable energy however has vast potential in the US. Recently International Renewable Energy Agency IRENA published a roadmap for RE to cover 50 % of power demand by 2030[12]. Already in 2007 to 2014, growth in renewable power generation, led by wind and solar, covered 44% of the fall in coal use, and reduction in consumption covered 15%[13].

EU: renewable energy is booming while old, dirty power plants are on the way out

The facts on 2015 coal use: The **UK**'s coal use for power generation in January-June fell 16%[14] as coal-fired power plants closed down or scaled back output. **Germany's** coal consumption fell 2.8% in January-July[15] on top of an over 5% contraction last year, as generation from renewable energy grew a jaw-dropping 29% and hydro 15%[16].

Power generation data from European grid operators (ENTSO-E)[17] indicates that other **European Union** countries *increased* coal-fired power generation as low seaborne coal prices made coal more competitive in the short term. That kept coal use flat in the EU in the first three quarters of 2015, after a record fall of 6.5% in 2014.

What's going on:

EU's coal consumption has been now back on a downward trajectory for three years after a short-lived rebound from the 2009 economic shock. EU's fossil CO2 emissions have fallen at 3% per year since 2010 - a rate that needs to be sustained.

All net increases in EU power generating capacity have come from renewable energy and natural gas since 2000, and in more recent years increasingly from renewable energy, and up to 50 gigawatts of coal-fired capacity is retiring in the next 10 years. However, the EU still has a very large, polluting coal power plant fleet that needs to be phased out to enable the transition to a 100% renewable power system.

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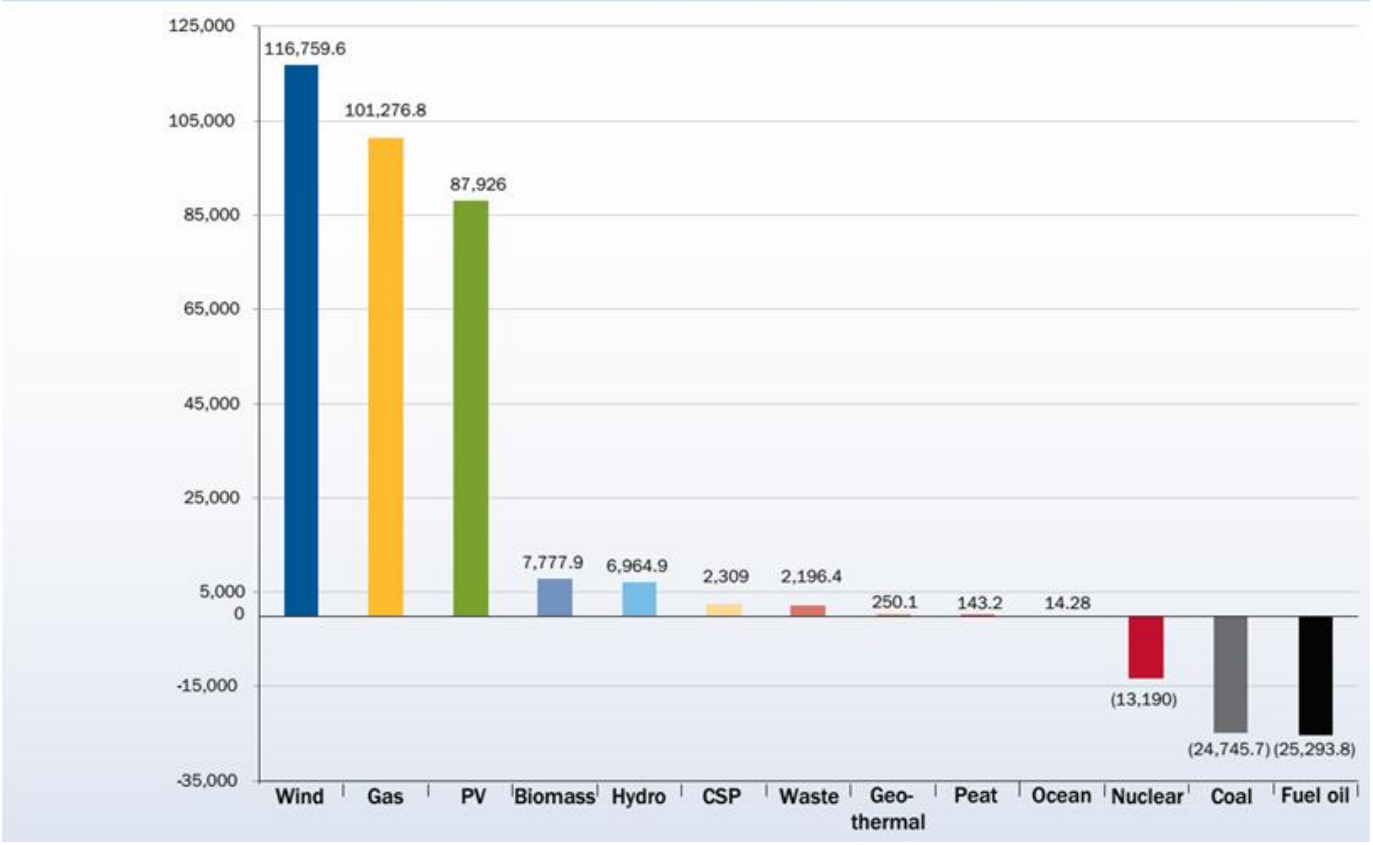
[9] http://www.eia.gov/electricity/data.cfm#consumption
[10] http://content.sierraclub.org/coal/victories
[11] http://www.climatechangenews.com/2015/04/10/us-carbon-pollution-set-for-2015-drop-as-coal-plants-close/
[12] https://www.irena.org/remap/IRENA_REmap_USA_report_2015.pdf
[13] US EIA Electricity Data http://1.usa.gov/1RxK4hc
[14] https://www.gov.uk/government/collections/energy-trends
[15] http://www.ag-energiebilanzen.de/index.php?article_id=29&fileName=quartalsbericht_q2_2015.pdf
[16] http://www.iea.org/statistics/relatedsurveys/monthlyelectricitysurvey/
[17] https://www.entsoe.eu/data/data-portal/production/Pages/default.aspx

FIGURE 6: NET ELECTRICITY GENERATING INSTALLATIONS IN THE EU 2000-2014 (MW)



India: coal expansion failing to keep lights on, renewable energy delivering

The facts on 2015 coal use:

India's domestic coal production has been increasing rapidly, with Coal India's coal sales growing 7% year-on-year in January-September[18] and the second largest producer, Singareni Collieries, posting a 15% increase for April-September[19]. At the same time, the growth in imports has slowed from 20-30% growth rates in the past years to approximately 7% in January-August.

However, much of the growth in coal supply has ended up in coal stockpiles, which were at low levels at the end of last year and have increased by at least 15 million tonnes since then[20]. Apparent consumption has grown by approximately 5%.

Despite the increase in coal supply, total power generation only increased by 3.1% in April-August[21], steel production stagnated[22] and cement production increased by a meagre 1.8%[23], indicating that total coal consumption is unlikely to have increased by much more than 3%.

[18] Calculated from Coal India's monthly performance reports at https://www.coalindia.in/en-us/performance/physical.aspx
[19] https://scclmines.com/scclnew/performance_production.asp
[20] Information compiled from news reports on inventories, e.g. http://www.platts.com/latest-news/coal/london/indian-power-plants-coal-stocks-hit-record-high-26079384
[21] http://www.thehindubusinessline.com/economy/coal-indias-output-up-9-in-aprilaug-but-overall-fuel-output-stagnant/article7716246.ece
[22] http://www.livemint.com/Industry/jYsaKXOIpacyQzG0sn5eAO/Indias-steel-production-falls-08-in-September.html
[23] http://www.eaindustry.nic.in/eight_core_infra/eight_infra.pdf

What's going on

- Renewable energy ambitions are materializing**:** India is aiming for more than 10% increase in renewable energy generating capacity in the financial year starting from April 2015, and the realized installations in the first quarter show that the programme is on track[24]

- Coal-based electricity strategy is failing as new power plants get built but not operated

Brief overview of other key markets

Remarkably, the record low coal prices do not seem to have stimulated demand from other major importers: **Japan's** coal use for power generation was down 3.3% in January-July[25] according to Ministry of Economy, Trade and Industry data. Increased renewable energy output and lower power demand both ate into coal-fired generation, as thermal power generation fell 5% in total[26]. **South Korea's** coal imports fell 0.4% over the same period, according to data from the Korean Coal Association[27].

In **South Africa**, the state utility Eskom reported a 2.0% fall in power output[28]. As coal makes up well over 90% of Eskom's portfolio, coal-fired generation is very likely to have fallen by a similar amount.

Indonesia's coal use in January-August was down 1%[29].

IEA monthly electricity data showed thermal power generation down 13% in **Turkey**, 7% in **Canada**, 1% in **Mexico** and stable in **Australia**[30].

No preliminary data was available for **Russia**, but the country's GDP is projected to contract by 3.4%[31], making it highly likely that coal consumption will fall as well.

These trends mean that a sustained global CO2 emissions peak and then decline is within reach, but increased action is needed urgently to shift new investments fully into renewable energy globally, and to accelerate the phase-out of coal and other fossil fuels in developed countries.

Current climate pledges by most of the world's key economies, including the EU's, do not reflect what is happening in the real world. But the Paris climate summit needs to play its role by accelerating the world's energy transformation and the shift away from coal -- and other fossil fuels.

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[24] http://mnre.gov.in/mission-and-vision-2/achievements/
[25] http://www.enecho.meti.go.jp/statistics/electric_power/ep002/results.html#headline1
[26] http://www.iea.org/statistics/relatedsurveys/monthlyelectricitysurvey/
[27] http://www.kcoal.or.kr/info/info04.php
[28] http://www.eskom.co.za/Whatweredoing/SupplyStatus/Pages/Supply_Status2.aspx
[29] http://www.indonesia-investments.com/news/news-columns/coal-production-in-indonesia-down-15.4-to-263-million-in-january-august/item5930
[30] https://www.iea.org/media/statistics/surveys/electricity/mes.pdf
[31] https://www.imf.org/external/pubs/ft/survey/so/2015/car080315b.htm

Overview of data on 2015 coal demand compiled for this briefing

Country/region	2014 coal consumption, Mtce	2015 growth rate		Basis	2015 data until
		Low	High		
China	2774	-5.0%	-3.0%	Apparent demand	Sep
US	648	-11.0%	-11.0%	Power sector fuel use	Jul
India	515	3.1%	6.1%	Electricity consumption, apparent demand	Sep
Germany	111	-2.8%	-2.8%	Total energy use	Jun
UK	42	-15.5%	-15.5%	Total energy use	Jun
EU Total	248	0.0%	0.0%	Electricity statistics	Sep
Japan	181	-3.3%	-3.3%	Power sector fuel use	Aug
South Africa	128	-2.0%	-2.0%	Electricity generation	Sep
Russia	122	0.0%	0.0%	Fall in GDP	-
Korea	121	-0.4%	-0.4%	Coal imports	Jul
Australia	63	0.2%	0.2%	Electricity statistics	Jul
Canada	30	-6.5%	-6.5%	Electricity statistics	Jul
Mexico	21	-0.7%	-0.7%	Electricity statistics	Jul
Turkey	51	-13.0%	-13.0%	Electricity statistics	Jul
Indonesia	87	-1.0%	-1.0%	Total energy use	Jun
Global	5545	-4.6%	-2.3%		

Methodology notes

Some countries (US, Japan, Germany, UK) report coal consumption on monthly or quarterly basis. For some others (rest of EU, China), power generation by fuel is available. Where this data is not available, two main approaches are used to estimate coal consumption in 2015: apparent consumption and sector growth rates for key coal consuming sectors.

Apparent consumption refers to a simple accounting identity - every tonne of coal mined or imported must be either consumed, stockpiled or exported. Hence consumption equals coal production plus net imports minus stock change.

These countries with preliminary data make up over 90% of the global market for coal. For the countries not covered, we analysed the range of changes in coal use seen in historical data, and used the extreme values for the low and high estimates, and average change for the central estimate. Even very dramatic changes in these countries would not change the results in any way. These sources of preliminary data cover over 90% of the global market for coal. For the countries not covered, we analysed the range of changes in coal use seen in historical data, and used the extreme values for the low and high estimates, and average change for the central estimate. Even very dramatic changes in these countries would not change the results in any way.

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