



# COAL EXIT OR COAL EXPANSION?

A Review of Coal Market Trends  
and Policies in 2017

**Sylvie CORNOT-GANDOLPHE**

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# Executive Summary

Coal in the power sector is the principal focus of climate-related policies due to its high carbon intensity, making CO<sub>2</sub> emissions from coal a leading contributor to climate change. While 38% of global power generation come from coal (in 2017), coal-related CO<sub>2</sub> emissions represent more than 70% of power sector emissions. Coal-fired power plants are also the leading source of all primary air pollutants within the power sector, causing respiratory diseases and premature deaths.

Structural changes are fast sweeping through global electricity markets. A key driver is the fast deployment of renewable energy sources and their falling costs, making renewables increasingly competitive with coal. Coal is also becoming less competitive than other sources of electricity in several regions, due to the fall in gas prices, the rising cost of the carbon price and higher coal import prices. Pressures against investment in coal activities increasingly create challenges for financing coal projects. Global coal power investment has passed an all-time peak and has contracted over the past two years. Investment in greenfield coal mines is also at a standstill in all major coal exporting countries.

Nevertheless, while the future of coal is dark, 2017 has been a good year for the sector. World coal production increased after three consecutive years of decline. Global coal demand and international trade rose again, and high coal prices (above \$80/tonne levels since summer 2016) boosted the financial results of coal mining companies. As a result of growing fossil fuel demand, global energy-related CO<sub>2</sub> emissions rose again in 2017. These short-term results don't call into question global decarbonization trends but demonstrate that current efforts are insufficient to meet the objectives of the Paris Agreement.

The world is still divided about the future role of coal. A major change came in 2015 with the Paris Agreement, which prompted many nations across the world to accelerate their efforts to reduce coal consumption. Since then, several governments and power utilities have decided to phase out coal from their electricity mixes and joined the "Powering Past Coal Alliance". Coal reduction or phase-out policies are being adopted or considered by more and more countries, and the reduction in the share of coal power generation goes faster than expected in several coal consuming countries.

But **South and Southeast Asia** remains a region for short to medium term growth in coal demand and Africa is a potential area for new growth. In this, new coal markets can also develop thanks to the support of countries eager to export their coal combustion technologies, led by China and Japan, and by the desire of coal exporters to find new outlets. Despite this growth, the sustainability of the relative good performance of the coal sector in 2017 is far from being ensured.

**China**, the world's largest coal consumer, increased slightly its coal consumption in 2017, following surging demand by the power sector. But this rise does not call into question fundamental market trends: Chinese demand for coal peaked in 2013. The fight against air pollution strengthened last year and now encompasses a switch of heating from coal to natural gas and electricity, and the end to usage of low-quality and polluting loose coal. The electricity sector is still dominated by coal, but the share of coal generation has declined steadily since 2010 (including in 2017), while renewables have risen fast. Chinese efforts to eliminate overcapacity in the power and coal sectors accelerated in 2017 and the pipeline of coal power plants projects contracted dramatically. However, Chinese banks and companies continue to be the world's first investor in coal power plants abroad, despite China being the world's largest investor in renewables.

The growth in coal demand in **India** has slowed down since 2015. Coal produces most of the country's electricity generation but the rapid development of renewables, and the sharp decrease in their cost, is beginning to nibble the share of coal in the electricity mix. Power generation from new renewables (excluding large hydro) increased significantly in 2017. For the first time in Indian history, the installed capacity of new renewables far exceeded coal capacity additions. The utilization factor of coal power plants has declined and led the Indian government to limit the construction of new coal capacity. Coal is nevertheless expected to remain the major energy source in the short to medium term. But the revision of the national electricity plan in April 2018 shows that the growth in coal demand by the power sector will be limited. Ongoing efforts to improve the efficiency of the coal fleet and reduce air pollution will lead to a wave of retirement of highly-polluting and inefficient coal plants.

In the **United States** (US), the coal market continues to shrink as coal power generation is squeezed by natural gas and renewables. Efforts by President Trump to reverse the trend can only marginally alter the situation. Retirements of coal power plants continue apace despite the proposed repeal of the Clean Power Plan. Major power utilities favour

investments in renewable and gas-fired electricity, regardless of the Trump administration's plans. In stark contrast with the previous two years, US coal production increased in 2017, driven by higher international prices. A surge in US coal exports more than offset the structural decline in US coal consumption, contributing to the higher coal production. The current US administration, which sees the export market as a vital and necessary area for the US coal industry growth, is pushing for an international "Clean Coal Alliance" that would share carbon capture and storage (CCS) and high efficiency, low emission (HELE) technologies with developing countries. While the focus on clean coal is baffling, given that the US President doesn't acknowledge man-made climate change, the proposed alliance could be consequential if it means that the US would fund and develop joint CCS projects. At global level, CCS is seen by the Intergovernmental Panel on Climate Change (IPCC) and by the International Energy Agency (IEA) as one of the essential solutions for massively reducing global CO<sub>2</sub> emissions by 2050. Meanwhile, the US has taken new initiatives to promote CCS by extending and raising tax credit for demonstration projects.

**The European Union's** (EU) coal demand stagnated in 2017 after its sharp drop in 2016. The share of coal (hard coal and lignite) in EU power generation has continued its structural decline, squeezed by renewables and natural gas. New renewables generation (excluding hydropower) sharply increased in 2017, and collectively overtook coal for the first time. EU-wide policies and regulations, such as the EU climate and energy targets, the Industrial Emission Directive (IED), the EU Emission Trading Scheme (ETS), have reduced the use of coal in the power sector, also encouraged by national support schemes for renewables and the collapse of natural gas prices. All these factors combined have made it tougher for coal to compete in a market environment where the growth in electricity consumption remains low. Further EU and national regulations, adopted in 2017-18, such as the reform of the EU ETS and the adoption of new EU air pollution standards, will reinforce the pressure on coal and undermine the competitiveness of coal power generation. The EU is leading the global move to phase out coal in the power sector. As of the beginning of April 2018, 14 EU countries have joined the "Powering Past Coal Alliance" and pledged to phase out unabated coal power by 2030 or even before. Although Germany and Poland, the two largest coal users in the EU, have not yet pledged to phase out coal, the new grand coalition in Germany should determine, by early 2019, an end date for coal-fired power generation, both for hard coal and lignite. In Poland, in a complete U-turn from previous administrations, the new government seems eager to

increase the share of renewables and natural gas in the country's electricity mix, thus reducing the share of coal.

In **Japan, South Korea and Taiwan**, which constitute the traditional coal buyers in the Pacific Basin, nuclear power issues increased coal demand in 2017. However, the trend is going to be altered by new electricity supply policies in South Korea (albeit at a slower pace than expected), and Taiwan (which intends to phase out nuclear power and reduce the share of coal in its electricity mix). Japan's energy policy has given a significant role to coal so far. But Japan is facing mounting international criticism over its coal power investment, at home and abroad. The Japanese government has been warned that its pro-coal policies are creating a "bottleneck" in international climate talks – and that the country risks being left behind in the global green energy boom. The outcome of the review of the national energy policy, currently conducted by the Ministry of Economy, Trade and Industry (METI), will be a key test for the global community to see if its concerns have been addressed.

In **Southeast Asia**, coal demand and imports have continued their surge driven by rapidly increasing electricity demand. The availability of coal in the region, notably in Indonesia, the world's largest steam coal exporter, and its lower cost than competing fuels, has made coal the preferred option to fuel rising power demand. Gas still dominates South Asian power generation, but its share is declining, while the share of coal is rising. In the short to medium term, the trend towards coal is going to continue due to the large coal-fired power capacity currently under construction. In this, Southeast Asian countries are helped by countries wishing to export their coal combustion technologies, led by China and Japan. However, there are some signs that the rapid rise in coal-fired capacity is running out of steam. Several factors are undermining coal dominance in the medium term, such as air quality concerns, environmental and financial issues, local opposition to new coal plants. Coal's main advantage in Asia, its cost-competitiveness, is challenged by the rising price of coal for regional importing countries and the falling cost of renewables and, to an extent, by ample availability of low-cost LNG. In spite of the Paris Agreement, Southeast Asian energy leaders still view a continuing role for coal in addressing energy security economic competitiveness, and environmental sustainability in the region, especially in switching from inefficient coal plants to clean coal combustion technologies.

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# Introduction

Since the adoption of the Paris Agreement, coal is facing increasing pressure. Coal phase-out policies and divestment from the coal industry are promoted by numerous initiatives, such as the “Powering Past Coal Alliance”. Indeed, coal is the most carbon-intensive fossil fuel, emitting twice as much CO<sub>2</sub> than natural gas. Its use in the power sector is responsible for 71% of the sector CO<sub>2</sub> emissions, while coal-fired power plants produce 37% of global electricity. In addition to be a key driver of climate change, air pollution from the burning of coal impose massive costs in both human and economic terms. Several studies have shown that coal is not compatible with the goal of the Paris Agreement and that a phase-out of unabated coal-fired power plants is needed by 2030 in the Organisation for Economic Co-operation and Development (OECD) countries, and by 2050 in the rest of the world.<sup>1</sup>

In the power sector, a diverse set of low-carbon technologies are available to produce electricity, making coal the most vulnerable fossil fuel in the move towards a decarbonized energy sector. The rapid deployment and falling costs of clean energy technologies is reshaping responses to the world’s pressing environmental challenges. The power sector is witnessing a shift to renewables, driven by widespread policy support and falling costs, even, and notably, in the biggest coal producing and consuming countries. So, the question today seems not to be if coal will be phased out, but rather when and to what extent. The answer needs to be nuanced because coal consumption trajectories in the world are far from converging and despite its recent declining role in global power generation, coal still accounts for 64% of power generation in China, 76% in India and, more generally 50% in Asia.

This report reviews recent global and regional coal market trends and policy developments. It focuses on coal demand by the power sector and covers five main coal consuming countries/regions: China, India, the United States (US), the European Union (EU), and other Asian countries (Japan/South Korea/Taiwan and Southeast Asian), which collectively account for almost 90% of global coal demand.

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1. See for instance the IEA’s Sustainable Development Scenario, IEA (2017a), “World Energy Outlook 2017”, November 2017, available at: [www.iea.org/weo2017](http://www.iea.org/weo2017) and Climate Analytics (2017), “Ten key short-term sectoral benchmarks to limit warming to 1.5° C”, December 2017, available at: [climateanalytics.org](http://climateanalytics.org).



# Recent Global Coal Market and Policy Developments

## Coal's come-back defies the planet

If the future of coal was not so dark, 2017 would have been a good year for the sector. **World coal production, demand and international trade rose again, and high coal prices boosted the financial results of coal mining companies.** China's coal demand recovered, Peabody Energy Corp, the US largest coal miner, emerged from Chapter 11 bankruptcy protection, and US coal exports surged.

The final results for the year 2017 are not yet known, but the first trends in the major markets indicate a growth in global production (in tonnage) of around 2% in 2017 compared to 2016. In the six major producing countries (China, India, the United States, Australia, Indonesia and Russia, which produce 85% of world production), production is up except in Australia. The rise is a reversal of past trends. World coal production declined for the previous three consecutive years.

**Table 1: World coal production, 2014-2017e**

(in million tonnes)	2014	2015	2016	2017 (est)	% change 2017/2016
China	3880	3750	3410	3520	3.2%
India	657	683	708	721	1.8%
United States	907	814	661	702	6.2%
Australia	489	512	503	490	-2.6%
Indonesia	485	469	459	477	3.9%
Russia	333	352	366	388	6.0%
Total six major producers	6751	6580	6107	6298	3.1%
<b>WORLD</b>	<b>7934</b>	<b>7727</b>	<b>7269</b>	<b>7420</b>	<b>2.1%</b>

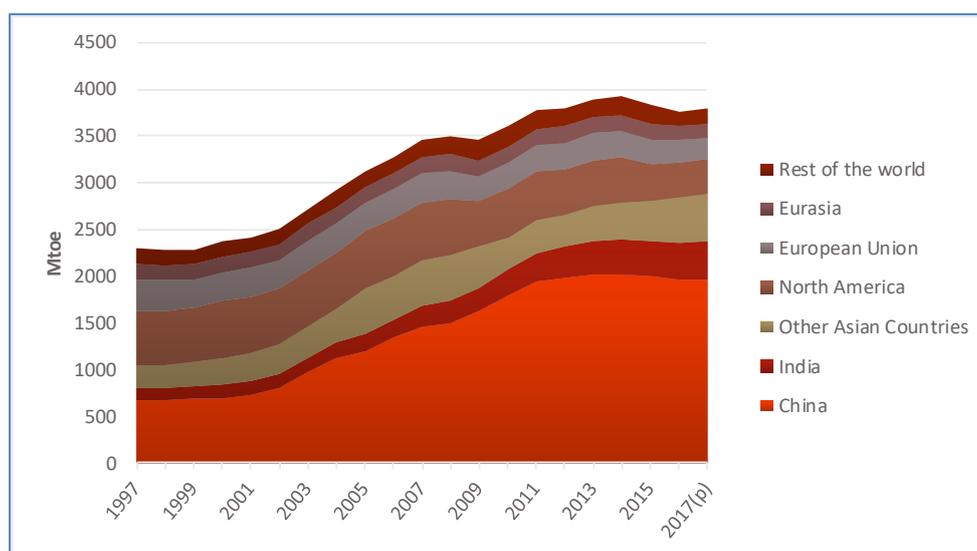
Source: IEA, EIA, NBS; 2017: estimated.<sup>2</sup>

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2. International Energy Agency (IEA) (2017b), "Coal Information 2017", August 2017, available at: [www.iea.org](http://www.iea.org); Energy Information Administration (EIA) (2018a), "Quarterly coal report", 2 April 2018, available at: [www.eia.gov/coal](http://www.eia.gov/coal); National Bureau of Statistics of China (NBS) (2018), "Statistical communiqué of the People's Republic of China on the 2017 national economic and social development", 28 February 2018, available at: [www.stats.gov.cn](http://www.stats.gov.cn).

**Global coal demand rose in 2017 by 1% to 3 790 million tonnes oil equivalent (Mtoe) after two years of decline.**<sup>3</sup> The rebound in coal demand was driven entirely by an increase in coal-fired electricity generation in Asia, which drove up coal demand for power by nearly 3.5% compared to the previous year. Despite last year's uptick, global coal demand remains well below its peak of 3 927 Mtoe in 2014.

**Figure 1: Global coal consumption by major region/country, 1997-2017e**



Source: IEA (2017b), 2017: estimated.

As a result of growing fossil fuel demand in 2017, global energy-related CO<sub>2</sub> emissions rose again to a historic high of 32.5 giga tonnes (Gt), after three years of global emissions remaining flat. The growth in CO<sub>2</sub> emissions in 2017 is a strong warning for global efforts to combat climate change and demonstrates that current efforts are insufficient to meet the objectives of the Paris Agreement.<sup>4</sup>

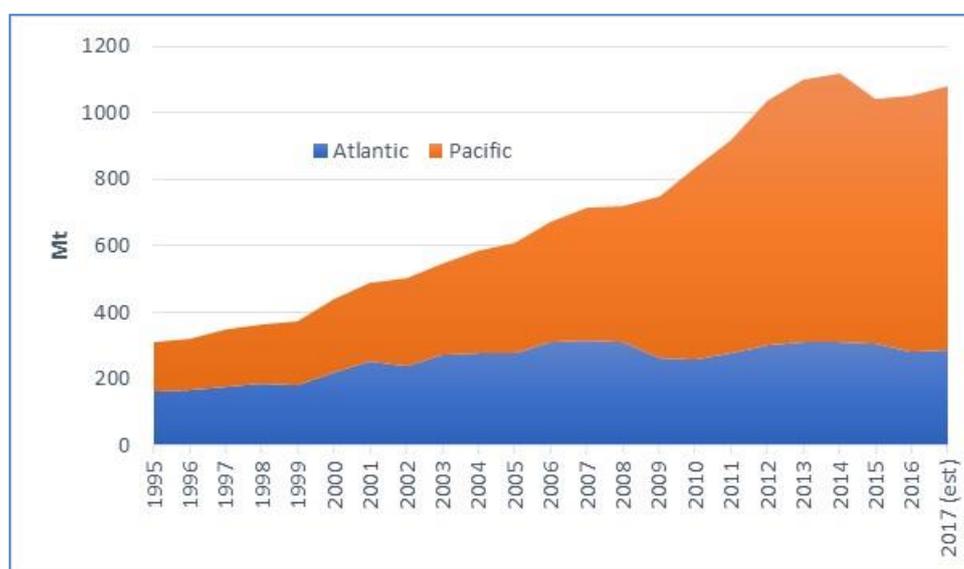
After a modest increase in 2016, export trade of all types of coal in the world increased by some 3% in 2017 to 1.4 Gt, according to first estimates based on export data by main exporting countries. **Steam coal exports increased by 3% to 1080 million tonnes (Mt)** and coking coal exports increased by 5% to 330 Mt. The Pacific Basin is responsible for most of the increase in steam coal imports. Virtually all Asian countries (except India) increased their imports in 2017. The Pacific Basin accounts

3. IEA (2018a), "Global Energy & CO<sub>2</sub> Status Report 2017", March 2018, available at: [www.iea.org](http://www.iea.org).

4. IEA (2018a), *ibid.*

for almost three-quarters of global steam coal imports. But imports from the Atlantic Basin posted a slight increase in 2017, after their sharp drop in 2016.

**Figure 2: Imports of steam coal by Basin, 1995-2017e**



Source: Historical data: IEA (2017b), 2017: estimated.

**As already observed in 2016, the response of coal exporting countries to the rising demand for imported coals was mixed.** The two largest steam coal exporting countries (Indonesia and Australia) have struggled to increase their exports due to weather-related events. Australia was hit by Cyclone Debbie in April 2017 which led to reduced coal production and exports. Indonesian production and exports increased in 2017, but the rise was constrained by heavy rains. As in 2016, higher Asian demand for imported coal has tightened the international coal market. In 2016, the sharp drop in European imports helped the steam coal market to rebalance, albeit at higher prices. In 2017, European imports increased slightly, and the rebalancing of the market required an increase in US exports, the “swing producer” of the coal market, resulting in even higher prices.

After their plunge in the period 2011-2015, **international steam coal prices have risen sharply since July 2016.** In 2016, the price of steam coal exported from Australia doubled from 50 United States Dollars (\$)/tonne (t) in January to \$100/t in November (monthly averages). The rise was mainly due to a sudden rise in Chinese imports to compensate for falling domestic production. Chinese production fell sharply after the government set quotas for mine operating days. The restrictions were

relaxed in November 2016 and the market expected a price drop in 2017, anticipating a reduction in Chinese demand for imported coals. But, after a contraction in the first half of 2017, the Australian price was once again buoyant in the second half of the year, driven by rising imports in China and almost all Asian importing countries (see **Box 1**). Prices soared to more than \$100/t in December 2017, and close to \$110/t in January 2018.

**Figure 3: Prices of imported steam coal into Europe and Asia, 01/2011-01/2018**



Sources: World Bank, Globalcoal.com.<sup>5</sup>

In Europe, the price for imported steam coal followed trends in Asian prices, but also responded to the short-term vagaries of the European market. Tensions in the electricity market (nuclear power plants maintenance in France, cold spells in January and December 2017, lower hydropower in the Iberian Peninsula) propelled the price of steam coal imported into Europe from \$74/t in May 2017 to a four year high of \$100/t at the end of the year. On average, the price for imported steam coal increased by 41% to \$84.4/t in 2017 compared with \$60 in 2016.

5. World Bank, "Commodity prices", available at: [www.worldbank.org](http://www.worldbank.org); GlobalCOAL, "Coal prices", available at: [www.globalcoal.com](http://www.globalcoal.com).

**Box 1: The role of China in the international coal market**

China plays a key role in the international coal market and the strength of Chinese coal imports dictates prices on the international market, including prices on the European market. Although Chinese steam coal imports represent only 7% of its coal demand, on the narrow international steam coal market, they account for nearly 20% of global imports. After two years of declining imports in 2014 and 2015, combined with production overcapacity and declining coal demand, in 2016, China's imports surged suddenly following production restrictions imposed by the Chinese government. In 2017, although the government had relaxed the restrictions, the structural reform of the coal mining sector continued, limiting the increase in production. Chinese coal production rose by 3.2% to 3.52 Gt, but China's demand grew more strongly (+3.5% to 3.81 Gt),<sup>6</sup> driven by economic growth and strong demand from the power sector. An increase in coal demand in the summer of 2017, following heat waves and a sharp rise in power generation, again caused Chinese domestic coal prices to rise and re-opened the price arbitrage between domestic and imported coal, in favour of imported coal. The Chinese government has tried to stabilize domestic coal prices within a target range of \$80-90/t. But domestic coal prices surged again at the end of the year and the beginning of 2018. In order to reduce seasonal pollution in the north of the country, due to small coal-fired heating boilers, the government imposed the replacement of coal with natural gas from October 2017. The new regulation has completely disrupted the global gas and coal markets. The cold spell that hit the country in December 2017 and January 2018 caused a sharp rise in gas demand and led to gas shortages in the Chinese market, despite record levels of imported liquefied natural gas (LNG). The gas transportation system was not able to meet such peak demand. As a result, the government had to back track and restrictions on imported coal deliveries were temporarily relaxed amid concerns of a supply shortage over the winter period. Following the sudden and sharp increase in LNG and coal imports, the international price of both fuels skyrocketed in December 2017 and only cooled down at the end of the winter period.

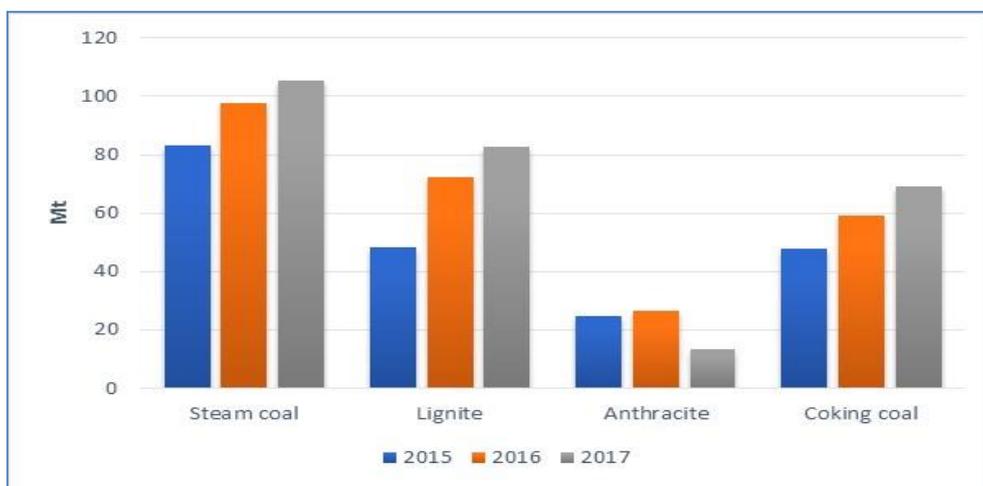
Overall, Chinese coal imports continued to increase in 2017, despite government efforts to reduce their growth (for instance, by issuing a coal import ban in some ports in southern China from July 2017). They increased by 6% from 2016 and reached 271 Mt in 2017.<sup>7</sup> However, this increase is much lower than in 2016, when the restrictions on the number

6. The increase is based on tonnage and is related to apparent demand. The Chinese Government estimates the increase in coal demand (in energy unit) at 0.4% in 2017. NBS (2018), *op. cit.*

7. NBS (2018), *op. cit.*

of working days in domestic mines led to a 25% jump in imports. Therefore, in 2017, China is only partly responsible for the increase in steam coal prices. Buoyant demand for imported coal in other Asian countries, notably Japan, South Korea and Southeast Asia also contributed to the tightness of the global coal market and the strength in steam coal prices.

**Figure 4: Chinese coal imports, 2015-2017**



Source: NBS.

## Global coal power investment has passed an all-time peak

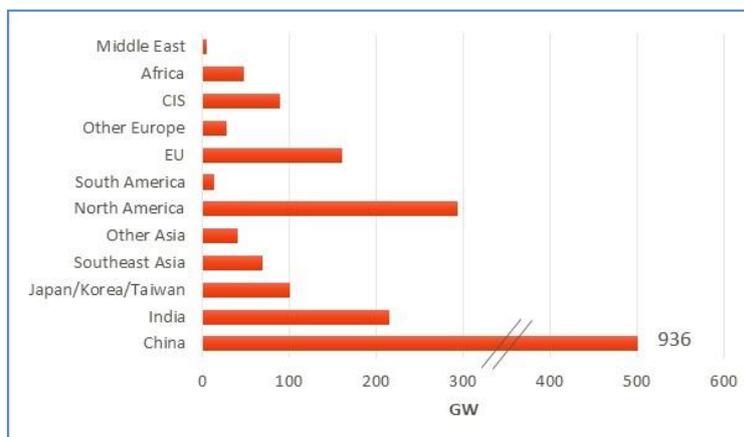
Coal has played and still plays a vital role in electricity generation worldwide. **Coal-fired power plants currently fuel 37% of global electricity** (2016 data) and much more in some countries. Rising electricity demand in Asia led to a surge in coal consumption over the period 2000-2010, which can certainly be qualified as the golden years of coal. Global coal demand increased by 50% during the period and accounted for 45% of the growth in total energy demand (see Figure 1). This spectacular increase was mainly driven by China and, to a lesser extent, by India. The growth has slowed down and even reversed in recent years (except in 2017) as a number of countries are moving away from coal and invest in cleaner fuels to cover their rising power needs. Power generation from coal declined between 2013 and 2016, its share of global electricity supply falling from 40% to 37%. At global level, the power sector account for 62% of total coal consumption and this share is higher (around

80%) in most countries but China, which still uses significant amount of coal in the industrial sector.

The use of coal for power generation has been the main driver of global CO<sub>2</sub> emissions growth over 2000-2016. In 2016, coal-fired power plants emitted 9.5 Gt of CO<sub>2</sub> emissions or more than 70% of power sector CO<sub>2</sub> emissions.

**Total coal-fired power capacity reached 2,000 GW at the beginning of 2018**, accounting for some 30% of global power capacity. Most of these coal plants are located in China, India, the US and the EU.

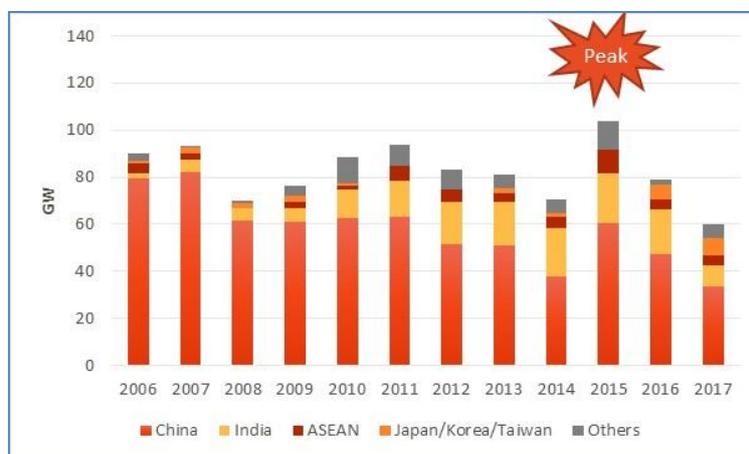
**Figure 5: Global coal power capacity at the beginning of 2018**



Source: *Global Coal Plant Tracker (2018)*.<sup>8</sup>

**The coal fleet is young.** Half of the current coal power capacity was built during the past 12 years, mostly in China and India. Without any policy change, these plants would still be in operation in 2050.

8. Global Coal Plant Tracker (2018), available at: [endcoal.org](http://endcoal.org). Please note that Chinese sources indicate a coal capacity of 980 GW at the end of 2017.

**Figure 6: Newly operating coal plants by year, 2006-2017**

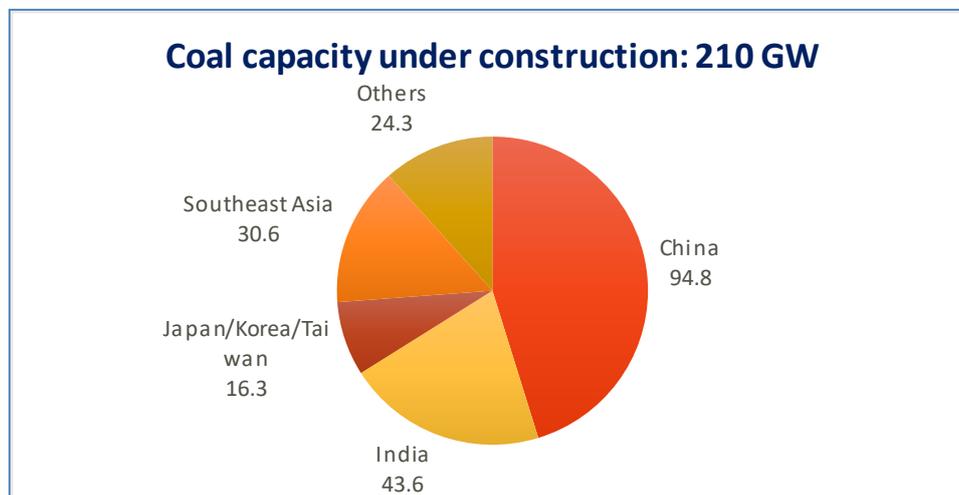
Source: *Global Coal Plant Tracker (2018)*.

From 2000 onwards, coal was the single biggest source of the growth of power generation, especially in China and India. This coal investment wave is coming to an end. As shown in Figure 6, **the coal power plant build-out has reached a peak in 2015 and has contracted since then**. Coal-fired power generation capacity which is under construction went down from around 100 GW around 10 years ago to only 60 GW last year. This is mainly due to a sharp slowdown in the construction of coal plants in China and India (see Sections on China and India).

## But still a huge pipeline of coal power projects

Despite growing pressure to phase out coal, there is still a significant pipeline of coal power plants under construction and planned in the world. **Globally, a total of 210 GW of new coal power plants are under construction, two-thirds of them in China and India.**

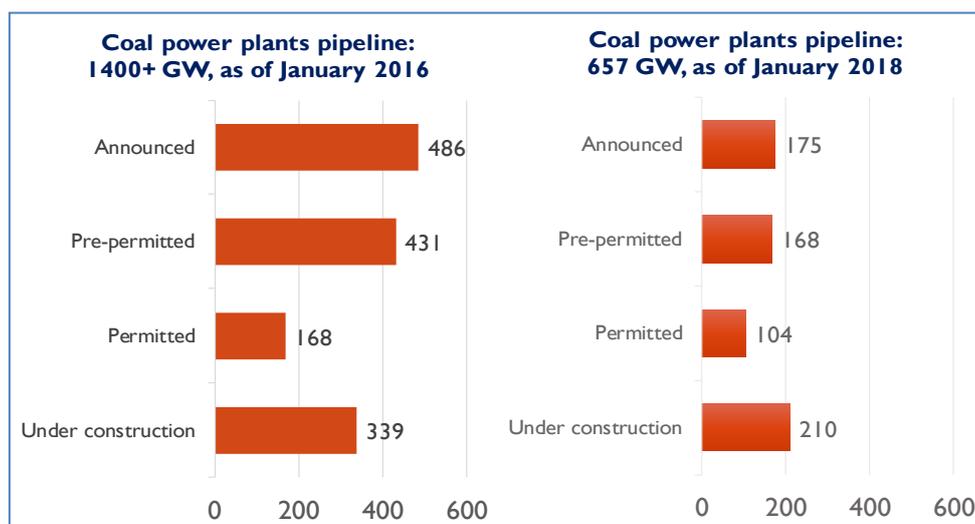
**Figure 7: Coal plants under construction in the world at the beginning of 2018**



Source: Global Coal Plant Tracker (2018).

In addition, **another 272 GW of coal capacity are permitted or pre-permitted and 175 GW have been announced.** However, the pipeline of coal power plants under construction and proposed has shrunk over the past two years. Since 2016, there has been a 38% drop in construction activity and a 59% drop in pre-construction activity with more than 600 GW of capacity shelved, mostly in China and India.

**Figure 8: Coal power plants under construction and planned in the world, January 2016 vs. January 2018**



Source: Global Coal Plant Tracker (2018).

In addition, retirements have accelerated in many countries, most notably in the United States. Global retirements in 2017 exceeded 25 GW. Most of the capacity retired was in the United States, China, India and the EU.

### Box 2: Several proposed coal-fired power plants in Africa

**With just under 200 Mt, Africa consumes only 3% of the global demand for coal.** South Africa alone accounts for 90% of Africa's coal demand, but coal is consumed in many other African countries, among them Botswana, Egypt, Ethiopia, Kenya, Mauritius, Morocco, Mozambique, Senegal and Zimbabwe. Coal accounted for 22% of the continent's commercial energy needs in 2016 and 31% of its electricity supply. The rise of environmental concerns suggests a decreasing share of coal in the African energy balance. However, there are several new coal-fired power plants proposed in the region and financed by Chinese public or private companies, but also by Japanese companies. The installed coal capacity reached 47 GW at the beginning of 2018, dominated by South Africa, which has commissioned new large coal units recently.

**Projects currently under construction (8 GW) or planned (41 GW) could double this capacity.** Most of the planned projects are located in new coal markets with currently no or little coal consumption. Outside of South Africa, most of these projects are based on imported coal.

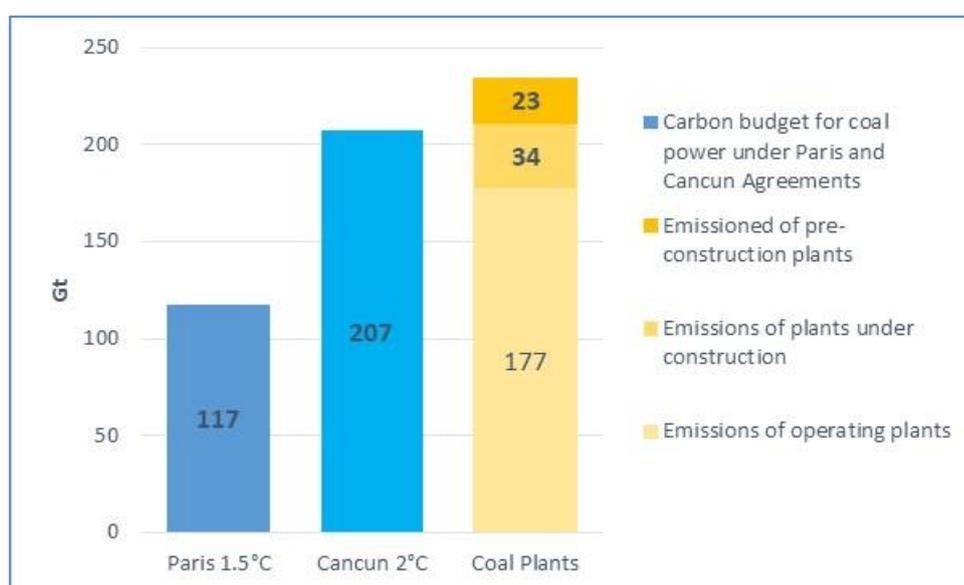
**Figure 9: Coal power plants under construction and planned in Africa, as of January 2018**



Source: *Global Coal Plant Tracker (2018)*.

According to a report by Coal Swarm, the Sierra Club and Greenpeace, with declining deployment and high levels of retirement, coal power capacity is now caught in a squeeze: **if current trends continue, by 2022 yearly retirements will exceed new capacity and the global coal fleet will begin to shrink.**<sup>9</sup> However, despite the reduction of the coal power plant pipeline, CO<sub>2</sub> emissions from existing, under construction and pre-construction coal plants already **exceed global carbon budgets**, requiring stronger policy measures to reach the goal of the Paris Agreement.

**Figure 10: Global coal power emissions compared to coal CO<sub>2</sub> budgets**



Source: Coal Swarm, Sierra Club and Greenpeace (2018).

### Box 3: How coal features in the IEA's scenarios?

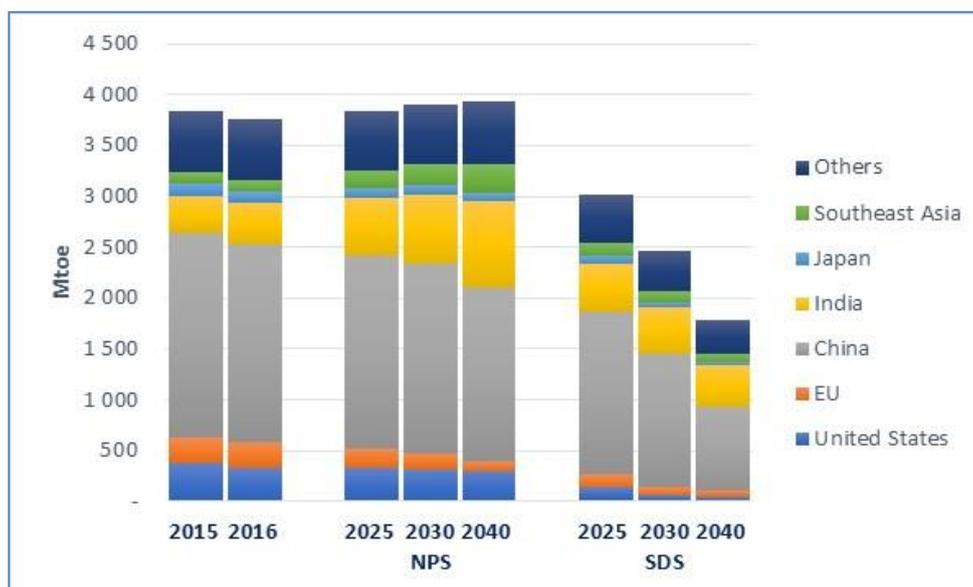
The **New Policies Scenario (NPS)** is the main scenario of the World Energy Outlook (WEO). In this scenario, the coal price relative to that of other fuels, together with policy, macroeconomic and demographic assumptions, leads to a dampening of the growth prospects for global coal consumption over the next 25 years. Global coal demand reaches 3930 Mtoe in 2040, the same level than in 2014 (the recent peak year), translating into an average annual growth rate of 0.2% per year between 2016 and 2040. This major change in trends compared with the past 25

9. Coal Swarm/Sierra Club/Greenpeace (2018), Boom and Burst 2018, "Tracking the global coal plant pipeline", March 2018, available at: [endcoal.org](http://endcoal.org).

years reflects the rapidly falling cost of renewables and the increasing focus on environmental issues by policy-makers around the world.

In this scenario, **global coal-fired electricity generation increases by less than 10% to 2040** (in stark contrast to the doubling over the last 25 years). In turn, coal's share of global electricity supply tumbles from 37% in 2016 to 26% in 2040, continuing the recent declining trend. While global coal-fired electricity production increases by less than 10% to 2040, the amount of coal consumed in the process rises by just 1%. The improvement reflects the increasing contribution of more efficient supercritical and advanced technologies. The fleet of coal-fired power plants continues to expand to some 2400 GW by 2040. The expansion of coal-fired power is mainly in developing economies, increasingly concentrated in Asia. In this scenario, CO<sub>2</sub> emissions from coal power remain flat at 9.5 Gt over the period 2016-2040 and total energy-related emissions rise to 35.7 Gt in 2040.

**Figure 11: Total Coal demande in the IEA's New Policies Scenario and Sustainable Development Scenario**



Source: IEA (2017a).

The **Sustainable Development Scenario (SDS)**, a new Scenario developed by the IEA in the World Energy Outlook 2017, reflects the energy components of the UN Sustainable Development process. It starts with a vision of where the energy sector needs to stand in 2040 to achieve three policy goals – urgent action on climate change consistent with the

Paris Agreement +2 degrees' target, achieving universal access to modern energy by 2030 and significantly reducing air pollution – and then maps how to achieve them.

The goals of this scenario are not compatible with unabated coal use, and thus global coal demand falls by 3% per year, on average, over the period 2016-2040. Coal demand peaks before 2020 and is cut by half, to below 1800 Mtoe in 2040, relative to the New Policies Scenario. About 90% of the decline in coal use in 2040 occurs in the power sector alone. In this scenario, **global coal-fired electricity generation decreases by more than 75% to 2040**. Power generation is mostly decarbonised by 2040, relying on renewables (over 60%), nuclear power (15%) and CCS applied to coal and gas (6%). The share of coal in electricity generation falls to 6% in 2040. Almost 60% of this comes from plants equipped with CCS. Phasing out the use of unabated coal-fired power generation is a key feature of the power sector transition in the Sustainable Development Scenario. The coal fleet sharply reduces after 2025 and coal capacity is only 1150 GW in 2040. CCS is one of the essential components of action to deliver the goals incorporated in this Scenario, which sees some 210 GW of coal plants worldwide being fitted with CCS by 2040 (150 GW in China). In the Sustainable Development Scenario, CO<sub>2</sub> emissions from coal power are reduced to 1.2 Gt by 2040, helping total energy-related emissions to drop to 18.3 Gt in 2040.

In the New Policies Scenario, many people still remain without access to electricity even after 2030, concentrated primarily in sub-Saharan Africa, whereas in the Sustainable Development Scenario universal access is achieved by that time.

## Pressure against coal power is mounting

**Since COP21, there have been mounting pressures against the traditional use of coal in the power sector.**<sup>10</sup> In response to these pressures, several governments and power utilities across the world have decided to **phase out coal from their electricity mix**, or significantly reduce its contribution. The announced withdrawal of the US from the Paris Agreement has not undermined the determination of other nations, nor that of individual US states and corporations, to pursue their clean agenda. There are several drivers for governments and power utilities across the world to move away from coal in the electricity mix.

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10. Traditional use refers to the use of coal in power plants without equipment to capture and store CO<sub>2</sub> emissions.

- **Climate change:** The pressure against coal has been reinforced since the signature of the Paris Agreement. Governments are under increasing pressure to phase out coal-fired capacity to address the impact of emissions on climate change and meet their national/regional binding commitments to reduce greenhouse gas (GHG) emissions. In the EU, reaching the 2030 objectives of a reduction by 40% of GHG emissions requires that the power sector reduces its CO<sub>2</sub> emissions by about 60% by 2030 compared with 1990. Several EU Member States have adopted coal phase-out policies to reach rapid reductions in CO<sub>2</sub> emissions and discussions are ongoing involving in particular France, Germany, Finland, the Netherlands, Sweden, Belgium on regional carbon policy instruments to accelerate this phase out: a carbon price floor for power generation assets, or an enhanced ETS system.
- **Air pollution:** Local air pollution from the combustion of coal and its impact on citizen's health is a major concern for governments and the main driver in some Asian countries to adopt stringent standards on local emissions of pollutants. It has been a major driver in China to adopt a broad policy to fight against air pollution and more specifically against emissions of local pollutants, whether from large coal-fired power plants or from small coal boilers. Air quality is also a rising issue in India.
- **Divestment campaigns:** Divestment campaigns started in 2013 when President Obama unveiled his Climate Action Plan, which included the permanent halt of American financial assistance for coal plants abroad. Several major multilateral financing institutions followed suit, as well as several European countries. The World Bank, the US Trade and Development Agency, the European Investment Bank, and the European Bank for Reconstruction and Development all put an end to coal finance as part of their climate change efforts. Since COP21, the pressure to stop financing coal activities and exit from coal has been extended to a much larger group, including commercial banks, investment funds, energy and insurance companies, and many of them have responded by announcing new commitments to end financing/insuring/developing coal plants. Several initiatives have been launched to phase out unabated coal power, such as the "Powering Past Coal Alliance", launched by the United Kingdom and Canada at COP23 in Bonn in November 2017.<sup>11</sup> At the One Planet Summit in Paris in

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11. The coalition unites a number of governments, businesses and organizations, which aim to lead the action in tackling climate change by committing to phase out unabated coal power. Initially, the alliance included 19 countries as well as several Canadian provinces and US states, but the group has already expanded and strives to grow to include 50 countries by COP24. The members of the initiative commit not only to phase out coal power in their jurisdictions or operations but also to support clean power instead, including climate finance activities. In addition, the coal

December 2017, Canada and the World Bank announced that they would work together to support the acceleration of developing countries' transition away from traditional coal-fired electricity towards clean energy to power their fast-growing economies.<sup>12</sup>

#### **Box 4: Financing of coal power plants and coal mines**

Despite pressure to stop financing coal power plants, financing for upcoming projects has not yet ended. According to two complementary reports, launched at the Climate Finance Day in Paris in December 2017, bank financing of coal plant developers in the period from January 2014 to September 2017 involved \$630 billion in lending and underwriting, with Chinese and Japanese banks responsible for 68% of the total.<sup>13</sup> In the two years since the Paris Agreement was signed, banks have provided \$275 billion to the top 120 coal plant developers. 17 of the top 20 underwriters for bond and share issues of coal plant developers are Chinese banks, led by the Industrial and Commercial Bank of China, which provided over \$33 billion to coal plant developers through underwriting.

Both export and import banks (EXIM) and private sector banks in Asia have continued to back coal power projects on both the financial and technology front. In doing so, the EXIM banks support their domestic industries that manufacture coal-based power generation equipment. Removing overseas financing would accelerate the decline of domestic industries given the slow overall growth of power demand in these markets, particularly in China, Japan and South Korea.

Public finance for overseas coal projects has also remained significant. A report from the Natural Resources Defense Council (NRDC) shows that G20 members provided at least \$38 billion in public financing for overseas coal projects from 2013 to 2016.<sup>14</sup> During that period, the five biggest G20 coal financiers were China (\$15 billion), Japan (\$10 billion), Germany (\$4 billion), Russia (\$3 billion), and South Korea (\$2 billion). In addition,

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phase out shall proceed in a “sustainable and economically inclusive way”, meaning that affected communities and workers shall be supported adequately. See Powering Pas Coal Alliance declaration, available at: [www.gov.uk](http://www.gov.uk).

12. United Nations Climate Change, “One Planet Summit: Finance Commitments Fire-Up Higher Momentum for Paris Climate Change Agreement”, 12 December 2018, available at: [unfccc.int/news](http://unfccc.int/news).

13. Banktrack, “Banks vs The Paris Agreement, Who’s Still Financing Coal Plant Development?”, December 2017, available at: [www.banktrack.org](http://www.banktrack.org) and Urgewald (2017), “Investors vs the Paris Agreement”, December 2017, available at: [coalexit.org](http://coalexit.org).

14. Natural Resources Defense Council (NRDC), “Power Shift: Shifting G20 International Public Finance From Coal To Renewables”, December 2017, available at: [www.nrdc.org](http://www.nrdc.org).

according to NDRC, around \$30 billion may be invested for upcoming coal projects abroad, led by China, Japan and South Korea. The United States may provide additional financing for coal (see Section on the United States).

On the contrary, financing for greenfield coal mines seems at a standstill in most coal exporting countries (e.g. the Carmichael coal mine in Australia). The additional demand and higher coal prices in 2017 hasn't resulted in more investment in supply and may not even if prices remain elevated. Pressures against coal have made it difficult for would-be coal miners to obtain financing.

- **Economic factors:** The closure of coal plants also responds to economic factors and to the financial impact of the energy transition on coal power. In China, the over building of coal units has led to declining and low utilization factors of coal plants, reducing their profitability. Simultaneously, structural changes are fast sweeping through global electricity markets. A key driver is that renewable energy technologies continue to improve, and their costs continue to fall, making renewables increasingly competitive with coal. Coal is becoming less competitive than other sources of electricity, either due to the fall in gas prices (the United States), falling prices of solar photovoltaic (PV) (India), or the rising cost of the carbon price (Europe). A report by Carbon Tracker illustrates the loss of competitiveness of hard coal plants in the EU and shows that 97% of coal plants would be loss-making in 2030.<sup>15</sup> Already, several EU power utilities have exited from coal power.
- **Physical factors:** Ageing coal fleets (US, Europe) also force the retirement of coal units.
- **Technological risks:** The compatibility of coal use with stringent climate goals hinges critically on the development of carbon, capture and storage (CCS) technologies, which so far have made little progress. It is still highly uncertain whether CCS could be deployed at large scale due to costs and in some regions, the availability of storage sites as well as public acceptance.
- **Corporate responsibility and reputational risks:** Responding to these pressures and demand from their shareholders, many companies, energy producers and power utilities, are exiting the coal sector. This exit gives them more credibility to operate in less-carbon intensive energy sectors.

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15. "Nearly all European Coal-Fired Power Plants Will Be Loss-Making by 2030", *Reuters* - Research, 7 December 2017, available at: [www.reuters.com](http://www.reuters.com).

These multiple factors are ending the era of coal power expansion and may signal the beginning of a global phase-out of the coal fleet. However, as analysed in the next sections, changes in policies and trajectories for coal demand still differ widely across the world.



# China: Policy Changes Erode the Share of Coal

## The share of coal in the energy mix is falling

China is the first coal market in the world and consumes half of global coal consumption. China is also the world's first-largest emitter of GHG, and as such, its role in global efforts to address the issue of climate change is significant. In its National Determined Contribution (NDC) to the Paris Agreement, China has committed to peak its CO<sub>2</sub> emissions by 2030 at the latest, lower the carbon intensity of its gross domestic product (GDP) by 60%–65% below 2005 levels by 2030, and increase the share of non-fossil energy in total primary energy supply to around 20% by that time.

**The rise in Chinese coal demand in 2017** (+3.5% to 3.81 Gt in tonnage, but only +0.4% in energy terms according to official data)<sup>16</sup> **does not call into question fundamental market trends: Chinese demand for coal peaked in 2013 (4.24 Gt)**, but cyclical factors (mainly related to weather conditions, e.g. waves of heat or cold weather, low hydropower, or logistical constraints) can still temporarily increase coal demand. In 2017, electricity demand rose strongly (+6.6%), while the growth in hydro power was limited, requiring higher coal power generation.

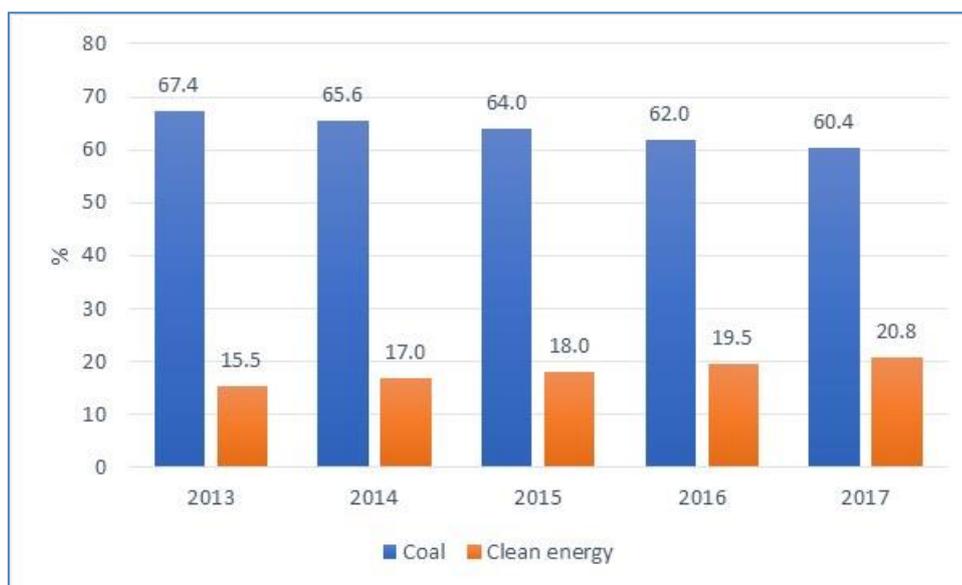
Current government's efforts to shift the orientation of the economy from heavy industries towards the services sector, combined with policies and measures to prevent and control air pollution as well as the continued push to develop renewables, are altering the coal market profoundly. **The share of coal in the energy mix has fallen at a rapid rate since 2013** when the State Council, China's top administrative authority, issued an Action Plan for Air Pollution Prevention and Control (APPC). The APPC sets reduction targets for coal use in the main polluting regions. Since the issuance of the plan, the fight against pollution has become a priority of the central government. China has adopted regulation for local pollutant emissions from large power plants which are the strictest in the world. The

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16. NBS (2018), *op. cit.*

government has also mandated the switch of heating from coal to natural gas and electricity, and the end to usage of low-quality and polluting loose coal.

**Figure 12: Share of coal and clean energy in Chinese total energy consumption, 2013-2017**



Source: NBS.<sup>17</sup>

Clean energy includes renewables, nuclear and natural gas.

The Five-Year (2016-2020) Plan for Coal, published in December 2016, caps coal consumption at a maximum of 4.1 Gt in 2020.<sup>18</sup> **The share of coal in the Chinese energy mix is expected to decrease to less than 58% by 2020.** According to the IEA's New Policies Scenario, this share will be only 40% in 2040.<sup>19</sup> A long decline in Chinese demand for coal can therefore be expected and the decline may be faster than expected. So far, the government has been primarily concerned with tightening emissions standards for air pollution, as it is the main concern of the Chinese public. The next round of regulatory tightening will target CO<sub>2</sub> emissions. China has just launched its national emissions trading system.<sup>20</sup> In the long run, it will have a negative impact on the production of electricity from coal and favour lower carbon-intensive energies.

17. NBS (2018), *op. cit.* and NBS (2017), *China Statistical Yearbook 2016*, available at: [www.stats.gov.cn](http://www.stats.gov.cn)

18. National Energy Administration (NEA) (2016), *Five-year plan for coal* (in Chinese), 30 December, available at: [www.nea.gov.cn](http://www.nea.gov.cn).

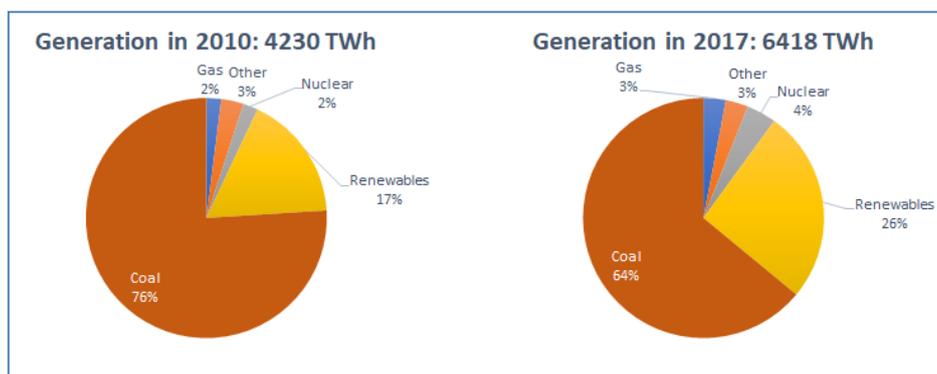
19. IEA (2017a), *op. cit.*

20. T. Voita, "China's National Carbon Market, A Game Changer in the Making?", *Édito Énergie*, Ifri, 22 March 2018, available at: [www.ifri.org](http://www.ifri.org).

## Eliminating overcapacity in the power and coal mining sectors

Policy change in China is driving a surge in renewable generation and a downward trend in the share of coal power generation. **The electricity sector is still dominated by coal, which supplies some 64% of the country's power generation**<sup>21</sup> from a coal fleet of 980 GW at the end of 2017 (55% of the total capacity installed at the end of 2017).<sup>22</sup> But this share has declined steadily since 2010. **There is a clear trend towards renewable energy sources (RES).** Since 2010, the share of RES in the power mix has increased by 9 percentage points to 26% in 2017, while coal has decreased by 12 percentage points. Renewable power capacity is surging: in 2017, China added 53 GW of solar power capacity and 16 GW of wind capacity. The Chinese target of having 110 GW solar energy capacity installed in 2020 has already been achieved in 2017. RES have outpaced the capacity expansion of coal in China in each of the past five years due to strengthened policy support linked to increasing environmental concerns and falling technology costs. Despite the high growth rate in wind and solar generation, they still account for a small share of electricity generation (5% and 2% in 2017, respectively), as does natural gas (3%).

**Figure 13: China's power generation mix - 2010 vs. 2017**



Source: Energy Brainpool, China Electricity Council (CEC) (preliminary figures).<sup>23</sup>

21. Thermal power generation, which includes coal, gas, oil and biomass, generated 70% of total electricity generation in 2017.

22. China Electricity Council (CEC), *2016-2018 Annual Electricity Supply and Demand Situation Analysis and Forecast Report*, 1 February 2018, available at: [www.cec.org.cn](http://www.cec.org.cn). This is a little higher than the capacity given by Global Coal Plant Tracker.

23. Energy Brainpool (2017), "Energy Transition in the Power Sector in China: State of Affairs in 2016. Review on the Developments in 2016 and an Outlook", *Analysis* on behalf of Agora Energiewende and China National Renewable Energy Centre, [www.agora-energiewende.de](http://www.agora-energiewende.de), CEC, *ibid*.

**There has been a sharp decline in coal power plant construction and permitting over the past three years** (39 GW of coal capacity was added in 2017 compared to nearly 60 GW in 2015). The utilization factor of the coal fleet has fallen sharply since 2014 and was less than 50% in 2017. After the approval of the construction of new power stations was decentralized in October 2014, local governments saw the construction of new power plants as a source of revenue and jobs. But the diversification of the electricity mix towards low carbon energy sources leads to the underutilization of coal power plants and reduces their profitability, which has been further eroded by the increase in domestic coal prices. This situation has led the government to closely monitor the sector **to eliminate overcapacity in coal-fired power generation**. According to the Five-Year (2016-20) Plan for Electricity, the government intends to limit coal capacity to less than 1100 GW by 2020 (accounting for 55% of the planned total power capacity of 2000 GW) while power capacity based on non-fossil energy will be increased to 770 GW (39%). In 2016, a moratorium on the construction of new coal-fired power plants was put in place in 13 provinces having surplus electricity. In January 2017, the government requested the termination of no less than 104 projects (120 GW) in the 13 provinces. The government has also announced the suspension or postponement of 150 GW of new projects during the period 2016-2020 and the withdrawal of 20 GW of obsolete capacity. According to Global Coal Plant Tracker, there were 193 GW of coal-fired power plants under construction in the country in early 2016 and more than 500 GW planned (licensed or announced). At the beginning of 2018, these numbers have been reduced to 95 GW and 116 GW, respectively.<sup>24</sup>

Efforts are also made to **improve the efficiency of the coal fleet** by eliminating outdated and small power plants. All coal-fired plants will have to use ultra-low emission technologies by 2020. The Chinese coal fleet already includes 186 GW of ultra-supercritical (USC) plants, i.e. 80% of the USC plants in the world. The coal-fired fleet had an average operational efficiency of 42% in 2016, higher than the average of that across the IEA member countries.<sup>25</sup> China continues to invest in R&D. For example, the double-reheat 1000 MW USC Guodian Taizhou II unit 3, in operation since September 2015, was domestically designed, manufactured and built. It has reached an efficiency of 47.82%, the highest globally for a double-reheat coal-fired power plant.<sup>26</sup>

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24. Global Coal Plant Tracker (2018), *op. cit.*

25. IEA (2017a), *op. cit.*

26. IEA Clean Coal Centre (2016), "An overview of HELE technology deployment in the coal power plant fleets of China, EU, Japan and USA, CCC/273", available at: [www.iea-coal.org](http://www.iea-coal.org).

Simultaneously, the government is pursuing a **structural reform of the coal mining sector to reduce coal production overcapacity** (the capacity of Chinese mines is estimated at 5.1-5.2 Gt in 2017). The reform aims to eliminate excess and inefficient capacities (small mines, unsafe mines, or using outdated technologies), while developing new modern production capacities concentrated in 14 large production bases.<sup>27</sup> China eliminated close to 500 Mtpa of coal capacity in 2016-17. The government has announced plans to eliminate another 150 Mtpa in 2018. At the same time, China is developing new mines. About 200 Mtpa of new capacity will be added in 2018, which should ease the Chinese market and keep prices down. The supply-side reform was also aimed at stopping the collapse of coal prices on the domestic market to help miners to repay their debts. This goal is being achieved. The sharp increase in domestic coal prices since 2016 has allowed Chinese mining companies to return to profits.<sup>28</sup> But the sharp rise in coal prices is causing financial difficulties to power utilities, whose electricity mix is still largely dependent on coal, and which cannot pass the cost increase to their customers. To tackle the situation, the government intends to **keep domestic coal prices within a “reasonable” range** in order to avoid an increase in electricity production costs. In January 2017, the government introduced a mechanism to keep prices in the range of 500-570 yuan/t (around \$80-90/t, based on 5,500 kcal/kg). But tight domestic coal supply in 2017 pushed the price in the upper band of the range for most of the year.

**The government is also encouraging the integration of coal mining and power companies.** In 2017, the largest Chinese mining company, Shenhua Group, absorbed the fifth largest electricity producer, China Guodian Corporation, to form a new global giant, China Energy Investment Corporation (CHNENERGY). The assets of this group (over \$270 billion), its diversification (more than 400 Mtpa of coal production capacity, more than 200 GW of power capacity, including 30 GW of wind power, railways, ports and petrochemical activities), but also its name, say a lot about China's strategy: investing in energy around the world. According to its Chairman, the company will focus on coal mining and power generation, while making more effort to eliminate excess capacity, and speed up its drive to go global.<sup>29</sup> Internationally, with its dual expertise, coal and renewables, one can expect to find CHNENERGY in

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27. See Oxford Institute for Energy Studies (OIES) (2014), “China’s Coal Market: Can Beijing Tame ‘King Coal’?”, CL 1, December 2014, available at: [www.oxfordenergy.org](http://www.oxfordenergy.org).

28. “China Coal Industry 2017 Profit Surges 21% On Yr”, *Sxcoal*, 26 January 2018, available at: [www.sxcoal.com](http://www.sxcoal.com).

29. “Four World Records China’s Newly-Merged Energy Colossus Possesses”, *Sxcoal*, 29 November 2017, available at: [www.sxcoal.com](http://www.sxcoal.com).

most energy projects in emerging countries... but also other countries: its first international contract (a non-binding memorandum of understanding) was signed during President Trump's visit to China in September 2017. It covers the development of shale gas production, power and petrochemical capacities, in the state of West Virginia for a total investment of \$84 billion! China Energy Investment Corporation, which is now the world's largest developer of wind energy, recently bought a 75% stake in four Greek wind plants.<sup>30</sup>

The Chinese National Development and Reform Commission (NDRC) also plans to create **several super-large coal mining companies** by the end of 2020 through mergers in order to streamline and modernize the sector.<sup>31</sup> Each newly created company would have a production capacity averaging around 100 Mtpa so that they could compete on the global market.

If China reduces its coal investments at home, it is not yet ready to do so abroad. **China is the first biggest public financier of overseas coal-fired power capacity**, with \$15 billion already invested in coal projects from 2013 to 2016, and another \$13 billion of proposed funding.<sup>32</sup> Most Chinese coal power financing has been going towards South Asia and Southeast Asia, with three countries – India, Indonesia, and Vietnam – representing around 60% of the total.<sup>33</sup> Chinese firms have, through Chinese bank loans, built 15 coal-fired power units in Vietnam, representing an investment of \$8.6 billion. Despite China being the world's largest investor in renewables and the largest exporter of renewables equipment, its overseas investment confirms that so far, China has a technology-agnostic view.

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30. Institute for Energy Economics and Financial Analysis (IEEFA) (2018), "China 2017 Review: World's Second Biggest Economy Continues to Drive Global Trends in Energy Investment", January 2018, available at: [ieefa.org](http://ieefa.org).

31. "China Aims to Supersize Coal Sector through Mergers", *Reuters*, 5 January 2018, available at: [www.reuters.com](http://www.reuters.com).

32. NDRC (2017), *op. cit.*

33. W. Gao, "China Funds Coal Away from Home", *Sxcoal*, 2 January 2018, available at: [www.sxcoal.com](http://www.sxcoal.com).

# India's Solar Revolution to Reduce the Share of Coal

## Coal demand is not growing as fast as foreseen

**India became the world's second largest consumer of coal in 2015 and the second largest producer in 2016**, ahead of the US. Coal production (hard coal and lignite), which has been steadily increasing, totalled 708 Mt in 2016 (fiscal year)<sup>34</sup> and an estimated 721 Mt in 2017.<sup>35</sup> **Coal India Limited (CIL), the state-owned coal mining company, increased its production by 2.4% in 2017 to 567 Mt** but underperformed its annual target of 600 Mt. However, thanks to logistics optimization, CIL increased its coal shipments to power utilities. Consequently, power utilities succeeded in reducing their coal imports, which is one of the main objectives of the ongoing reform of the Indian coal market.<sup>36</sup> **Steam coal imports from all consuming sectors peaked at 174 Mt in 2014 and have since declined**, although the decline is slowing (an estimated 141 Mt imported in 2017) and may be reversed in the short term if CIL is not able to increase its production at higher rates.

Despite the steady decrease in steam coal imports, India is far from the initial vision of the Modi government, which, in 2014, intended to stop steam coal imports within three years. Similarly, the government's target of a coal production of 1,500 Mt by 2020, of which 1,000 Mt produced by CIL and nearly 500 Mt by other private and public coal miners will not be reached. CIL has difficulties to raise its production due to environmental and permit challenges. **The opening of mines to the private sector was delayed but has just been approved** by the Cabinet Committee on Economic Affairs. This will end CIL's decades-long monopoly on coal mining and will allow the private sector to mine and sell coal to any consumers.

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34. Indian fiscal year runs from 1 April to the end of March.

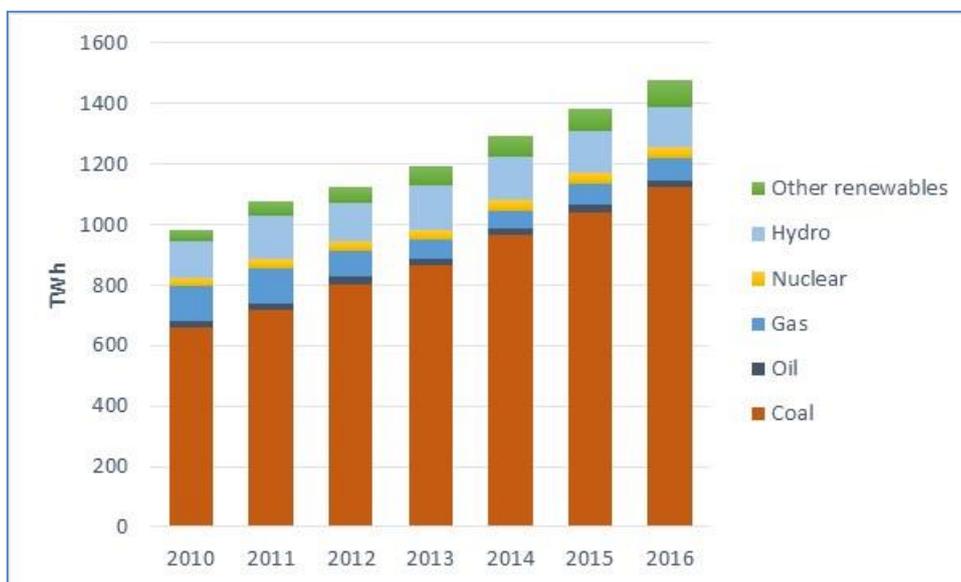
35. Ministry of Coal (2017), "Provisional Coal Statistics 2016-17, Coal Controllers Organization", November 2017, available at: [www.coalcontroller.gov.in](http://www.coalcontroller.gov.in).

36. See OIES (2016), "Indian Steam Coal Imports: The Great Equation, CL 3", March 2016, available at: [www.oxfordenergy.org](http://www.oxfordenergy.org).

On the other hand, **Indian demand for coal, although rising, has not grown as fast as expected** in initial government plans, putting less pressure on domestic production. The growth in total coal demand has slowed since 2015. It is estimated at around 2% in 2017.

Coal is the mainstay of India's electricity sector. The installed capacity of the country was 344 GW at the end of March 2018, of which 197.2 GW (57.3%) was coal-based.<sup>37</sup> **Coal covers most of the country's electricity supply (76% in 2016)** but the rapid development of renewables, and the sharp decrease in their cost, is beginning to nibble the share of coal in the electricity mix. Power generation from new renewables (excluding large hydropower plants) increased by 20% to almost 100 terrawatt hours (TWh) in 2017. For the first time in Indian history, in 2017, the installed capacity of new renewables far exceeded coal capacity additions (15.7 GW vs. 7.7 GW).<sup>38</sup> The coal power fleet has developed rapidly, but **the utilization factor of coal power plants has declined** and was only 59% at the end of 2017. This situation has led the Indian government to limit the construction of new coal capacity and cancelled plans for 16 GW of ultra-mega power plants.

**Figure 14: India's power generation mix, 2010-2016**



Source: IEA.

37. Central Electricity Authority (CEA), *All India installed capacity of power stations*, April 2018, available at: [www.cea.nic.in](http://www.cea.nic.in).

38. IEEFA (2017), "India's Electricity Sector Transformation", November 2017, available at: [ieefa.org](http://ieefa.org).

Another factor which limits the growth of coal consumption is the **ongoing efforts to improve efficiency of the coal fleet**. The coal fleet has a low efficiency (35% currently).<sup>39</sup> The majority of India's coal-fired power plants is still based on subcritical technology with efficiencies of 31-33%, although the share of power plants based on supercritical (SC) technology is increasing rapidly (24% at the end of 2017). In its NDC, India committed to improve the efficiency of the nation's coal fleet. Already, all new, large coal-based power plants have been mandated to use the USC technology. In addition, in 2015, India adopted a legislation on new emissions limits for local pollutants. The legislation defines minimum performance standards for new coal-fired power plants but also for existing plants, which have to be retrofitted with emissions controls, or close. The legislation took effect at the end of 2017. Retirement of old and inefficient thermal generation units, in a phased manner, is being undertaken (see Box 5). A capacity of 4 GW of old units was retired in 2017.

## Solar could disrupt the future of coal

There is currently a strong push in India to develop a low carbon energy system. The transformation is helped by a sustained deflation in renewable energy costs, technology upgrades in the wind and solar sectors, acceleration in wind and solar tender activity and a national political desire to abide by the Paris Agreement.<sup>40</sup> Access to cheaper finance remains a major issue address.<sup>41</sup> In its NDC to the Paris Agreement, India vowed to achieve about 40% of installed power capacity from non-fossil fuels by 2030. The government plans to increase **the capacity of new RES to 175 GW by 2022**, compared with 37 GW at the end of 2015. The target includes 100 GW from solar, 60 GW from wind, 10 GW from bio-power and 5 GW from small hydro power. Already, new renewables installed capacity reached almost 69 GW at the end of 2017. **Prices for both wind and solar power have fallen significantly recently**, with record low prices in 2017, narrowing the cost gap with other technologies. The IEA makes special note of **coal's competition with solar PV** in India, while remembering that the PV auctions in 2017 are for delivery a few years later, so do not necessarily reflect prevailing costs (developers may have built in an assumption about future cost reductions into their bid).<sup>42</sup>

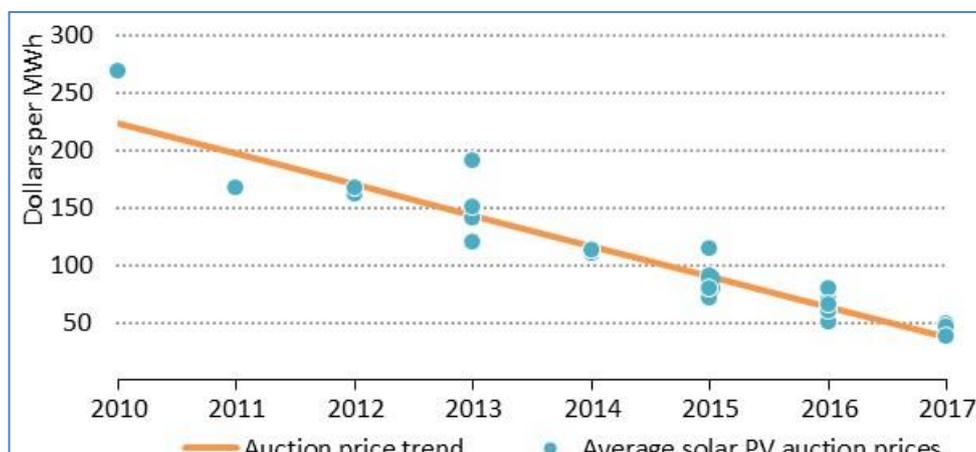
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39. IEA (2017a), *op. cit.*

40. IEEFA (2017), *op. cit.*

41. G. Shrimali, "Renewable Energy in India Solutions to the Financing Challenge", *Notes de l'Ifri*, Ifri, February 2018, available at: [www.ifri.org](http://www.ifri.org).

42. IEA (2017a), *op. cit.*

**Figure 15: Auction results for solar PV in India, 2010-2017**

Source: IEA (2017a).

### Box 5: India National Electricity Plan

The draft National Electricity Plan (NEP), published in December 2016 by the Central Electricity Authority (CEA) of India, projects a doubling of electricity demand by 2027.<sup>43</sup> The draft NEP limits the share of coal in the electricity mix to the benefit of more environmentally-friendly energies, mainly new renewables, and, to a lesser extent, hydropower and nuclear. The most profound change compared with previous plans is the inclusion in the reference scenario of 175 GW of new renewables by 2022. The draft plan saw no need for additional coal capacity before 2027, beyond 50 GW of capacity that were under construction at that time.<sup>44</sup> A revised version of April 2018 sees **a need for 6.4 GW of new capacity by 2022** (which will be fully covered by the 48 GW of coal capacity currently under construction).<sup>45</sup> In addition, the revised CEA plan indicates that a coal-based capacity of **22.7 GW is considered for retirement during 2017-22** due to their old age and inability to adhere to the new environmental norms. Additionally, a coal-based capacity of 25.6 GW is considered for retirement during 2022-27, while a capacity of 46.4 GW will be needed by 2027.

This is a turning point from previous plans that included a continuous large increase in coal power capacity and little retirement of old inefficient coal plants. This new development has important consequences for the

43. Central Electricity Authority (CEA) (2016), *Draft National Electricity Plan*, December 2016, available at: [www.cea.nic.in](http://www.cea.nic.in).

44. According to the draft plan, current coal capacity was sufficient to meet power demand until 2022, including in scenarios where the target of 175 GW of renewables was not reached in 2022.

45. Business Standard, "National Electricity Plan revised to make room for more coal", 9 April 2018, available at: [www.business-standard.com](http://www.business-standard.com).

country's coal market and CO<sub>2</sub> emissions. In the CEA's reference scenario (revised version of April 2018), **demand for coal by the power sector increases by some 20% above current level to 735 Mt by 2022.** This is a reduction by 30% from previous plans.<sup>46</sup> By 2027, coal demand by the power sector is estimated at 877 Mt. To accommodate a higher share of RES, coal plants are likely to run at low load factor (56.5% in 2022 and 60.5% in 2027).

Source: CEA.

**Figure 16: Planned coal power capacity in India by 2027**



Coal is expected to remain the major energy source in the short to medium term. In the future, the growth of RES will slow down the growth of coal demand. **There is no consensus among international institutions on future Indian coal demand.** The IEA's New Policies Scenario forecasts India's coal consumption by the power sector will rise by 40% by 2030.<sup>47</sup> In contrast, according to the Institute for Energy Economics and Financial Analysis (IEEFA), coal demand by the power sector is likely to peak not more than 10% above current levels by 2027.<sup>48</sup> The IEA reckons that the cost gap between PV and coal-fired electricity is closing fast and concludes that solar PV could therefore disrupt the future of coal in a country that has been widely expected to be a major growth engine for global coal use for decades to come.

46. The 12th Five-Year Plan (2012-2017) projected a coal demand in the power sector of 1,040 Mt in 2021-22.

47. IEA, (2017a), *op. cit.*

48. IEEFA (2017), *op. cit.*



# The US Market Continues to Shrink

## Higher exports led to increased production

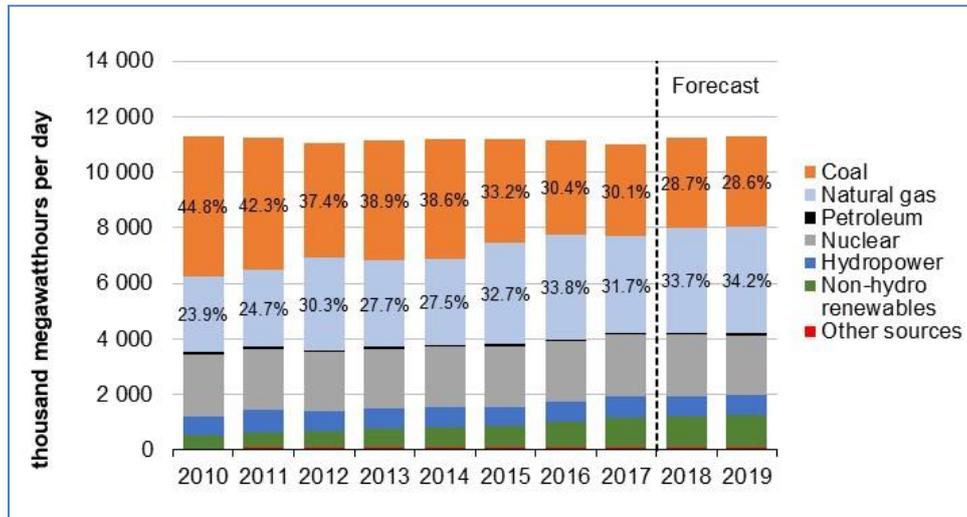
**US coal production recovered in 2017.** After a cumulative drop by 27% in the previous two years (-246 Mt), US coal production totalled 702 Mt in 2017, up 6.2% over 2016.<sup>49</sup> **An increase in demand for US coal exports more than offset the structural decline in US coal consumption,** contributing to the higher coal production. If President Trump tries by all means to facilitate this recovery (exit from the Paris Agreement, repeal of the Clean Power Plan, attempt - which will not succeed - to subsidize unprofitable coal power plants), this is the international market that is responsible for the improvement and not the new administration pro-coal policy, which cannot change the coal market, or only marginally. The wave of bankruptcies, mine closures, and job losses and layoffs, which crashed over the US coal industry during 2015-16, were the result of market forces rather than government regulations introduced by the Obama administration.

**Since 2010, US coal demand has collapsed, declining by a third (300 Mt) over the period 2010-2017.** It continued to shrink in 2017, but at a lower rate than in 2015-16: coal consumption amounted to 650 Mt, 2% lower than the 663 Mt consumed in 2016. The US is now the third largest coal market, behind India, and account for less than 10% of global coal demand. About 90% of domestic coal consumption is in the power sector, and despite higher natural gas prices in 2017, **the coal share of total 2017 power generation was 30%, the lowest on record and lower than the natural gas share (32% in 2017) for the second consecutive year.** Electricity generation from coal is now second to natural gas, which surpassed coal as the leading source of US electricity generation in 2016. The coal-to-gas switching is the result of the increased cost competitiveness of natural gas in detriment to coal. RES also reduced the share of thermal generation. Their contribution to power generation rose from 15% in 2016 to 17% in 2017.

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49. EIA (2018a), *op. cit.*

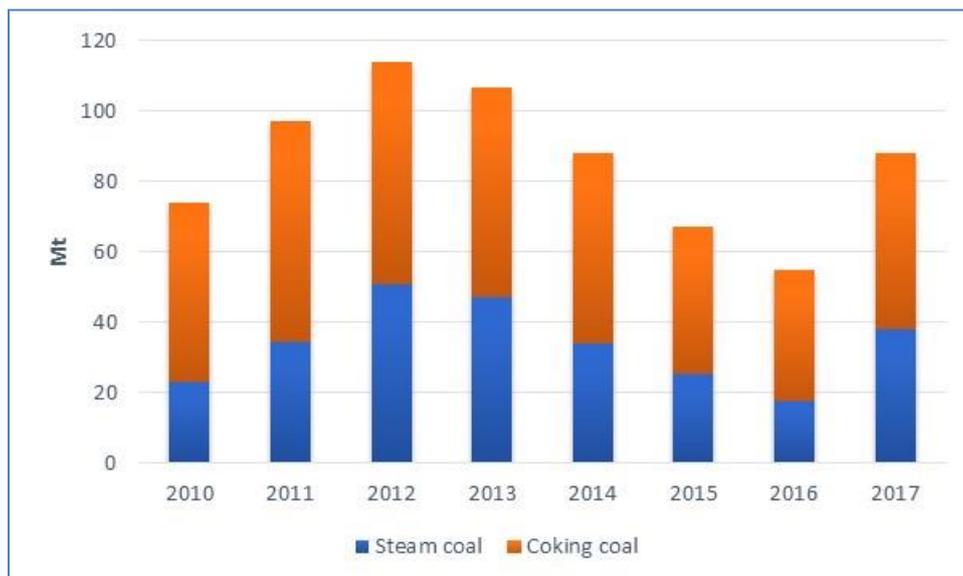
Figure 17: US electricity generation by fuel



Source: EIA.<sup>50</sup>

**US exports of steam coal more than doubled in 2017** to reach nearly 38 Mt, an unexpected growth... even for the most pro-coal president.

Figure 18: US steam and coking coal exports



Source: EIA.<sup>51</sup>

50. EIA (2018b), "Short-Term Energy Outlook (STEO)", April 2018, available at: [www.eia.gov](http://www.eia.gov).

51. EIA (2018a), *op. cit.*

Total US exports (steam and coking coal) increased by 61% to 88 Mt in 2017. This is a significant reversal of the market: exports fell continuously during the previous four years. This reversal is due to the rise in international coal prices, shortages of coking coal due to Cyclone Debbie in Australia, and a tight supply on the steam coal market. US steam coal export mines have high delivered costs (especially transportation costs to export ports). Therefore, steam coal exports from the United States require a high international price to be economical. **International demand for US steam coal was driven by Asian and European countries.** Approximately 16 Mt of steam coal was exported to Asia in 2017, nearly triple the volume exported in 2016. US steam coal exports to Europe reached 14 Mt in 2017, an increase of 6 Mt from the 2016 level.

## Ageing fleet and retirements will reduce coal demand

**The medium-term outlook for the US coal industry remains weak.** Another major contraction of the US coal demand is likely in the next few years as competition from natural gas, the growing uptake of solar- and wind-powered generation, and little growth in electricity demand will continue to reduce the market share for coal power generation. In addition, the US coal fleet is shrinking steadily. At the end of 2017, coal-fired generation capacity totalled 260 GW, down from a peak of 310 GW in 2011.<sup>52</sup> The coal fleet is ageing. Most coal-fired capacity (88%) was built between 1950 and 1990, and the capacity-weighted average age of operating coal facilities is 39 years.<sup>53</sup> Thus, many coal-fired power plants are reaching the end of their operating life. When they close, they are replaced by natural gas and renewables. **At least 25 GW of coal-fired capacity will retire within the next three years (2018–2020),** of which about 15 GW in 2018, which will reduce potential demand for coal. The EIA predicts that coal demand by the power sector will continue to shrink in 2018 (down 4% or some 28 Mt).<sup>54</sup>

In October 2017, President Trump proposed to **repeal the Clean Power Act**, signed by Obama in August 2015. This is part of the effort of the new administration to "end the war on coal". The repeal would likely prolong the life of certain coal generators that would have seen retirement sooner if the carbon-cutting regulation were implemented. This may delay

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52. EIA, "EIA Projects that U.S. Coal Demand Will Remain Flat for Several Decades", *Today in Energy*, 30 March 2018, available at: [www.eia.gov](http://www.eia.gov).

53. EIA, "Most Coal Plants in the United States Were Built before 1990", 17 April 2017, *Today in Energy*, available at: [www.eia.gov](http://www.eia.gov).

54. EIA (2018b), *op. cit.*

the decarbonisation of the American energy mix. However, this will not prevent states that wish to do so (such as California) from pursuing their renewable energy development policy, nor power utilities to continue their switch to natural gas and renewables.<sup>55</sup> Some of the biggest US power companies, including American Electric Power, NRG Energy and Southern Co. say they will move forward with investments in renewable and gas-fired electricity, regardless of the Trump administration's plans to roll back Obama-era environmental rules.<sup>56</sup> In its Annual Energy Outlook 2018 (reference case), the EIA projects a decline of coal-fired power capacity by 65 GW from 2018 through 2030 and assumes no new coal-fired power capacity to be built.<sup>57</sup> Coal-fired electric generating capacity decreases through 2030, even without the Clean Power Plan.

The much-publicized **reopening of US coal mines has been limited so far to small mines**, most often producing coking coal for exports, and to extensions of operating mines (some large ones in Montana). Despite efforts by the new administration to reverse the situation, coal employment in 2017 was essentially flat as compared to 2016, and over the past two years coal-mine employment has been at its lowest levels in a decade.<sup>58</sup> The financial results of US coal mining companies returned in positive territories in 2017, but their long-term survival is not ensured. The export market has provided some relief in 2017, but, it is a small outlet for US producers, accounting for only 12.5% of their production. Therefore, it may not be able to replace the declining domestic market. In addition, its long-term viability is far from certain as it depends on the level of prices on the international market, competition from other suppliers, and demand by traditional buyers in Asia and Europe and some new markets in Southeast Asia and Africa targeted by US coal exporters. However, regional suppliers, such as Indonesia, Australia and South Africa, have lower production costs than US coal producers and lower transportation costs due to their proximity to these markets. **The EIA sees US coal exports falling in 2018 and then again in 2019**, mostly due to a strong reduction in steam coal exports.<sup>59</sup>

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55. J.-F. Boittin, "Politique américaine de l'énergie et de l'environnement d'Obama à Trump, continuité et ruptures", *Notes de l'Ifri*, Ifri, February 2018, available at: [www.ifri.org](http://www.ifri.org).

56. T. Puko, "Power Companies Say They'll Stick With Plans Despite EPA Emissions Rollback", *The Wall Street Journal*, 11 October 2017, available at: [www.wsj.com](http://www.wsj.com).

57. EIA (2018), *Annual Energy Outlook 2018 with projections to 2050*, February 2018, available at: [www.eia.gov](http://www.eia.gov).

58. IEEFA (2018b), "U.S. Coal Market Erosion Continues", 1 February 2018, available at: [ieefa.org](http://ieefa.org).

59. EIA (2018b), *op. cit.*

## The “Clean Coal Alliance”

The current US administration, which sees the export market as a vital and necessary area for the US coal industry growth, is pushing for an **international “Clean Coal Alliance” that would share CCS and high efficiency, low emission (HELE) technologies with developing countries.** First promoted at COP23 by the US delegation, the initiative was announced by the White House in December 2017, and China, Japan, India, Bangladesh, Poland, South Africa, Australia, the Philippines and Ukraine are all likely to be asked to join.<sup>60</sup>

**The Trump administration's focus on clean coal is baffling, given that the President doesn't acknowledge man-made climate change.** The promotion of HELE technologies by the US is also startling. As mentioned before, the US coal fleet is dominated by old units. According to the IEA Clean Coal Centre, it includes both subcritical and supercritical plants, and its average efficiency is low: around 37.4% in 2015.<sup>61</sup> The US has only one USC plant, the 665 MW John Turk Jr plant which achieves an efficiency of 42%. The low efficiency of the US coal fleet was already highlighted by the Japanese government when, in 2014, the METI laid out a plan to step up support for highly-efficient coal-fired power plants in developing countries to speed up economic development and expand access to electricity. According to a METI's statement at that time, “replacing all coal power capacity in China, India and the US with the Japanese up-to-date technologies would bring about a cut of 1.5 Gt a year of CO<sub>2</sub> emissions, more than Japan's total”<sup>62</sup> (Japanese coal fleet has the highest efficiency in the world, 42%). The Japanese plan did not receive support from other OECD countries but Japan's position led the OECD Export Credit Group to not completely eliminate, but only restrict financing for coal plants.<sup>63</sup> Under the agreement reached in November 2015 by the OECD Export Credit Group, which took effect in January 2017, financing is still allowed for the most advanced USC plants, and for some other plants in the very poorest countries. Since then, numerous studies have shown that **even unabated HELE power plants are incompatible with the goals of the Paris Agreement** (despite their higher efficiency, they emit 705 gCO<sub>2</sub>/kWh).

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60. E&E News, “Trump Is Pushing Coal Abroad Markets May Abide — For Now”, 13 December 2017, available at: [www.eenews.net](http://www.eenews.net); Governors' Wind & Solar Energy Coalition, “Trump Admin to Launch ‘Clean Coal’ Effort”, 15 December, available at: [governorswindenergycoalition.org](http://governorswindenergycoalition.org).

61. IEA Clean Coal Centre (2016), *op. cit.*

62. See Ifri (2015), “Japan's Energy and Climate Policy: Towards Dispelling the Uncertainties”, *Notes de l'Ifri*, Ifri, May 2015, available at: [www.ifri.org](http://www.ifri.org).

63. “OECD Countries Agree to Restrict Financing for Overseas Coal Power Plants”, *The Guardian*, 18 November 2015, available at: [www.theguardian.com](http://www.theguardian.com).

On the contrary, the proposed alliance could be consequential if it means that the Trump administration would work with other countries to fund joint CCS projects – and more generally Carbon Capture, Utilization, and Storage (CCUS). At global level, CCS is seen by the Intergovernmental Panel on Climate Change (IPCC) and by the IEA, as one of the essential solutions for massively reducing global CO<sub>2</sub> emissions by 2050. The IPCC scenarios show that most climate models cannot lead to limiting global warming below 2°C without CCS.<sup>64</sup> The IPCC also stresses that, of all mitigation technologies, the absence of CCS would lead to the costliest scenario: the mitigation cost would increase by 138% in a scenario without CCS. The IEA sees CCUS as an essential component of action to deliver the goals incorporated in the Sustainable Development Scenario, which sees some 210 GW of coal plant worldwide being fitted with CCS by 2040, implying that efforts to help it to become commercially viable need to be stepped up.<sup>65</sup> According to the Global CCS Institute, there are 17 CCS projects operating in the world, with a CO<sub>2</sub> storage capacity of 31 Mtpa.<sup>66</sup> Very few CCS projects have been developed in the power sector. The Boundary Dam power station in Saskatchewan, Canada, started operations in 2014. The second large-scale coal power plant equipped with CCS, the Petra Nova project in Texas, US, was commissioned in 2017. CCUS deployment has started in China with the construction of the Yanchang CCUS Project. China accounts for about half of all CCUS projects under serious consideration or planning, including four projects which will apply CCUS to coal-fired power generation. But CCS/CCUS has still to make progress in demonstrating its commercial viability.

**CCS is an area where the US has a proven record and claims leadership.** Among the 37 CCUS projects, operating, under construction or at an advanced stage in the world, 11 are in the US, of which 9 are operating. Most of them, but the Petra Nova project, have been developed for enhanced oil recovery (EOR). The Kemper County Energy Facility, a planned integrated gasification combined-cycle (IGCC) plant fitted with a CCS system was stopped in 2017 and will be turned into a natural gas plant project in the wake of technical issues, delays and cost overruns attributed to the new coal gasification technology.<sup>67</sup>

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64. Intergovernmental Panel on Climate Change (IPCC) (2015), *Fifth Assessment Report (AR5)*, available at: [www.ipcc.ch](http://www.ipcc.ch).

65. IEA (2017a), *op. cit.*

66. Global CCS Institute, “Large-scale CCS facilities”, 9 February 2018, available at: [www.globalccsinstitute.com](http://www.globalccsinstitute.com).

67. MIT Technology Review, “Clean Coal’s Flagship Project Has Failed”, 29 June 2017, available at: [www.technologyreview.com](http://www.technologyreview.com).

Meanwhile, **the US has taken new initiatives to promote national CCS projects.** The US 2018 Budget Bill, passed by congress and signed by the President into law in mid-February 2018, includes the “FUTURE Act”.<sup>68</sup> This act contains an extension to the US tax credit for CCS and CCUS, known as “45Q”. It raises the existing so-called “45Q” tax credit for storing CO<sub>2</sub> permanently underground from \$22/t today to \$50/t in 2026. It is expected to provide a significant boost for CCUS investment, including potentially a revisit of Kemper project’s economics. This could lead to capital investment on the order of \$1 billion over the next six years, potentially adding 10 to 30 Mt or more of additional CO<sub>2</sub> capture capacity.<sup>69</sup> The CO<sub>2</sub> credit might spur some (limited) new coal power investment.<sup>70</sup>

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68. IEA, “Commentary: US Budget Bill May Help Carbon Capture Get Back On Track”, 12 March 2018, available at: [www.iea.org](http://www.iea.org).

69. IEA (2018a), *op. cit.*

70. “The New Federal Carbon Credits Might Bring Back ‘Some’ Coal”, *Forbes*, 9 March 2018, available at: [www.forbes.com](http://www.forbes.com).

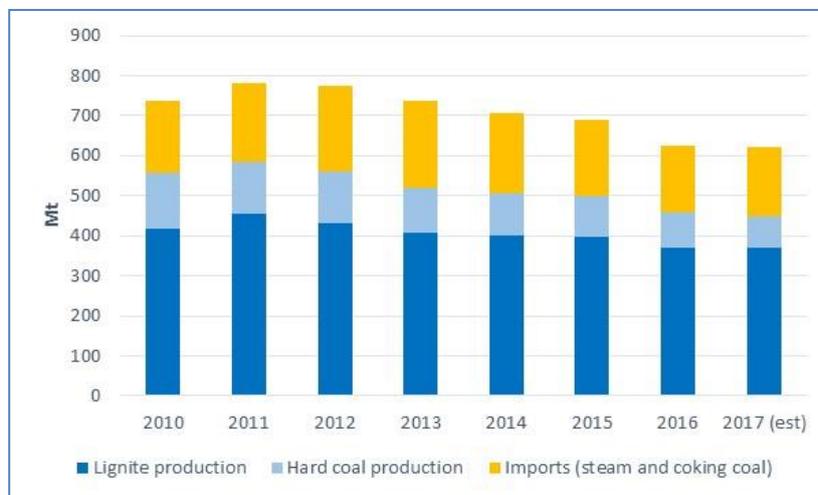


# Europe: New Renewables Beat Coal Power for the First Time

## Coal demand stagnated in 2017

The EU is the fourth-largest consumer of coal in the world, but far behind the first three markets, accounting for only 6% of global coal demand. EU coal demand has been on a long structural decline, except for a brief recovery in 2011 and 2012. According to preliminary estimates, **EU demand for coal (all types of coal) stagnated in 2017 (-0.5% compared to 2016) after its sharp drop in 2016 (-10%)**. Demand for coal was slightly above 620 Mt in 2017, of which some 450 Mt produced in the Community and 174 Mt imported.

**Figure 19: Evolution of EU coal demand, 2010-2017e**



Source: Euracoal, Eurostat,<sup>71</sup> 2017: first estimates based on author's calculations.

**Hard coal production continued its downward trend.** Subsidized hard coal mines are closing due to the end of subsidies to hard coal mining by 2018, as mandated by EU regulation. In Germany, the latest hard coal mine in the Ruhr area, the Bottrop coal mine, will close at the end of 2018. Poland's hard coal production declined sharply in 2017 (-6.8% to 65.8 Mt), forcing the country to turn to the overseas market. EU lignite

71. Euracoal (2017), *Coal industry across Europe*, 6<sup>th</sup> Edition 2017 (and previous editions), available at: [euracoal.eu](http://euracoal.eu); Eurostat, "Energy database", available at: [ec.europa.eu/](http://ec.europa.eu/)

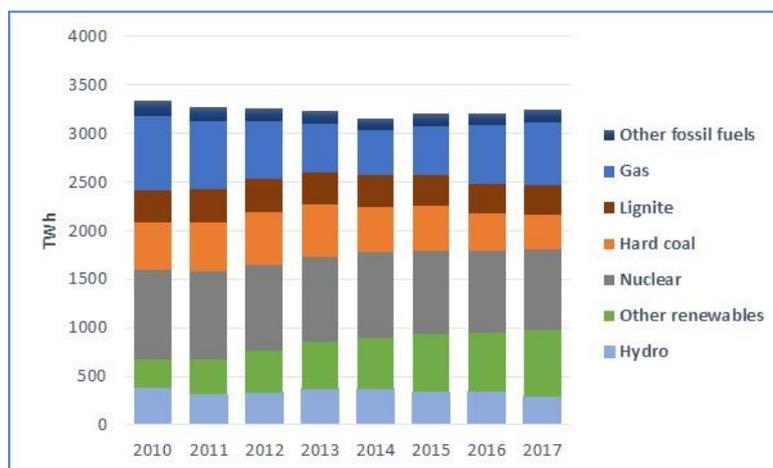
production, however, remained stable at around 370 Mt, most of it produced in Germany, the world's largest producer, Poland, the Czech Republic, Greece and Bulgaria. Coal imports (steam and coking coal) increased by 4% (preliminary data) to compensate for the fall in regional hard coal production. Steam coal imports were up 5 Mt, mainly driven by higher imports in Poland and Spain, whereas imports in northwest Europe, including Germany, decreased.

**The EU coal market is still divided between Western European markets and Central-Eastern European markets (including Germany).** In most Western European markets, coal use is on its way out. Coal production has almost ceased, and coal demand is covered by imports. In Central-Eastern Europe, however, dependence on coal remains high: this region comprises five of the six EU member states where coal provides more than 30% of power generation. This is because of sizeable coal deposits (including lignite) in several parts of this region, which support the production of affordable electricity, reduce the need for energy imports, and maintain employment in the mining sector.

## Coal is losing steam in the power sector

**In 2017, the share of coal (hard coal and lignite) in EU power generation was 20.6%.<sup>72</sup>** This is much lower than the OECD average (27%). However, in some countries (Bulgaria, Czech Republic, Germany, Greece, Poland and Slovenia), this share is significantly higher (between 30% and 50% and even 77% in Poland).

**Figure 20: EU gross electricity generation by source, 2010-2017**



Source: Agora Energiewende and Sandbag.

72. Agora Energiewende and Sandbag (2018), "The European Power Sector in 2017 State of Affairs and Review of Current Developments", January 2018, available at: [www.agora-energiewende.de](http://www.agora-energiewende.de).

**Since its recent peak in 2012 (27.3%), the share of coal in EU power generation has declined by 6.7 percentage points.** EU-wide policies and regulations, such as EU climate and energy targets, air quality regulation, the EU ETS, have reduced the use of coal-fired power, as have support for renewables at national level, the carbon floor price in the United Kingdom and the collapse of natural gas prices. All these factors combined have made it tougher for coal to compete in a market environment where electricity consumption remains flat. Since 2016, power generation from natural gas has become more profitable than that from hard coal, due to rising coal prices and lower gas prices. The loss of competitiveness of hard coal has led to a decline in its share of EU power generation (11% in 2017 against 15-16% at the beginning of the 2010s). Lignite retains a share of about 10%. On the contrary, the share of gas has continued its recovery and accounted for 19.7% of power generation in 2017. Wind power generation increased significantly in 2017 further squeezing coal power generation. Renewable power accounted for 30% of electricity generation in 2017, a new record. **New renewables generation (excluding hydro) sharply increased in 2017, and collectively overtook coal for the first time.**

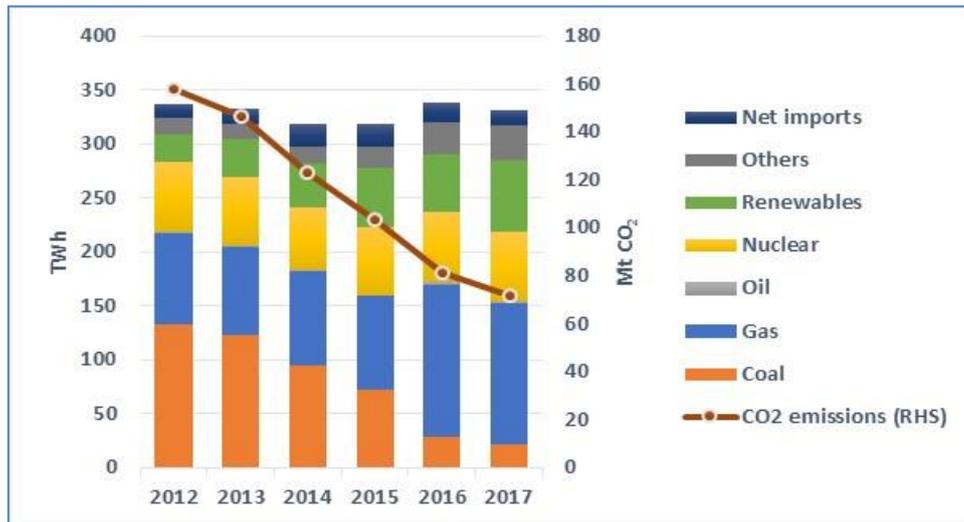
**In the UK, coal's share of total generation** had been steadily falling since 2012, when it was 40%, before a large drop to 9% in 2016 and **a new low of 7% in 2017.** In contrast, the share of gas jumped from 28% in 2012 to 43% in 2016, before decreasing to 40% in 2017 as both coal and natural gas were squeezed by rising renewables (mainly wind) which generated 29% of total power.<sup>73</sup> Hard coal has lost its competitiveness due to the carbon floor price (£18/t) paid by power utilities, on top of the price of EU CO<sub>2</sub> allowances. CO<sub>2</sub> emissions from the UK power sector fell by a massive 54% between 2012 and 2017, mainly driven by the large coal-to-gas switching.<sup>74</sup> Overall, UK emissions from all sectors fell by 22% during the period to 367 Mt in 2017.

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73. Department for Business, Energy and Industrial Strategy (BEIS), "Energy trends: electricity", 29 March 2018, available at: [assets.publishing.service.gov.uk](https://assets.publishing.service.gov.uk).

74. BEIS, "2017 UK Greenhouse gas emissions, provisional figures", 29 March 2018, available at: [assets.publishing.service.gov.uk](https://assets.publishing.service.gov.uk).

**Figure 21: UK electricity supply and CO<sub>2</sub> emissions from the power sector, 2012-2017**



Source: BEIS.

**In Germany**, changed market fundamentals with rising hard coal and carbon prices (notably in the second half of 2017) have made **old low-efficient hard coal-fired power plants no longer economically viable**. The share of coal in the power mix dropped sharply in 2017 with the combined lignite/hard-coal-fired power generation accounting for 37% down from 40.3% in 2016 (the decline is due to hard coal, the share of lignite remaining stable at 23%). Six hard-coal plants were taken offline in 2017 in addition to two lignite units that were moved into the reserve mechanism and no longer participated in the wholesale market.<sup>75</sup> Renewables accounted for 33.4% of gross power production in 2017. The large wind power feed-in, which pushed down hard coal use for power generation, helped Germany reduce its emissions. Emissions from power plants dropped by almost 5% in 2017 to 319 Mt. Germany's GHG emissions declined by a total of 4.7 Mt CO<sub>2</sub> equivalent, or 0.5%.<sup>76</sup> Despite the high share of renewables, Germany has been struggling to keep its GHG emissions in check. The country aimed to reduce total GHG emissions by 40% by 2020 but the renewed "grand coalition" has waived the 2020 climate targets and now Germany focusses on its 2030 targets, which

75. Agora Energiewende and Sandbag (2018), *op. cit.*

76. Clean Energy Wire, "Energy Sector Drives Slight Drop in German Emissions in 2017", 27 March 2018, available at: [www.cleanenergywire.org](http://www.cleanenergywire.org).

include a 55% cut in GHG emissions from 1990 and a 65% share of renewables in the power mix.<sup>77</sup>

In Spain, electricity supply from coal rose to 44 TWh in 2017, 22% higher compared to 2016 to compensate for lost hydro generation which was only half the levels of 2016.

**Only Poland maintains an electricity mix largely dominated by coal** (77% in 2017). The country commissioned a new 1-GW plant in Kozenice at the end of 2017 and has 5 units under construction with a capacity of 3.5 GW, which are expected to be commissioned between 2018 and 2020.

## Coal-to-gas switching is reducing CO<sub>2</sub> emissions

Coal-to-gas switching, rising renewables and energy efficiency gains have helped reducing CO<sub>2</sub> emissions by the EU power sector, which fell from 1120 Mt in 2012 to 1019 Mt in 2017. **The fall was sharp in 2016 (48 Mt), thanks to the large coal-to-gas switching** that year, mainly in the United Kingdom. But EU emission by the power sector stagnated in 2017. While the United Kingdom illustrates that coal-to-gas switching leads to rapid decrease in CO<sub>2</sub> emissions, Germany shows that a transition to renewables with unabated coal (a strategy followed by many Asian countries) is not compatible with a rapid reduction of CO<sub>2</sub> emissions as required by the Paris Agreement.

Coal-to-gas switching depends on economic factors, EU regulation and national policies. In the short term, the competitiveness of gas relative to coal depends on the relative prices of the two fuels, the efficiency of power plants and the carbon price. At average prices for gas and coal delivered to Europe in 2017 (\$5.65/Million British thermal units (MBtu) and \$84/t, respectively), the carbon price (€5.84/t on average in 2017) encourages the substitution of low-efficient coal plants by high-efficient gas plants but is not sufficient to substitute the production of the most efficient coal plants. **A CO<sub>2</sub> price of around €20-25/t would be required to incentivise the switch from efficient coal plants to efficient gas plants (at average fuel prices in 2017).** This level is reached on the UK market with the carbon floor price, but on the continental European market, low carbon prices has limited coal-to-gas switching. The reform of the EU ETS is expected to remedy this situation (see below).

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77. Platts, "German Coal Phase-Out Commission to Be Led by Economy Ministry: Merkel", 13 April 2018, available at: [www.platts.com](http://www.platts.com) and Platts, "Germany Confirms Target to Halve Coal-Fired Power Output By 2030: Energy Minister", 17 April 2018, available at: [www.platts.com](http://www.platts.com)

**Figure 22: Switching prices from coal-to-gas in the EU**

Source: Author's calculations.

The blue and red curves show which combinations of gas and coal prices trigger a switch from coal to gas in the EU, taking into account the 2017 CO<sub>2</sub> average price (5.84€/t). The gas-fired power station is always assumed to have a 55% efficiency rate, while the coal-fired power stations have a 36% efficiency rate for the blue curve and a 45% efficiency rate for the red curve.

## Coal phase-out policies

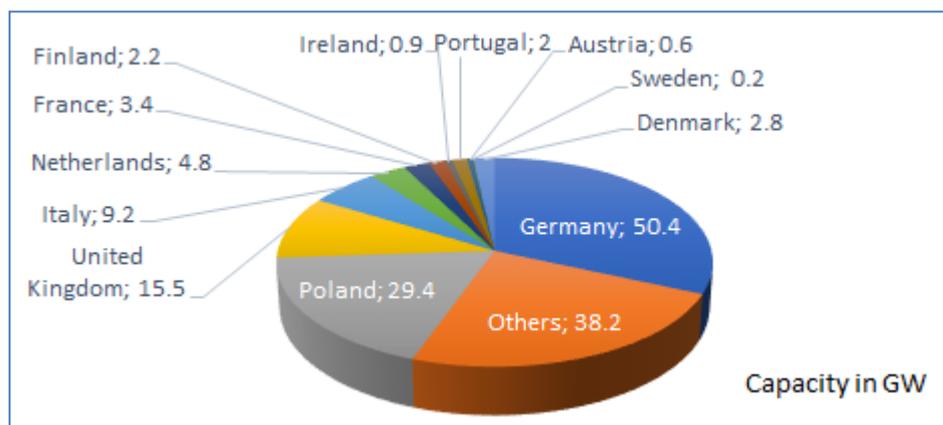
**The EU is leading the global move to exit from coal in the power sector.** As of beginning of April 2018, 14 EU countries<sup>78</sup> have joined the "Powering Past Coal Alliance" and pledged to phase out coal power by 2030. They have been joined by major energy utilities (EDF, ENGIE, Iberdrola, Orsted). All in all, there are 7 countries in Europe that do not use coal in their power mix, and this will grow to at least 17 by 2030. Ten countries have recently announced that they will eliminate coal from their power mix: the UK, which was the first European country to announce a coal phase-out and confirmed in January 2018 the phase out of unabated coal use by October 2025, Austria (2025, considering bringing forward the end date to 2020), Denmark (2030), Finland (2030, considering bringing forward the end date to 2025, or even 2021), France (2021), Ireland (2025), Italy (2025), Netherlands (2030, the phase-out includes three power plants inaugurated in 2015 and 2016), Portugal (2030) and Sweden (2022).<sup>79</sup>

78. Austria, Denmark, Finland, France, Ireland, Italy, the Netherlands, Portugal, Sweden and the United Kingdom (which still use coal in the power sector), as well as Belgium, Luxembourg, Latvia and Lithuania (which do not consume coal in the power sector). Ireland joined in March 2018.

79. See Europe Beyond Coal (2018), "Overview: National Coal Phase-Out Announcements in Europe Status as of March 2018", available at: [beyond-coal.eu](http://beyond-coal.eu).

**A total of 41.6 GW of coal power capacity, corresponding to 26% of Europe's currently operational coal fleet (160 GW at the beginning of 2018), is covered by the coal phase-out announcements.**<sup>80</sup> Coal power generation by the ten countries was 136 TWh in 2017, accounting for 20% of EU coal generation.

**Figure 23: EU coal phase-out by 2030**



Source: Author based on *Global Coal Plant Tracker* and *Europe Beyond Coal*.

In addition, in April 2017, all Eurelectric member countries, except Poland and Greece, pledged to cease investment in new coal plant construction after 2020, which means that the building of new coal capacity in the EU is unlikely.

Germany and Poland together account for around half of both EU's coal generation and capacity and so far, have not pledged to phase out coal. The success of any broader coal phase-out policy in Europe will depend on their participation in it.

In **Germany**, the issue remains sensitive and divides political leaders.<sup>81</sup> Arguments over how many coal plants to close by 2020 were a key reason for the failure of the first attempt to form a coalition with the Conservative, the Green and the Liberal Parties. According to the “renewed grand coalition” agreement reached in February 2018, a **“coal phase-out commission” will be set up to determine, by early 2019, an end date for coal-fired power production, both for hard coal and lignite.** The commission named “Growth, structural change and employment”, is now being set up by the Ministry of Economy and Energy and is expected to confirm plans to halve coal-fired power output by 2030.

80. *Global Coal Plant Tracker* (2018), *op. cit.* and *Europe Beyond Coal* (2018), *ibid.*

81. See IFRI (2017), “Decarbonizing Germany’s Power Sector: Ending Coal with a Carbon Floor Price?”, *Notes de l’Ifri*, Ifri, December 2017, available at: [www.ifri.org](http://www.ifri.org).

<sup>82</sup> The Ministry has indicated its preference for a gradual approach to the phase-out. Regional economic perspectives in the lignite mining regions will be key to the policy.

In **Poland**, the new government, in a complete U-turn from previous administrations, seems **eager to increase the share of renewable energy and natural gas in the country's electricity mix**, which will reduce demand for coal.<sup>83</sup> PGE SA, Poland's largest utility, is speeding up its investments in offshore wind, natural gas and combined heat and power. The power utility has plans to eventually supply 2.5 GW from wind by 2030. The move is in sharp contrast with its previous policy, largely dominated by coal and is driven by a plunge in the cost of wind turbines and rising costs for emissions permits.

## Different policy tools to phase-out coal

Phasing out coal requires from governments clarity over targets, dates and implementation tools, and how to manage impacts on companies, workers and the electricity system. These actions need to be in line with climate, environmental and health responsibilities, and address the needs of the affected workers, communities, and regions.<sup>84</sup>

**There are a range of measures that can be taken by national governments to phase out coal-fired capacity, some of which are market based, while others are of a regulatory nature.**<sup>85</sup> The options are not mutually exclusive and countries are likely to rely on several of the policy tools to close plants. However, each policy tool presents challenges in terms of effectiveness and cost. Regulatory measures will likely be required to achieve even a partial phase-out of coal in Europe by 2030.

▀ **Air quality regulation:** EU air quality regulation is leading to coal plant retirements. The Large Combustion Plant Directive (LCPD), which restricted the emissions of local pollutants already led to the closing of 15.8 GW of coal-fired capacity at the end of 2015, mainly in the UK and France. The IED, which succeeded the LCPD from 1 January 2016, has strengthened the emission limits of sulphur oxides

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<sup>82</sup> Platts, "German Coal Phase-Out Commission to Be Led By Economy Ministry: Merkel", *op. cit.*, and Platts, "Germany Confirms Target To Halve Coal-Fired Power Output By 2030: Energy Minister", *op. cit.*

<sup>83</sup> Bloomberg, "One of Europe's Biggest Polluters Is Turning Toward Wind Power", 28 March 2018, available at: [www.bloomberg.com](http://www.bloomberg.com).

<sup>84</sup> Europe Beyond Coal (2018), *op. cit.*

<sup>85</sup> ICIS, "ICIS Power Perspective: Coal phase-out in Europe – Policy tools and country analysis", 6 October 2017, available at: [www.icis.com](http://www.icis.com).

(SOx), nitrogen oxides (NOx) and particulates of large combustion plants and will lead to the closure of coal capacity by 2021-23 (or before) as some coal plants have chosen to opt out, thus requiring such plants to close by the end of 2023 or earlier if their allocated maximum number of operating hours has been reached before.

In addition, in July 2017, the Commission adopted an implementing act which brings into effect "Best Available Technique" (BAT) conclusions for large combustion plants. These include new minimum binding limits for NOx, SOx, dust, mercury, thermal efficiency, soil and water pollution in combustion plants, called Best Available Technology Reference documents (BREF). The implementing regulation must now be translated into national law. Governments have some flexibility in the transposition, provided the minimum limits are met. For all affected installations, the Commission proposes that a review of their permits must happen within four years, so that by mid-2021 stricter EU-wide standards for all large combustion plants will be met. This means that many existing coal power stations will have to carry out costly upgrades, reduce operations or shut down by the 2021 deadline. According to Climate Analytics, the costs for upgrading the EU coal fleet to meet the new binding limits could be between €8 billion and €14.5 billion, of which €2.4-4.3 billion for Poland and €0.7-1.2 billion for Germany.<sup>86</sup> For some ageing plants, especially lignite plants in Germany, the upgrading costs will not be justified, forcing an early retirement.

- **Emissions Performance Standards (EPS):** The UK has adopted an EPS regulation, which sets a maximum level on the amount of carbon a plant can emit in a year (450gCO<sub>2</sub>/kWh). The EPS currently only applies to new build fossil fuel plants. In January 2018, the UK government has proposed applying the rule to unabated coal plants (on a unit basis) to guarantee their closure by October 2025.<sup>87</sup>

Other EU Member States may decide to set their own regulations on plant emissions, as a way to ensure the closure of unabated coal plants.

- **EU Emission Trading Scheme:** The EU ETS was created as an instrument to reorient investment towards clean coal technologies. However, due to a large surplus of CO<sub>2</sub> quotas on the EU ETS, the price for EU emission allowances has been sagging at a very low level between €5 and €8/t for years (€5.84 on average in 2017), despite a recent rise (see below). To tackle the issue, in July 2015, the

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86. Climate Analytics, About 80% of EU and German, virtually all Polish coal plants non-compliant with new EU 2021 air pollution regulations, 2017, available at: [climateanalytics.org](http://climateanalytics.org).

87. BEIS (2018), "Implementing the end of unabated coal by 2025 - Government response to unabated coal closure consultation", January 2018, available at: [assets.publishing.service.gov.uk](https://assets.publishing.service.gov.uk).

Commission made a proposal to reform the EU ETS. The reform, adopted in February 2018 by the European Parliament after a trilateral agreement was reached in November 2017, strengthens the functioning of the EU ETS and could produce a carbon price sufficient to push some coal-fired plants off the market.

The reform aligns the system with the European GHG reduction goals for 2030 and makes the EU ETS legislation fit to deliver its share; a 43% cut in emission from 2005 levels. The number of CO<sub>2</sub> certificates issued on the market will be reduced by an annual 2.2% (Linear Reduction Factor, LRF) during the fourth trading period, which runs from 2021 to 2030. The current LRF is 1.74 %. The Market Stability Reserve (MSR), introduced in 2015, will be used starting in 2019 in order to enable the more flexible management of the supply of emission allowances. The new regulation envisages withholding up to 24% of the volume allocated on the market annually from 2019 to 2023 and transferring it to the MSR. As of 2023, the number of allowances kept in the MRS will automatically be limited to the number of allowances auctioned in the previous calendar year; all further allowances in the MSR will be cancelled. In addition, it will allow Member States to cancel certificates relating to power plants closed as a result of emission reduction measures.

While analysts feared that the new reform would not create sufficient incentives for short-term coal-to-gas switching, nor for long-term investments into low-carbon technologies, the cost of CO<sub>2</sub> allowances has more than doubled over the past twelve months from around €5/t in April 2017 to €13/t at the beginning of April 2018. Projections for the price of EU CO<sub>2</sub> allowances are being revised upward, although analysts remain divided over the sustainability of the current trend. At the beginning of April 2018, Bloomberg New Energy Finance projected that the price may jump to €32/t by 2023.<sup>88</sup> At this level, they will be little incentives to burn coal, forcing the closure of coal plants.

- ▀ **Carbon floor price:** The UK introduced in 2013 a carbon floor price that utilities have to pay on top of the price of EU CO<sub>2</sub> allowances. This carbon floor price, which was raised to £18/t in April 2015, has demonstrated its key role to undermine the competitiveness of coal power plants in the UK and force their closures.

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88. EcoNews, "Europe's US\$38bn carbon market finally doing its job", 27 March 2018, available at: [econews.com.au](http://econews.com.au).

Other Member States are discussing the possibility to introduce a national or regional carbon floor price, as the EU ETS has failed so far to produce a price on carbon high enough to lead to coal plants closures.<sup>89</sup> However, the introduction of a carbon floor price faces legal, technical and political challenges. To be effective in reducing regional CO<sub>2</sub> emissions, the establishment of a carbon floor price requires a concerted action at the regional level. Otherwise, it would incentivise coal generation in the neighbouring countries to make up for the shortfall created in the country where the carbon floor price was established. This would affect the effectiveness of the policy if CO<sub>2</sub> emissions are simply displaced.

- **Mandating CCS technology to be deployed on existing coal power stations.** This option was studied by the UK government, as one of the options for putting the closure of unabated coal into effect. But the option was finally ruled out due its likely prohibitive cost and time needed to commission full-chain CCS.<sup>90</sup> Other Member States that have later end dates for unabated coal closure may consider this option, although government support to CCS in the EU has been limited so far.
- **Government decree of closure:** Governments could decide to pass a law stating that plants have to close by a given date. This is the most interventionist approach that can be taken by a government, but is arguably the most effective as it enables the government to determine the date at which individual plants close, thus avoiding plants all going offline at the same time. However, the policy may open the government up to having to pay substantial compensation costs to plant owners, especially for plants that have only recently come online, or to face legal challenges by the operator.<sup>91</sup>

During the phase-out of coal power, several resulting factors will need to be addressed by governments. **Security of electricity supply** is a major concern for some governments. In Spain, despite the surge in RES, Iberdrola's decision to close its last two coal-fired power plants has been discussed by the government, due to the possible implications of the closure on security of electricity supply. In Germany, the ongoing phase-out of nuclear power has been a key factor to delay the phase-out of coal. It is fair to say that the EU coal capacity has brought flexibility to the EU and global energy system. After the Fukushima accident, coal generation increased in the EU, freeing gas/LNG which was sent to the Pacific Basin

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89. See IFRI (2017), *op. cit.*

90. BEIS (2018), *op. cit.*

91. ICIS, "ICIS Power Perspective: Coal phase-out in Europe – Policy tools and country analysis", 6 October 2017, available at: [www.icis.com](http://www.icis.com).

market. Thus, the phase-out of coal power in the EU will have impacts beyond the EU electricity system.

**The cost of the phase-out policies**, either due to the need to build additional power capacities to ensure security of supply, or to compensate coal plant owners for early closure, will have to be taken into account by governments. The associated costs may rise energy bills and impact industry competitiveness, unless compensation measures are introduced.

**The resultant job losses of coal phase-out policies**, notably in coal producing countries, where the end of coal mining is associated to the phase-out of coal power, will need to be carefully managed by governments to avoid social and economic impact of the coal exit policies. To facilitate the transition to cleaner energy, the European Commission launched a **Platform on Coal Regions in Transition** in December 2017.<sup>92</sup> Its aim is to facilitate the development of projects and long-term strategies in coal regions. It is designed to boost the clean energy transition by bringing more focus to social fairness, structural transformation and new skills and by promoting investment in new technologies and creating new jobs. It brings together EU, national, regional and local stakeholders involved in the transition to help them foster partnerships and learn from each other's experiences.

In summary, **coal phase-out targets are spreading fast in the EU and the trend is irreversible**. Coal demand by the power sector is expected to be reduced dramatically by 2030. According to the IEA's scenarios, coal demand by the power sector falls from 174 Mtoe in 2016 to 99 Mtoe (New Policies Scenario) and 44 Mtoe (Sustainable Development Scenario) in 2030. CO<sub>2</sub> emissions from coal power plants drop to 235 Mt in 2030 in the Sustainable Development Scenario.

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92. European Commission, "No region left behind: launch of the Platform for Coal Regions in Transition", 11 December 2017, available at: [europa.eu](http://europa.eu).

# Other Asian Countries: New-build Coal Power Plants Increase Coal Demand

## In Japan, Korea and Taiwan, nuclear power issues increase coal demand

Japan, South Korea and Taiwan account for a large proportion of steam coal imports from the Pacific Basin and form the world's largest importing region. These countries don't produce coal and their supply depends entirely on imports. Together they import 300 Mt/y of steam coal, and this level has been very stable so far. But in 2017, **they collectively increased their imports by nearly 7% to 317 Mt.** The rise in Japan is mainly due to constraints on the reopening of nuclear power plants. Just five of Japan's operable nuclear reactors are running at present. Taiwan also faced nuclear power supply issues and in mid-2016 four of its six reactors were shut down. The strong increase (13%) in South Korean steam coal imports is more surprising since the new government intends to reduce pollution caused by coal combustion. But the country was embarked on a huge coal build-out, decided by the previous administration, and 11 GW of new coal capacity were commissioned in 2016 and 2017.

In **Japan**, since the catastrophic Fukushima Daiichi accident, coal power generation has been greatly expanded to compensate for the loss of nuclear power. **Coal generation accounts for over 30% of all electricity produced in the nation.** In its basic energy plan adopted in April 2014, Japan gives a significant role to coal (26% of the electricity mix in 2030), which is described as "a fuel for important baseload power sources".<sup>93</sup> Japan puts the emphasis on HELE coal-fired power plants (USC and IGCC technologies). Currently, Japanese private-sector utilities plan to build 36 units totalling almost 19 GW, of which 5 GW are under construction. About 2.5 GW of proposed coal capacity was suspended in 2017, with no new coal proposals added. If all planned plants are implemented, Japan's overall coal-fired power generation capacity will

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93. See IFRI (2015), *op. cit.*

increase by about 40%, causing its CO<sub>2</sub> emissions to surge to levels far above the government's estimates for years to come. Japan has ratified the Paris Agreement with a commitment to reduce the country's GHG emissions by 26% by 2030 against 2013 levels.

Japan is the second biggest public financier, behind China, of overseas coal-fired power capacity, with \$10 billion already invested in coal projects from 2013 to 2016 through international development funds, and another \$9 billion of proposed funding.<sup>94</sup>

**Japan is facing mounting international criticism over its coal plans.** The Japanese government has been warned that its pro-coal policies are creating a “bottleneck” in international climate talks – and that the country risks being left behind in the global green energy boom.<sup>95</sup> The Advisory Panel to the Foreign Minister on Climate Change calls for a transformation of the way Japan engages with the international community on energy issues.<sup>96</sup> It strongly advises Japan to refocus its energy diplomacy on renewables as a core pillar of its diplomacy, instead of coal. The document provides food for thought for policymakers in Tokyo as **the METI is currently conducting its own review of Japan's energy policy.**

**In South Korea,** recently-elected President Moon Jae-in has vowed to cease permitting new coal plants and to phase out old coal plants. But **the new electricity plan adopted in late December 2017 is less ambitious than previously expected.**<sup>97</sup> While the government had proposed switching the current planned coal projects to natural gas, the electricity plan proposes that only two coal units changed to a gas-fired project, leaving 7.4 GW of coal-fired capacity under development. The electricity plan focuses on clean energy with the aim of increasing the share of renewables in the electricity mix to 20% in 2030 (currently 6%) and national security (the nuclear share which was 30% of electricity production in 2016 will be reduced to 23.9% in 2030). **Despite a desire to reduce the share of coal, it should decline only marginally (to 36% in 2030 against 40% in 2016).** The new plan shows the thorny problem of reducing coal and nuclear power at the same time, an issue shared by German policy makers.

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94. NDRC (2017), *op. cit*

95. D. Hurst, “Why Japan Is Rethinking Its Energy Diplomacy”, *The Diplomat*, 28 February 2018, available at: [thediplomat.com](http://thediplomat.com) and The Asahi Shimbun, “Editorial: Coal As A Major Power Source Represents Huge Step Backward”, 13 January 2018, available at: [www.asahi.com](http://www.asahi.com).

96. See [www.mofa.go.jp](http://www.mofa.go.jp).

97. S. Cornot-Gandolphe, “South Korea's New Electricity Plan, Cosmetic Changes or a Breakthrough for the Climate?”, *Édito Énergie*, Ifri, 28 February 2018, available at: [www.ifri.org](http://www.ifri.org).

Despite signs of a domestic policy shift toward renewables, South Korea remains a major source of public finance for coal projects internationally, having provided over \$2 billion for coal power projects outside the country between 2013 and 2016, with another \$3 billion of proposed funding.<sup>98</sup>

**Despite rising demand for coal in 2017, Taiwan aims to lower the share of coal in its electricity mix.** The government plans to drastically alter the country's energy mix as nuclear power is going to be phased out by 2025.<sup>99</sup> The government looks to raise the share of renewables to 20% by 2025 from 5% currently, hike up the share of natural gas to 50% from 32%, lower the share of coal to 30% from 45%, and fully phase out nuclear power (15% currently). The government expects to attract \$59 billion in private capital to help finance new renewable projects. However, the massive blackout that hit the power system on 15 August 2017 has highlighted some key issues in the country's power sector, such as construction delays and the tightness of the current power supply. This may delay the Taiwanese energy transition.

## Southeast Asia: Soaring power needs and coal demand

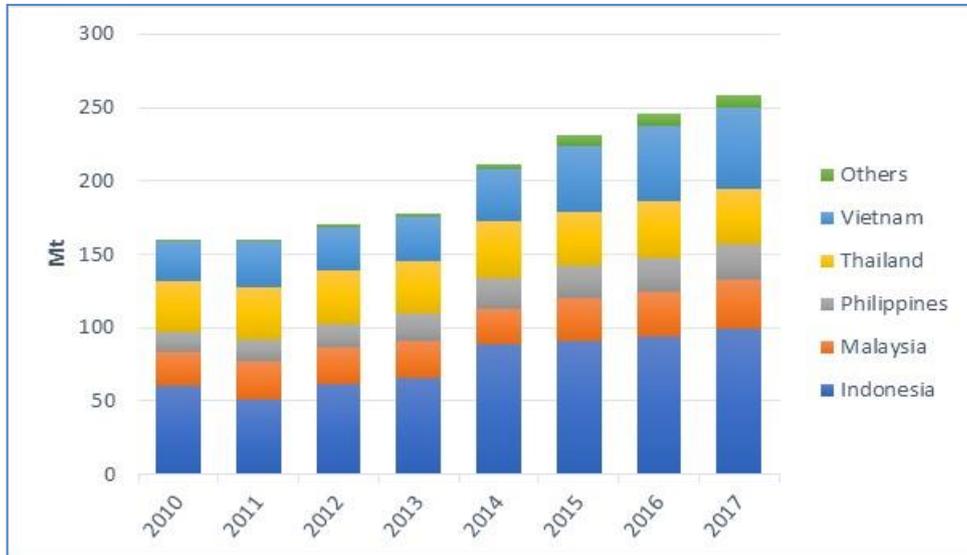
Driven by rapidly increasing electricity demand, **Southeast Asian coal demand has surged since 2010 to an estimated 260 Mt in 2017.** The availability of coal in the region, notably in Indonesia, the world's largest steam coal exporter, and its lower cost than competing fuels, has made coal the preferred option to fuel rising power demand. Even the gas-producing countries in the region have introduced more coal in their electricity mix as gas shortages pushed them to diversify their mix.

Regional coal imports have also surged – growing by 30 Mt in the past three years to 94 Mt in 2017, as Vietnam turns into a net importer and imports by the Philippines and Malaysia surged – making the region a highly coveted market by coal exporters.

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98. NDRC (2017), *op. cit.*

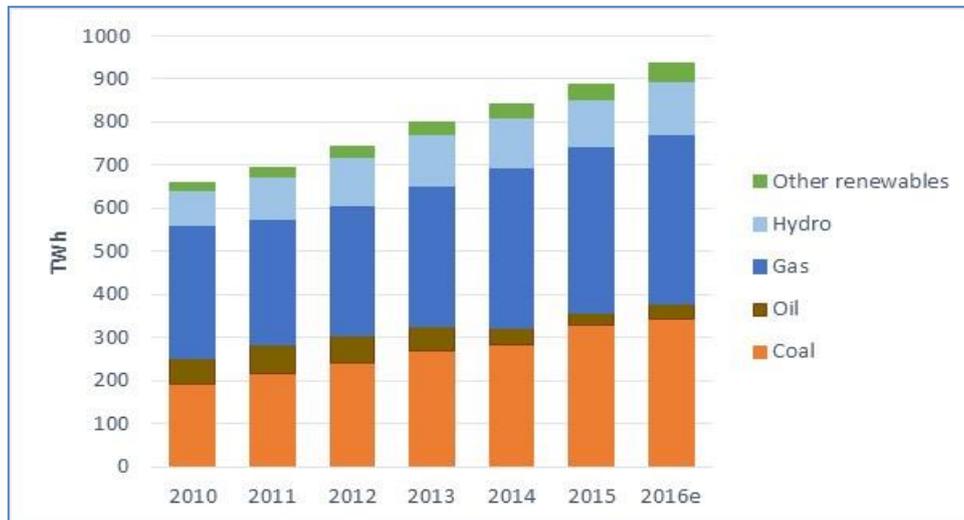
99. Asian Power, "Taiwan's Nuke-Free Vow under Fire as Energy Supply Issues Arise Amidst Massive Blackout", 6 April 2018, available at: [asian-power.com](http://asian-power.com).

**Figure 24: Coal demand in Southeast Asia, 2010-2017e**

Source: IEA,<sup>100</sup> 2017: author's estimates.

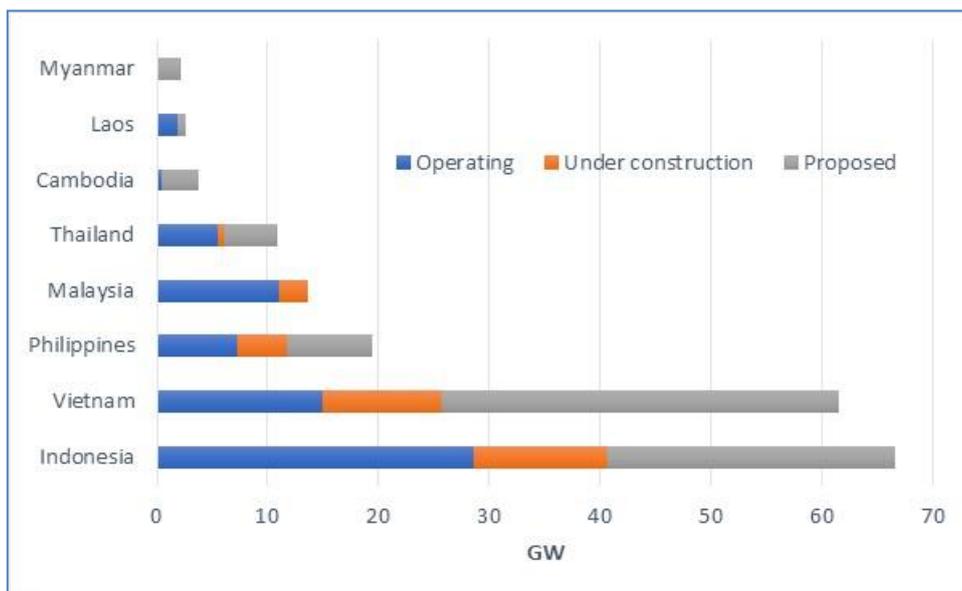
**The region added almost 40 GW of coal-based capacity between 2010 and 2017.** In this, Southeast Asian countries are helped by countries wishing to export their coal combustion technologies, led by China and Japan. Gas still dominates the power generation mix, with a share of 42% in 2016, but its share is declining. On the contrary, the share of coal has increased from 29% in 2010 to 36% in 2016.

100. IEA (2017b), *op. cit.*

**Figure 25: Southeast Asian electricity generation, 2010-2016e**

Source: IEA.

In the short to medium term, **the trend towards coal is going to continue**. Currently, 30.6 GW of coal capacity is under construction in the region and projects for 80 GW of additional capacity are at various stages of development.

**Figure 26: Operating and planned coal capacity in Southeast Asia by country**

Source: Global Coal Plant Tracker (2018).

**However, there are some signs that the rapid rise in coal-fired capacity is running out of steam:** final investment decisions taken on new coal plants in Southeast Asia (except Indonesia) fell in 2016 for a third year in a row.<sup>101</sup> The recent slowdown is symptomatic of the challenges facing the large-scale deployment of new coal-fired power plants, including the need to address environmental concerns and to secure financing. Financial restrictions on coal projects by international financial institutions and the global campaigns against coal – if they don't stop financing of coal plants in the region – make the funding of coal projects more difficult and longer and favour cleaner sources. Public opposition against coal projects – mostly on environmental grounds such as concerns about local air pollution – is growing in the region and several coal power plant projects have been blocked by local opposition (e.g. Thailand). Coal's main advantage in Asia, its cost-competitiveness, is challenged by the rising price of coal for importing countries in the region and the falling cost of RES and, to an extent, by ample availability of low-cost LNG.

In the wake of the Paris Agreement, national governments across the region have started to reassess their power electricity supply plans, introducing more renewable energy sources, promoting energy efficiency measures, increasing the share of gas and reducing the contribution of coal to the electricity mix. This reassessment, however, does not constitute a shift away from coal. Despite the scale back, coal still dominates the targeted additional capacity, followed by natural gas, hydropower, and other renewables. In September 2017, a joint ministerial statement from the 35<sup>th</sup> ASEAN Ministers on Energy Meeting (AMEM) in Manila, Philippines, acknowledged the continuing role of coal in addressing the energy security, economic competitiveness, and environmental sustainability in the region.<sup>102</sup> The Ministers have pledged their commitment to switch from inefficient coal plants to ones that operate with low emission technologies.

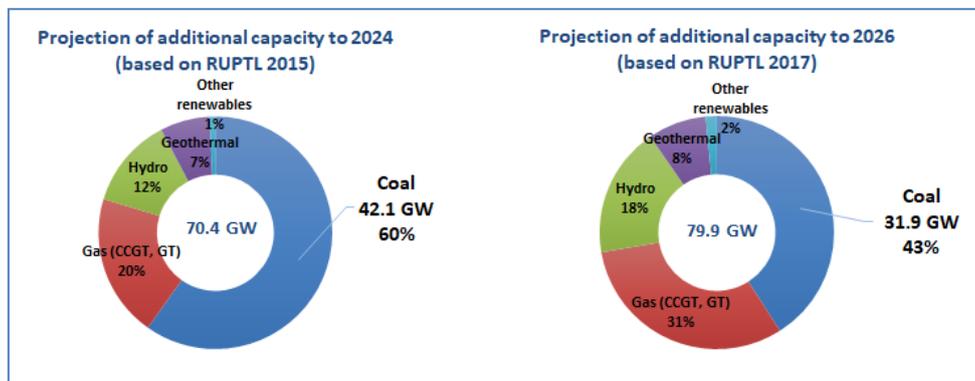
**Most of the additional coal capacity is concentrated in two countries, Indonesia and Vietnam.** But in both countries, the targets are challenging. After COP21, the Vietnamese government announced its intention to review the development plans of all coal plants, making the planned projects uncertain (after the wave of new plants currently under construction). Even Indonesia has reviewed downward its coal expansion target after COP21.

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101. IEA (2017c), *Southeast Asia Energy Outlook 2017*, October 2017, available at: [www.oecd.org](http://www.oecd.org).

102. ASEAN Secretariat (2017), "Joint Ministerial Statement of the 35<sup>th</sup> ASEAN Ministers on energy meeting", 27 September 2017, Manila, Philippines, available at: [asean.org](http://asean.org).

**Figure 27: Additional power capacity in Indonesian electricity supply plans (RUPTL) 2015 vs. 2017**



Source: Perusahaan Listrik Negara (PLN).<sup>103</sup>

**Today, Southeast Asia is again at the forefront of historic changes in its energy mix.** Driven by rapid economic growth, demographic and urbanization trends, and the extension of access to modern electricity to larger segments of rural populations, electricity demand is expected to more than double by 2040, at a pace twice the global average, according to the IEA's New Policies Scenario.<sup>104</sup> To meet surging demand, the region must secure a reliable and affordable energy supply. It must also limit the environmental pressures associated with energy consumption. The power sector is fundamental to these changes. According to the IEA's New Policies Scenario, Southeast Asian coal demand by the power sector increases from 83 Mtoe in 2016 to 155 Mtoe in 2030 as the region adds almost 60 GW of new coal capacity between 2017 and 2030. CO<sub>2</sub> emissions due to the use of coal in the power sector almost double during the period to 624 Mt, although the new coal-fired capacity uses high efficiency supercritical or ultra-supercritical technologies. However, the road ahead for Southeast Asia is not set in stone. In the Sustainable Development Scenario, Southeast Asian use of coal in the power sector peaks around 2025 (94 Mtoe) and falls to 63 Mtoe by 2030, as renewables eat into coal's share of the power mix. The transition in the Sustainable Development Scenario has profound impacts on GHG and air pollutant emissions, with CO<sub>2</sub> emissions due to the use of coal in the power sector 60% lower than in the New Policies Scenario by 2030.

103. Perusahaan Listrik Negara (PLN) (2015), "RUPTL 2015–2024", (Electricity Supply Business Plan for 2015–2024), and PLN (2017), "RUPTL 2017–2026", (Electricity Supply Business Plan for 2016–2027), available at: [www.djk.esdm.go.id](http://www.djk.esdm.go.id).

104. IEA (2017c), *op. cit.*



# Conclusion: Coal Exit instead of Coal Expansion

A major change in the world's attitude towards coal came in 2015 with the Paris Agreement, which prompted many industrial nations, notably in the EU, to accelerate their efforts to reduce coal consumption. China, the world's largest coal consumer, had also started to curb its coal consumption to reduce local air pollution.

Two years later, the speed of change differs across regions according to the role of coal in their electricity mix, their rate of economic development and power needs. One key conclusion is the acceleration of efforts to reduce coal demand, as illustrated by new policies in the EU, China and India. The slight rise in global coal demand in 2017 does not call into question some new fundamental trends. Investment in the global coal power sector has declined dramatically and passed an all-time high in 2015. But a second key conclusion is that the world is still divided about the role of coal.

- Phase-out policies are spreading in more and more OECD countries to reduce CO<sub>2</sub> emissions rapidly in line with the goal of the Paris Agreement. The EU is a sterling illustration of these policies with 14 EU Member States having pledged to stop coal power by 2030 or before. Even Germany has announced that a date for an end to coal and lignite power will be fixed by early 2019. In heavy coal-dependent countries (China, India), the fast development of renewables reduces the share of coal in the power sector, although both countries have not yet reached the point where their coal power generation decreases. In China, despite the fast deployment of renewables and other low-carbon electricity sources, these sources cannot yet fully keep up with rising power needs, requiring a slight increase in the use of coal in the power sector. But Chinese total coal demand peaked in 2013 due to strong policies and measures against air pollution, a switch away from coal and the shift of the economy from heavy industries towards the services sector. In India, the growth of coal demand by the power sector, although rising, has slowed down since 2015. The rate of new coal construction activity plunged last year. The ambitious goals to raise the share of renewables in the power mix, combined with ongoing efforts to increase coal power plants efficiency and retire highly-polluting and inefficient coal plants, will limit the growth of coal demand. Demand for coal by the US power sector continues to shrink despite efforts by

the Trump's administration to reverse the situation. US power utilities continue their transition towards renewables and natural gas. And no new commercial investment in coal generation is expected in the country.

- On the contrary, several emerging countries in Asia, but also in Africa, are still relying upon coal to fuel their economic development and the rising power needs of a growing population. Despite their willingness to move to a cleaner energy mix, they still view coal as an economic and secure solution to their economic and social development, a trend that can only be reversed if alternative solutions, at the same scale and with the same attributes, are promoted. The announced withdrawal of the US from the Paris Agreement has not undermined the determination of other nations to follow their clean agenda. However, it has opened the Pandora's box: promoting clean coal technologies as the solution for fuelling rising energy demand of developing and emerging economies, a message that has not been unheard in regions such as Africa<sup>105</sup> and Southeast Asia.<sup>106</sup> Incidentally, the rise of coal demand in Southeast Asia, Africa, and South Asia (notably Pakistan and Bangladesh), if it happened as expected by the US administration, would limit the share of gas in the energy balances of the potential new coal markets, and their LNG imports, including US LNG.

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105. See for instance Ghana Business News, "US Backs Use of Coal for Energy in Africa", 29 July 2017, available at: [www.ghanabusinessnews.com](http://www.ghanabusinessnews.com); Modern Ghana, "Climate Change Coal Alliances Formed", 8 December 2017, available at: [www.modernghana.com](http://www.modernghana.com).

106. See for instance Manilla Bulletin, "US Eyeing 'Clean Coal' Alliance with PH", 25 November 2017, available at: [business.mb.com.ph](http://business.mb.com.ph).

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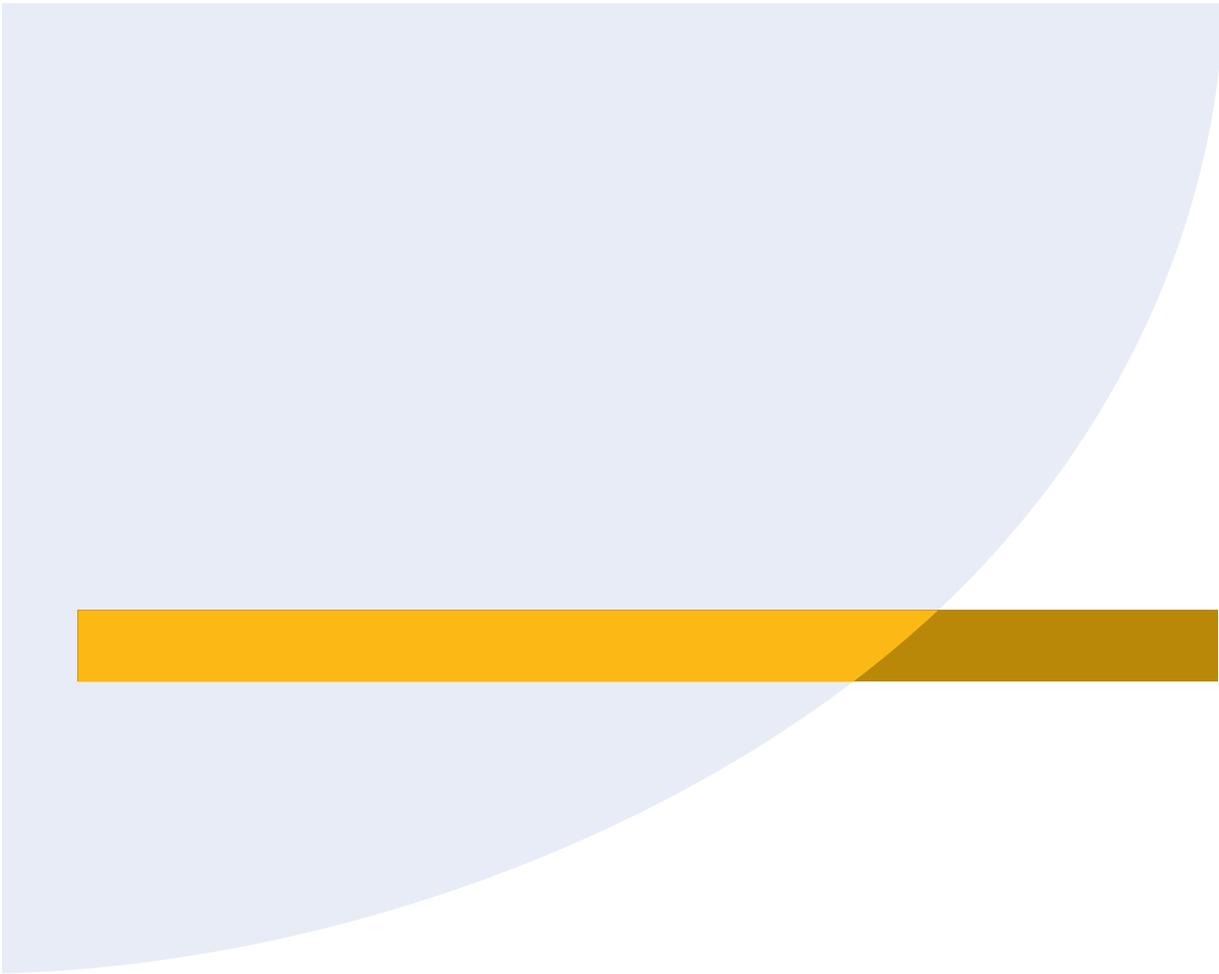
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