

Boom and Bust 2019

TRACKING THE GLOBAL COAL PLANT PIPELINE

Christine Shearer, Neha Mathew-Shah, Lauri Myllyvirta, Aiqun Yu, and Ted Nace



ABOUT THE COVER

The cover shows the cooling towers of the retired Orlando coal plant in South Africa. The towers now display large murals and advertisements as well as being used as a platform for bungee and BASE jumping. Photo available at <http://bit.ly/2SPHNVI> and licensed under this Creative Commons License: <http://bit.ly/2SPNin5>



**Global
Energy
Monitor**

ABOUT GLOBAL ENERGY MONITOR

Global Energy Monitor (formerly CoalSwarm) is a global network

of researchers developing collaborative informational resources on fossil fuels and alternatives. Current projects include the Global Coal Plant Tracker, the Global Fossil Infrastructure Tracker, the CoalWire newsletter, and the CoalSwarm and FrackSwarm wiki portals.



ABOUT THE SIERRA CLUB

The Sierra Club is America's largest and most influential grassroots environmental organization, with more than 3.5 million members and supporters. In addition to protecting every person's right to get outdoors and access the healing power of nature, the Sierra Club works to promote clean energy, safeguard the health of our communities, protect wildlife, and preserve our remaining wild places through grassroots activism, public education, lobbying, and legal action. For more information, visit www.sierraclub.org.



ABOUT GREENPEACE

Greenpeace is an independent campaigning organization, which uses non-violent, creative confrontation to expose global environmental problems, and to force the solutions which are essential to a green and peaceful future. Greenpeace's goal is to ensure the ability of the earth to nurture life in all its diversity. Therefore Greenpeace seeks to protect biodiversity in all its forms, prevent pollution and abuse of the earth's ocean, land, air and fresh water, end all nuclear threats and promote peace, global disarmament and non-violence. Greenpeace India exists because of activists, supporters, donors and volunteers who believe in taking collective action for the environment. Our planet needs us more than ever—individuals, communities and groups who have the power to shift the paradigm.

ABOUT THE GLOBAL COAL PLANT TRACKER

The Global Coal Plant Tracker is an online database that identifies, maps, describes, and categorizes every known coal-fired generating unit and every new unit proposed since January 1, 2010 (30 MW and larger). Developed by Global Energy Monitor, the tracker uses footnoted wiki pages to document each plant and is updated biannually. For further details, see [Tracker Methodology](#) at EndCoal.org.

AUTHORS

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FURTHER RESOURCES

For additional data on proposed and existing coal plants, see [Summary Statistics](#) at EndCoal.org, which provides over 20 tables providing results from the Global Coal Plant Tracker (GPCT), broken down by province, nation, and region. For links to reports based on GPCT data, see [Reports](#) at EndCoal.org. To obtain primary data from the GCPT, contact Ted Nace (ted@tednace.com).



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EXECUTIVE SUMMARY

For the third year in a row, most leading indicators of coal power capacity growth declined in 2018, including construction starts, pre-construction activity, and plant completions, according to the [Global Coal Plant Tracker](#).¹ In China and India, which have accounted for 85% of new coal power capacity since 2005, the number of permits for new coal plants dropped to record lows. The level of coal plant retirements continued at a record pace, led primarily by the US, despite efforts by the Trump Administration to keep aging coal plants online.

The decline in most coal power growth indicators reflected an increasingly constrained political and economic climate for coal plant developers, including financial restrictions by over 100 institutions and coal phase-out plans in 31 countries. However, state-owned financial agencies in China, Japan, and South Korea have emerged as the largest sources of funding for coal plants outside their borders, respectively.

A glaring exception to the global decline in coal plant development was China, where an excess of permitting from 2014 to 2016 remains to be resolved. In 2018, satellite photos showed ongoing construction at a number of project sites previously reported as suspended under central government restrictions. A March 2019 report by the China Electricity Council proposed capping the country's coal power at 1,300 gigawatts (GW) in 2030, signaling that the industry body representing China's power sector is pushing for a large expansion of the country's coal fleet. The change would allow hundreds of new coal plants to be added, including plants that had been suspended under central government restrictions.

1. Includes coal-fired units size 30 megawatts and above.

Despite steady declines in coal power capacity additions, global climate goals cannot be met without a full halt in new coal plants and a rapid retirement of operating coal plants.

Key developments for 2018 include:

- A 39% drop in new construction starts from 2017, and an 84% drop since 2015.
- A 20% drop in newly commissioned coal power capacity from 2017, and a 53% drop from 2015.
- A 24% drop in pre-construction activity from 2017, and a 69% drop from 2015.
- Coal plant retirements continued at a record pace, making 2018 the third highest year for retirements globally and the second highest for the US.
- A 12% increase in coal power capacity under construction since 2017, as China has resumed development of previously shelved plants. However, total capacity under construction has declined 30% since 2015.
- An unprecedented slowdown in coal plant permits in both China and India. China permitted less than 5 GW of coal power for construction in 2018, compared to 184 GW in 2015. India permitted less than 3 GW in 2018, compared to 39 GW in 2010.
- Despite the slowdown in new permits in China, the China Electricity Council has proposed a 2030 coal power cap of 1,300 GW, which would allow the country to increase its coal power capacity by 290 GW above current levels—more than the entire coal fleet of the US (259 GW).
- The emissions from currently operating coal plants alone utilized at an average rate and lifetime are too high to hold global warming to 1.5°C or 2°C, according to estimates for coal use by the Intergovernmental Panel on Climate Change.

THE COAL PIPELINE KEEPS SHRINKING

The amount of coal power capacity in pre-construction stages has declined every year since 2015. In 2018, proposed capacity dropped nearly a quarter, from 447 gigawatts (GW) in 2017 to 339 GW.² Overall, the pre-construction pipeline has fallen nearly 70% since 2015, when it was 1,090 GW.

Planned new coal capacity has fallen particularly rapidly in China and India. At the end of 2015, China had plans to construct 515 GW of new coal power capacity. That figure now stands at 70 GW, an 86% decline. In India, the pre-construction pipeline has shrunk 83%, from 218 GW in 2015 to 36 GW today (see Appendix for country-level totals).

Plants in pre-construction status would have declined further if not for the emergence in the past few years of several large coal plant proposals (between 4 GW to 6.6 GW each) in [Russia](#), [Egypt](#), [South Africa](#), and [Bangladesh](#), all supported by Chinese finance. Combined, the proposals make up over 12% (21.2 GW) of the 174 GW of proposed capacity outside China and India without a construction permit.

Still, the pipeline across the rest of the world also continues to shrink. Japan has cancelled over 7 GW of proposed coal capacity since 2017, while South Korea has stopped issuing permits for new coal plants. The only countries with an over 1 GW increase in 2018 pre-construction capacity were the Philippines, Nigeria, and Russia.

Figure 1: Planned coal power capacity in pre-construction status has declined from 1,090 GW in 2015 to 339 GW in 2018, with the biggest drops in China and India (gigawatts).

China = blue, India = purple, Other = yellow

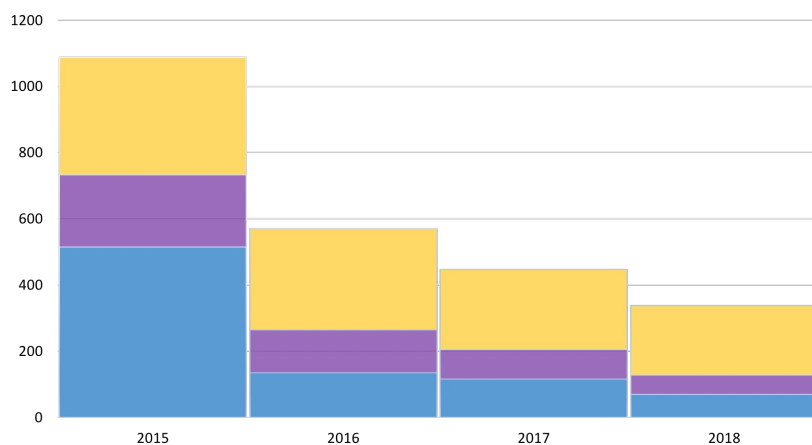


Table 1: Changes in pre-construction capacity under development, 2015 to 2018 (megawatts).

	2015	2016	2017	2018	Change from 2017 to 2018	Change from 2015 to 2018
Announced	487,261	247,909	174,884	122,258	-30%	-75%
Pre-permit	434,180	222,055	168,127	133,215	-21%	-69%
Permitted	168,230	99,637	103,613	83,098	-20%	-51%
Announced + Pre-permit + Permitted	1,089,671	569,601	446,624	338,571	-24%	-69%

For definitions of the status designations, go to <https://endcoal.org/global-coal-plant-tracker/about-the-tracker/>

2. The average coal-fired unit has a gross electrical capacity of 350 megawatts (MW), while the most common size unit is 660 MW. Newer units can be up to 1,000 MW, or 1 GW. Most power stations have two or more units.

CONSTRUCTION HEATS UP AGAIN IN CHINA

Coal power capacity under construction increased 12% in 2018, from 209 GW in 2017 to nearly 236 GW in 2018. The increase is due primarily to China, which has quietly resumed construction on over 50 GW of coal power capacity that had been postponed by central government restrictions.

Outside of the resumed construction in China, a total of 28 GW of coal power capacity began construction in 2018, compared to 46 GW that began construction in 2017, a decline of 39%. New construction was concentrated in eleven countries, primarily China, followed by Japan with 2.7 GW of new coal power capacity,

India with 2.4 GW, Indonesia with 2 GW, Vietnam with 1.3 GW, and Poland with 1 GW.

Beyond India and China, capacity under construction is highest in Southeast Asia, particularly Bangladesh, Indonesia, Pakistan, the Philippines, and Vietnam. Together, the five countries make up 42% (30 GW) of the 71 GW of coal power capacity under construction outside China and India. Yet capacity under construction in the five countries is about one quarter the current construction in all of China. Overall, global capacity under construction has fallen 30% since 2015, when 338 GW was being built.

Figure 2: Coal power capacity under construction declined from 338 GW in 2015 to 210 GW in 2017, but went up to 236 GW in 2018, as China (blue) resumed construction on coal plants postponed by the central government (gigawatts).

China = blue, India = purple, Other = yellow

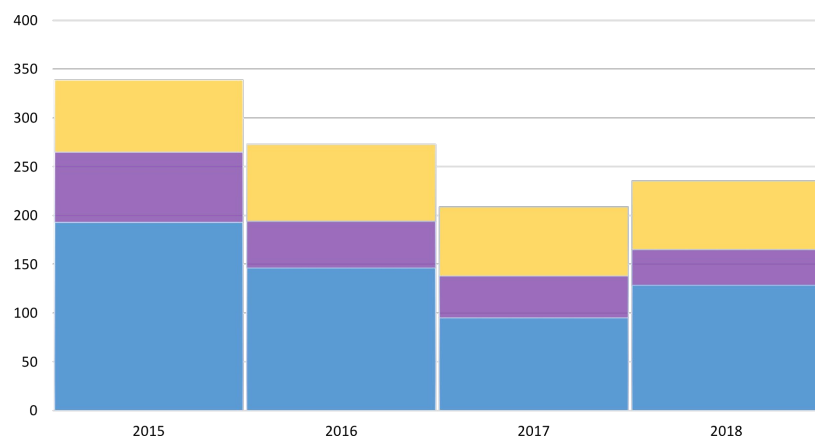


Table 2: Total coal power capacity under construction, capacity that started construction each year, and capacity on hold (megawatts). China has resumed development of previously shelved plants, decreasing the amount of capacity on hold in 2018.

	2015	2016	2017	2018	Change from 2017 to 2018	Change from 2015 to 2018
In Construction	338,458	272,940	209,566	235,633	12%	-30%
Started Construction	169,704	65,041	45,913	27,829	-39%	-84%
On Hold	230,125	607,367	634,777	483,160	-24%	110%

NEAR RECORD RETIREMENTS LED BY THE US

While total coal power capacity continues to go up, net annual additions to the global coal power fleet (i.e. new capacity minus retired capacity) continue to decline. In all, net new global coal power capacity was 19 GW in 2018—the slowest rate of growth on record, and the fourth straight year of decline.

In 2018, 50.2 GW of new coal capacity was commissioned: 34.5 GW in China, 7.7 GW in India, and 8 GW in the rest of the world (primarily Indonesia, Japan, Pakistan, Philippines, South Africa, Taiwan, Turkey, and Vietnam).

Retirements totaled nearly 31 GW in 2018, making it the third highest year for global coal plant retirements. Retired capacity was led by the US with 17.6 GW—the second-highest year for US coal retirements after 2015, which had 21 GW of retirements. The near record retirements took place even as the Trump Administration has tried limiting coal plant

closures by [rolling back](#) coal regulations and attempting to designate aging plants as [essential](#) to keep online for back-up power.

Retired capacity in China and India totaled 9 GW, and is set to increase in the future. India has proposed 48 GW of coal plant retirements through 2027, mainly subcritical coal plants ill-equipped to meet [new pollution standards](#). China [plans](#) to close small coal plants under 300 MW that cannot meet new standards for environmental protection, efficiency, and safety, as well as plants concentrated within 15 kilometers of a power plant size 300 MW or above.

In the EU, 2018 retirements totaled 3.7 GW, with 2.8 GW from the UK, where coal power has declined from 39% of total electricity generation in 2012 to [5%](#) in 2018. Over [half](#) of EU member countries have committed to phase out coal use by 2030, and Germany by [2038](#).

Figure 3: Coal power capacity additions (above 0 GW) and retirements (below 0 GW) between 2000 and 2018 (colored columns) and the global net change (black line) (gigawatts).

China = blue, India = purple, Other = yellow, USA = red, EU = dark blue, Net change = black line

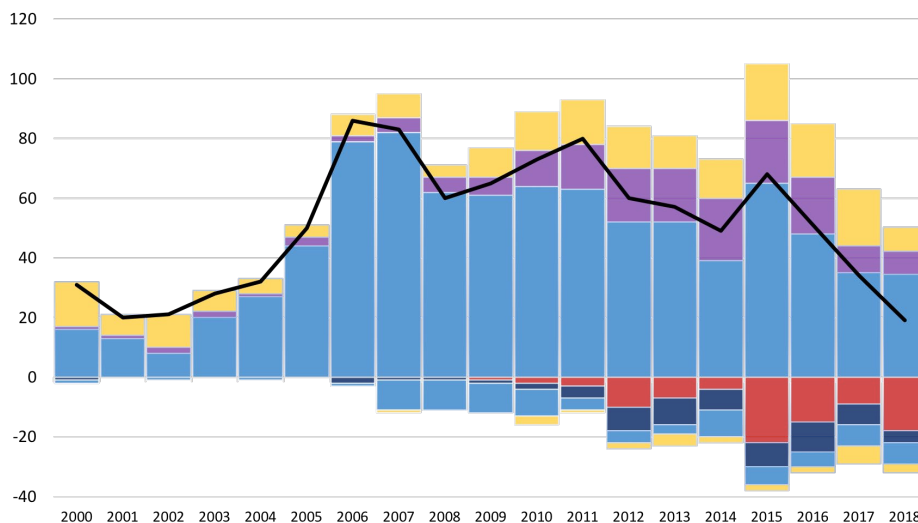


Table 3: Annual completed and retired capacity, 2015 to 2018, and the annual net change (megawatts).

	2015	2016	2017	2018	Change from 2017 to 2018	Change from 2015 to 2018
Completed	105,837	84,069	62,575	50,265	-20%	-53%
Retired	37,477	32,572	28,864	30,890	7%	-18%
Net change	68,360	51,497	33,711	19,375	-43%	-72%

COAL AND CLIMATE GOALS

Coal is the biggest global contributor to heat-trapping carbon dioxide, making it essential to immediately phase down coal plant use to keep warming “well below” 2°C, in line with [international climate goals](#).

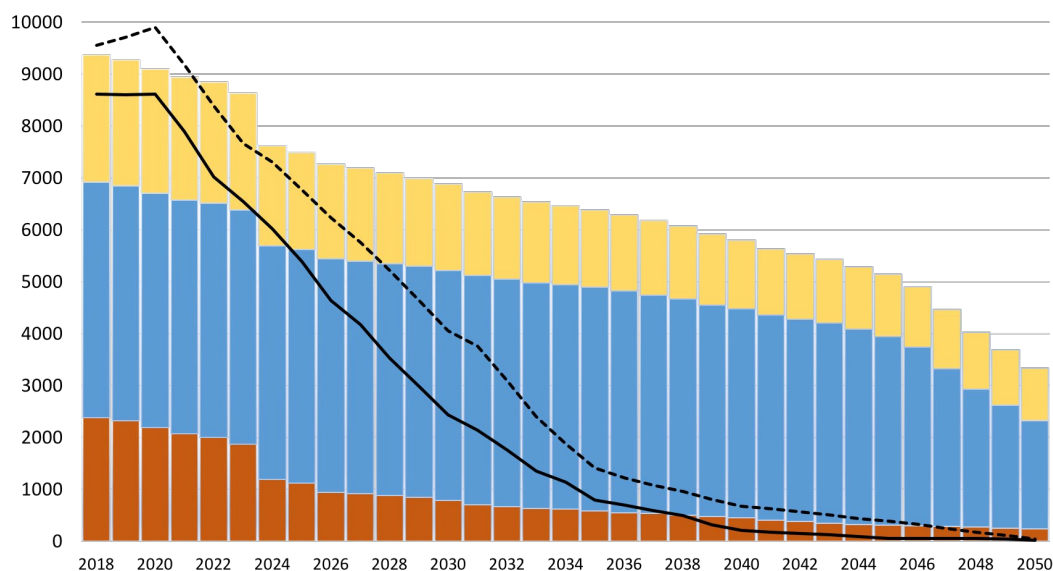
According to a recent [analysis](#) by the UN’s Intergovernmental Panel on Climate Change (IPCC), keeping global warming to 1.5°C requires a 70% reduction in coal power generation by 2030, and a phase out by 2050. Having a better than average chance of holding warming to 2°C requires an over 55% reduction in coal

power generation by 2030, and a near total reduction by 2050.

The figure below shows IPCC estimates on coal power for the [1.5°C and 2°C targets](#)³ against the power produced from all currently operating plants utilized at the global average rate over an average lifetime ([52.8% capacity factor and 40 years](#)). To hold temperatures at 1.5°C or 2°C above pre-industrial levels, coal plant use will have to rapidly decline and retirements accelerate.

Figure 4: Electricity produced from currently operating coal power capacity in the OECD (orange), China (blue), and the rest of the world (yellow) utilized at the current average rate and retired at 40 years of age will exceed the median limits estimated by the IPCC to keep warming to 1.5°C and 2°C (coal power, terawatt-hours).

OECD = orange, China = blue, Other = yellow, 1.5°C = solid line, 2°C = dotted line



3. Median of the 1.5°C scenarios with no to limited overshoot and 2°C scenarios with a 66% probability, without carbon capture and storage.

CHINA ELECTRICITY COUNCIL PROPOSES HUGE COAL CAP INCREASE

From 2000 through 2018, China added 864 GW of new coal power capacity, well over three times the entire coal-fired generating capacity of the US (259 GW). In addition, a permitting decentralization program in effect from late 2014 to early 2016 led to local authorities approving 245 GW of coal power capacity for construction—a three-fold increase from previous levels.

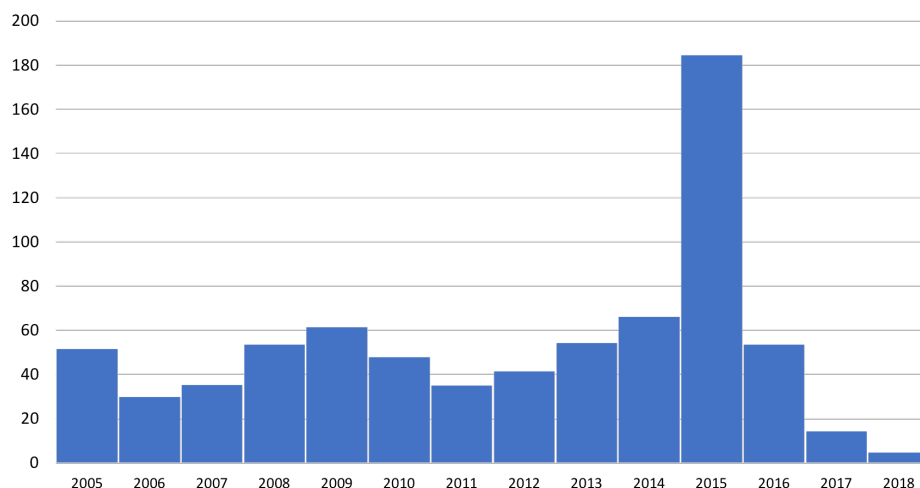
Facing overcapacity, the central government in March 2016 began to restrict the permitting and construction of new coal plants, with exceptions for projects located in impoverished areas and for residential heat and power.

In 2017 the central government listed 170 GW of plants by name for suspension, mainly projects in construction or advanced stages of permitting. One-quarter (44 GW) of the 170 GW of capacity was ordered to slow development, 16% (28 GW) to stop development until issues with permitting and regulations were resolved, and nearly 60% (98 GW) to postpone all development until after 2020. By the end of 2018, satellite imagery and analysis showed development ongoing

at [nearly half](#) (78 GW, or 46%) of the 170 GW of coal plants. It remains to be seen how much of the remaining 54% (92 GW) will also continue development.

However, in what appears to be a potential sign that the central government may not only greenlight all the suspended plants, but also build new ones, the China Electricity Council (CEC) published a March 2019 [report](#) that proposed capping the country's coal power capacity at 1,300 GW in 2030—the first time the 1,300 GW cap has appeared in a semi-official document. The change would allow the country to increase its coal fleet 290 GW above the current level, an amount more than the entire coal power capacity of the US (259 GW).⁴ The proposal signals that the CEC, the industry body representing China's power sector, is pushing for a large, continued expansion of the country's coal fleet. It is unclear how the central government will respond, given its recent efforts to slow the rate of coal plant commissioning and the issuing of new permits, with only 5 GW of new coal capacity green-lighted for construction in 2018, a record low.

Figure 5: Coal-fired capacity permitted for construction in China, before and after authority was transferred from the central government to the provinces from September 2014 to March 2016 (gigawatts).



4. According to the China Electricity Council (CEC), total operating coal power capacity at the end of 2018 was 1,010 GW, about 36 GW higher than the Global Coal Plant Tracker, due to the CEC's inclusion of units smaller than 30 MW.

China's future coal use therefore depends on whether the previously restricted plants from the provincial permitting spree are revived, and how much coal plants are allowed to supplant lower carbon sources of power on the grid, as solar and wind power capacity are also being rapidly added to the country's grid, at a rate [above](#) any other country.

Globally, the future of coal is also largely dependent on China: the country leads the world in funding coal plants and associated projects like mines and ports,

financing [one quarter](#) of all global coal power capacity under development outside China, mainly through its state-owned entities (SOEs).

Combined with its domestic proposals, Chinese financing is behind over 50% of all global coal power capacity currently under development. If the central government were to have its SOEs join the over [100](#) financial organizations transitioning away from coal, the pipeline for new coal plants would potentially be cut in half.

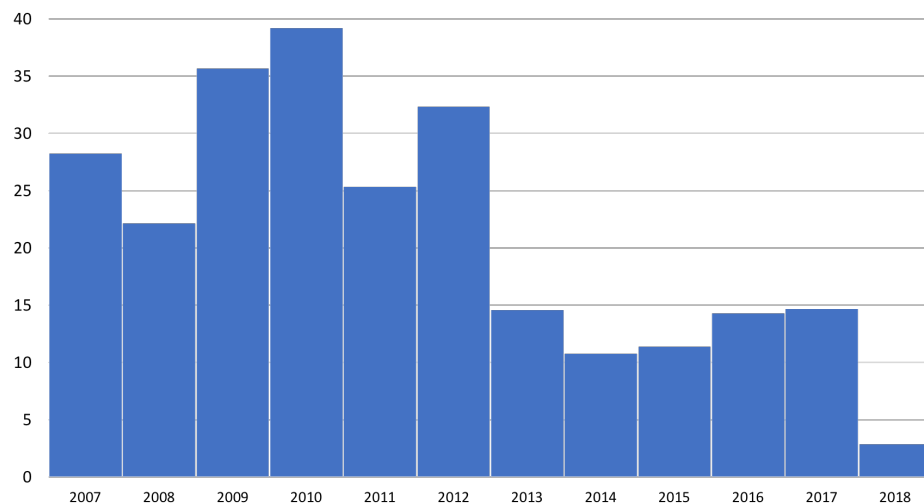
INDIA ADDS MORE SOLAR AND WIND THAN COAL

Like China, India is facing the effects of its own coal plant over-permitting boom, albeit one rooted further back than China's boom.

In 2011 a study by [Prayas Group](#) reported more than 512 GW of proposed new coal plants in India had received at least preliminary approval—five times the size of the country's coal-fired generating capacity at that time. The permitting boom was part of a 2003 privatization push for new coal plants, which included fixed, long-term power purchase agreements (PPAs). Prayas warned that the situation was overheated and would end with “stranded assets of plant and transmission facilities.”

By 2012 it was clear that the coal plant boom was becoming a bubble, and banks and other financial gatekeepers pulled back their support. Facing rising coal prices, decreasing financial support, and often public opposition over land use and pollution, and with limited ability to adjust power prices, many of the coal plant projects were eventually abandoned. By 2013 the amount of new permits fell over 40% from 2012, and by 2015 India had 305 GW of cancelled coal plant projects. In 2017 the only coal plants in India entering construction were sponsored by public companies.

Figure 6: Coal-fired capacity permitted for construction in India soared following a privatization boom, which cooled down from 2013 to 2017, with record low permits in 2018 (gigawatts).



Coal plants in India are now competing with increasingly low tariffs for wind and solar power, with the bids coming in below the operating costs for [nearly one-third](#) of the country's coal plants. Operating costs will only increase as coal plant owners comply with long-impending [pollution restrictions](#). Facing increasing competition, new coal plants are having difficulty securing PPAs and recouping their development costs. The Indian government lists over [40 GW](#) of

the country's coal plants as financially stressed, 10 GW of which are considered beyond saving financially.

In 2018 the country permitted less than 3 GW for construction, compared to an annual average of 31 GW from 2008 to 2012, and 13 GW from 2013 to 2017. For the [second](#) year in a row, India added more solar and wind power capacity in 2018 than thermal power capacity.

APPENDIX

Coal power capacity in development and operating by country (megawatts).

Country	Pre-construction	Construction	All Active Development	Shelved	Operating
China	69,950	128,650	198,600	278,125	973,609
India	57,800	36,158	93,958	87,716	220,670
Vietnam	32,610	9,705	42,315	5,200	17,387
Turkey	36,666	800	37,466	24,554	18,826
Indonesia	15,225	11,466	26,691	16,240	29,047
Bangladesh	18,724	2,640	21,364	10,150	525
Japan	6,584	8,724	15,308	2,000	45,568
South Africa	7,840	6,352	14,192	3,050	42,281
Egypt	13,240	0	13,240	2,000	0
Philippines	9,728	2,890	12,618	3,650	8,273
Pakistan	6,773	3,300	10,073	3,995	3,110
Poland	5,200	4,170	9,370	0	29,625
Mongolia	7,430	1,085	8,515	1,200	831
South Korea	2,100	5,429	7,529	500	37,064
Zimbabwe	4,880	670	5,550	1,200	950
United Arab Emirates	3,000	2,400	5,400	0	0
Russia	4,480	466	4,946	0	47,663
Thailand	3,506	750	4,256	4,070	5,457
Bosnia & Herzegovina	4,080	0	4,080	0	2,073
Cambodia	3,200	150	3,350	0	505
Germany	2,020	1,100	3,120	0	47,105
Brazil	2,566	340	2,906	600	2,804
Malaysia	0	2,600	2,600	0	11,008
Nigeria	2,430	0	2,430	1,000	0
Botswana	1,950	132	2,082	2,104	600
Kenya	2,010	0	2,010	64	0
Tanzania	1,690	0	1,690	200	0
Colombia	1,575	0	1,575	0	1,643
Morocco	0	1,386	1,386	1,320	2,931
Serbia	1,350	0	1,350	0	4,405
Oman	1,200	0	1,200	0	0
Greece	450	660	1,110	0	4,375
Zambia	940	0	940	0	330
Taiwan	0	849	849	1,600	19,007
Mozambique	770	0	770	3,110	0
Czech Republic	110	660	770	0	8,932
Dominican Republic	0	770	770	0	305
Ghana	700	0	700	1,400	0

Coal power capacity in development and operating by country (megawatts) continued.

Country	Pre-construction	Construction	All Active Development	Shelved	Operating
Ukraine	660	0	660	660	21,840
Kazakhstan	0	636	636	0	12,000
Romania	600	0	600	0	5,305
Malawi	520	0	520	2,400	0
Hungary	500	0	500	0	1,024
Swaziland	500	0	500	200	0
Democratic Republic of Congo	500	0	500	0	0
Kosovo	450	0	450	0	1,290
North Macedonia	429	0	429	0	800
Chile	0	375	375	2,135	5,096
Tajikistan	300	0	300	350	400
Georgia	300	0	300	0	0
North Korea	0	200	200	300	3,500
Argentina	0	120	120	0	350
Niger	100	0	100	600	0
Guinea	80	0	80	250	0
Madagascar	60	0	60	0	120
Papua New Guinea	60	0	60	0	0
Honduras	35	0	35	0	70
Myanmar	0	0	0	11,800	160
Laos	0	0	0	1,326	1,878
Ivory Coast	700	0	700	0	0
Montenegro	0	0	0	0	225
United States	0	0	0	895	259,478
Australia	0	0	0	2,516	24,442
United Kingdom	0	0	0	0	12,435
Spain	0	0	0	0	10,601
Canada	0	0	0	0	9,129
Italy	0	0	0	0	9,180
Hong Kong, China	0	0	0	0	6,608
Mexico	0	0	0	0	5,378
Bulgaria	0	0	0	0	4,889
Israel	0	0	0	0	4,900
Netherlands	0	0	0	0	4,837
France	0	0	0	0	3,526
Denmark	0	0	0	0	2,805
Uzbekistan	0	0	0	0	2,522
Finland	0	0	0	0	1,836
Portugal	0	0	0	0	1,978
Moldova	0	0	0	0	1,610
Slovenia	0	0	0	0	1,069

Coal power capacity in development and operating by country (megawatts) continued.

Country	Pre-construction	Construction	All Active Development	Shelved	Operating
Ireland	0	0	0	0	915
Slovakia	0	0	0	0	881
Sri Lanka	0	0	0	1,200	900
Guatemala	0	0	0	0	887
Kyrgyzstan	0	0	0	1,200	945
Austria	0	0	0	0	635
New Zealand	0	0	0	0	500
Croatia	0	0	0	0	210
Sweden	0	0	0	0	252
Mauritius	0	0	0	0	195
Peru	0	0	0	0	135
Namibia	0	0	0	0	120
Reunion	0	0	0	0	0
Syria	0	0	0	0	60
Guadeloupe	0	0	0	0	0
Senegal	0	0	0	600	155
Iran	0	0	0	650	0
Venezuela	0	0	0	1,000	0
Jamaica	0	0	0	0	0
Albania	0	0	0	0	0
Belarus	0	0	0	0	0
Belgium	0	0	0	0	0
El Salvador	0	0	0	0	0
Latvia	0	0	0	0	0
Panama	0	0	0	0	300
Sudan	0	0	0	0	0
Jordan	0	0	0	30	0
Total	338,571	235,633	574,204	483,160	2,015,280
China and India	127,750	164,808	292,558	365,841	1,194,279
Rest of the World	210,821	70,825	281,646	117,319	821,001