Boom and Bust 2016

TRACKING THE GLOBAL COAL PLANT PIPELINE

Christine Shearer, Nicole Ghio, Lauri Myllyvirta, Aiqun Yu, and Ted Nace

ABOUT COALSWARM

CoalSwarm is a global network of researchers seeking to develop collaborative informational resources on coal impacts and alternatives. Current projects include identifying and mapping proposed and existing coal projects worldwide, including plants, mines, and infrastructure.

ABOUT THE SIERRA CLUB

The Sierra Club is America's largest and most influential grassroots environmental organization, with more than 2.4 million members and supporters. In addition to helping people from all backgrounds explore nature and our outdoor heritage, 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.

ABOUT GREENPEACE

Greenpeace uses peaceful protest and creative communication to expose global environmental problems and to promote solutions that are essential to a green and peaceful future. With over 40 associated offices located throughout the world, Greenpeace works to protect our oceans and ancient forests, and to end toxic pollution, global warming, nuclear threats, and genetic engineering. Since 1971, Greenpeace has been the leading voice of the environmental movement by taking a stand against powerful political and corporate interests whose policies put the planet at risk. Greenpeace furthers its mission through research, advocacy, public education, lobbying, and litigation with a staff that includes scientists, lawyers, campaigners, policy experts, and communications specialists.

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 proposed since January 1, 2010. Developed by CoalSwarm, the tracker uses public sources to document each plant and is designed to support longitudinal monitoring. The following people participated in plant-by-plant research: Elena Bixel and Elif Gündüzyeli of CAN Europe, and Bob Burton, Gregor Clark, Joshua Frank, Ted Nace, Christine Shearer, Adrian Wilson, and Aiqun Yu of CoalSwarm. The tracker architect and project manager was Ted Nace. Web/GIS programming was done by Tom Allnutt and Gregor Allensworth of GreenInfo Network, with support from Tim Sinnott of GreenInfo Network.

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COVER

The photograph on the cover shows the smokestack at Eggborough Power Station, a 1,960-megawatt coal-fired power station in North Yorkshire, UK. The plant was built in 1966. In September 2015 plant owner Eggborough Power Ltd announced that the plant might cease operating in March 2016 due to the combined effects of deteriorating economics, carbon taxes, and environmental permitting issues. According to subsequent reports, the National Grid offered the owner a contract for the plant to provide emergency power to the grid during the winter of 2016/17.

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EXECUTIVE SUMMARY

The world has too many coal-fired power plants, yet the power industry continues to build more. While the amount of electricity generated from coal has declined for two years in a row, the industry has ignored this trend and continues to build new coal-fired generating plants at a rapid pace, creating an increasingly severe capacity bubble. The problem of overbuilding is especially severe in China, where the average coal plant is now run less than half the time and the government recently announced plans to halt new coal plant approvals. Worldwide, 338 GW of new coal capacity is in construction and 1,086 GW is in various stages of planning—the equivalent of 1,500 coal plants. The amount of capital potentially wasted on these plants amounts to US$981 billion, or close to one trillion dollars. Meanwhile, as clean, renewable energy becomes more affordable and more accessible, the amount of capital wasted on these unneeded plants will be one and a half times the amount the International Energy Agency estimates could provide electricity to the 1.2 billion people who need it worldwide.

This report provides the results of the survey completed in January 2016 by the Global Coal Plant Tracker. The report provides the following highlights:

- In 2015, actual consumption of coal to generate electricity declined worldwide, led by a drop of 3.6 percent in China.
- Despite the decline in power generation from coal, the global power sector added at least 84 gigawatts (GW) of new coal power capacity in 2015, a 25 percent jump over 2014. Since 2010, 473 GW of coal power capacity has been built globally, of which over 90 percent is in Asia, led by China and India.
- Due to falling use of existing coal plants combined with aggressive building of new ones, plant utilization rates have fallen in all major regions, including a 49.4 percent utilization rate in China, the lowest level since 1969. The Chinese government projects that the utilization rate for thermal power will drop to 45.7 percent in 2016.
- In China, a shift in permitting from central authorities to provincial authorities led to a tripling of plant approvals in the past year. The Chinese government has clearly recognized the problem and is reportedly moving to order 13 provinces and regions to suspend approvals for new coal plants through 2017, and to order 15 provinces and regions to halt the initiation of new construction. The large amount of capacity already under construction across the country, or under development in provinces and regions not covered by the new restrictions, means that without further intervention China's coal power overcapacity will continue ballooning.
- Captive coal-fired power plants serving industrial facilities and built largely outside the official per-

mitting process emerged as a major issue in China. One company in Shandong Province, Shandong Weiqiao group, accounts for 23 GW of such projects, as much as all the coal plants built or under construction in the EU since 2010.

- In India, 11GW of thermal capacity is lying idle. 2015 saw India's first drop in annual installations after continuous growth since 2006, and the drop in 2016 is expected to be even more pronounced. With solar power now cheaper than new coal plants, a significant uptick in new coal plant construction starts appears unlikely.
- Global coal plant retirements are growing, led by retirements in Europe and the United States, but not fast enough to balance out the over-building: worldwide levels of plant retirements are only a fifth the size of new plant building. Europe and the U.S. continue to produce far more carbon dioxide per capita than the global average.
- Even with no further building of coal plants, emissions from current coal plants will still be 150 percent higher than what is consistent with scenarios limiting warming to 2°C—meaning that most operating and new coal-fired plants will have to be phased out well before the end of their planned lifetime.
- Air pollution from coal currently causes an estimated 800,000 premature deaths annually, and planned coal plants would increase such deaths by 130,000 people per year.
- The capital expenditure represented by the proposed coal plant pipeline could be applied toward other goals. Currently the power industry is on track to spend US$981 billion on new coal plants. That level of investment could fully fund the scenario from the International Energy Agency (IEA) to provide electricity for the 1.2 billion people currently lacking access, as well as increase the amount of solar photovoltaic (PV) and wind power installed worldwide by 39 percent.
- Much of today's overbuilding is defended on the claims that newer plants are more efficient than older ones. However, even adding so-called efficient plants is counterproductive because it locks in large, long-lived carbon emitters, interfering with the need to fully decarbonize the power sector by 2040 in order to limit warming to 2°C.

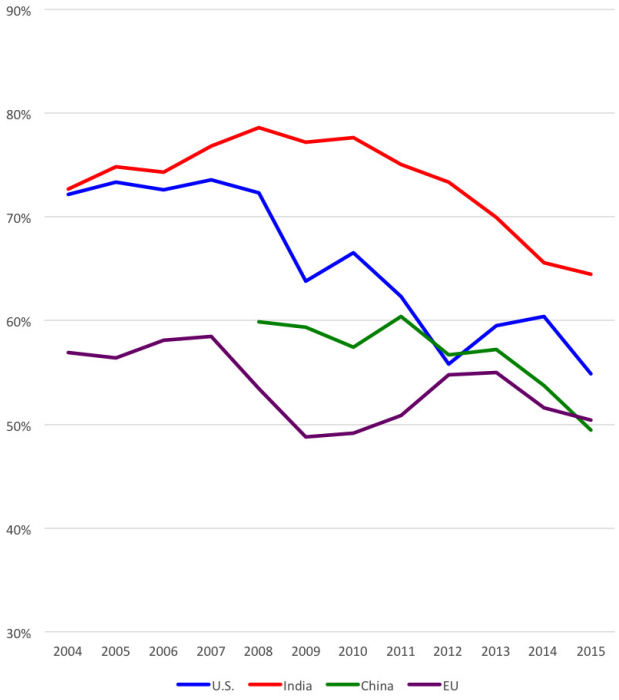
PART I
GLOBAL RESULTS

OVERBUILDING

The world has too many coal-fired power plants, yet the power industry continues to build more. While the amount of electricity generated from coal has declined for two years in a row, the industry has ignored this trend and continues to build new coal-fired generating plants at a rapid pace, creating an increasingly severe capacity bubble. The problem of over-capacity is especially pronounced in China, where the average coal plant is now run at a 49.4 percent rate, less than half its full capacity. Meanwhile, 338 GW of new coal capacity is in construction worldwide, and 1,086 GW is in various stages of planning—the equivalent of 1,500 coal plants. The amount of overspending on these potentially unneeded plants amounts to US$981 billion, or close to one trillion dollars.

As shown in Figure 1, the average coal plant is being used at a lower and lower rate—less than 50 percent of the time in the massively overbuilt Chinese power market, and still going down. Falling utilization rates in coal plants—the percentage of maximum output actually achieved—are symptoms of excess capacity and overbuilding. Yet despite the capacity glut, hundreds more coal plants are in construction and development. This report examines the situation in depth, with discussion of global and country-specific dynamics. Building too many coal plants is a massive diversion of resources away from clean energy technologies that must rapidly be developed if the worst effects of climate change are to be averted. Coal plants are an investment that society can ill afford. Moreover, air pollution from coal combustion is among the leading causes of illness and premature death. Whether viewed from a climate perspective, a public health perspective, or a financial perspective, the implication is clear: rather than building still more coal plants, the time has come to shift resources toward cleaner, safer, and ever cheaper alternatives.

Figure 1: Coal/Thermal Power Plant Utilization



Sources: China National Energy Administration, Eurostat, Indian Environmental Portal, Platts WEPP, U.S. Energy Information Administration

A TALE OF TWO WORLDS

Global coal consumption began falling in 2014 and fell more rapidly in 2015, according to preliminary figures (Greenpeace International 2015). Due to the high greenhouse gas emissions from burning coal, the flattening of coal usage is good news for climate stability. It is also good news for the health of the world's population, since premature deaths caused by fine particulates from coal are estimated at 800,000 annually in the four largest coal-burning economies alone.[1]

Continuing a five-year trend, coal prices fell in 2015, pushing some coal mining companies into bankruptcy, including Alpha Natural Resources and Arch Coal, and others like Peabody Energy and Anglo American towards the brink. Prospects for new proposed mines plus the associated rail and port infrastructure, including the 60 million tonne per annum (Mtpa) Carmichael Mine in Australia and the Millennium Bulk and Gateway Pacific Terminals in Washington, continued to fade as coal companies slashed expansion plans and placed existing assets on the block.

In terms of how power companies and regulators reacted to the decline in coal consumption, 2015 could be termed "A Tale of Two Worlds." As shown in Tables 1 and 2, levels of pre-construction activity and construction activity grew in China while declining elsewhere. The increases in China in the face of shrinking coal usage point toward dysfunction, both in power sector regulation and in capital allocation, as the country continues to approve and finance new coal capacity despite declining output of the current coal plant fleet. The causes of this dysfunction are discussed in Part II of this report.

Outside China, construction activity dropped or remained level in ten out of twelve regions, as shown in Table 3. Besides China, the only region showing

Table 1. Change in the Pre-Construction Coal Plant Pipeline, China versus Rest of the World, 2015–2016 (MW)

	January 2016 (MW)	January 2015 (MW)	Change since January 2015 (MW)
China	515,494	496,330	19,164
Rest of the World	570,257	587,038	−16,781
Total	**1,085,751**	**1,083,368**	**2,383**

Source: Global Coal Plant Tracker, January 2016

Table 2. Change in Coal Power Construction Activity, China versus Rest of the World, 2015–2016 (MW)

	January 2016 (MW)	January 2015 (MW)	Change since January 2015 (MW)
China	193,179	171,520	21,659
Rest of the World	145,279	158,973	−13,694
Total	**338,458**	**330,493**	**7,965**

Source: Global Coal Plant Tracker, January 2016

Table 3. Change in Coal Power Construction Activity by Region, 2015–2016 (MW)

	January 2016 (MW)	January 2015 (MW)	Change since January 2015 (MW)
East Asia	211,290	193,827	17,463
South Asia	73,130	69,471	3,659
SE Asia	26,055	28,934	−2,879
Middle East and North Africa	2,036	2,036	0
Southern Africa	9,043	10,128	−1,085
Other Africa	0	600	−600
Australia	0	0	0
Latin America	2,702	3,275	−573
US/Canada	582	1,430	−848
Eurasia	1,700	2,690	−990
EU28	8,655	12,767	−4,112
Non-EU Europe (incl Turkey)	3,265	5,335	−2,070
Total	**338,458**	**330,493**	**7,965**

Source: Global Coal Plant Tracker, January 2016

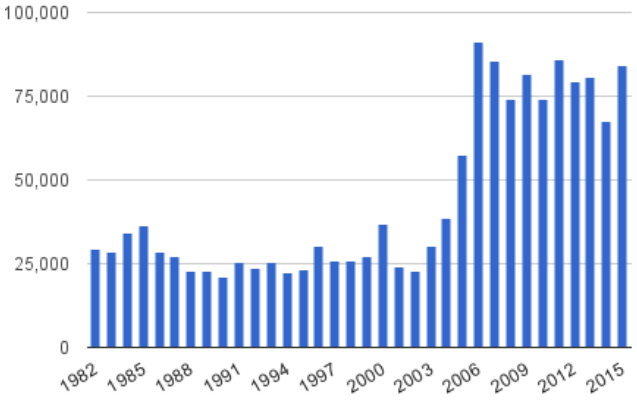
1. China: 670,000 premature deaths annually (Abrams 2014); India: 80,000–115,000 (Goenka and Guttikunda 2013); United States: 13,200 (Schneider and Banks 2010); European Union plus Serbia and Turkey: 23,300 (Jensen 2013).

increased construction activity in 2015 was South Asia, where resolution of the Coalgate scandal caused the reactivation of a number of stalled projects in India.

Figures 2 and 3 allow the current global coal plant pipeline to be evaluated in the context of longer-term trends. Prior to 2006, the pace of global coal plant building was 20 to 25 GW per year; it then tripled to over 75 GW a year as China aggressively added capacity. A downturn in new coal power capacity in 2014, accompanied by a decrease in global coal consumption and steady growth in coal plant retirements, gave room for optimism that the bubble in coal plant capacity that had characterized the period since 2006 was coming to an end.

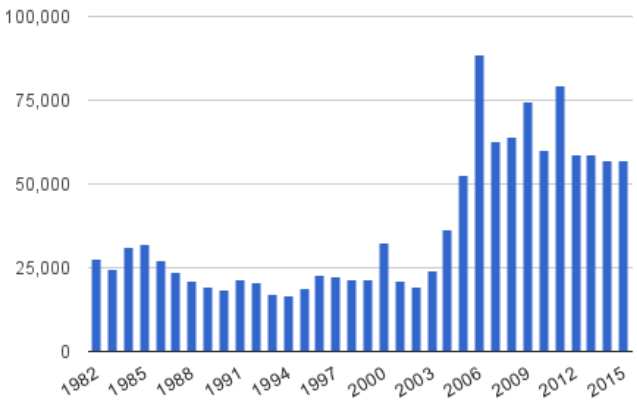
The upswing in new plant capacity in 2015 appears to contradict such optimism. However, with both pre-construction and construction activity shrinking in most regions, there is good reason to expect a downswing in new coal plants in future years outside China. Within China, the central government has reportedly ordered provincial governments to suspend new approvals in 13 provinces and regions through 2017, and to halt initiation of new construction in 15 provinces and regions. This is an important step that, according to an analysis based on the Global Coal Plant Tracker data, could see up to 183 GW of new projects suspended, and signal that the problem is being tackled. However, the large amount of capacity already under construction across the country, or under development in provinces and regions not covered by the new restrictions, means that much more stringent measures will be needed to stop the ballooning over capacity. Average coal plant utilization rates in China have fallen from a high of 60 percent in 2011 to just 49.4 percent in 2015, and the Chinese government projects that utilization rates will fall to 45.7 percent (China Electricity Council 2016). China is effectively adding more than one redundant coal power plant each week.

Figure 2. New Coal Power Worldwide, 1982–2015 (MW)



Source: Platts WEPP (1982–2009), Global Coal Plant Tracker (2010–2015). Figures for 2015 preliminary

Figure 3. New Coal Power Worldwide, Net Retirements, 1982–2015 (MW)



Sources: 1982–2009, Platts WEPP, December 2015; 2010–2015, Global Coal Plant Tracker, January 2016, and Sierra Club. Figures for 2015 preliminary.

REGIONAL DISTRIBUTION

As shown in Table 4, since 2010 coal plants have been built in 33 countries, but only eight countries have added more than 2,000 MW of capacity. Just two countries, China and India, account for 85 percent of all new coal capacity.

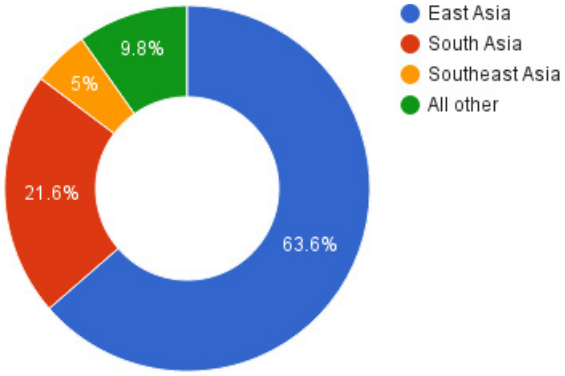
Table 4. New Coal Power by Country, 2010–2015 (MW)

Country/Region	2010	2011	2012	2013	2014	2015 (preliminary)	Total 2010–2015
China	52,955	60,270	48,368	51,697	35,640	49,045	297,975
India	10,451	15,039	17,222	17,975	21,323	19,205	101,215
United States	6,468	4,253	3,953	1,813	106	0	16,593
Indonesia	330	3,140	3,940	1,859	900	1,626	11,795
Germany	0	0	2,875	1,600	1,710	3,472	9,657
Vietnam	0	930	300	1,040	2,744	3,134	8,148
Turkey	1,390	600	0	328	950	1,470	4,738
Chile	267	709	905	270	0	0	2,151
Japan	0	0	0	1,850	0	0	1,850
Russia	0	0	423	0	361	1,025	1,809
Brazil	350	0	365	1,090	0	0	1,805
South Korea	0	0	0	0	1,740	0	1,740
Netherlands	0	0	0	0	0	1,600	1,600
South Africa	225	100	100	225	100	795	1,545
Italy	1,320	0	0	0	0	0	1,320
Philippines	103	103	0	600	0	285	1,091
Malaysia	0	0	0	0	0	1,080	1,080
Poland	0	858	0	0	0	0	858
Morocco	0	0	0	0	700	0	700
Bulgaria	0	670	0	0	0	0	670
Thailand	0	0	660	0	0	0	660
Mexico	651	0	0	0	0	0	651
Laos	0	0	0	0	0	626	626
Canada	0	495	0	0	115	0	610
Sri Lanka	0	0	0	0	600	0	600
Botswana	0	0	0	300	300	0	600
Slovenia	0	0	0	0	0	600	600
Colombia	0	0	0	0	0	164	164
Kazakhstan	0	150	0	0	0	0	150
Czech Republic	0	0	0	0	135	0	135
Argentina	0	0	0	0	0	120	120
Cambodia	0	0	0	0	100	0	100
Guatemala	0	0	60	0	0	0	60
World Total	**74,510**	**87,317**	**79,171**	**80,647**	**67,524**	**84,247**	**473,416**

Source: Global Coal Plant Tracker, January 2016

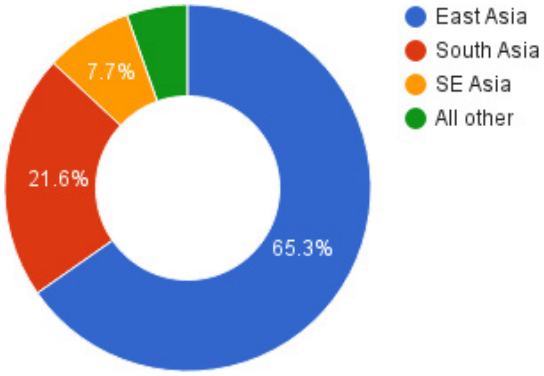
As shown in Figure 4, over 90 percent of coal capacity built since January 1, 2010 has been in Asia, with East Asia accounting for 63.6 percent of the total, followed by South Asia with 21.6 percent and Southeast Asia with 5 percent. For plants in construction, as shown in Figure 5, East Asia accounts for an even larger share: 65.3 percent of the total, followed by South Asia with 21.6 percent and Southeast Asia with 7.7 percent. All other regions combined account for only 5.4 percent of projects under construction. As shown in Figure 6, for coal projects in the pre-construction phase, East Asia continues to dominate with 51 percent of projects, with South Asia accounting for 23.7 percent, Southeast Asia rising to 10.6 percent, and all other regions 14.7 percent.

Figure 4. Regional Distribution of New Coal Power Capacity, 2010–2015



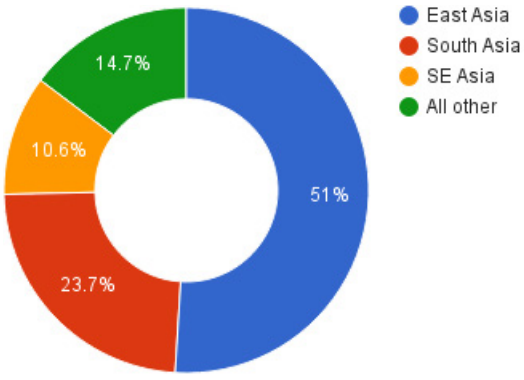
Source: Global Coal Plant Tracker, January 2016

Figure 5. Regional Distribution of Coal Power Capacity in the Construction Phase, January 2016



Source: Global Coal Plant Tracker, January 2016

Figure 6. Regional Distribution of Coal Power Capacity in the Pre-Construction Phase, January 2016



Source: Global Coal Plant Tracker, January 2016

As shown in Table 5, of the top 30 entities building power plants since the beginning of 2010, 25 are Chinese provinces and autonomous regions or Indian states. Chinese provinces and autonomous regions occupy the top seven positions.

Table 5. Top 30 Locations of Completed Coal Power, 2010–2015 (MW)

Rank	Entity	New Coal Power Capacity 2010–2015
1	Xinjiang Uyghur Autonomous Region (China)	32,655
2	Shandong Province (China)	28,438
3	Jiangsu Province (China)	25,160
4	Guangdong Province (China)	22,012
5	Henan Province (China)	19,090
6	Shanxi Province (China)	18,150
7	Inner Mongolia Autonomous Region (China)	17,890
8	**United States**	16,593
9	Anhui Province (China)	16,100
10	**EU28**	14,840
11	Maharashtra State (India)	14,004
12	Zhejiang Province (China)	13,840
13	Chhattisgarh State (India)	12,455
14	**Indonesia**	11,795
15	Madhya Pradesh State (India)	11,080
16	Gujarat State (India)	11,040
17	**Germany**	9,657
18	Hebei Province (China)	9,390
19	Guizhou Province (China)	9,340
20	**Vietnam**	8,148
21	Ningxia Hui Autonomous Region (China)	7,980
22	Tamil Nadu State (India)	7,463
23	Hubei Province (China)	7,400
24	Fujian Province (China)	7,360
25	Shaanxi Province (China)	7,300
26	Uttar Pradesh State (India)	7,200
27	Odisha State (India)	7,090
28	Liaoning Province (China)	6,720
29	Gansu Province (China)	6,600
30	Jilin Province (China)	6,540

Source: Global Coal Plant Tracker, January 2016

Tables 6 and 7 show the full regional breakdown of the proposed coal plant pipeline by category and by number of units. Note: Status categories for plants are defined in Appendix A, "About the Global Coal Plant Tracker."

Table 6. Proposed Coal Power by Region, January 2016 (MW)

Region	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating 2015
East Asia	261,942	232,523	58,982	553,447	211,290	68,535	49,045
South Asia	87,677	105,295	64,037	257,009	73,130	91,465	19,205
SE Asia	55,008	39,882	20,510	115,400	26,055	10,585	6,751
EU28	5,000	5,656	1,160	11,816	8,655	17,993	5,672
non-EU Europe	36,879	31,729	6,795	75,403	3,265	15,601	1,470
Africa and Middle East	23,865	10,675	8,613	43,153	11,079	10,220	795
Latin America	2,600	440	4,713	7,753	2,702	4,025	284
Eurasia	11,450	1,750	3,020	16,220	1,700	5,910	1,025
Canada/US	0	2,460	400	2,860	582	325	0
Australia	1,640	1,050	0	2,690	0	4,966	0
Total	**486,061**	**431,460**	**168,230**	**1,085,751**	**338,458**	**229,625**	**84,247**

Source: Global Coal Plant Tracker, January 2016

Table 7. Proposed Coal Power by Region, January 2016 (Generating Units)

Region	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating 2015
East Asia	378	383	112	873	390	90	94
South Asia	96	172	108	376	144	137	42
SE Asia	95	84	41	220	92	22	19
EU28	3	9	2	14	12	30	7
non-EU Europe	38	54	14	106	12	28	4
Africa and Middle East	39	33	40	112	17	18	1
Latin America	7	3	13	23	12	11	2
Eurasia	11	4	9	24	10	19	2
Canada/US	0	6	1	7	1	1	0
Australia	5	2	0	7	0	10	0
Total	**672**	**750**	**340**	**3,007**	**690**	**366**	**171**

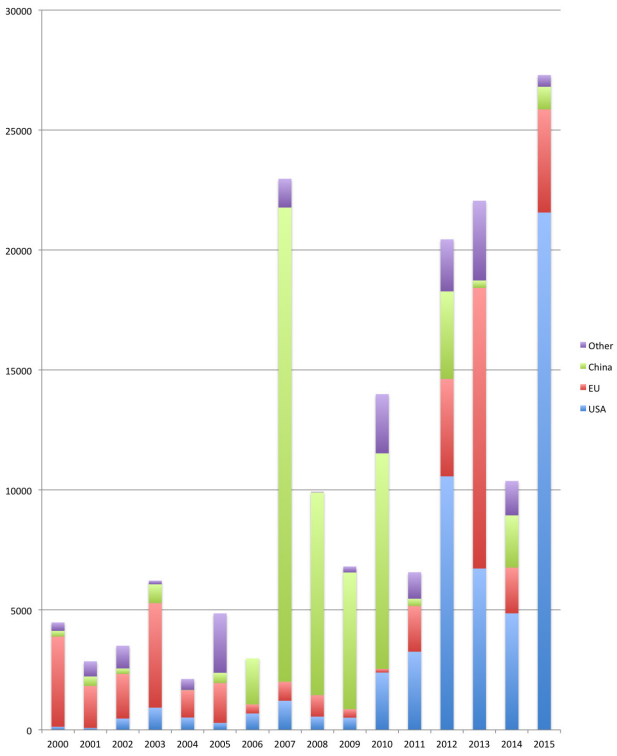
Source: Global Coal Plant Tracker, January 2016

RETIREMENTS

As shown in Figure 7, coal plant retirements worldwide remained under 5 GW annually until 2007, when large amounts of older capacity began to be retired in China under the Small Plant Replacement Policy. The policy linked the building of larger, more efficient plants to the closure of smaller, less efficient ones. The main impact of the program was from 2007 to 2010. Since 2011, retirements in the U.S. and the EU have dominated the global total.

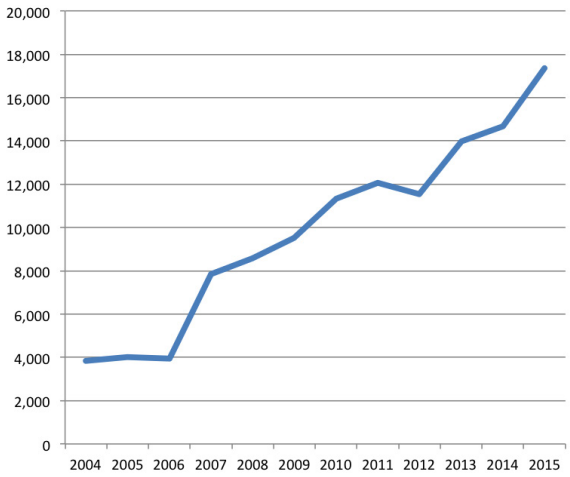
From the standpoint of near-term greenhouse gas emissions, replacing inefficient older plants with more efficient newer plants may appear to be beneficial. However, as shown by "commitment accounting" studies that estimate the lifetime emissions of energy infrastructure, larger and newer plants actually contain a greater amount of committed emissions over their lifetimes than smaller, older plants (Davis and Socolow 2014). For that reason, replacement of older, less-efficient capacity with newer, more-efficient capacity should not be seen as a climate solution. Rather, it locks in a carbon emissions trajectory that is inconsistent with the 2°C commitments made at COP21 in Paris.

Figure 7. Global Coal Power Retirements, 2000–2015 (MW)



Source: Platts WEPP, December 2015. (Figures for 2015 preliminary.)

Figure 8. Global Coal Power Retirements, Five-Year Moving Average, 2004–2015 (MW)



Source: Platts WEPP, December 2015. (Figures for 2015 preliminary.)

IMPLEMENTATION RATE

To monitor the coal plant pipeline, the Global Coal Plant Tracker includes retrospective data on the outcomes of coal projects under development from 2010 through 2015. During that period, 813 GW of capacity entered construction or was completed, while 886 GW was either shelved or cancelled.

Based on those worldwide figures, it appears that the typical coal plant proposal has a roughly even chance of being implemented. However, the global average masks considerable regional differences. In East Asia, 32 percent of coal plant proposals are halted. Outside East Asia, those odds are reversed: 68 percent of coal plant proposals are halted.

Table 8. Outcome of Coal Power in the Developmental Pipeline, All Regions, 2010–2015 (MW)

Region	Halted (Shelved or Cancelled)	Implemented (In Construction or Operating)	Percent halted
East Asia	236,870	512,855	32%
South Asia	405,840	175,605	70%
SE Asia	38,560	49,555	44%
EU28	89,109	23,495	79%
non-EU Europe	34,362	8,003	81%
Africa and Middle East	20,905	13,924	60%
Latin America	17,460	7,653	70%
Eurasia	11,910	3,659	76%
Canada/US	25,726	17,785	59%
Australia	4,966	0	100%
World Total	**885,708**	**812,534**	**52%**

Source: Global Coal Plant Tracker, January 2016

Table 9. Outcome of Coal Power Proposals in the Developmental Pipeline, East Asia versus Rest of the World, 2010–2015 (MW)

	Halted (Shelved or Cancelled)	Implemented (In Construction or Operating)	Percent halted
East Asia	236,870	512,855	32%
ROTW	648,838	299,679	68%
World Total	**885,708**	**812,534**	**52%**

Source: Global Coal Plant Tracker, January 2016

FINANCE

Economics and the international divestment movement have pushed private capital away from fossil fuels. Big banks including Citibank, Natixis, and Crédit Agricole are reducing their exposure to or even ending support for coal (Terre 2015). Activists have successfully pushed institutions to reject specific big projects, like Adani's proposed Carmichael Coal Project in Australia's Galilee Basin, bringing the future of these proposals into question. Garnering less attention, however, are the seismic shifts in public finance for coal.

It generally started in June 2013, when United States President Barack Obama announced an end to financing for overseas coal-fired power plants in all but the world's poorest countries when no alternative exists (Drajem 2013). This was the first in a series of countries and publicly funded financial institutions ending support for overseas coal except in rare circumstances, including the World Bank, the European Investment Bank, the European Bank for Reconstruction and Development, the Nordic countries, the United Kingdom, the Netherlands, Germany, and France (Ghio 2015a).

The importance of these commitments cannot be overstated, especially when we consider that between 2007 and 2014 Germany and the United States were ranked the fourth and fifth largest supporters of overseas coal worldwide (Bast et al. 2015). In June 2015 the Norwegian parliament voted to divest the country's US$900 billion pension fund, the world's largest sovereign wealth fund, from coal (Carrington 2015). And in September, the US and China issued a joint statement in which China pledged to curb support for carbon-intensive projects along the lines of the US ban (White House 2015). While the details and policy implications of the January 2016 new Chinese policy to close 1,000 Mtpa of coal mining capacity over the next three years are still unclear, this commitment from the world's second largest financier of overseas coal removed any excuse other countries might have not to act.

Riding the global momentum, the world's wealthiest countries—the members of the Organization for Economic Co-operation and Development (OECD)—agreed in November to limit export credit agency support for coal (Sink and Nussbaum 2015). The OECD deal covers finance provided under the *Arrangement on Officially Supported Export Credits*, an agreement that limits the subsidies that participating countries can provide to their exporters. It does not allow support for subcritical coal units above 300 MW in even the world's poorest countries, but it will allow finance for supercritical units 500 MW or below in International Development Agency–eligible countries and for ultra-supercritical in all countries. According to the OECD statement, "Over two-thirds of the coal-fired power projects receiving official export credit support from participants between 2003 and 2013 would not have been eligible for such support under the new rules." (OECD 2015)

The agreement does not cover public support provided outside of the Arrangement, such as unsubsidized funding by state-owned banks. This support can include market window export credits, untied export credits, untied export credit insurance, and political risk guarantees or insurance (Oil Change International 2015). There is particular concern that Japan may attempt to continue supporting overseas coal using non-Arrangement finance, which made up 36.6 percent of Japanese support for overseas coal from 2009 to 2013.

These new restrictions will not enter into force until 2017, and they are not as strong as many of the domestic commitments from individual countries, but they are historic nonetheless. Together with the US-China announcement, in less than one year there will be limits on the use of officially supported export credit financing by the world's top overseas coal backers.

Furthermore, countries such as Japan will face scrutiny if they choose to ignore either the spirit or the letter of the agreement. EU officials already warned Japan that its support for overseas coal could be "unsustainable" ahead of the OECD deal (*Japan Times* 2015), and the Paris agreement enshrines the goal of "making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development." Meanwhile, groups from countries facing proposed coal-fired power plants are speaking out. This includes frontline communities in Myanmar that traveled to Tokyo to urge Japan to reject coal projects in their country, and a state-sanctioned, independent Human Rights Commission in Indonesia, which warned of human rights violations at the Japan-backed Batang coal plant in Central Java. Additionally, Japanese claims that exporting "high efficiency" coal plants will help to displace less efficient plants, leading to a net positive for the climate, have been debunked by new data showing that Japanese-backed coal plants were no more efficient than the worldwide average and that China is already exporting the same technology (Kiko Network et al. 2015). Analysis also shows that replacing less efficient plants with new high-efficiency plants, while it can lead to a short-term reduction in carbon emissions, can lead in the long term to increased carbon emissions by delaying the ultimate replacement of coal power with clean power solutions such as wind and solar power (Davis and Socolow 2014). These forces are only growing in strength, and should Japan or any OECD country attempt to circumvent the agreement, it could find itself isolated in the international community.

HEALTH IMPACTS

Air pollution is the biggest environmental health risk in the world, leading to an estimated 5.5 million premature deaths in 2013 (Amos 2016). It increases the risk of lung cancer, stroke, heart disease, and chronic respiratory disease—the most common causes of death in most countries. Emissions from coal-fired power plants contribute to all major health-damaging air pollutants, with the largest impacts generally resulting from the formation of particulate matter (PM) 2.5 particles from the power plants' sulfur dioxide and nitrous oxide emissions. In most countries coal-fired power plants are the biggest source of toxic mercury emissions, as well as one of the largest sources of nitrogen oxides, coal dust, and soot.

Research by the Natural Resources Defence Council and Tsinghua University found that coal burning was responsible for 670,000 premature deaths in China in 2012, or approximately 60 percent of the overall death toll attributed to air pollution (NRDC and Tsinghua University 2015). Other studies have estimated premature deaths from coal pollution at 80,000–115,000 in India (Goenka and Guttikunda 2013), 13,200 in the United States (Schneider and Banks 2010), and 23,300 in the European Union plus Serbia and Turkey (Jensen 2013).

As shown in Table 10, a compilation of studies on the health impacts in 35 countries of new coal-fired power plants finds they could be responsible for approximately 130,000 premature deaths for every year of operation, if completed. This could mean approximately 5 million premature deaths over an average operating life of 40 years, unless more effective emission controls are retrofitted after commissioning. All of the studies assumed that new coal-fired units comply with national emission standards for new plants.

This compilation of projected health impacts is intended as indicative, as different studies rely on different underlying epidemiological data and other methodological choices and cannot be directly compared. In any case, the results of these studies do, at the very least, give an indication of what could be at stake from a public health perspective.

Air pollution is among the biggest financial and regulatory hurdles to the coal industry. From giving rise to coal consumption caps and bans on increased coal-fired capacity in China, to driving dozens of gigawatts of retirements in the U.S. and EU, and intensifying public resistance to coal projects across the world, air pollution is already one of the most important factors shaping the future of the coal industry.

While all coal-fired power plants cause death and disease through their emissions, Southeast Asia is of particular concern due to the large power plant pipeline but very lax emission standards—all Southeast Asian countries allow new coal-fired power plants to emit 5–10 times more of the major air pollutants than China, the U.S., and the EU. India recently passed new air emission norms that should be implemented by the end of 2017.

Coal also has large impacts on water quality and health. Coal mining and washing, power generation from coal, industrial use of coal, and disposal of coal ash all consume and contaminate vast amounts of water, resulting in very significant but largely unquantified damage to human health and ecosystems.

Table 10. Compilation of Studies on Projected Premature Deaths Caused by Air Pollution from Planned Coal-Fired Power Plants

Country	Projected premature deaths per year of operation	Study
India, all new coal power projects	Without flue gas desulphurization: 74,000–104,000. Assuming desulphurization in all plants: 35,000–65,000.	Coal Kills: Health Impacts of Air Pollution from India's Coal Power Expansion (Conservation Action Trust and Urban Emissions 2014)
China, coal power plants permitted in Jan–Sep 2015	6,100	Is China Doubling Down on its Coal Power Bubble? (Myllyvirta et al. 2015)
China, all new coal power projects	32,000	China's Coal Rush Faces Conundrum (Greenpeace East Asia 2013)
Vietnam, all new coal power projects	21,000	Burden of Disease from Rising Coal Emissions in Vietnam (Koplitz et al. 2015)
Indonesia, all new coal power projects	19,000	The Human Cost of Coal (Greenpeace Southeast Asia 2015)
Thailand, all new coal power projects	3,800	Cost of living: Coal power plant with a threat to the health of Thailand (Greenpeace Southeast Asia 2015)
Philippines, all new coal power projects	2,400	Coal: A Public Health Crisis (Greenpeace Southeast Asia 2016)
Turkey, all new coal power projects	3,100	Silent Killers: Why Turkey Must Replace Coal Power Projects (Myllyvirta 2014)
European Union, all new coal power projects	2,900	Silent Killers: Why Europe Must Replace Coal Power with Green Energy (Greenpeace International 2013)
Total	**130,000**	

CLIMATE IMPACTS

In December 2015, Climate Action Tracker (CAT) prepared an analysis of proposed and existing coal plants, based on the Global Coal Plant Tracker (CAT 2015a). With respect to further construction of coal plants, the findings were stark: if we are to avoid the worst effects of climate change, further construction of coal plants must be avoided, and existing plants must be phased out by mid-century.

Coal's impact on the climate is important because coal burning is estimated to be the largest source of global carbon dioxide (CO_2) emissions in the world, making up 42 percent of the 35.9 billion tonnes (gigatonnes [Gt]) of CO_2 emitted by fossil fuels in 2014, according to the Global Carbon Budget (2015). That year coal made up 41 percent of global electricity use (IEA 2015a).

The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) suggested that for a 50 percent chance of avoiding more than a 2°C global temperature rise above pre-industrial levels, CO_2 emissions between 2011 and 2050 should be limited to 870 to 1,240 Gt (McGlade and Elkins 2015). Of this number, the world's existing infrastructure (power plants, cars, industrial facilities, etc.) is already estimated to emit 729 Gt CO_2 over its lifespan, unless decommissioned early (Raupach et al. 2014)—leaving a remaining "carbon budget" of only 141 to 511 Gt.

According to most AR5 scenarios for achieving the median amount of CO_2 emissions consistent with 2°C, no further coal capacity is added (CAT 2015a).

In addition, existing coal-fired power without carbon capture and storage (CCS) begins declining by 2020, with two-thirds of the current global coal fleet offline by 2030, and phased out completely by 2050. In 1.5°C scenarios, regarded as safer for preventing the worst effects of climate change, the decline in power production from coal is slightly faster, with nearly all plants retired by 2040. Both the median 2°C and 1.5°C scenarios require cancellation of coal plants currently under construction (CAT 2015a).

According to CAT, even with no new coal plant construction, emissions from coal-fired power generation in 2030 would still be 150 percent higher than what is consistent with scenarios limiting warming to below 2°C (CAT 2015a). Additionally, researchers have estimated that 80 percent of global coal reserves must stay in the ground to avoid runaway warming (McGlade and Elkins 2015, Jakob and Hilaire 2015).

As part of the global effort to limit warming, countries submit their Intended Nationally Determined Contributions (INDCs), consisting of their proposed policies to lower greenhouse gas emissions over time. On its website, CAT has determined that many INDCs are inadequate to prevent runaway global warming. Using country-specific data from the Global Coal Plant Tracker, CAT (2015a) also found that for nine countries with inadequate INDCs, coal plant proposals would add additional emissions of around 1.5 Gt CO_2 per year, on top of the projected emissions from their INDCs. In short, the proposed plants are incompatible with the nine countries' current climate commitments.

As shown in Table 11, coal capacity currently under construction will add nearly 58 Gt CO_2 over a 40-year plant lifetime. This is an increase from the 49 Gt CO_2 estimated for construction in January 2015 (Shearer et al. 2015), partly due to the recent CoalSwarm discovery of years-old construction in China, much of it unpermitted. The remaining proposals (Announced, Pre-Permit Development, and Permitted) would add an additional 186 Gt CO_2 over a 40-year plant lifetime, although it is not likely they would all be built. If they were, emissions from proposed and constructed plants combined would be 245 Gt CO_2, pushing the planet well within the remaining carbon budget of 141 to 511 Gt—without accounting for future investments in oil or natural gas.

High-efficiency coal combustion has been touted as a way to lower CO_2 emissions from the coal sector. CoalSwarm tallied the emissions if all currently proposed subcritical and supercritical plants were replaced with ultra-supercritical technology, assuming the high end of the IEA's range for ultra-supercritical plants, or 46 percent gross LHV efficiency (IEA 2014b). The result was lifetime CO_2 emissions growth of 158.1 Gt for the high-efficiency scenario compared to 186.5 Gt emissions growth for the status quo scenario, or a reduction in total CO_2 emissions of 15 percent. Such a marginal reduction in the level of increase would not be sufficient to achieve the levels of decarbonization outlined by Climate Action Tracker, which calls for actual reductions in emissions rather than slower growth (CAT 2015a). This result shows that efforts aimed at promoting high-efficiency coal plants as a solution to the climate change crisis are misplaced: rather than building new coal plants, even highly efficient ones, providers of future electric generating capacity should deploy low-carbon options such as wind and solar.

Table 11. Lifetime CO_2 Output of Proposed Global Power: Regional Totals (Million Tonnes)

Region	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction
East Asia	44,532	39,282	10,052	93,866	35,707
South Asia	15,349	18,718	11,434	45,502	12,964
SE Asia	9,511	6,874	3,570	19,955	4,577
EU28	579	749	197	1,525	1,443
non-EU Europe	6,497	5,442	1,169	13,108	572
Africa and Middle East	4,102	1,859	1,485	7,445	1,842
Latin America	448	76	815	1,339	468
Eurasia	2,031	287	522	2,840	294
Canada/US	0	342	60	402	88
Australia	282	181	0	463	0
Total	**83,330**	**73,810**	**29,305**	**186,445**	**57,956**

Source: Global Coal Plant Tracker, January 2016

Note: Assumes 40 year plant lifetimes. Parameters for estimating CO_2 emissions can be found here.

COSTS AND ALTERNATIVES

What is the cost of building large numbers of new coal plants? What goals could be accomplished if all or part of the capital outlays for such plants were channeled toward other goals? The worldwide drop in coal consumption for power generation and rapidly falling utilization rates for coal plants provide an opportunity to assess such costs and to consider the possibility of different goals: (1) extending energy access to 1.2 billion people who currently lack electricity, (2) accelerating the transition away from carbon-intensive coal toward clean power sources.

Such questions are all the more compelling in light of the global consensus reached in Paris in 2015 to urgently address the climate crisis. As reported by Climate Action Tracker, further building of coal plants is incompatible with avoiding global warming above 2°C. Even with no new coal plant construction, emissions from coal-fired power generation in 2030 would still be 150 percent higher than what is consistent with scenarios limiting warming to below 2°C (CAT 2015a).

Our estimate of the costs of the coal pipeline begins with the assumption that status quo conditions continue: i.e. that the implementation rates for proposed plants observed from 2010 through 2015 will continue to apply in future years. Based on that status quo assumption, it is projected that an additional 854 GW of capacity would be built, as shown in Table 12. As for the cost of that capacity, US$981 billion, our figure for each global region is based on the IEA's estimated costs for that region, adjusted for inflation and prorated according to the share of each combustion technology's shares in the region. (IEA 2014b, CoalSwarm 2016).

Table 12. Estimated Cost of New Proposed Coal Plants, Assuming Continuation of 2010–2015 Implementation Rates

Region	Construction	Pre-Construction	Implementation Rate	Projected New Capacity	US$/kW	Cost (Billion $US)
East Asia	211	553	68%	590	915	540
South Asia	73	257	30%	151	1,290	194
SE Asia	26	115	56%	91	1,290	117
EU28	9	12	21%	11	2,134	24
non-EU Europe	3	75	19%	18	2,134	37
Africa and Middle East	11	36	40%	25	1,736	44
Latin America	3	8	30%	5	1,702	9
Eurasia	2	16	24%	6	2,134	12
Canada/US	1	3	39%	2	2,242	4
Australia	0	3	0%	0	2,134	0
World Total	**338**	**1079**		**854**		**981**

Source: Global Coal Plant Tracker, January 2016.

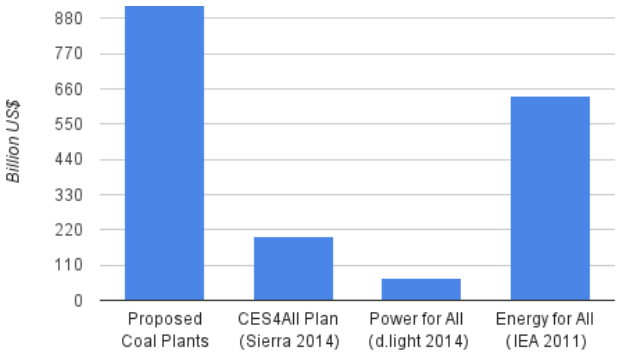
Extending Energy Access

Rather than being channeled toward building more coal plants in a market where current capacity is underutilized, the vast capital expenditure required to build the coal plants in the proposed coal plant pipeline (US$981 billion) could serve other purposes, such as supplying power to the 1.2 billion people who currently lack access to electricity. Among the proposals that have been developed to fill this gap by 2030 or sooner, costs range from US$70 billion to US$640 billion. The amount of potentially wasted finance for the proposed coal plant pipeline is one and a half times the amount of even the most costly option outlined below:

- **"Energy for All" case, in the IEA's 2011 World Energy Outlook:** This case, which estimated the cost of providing universal energy access by 2030, involves more than half of new investments going towards mini-grid and off-grid solutions (IEA 2011).
- **Clean Energy Services for All: Financing Universal Electrification report, Sierra Club, 2014:** This analysis challenged the high cost of the IEA's "Energy for All" study, incorporating rapidly falling photovoltaic (PV) solar costs and high-efficiency lighting and appliances. It estimated the cost of providing those currently lacking electricity with lighting, television, and medium power appliances (Crane et al. 2014).
- **Power for All Plan, d.light, 2014:** This plan uses a "leapfrog the grid" approach that uses the rapid diffusion of cell phones into non-electrified areas as a model for accelerating the introduction of solar technology to those currently lacking electricity. It assumes a solar home system costing approximately US$300, delivering the functional equivalent of 250 kWh per household (d.light 2014).

Figure 9 compares the estimated cost of capacity in the current proposed coal pipeline, assuming current implementation rates, to the costs of various energy access proposals. As shown in the figure, the cost of the proposed coal pipeline dwarfs the estimated cost of providing clean energy access to those currently unserved.

Figure 9. Comparing Cost of Coal Pipeline to Proposals for Providing Electricity to 1.2 Billion People



Accelerating the Clean Energy Transition

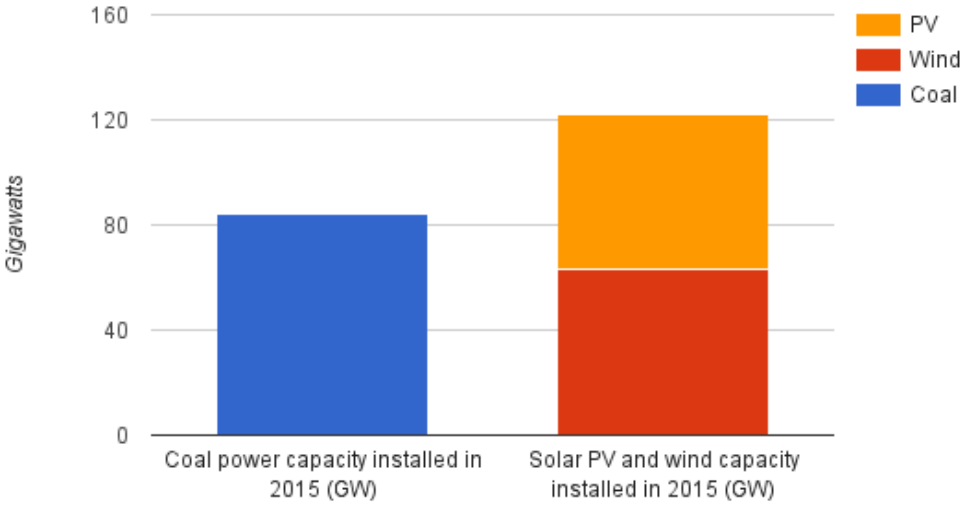
Both wind power and photovoltaic (PV) power are now cost-competitive with new coal capacity in most regions. In the United States, new wind power is estimated to cost US$32 per MWh, versus US$65 per MWh for new coal power (Lazard 2015). After competitive bidding in India, multiple contracts for PV power were signed in late 2015 and early 2016 at INR 4,780/MWh or less, the equivalent of US$70–$75/MWh, and fixed flat for 25 years—i.e. equivalent to a 5 percent annual decline in real local currency terms (Kenning 2016).

Given such favorable costs, combined global installations of wind and PV power now exceed installations of coal power, as shown in Figure 10. Installations of wind power in 2015 were 63 GW, according to the Global Wind Energy Council (Global Wind Energy Council 2016). Installations of PV in 2015 were 59 GW, according to preliminary figures (SolarServer 2016). In comparison, the Global Coal Plant Tracker identified 84 GW of new coal power capacity in 2015.

If redirected toward wind and PV, the projected US$981 billion capital investment needed to implement the projects in the current coal pipeline could greatly accelerate the transition to clean energy. Based on current costs, estimated by the International Renewable Energy Agency at US$1315/kW for wind power and US$1670/kW for PV in China and India, the capital cost of increasing today's installed base of utility PV (177 GW) and wind (432 GW) by 39 percent is US$337 billion, assuming most capacity was built in the same regions that are building most new coal (IRENA 2015). That estimate is conservative, since it does not assume a continuation of the rapid cost declines in wind and PV that have occurred over the past five years.

It should be noted that accommodating additions in solar and wind may require increased investment in transmission and distribution lines if available renewable resources are located far from demand centers. Based on available data, IRENA (2015) estimates the resulting grid costs for transmission networks to be US$0.013/kWh or less.

Figure 10: Global Capacity Additions of Coal, Wind, and Photovoltaic Capacity, 2015 (GW)



Sources: Coal, Global Coal Plant Tracker January 2016; Wind, Global Wind Energy Council, 2016; PV, SolarServer, 2016

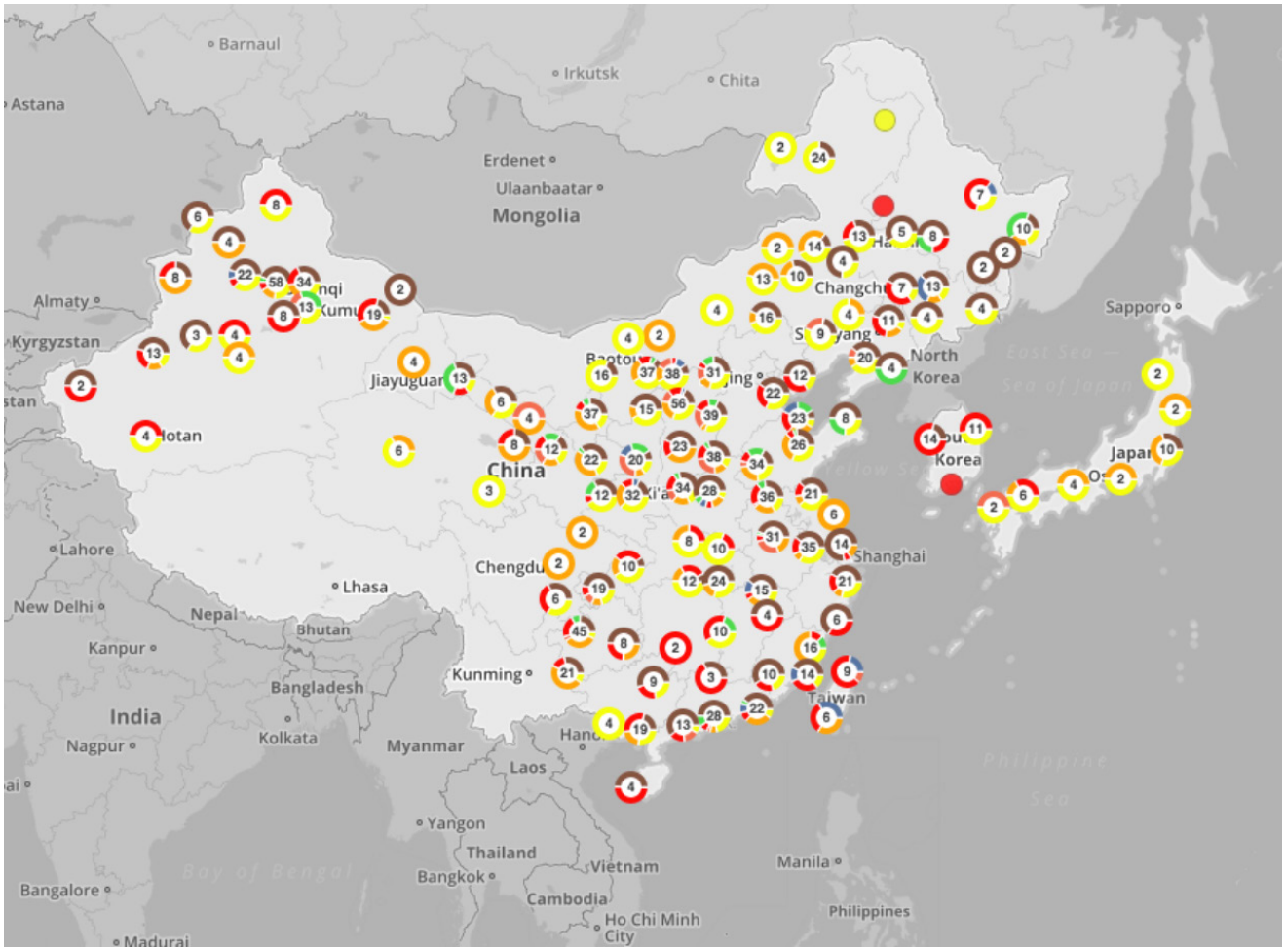
The cost component of increased wind and solar can be reduced by peak shaving through demand-side management, as well as stronger and more flexible electricity grids. The integration costs are also less applicable to areas that are still building up a centralized electricity system, and more remote areas may benefit from a distributed electricity system.

Conclusion: Instead of More Coal, Clean Power and Universal Access are Both Possible

The global coal plant pipeline represents a vast misplacement of resources that would be better redirected toward the twin goals of accelerating the pace of global decarbonization and providing electricity to the 1.2 billion people who currently lack it. Both the IEA Energy Access for All plan (US$640 billion) and a 39 percent increase of today's installed base of wind and PV power (US$337 billion) could be accomplished for US$977 billion, less than the cost of the proposed coal plant pipeline (US$981 billion), assuming a continuation of current costs and 2010–2015 implementation rates. The assumption that costs of clean power will remain level rather than declining further is highly conservative, in light of the rapid cost reductions that have been evident over the last decade (IRENA 2015).

PART II
REGIONAL DISCUSSION

EAST ASIA



OVERVIEW

Japan, South Korea, and Taiwan continue to be large consumers of coal and developers of new coal-fired capacity. In 2014, Japan and South Korea ranked sixth and seventh, respectively, in global coal consumption (Enerdata 2015), and Taiwan twelfth (BP 2015). With almost no domestic coal resources, large coal capacity, and high per-capita energy demand, Japan ranked third, South Korea fourth, and Taiwan fifth for coal imports in 2014, behind only China and India (Enerdata 2015).

Japan has the world's sixth highest amount of proposed coal capacity, at 21.4 GW. However, development of most of these projects is still at an early stage, and only 3 GW of the proposals have been permitted. Japan is in the midst of a struggle over the future of the country's—and the world's—energy use, as it continues to promote ultra-supercritical coal plants at home and abroad, even as the country installs ever higher amounts of renewable energy and domestic electricity demand declined annually for five consecutive years through 2015.

Taiwan's coal use has flattened, decreasing 0.2 percent from 2013 to 2014, after growing about 12 percent from 2004 to 2013 (BP 2015). Taiwan has 6 GW of proposed coal capacity and an additional 5.6 GW under construction; all construction is replacing older and smaller coal- and oil-fired plants.

South Korea's coal use has also slowed, after growing nearly 60 percent since 2004 (BP 2015). At 10.2 GW, South Korea ranks fourth globally in the amount of coal plants currently under construction, after China, India, and Vietnam. It has additional proposed capacity of 10.5 GW. North Korea has a number of primarily older coal plants, and its Rason (Rajin) Port is being used by North Korea to import coal from Mongolia. The port is also used by China to export coal to Shanghai from nearby Chinese mines. South Korea hopes to use the port to import coal from Russia.

Table 13. Proposed Coal Power in East Asia (MW)

Country/Region	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating (2010–2015)	Cancelled (2010–2015)
China	245,960	216,574	52,960	515,494	193,179	61,735	297,975	164,495
Japan	7,982	10,407	3,022	21,411	1,977	0	1,850	0
North Korea	0	0	0	0	300	0	0	0
South Korea	2,000	7,542	1,000	10,542	10,234	0	1,740	3,840
Taiwan	6,000	0	0	6,000	5,600	6,800	0	0
East Asia	**261,942**	**234,523**	**56,982**	**553,447**	**211,290**	**68,535**	**301,565**	**168,335**

Source: Global Coal Plant Tracker, January 2016. Note: This data does not yet include the potential impact of China's announced suspension of new permits in 13 provinces and regions, and moratorium on new construction starts in 15 provinces; data will be updated as actual plant-level permitting and investment decisions are made.

Table 14. Proposed Coal Power in East Asia (Units)

Country/Region	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating 2010–2015	Cancelled 2010–2015
China	358	352	103	813	364	82	659	200
Japan	12	23	6	41	5	0	3	0
North Korea	0	0	0	0	1	0	0	0
South Korea	2	10	1	13	13	0	2	5
Taiwan	6	0	0	6	7	8	0	0
East Asia	**378**	**385**	**110**	**873**	**390**	**90**	**664**	**205**

Source: Global Coal Plant Tracker, January 2016. Note: This data does not yet include the potential impact of China's announced suspension of new permits in 13 provinces and regions, and moratorium on new construction starts in 15 provinces; data will be updated as actual plant-level permitting and investment decisions are made.

EAST ASIA: CHINA

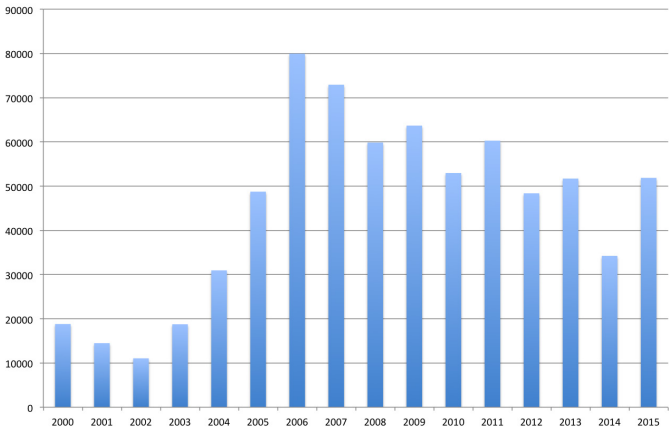
There is a huge disconnect regarding coal in China, with the data showing that usage has peaked and is currently in decline, while generating capacity continues to grow. What are we to make of this discrepancy? Given the immense climate consequences of China's massive coal power sector, which has accounted for three-quarters of all new coal capacity worldwide in the current century, understanding the dynamics driving continued capacity expansion is of critical importance. From the beginning of 2000 through 2015, China built approximately 724 GW of new coal power capacity, the largest coal power expansion by any country in human history. As shown in Figure 11 below, the boom peaked at 80 GW in 2006 and seemed to be declining steadily until 2015, when the amount of new coal power once again increased. As discussed on page 28 under "Accelerating Capacity," coal capacity grew by 39.5 GW in 2014 and by 51.9 GW in 2015. With 203 GW in construction and 509 GW in the pre-construction pipeline, as shown in Table 15, the danger of continued expansion remains very real.

In 2014, the Chinese economy experienced a change of great positive significance for the world's climate: the amount of power generated from coal actually dropped. In 2015, the decline in coal-fired power continued. Yet despite the decline in power output for two years in a row, China kept building coal plants. In markets where gas-fired generation sets power prices, once a coal plant is built there usually is an economic incentive to use it and regain at least some of the costs, but in China we are seeing utilization rates across the coal sector nosedive. The paradox of rising capacity in the midst of falling output raises major questions. Is the decline in power generation a trend that will continue? Can the momentum of continued power plant building be brought into line with slowing thermal power demand? Has China's electricity demand temporarily or permanently decoupled from economic growth? Such questions can only be answered by understanding the factors that drive coal plant building in China.

Dropping Usage of Coal

According to government statistics, overall coal usage in China was 3.7 percent lower in 2015 than in 2014, marking the second consecutive yearly decline. Greenpeace estimates that use of coal for power generation declined by 3.6 percent (Chan 2016, Myllyvirta 2016, National Bureau of Statistics 2016). Three factors account for the decline. The first is

Figure 11. China Coal Power Additions, 2000–2015 (MW)



Sources: Platts WEPP (2001–2009), Global Coal Plant Tracker (2010–2013), China Electricity Council (2014–2015)

the structural evolution of China's economy, which continues to move toward services and light manufacturing and away from heavy industry and construction. A second factor is the strong growth of renewable generation, including 30 GW of new wind power and 15 GW of new solar power in 2015, as well as nuclear power (6 GW) and hydro capacity (15 GW) (National Energy Administration 2016). A final factor in the decline is the effect of government programs aimed at reducing air pollution, which have curtailed the operations of coal plants near some cities (Myllyvirta 2016).

Table 15. Proposed Coal Power in China, January 2016 (MW)

Province	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating 2010–2015	Cancelled 2010–2015
Anhui	9,320	11,320	1,320	21,960	6,840	1,000	16,100	7,200
Chongqing	2,240	0	0	2,240	4,540	0	4,980	0
Fujian	4,000	8,555	2,000	14,555	5,320	600	7,360	3,320
Gansu	18,520	10,320	2,020	30,860	2,000	0	6,600	7,450
Guangdong	16,700	7,980	3,020	27,700	11,000	1,200	22,012	2,600
Guangxi	2,700	5,240	0	7,940	6,870	470	5,280	1,900
Guizhou	16,640	22,585	8,200	47,425	5,320	2,620	9,340	1,200
Hainan	0	0	0	0	0	0	1,400	0
Hebei	3,450	2,800	700	6,950	6,000	4,000	9,390	1,320
Heilongjiang	6,000	0	0	6,000	2,600	200	3,250	16,200
Henan	15,400	8,220	4,680	28,300	4,880	270	19,090	2,700
Hubei	6,400	7,300	2,020	15,720	5,020	4,000	7,400	2,000
Hunan	4,000	8,000	2,000	14,000	5,200	600	3,840	270
Inner Mongolia	26,780	38,710	2,620	68,110	19,360	11,805	17,890	60,020
Jiangsu	18,240	10,420	0	28,660	4,500	0	25,160	4,700
Jiangxi	6,700	2,000	1,320	10,020	5,000	0	6,340	0
Jilin	3,360	2,370	0	5,730	700	700	6,540	1,860
Liaoning	2,500	2,050	1,400	5,950	800	6,200	6,720	3,400
Ningxia	0	6,600	2,720	9,320	11,030	0	7,980	7,600
Qinghai	3,840	1,980	0	5,820	4,040	0	970	405
Shaanxi	25,440	9,320	5,420	40,180	8,720	7,300	7,300	7,600
Shandong	9,100	12,200	6,400	27,700	18,900	4,520	28,438	8,360
Shanghai	0	0	0	0	0	0	2,000	0
Shanxi	15,820	16,064	5,620	37,504	23,464	0	18,150	4,400
Sichuan	0	2,000	2,000	4,000	2,000	4,000	3,000	0
Tianjin	700	800	0	1,500	2,000	600	1,650	1,800
Xinjiang	21,590	15,740	0	37,330	27,075	10,450	32,655	13,990
Yunnan	1,200	0	600	1,800	0	1,200	3,300	1,200
Zhejiang	5,320	2,000	200	7,520	0	0	13,840	3,000
Total	**245,960**	**214,574**	**54,260**	**514,794**	**193,179**	**61,735**	**297,975**	**164,495**

Source: Global Coal Plant Tracker, January 2016

Table 16. Proposed Coal Power in China, January 2016 (Units)

Province or Autonomous Region	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating 2010–2015	Cancelled 2010–2015
Anhui	10	12	2	24	9	1	25	3
Chongqing	5	0	0	5	10	0	9	0
Fujian	4	19	2	25	6	2	13	4
Gansu	21	15	4	40	6	0	16	8
Guangdong	17	9	5	31	14	2	36	3
Guangxi	4	10	0	14	11	2	9	4
Guizhou	38	53	16	107	11	6	17	2
Hainan	0	0	0	0	0	0	4	0
Hebei	12	8	2	22	12	4	28	2
Heilongjiang	10	0	0	10	6	1	10	9
Henan	18	11	7	36	8	2	32	8
Hubei	8	12	4	24	7	4	16	2
Hunan	2	8	2	12	6	2	6	2
Inner Mongolia	41	65	8	114	38	15	48	59
Jiangsu	18	12	0	30	9	0	31	6
Jiangxi	8	2	2	12	5	0	11	0
Jilin	7	5	0	12	2	2	20	5
Liaoning	8	9	4	21	4	8	16	6
Ningxia	0	10	6	16	17	0	16	10
Qinghai	6	3	0	9	8	0	4	3
Shaanxi	32	10	10	52	16	4	18	12
Shandong	14	15	10	39	42	6	84	14
Shanghai	0	0	0	0	0	0	2	0
Shanxi	22	22	13	57	53	0	47	6
Sichuan	0	2	2	4	2	4	5	0
Tianjin	2	2	0	4	2	2	5	3
Xinjiang	43	34	0	77	60	13	102	21
Yunnan	2	0	2	4	0	2	7	2
Zhejiang	6	2	4	12	0	0	22	6
Total	**358**	**350**	**103**	**811**	**364**	**82**	**659**	**200**

Source: Global Coal Plant Tracker, January 2016

Accelerating Capacity

According to government figures, coal power capacity in China increased by 51.86 GW in 2015, compared with 34.22 GW in 2014 (Greenpeace East Asia 2015a, China Electricity Council 2016).[2] Table 17 shows China's new capacity by year.

Table 17. Newly Operating Coal Power in China Provinces and Autonomous Regions by Year, 2010–2015 (MW)

Province or Autonomous Region	2,010	2,011	2,012	2,013	2,014	2015 (preliminary)
Anhui	660	2,320	1,920	3,900	2,640	4,660
Chongqing	0	0	0	1,320	1,660	2,000
Fujian	1,920	2,840	600	0	0	2,000
Gansu	1,200	1,320	700	2,350	330	700
Guangdong	4,220	5,520	1,200	6,572	950	3,550
Guangxi	0	1,330	2,750	0	350	850
Guizhou	600	1,200	1,200	3,360	960	2,020
Hainan	0	0	700	0	0	700
Hebei	1,500	2,460	1,530	1,900	700	1,300
Heilongjiang	300	900	0	1,350	350	350
Henan	3,890	3,990	4,590	1,960	660	4,000
Hubei	680	0	2,940	1,000	2,430	350
Hunan	0	1,260	1,260	0	0	1,320
Inner Mongolia	6,790	3,280	2,200	3,910	350	1,360
Jiangsu	8,250	4,930	4,000	4,320	2,660	1,000
Jiangxi	1,320	1,300	1,400	0	0	2,320
Jilin	2,400	2,040	300	1,010	790	0
Liaoning	4,100	600	1,320	0	700	0
Ningxia	3,700	3,620	0	660	0	0
Qinghai	0	0	270	700	0	0
Shaanxi	1,000	1,920	0	2,850	600	930
Shandong	2,220	4,050	6,583	4,465	3,330	7,790
Shanghai	2,000	0	0	0	0	0
Shanxi	1,920	5,290	4,150	1,620	2,220	2,950
Sichuan	0	1,800	600	600	0	0
Tianjin	700	0	250	0	700	0
Xinjiang	1,035	5,100	5,805	7,850	7,950	4,915
Yunnan	600	600	1,800	0	300	0
Zhejiang	1,950	2,600	300	0	5,010	3,980
Total	**52,955**	**60,270**	**48,368**	**51,697**	**35,640**	**49,045**

Source: Global Coal Plant Tracker, January 2016

2. By comparison, the Global Coal Plant Tracker, which tracks only power additions of 100 MW or more at each location, identified 35.64 GW of new capacity in 2014 and 49.02 GW of new capacity in 2015.

Falling Utilization Rate

As shown by Chinese government statistics, the utilization rate for thermal plants—the percentage of maximum output actually achieved—reached an all-time low in 2015, falling to 49.4 percent (4329 hours), compared to 60.4 percent in 2011. The utilization rate is the lowest since 1969, and is expected to drop still further, to 45.67 percent (4000 hours) in 2016 (China Electricity Council 2016). Note that the government does not publish data on utilization rate for coal plants, but utilization rate for thermal plants overall is considered to be only about 100 hours lower than for coal plants, a difference of 1.1 percent. (Greenpeace East Asia 2015a).

A Lagged Response?

Because it takes multiple years for a coal plant to go through the stages of planning, permitting, and construction, the capacity that was completed in China in 2015 reflects decisions made at a time when the country's demand for electric power was still growing rapidly. Given the lag between decisions on capacity expansion and the realization of those decisions, it is not surprising that power capacity could still be coming online or entering construction at a time when power usage was flattening or falling.

The lag in decision-making can help explain why China continued to add coal power capacity in 2015, and why large numbers of coal plants are currently under construction—193 GW at the end of 2015. However, it cannot account for the fact that the 2014 and 2015 slowdown in actual power usage did *not* translate into a curb in construction activity or in the pre-construction pipeline. In 2015 construction activity actually increased by 22 GW from the previous year's Global Coal Plant Tracker results, an increase of 13 percent. The China Electricity Council reported an even larger increase in coal plant construction: 55 percent more construction in the first six months of 2015, compared with the same period in 2014 (Reuters 2016).

As for future expansion, the Global Coal Plant Tracker shows an additional 515 GW of coal power in the pre-construction pipeline, including projects in the announced, pre-permit, and permitted categories. As shown in Table 1, this is an increase of 19 GW from the 496 GW found in the pre-construction pipeline in January 2015. Tables 15 and 16 show the breakdown of proposed coal plants in China by category and by province or autonomous region.

As shown in Table 15, the leaders, in order of capacity in the pre-construction pipeline, are Inner Mongolia (68 GW), Guizhou (47 GW), Shaanxi (40 GW), Shanxi (38 GW), and Xinjiang (37 GW). In order of capacity under construction, the leaders are Xinjiang (27 GW), Shanxi (23 GW), Inner Mongolia (19 GW), Shandong (19 GW), and Ningxia (11 GW).

Permitting Accelerates and Shifts to the Provinces

As part of its analysis of the status of proposed Chinese coal plants, the Global Coal Plant Tracker project examined permits issued by the National Development and Reform Commission (NDRC) and the provincial DRCs during 2014 and 2015. NDRC and DRC permits are in most cases the final permit prior to construction. The survey found a dramatic increase in permits issued after the transfer of authority over such permits from the national to the provincial level after September 2014. Prior to the transfer of authority, from January through September 2014, 32 permits were issued by NDRC, amounting to 35 GW of capacity in nine months. Following the transfer, the pace of permitting increased. From October 2014 to December 2015, 149 provincial DRC permits were issued for new plants, amounting to 151 GW of new capacity in 15 months. On a monthly basis, the pace of permitting increased from approximately 4 GW per month under national authorities to 10 GW per month under provincial authorities.

Our findings confirm those of surveys by Greenpeace East Asia of environmental permits issued by national and provincial authorities (Greenpeace East Asia

2015b, Greenpeace East Asia 2016). Greenpeace found that during 2015, China's Ministry of Environmental Protection and provincial Environmental Protection Bureaus issued permits for 210 coal plants, amounting to 169 GW of capacity. In comparison, Greenpeace found 33 plants approved in 2012, 41 approved in 2013, and 56 approved in 2014. The 2015 permits were concentrated in six provinces: Shanxi (25 permits), Jiangsu (23 permits), Shandong (21 permits) Inner Mongolia (20 permits), Xinjiang (16 permits), and Ningxia (13 permits).

A major reason for the increased numbers of approvals is the State Council's "Reduce government, Delegate authority" initiative of 2013. In response, both the National Development and Reform Commission and the Environmental Protection Ministry decentralized authority for approving power plant projects in 2014 to the provincial level Development and Reform Commissions and the Provincial Environmental Protection Bureaus. The NDRC only conducts the total capacity control and creates policy guidelines.

While the stated goals of decentralization were to reduce executive interference, raise market efficiency and let the market guide investments, in practice decentralization resulted in an unprecedented surge in permits, as local authorities raced to approve projects they believe would stimulate local economies and benefit economic interests with influence at the provincial level.

In some cases, local authorities have shown greater leniency than central authorities, moving quickly to grant permits that had sat for several years on federal waiting lists and even retroactively approving some coal power plants that had been illegally operating for years without permits.

Under the goal of reducing the quantities of waste coal, the provincial DRC of Shanxi province granted 23 permits to waste coal power plants in 2015, amounting to 95 percent of the total capacity that the NDRC set as the limit for Shanxi for the entire 12th Five-Year Plan (2011–2015). Prior to handing authority to the provincial Environmental Protection Bureau, the federal Ministry of Environmental Protection vetoed two projects from Shanxi Province due to emission concerns in an already over-polluted area. Shanxi's EPB reapproved these two projects immediately after it received the authority, then approved 21 similar projects in seven months.

March 2016: Central Government Announces Curbs

In a recognition of the overbuilding problem and as a first step towards closing the floodgates, the central government has reportedly ordered provincial governments to suspend new approvals in 13 provinces and regions through 2017, and to halt initiation of new construction in 15 provinces and regions. This is an important step that could see up to 183 GW of new projects suspended based on initial analysis of the Global Coal Plant Tracker data. However, the 193 GW of projects already in construction, and the 86 GW of projects applying for permits in provinces and regions not covered by the suspension, show that much more stringent measures will be needed to stop the ballooning overcapacity, let alone begin reducing it. (Note: The tables in this report do not include the impact of the latest policy.)

Citizen Opposition

Proposals for coal-fired power plants have drawn opposition at the local level by citizens concerned that financial interests are being prioritized at the expense of public health. Protests have been reported in Guangdong, Hainan, Hunan, and Inner Mongolia (SourceWatch 2016). In April 2015, an estimated 10,000 people demonstrated against the expansion of the Heyuan power station in Guangdong. In September 2014, thousands of people staged a sit-in and hunger strike against proposals to expand the Huaneng Yueyang power station in Hunan. According to the Hong Kong–based Center for Human Rights and Democracy and the U.S.-based Boxun news portal, the size of the demonstration grew to 20,000 people, with

demonstrators holding banners that read, "Rather starved than poisoned to death." Protesters were concerned that the siting of four proposed 1,000 MW units in a valley location would lead to intolerable concentrations of air emissions (Kyodo News International 2014). Despite the protests, the project was approved by the Hunan DRC in 2015.

Regional Shifts

A second policy measure with significant impact on the distribution of China's coal plant pipeline is the central government's strategy of shifting coal power—along with the air pollution that it generates—out of the main population centers of Eastern China and toward less populated western provinces, particularly Inner Mongolia and Xinjiang. Among the measures for carrying out this objective is a ban on increasing total coal plant capacity in three main economic growth engine areas: Yangtze River Delta, Pearl River Delta, and Beijing-Tianjin-Hebei Circle. While this policy may improve air quality in the most densely populated regions, it will also further the damage to vulnerable water-scarce areas in the West. Furthermore, eastern provinces outside the three economic regions are also seeing very significant capacity growth.

Table 18 shows the shift in China's coal capacity away from the East Coast and Northeast provinces toward the Western region, especially the provinces of Guizhou, Inner Mongolia, Ningxia, and Xinjiang. While only 28 percent of current coal capacity is located in the Western region, nearly half of all proposed coal capacity in pre-construction phases is located in the region.

The Problem of Captive Power Plants

While government policy aims to ameliorate pollution by shifting coal capacity away from the most populated regions, that policy is being undermined by industries developing dozens of new captive or "self use" coal plants in the same East Coast provinces where pollution is already severe. These captive plants, which supply power to energy-intensive facilities like aluminum smelters, are not covered by the same regulations as public power plants. According to government documents, such plants often enter construction without any permits.

The most prominent builder of captive coal plants is Shandong Weiqiao group, a collection of companies controlled by the Zhang Shiping family, which accounts for 23,180 MW of capacity built or under construction since the beginning of 2010. A second aluminum company located in Shandong is Xinfa Group, which accounts for 5,360 MW built or under construction in the same period. The coal capacity built or under construction by Shandong Weiqiao group since 2010 matches the capacity built or under construction in the European Union during the same period, 23,495 MW.

Table 18. Regional Shifts in China's Coal Capacity, January 2016

Region	Existing Plants (Share of Total)	Pre-Construction Pipeline (Share of Total)	Change
East Coast	39%	22%	−17%
Central	25%	25%	0%
Northeast	8%	3%	−5%
Western	28%	50%	22%
Total	**100%**	**100%**	

Sources: Platts WEPP, December 2015, and Global Coal Plant Tracker, January 2016

In terms of its impact on the government's efforts to shift pollution westward, the capacity built by Shandong Weiqiao group and Xinfa Group in Shandong since 2010 is nearly equivalent to the 30 GW of high voltage transmission capacity from Northwestern China to Eastern China (Myllyvirta et al. 2015, Table I-1).

Captive power capacity is also a major factor in the expansion of coal power in Western China. In Xinjiang Autonomous Region, where cheap coal prices and industry-friendly policies have attracted a variety of aluminum processors and other energy-intensive companies, at least 7,700 MW of captive coal power capacity has gone into operation since 2010, and an additional 6,760 MW is under construction. Sponsors include Qingdao Antaixin Group, Sichuan Qiya Aluminum Industries, Xinjiang Tianshan Aluminum, East Hope Group, Henan Shenhuo Group, and Zhongtai Chemical Company.

In July 2015, the Ministry of Environmental Protection of China (MEP) openly criticized Shandong Weiqiao group, noting that none of its nine captive power plants had submitted an environmental impact assessment (EIA) nor met legal emission standards. MEP halted the entire EIA approval process in Beizhou, where Shandong Weiqiao is located, until Shandong Weiqiao improves its emission levels and submits to emission monitoring by the local Environmental Bureau.

In the second half of 2015, the Department of State issued a new regulation ("The guideline about strengthening the monitoring and regulating the management of the captive coal power plants") that sought to bring captive power plants under its oversight. This regulation rules that captive power capacity must be developed in accordance with national energy industry policy and the national electricity generation general layout. The new regulation prohibits the approval of captive coal plants that do not meet its requirements, including supporting documentation supplied before and during the construction, and adherence to all relevant standards.

How the new regulation will affect current and future coal proposals is a question, since similar government regulations have been issued before with little effect. In 2012, Shandong Provincial Government vowed not to allow any more captive power plants to be built. However, in the same year, Weiqiao Group started five projects, each 1320 MW in size. A more strict application of regulations would curb reckless capacity expansion.

Economic Drivers of Coal Capacity Growth

Bringing captive power capacity under a more coherent regulatory regime and dealing with permissive regulatory stances at the provincial level will do much to solve the problem of China's coal power construction. However, a deeper problem awaiting resolution stems from the nature of China's economic growth model, which is driven by high levels of capital spending funded by easily accessible financing, as well as the economic structure of the electric power sector. According to Greenpeace, capital spending in China is almost 50 percent of GDP, higher than any other major economy in history and far higher than the 20 percent level in most developed economies (Greenpeace 2015).

Specific to the state-owned entities that account for 61 percent of China's installed capacity, several policies drive continued capacity expansion. First, under standard practice, electricity tariffs are adjusted to cover generation costs and other expenses while providing reasonable profits for an average plant. Second, the standard dispatch scheme allocates roughly equal operating hours to generators in a region, with almost uniform tariff rates applied to the same type

of generation. Third, some utility contracts provide a guaranteed allotment of hours during which coal plants can sell power to the grid. Together, these policy mechanisms tend to incentivize electricity capacity expansion as a means of improving generator revenue. In addition, financing for new plants is readily available at low cost in the form of debt capital from state-owned banks, new equity capital, and retained earnings (CPI 2015a, Wong 2015).

Further enabling continued capacity expansion, even in the face of flat demand for power, is the uniquely low cost of building new coal plants. With the benefit of low labor costs, low commodity prices, large average plant sizes, and economies of scale, Chinese coal plants cost half to a third as much per MW as the global average (CPI 2015a). Operating costs are also relatively low, since China's newest plants lead the world in efficiency. The Coal Power Energy Saving and Emission Reduction Upgrade Action Plan, introduced in 2014, requires all new plants to be at least 600 MW in size and to use ultra-supercritical combustion technology (CPI 2015a).

A final factor driving the surge of power capacity is the increased involvement in the power business of mining companies seeking to benefit from the larger profit margins typical of the power sector. An example is Shenhua, which in addition to being the country's largest mining company is now China's fifth largest owner of coal plants (Wen 2015). According to the Global Coal Plant Tracker, China Shenhua Group is the sponsor of 104 out of the 813 projects in China's pre-construction pipeline. Earnings posted by Shenhua in March 2015 showed a decrease in operating profit of 29.2 percent from coal mining, accompanied by a rise in operating profit from power generation of 9.3 percent. Overall, profits from coal mining were 25.5 billion yuan, whereas profits from power generation were 18.58 billion yuan (Ng 2015).

Retirements

Relative to coal plants in the United States and Europe, the Chinese coal fleet is relatively young, reducing the pool of coal plants reaching the age of retirement. In recent years, the impact of the government's Small Plant Replacement Policy (SPRP) has dwindled. While official statistics on plant retirements in China are not available, annual retirements have fallen from 43 GW in 2007–2010 to 6 GW from 2011–2014, according to Platts (2015).

The Need for Structural Change

While policy changes and alternatives are driving the downward turn in Chinese coal use, the momentum of China's coal plant building still threatens to harm both the nation's economy and the world's prospects for solving the climate crisis. For China's economy, building unneeded capacity at a time of historically low utilization rates represents a diversion of resources away from clean power and a potential impediment to the development of such resources. The vast amount of idle or underutilized coal-fired generating capacity has also created a conflict between coal and renewable energy in the grid, with the grid operator often failing to require coal-fired power plants to reduce output when generation from renewable energy is high.

As described in this chapter, continued expansion of coal capacity is driven by several structural factors: economic incentives to utilities and other plant operators such as coal mining companies, permissive permitting regimes at the provincial level, and the vested interests of the plant equipment manufacturers, construction companies, and others who benefit from coal plants. In order to bring coal plant expansion into line with climate goals and the changing nature of China's economy, central authorities need to find mechanisms allowing them to slow the runaway train.

EAST ASIA: JAPAN

Last year we reported on the boom in both coal and solar power that followed the Fukushima disaster. One year later, solar continues to exceed expectations, but coal is not going away. Although the already massive Japanese coal pipeline has grown somewhat, with 21,411 MW in pre-construction development and another 1,977 MW under construction, no new plants went online in 2015. Thermal coal imports rose 4.8 percent to a record 114.145 million tonnes in 2015 (Tsukimori 2016). The true game changer in Japan, however, is energy efficiency, which has led electricity demand to fall 10 percent over the past four years. In a close second is the rapid rise of renewables: Japan installed 10 GW of solar in 2015, matching its previous record of 10 GW in 2014.

If we are going to stay below 1.5°C or 2°C warming, as agreed at the climate negotiations in Paris, the world's industrialized countries must take coal offline entirely, not simply replace older plants with more efficient newer plants. More efficient plants may burn less, but they will also operate for decades, locking in coal use for years to come and leading to greater emissions over the full lifetime of the project. Moreover, as described in "Climate Impacts" above, an examination of all projects in the proposed coal plant pipeline shows that replacing all currently proposed subcritical and supercritical plants with ultra-supercritical running at 46 percent efficiency—the high end of the IEA's assumed range for such plants—would result in marginally lower lifetime emissions from the proposed plants: 158.1 Gt of carbon dioxide if all proposed plants were ultra-supercritical compared to 186.5 Gt for the current proposed coal plant pipeline. Such a reduction would not be sufficient to achieve the levels of decarbonization outlined by Climate Action Tracker in its 2015 "Coal Gap" analysis (CAT 2015a). According to the CAT analysis, it is not sufficient to slow the growth of carbon dioxide emissions; rather, current plants need to be rapidly retired.

The good news is that advocacy groups and policy makers are increasingly pushing back against the proposed coal pipeline. Kiko Network launched the Japan Coal Plant Tracker to follow and challenge proposed coal development, allowing anyone to access the most up-to-date information. Controversy is also brewing within the government. Former Environment Minister Yoshio Mochizuki took the unprecedented step of challenging two proposed coal-fired power plants—the 1,070 MW Taketoyo power station and the 1,200 MW Ube power station—citing climate concerns. After Prime Minister Shinzo Abe reshuffled his cabinet and replaced Mochizuki with Tamayo Marukawa (Stapczynski 2015), possibly due to the former's objection to the coal plants, Marukawa also objected to two new coal plants—the 1,300 MW Akita power station and the 1,000 MW Ichihara power station—as Japan faced increased pressure in the lead-up to the Paris talks. However, Marukawa later reversed course and said she would approve new coal plants in exchange for power companies and the industry ministry taking tougher measures to reduce CO_2 emissions.

The pressure against increased coal use has led to changes in Japanese foreign policy as well. Japan is the world's leading financier of overseas coal plants (Schmidt 2015), including proposals in South America, Africa, and Asia, but in 2015 it agreed to the first-ever limits on this support. While many of the world's countries have ended financing for overseas coal except in rare circumstances, Japan remained firmly opposed to any ban among OECD countries. But in a blow to the coal industry, Japan reversed course and supported a new OECD deal that, while not as strong as the restrictions in the U.S., France, Nordic countries, UK, Netherlands, or Germany, nonetheless requires the world's richest countries to limit economic support for overseas coal plants, starting in 2017 (AP 2015).

EAST ASIA: TAIWAN

Coal made up 31 percent of Taiwan's primary energy consumption in 2014, and nearly half of its electricity use. It imported 67.1 million tonnes (Mt) of coal in 2014, according to the Taiwan Bureau of Energy. Taiwan has had no domestic coal production for more than a decade and uses imported coal to feed its coal plants (Tse 2015).

Taiwan has just over 31.6 GW of operating coal capacity. All plants built before 1999 are subcritical (Platts 2015), while all current proposals are either supercritical or ultra-supercritical.

The 5.6 GW of capacity under construction consists entirely of 800 MW ultra-supercritical (USC) units replacing older and smaller coal- and oil-fired plants at three locations: Linkou power station, a 600 MW coal plant closed in 2014; Talin (Dalin) power station; and Shenao power station, a 215 MW coal- and oil-fired plant that is being decommissioned.

In addition, 6,000 MW of proposed coal capacity is under development, consisting solely of the Taipei Port power station—although plans remain tentative.

Coal plant proposals in Taiwan face growing public opposition. Prior to lifting martial law in 1987, Taiwan experienced three decades of rapid industrialization with little concern for the environment. Since 1987, there has been a surge in environmental organizations and activism (Grano 2015). In June of 2015, approximately 10,000 people in nine cities and counties took to the streets in protest against air pollution (*China Post* 2015). In December, 2015, members of the Green Party-Social Democratic Party Alliance gathered in front of the Environmental Protection Administration (EPA) offices in Taipei to demand stronger regulations for PM2.5. Annual PM2.5 concentrations in Taiwan have averaged between 30 and 40 micrograms (mg) per cubic meter, much higher than the U.S. average concentration of 15 mg (Wei-han 2015).

EAST ASIA: SOUTH KOREA

South Korea generated 30.5 percent of its primary energy in 2014 from coal. That year, the country consumed 134 Mt of coal, and imported 128 Mt (BP 2015). South Korea currently has nearly 27.6 GW of coal capacity, over a third of which (10.7 GW) has been added in the last decade (Platts 2015).

South Korea did cancel four coal plants totaling 3,740 MW in 2015, due to fuel and transmission facility issues: units 7-8 of the 5,080 MW Yeongheung power station, and the two-unit, 2,000 MW Dongbu Hasla power station. The coal plants will be replaced with two nuclear units totaling 3,000 MW. However, the country still has a large number of active coal proposals, which would emit an estimated 3.5 Gt of carbon dioxide over a forty-year lifetime, leading to criticism of its leaders' commitment to combating climate change.

The country ranks tenth in the amount of coal capacity in the pre-construction stage (10.5 GW). Most of that total (7.5 GW) still lacks final permits. Nearly all the proposals are sponsored by the country's largest electric utility, Korea Electric Power Corporation (KEPCO), but they also include the 2,100 MW Pospower Samcheok power station proposed by the country's largest steel-making company, POSCO Energy, which entered the coal-fired power generation business in 2014. The 2,180 MW Goseong Green power station has been opposed by local residents over pollution concerns.

South Korea ranks fourth worldwide after China, India, and Vietnam in the amount of coal capacity under construction (10.2 GW). Projects include a 2,000 MW expansion of the 4,000 MW Dangjin power station, planned for completion this year. The expansion would make Dangjin the largest coal plant in the world, passing Taiwan's 5,500 MW Taichung power station (although China's Datang Tuoketuo power station is planned to reach 6,720 MW total in 2016).

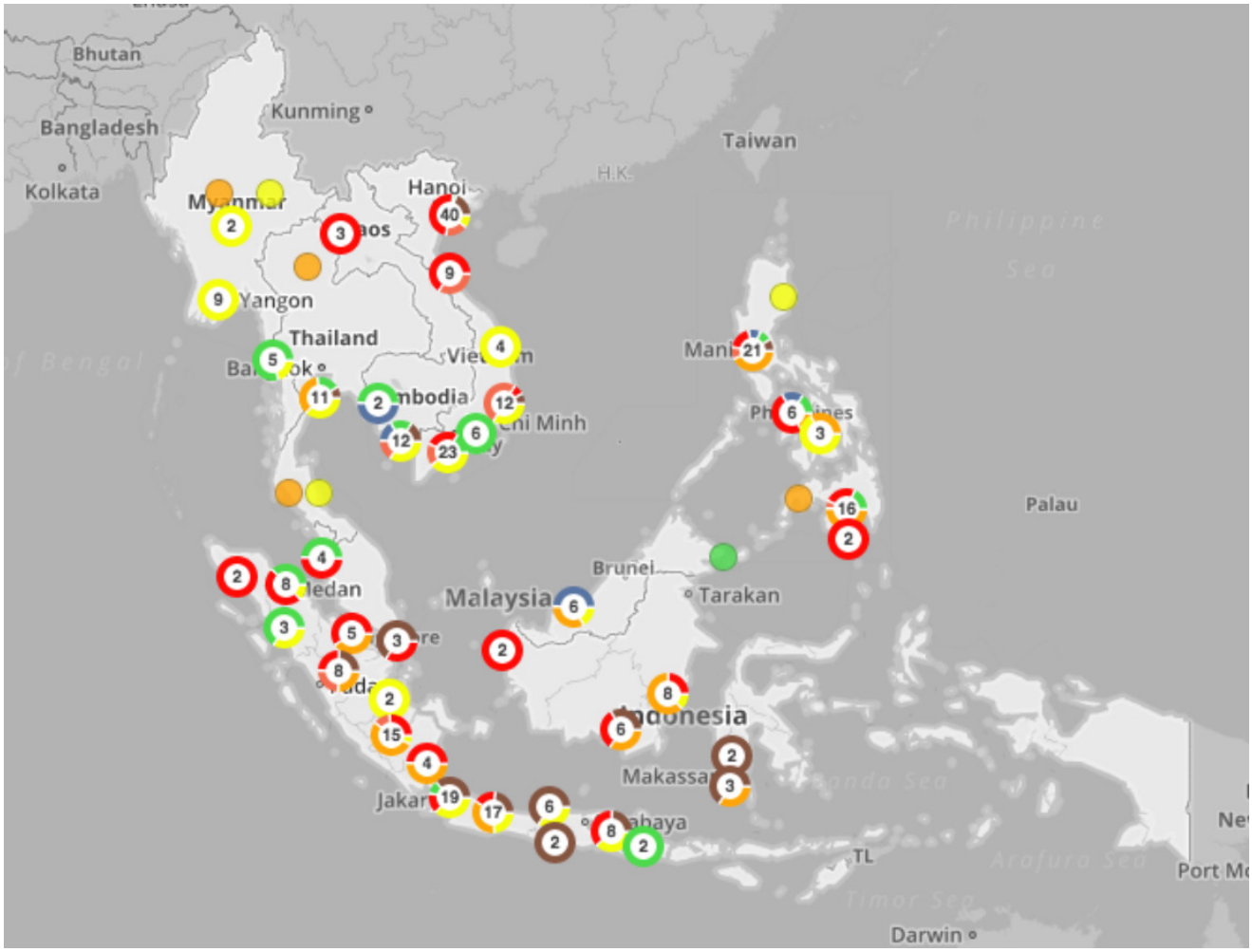
Another project is the 2,044 MW Samcheok Green power station, which may be expanded to 5,000 MW. The project was slated to feature carbon capture and storage, but those plans appear to have been dropped.

EAST ASIA: NORTH KOREA

North Korea relies on two domestic sources of commercial energy for most of its needs: coal and hydropower. The country currently has about 3,750 MW of coal-fired generating capacity (Platts 2015). Most of its coal plants are subcritical units of 50 to 100 MW that were built in the 1960s, 1970s, and 1980s. The government is reportedly constructing the 300 MW Kangdong power station.

Rason (Rajin) Port lies along the Sea of Japan in North Korea, bordering China and Russia. North Korea uses the port to import coal from Mongolia. South Korea plans to bring Russian coal through the port. China is also making investments in the port, as it gives China access to the Sea of Japan.

SOUTHEAST ASIA



OVERVIEW

With coal use dropping in the U.S. and the EU, and the dramatic turnaround in China's once insatiable demand, Southeast Asia is becoming the last stand for a coal industry in peril. The region's proximity to the first and second largest coal exporters, Indonesia and Australia, as well as the first, second, and third largest public financiers of overseas coal, Japan, China, and South Korea, makes it an obvious target for developers of coal plants. Japan is particularly active in the region through the Japan Bank of International Cooperation (JBIC) and Japan International Cooperation Agency (JICA), which are promoting Japanese coal plants as the solution to Southeast Asia's energy needs. While the numbers reflect the large-scale push to increase coal use in Southeast Asia, the story is more complicated.

An additional 6.8 GW of coal-fired capacity came online since last year's report, bringing total new capacity since 2010 to 23.5 GW. In addition, the announced, permitted, and pre-permit pipeline rose 23.5 GW to over 115.4 GW—the third highest region for coal proposals after East and South Asia. However, the capacity under construction fell nearly 3 GW to 26.1 GW, while halted projects rose by 16.3 GW, bringing the total halted to 38.5 GW.

Table 19. Proposed Coal Power in Southeast Asia (MW)

	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating (2010–2015)	Cancelled (2010–2015)
Indonesia	17,825	17,930	4,400	40,155	5,210	1,450	11,795	5,465
Malaysia	0	2,000	0	2,000	2,600	1,800	1,080	1,710
Myanmar	13,840	660	0	14,500	0	905	0	4,720
Philippines	1,872	4,952	750	7,574	4,448	600	1,091	1,450
Thailand	3,425	3,940	0	7,365	0	4,000	660	500
Vietnam	15,620	10,400	14,820	40,840	12,140	0	8,148	13,930
Cambodia	1,200	0	540	1,740	405	1,830	100	200
Laos	1,226	0	0	1,226	1,252	0	626	0
Total	**55,008**	**39,882**	**20,510**	**115,400**	**26,055**	**10,585**	**23,500**	**27,975**

Source: Global Coal Plant Tracker, January 2016

Table 20. Proposed Coal Power in Southeast Asia (Units)

	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating 2010–2015	Cancelled 2010–2015
Indonesia	39	40	8	87	32	7	46	27
Malaysia	0	2	0	2	4	4	1	3
Myanmar	20	1	0	21	0	2	0	6
Philippines	10	20	3	33	27	3	6	6
Thailand	2	8	0	10	0	5	1	2
Vietnam	17	13	26	56	24	0	20	24
Cambodia	4	0	4	8	3	1	2	1
Laos	3	0	0	3	2	0	1	0
Total	**95**	**84**	**41**	**220**	**92**	**22**	**77**	**69**

Source: Global Coal Plant Tracker, January 2016

SOUTHEAST ASIA: VIETNAM

With 40.8 GW proposed and another 12.1 GW under construction, Vietnam has the largest coal pipeline in the region, and in many ways anchors the dream of expanding coal in Southeast Asia. It also may have the most unstable pipeline.

Since January 2015 the capacity proposed and under construction in Vietnam has shrunk by 8.3 GW, while the halted capacity has risen by 7.4 GW. This was before Prime Minister Nguyen Tan Dung's January 2016 announcement that the government intends to "review development plans of all new coal plants and halt any new coal power development," as part of Vietnam's intention to "responsibly implement all international commitments in cutting down greenhouse gas emissions; and to accelerate investment in renewable energy" (Khanh 2016).

A number of issues are driving this shift, which has turned Vietnam from one of the most likely coal pipelines into one of the most uncertain, including the global movement to cut emissions, culminating in the 2015 Paris climate negotiations. However, concerns about public health within Vietnam set the stage for the country's increased ambition on the international level.

A health study from Harvard researchers released in September 2015 estimated that coal-fired power plants lead to 4,300 premature deaths every year in Vietnam, a number that could rise to 25,000 if the proposed pipeline is constructed (Greenpeace Southeast Asia 2015b). But the dangers of coal were not news to those already living with devastating pollution. In April 2015, residents blockaded a national highway for 30 hours in a protest against choking emissions and dust from the smokestack, coal trucks, and ash dumps of the newly constructed Vinh Tan 2 power station. The plant had electrostatic precipitators to limit particulate emissions, but the operators of the project were not using them, highlighting the all too common occurrence of expensive pollution control technology being installed but not employed (Burton 2015a). Then in July, heavy rains and flooding led to toxic sludge from an open pit coal mine inundating villages and threatening the Ha Long Bay World Heritage site (Waterkeeper Alliance 2015). These are just a couple of examples of recent coal crises, and given the falling price of renewable energy, it appears Vietnam is looking to move away from coal before pollution reaches the levels seen in countries like China.

SOUTHEAST ASIA: INDONESIA

Along with Australia, Indonesia is feeling the effects of the global downturn in demand for coal imports. In addition, the country has a large amount of capacity in the proposed coal plant pipeline: nearly 40.2 GW in pre-construction development and another 5.2 GW under construction.

From a high of 474 million tonnes (Mt) in 2013, the country's coal mining production in 2014 decreased to 458 Mt and by 2015 had decreased by another 14 percent to 392 Mt. Production levels in 2016 are expected to be lower still. Australia has now once again overtaken Indonesia as the world's largest coal exporter. Due to declines in the coal export market, the major Indonesian coal companies are looking to shore up domestic demand through investing in a new suite of coal plants in the country. They are aided by President Jokowi's plans to expand power supply by 35 GW by 2019, of which 20 GW would be coal. While the timeline for implementing this expansion is unrealistic, the threat is real. More than 70 percent of coal production is controlled by seven companies. These companies are now all becoming coal plant developers—they are entering into consortia with Asian utility companies and contractors to develop non–publicly held coal plants with financing from Japan, South Korea, and/or Chinese export credit agencies coupled with private banks.

Within Indonesia, there is massive resistance to new coal development. As with Vietnam, health concerns are at the forefront of the resistance. Researchers from Harvard released a report with Greenpeace Southeast Asia showing that coal-fired power plants in Indonesia are responsible for over 7,100 deaths every year, and if all the proposed projects are built that number could rise to over 28,000 (Greenpeace Southeast Asia 2015a). Villagers in Cirebon, West Java, have hosted visitors from other parts of the country so they can see firsthand how the project, backed by the Japan Bank for International Cooperation (JBIC), has impacted their health and devastated the fishing industry (Sierra Club 2013). They also continue to fight back against the coal industry, calling on the government to protect them from the coal dust that is affecting their health by stopping loading and unloading at the Cirebon Port.

Perhaps the most controversial project is the flagship 2,000 MW Batang power station in Central Java. The project has powerful proponents, including JBIC, which will provide 70 percent of the funding if land acquisition is ever completed, and Indonesian President Joko "Jokowi" Widodo, who has personally assured Japanese Prime Minister Shinzo Abe that he will keep the project moving (*Jakarta Globe* 2015a). Despite these powerful forces, as well as intimidation, arrests, and violent crackdowns, local communities have resisted. In addition to health and livelihoods, land rights are central to the fight. By refusing to sell, landowners have delayed the project for four years and prevented it from reaching financial closure (Fiyanto 2015). Now an independent, state-sanctioned human rights organization has urged JBIC to review the project due to violations in the land acquisition process, which does not bode well for either the Batang plant's future or the future of other JBIC-backed projects.

SOUTHEAST ASIA: THAILAND

Compared to Vietnam and Indonesia, the Thai coal pipeline seems small, with just over 7.3 GW announced, permitted, or in pre-permit development, and no projects under construction. Here, for every megawatt of proposed coal power that has entered construction since the beginning of 2010 in the country, seven megawatts of capacity have been halted. Proposed coal plants are highly controversial, with opponents of the Krabi power station on the Andaman coast engaging in a two-week hunger strike, which only ended after Prime Minister Prayut Chan-o-cha agreed to put the project on hold and set up a joint committee with stakeholders to investigate the proposal.

Given Thailand's internal resistance to coal, some developers are looking to construct plants across the border in Myanmar, Laos, or Cambodia and then export the power to Thailand.

SOUTHEAST ASIA: MYANMAR

Embargoes imposed during Myanmar's former military dictatorship were lifted in 2010 to the excitement of coal, oil, and gas industrialists eager to invest in the "last unopened Asian market," with borders connecting it to the larger economies of India, China, and Thailand. Most plans are still in the early stages. While 14.5 GW of coal generation is announced, permitted, or in pre-permit development, no coal plants are under construction, and no new coal capacity came online between 2010 and today.

Many of Myanmar's proposed coal plants are planned in conflict zones or areas where conflicts only recently ended, often due to their proximity to Thailand. Despite the fact that Myanmar has some of the lowest electrification rates in the world (World Bank 2014), new coal plants are more likely to benefit those beyond its borders since domestic grid connections are expensive and buyers outside the country will pay more for electricity. The Japanese company Marubeni

planned to export 80 percent of electricity from its proposed Tanintharyi power station to Thailand, and protests against the plant led Myanmar company and project partner Ayeyar Hintha to pledge it will withdraw if there are negative environmental impacts.

Other proposed coal plants in Myanmar face similar opposition. A series of protests were held against the announced 1,280 MW Inn Din power station in Mon State, backed by the Thailand-based Japanese company Toyo-Thai Corporation (TTCL). Responding to the controversy, the Mon State parliament attempted to block a feasibility study for the project, but the central government signed a memorandum of agreement regardless. Later, officials attempted to crack down on the continued resistance, arresting 26 people, including the village chairman. Their effort backfired, however, when 350 people from Andin and neighboring villages showed up at the police station and asked to be arrested in solidarity. In December, representatives from communities where coal plants are proposed, including Andin, traveled to Japan to deliver a letter signed by 72 civil society organizations asking that JBIC reject support for coal in Myanmar. In January 2016 the Inn Din project was suspended, though not cancelled.

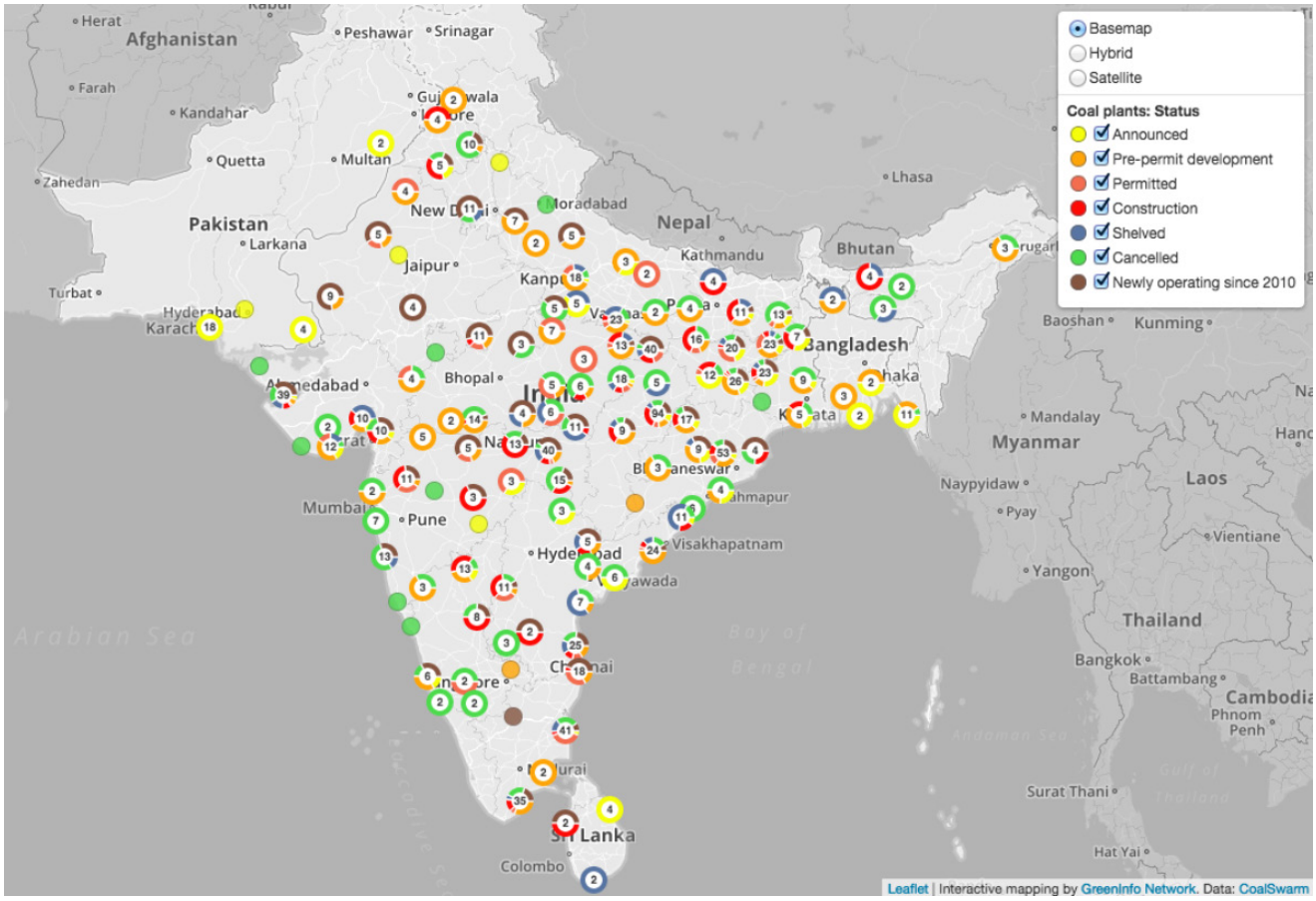
Myanmar's political situation has also thrown plans for proposed coal plants into question. Due in large part to the controversy surrounding coal, all coal projects were put on hold in the months leading up to the historic November 2015 election (Shin 2015). On February 1, 2016, the National League for Democracy (NLD) took over a majority of parliament, led by pro-democracy activist and former political prisoner Aung San Suu Kyi. What this means for the former government's coal expansion plans remains to be seen.

SOUTHEAST ASIA: PHILIPPINES

While the government of the Philippines is backing the expansion of coal power, with 7.5 GW announced, permitted, or in pre-permit development and another 4.5 GW under construction, it faces a powerful opponent—the Catholic Church. The country is 80 percent Catholic, and Filipino bishops have taken Pope Francis's call to fight climate change as a directive to stop coal, asking the government to reverse approval for projects and instead shift resources to renewable energy.

The urgency of the church's call is heightened by citizens' awareness of the danger climate change poses to their country in the wake of Typhoon Haiyan, which killed 6,000 people when it swept through the country in 2013. In December, the bishops reiterated their commitment to stopping coal, stating: "The church will oppose the opening of new coal-fired power plants and advocates the denial of government permits and licenses to coal mines" (Torres 2015).

SOUTH ASIA



OVERVIEW

India is second only to China in the amount of proposed coal power capacity in the pipeline (218 GW), under construction (72 GW), and newly operating (19 GW in 2015). In its *Medium-Term Coal Market Report*, the IEA projected that India, along with Southeast Asia, would continue to drive global coal power growth (IEA 2015b). But while India continues to pursue new coal plants, prices for solar projects have fallen below those of plants fueled by imported coal, and as a result it appears increasingly likely that the country will soon be downscaling its coal power expansion plans.

Among the other South Asian countries—Bangladesh, Pakistan, and Sri Lanka—no new coal capacity went into operation in 2015, and only 930 MW of coal capacity is currently under construction (in Pakistan). However, the three countries do have 38.5 GW in various stages of development, though many projects face strong grassroots opposition.

Table 21. Proposed Coal Power in South Asia (MW)

	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating (2010–2015)	Cancelled (2010–2015)
India	64,630	95,595	58,244	218,469	72,200	85,065	101,875	305,272
Bangladesh	9,277	4,810	0	14,087	0	0	0	283
Pakistan	10,470	3,890	5,793	20,153	930	5,800	0	7,620
Sri Lanka	3,300	1,000	0	4,300	0	600	600	1,200
Total	**87,677**	**105,295**	**64,037**	**257,009**	**73,130**	**91,465**	**102,475**	**314,375**

Source: Global Coal Plant Tracker, January 2016

Table 22. Proposed Coal Power in South Asia (Units)

	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating 2010–2015	Cancelled 2010–2015
India	56	150	96	302	141	124	258	335
Bangladesh	13	8	0	21	0	0	0	1
Pakistan	26	10	12	48	3	11	0	14
Sri Lanka	1	4	0	5	0	2	2	1
Total	**96**	**172**	**108**	**376**	**144**	**137**	**260**	**351**

Source: Global Coal Plant Tracker, January 2016

SOUTH ASIA: INDIA

Coal is India's primary energy source. In fiscal year (FY) 2014–2015, coal-fired power generation provided 74 percent of the country's electricity generation (Buckley 2015b). India overtook the United States as the second largest coal consumer in 2014 in terms of physical tonnes, using 924 million tonnes (Mt) of coal compared to 835 Mt consumed in the U.S. (Enerdata 2015). The IEA projects coal use will grow around 4 percent a year in India through 2020 (IEA 2015b).

As can be seen in Table 23, India is second only to China in the amount of proposed coal power capacity in the pipeline (218 GW is announced, pre-permitted, or permitted), under construction (72 GW), and newly operating (102 GW from 2010 through 2015). The 218 GW in the pipeline represents a drop of 79 GW from 2014, when 297 GW of proposed capacity was proposed (Shearer et al. 2015). According to the classification system used by the Global Coal Plant Tracker, described in detail in Appendix A of this report, projects are considered to be shelved if no developmental

Table 23. Proposed Coal Power in India by State (MW)

State	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating 2010–2015	Cancelled 2010–2015
Andhra Pradesh	7,640	10,470	5,560	23,670	2,520	7,480	6,070	36,277
Assam	0	500	0	500	500	0	250	1,820
Bihar	5,320	3,960	1,320	10,600	6,975	3,980	2,015	24,720
Chhattisgarh	660	11,730	1,940	14,330	12,185	2,120	12,455	27,040
Gujarat	6,240	1,920	13,100	21,260	1,570	4,680	11,040	16,530
Haryana	0	800	0	800	0	1,600	4,020	1,980
Jharkhand	5,320	8,200	2,483	16,003	4,760	16,530	4,413	25,355
Karnataka	1,600	5,200	660	7,460	5,120	1,920	2,185	16,960
Kerala	0	0	0	0	0	0	0	1,320
Madhya Pradesh	1,600	10,460	9,240	21,300	6,700	11,640	11,080	30,760
Maharashtra	1,560	7,120	2,450	11,130	8,490	3,480	14,004	42,025
Meghalaya	0	0	0	0	0	0	0	740
Odisha	12,240	6,760	3,121	22,121	7,040	12,505	7,090	25,945
Puducherry	0	0	0	0	0	0	0	1,980
Punjab	0	2,640	0	2,640	1,200	500	2,020	6,670
Rajasthan	1,600	4,870	250	6,720	2,640	0	5,060	120
Tamil Nadu	5,710	8,665	10,600	24,975	1,920	9,210	7,463	16,240
Telangana	4,000	3,280	920	8,200	1,800	0	650	5,610
Uttar Pradesh	10,640	5,300	6,600	22,540	5,860	5,620	7,860	10,760
West Bengal	500	3,720	0	4,220	2,920	3,800	4,200	12,420
Total	**64,630**	**95,595**	**58,244**	**218,469**	**72,200**	**85,065**	**101,875**	**305,272**

Source: Global Coal Plant Tracker, January 2016

activity occurs for two years, and they are considered to be cancelled if no developmental activity occurs for four years. In India, while 174 GW of capacity began construction or was completed from the beginning of 2010 to late 2015, over 390 GW of capacity was halted over that same period.

Coal plant proposals are concentrated in the states of Andhra Pradesh, Gujarat, Madhya Pradesh, Odisha, Tamil Nadu, and Uttar Pradesh, and have moved a bit away from Chhattisgarh and Maharashtra, which had the highest number of newly operating plants from 2010 through 2015.

Table 24. Proposed Coal Power in India by State (Units)

State	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating 2010–2015	Cancelled 2010–2015
Andhra Pradesh	5	16	7	28	5	7	14	33
Bihar	3	6	2	11	15	3	4	19
Chhattisgarh	1	19	6	26	25	4	29	37
Gujarat	6	4	18	28	5	7	22	22
Haryana	0	1	0	1	0	2	7	3
Jharkhand	7	7	6	20	10	22	13	25
Karnataka	2	8	1	11	8	4	6	16
Madhya Pradesh	2	15	14	31	10	18	25	39
Maharashtra	4	12	8	24	20	6	40	39
Odisha	7	10	7	24	10	19	23	21
Punjab	0	4	0	4	3	1	3	9
Rajasthan	1	8	1	10	4	0	21	1
Tamil Nadu	6	18	14	38	3	15	24	20
Uttar Pradesh	6	7	10	23	13	9	15	17
West Bengal	1	6	0	7	5	7	9	16
Meghalaya	0	0	0	0	0	0	0	3
Assam	0	2	0	2	2	0	1	4
Telangana	5	7	2	14	3	0	2	6
Puducherry	0	0	0	0	0	0	0	3
Kerala	0	0	0	0	0	0	0	2
Total	**56**	**150**	**96**	**302**	**141**	**124**	**258**	**335**

Source: Global Coal Plant Tracker, January 2016

As can be seen in Figure 12, the year 2015 saw India's first drop in annual installations of new coal power capacity, to 19.2 GW, after continuous growth since 2006. This is a 10 percent decline from the amount of capacity installed in 2014 of 21.3 GW.

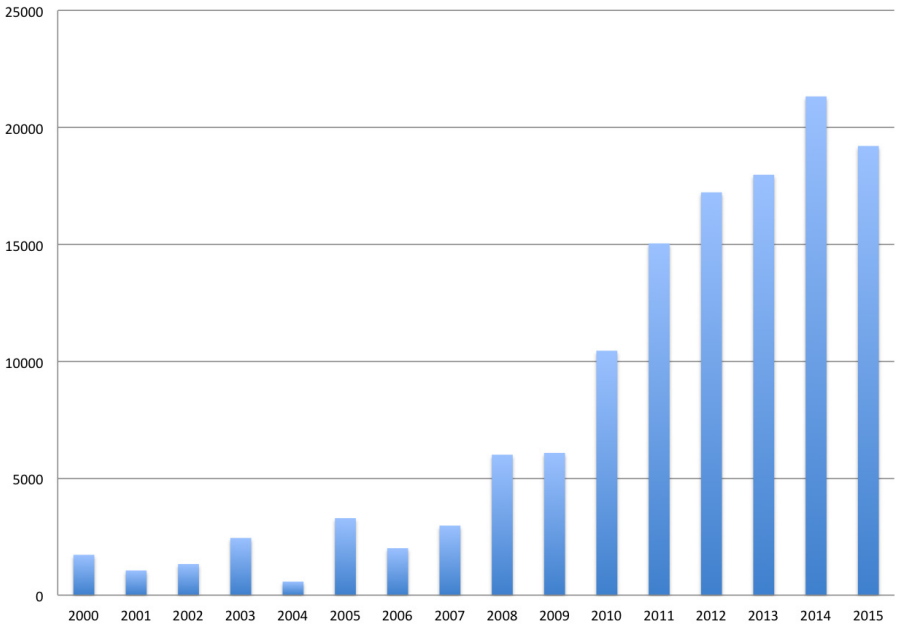
The decline in proposed and newly operating coal plants, and the high number of cancelled projects, highlight the issues facing India's coal and power sectors. Barriers include financially strapped electricity distribution companies; the difficulty of ramping up mining of domestic coal; the high cost of coal imports relative to the constraints on the ability of India's distribution companies to charge their customers for power; and grassroots opposition against new coal plants and mines. Finally, given the inadequacies of India's electrical grid, there is the fundamental question of whether building more coal plants is actually a feasible way to deliver power to the estimated 300 to 400 million people in India lacking access to electricity.

Financing

To understand the current state of coal power development in India, it is useful to review the government's efforts over the past decade to transform the country's power sector and accelerate the growth of its generating capacity. Starting in 2003, India's government introduced a partial privatization of coal plant ownership, initiating a series of tenders for the construction, ownership, and operation of large-scale coal plants. The program involved putting out for private market tender a large number of electricity power purchase agreements (PPAs), most priced in the range of Rs2–3/kWh (US$30–40/MWh). As noted by Tim Buckley of IEEFA: "Many Indian firms diversified into the coal-fired power generation sector on the back of US$1-4 billion commitments to build greenfield power plants" (Buckley 2014).

The PPA contracts were generally long term in nature (15–25 years) and included little scope to adjust prices in response to inflation. At the time, coal was expected to be provided predominantly from lower cost domestic Indian sources.

Figure 12. India Coal Power Additions, 2000–2015 (MW)



Sources: Platts WEPP (2000–2009), Global Coal Plant Tracker (2010–2015).

The government's privatization initiative produced a tsunami of coal plant proposals. In 2011 a study by Prayas Group reported more than 512 GW of proposed new coal plants had received at least preliminary approval from the Ministry of Environment, Forests, and Climate Change—five times the size of the country's coal-fired generating capacity at that time. Prayas warned that the situation was overheated and would end with "stranded assets of plant and transmission facilities" and impacts that "will be borne to a significant extent by the common people, the country and the environment" (Dharmadhikary and Dixit 2011).

As developments unfolded, it was clear that most of the proposals that had been floated in response to the government's privatization initiative would never be built. While a significant number of coal projects did proceed into construction, and 102 GW of new capacity was built from 2010 through 2015, the overwhelming majority of the projects in the developmental pipeline in 2011 did not come to fruition. By 2012, banks and other financial gatekeepers had become wary of the boom and pulled back their support. In 2015 CoalSwarm found that only 9.5 GW (2 percent of the 512 GW) actually entered construction during the period from mid-2012 to mid-2014. Although construction has subsequently rebounded to some degree, the overall level of enthusiasm for further large-scale capacity additions has faded dramatically. As of January 2016, the amount of proposed coal plants in the pre-construction stages has shrunk to just under 218 GW, with only 58 GW of the proposals permitted.

The privatization push was built on the expectation of plentiful and affordable domestic and/or imported coal. However, as the country was unable to meet coal demand through domestic supply it increasingly turned to imported coal, which became expensive and unsustainable. Many companies are losing money due to excessive financial leverage and PPAs that were negotiated at too low a level to allow for a profit margin (Buckley 2015b). On top of that, many state electricity distribution companies are struggling financially and have reduced or cancelled their PPAs with power plant owners. By April 2015, around 29 GW of power generation capacity in India was without a PPA (Jai 2015). In January 2016, 45 percent of power offered for sale on India's electricity exchange remained unsold, in another indication that India's power market is unable to afford the cost of the expanding supply of coal-fired power, despite large unmet electricity need in the country (Burton 2016).

Domestic Coal Mining

India's installed coal-fired capacity doubled from 1990 to 2010, from 50 GW to 100 GW. Most of these were subcritical plants using domestic coal. By 2009, the country's coal demand started to outstrip domestic coal supply. The lack of coal supply was exacerbated by the Coalgate scandal, which emerged in 2012 after a Central Bureau of Investigation probe into mishandling of lucrative coal allocations. In March 2014, a report released by the Comptroller and Auditor General accused the government of allocating coal blocks in an inefficient and uncompetitive manner during the period 2004–2009, creating an estimated windfall gain to the coal block allocatees of US$160 billion. In August 2014, India's Supreme Court canceled 214 out of 218 coal licenses allocated since 1993.

In May 2014 Narendra Modi took over as Prime Minister on a platform that included increased industrial production and electricity access. To increase domestic coal mining, the Modi administration accelerated environment and land approvals, cleared more mining projects, and resumed the auctioning of coal blocks. Under the Modi government, Coal India set a target of 1,000 million tonnes per annum (Mtpa) within five to seven years, a doubling of the 494 Mt produced in FY 2014–2015. The government also announced plans for an additional 500 Mtpa by 2021, to be mined by private companies.

In FY 2014–2015 Coal India, which accounts for 80 percent of India's domestic coal output, raised its production by 7 percent. Coal plants under construction reached 72 GW by the end of 2015. However, infra-

structure bottlenecks continued to slow the drive for increased coal production, in particular insufficient rail capacity (Sonar 2015). Moreover, for Coal India's expansion goals to be met, hundreds of thousands of residents would face relocation, including a reported 100,000 people in Jharkhand alone (Buckley 2015b).

A further challenge for plans to expand coal mining is the declining energy content and high ash content of the country's domestic coal, and the potential unsuitability of such coal for new supercritical plants (Cully 2015). As seen in Table 25, in cases where the combustion technology is known, supercritical plants currently make up 152.5 GW (88 percent) of India's proposed plants and 45 GW (66 percent) of plants under construction.

India's coal shortage impacted 13 GW of thermal power capacity in 2015, with an estimated value of US$15 billion (Sonar 2015). Many nearly completed plants, such as the 3,600 MW KSK Mahanadi Power Project in Chhattisgarh and the 1,800 MW Tori power plant in Jharkhand, do not have a coal supply. Other proposals in various stages of permitting have been put on hold due to lack of coal, such as the 3,960 MW Chitrangi Power Project and phase II of the 2,520 MW Annupur Thermal Power Project, both in Madhya Pradesh.

Although many plants have yet to receive a coal linkage, the country recently reported surplus domestic coal supplies, due to the inability or unwillingness of state-owned distribution companies to purchase power at rates that would ensure the financial viability of power generation companies, resulting in power companies reducing utilization rates. Excess coal supply was estimated by the Central Electricity Authority at 74 million tonnes in January 2016. With growing stockpiles, interest from private bidders in the fourth round of coal block auctions was so limited the government opted to cancel it (Burton 2016).

Domestic coal shortages and price imbalances have led to a dramatic fall in the average coal plant utilization rate—the percentage of maximum output that plants are actually achieving—from 78.6 percent in 2007–2008 to 64.5 percent in 2014–2015 (CEA 2015).

Table 25: Coal Combustion Technology in India (MW)

	Subcritical	Supercritical	Ultra-super	Unknown
Announced	1,030	33,960	4,000	25,640
Pre-permit development	9,050	69,410	0	17,035
Permitted	4,915	49,140	1,320	2,806
Announced + Pre-permit + Permitted	14,995	152,510	5,320	45,481
Construction	22,780	45,085	0	3,835

Source: Platts WEPP December 2015

INDIA'S ULTRA MEGA POWER PROJECTS

The program of Ultra Mega Power Projects (UMPP) was introduced in 2005 by the India Ministry of Power to help streamline the construction of large supercritical coal plants of around 4,000 MW each. The UMPP program creates a two-stage process. In the first stage the Power Finance Corporation creates a shell company called a Special Purpose Vehicle to secure clearances, acquire land and water, and obtain commitments for coal. Private companies are then given a chance to acquire the shell company under a process of competitive bidding. The bidder guaranteeing to sell power at the lowest levelized tariff is selected. The Ministry planned for up to 16 UMPPs throughout the country.

The power purchase agreements (PPA) underpinning the UMPPs were generally priced at Rs2–3/kWh for terms of up to 25 years. Low PPAs were built on the expectation of plentiful domestic coal and/or cheap imported coal, neither of which has panned out (Buckley 2014). Most of the projects have floundered due to economic viability and land acquisition issues.

The central government has so far awarded four UMPPs—Mundra UMPP in Gujarat to Tata Power, and Sasan UMPP in Madhya Pradesh, Krishnapatnam UMPP in Andhra Pradesh, and Tilaiya UMPP in Jharkhand to Reliance Power.

Mundra and Sasan have been constructed but face challenges.Tata Power had to renegotiate its PPA with the state electricity regulator before the 2012 commissioning, due to a fourfold increase in the price of coal imported from Indonesia. Shortly after Sasan's final unit was completed in 2015, owner Reliance Power asked India's Power Finance Corporation to buy out the project, citing a "breach of representation" due to the de-allocation of the Chhatrasal coal block, which had been linked to the project.

Krishnapatnam and Tilaiya have both been delayed, perhaps indefinitely. Work on Krishnapatnam halted in 2011 due to ongoing legal battles over the project's coal supply. In January 2016, Reliance Power said the project could not be taken forward due to escalated coal costs from Indonesia. Tilaiya has been stalled over issues with land acquisition, including allegations of police firing on protesters, killing one person. In late April 2015 Reliance Power announced that it had withdrawn from the project.

The government has identified an additional five UMPPs to be built across the country starting in FY2015. The bidding has been delayed, and *Indian Express* reported in January 2016 that only three UMPPs are likely to see bidding this fiscal year: Cheyyur UMPP in Tamil Nadu, Bedabahal UMPP in Odisha and Kakwara UMPP in Bihar (Verma 2016).

Of the remaining two proposals, Deoghar UMPP has been proposed since 2012 and is still seeking a coal source, while representatives in Chhattisgarh have said the state does not currently require the Surguja UMPP due to surplus power in the state.

In February 2016, *Mining Weekly* quoted a "senior official" with NTPC saying that UMPPs were turning out to be "pipe dreams," with no new projects put up for bidding since 2014 and projects put for bidding in 2014 having fallen through (Das 2016).

Coal Imports

To close the gap between demand and supply for coal, India began ramping up its coal imports from 50 million tonnes (Mt) in 2007–2008 to 170 Mt by 2013–2014, mainly thermal coal for power plants (Platts 2015). By FY 2014–2015, imported coal reached 212 Mt of coal, making up 22 percent of India's annual coal use.

The move toward imported coal has been expensive, however, costing the country about US$15 billion in 2014 (*Economic Times* 2016). Attempts to increase coal imports have proven both costly and difficult. The country's largest coal import proposal, the US$16.5 billion Carmichael Coal Project, is a 60 Mtpa coal mine, rail, and port expansion project proposed by Adani Mining to export Australian coal to India. The project has faced numerous challenges over its climate and environmental impacts. Allegations of crony capitalism preceded the State Bank of India's decision to reject a US$1 billion loan for the project after Prime Minister Narendra Modi struck a preliminary deal. Public pressure has also led a number of financial institutions to refuse funding for the project, and the project's own financial advisers have backed out.

Other coal import projects have also faced setbacks: the coal in Coal India's licenses for Mozambique's Tete Province proved to be of low-quality; Essar Group acquired Trinity Coal of the United States, which later went into bankruptcy; and Tata Power sold off the majority of its shares in its Bumi Resources mines in Indonesia, due to losses at its import coal–fueled Tata Mundra Ultra Mega Project (UMPP). Another UMPP, Krishnapatnam, has been abandoned by sponsor Reliance Power due to escalating coal costs from Indonesia, as described in the sidebar "India's Ultra Mega Power Projects."

By FY 2015–2016, India's coal imports fell 15 percent in the first 9 months compared to the previous fiscal year (132.3 Mt from 155.4 Mt) (*Economic Times* 2016). The fall in imports contradicts the assumptions of IEA's *Medium-Term Coal Market Report*, which projected continuing coal import growth (IEA 2015b). Energy Minister Goyal said in 2014 that he believed India could end thermal coal imports within the next two to three years.

Public Opposition

The legal and economic issues affecting India's coal plants only paint part of the picture. There is widespread grassroots opposition to coal in India, most notably in the communities that will be most impacted—and for good reason. In rural areas, coal plants and mines displace entire villages, destroy forests, compete with agriculture for scarce water, produce emissions that damage agricultural yields, and impact fisheries through thermal emissions into coastal waters. Plants contribute to India's worsening air pollution, which has become a major public health issue. According to the World Health Organization, India already has 13 of the 20 most polluted cities in the world, many of them worse than the most polluted cities in China (WHO 2014). The toll from coal-fired power plants has been estimated at 80,000–115,000 premature deaths every year in India (Goenka and Guttikunda 2013).

Attracting national headlines, in January 2010 more than 3,000 community members demonstrated against the Sompeta thermal power plant in Andhra Pradesh, and three people were killed in the ensuing crackdown by police and security forces. The opposition succeeded in getting the project suspended, and in August 2015 the land allotments for the plant were cancelled.

Similar grassroots resistance elsewhere has won victories in dozens of locations across the country. Following intensive local campaigning, the auctioning of the Mahan forest coal block in Madhya Pradesh—which threatened the livelihoods of over 50,000 people—was cancelled (Yeo 2014).

The Tilaiya UMPP in Jharkhand was halted over issues with land acquisition, including allegations of police firing on protesters, killing one person and injuring others. The mining project for the plant was estimated

to displace more than 8,500 households. In July 2014 the U.S. Export-Import Bank stated that it was considering financing the plant and associated coal mine. In response, over 100 organizations in India signed a letter urging the Bank to reject funding the coal project. In late April 2015 Reliance Power announced that it had withdrawn from the Tilaiya project due to its inability to obtain the required land.

In April 2015 fishing communities and farmers from India filed suit against the World Bank's International Finance Corporation (IFC) for its US$450 million loan toward the 4,000 MW Tata Mundra Ultra Mega Power Project in Gujarat. The plaintiffs allege that the IFC caused the loss of their livelihoods, destroyed their lands and water, and created threats to their health. Since then the Compliance Advisor Ombudsman, the independent investigative branch for the IFC, has issued numerous reports upholding the community's complaints and criticizing the IFC for its failure to act (Ghio 2015b).

Energy Access

The primary reason cited for the country's new coal plants and mines is rural access to electricity: It is estimated that around 300 to 400 million people do not have access to electricity. Nearly 93 percent are in rural areas (Dubey et al. 2014).

However, the idea that centralized coal will fill the gap is questionable: Thermal electricity generation capacity increased by more than 100 percent between 2002 and 2013 (from 72 GW to 153 GW), while the number of rural households reached by electricity increased by only 6.4 percent during the same period. High costs have acted as a barrier to building out the centralized electricity grid to many remote areas and communities (Dubey et al. 2014). Centralized power is most likely to feed existing users and industry. Conversely, mini and off-grid sources can provide local solutions that can help remote and rural communities without grid access take the first step on the energy ladder.

Growth of Renewables

In addition to increasing domestic coal mining, Energy Minister Goyal has proposed a target of installing 175 GW of renewable energy in India by 2021–2022, including 100 GW of solar and 60 GW of wind power. Solar installs of 75 GW could meet 22 percent of the country's projected electricity increase, while wind installs to 60 GW could meet an additional 18 percent (Buckley 2015b). Goyal has also set a target to reduce grid transmission losses from around 21 percent to 15 percent by 2019, thereby maximizing power resources.

Solar costs in India are dropping rapidly. In November 2015 SunEdison secured power purchase agreements (PPAs) for 500 MW of solar bids at Rs4.63/kWh (US$7.1cents/kWh)—lower than the baseline PPA of Rs 5.4/kWh (US$8.6 cents/kWh) that would be needed to profitably build a new plant using imported coal. In January 2016, solar tariffs fell even further, to a new low of Rs4.34/kWh (~US6.5 cents/kWh), prompting Energy Minister Goyal to say that solar PV is now cheaper than coal-fired generation. Solar's total installed cost in India dropped by more than 20 percent in 2015 alone (Buckley 2016).

Of the proposed 100 GW of solar power, 40 GW is planned to be distributed rooftop systems. Such distributed generation projects can cost-effectively reach those in rural areas who currently lack electricity access (Dubey et al. 2014).

SOUTH ASIA: PAKISTAN

Among the South Asian countries of Bangladesh, Pakistan, and Sri Lanka, no new coal capacity went into operation in 2015, and only 930 MW of new coal capacity is currently under construction (in Pakistan). However, the three countries do have 38.5 GW in various stages of development.

The signing of the China-Pakistan Economic Corridor Agreement in April 2015 brought the prospect of a large influx of Chinese capital and expertise into the building of coal projects in Pakistan. The deal

included four coal plants totalling 4,920 MW: Port Qasim EPC power station, 1320 MW; Thar Engro power station, 1320 MW; Hubco power station, 1320 MW; and Salt Range power station, 300 MW. In addition, the deal provided for coal terminal and mine developments, two necessary ingredients for boosting Pakistan's coal capacity. The corridor agreement included (1) financing support from the Ex-Im Bank of China for Port Qasim EPC power station; (2) control of Gwadar Port by China for 40 years; (3) agreement on Port Qasim EPC power station between Power China and the government of Pakistan; (4) terms and conditions in favour of Sindh Engro Coal Mining Company for the Thar Block II 3.8 Mtpa mining project, arranged by China Development Bank Corporation; (5) terms and conditions in favour of Engro Powergen Thar (Private) Limited, Sindh, Pakistan for the 660 MW Thar Engro power station, arranged by China Development Bank Corporation; (6) a facility agreement for the Sahiwal power station between Industrial and Commercial Bank of China Limited, Huaneng Shandong Electricity Limited and Shandong Ruyi Group; (7) a cooperation agreement on the Hubco power station between CPIH and Hubco Power Company; and (8) a facilitation agreement on the Salt Range power station between CMEC and the government of Punjab.

Coal projects in Pakistan have enountered resistance. In July 2015, local residents succeeded in forcing the Punjab government to drop the proposed Lahore power station. In September, dozens protested the 110 MW Multan power station in Punjab, objecting to the impact on mango orchards and other crops. Farmers in Punjab also initiated legal action to stop the Sahiwal power station. In January 2016, hundreds held a demonstration against the proposed Hubco power station in Balochistan.

SOUTH ASIA: BANGLADESH

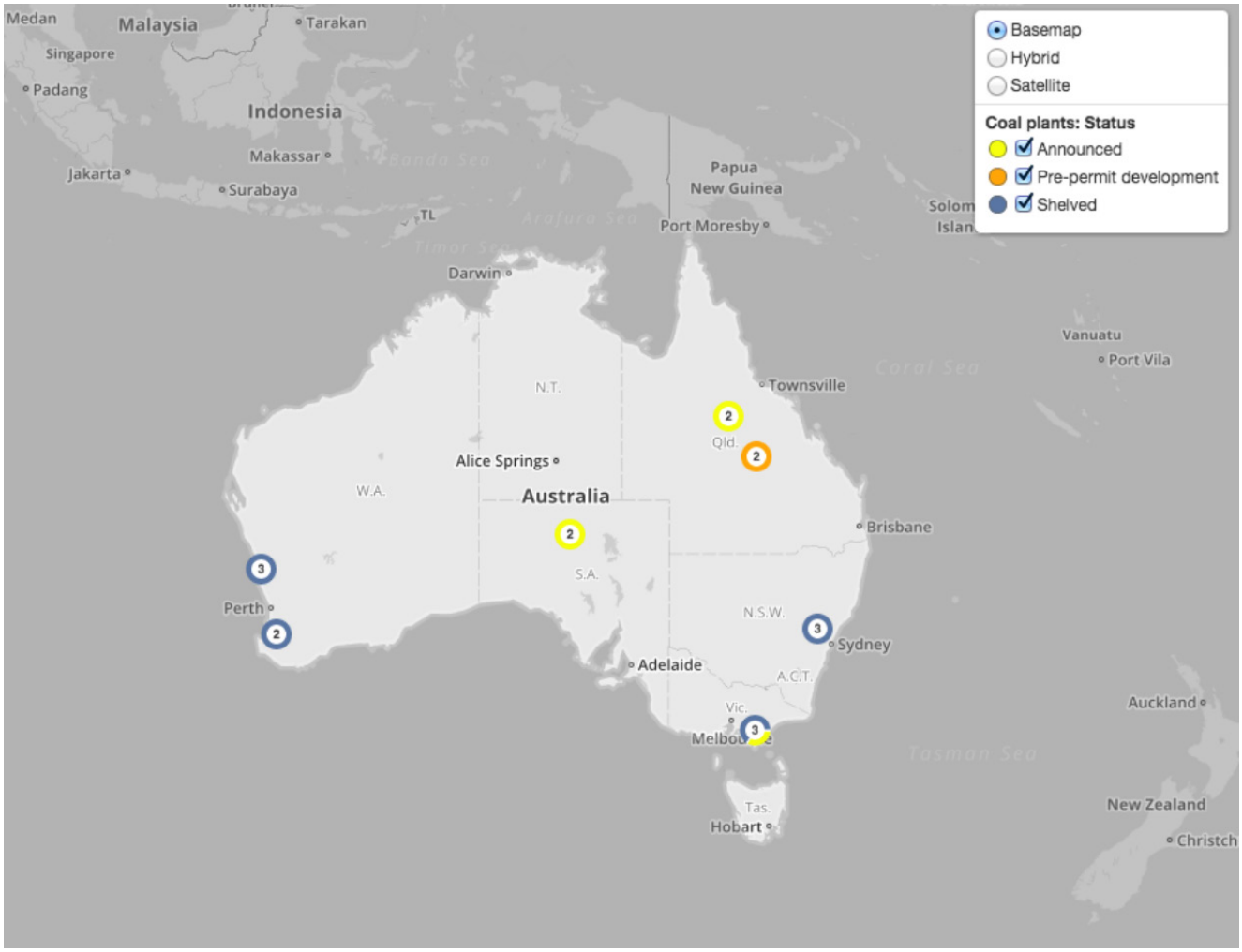
Bangladesh has been a particular focus for foreign power companies, including China Huadian Hong Kong (Maheshkhali power station), Korea Electric Power Corporation (also Maheshkkhali power station), India Power Development Board and NTPC (Rampal power station), Malaysia's Tenaga Nasional Berhad (BPDB/TNB Joint Venture Plant) and China National Machinery Import & Export Group Corporation (Kalapara power station).

In addition, the Japan International Cooperation Agency (JICA), has offered to bankroll the Matarbari power station with nearly US$3.8 billion in loans. Among the proposed coal projects in Bangladesh is the Rampal power station, located in the environmentally sensitive Sundarbans mangrove area. The Rampal project is one of the most controversial in the world and has been the focus of persistent opposition for several years. Thousands of Bangladeshis joined a five-day, 400 km march against the project. In June 2015 three French banks announced that they would not support the project, following opposition from the council on ethics in Norway, which urged the country's pension fund to steer clear of the project.

SOUTH ASIA: SRI LANKA

While the second two units of Sri Lanka's only coal plant, the 900 MW Lakvijaya power station, were commissioned in 2014, the Chinese-built plant continues to experience severe problems. Since the commissioning of the first unit in 2011, operations have been frequently interrupted by problems including fires, steam leaks, pressure fluctuations, transmission breakdowns, equipment breakdowns, instrumentation errors, and pipe blockages. As of December 2015, all three units were once again offline due to multiple plant failures.

AUSTRALIA



Currently Australia is not an active arena for the development of coal-fired generating capacity. No plants have been built in the country in recent years, and none is in construction or permitted. According to the Australian Energy Market Operator, the National Energy Market is in a state of oversupply with up to 9 GW of excess capacity and electricity demand now 7.5 percent below its peak (AEMO 2014).

Among the projects that do remain in the developmental pipeline, none shows a high likelihood of moving forward in the near future. For existing capacity, the coal fleet consists of older subcritical plants, giving Australia's power sector the highest carbon intensity in the world (King 2015).

The country is a large coal miner, ranking fourth in global production in 2014 (Enerdata 2015). Despite the global decline in the sea-based coal trade, Australia continues to evaluate the Adani Group's Carmichael Coal Project, which would include a 60 Mtpa mine, a 189 km rail link, and an expansion of the Abbot Point Coal Terminal from 70 Mtpa to 120 Mtpa. In July 2015 Adani dissolved the project management team before construction was set to begin, leading to speculation that the project might be cancelled. Adani said it remained committed and insisted the move, which leaves only a small legal and approvals team engaged in the project, was linked to the suspension of engineering contractors in June 2015.

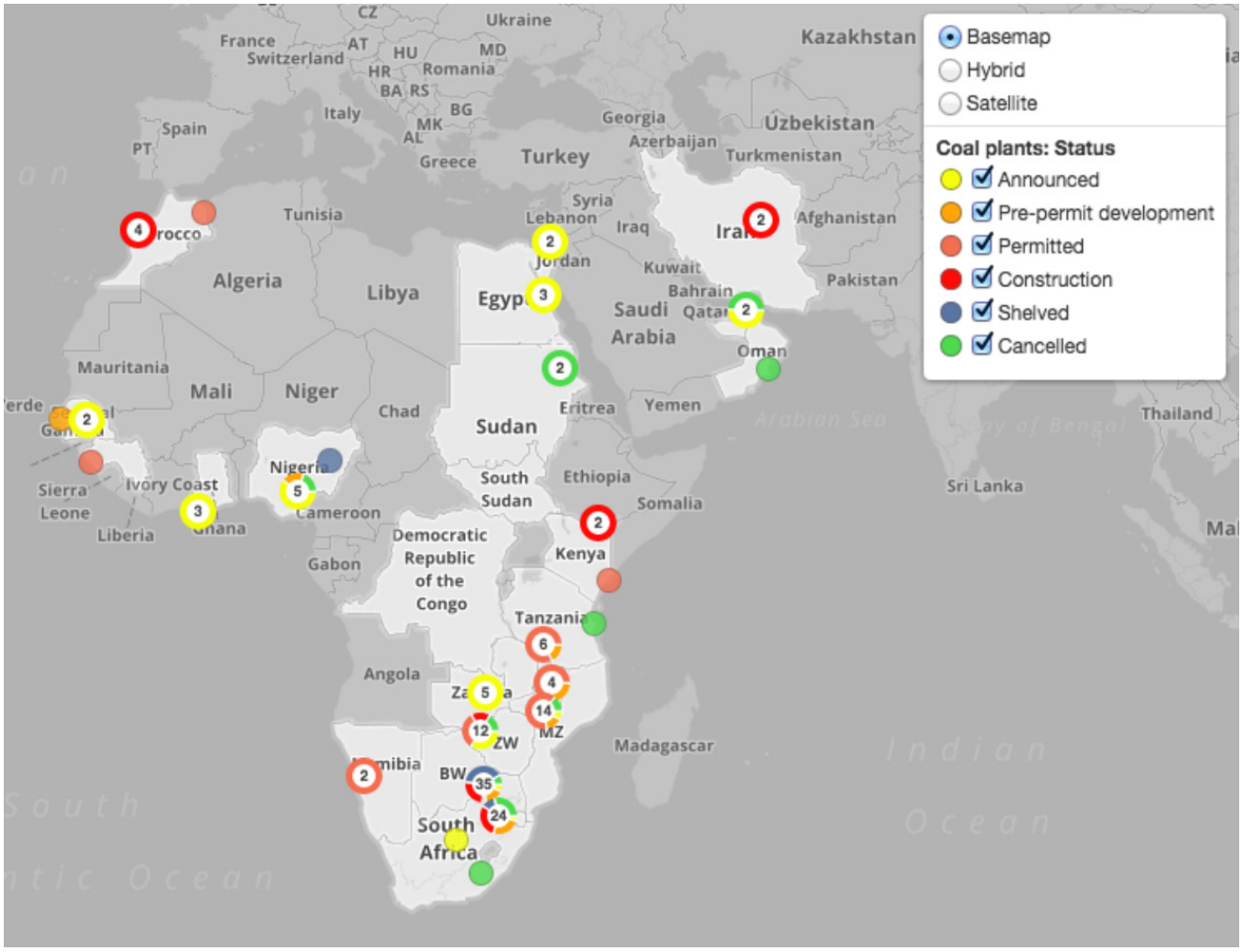
In August 2015 a federal court overturned the Abbott government's approval of the proposed Carmichael mine, finding environment minister Greg Hunt ignored his own department's advice about the mine's impact on two vulnerable species, the yakka skink and the ornamental snake. As stated in the *Guardian*: "The decision leaves Adani, which is yet to secure sufficient financial backing for Carmichael and recently slashed its workforce on the project, without legal authority to begin construction." Shortly after the federal court ruling, the Commonwealth Bank of Australia pulled out of its role as financial adviser to the project, followed by Standard Chartered.

However, in October 2015 the Australia government reissued the environmental permit for the coal and rail project, subject to 36 conditions including improving the habitat of an endangered finch, protecting groundwater, and providing A$1 million for conservation research.

In February 2016 Adani was issued environmental authority for the Carmichael mine by the Australia Department of the Environment. Adani still needs to obtain significant bank funding and must convince the Queensland government it has obtained "financial closure" before it will be allowed to begin dredging near Great Barrier Reef waters to expand the Abbot Point Coal Terminal. Adani also still has to obtain a mining lease from the Queensland government.

Shortly after the project received environmental authority, a report by Axis Capital described Adani's investment in Carmichael as "dormant" and said no capital expenditure was expected in the mine until at least April 2016. According to the report, Adani's management said that "further investments in its Australian coal mine project shall be dependent on visibility of revival in global coal prices." Still, Adani has denied reports that the Carmichael mine is on hold until coal prices rebound. However, analysis raises doubts about the project's financial viability, and the Queensland courts have found that Adani overstated the economic benefits of the project, including jobs and royalties.

AFRICA AND THE MIDDLE EAST



OVERVIEW

Africa and the Middle East have 43 GW in the proposed coal plant pipeline, over half of which is categorized by the Global Coal Plant Tracker as "announced," the most preliminary stage of development. An additional 11 GW is under construction, mostly consisting of the Medupi Power Station (4,864 MW) and the Kusile Power Station (4,864 MW) in South Africa, both planned for completion by 2021.

South Africa is estimated to have 95 percent of Africa's total coal reserves (EIA 2015). The country has launched a program to have new coal plants built by the private sector and fueled by existing or proposed domestic coal mines, leading to a number of proposals. Other countries with smaller amounts of domestic coal, including Mozambique, Nigeria, and Zimbabwe, are also proposing new plants fueled primarily by domestic mines. Zimbabwe's nearly 8.4 GW of proposed coal projects are sponsored or supported almost entirely by Chinese companies and organizations. Egypt has emerged as a large coal plant proponent with 6,640 MW of proposals, all of which are in early stages.

Table 26. Proposed Coal Power in Africa and the Middle East (MW)

Country/Region	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating (2010–2015)	Cancelled (2010–2015)
Zimbabwe	5,630	0	3,300	8,930	0	0	0	0
South Africa	2,315	3,735	600	6,650	8,743	6,720	1,545	520
Egypt	6,640	0	0	6,640	0	1,950	0	0
Nigeria	1,500	0	1,700	3,200	0	0	0	115
Mozambique	1,920	300	900	3,120	0	0	0	1,500
Botswana	1,500	1,100	300	2,900	0	300	600	3,300
Ghana	0	2,000	0	2,000	0	0	0	0
Tanzania	600	300	800	1,700	0	400	0	0
United Arab Emirates	1,200	0	270	1,470	0	0	0	1,000
Israel	1,260	0	0	1,260	0	0	0	0
Malawi	700	240	300	1,240	0	0	0	0
Kenya	0	1,050	0	1,050	0	0	0	600
Senegal	0	850	125	975	0	0	0	0
Zambia	300	600	0	900	300	0	0	1,000
Democratic Republic of Congo	0	500	0	500	0	0	0	0
Morocco	0	0	318	318	1,386	0	700	0
Namibia	300	0	0	300	0	0	0	250
Iran	0	0	0	0	650	0	0	0
Oman	0	0	0	0	0	0	0	1,000
Swaziland	0	0	0	0	0	0	0	1,400
Guinea	0	0	0	0	0	250	0	0
Sudan	0	0	0	0	0	600	0	0
Total	**23,865**	**10,675**	**8,613**	**43,153**	**11,079**	**10,220**	**2,845**	**10,685**

Source: Global Coal Plant Tracker, January 2016

SOUTH AFRICA

South Africa is estimated to have the ninth-largest reserves of recoverable coal in the world. In 2014, the country mined 260 million tonnes (Mt) of coal. Of this, about 183 Mt (70 percent) was used internally (EIA 2015).

Over 90 percent of South Africa's electricity is generated from coal, and over 30 percent of South African fuel is liquefied coal (World Coal Association, 2015). With respect to curbing its greenhouse gas emissions, the country plans to continue being a large consumer and miner of coal, pledging only that its future greenhouse gas emissions are moderately beneath a "business-as-usual" scenario (CAT 2015b).

In 2011 the South Africa Department of Energy (DOE) released a 2010–2030 Integrated Resource Plan (IRP) on future energy use. Plans for coal power included Medupi Power Station and Kusile Power Station, as well as 6,253 MW of unnamed projects. According to the Global Coal Plant Tracker, the country currently has 6,650 MW of proposals, only 600 MW of which are currently permitted. Other than the long-discussed 1,500 MW Coal-3 power station, South Africa's state-owned utility, Eskom, is not the sponsor of any proposals in the pipeline. Eskom did commission one unit of the Medupi Power Station in March 2015. Medupi has been plagued by labor disputes and concerns over water scarcity, while Kusile is being constructed in an area that already exceeds South African air pollution standards.

In December 2014 the government announced that it would launch a private sector–led, independent power producer (IPP) coal plant program, intended to add 2,500 MW of generation capacity to the grid. This has led to a number of current proposals including the 660 MW Namane power station and the 600 MW Waterberg Coal power station, which would each use low-grade coal from a proposed adjacent mine, and the 600 MW Umbani power station and 600 MW Khanyisa Power Station, which would each source waste coal from a nearby mine.

The proposals have been opposed by local communities and environmental groups, including groundWORK and EarthLife Africa. Public opposition led French company Engie to withdraw in 2015 from the Thabametsi project, a proposed power station and mine in SA's Limpopo province. After Engie's withdrawal, co-sponsor Exxaro Resources said it would press ahead with the coal project with Marubeni Corporation of Japan.

South Africa is also a large coal exporter, totaling 78 Mt in 2014. Asia received more than half of South Africa's coal exports, with India accounting for 40 percent (EIA 2015). More than 90 percent of South Africa's exported coal moves through the Richards Bay Coal Terminal of KwaZulu-Natal province, one of the world's largest coal export terminals. Future plans called for increasing the capacity of the terminal to 110 million tonnes per annum (Mtpa), but talks were suspended in January 2016, as the terminal's existing 91 Mtpa of capacity is not being fully utilized.

SOUTHERN AFRICA

Botswana has 2,900 MW of proposals, but only 300 MW have received the necessary permits. Most proposed projects include captive mines to fuel the plant. Mmamabula Energy Project is a proposed 600 MW coal plant and mine in Botswana, co-sponsored by India's Jindal Group, which sold 74 percent of the long-proposed project to South Africa's Glendal Trading in 2015. Mozambique has 3,120 MW of proposals, but most are only in the announced stage (1,920 MW) and involve expanded mining of domestic coal.

Zimbabwe has 8,390 MW of proposals: 5,630 MW announced and 3,300 permitted. All of the proposals are being financed, sponsored, or developed by Chinese organizations and companies, with the exception of the 630 MW Dangote power station, sponsored by Africa's richest man, Aliko Dangote, and the Sengwa power station, which is still seeking developers and financing, and may be used to export power to South Africa. Most of the proposals also include captive mines.

CENTRAL AFRICA

The Ghana Coal power station is a proposed 700 MW coal plant that may be expanded to 1,900–2,100 MW. It is being developed with Shenzhen Energy Group of China and would source coal from South Africa. It is the only proposal in Ghana. In Nigeria, the largest proposal is the 1,200 MW Kogi power station, also known as Itobe power station, followed by the 1,000 MW Ezinmo power station, which would use domestic coal and has been opposed by local residents.

NORTH AFRICA AND THE MIDDLE EAST

Activity in North Africa and the Middle East is dominated by Egypt, which has 6,640 MW of proposals, all of which are announced. The Hamarawein Port power station is a proposed 3,000–4,000 MW plant that may be financed by state-run Egyptian banks. Plans for the 2,640 MW Ayoun Moussa power station include a jetty to import coal from South Africa and Indonesia. The United Arab Emirates said it is planning to begin construction on the 1,200 MW Hassyan Clean-Coal Power Project this year.

LATIN AMERICA AND THE CARIBBEAN

With abundant supplies of hydroelectric power, Latin America and the Caribbean make relatively little use of coal for electricity generation. Colombia is the only major miner of coal (81 million tonnes in 2013), but most Colombian coal (74 million tonnes per year) is exported (WCA 2013). Across Latin America, there is only 6 GW of coal-fired power generation (IEA 2014, p. 620). As shown in Table 27, a total of 3,335 MW of new coal-fired power capacity is under construction in seven countries, while 3,012 MW is in pre-permit development and 1,450 is permitted.

Since 2013, only two small coal plants have gone into operation in Latin America and the Caribbean, one of 120 MW in Argentina and one of 164 MW in Colombia. Currently there are projects under construction in Brazil, Argentina, Chile, Colombia, the Dominican Republic, Guatemala, and Panama, totaling 2,702 MW of capacity overall. Further upstream in the development process, 7,753 MW of capacity is in various stages of planning in Brazil, Chile, Colombia, Venezuela, and the Dominican Republic.

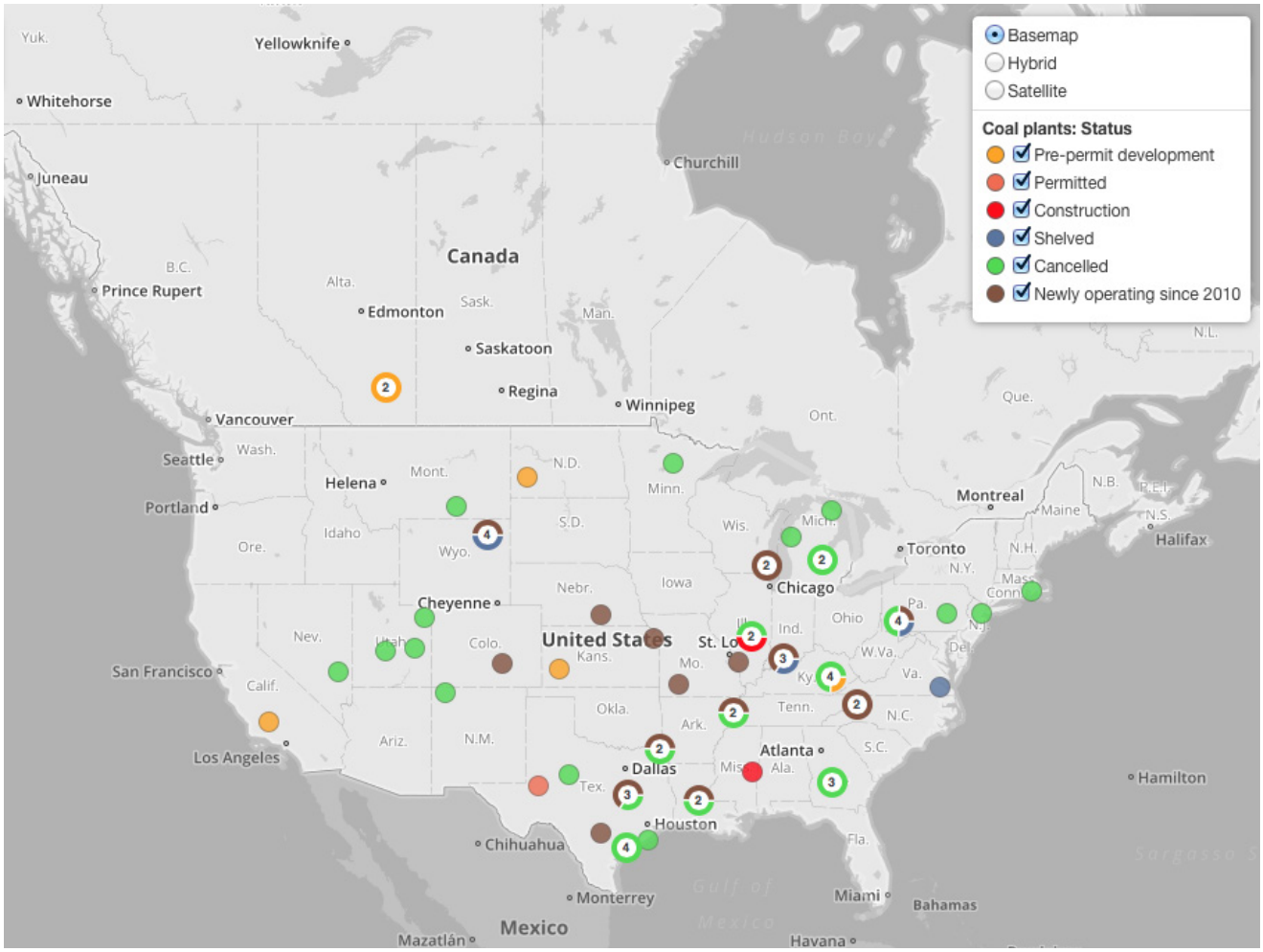
Across Latin America and the Caribbean, opponents of coal have won the cancellation of 13,435 MW of proposed capacity since the beginning of 2010. In Chile, opponents of coal have been particularly effective. In July 2015 Endesa said it will no longer build coal plants in Chile and said it had abandoned the Punta Alcalde power station. Endesa is owned by Italian utility Enel, which in March 2015 announced an agreement with Greenpeace that it would phase out future investments in coal. (Anna 2015). In January 2015, after an eight year campaign, communities along central Chile's Maule coast celebrated the collapse of efforts to build a 750 MW coal plant at Los Robles.

Table 27. Proposed Coal Power in Latin America (MW)

	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating (2010–2015)	Cancelled (2010–2015)
Brazil	600	0	3,476	4,076	340	1,950	1,805	2,100
Argentina	0	0	0	0	120	0	120	0
Chile	0	0	1,237	1,237	682	1,425	2,151	5,830
Colombia	400	200	0	600	430	350	164	0
Peru	0	0	0	0	0	0	0	135
Venezuela	1,300	0	0	1,300	0	0	0	1,500
Dominican Republic	300	240	0	540	770	0	0	1,500
El Salvador	0	0	0	0	0	0	0	220
Guatemala	0	0	0	0	60	300	60	300
Mexico	0	0	0	0	0	0	651	1,850
Panama	0	0	0	0	300	0	0	0
Total	**2,600**	**440**	**4,713**	**7,753**	**2,702**	**4,025**	**4,951**	**13,435**

Source: Global Coal Plant Tracker, January 2016

UNITED STATES AND CANADA



OVERVIEW

Coal-fired generating capacity in both the United States and Canada is on the decline. On the West Coast, plans to build new terminals in British Columbia, Washington, and Oregon have stalled, due to vigorous opposition and dwindling demand in Pacific markets. In Canada, regulations require new coal plants to have carbon capture and storage (CCS) technology.

UNITED STATES

The United States continues to rapidly move away from using coal-fired power plants. In 2015 coal plants supplied 33 percent of the overall electric power in the country, down from 50 percent just 10 years earlier, while the amount of coal mined in the United States reached the lowest levels in nearly thirty years (EIA 2016). Almost one-third of U.S. coal generation totaling over 99 GW has been announced to retire since 2010.

As shown in Table 29, 38.3 GW of coal power have ceased operation since 2003. The decline of coal in the United States is only expected to accelerate, as an additional 60 GW of coal capacity is already announced to retire in the coming years, virtually no new coal plants are coming online, and advocates are working to accelerate the pace of retirements. One of the only remaining coal proposals left, the controversial Kemper coal project, has been delayed as costs have ballooned to US$6.5 billion.

One of the biggest developments in 2015 was the finalization of the Clean Power Plan (CPP) by the U.S. Environmental Protection Agency (EPA), setting the first national limits on carbon pollution from power plants. Full implementation of the CPP, which is scheduled to start in 2022, will result in even more coal-fired power plants retiring. Although the Supreme Court in February, 2016, put a temporary pause on the CPP until all legal challenges are resolved, there is still adequate time for states to meet the 2022 compliance deadline, and many states are continuing their work to develop state plans to implement the standard. Meanwhile, the Supreme Court's action is not expected to revive the coal industry or slow clean energy, due to grassroots advocacy, market trends, and a host of other federal and state policies.

Those policies include a five-year extension of tax credits for renewable energy technologies, approved by Congress in 2015, which will speed up the replacement of coal-fired power with energy efficiency, wind, and solar power. Implementation of new federal coal plant standards for air and water pollution—including mercury and air toxics, coal ash, water toxics, sulfur dioxide, haze, and more—are also forcing power companies to install adequate pollution controls on operating coal plants or retire them. Faced with those investment decisions, and in the face of tireless state and local advocacy, coal operators are increasingly opting to retire the plants instead.

One of the last remaining business strategies for the U.S. coal industry had been the prospect of increased exports from the West Coast to nations across the Pacific Ocean, such as the proposed Longview Terminal and Gateway Pacific Terminal. But with signs of declining coal use in China and a virtual wall of public opposition to the local pollution and climate impacts from the increased trains and ports, many proposed coal terminals across the West Coast have already been cancelled. Other coal terminal proposals include the RAM Terminal in Louisiana, a few miles from the International Marine Coal Terminal and across the river from the United Bulk Terminal, both of which also handle coal. The market for East Coast proposals is similarly in question, as coal exports from the United States declined by more than 20 percent in 2015 (EIA 2016).

Table 28. Proposed Coal Power in the United States and Canada (MW)

	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating (2010–2015)	Cancelled (2010–2015)
Canada	0	1,000	0	1,000	0	0	610	0
United States	0	1,460	400	1,860	582	325	16,593	25,401
Total	**0**	**2,460**	**400**	**2,860**	**582**	**325**	**17,203**	**25,401**

Source: Global Coal Plant Tracker, January 2016

These recent headwinds for coal in the United States have further impacted the market position of companies already mired in debt from years of banking on coal rather than investing in alternatives. Three of the four largest coal companies in the United States have filed for bankruptcy, along with dozens of small ones. While the steepest drops in production have occurred in Central Appalachia, the United States has also now put a moratorium on new leases for mining coal on federal lands which are predominantly in the West. Major U.S. financial institutions have also ended their support for both mountaintop removal coal mining and new coal-fired power plants (RAN et al. 2015).

Table 29. Coal Power Additions and Retirements in the United States, 2003–2015 (MW)

Year	Capacity Added	Capacity Retired
2003	88	928
2004	585	516
2005	329	292
2006	574	685
2007	1,577	1,215
2008	1,584	553
2009	1,774	509
2010	6,468	2,391
2011	4,253	3,261
2012	3,953	10,569
2013	1,813	6,727
2014	106	4,858
2015	0	21,565
Total	**23,104**	**54,067**

Sources: Capacity added 2003–2009, EIA Form 860; capacity added 2010–2015, Global Coal Plant Tracker, January 2016; Retirements 2003–2009, EIA Form 860; Retirements 2010–2015, Sierra Club. Figures for 2015 preliminary.

The rapid shift beyond coal in the United States is the result of years of organizing by communities to protect their health and welfare from the damages wrought by mining and burning coal, and the resulting closure of federal loopholes that allowed coal companies to avoid paying for many of the external costs of coal. As coal-fired power plants and mining companies are made to address their pollution through federal coal plant standards, they are finding it harder to compete economically against lower-cost alternatives such as energy efficiency, wind, and solar power. The continued decreasing use of burning coal to generate power in the United States is looking likely; the key questions are how quickly it will come, what will replace it, and how best to ease the transition for coal workers and communities.

CANADA

On August 19, 2011, Canada released regulations that analysts said could phase out most of the country's coal by 2050. The new rules require coal plants to emit roughly the same greenhouse gases as natural gas generators, effectively requiring new coal plants in Canada to include carbon capture and storage (CCS).

Canada's sole new coal plant proposal is the 1,000 MW Bow City Power station, which would include CCS technology. A coal-burning unit that was retrofitted with CCS in 2014, Boundary Dam, has since been shut down for long periods due to technical problems. Owner SaskPower is paying millions of dollars in penalty payments to oil company Cenovus Energy for breaches of the contract for the sale of carbon dioxide, which Cenovus uses to pump into a reservoir for enhanced oil recovery (Burton 2015b).

In 2015 the newly elected New Democratic Party proposed phasing out all coal plants in Alberta by 2030, and replacing 50 to 75 percent of the retired coal power with electricity from renewable sources.

EURASIA

OVERVIEW

Eurasia includes several countries with large coal reserves, including Russia, Mongolia, and Kazakhstan. Overall, the region has 2 GW of new coal-fired generating capacity in construction and 16 GW in various stages of pre-construction development. Since 2010 only 2 GW of coal power has been completed throughout Eurasia.

EURASIA: RUSSIA

At 48 GW, Russia's existing fleet of coal plants is the fifth largest in the world, behind Germany and ahead of Japan. Since the beginning of 2010, only 1,809 MW of new coal power capacity has been built in Russia, including a new 800 MW unit at Berezovska power station in Krasnoyarsk and a 225 MW unit at Cherepetskaya power station.

While most of Russia's massive coal reserves, estimated to be the second largest in the world, are unlikely to be developed for Russia's own power needs, the country's location opens the possibility of coal mines or coal plants dedicated to Chinese markets. The first large example of such a project is the 8,000 MW Erkovetskaya power station, proposed for Amur Province near the Chinese border. In 2013, a framework agreement was signed between state-owned Inter RAO (owned by the Russian government) and State Grid Corporation of China, calling for Russia to hugely expand its power generation capacity in eastern Russia, for export to China. In February 2014, the two companies proposed the Erkovetskaya station, which, if built, would double the coal-fired generating capacity of Russia's Far East and be the largest coal plant in the world. Since the Chinese provinces close to this project are already oversupplied, the project is targeted to supply the Beijing grid. It would require the construction of 2,000 km of transmission lines. In February 2015, SGCC stated that the plant's cost would be US$15 billion. The Russian energy minister stated that the goal was to begin construction on the first stage of the plant by late 2015 or early 2016, and to finish the first stage by the end of 2019. Details on the plant are still scarce, including the size of the individual units.

EURASIA: BELARUS, KAZAKHSTAN, MONGOLIA, UZBEKISTAN, KYRGYZSTAN

Outside Russia, no new coal plants have gone into operation in the Eurasia region other than a 150 MW unit completed in Kazakhstan in 2011.

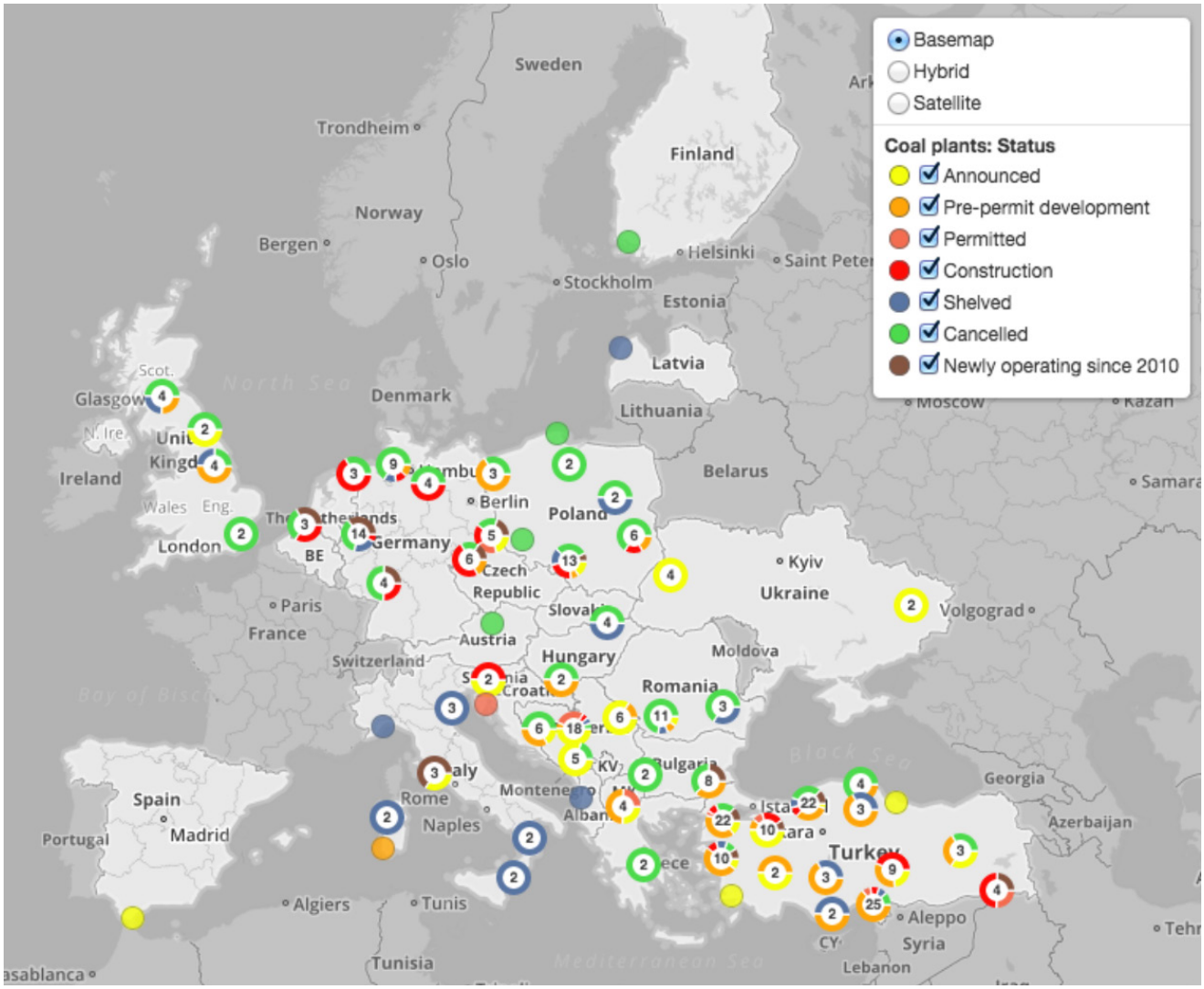
The Shivee Ovoo power station is a proposed coal-fired power station at the Shivee Ovoo coal mine in Mongolia. The plant has been proposed since 2008 and would export nearly all of its power to China. In 2015 the China National Electric Equipment Corporation agreed to a pre-feasibility study on the project, with some reports saying the plant may eventually reach up to 9,240 MW, although this would require increasing the mine's output from 1.6 million tonnes per annum (Mtpa) to 34 Mtpa.

Table 30. Proposed Coal Power in Eurasia (MW)

	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating (2010–2015)	Cancelled (2010–2015)
Russia	9,280	0	0	9,280	1,350	4,410	1,809	5,000
Armenia	0	0	0	0	0	0	0	0
Belarus	0	0	0	0	0	400	0	1,000
Georgia	150	0	0	150	0	0	0	0
Kazakhstan	0	0	1,820	1,820	0	0	150	0
Kyrgyzstan	1,500	0	0	1,500	0	0	0	0
Mongolia	370	1,750	1,200	3,320	200	1,100	0	0
Uzbekistan	300	0	0	300	150	0	0	0
Total	**11,600**	**1,750**	**3,020**	**16,370**	**1,700**	**5,910**	**1,959**	**6,000**

Source: Global Coal Plant Tracker, January 2016

EUROPE AND TURKEY



OVERVIEW

In Europe, the past year has seen the amount of proposed coal capacity decline or stay flat in all countries except Germany. The European Union as a whole saw a pronounced drop, with proposed coal capacity at 11.8 GW in January 2016, down 8.4 GW from January 2015. The drop reflects the culmination of an October 2014 EU agreement to lower GHG emissions, growing public opposition to coal and coal financing, and the increasing deployment and competitiveness of renewables. Outside the EU, the number of coal plant proposals also went down in all European countries except Kosovo, where it remained the same. Turkey, however, continues to pursue large numbers of new coal plants and mines, with nearly 67 GW proposed and 3 GW under construction.

Opposition to new coal projects has been widespread and continues to be effective in both Europe and Turkey, with cancelled capacity far outstripping commissioned capacity. From 2010 through 2015, 23.5 GW of coal power went into construction or operation in the EU, while 89 GW of proposed projects were halted during the same period. In the rest of Europe and Turkey, 8 GW went into construction or operation from 2010 through 2015, while 34 GW was halted over the same period.

TURKEY

At 67 GW, Turkey has the third highest amount of proposed coal capacity globally, exceeded only by China and India. However, nearly half of that—32 GW—is classified by the Global Coal Plant Tracker as "announced," the most preliminary stage. The country has an additional 3 GW under construction. Many of the proposals depend on mining the country's lignite coal.

Throughout Turkey, mobilizations against coal power generation have been active for years, bringing together diverse groups of people including farmers, engineers, lawyers, doctors, academics, and politicians. One active region is Iskenderun Bay, currently home to two dozen coal proposals. The large number of proposals led local communities to organize together under the East Mediterranean Environmental Platform and start filing class action lawsuits in 2009 against the simultaneous licensing of several coal power stations in the same area. In October 2015 the license applications for four nearby plants—Gölovası power station, Adana Ceyhan power station, Demirtaş power station, and İztek Ceyhan power station—were rejected due to their cumulative health and environmental impacts.

Also in October 2015, French public utility company Engie withdrew from the 1,320 MW Ada Yumurtalık power station in Iskenderun Bay due to civil society mobilization in France and Turkey. The plant is still under permit evaluation, although Engie's withdrawal has increased both grassroots engagement and investor uncertainty.

In January 2013 it was announced that the proposed Kolin Yırca power station would be built on the site of Deniş, a 400-year-old village with 265 residents. The prospect of relcation led to large-scale grassroots mobilization against the plant's permitting. On October 21, 2014, Yirca villagers were attacked for trying to prevent construction of the power station, which would involve the destruction of 6,000 olive trees. One month later, a Turkish court ruled Turkey's national

Table 31. Proposed Coal Power in Turkey and Non-EU Europe (MW)

	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating (2010–2015)	Cancelled (2010–2015)
Turkey	31,969	29,925	5,095	66,989	2,965	13,501	4,738	15,269
Bosnia & Herzegovina	1,250	0	1,700	2,950	300	1,480	0	520
Serbia	2,550	350	0	2,900	0	320	0	132
Ukraine	660	600	0	1,260	0	0	0	800
Albania	0	0	0	0	0	0	0	800
Kosovo	0	600	0	600	0	0	0	330
FYRO Macedonia	300	0	0	300	0	300	0	0
Montenegro	0	254	0	254	0	0	0	910
Total	**36,729**	**31,729**	**6,795**	**75,253**	**3,265**	**15,601**	**4,738**	**18,761**

Source: Global Coal Plant Tracker, January 2016

olive grove protection law forbids project sponsor Kolin Group from building at the proposed site. Although Kolin Group announced withdrawal from the site, it applied for a new plant in Kayrakaltı village, only three kilometers away from Yirca. Many nearby residents continue to express opposition to the plant.

In June 2015, 26 buses carried activists from local communities to Ankara to demonstrate against the planned Umut power station in Terme. The legal process against the plant was carried out by allies of Turkey's Justice and Development Party, and was supported by the Turkish Chambers of Engineers through Ecology Collective. In July 2015 the mayor of Terme announced, "Even if the President calls, I will not allow the coal power plant to be constructed." The project was called off after the EIA was cancelled.

Turkey continues to seek international sponsors to expand the Afşin-Elbistan power complex by up to 7,000 MW, although the expansion has been proposed since 2008.

Turkey officials argue that new coal capacity and mines are the most cost-effective route to meeting the country's future power demand. However, a 2014 BNEF study found that, through 2030, it would cost almost the same (around US$400 billion) for the country to build up and use a mix of clean energy technologies instead of coal (BNEF 2014).

BOSNIA & HERZEGOVINA, KOSOVO, SERBIA, AND UKRAINE

Like Turkey, Bosnia & Herzegovina, Kosovo, and Serbia contain large deposits of lignite coal, and proposed coal plants in the region often include new or expanded coal mining of the deposits. China continues to be a large funder of these new projects.

Nearly 3 GW of new coal plants or additions to existing plants are proposed in Bosnia & Herzegovina, based on local lignite. Chinese companies have expressed interest in building and possibly financing many of the proposals, including the 600 MW Ugljevik 3 power station, the 300 Banovici power station, a 350 MW expansion of the Gacko Thermal Power Plant, a 750 MW expansion of the Tuzla Thermal Power Plant, and a 600 MW expansion of the Kakanj Thermal Power Plant. The China Development Bank is financing the 300 MW Stanari Thermal Power Plant, currently under construction, while Tuzla is being financed by the Export-Import Bank of China.

Plans for the 600 MW Kosovo C power station remain highly contentious. As of June 2015, an estimated 1,000 people from the nearby Hade village have been moved out of their homes to make way for both coal mining and the plant. Thousands more fear displacement. On June 12, 2015, the villagers filed a lawsuit against the plant's funder, the World Bank, saying the bank allowed the government of Kosovo to take their homes and farmland without fair compensation or an adequate resettlement plan.

Serbia also contains large deposits of lignite coal, providing the main fuel for its power plants. In 2014 China agreed to finance the 350 MW expansion of the TPP Kostolac Power Plant and the nearby Drmno coal mine. China also expressed interest in funding the proposed 750 MW Kolubara B power station, including development of the nearby Radljevo coal mine.

Ukraine is still seeking permits to add 600 MW to the Dobrotvir power station and 660 MW to the Slavyansk power station. Both power stations were first built in the 1950s to 1960s. An 800 MW unit at Slavyansk was damaged by shelling in 2014, and was restored to run at 400 MW in 2015.

EU28 COUNTRIES

According to the European Coal Map, Europe's coal plants released a total of 762 million tonnes of CO_2 in 2014, making up 17 percent of the EU's total greenhouse gas emissions. Germany was the largest emitter, followed by Poland and the UK. In October 2014 EU leaders agreed to cut greenhouse gas emissions 40 percent by 2030, compared with 1990 levels. The move has been accompanied by strong public campaigns to phase out coal and coal financing, and divest funds from fossil fuels. Successful campaigns in Europe include the Norwegian Parliament's June 2015 decision to divest approximately 5 billion euros from coal companies; the September 2015 announcement by France that it would no longer provide financial support for overseas coal-fired power plants without carbon capture and storage; the 2015 decision by financial institutions BNP Paribas, Société Générale, and Crédit Agricole to end financing of coal mines; and the November 2015 agreement by members of the Organisation of Economic Cooperation and Development (OECD) to restrict subsidies used to export technology for coal-fired power plants.

Many European countries have also announced a phasing out of coal use. Two-thirds (66 percent) of Europe's coal plants have been in operation for 30 years or more. The UK became the first G20 economy to make this announcement, with the aim of retiring all of its coal plants by 2025. It was preceded by a similar move in Austria. Finland had already committed to phase out coal by the 2020s. A proposal to eliminate all coal power in Germany by 2040 has drawn support from the environment ministry, but is opposed by the governing Christian Democrat coalition.

Table 32. Proposed Coal Power in the European Union (MW)

	Announced	Pre-permit development	Permitted	Announced + Pre-permit + Permitted	Construction	Shelved	Newly Operating (2010–2015)	Cancelled (2010–2015)
Germany	2,000	2,020	0	4,020	1,100	660	9,657	25,443
Belgium	0	0	0	0	0	0	0	1,100
Austria	0	0	0	0	0	0	0	800
Netherlands	0	0	0	0	1,900	0	1,600	1,311
Poland	3,000	1,820	0	4,820	4,245	5,333	858	12,450
Italy	0	350	0	350	0	4,370	1,320	1,980
Romania	0	0	0	0	0	1,715	0	3,780
Bulgaria	0	0	0	0	0	560	670	2,100
United Kingdom	0	1,466	0	1,466	0	3,350	0	12,522
Croatia	0	0	500	500	0	0	0	800
Czech Republic	0	0	0	0	1,410	0	135	1,200
Finland	0	0	0	0	0	0	0	385
Greece	0	0	660	660	0	440	0	3,720
Hungary	0	0	0	0	0	330	0	2,640
Latvia	0	0	0	0	0	435	0	0
Slovakia	0	0	0	0	0	0	0	885
Slovenia	0	0	0	0	0	0	600	0
Spain	0	0	0	0	0	800	0	0
Total	**5,000**	**5,656**	**1,160**	**11,816**	**8,655**	**17,993**	**14,840**	**71,116**

Source: Global Coal Plant Tracker, January 2016

Germany

The German government has set a goal of 80 percent of German power provided by renewables by 2050. In 2015, the share was 30 percent, according to data from industry group BDEW. However, brown coal and imported hard coal still accounted for 42 percent. About 2.7 GW of power generation from brown coal will be closed, but retained as reserve power in case of emergency (Eckert 2016).

Despite Germany's accomplishments and ambitious goals for clean power, the German coal industry remains strong, and Germany was the world's tenth largest producer of coal in 2014 (BP 2015). Much of the coal is used domestically, and Germany continues to build large, new coal plants. In 2015, the country commissioned the 1,730 MW Moorburg power station and unit 9 (912 MW) of the GKM (Mannheim) power station.

Table 33. Coal Power Added and Retired in the European Union, 2003–2015 (MW)

	Capacity Added	Capacity Retired	Net gain/loss
2003	1,594	4,359	−2,765
2004	163	1,141	−978
2005	362	1,661	−1,299
2006	135	377	−242
2007	55	791	−736
2008	1,162	897	265
2009	599	356	243
2010	1,478	151	1,327
2011	1,583	1,906	−323
2012	2,953	4,063	−1,110
2013	1,646	11,697	−10,050
2014	2,667	1,910	757
2015	4,041	4,300	−259
Total	**18,437**	**33,607**	**−15,171**

Source: Platts WEPP, December 2015

The country has an additional 4 GW under construction and 11 GW proposed. However, there is a question of whether the plants will be needed or economically viable, given the country's existing coal capacity and rapid deployment of renewables, particularly solar. For example, even after the US$1.1 billion Westfalen Unit D entered construction, in 2015 owner RWE said the unit will be dismantled, as low electricity prices have made it too costly to complete and operate.

Germany is also a large funder of international coal projects. Examples include Greece's sole proposed coal plant, the 660 MW Ptolemaida power station V. Approximately half of the plant's cost (US$888 million) will be provided by German development bank KfW and guaranteed by the German Export Credit Agency, Euler Hermes. Since 2006, German taxpayers have provided over US$3 billion in overseas export and development credits linked to coal. In 2015 Germany supported the limiting of OECD funding for coal plants, but not the total ban pushed by France and the United States.

United Kingdom

In November 2015, Energy Secretary Amber Rudd announced that the UK will phase out coal by 2025 (BBC 2015). From 2010 to 2015, the country commissioned no new coal capacity. During that time, about 12.5 GW of coal proposals were cancelled. The country currently has 1,446 MW proposed, and none under construction. The country's only proposals involve carbon capture and storage (CCS) technology. Active proposals include the 570 MW Captain Clean Energy Project, which received government research funding in 2015; the 426 MW White Rose CCS Project, although UK power generator Drax decided in 2015 to cease funding the project; and the 470 MW Killingholme Power Station, which may be coal- or gas-fired.

Poland

Among members of the EU, Poland has the most proposed coal capacity at 4.8 GW, with an additional 4.2 GW under construction. In 2014 Poland was the eighth largest coal producer in the world (BP 2015). The country uses nearly all the coal it mines, and coal-fired power plants represent 75 percent of the country's electricity capacity (EIA 2015).

The state-owned Polska Grupa Energetyczna (PGE) continues to pursue the 3,000 MW Gubin Power Project and mine, which would displace an estimated 2,300 persons. A new 1,075 MW unit is under construction at the 2,820 MW Kozienice Power Station, while an additional 1,800 MW is being constructed at the 1,532 MW Opole Power Station.

In July 2015 Engie of France withdrew from the proposed 500 MW Leczna Power Station. It is unclear whether the Polish government will pursue the plant without Engie.

REFERENCES

Abrams, Lindsay. 2014. "China's Lethal Coal Dependency: 670,000 Deaths Linked to Air Pollution in 2012." *Salon,* November 13.

AEMO. 2014. "No New Power Generation Needed for next 10 Years." Australian Energy Market Operator, August 8.

Amos, Jonathan. 2016. "Polluted air causes 5.5 million deaths a year, new research says." *BBC News,* February 13.

Anna. 2015. "Chile's Endesa Says No New Coal." *EndCoal,* July 28.

AP. 2015. "OECD Countries Agree to Restrict Financing for Overseas Coal Power Plants." *The Guardian,* November 18.

Bast, E, S Godinot, S Kretzmann, and J Schmidt. 2015. "Under the Rug. How Governments and International Institutions Are Hiding Billions in Support to the Coal Industry." Oil Change International (OCI) and Natural Resources Defense Council (NRDC) report, June.

BBC. 2015. "UK's coal plants to be phased out within 10 years." November 18.

BNEF. 2014. "Turkey's Changing Power Markets." Bloomberg New Energy Finance.

BP. 2015. "Statistical Review of World Energy 2015." British Petroleum, June.

Buckley, Tim. 2014. "Briefing Note: India Power Prices." IEEFA.

———. 2015a. "The Solar Boom Rolls On in China, India, Japan…." IEEFA. May 26.

———. 2015b. "India's Electricity-Sector Transformation." IEEFA.

———. 2016. "China Delivers a World Record Wind Installs in 2015; India Announces Another Record Low Solar Tariff." IEEFA, January 20.

Buckley, Tim, and Tom Sanzillo. 2015. "Fact-Checking the IEA: The World's Three Largest Coal Importers Are Importing Less." IEEFA, October 13.

Burton, Bob. 2015a. "What Big Coal's Happy-Clappers Missed about Vietnam's Growing Coal Headache." *RenewEconomy,* April 27.

———. 2015b. "Boundary Dam CCS Hype Goes up in a Puff of Green Smoke." *EndCoal,* November 4.

———. 2016. "Is India Starting to Waver on Coal?" *EndCoal,* February 3.

Carrington, Damian. 2015. "Norway Confirms $900bn Sovereign Wealth Fund's Major Coal Divestment." *The Guardian,* June 5.

CAT. 2015a. "The Coal Gap." Climate Action Tracker.

———. 2015b. "South Africa." Climate Action Tracker, Updated October 2.

CEA, 2015. "Growth of Electricity Sector From 1947 to 2015." Page 40. Central Electricity Authority. April.

Central Electricity Authority. 2015. "All India Installed Capacity (in MW) of Power Stations, as on 31-12-2015 (Utilities)."

Chan, Cherie. 2016. "A Look at China's Efforts to Reduce Coal Use." *Deutsche Welle,* January 26.

China Electricity Council. 2015. 2015年度全国电力供需形势分析预测报告. March 29.

———. 2016. 中电联发布《2016年度全国电力供需形势分析预测报告. February 3.

China Post. 2015. "Protesters Take to the Streets Nationwide to Rally against Pollution." June 7.

CoalSwarm. 2016. "Projected Coal Plants by Combustion." January.

Conservation Action Trust and Urban Emissions. 2014. "Coal Kills: Health Impacts of Air Pollution from India's Coal Power Expansion."

CPI. 2015a. "Slowing the Growth of Coal Power in China: The Role of Finance in State-Owned Enterprises." Climate Policy Initiative, December.

CPI. 2015b. "Slowing the Growth of Coal Power Outside China: The Role of Chinese Finance." Climate Policy Initiative, November.

Crane, Stewart, Evan Mills, Justin Guay, 2014. "Clean Energy Services for All: Financing Universal Electrification." Sierra Club, June 2014.

Cully, Mark. 2015. "Coal in India." Australia Government Office of the Chief Economist, June.

Das, Ajoy. 2016. "India's Coal Appetite Dwindles." *Mining Weekly*, February 8.

Davis, Steven J, and Robert H Socolow. 2014. "Commitment Accounting of CO_2 Emissions." *Environmental Research Letters* 9 (8).

d.light. 2014. "Power for All: The Energy Access Imperative." June.

Dharmadhikary, Shripad, and Shantanu Dixit. 2011. "Thermal Power Plants on The Anvil: Implications and Need for Rationalisation." Prayas Energy Group.

Drajem, Mark. 2013. "Obama's Overseas Coal Pledge to Curb Ex-Im Bank Financing." *Bloomberg*, June 25.

Dubey, Sunita, Siddharth Chatpalliwar, and Srinivas Krishnaswamy. 2014. "Electricity for All in India." Vasudha Foundation.

Eckert, Vera. 2016. "UPDATE 1-Germany Warns against Rushed Exit from Coal Power." *Reuters*, January 19.

EIA. 2014. "Taiwan." U.S. Energy Information Administration.

———. 2015. "South Africa." U.S. Energy Information Administration.

———. 2016. "Short-Term Energy Outlook: Coal in the United States." U.S. Energy Information Administration, January 12.

Enerdata. 2015. "Coal and Lignite Domestic Consumption." Global Energy Statistical Yearbook 2015.

———. 2015. "Coal and Lignite Trading by Region 2014." Global Energy Statistical Yearbook 2015.

———. 2016. "China's Power Generation Fell in 2015, for the First Time since 1968." January 21.

Fiyanto, Arif. 2015. "Jokowi's misleading view of Batang plant." *Jakarta Post*, September 4.

GCB. 2015. "State of the Carbon Cycle: An Annual Update of the Global Carbon Budget." Global Carbon Budget.

Ghio, Nicole. 2015a. "New Report Sheds Light On Overseas Coal Financing By Export Credit Agencies." *Sierra Club Compass*, March 11.

———. 2015b. "The IFC Reveals Its True Colors: No Accountability For Project Violations." *Sierra Club Compass*, January 30.

Global Wind Energy Council. 2016. Global Wind Statistics 2015. February 2.

Goenka, Debi, and Sarath Guttikunda. 2013. "Coal Kills: An Assessment of Death and Disease Caused by India's Dirtiest Energy Source." Urban Emissions, the Conservation Action Trust, and Greenpeace India.

Grano, Simona. 2015. "Environmental Issues Facing Taiwan." Brookings Institution, November.

Greenpeace East Asia. 2013. "China's Coal Rush Faces Conundrum." December 2.

Greenpeace East Asia. 2015a. "Coal Power Overcapacity and the Investment Bubble in China." November.

———. 2015b. "Is China Doubling Down on Its Coal Power Bubble?" November.

———. 2016. "Is China Doubling Down on Its Coal Power Bubble? (version updated)" February.

Greenpeace International. 2013. "Silent Killers: Why Europe Must Replace Coal Power with Green Energy." June 11.

Greenpeace International. 2015. "Coal's terminal decline: How a bad year for coal in 2014 has been followed by the biggest fall in consumption ever." November.

Greenpeace Southeast Asia. 2015a. "Research from Harvard Reveals Health Impacts of Indonesia's Coal Plants." August 12.

———. 2015b. "Coal Expansion in Vietnam Could Claim 25,000 Lives per Year." September 30.

———. 2015c. "Cost of Living: Coal Power Plant with a Threat to the Health of Thailand." November 19.

———. 2016. "Coal: A Public Health Crisis." February 2.

IEA. 2010. "Projected Costs of Generating Electricity." International Energy Agency.

———.2011. "Energy for All: Financing Access for the Poor." International Energy Agency. October.

———. 2014. "World Energy Outlook 2014." International Energy Agency.

———. 2014b. "World Energy Investment Outlook 2014." Power Generation Investment Assumptions spreadsheet. International Energy Agency.

———. 2015a. "World Energy Outlook 2015." International Energy Agency.

———. 2015b. "Medium-Term Coal Market Report." International Energy Agency.

IRENA. 2015. "Renewable Power Generation Costs in 2014." International Renewable Energy Agency. January.

Jai, Shreya. 2015. "Coal Auction: Power Firms Staring at Losses, Demand Crisis." *Business Standard News*, April 11.

Jakarta Globe. 2015a. "Greenpeace criticizes Mr Jokowi for Batang power plant's groundbreaking." August 31.

Jakarta Globe. 2015b. "Harvard Study Reveals Premature Death Risks From Indonesia's Expanding Use of Coal Power." August 18.

Jakob, Michael, and Jérôme Hilaire. 2015. "Climate Science: Unburnable Fossil-Fuel Reserves." *Nature* 517 (7533): 150–52.

Jensen, Génon K (Ed.). 2013. The Unpaid Health Bill: How Coal Power Plants Make Us Sick. Health and Environmental Alliance.

Kenning, Tom. 2016. "Adani and Azure win in Uttar Pradesh solar auction with another 'surprise' low tariff." *PV Tech*, January 26.

Khanh, Nguy Thi. 2016. "Vietnam PM Announces Retreat from Coal Power - Bold Move Signals Further Decline for Global Coal Industry." *Green ID*, January 22.

Kiko Network, JACSES, Friends of the Earth Japan, CoalSwarm, Friends of the Earth USA, and Sierra Club. 2015. "Dirty Coal: Breaking the Myth About Japanese-Funded Coal Plants."

King, Timothy. 2015. "The Australian National Electricity Market: Old, Oversupplied and Vulnerable." Institute for Energy Economics & Financial Analysis, August 4.

Koplitz, Shannon, Daniel Jacob, Lauri Myllyvirta, and Melissa Sulprizio. 2015. "Burden of Disease from Rising Coal Emissions in Vietnam." Harvard University presentation.

Kyodo News International. 2014. "Thousands protest against power plant project in southern China." September 19.

Lazard Ltd. 2015. Levelized Cost of Energy Analysis, Version 9.0. November.

McGlade, Christophe, and Paul Ekins. 2015. "The Geographical Distribution of Fossil Fuels Unused When Limiting Global Warming to 2°C." *Nature* 517 (7533): 187–90.

Myllyvirta, Lauri. 2014. "Silent Killers: Why Turkey Must Replace Coal Power Projects." Greenpeace Mediterranean.

———. 2016. "China's CO_2 Emissions Likely Fell 3% in 2015 — and That Trend Looks Set to Continue." *Greenpeace Energydesk*, January 19.

Myllyvirta, Lauri, Xinyi Shen, and Harri Lammi. 2015. "Is China Doubling down on Its Coal Power Bubble?" Greenpeace East Asia. November.

National Bureau of Statistics of the People's Republic of China, 2016. "2015年国民经济和社会发展统计公报." February 29.

National Energy Administration. 2016. "国家能源局发布2015年全社会用电量---国家能源局." January.

Ng, Eric. 2015. "Coal Giant China Shenhua Energy to Get Bigger in Power Generation." *South China Morning Post*, March 23.

NRDC, Oil Change International, and World Wildlife Fund. 2015. "Under the Rug: How Governments and International Institutions Are Hiding Billions in Support for the Coal Industry." June.

NRDC and Tsinghua University. 2015. "China Coal Consumption Cap Plan and Research Report: Recommendations for the 13th Five-Year Plan." *China Coal Cap Project*.

OECD. 2015. "Statement from Participants to the Arrangement on Officially Supported Export Credits." Organisation for Economic Co-operation and Development. November 18.

Oil Change International. 2015. "Analysis: Public Finance from Rich Nations Driving Fossil Fuel Expansion Globally." March 4.

Platts. 2015a. "India's Coal Imports versus Domestic Production." *Platts*.

———. 2015b. "World Electric Power Plants Database." New York, NY. This database is not available online but can be purchased from Platts.

Rainforest Action Network (RAN), Sierra Club, and BankTrack. 2015. "The End of Coal? Coal Finance Report Card."

Raupach, Michael R., Steven J. Davis, Glen P. Peters, Robbie M. Andrew, Josep G. Canadell, Philippe Ciais, Pierre Friedlingstein, Frank Jotzo, Detlef P. van Vuuren, and Corinne Le Quere. 2014. "Sharing a Quota on Cumulative Carbon Emissions." *Nature Climate Change* 4 (10): 873–79.

Reuters. 2015. "China Should Stop Adding New Coal-Fired Power Plants - State Researchers." November 6.

Saral, Sudip. 2015. "Coal Concerns." *Platts Insight: 2016 Asia Energy Outlook*, October.

Sargent & Lundy, LLC. 2009. "Coal-Fired Power Plant Heat Rate Reductions."

Schmidt, Jake. 2015. "Ending the $73 Billion in Public Financing for Overseas Coal Projects." *NRDC Switchboard*, June 2.

Schneider, Conrad, and Jonathan Banks. 2010. "The Toll from Coal: An Updated Assessment of Death and Disease from America's Dirtiest Energy Source." Clean Air Task Force.

Shearer, Christine, Nicole Ghio, Lauri Myllyvirta, and Ted Nace. 2015. "Boom and Bust." CoalSwarm, Sierra Club, March.

Shin, Aung. 2015. "Coal Power Projects to Be Delayed." *Myanmar Times*. September 1.

Sierra Club. 2013. "Move Beyond Coal."

SolarServer. 2016. "GTM Research: Global solar PV Installations grew 34% in 2015; 59 GW added last year." *SolarServer*.

SourceWatch. 2016. "Opposition to coal in China."

Sink, Justin, and Alex Nussbaum. 2015. "In Coal Setback, Rich Nations Agree to End Export Credits." *Bloomberg*, November 17.

Stapczynski, Stephen. 2015. "Abe Appoints New Environment Minister in Japan Cabinet Change." *Bloomberg*, October 7.

Terre, Les Amis de la. 2015. "Natixis Becomes Second French Bank to Cut Coal Financing." *Banktrack*, October 15.

The Economic Times. 2016. "Coal Imports Fall for Sixth Straight Month in December." January 6.

The Japan Times. 2015. "EU Official Cautions Japan about Exporting Coal-Fired Power Plants." November 22.

Torres, Joe. 2015. "Philippine Bishops Take Stand against Use of Fossil Fuels." *UCA News*, December 18.

Tse, Pui-Kwan. 2015. "The Mineral Industry of Taiwan." US Geological Survey.

Verma, Sunny. 2016. "Of 5 UMPPs, Only 3 Likely to See Bids This Fiscal." *Indian Express*, January 6.

Waterkeeper Alliance. 2015. "Toxic Floods From Coal Mines and Power Plants Hit Vietnam's Ha Long Bay World Heritage Site." July 31.

WCA. 2013. "Coal Statistics." World Coal Association.

Wei-han, Chan. 2015. "Alliance Leads Pollution Protest." *Taipei Times*, December 1.

Wen, Ling. 2015. "Shenhua's Evolution From Coal Producer to Clean Energy Supplier." *Cornerstone Mag*, March 16.

White House. 2015. "FACT SHEET: The United States and China Issue Joint Presidential Statement on Climate Change with New Domestic Policy Commitments and a Common Vision for an Ambitious Global Climate Agreement in Paris." *Whitehouse.gov*, September 25.

WHO. 2014. "Ambient (outdoor) Air Pollution in Cities Database." World Health Organization.

Wong, Edward. 2015. "Glut of Coal-Fired Plants Casts Doubts on China's Energy Priorities." *The New York Times*, November 11.

World Bank. 2014. "Powering Up Myanmar: More Than 7 Million New Electricity Connections Needed by 2030." October 8.

World Bank. 2016. "Access to Electricity (% of population)."

Yeo, Sophie. 2014. "India's Green Court Says 'No' to Felling Mahan Forest for Coal." *Climate Home*, September 26.

APPENDIX A

ABOUT THE GLOBAL COAL PLANT TRACKER

BACKGROUND

To address the need for more complete data on proposed coal plants, CoalSwarm developed the Global Coal Plant Tracker, first released in November 2014 on EndCoal.org, a website sponsored by 52 citizen groups. The tracker pools data on proposed coal plants worldwide, providing detailed information in map and tabular form for over 4,780 generating units in 86 countries, proposed since January 1, 2010. Each project is linked to a footnoted wike page on SourceWatch or Wikipedia. Summary tables are posted on EndCoal.org.

ARCHITECTURE

The Global Coal Plant Tracker uses a two-level system for organizing information. Summary information is maintained in Google sheets, with a separate sheet for each country (outside India and China) and for each state or province (inside India and China). Each worksheet row tracks an individual coal plant unit. A wiki page is then created for each power station within the CoalSwarm website. When information about a proposed power station changes, the changes are made to both the spreadsheet and wiki page.

METHODOLOGY

Preliminary lists of plants in each country were gathered from public and private data sources including Global Energy Observatory, CARMA, BankTrack's "Dirty Deals" list, Kara Atlas (Turkey), Wikipedia, Enipedia, SourceWatch, WRI's "Global Coal Risk Assessment" report (2012), Platts UDI World Energy Power Plant database, Industcards "Power Plants Around the World Photo Gallery," India Central Electricity Authority's "Monthly Report on Broad Status of Thermal Power Projects in the Country," National Integrated Resource Plans, reports by state-owned and private utilities, and national-level trackers by environmental advocates (US: Sierra Club; Turkey: Kara Atlas; Germany: Deutsche Umwelthilfe). For each project in China, the English name was converted to Chinese characters. For all countries, alternate names for projects were also recorded.

For each project location, a wiki page was created on the Center for Media and Democracy's SourceWatch wiki. Wiki pages provided a repository for in-depth information including project background, financing, environmental impacts, coal types and sources, public opposition, aerial photographs, videos, links to permits, coordinates, and maps. Under standard wiki convention, each piece of information is linked to a published reference, such as a news article, company report, or regulatory permit.

In order to ensure data integrity in the open-access wiki environment of SourceWatch, CoalSwarm researchers review all edits of project wiki pages by unknown editors, an infrequent occurrence.

For each proposed coal plant unit, one of the following status categories is assigned:

- **Announced:** Proposed plants that have appeared in corporate or government plans but have not yet moved actively forward by applying for permits or seeking land, coal, or financing. Often such a project is the "Phase II" at a location where "Phase I" is currently under development.
- **Pre-permit development:** Plants that are seeking environmental approvals and pursuing other developmental steps such as securing land and water rights. In India, this means that a "Terms of Reference" has been received from the Ministry of Environment, Forests and Climate Change (MoEF). In China, this means a feasibility study has been completed.
- **Permitted:** All necessary environmental approvals have been received but the project has not yet begun construction. In India, this means a project has received an "Environmental Clearance" permit from the MoEF. In China, this means a plant has received a permit from the National Development and Reform Commission (NDRC) or from a provincial DRC, allowing for construction.
- **Construction:** Site preparation and other development and construction activities are underway.
- **Shelved:** In the absence of an announcement that the sponsor is putting its plans on hold, a project is considered "Shelved" if there are no reports of activity over a period of two years.
- **Cancelled:** In some cases a sponsor announces that it has has cancelled a project. More often a project fails to advance and then quietly disappears from company documents. A project that was previously in an active category is moved to "Cancelled" if it disappears from company documents, even if no announcement is made. In the absence of a cancellation announcement, a project is considered "Cancelled" if there are no reports of activity over a period of four years.
- **Operating:** The plant has been formally commissioned or has entered commercial operation.

Once wiki pages were created and summary data sets compiled, they were circulated for review to researchers familiar with local conditions and languages.

CARBON DIOXIDE EMISSIONS

For each coal plant unit, the tracker calculates carbon dioxide emissions based on the following:

- unit capacity;
- emission factor (pounds of carbon dioxide per million Btu) for each type of coal;
- heat rate for each combustion technology (Btu/kWh), adjusted for quality of coal;
- capacity factor based on the 2013 worldwide average of 59.3 percent (IEA 2015a).

Further details can be found at CoalSwarm, "Estimating carbon dioxide emissions from coal plants," SourceWatch, January 2016, at http://bit.ly/1jP1Lrw.

MAPPING

To allow easy public access to the results, CoalSwarm worked with GreenInfo Network to develop a map-based and table-based interface using the Leaflet Open-Source JavaScript library.

APPENDIX B
EXISTING COAL PLANTS

Rank	Country	MW
1	China	880,000
2	USA	308,645
3	India	173,018
4	Germany	55,704
5	Russia	48,763
6	Japan	43,750
7	South Africa	39,269
8	Poland	31,988
9	South Korea	28,568
10	Australia	27,616
11	Ukraine	24,781
12	Indonesia	24,197
13	England & Wales	17,819
14	Taiwan	17,008
15	Turkey	15,129
16	Kazakhstan	11,560
17	Italy	11,345
18	Spain	10,414
19	Czech Republic	9,400
20	Vietnam	9,304
21	Canada	9,291
22	Malaysia	9,009
23	Romania	6,976
24	Philippines	6,219
25	Thailand	5,656
26	Mexico	5,400
27	Greece	5,127
28	France	5,057
29	Israel	4,900
30	Chile	4,583
31	Bulgaria	4,563
32	Netherlands	4,440
33	Serbia	4,417
34	North Korea	3,565
35	Denmark	3,430
36	Brazil	3,386
37	Finland	2,735
38	Morocco	2,585
39	Uzbekistan	2,500
40	Scotland	2,406
41	Portugal	1,878
42	Bosnia-Herzegovina	1,750
43	Moldova	1,610
44	Kosovo	1,288
45	Laos	1,252
46	Slovenia	1,214
47	Hungary	1,184
48	Colombia	1,182
49	Zimbabwe	1,118
50	Slovakia	1,105
	All Others	12,173
	World	**1,910,275**

Sources: China, Central Electricity Council (2016); India, Central Electricity Authority (2015); Other Countries, Platts WEPP, December 2015