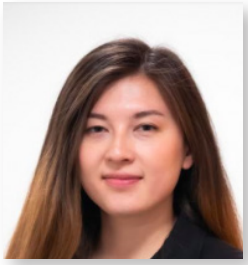
Understanding China's Global Power

2022 UPDATE

BY CECILIA SPRINGER, YANGSIYU LU, HUA-KE (KATE) CHI



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EXECUTIVE SUMMARY

China has financed electric power plants around the world for several decades and its involvement in the global power sector is of growing importance in the context of the Belt and Road Initiative (BRI) and continued attention to the social, environmental and economic impacts of China's overseas economic activity. This policy brief tracks findings from the 2022 update of the China's Global Power (CGP) Database. The CGP Database tracks power plants outside of China financed through Chinese foreign direct investment (FDI) and loans from China's two policy banks, the China Development Bank and the Export-Import Bank of China.

Key findings:

- China's policy banks and companies have financed 171.6 GW of generation capacity across 1,423 power units (representing 648 power plants) in 92 countries around the world. 113.5GW is already operational, with an additional 58.1GW under construction or planning.
- In terms of energy sources, coal represents the greatest share at 34 percent of the capacity of the overseas power units financed through Chinese investment and loans. The next largest energy sources are hydropower (29 percent of capacity tracked in the database) and gas (18 percent). Solar and wind combined total 12 percent and the remaining energy sources (oil, nuclear, biomass, geothermal and waste) make up 7 percent combined.

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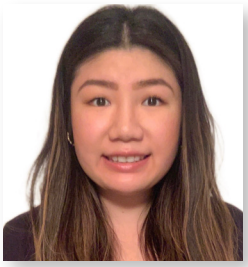

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- Fossil fuel projects, particularly coal and gas, account for more than 50 percent of the operational capacity and this trend is expected to continue for projects that are currently under construction. However, the majority of projects that are under planning are low-carbon energy sources, including 11 GW of hydropower and 5 GW of solar and wind power.
- Chinese policy banks contributed to 66 percent of coal power generation capacity and about 40 percent of hydropower plant capacity (including plants co-financed with FDI), while FDI accounts for the vast majority of Chinese overseas investment in gas-fired power plants and solar and wind projects.
- Regionally, Asia receives the most loans and investment in power generation capacity (90 GW), with a high concentration of fossil fuel-based power generating capacity, particularly coal-fired projects. The Americas (34 GW) and Africa (25 GW) follow.
- The majority of hydropower is distributed in the Americas, Asia and Africa.
- Solar and wind projects span across the globe, with the Americas the largest recipient region (6.6 GW).
- Chinese finance in Europe and Oceania is primarily focused on natural gas, nuclear and other non-hydro renewable energy projects.
- The median year of commission of oil, coal and gas plants in the CGP Database is 2016, meaning that more than half of these plants are six years or less into their lifetime. Fossil-fuel based power plants typically operate for decades and the annual and cumulative lifetime carbon dioxide emissions from these plants will contribute to global climate change.
- Estimated emissions for operating plants total 245 million tons (Mt) of CO_2 per year, approximately equaling the energy-related CO_2 emissions from the entire country of Spain or Thailand on an annual basis and cumulatively could consume 1.7 percent of the global carbon budget for a 50 percent chance of limiting global warming to 1.5 degrees Celsius (IPCC 2022).
- If plants currently under construction and planning come online, they will add another 82 Mt and 23 Mt to annual CO_2 emissions, respectively.
- Brazil has received the most power from Chinese financed power plants in terms of capacity, followed by Pakistan and Indonesia.
- Of the 92 countries that have received Chinese FDI and policy bank loans in the power generation sector, the top ten recipient countries represent 68 percent of the total capacity that Chinese entities have invested in and produce or will produce 82 percent of the CO_2 emissions by all overseas power plants with Chinese finance.
- Of the 72 Chinese companies that have participated in FDI in the power generation sector, the top ten companies are all state-owned enterprises (SOEs). They have contributed to 76 percent of the total FDI-supported capacity, and produce about 71 percent of the total FDI-supported CO_2 emissions.

While China has taken steps to decarbonize its overseas investments and shift towards a green BRI, more can be done to decarbonize China's global power and the CGP Database yields several insights towards this goal.

First, the CGP Database indicates that regionally, Asia should be an area of focus for decarbonization, as Asia has the most generating capacity financed by China and just over 50 percent is coal-based.

Second, the database indicates that China's policy banks have a more carbon-intensive portfolio than investing companies. Of emissions from currently operating capacity, 62 percent are financed by Chinese policy banks, which have traditionally supported coal power plants and hydropower plants.

Finally, based on scale of FDI as well as composition, the CGP Database shows that Chinese state-owned enterprises tend to have large and carbon-intensive portfolios compared to smaller private companies, many of which focus exclusively on renewable energy. Further research is needed to understand how state-owned enterprises are changing and could change their global power portfolios to meet China's green BRI goals.

INTRODUCTION TO THE CHINA'S GLOBAL POWER DATABASE

China has financed electric power plants around the world for several decades and China's involvement in the global power sector is of growing importance in the context of the Belt and Road Initiative (BRI) and continued attention to the social, environmental and economic impacts of China's overseas economic activity. To better understand this phenomenon, the Boston University Global Development Policy Center has created, maintained and updated the China's Global Power (CGP) Database. Launched in 2020, the CGP Database tracks power plants outside of China financed through Chinese foreign direct investment (FDI) and loans from China's two policy banks, the China Development Bank (CDB) and the Export-Import Bank of China (CHEXIM).

The CGP Database identifies power plants receiving Chinese policy bank loans based on the China's Global Energy Finance (CGEF) Database (BU GDPC 2022), which tracks lending commitments to public borrowers from CDB and CHEXIM. The CGP Database does not track power plants receiving lending commitments from Chinese commercial banks.

The CGP Database uses a unique methodology to identify plants with Chinese FDI, matching Chinese companies that invest in the power sector overseas to the S&P Global World Electric Power Plants database and using internet searches to verify financial arrangements (see Appendix). Among Chinese investors in the global power sector, both state-owned and private companies are active players. We have identified 72 Chinese companies that provide FDI for the global electric power sector. We note power plants that have both Chinese FDI and policy bank finance, but do not track other forms of co-financing, lending, or equity investment (i.e., equity funds). We divide FDI into two categories: greenfield investment for new projects and mergers and acquisitions (M&A) of existing projects. We track projects with more than 10 percent Chinese ownership. For projects with available ownership information, the average ownership percentage of Chinese investors is 81 percent.

The database is at the power generating unit level and notes when multiple units are part of the same power plant. This level of aggregation is necessary, because power plants may have multiple generating units that were built at different times and with different financiers. We only track Chinese-financed units, so power plants in the database may have additional units that are not tracked.

The CGP Database is updated biannually and this policy brief summarizes the state of Chinese-financed overseas power plants as of September 2022. Further information on methodology can be found in the CGP Database Methodology Note (Li et al. 2020) and in the Appendix.

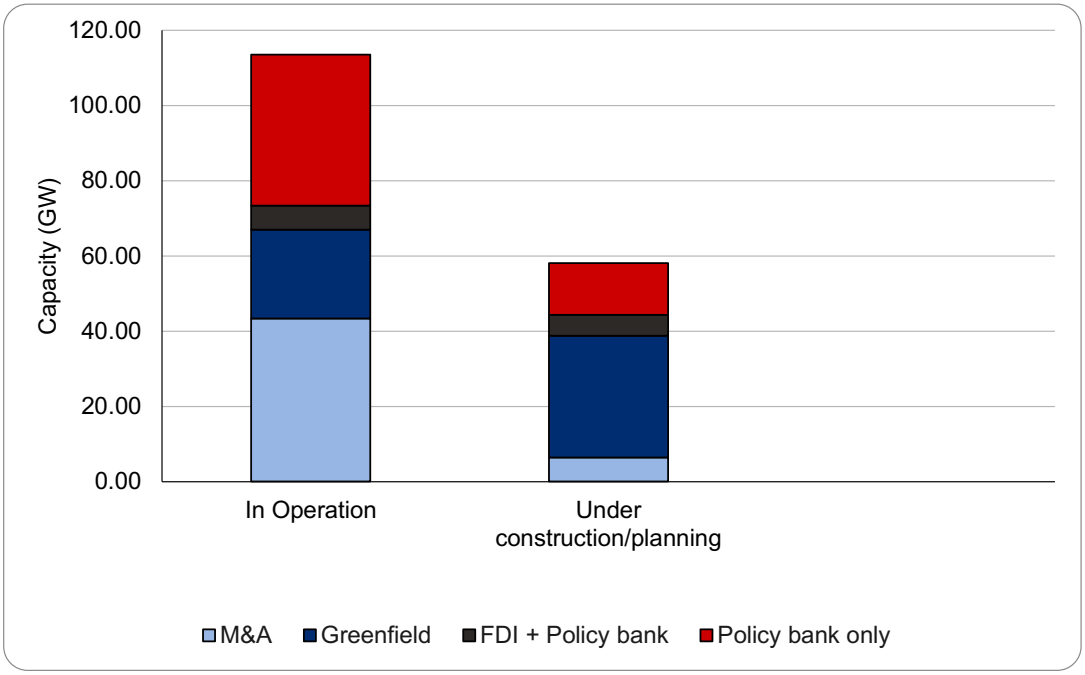
PATTERNS IN CHINESE-FINANCED POWER PLANTS OVERSEAS

Capacity Assessment

Chinese policy banks and companies have financed 171.6 GW of generation capacity across 1,423 power units (representing 648 power plants) in 92 countries around the world. 113.5GW is already operational, with an additional 58.1GW under construction or planning. Operating plants in the CGP Database were commissioned between 2000 and 2021, while plants under construction and under planning have projected years of commission between 2022 and 2032, when known.

Chinese FDI and policy bank loans have supported similar amounts of power generation capacity overseas. Policy banks alone have supported 31 percent of the 171.6 GW total capacity, with another 7 percent co-financed by policy banks and FDI. The rest was entirely funded by FDI, either in the form of greenfield investments or M&As (Figure 1).

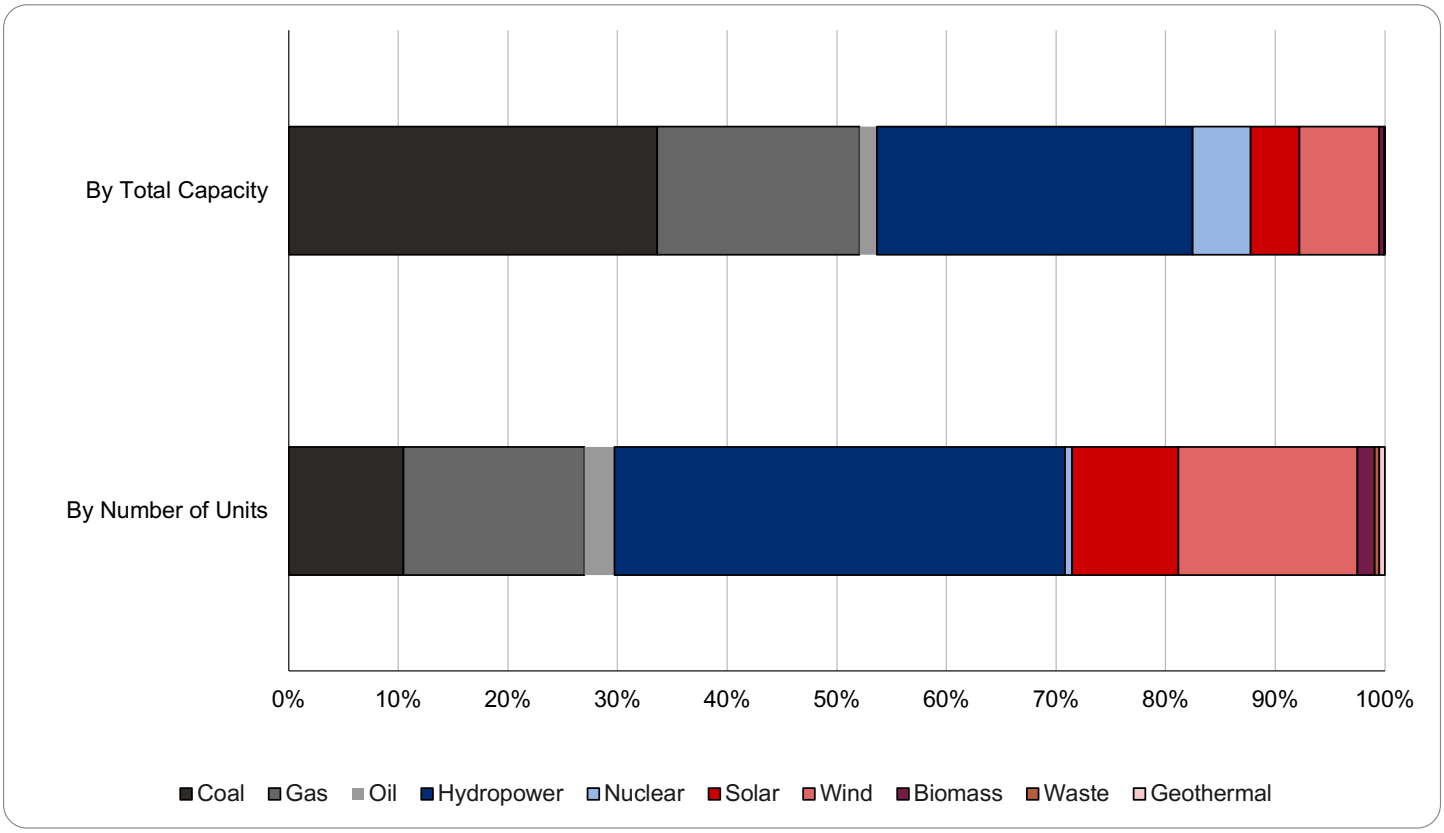
Figure 1: Operating and Future Generating Capacity of Chinese-Financed Power Plants Overseas by Deal Type



Source: China's Global Power Database: 2022 Update, Boston University Global Development Policy Center.

In terms of energy sources, coal represents the greatest share at 34 percent of the capacity of the overseas power units with Chinese investment and loans. The next largest energy sources are hydropower (29 percent of capacity tracked in the database) and gas (18 percent). Solar and wind combined total 12 percent and the remaining energy sources (oil, nuclear, biomass, geothermal and waste) make up 7 percent combined. At the unit level, the number of coal-fired generating units account for 10 percent of total units, while wind and solar units account for 26 percent (Figure 2). This does not come as a surprise, as renewable energy projects are typically much smaller in capacity than coal projects.

Figure 2: Distribution of Energy Sources for Chinese-Financed Power Plants Overseas



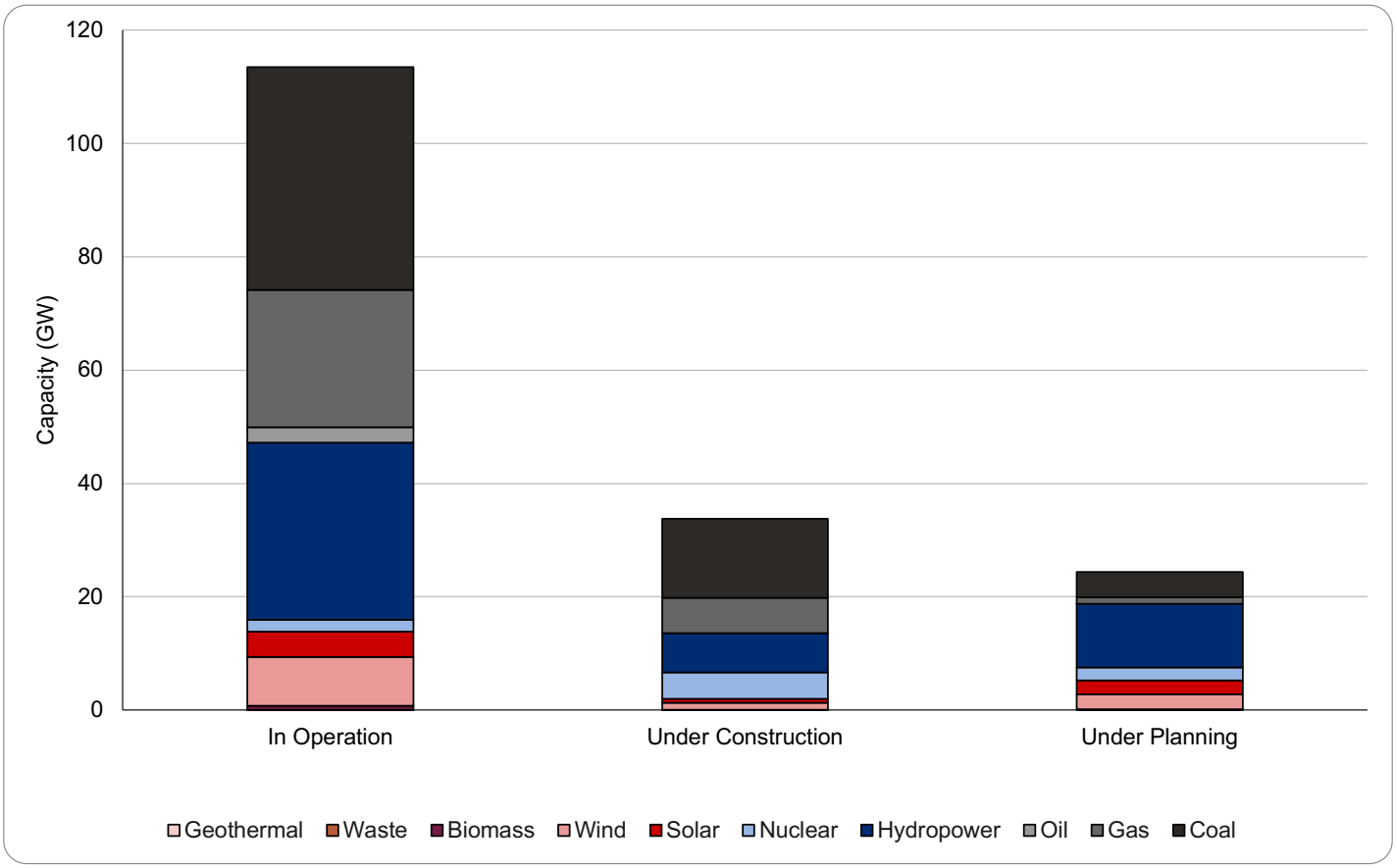
Source: China's Global Power Database: 2022 Update, Boston University Global Development Policy Center.

Taking a closer look at the portfolio of Chinese-financed overseas power capacity by status, fossil fuel projects, particularly coal and gas, account for more than 50 percent of the operational capacity and this trend is expected to continue for projects that are currently under construction. However, the majority of projects that are under planning are low-carbon energy sources, including 11 GW of hydropower and 5 GW of solar and wind power (Figure 3).

As shown in Figure 4, Chinese policy banks contributed to 66 percent of coal power generation capacity and about 40 percent of hydropower plant capacity (including plants co-financed with FDI). Meanwhile, FDI accounts for the vast majority of Chinese overseas investment in gas-fired power plants and solar and wind projects.

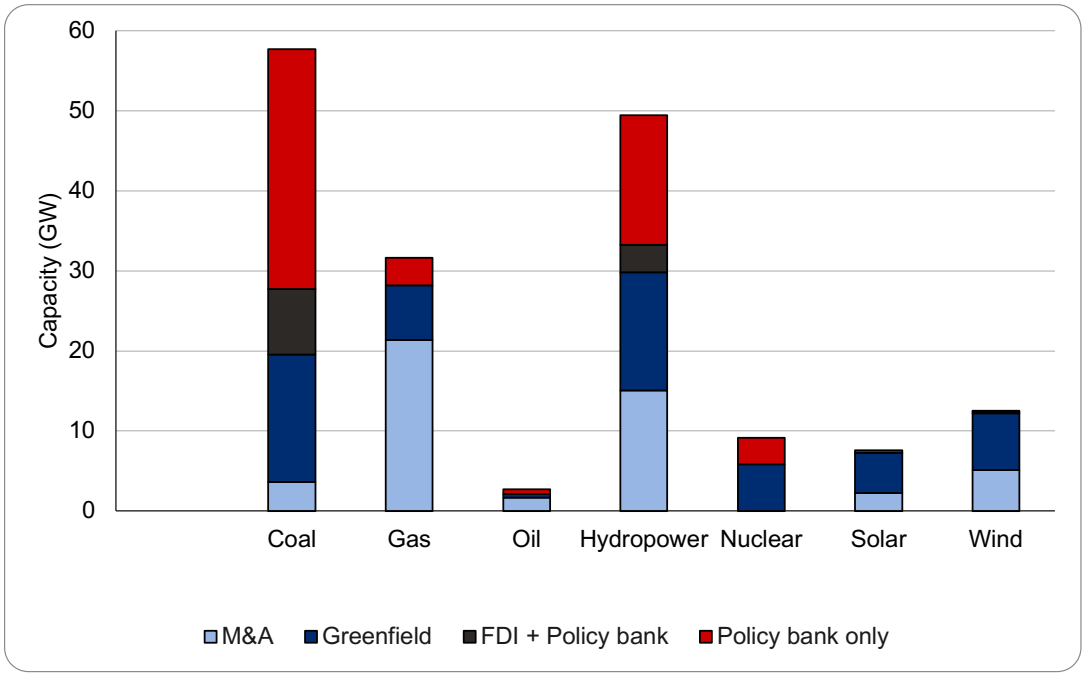
Chinese-financed power plants also show stark differences in energy sources across regions (Figure 5). Asia receives the most loans and investment in power generation capacity (90 GW), followed by the Americas (34 GW) and Africa (25 GW). Asia has a high concentration of fossil fuel-based power generating capacity, particularly coal-fired projects. The majority of hydropower is distributed in the Americas, Asia and Africa. Solar and wind projects span the globe, with the Americas the largest recipient region (6.6 GW). Chinese investment in Europe and Oceania is primarily focused on natural gas, nuclear and other non-hydro renewable energy projects.

Figure 3: Energy Sources of Chinese-Finance Power Plants Overseas, by Status



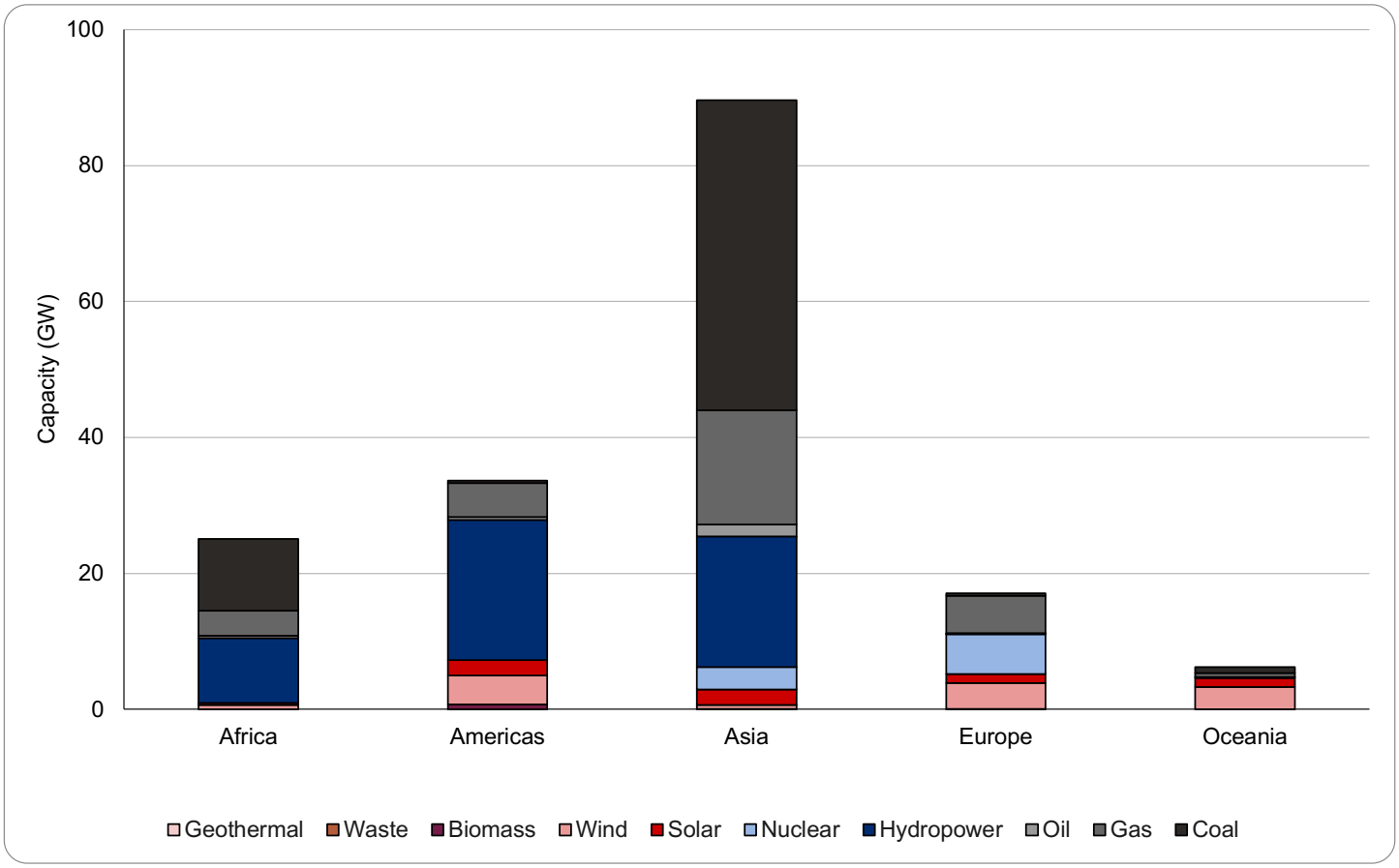
Source: China's Global Power Database: 2022 Update, Boston University Global Development Policy Center.

Figure 4: Energy Sources of Chinese-Financed Power Plants Overseas, By Deal Type



Source: China's Global Power Database: 2022 Update, Boston University Global Development Policy Center.

Figure 5: Regional Distribution of Energy Sources of Chinese-Financed Power Plants Overseas



Source: China's Global Power Database: 2022 Update, Boston University Global Development Policy Center.

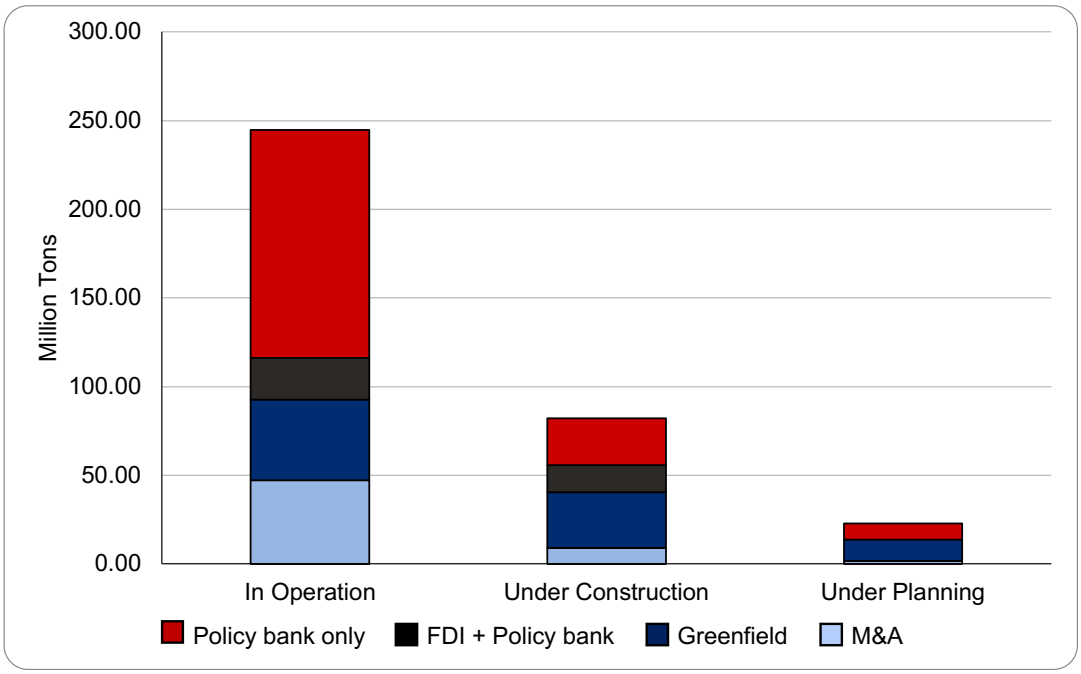
Carbon Dioxide Emissions

The median year of commission of oil, coal and gas plants in CGP is 2016, meaning that more than half of these plants are six years or less into their lifetime or less. Fossil-fuel based power plants typically operate for decades and the annual and cumulative lifetime carbon dioxide emissions from these plants will contribute to global climate change.

According to estimates, overseas fossil fuel power plants in operation and financed through Chinese overseas investment and policy bank loans are currently emitting approximately 245 million tons (Mt) of CO_2 per year. This is roughly equivalent to the annual energy-related CO_2 emissions from the entire country of Spain or Thailand, according to the World Resources Institute Climate Watch Database. Assuming a lifetime of 40 years (Tong et al. 2019), cumulative CO_2 emissions from operational fossil fuel units between 2020 and retirement will be approximately 8.7 Gt, which would consume 1.7 percent of the global carbon budget for a 50 percent chance of limiting global warming to 1.5 degrees Celsius (IPCC, 2022).

If plants currently under construction and planning come online, they will add another 82 Mt and 23 Mt to annual CO_2 emissions, respectively. Of emissions from currently operating capacity, 62 percent are financed by policy banks. The majority of emitting capacity supported by FDI in the form of M&A is already operational, whereas the majority of emitting capacity supported by greenfield investment is still under construction or planning (Figure 6).

Figure 6: Estimated Annual CO_2 Emissions from Overseas Chinese-Financed Power Plants



Source: China's Global Power Database: 2022 Update, Boston University Global Development Policy Center.

According to the CGP Database, Brazil has the most generating capacity from Chinese-financed power plants, followed by Pakistan and Indonesia. Among the 92 countries that have received Chinese FDI and policy bank loans in the power generation sector, the top ten recipient countries represent over two-thirds (68 percent) of the total capacity that Chinese entities have invested in, and produce or will produce 82 percent of the CO_2 emissions by all overseas power plants with Chinese finance (Table 1).

Table 1: Top Ten Countries by Chinese-financed Generating Capacity and Associated CO_2 Emissions

Country	Capacity (GW)	Estimated Annual CO_2 Emissions from Power Generation (Million Tons)
Brazil	22.2	6.0
Pakistan	18.6	44.0
Indonesia	17.7	73.1
South Africa	11.2	60.0
Vietnam	10.9	51.0
United Kingdom	9.5	3.6
Myanmar	7.4	3.1
Bangladesh	6.4	24.3
Malaysia	6.1	15.9
Australia	6.1	6.1
Proportion of Total	**68 percent**	**82 percent**

Source: China's Global Power Database: 2022 Update, Boston University Global Development Policy Center.

Among the 72 Chinese companies that have participated in FDI in the power generation sector, the top ten companies are all state-owned enterprises (SOEs). They have contributed to 76 percent of the total FDI-supported capacity and SOE FDI-funded power plants produce about 71 percent of the total CO_2 emissions. According to the CGP Database, all units with investment from China Three Gorges are low-carbon energy (hydro, solar and wind), making it the only company in the top ten that does not have any associated annual combustion-based CO_2 emissions.

Table 2: Top Ten Companies Providing FDI For Overseas Generating Capacity

Investing Company	Capacity (GW)	Estimated Annual CO_2 Emissions from Power Generation (Million Tons)
China General Nuclear Power Group	18.4	23.8
China Three Gorges Corporation	14.9	0.0
State Power Investment Corporation	14.4	21.4
China Huaneng Group	11.3	24.7
PowerChina	9.6	17.2
State Grid Corporation of China	6.9	1.0
China Huadian Corporation	3.9	14.7
Shenhua Group	3.8	14.6
China Datang	3.5	7.0
Harbin Electric	3.2	7.7
Proportion of Total Chinese FDI in Power Generation	**76 percent**	**71 percent**

Source: China's Global Power Database: 2022 Update, Boston University Global Development Policy Center.

OUTLOOK AND RECOMMENDATIONS

China has played a significant role in the expansion of electric power generating capacity around the world and these power plants will continue to generate electricity for decades to come. The expansion of electric power generating capacity in developing countries can bring significant economic benefits, but there are also environmental issues associated with fossil-fuel based electricity, including CO_2 emissions and air pollution.

Across energy types, coal has the largest share of Chinese-financed generating capacity. Coal is the most carbon-intensive source of electricity generation. The emissions tracked in the database are significant, approximately equaling the energy-related CO_2 emissions from the entire country of Spain or Thailand on an annual basis and cumulatively, emissions from operational power plants in the database could consume 1.7 percent of the global carbon budget for a 50 percent chance of limiting global warming to 1.5 degrees Celsius (IPCC 2022).

Since the initial release of the CGP Database in 2020, China has taken steps to decarbonize its overseas investments and shift towards a green BRI. In 2021, Chinese leader Xi Jinping announced that China would not build new coal plants overseas and would step up support for green and low-carbon energy in developing countries (Yi 2021). While the full implications of this announcement have yet to be determined, cancellation of future coal plants and retirement of existing ones could avoid a significant amount of CO_2 emissions (Springer and Ma 2021). China has issued subsequent guidelines

for green BRI development, but further steps can be taken to decarbonize Chinese-financed power plants overseas and the database yields several insights towards this goal.

First, the CGP Database indicates that regionally, Asia should be an area of focus for decarbonization, as Asia has the most generating capacity financed by China and just over 50 percent is coal-based.

Second, the database indicates that China's policy banks have a more carbon-intensive portfolio than investing companies. Of emissions from currently operating capacity, 62 percent are financed by policy banks, which traditionally have supported coal power plants and hydropower plants. While hydropower plants do not use fossil fuels to produce energy, they may still have significant social and environmental impacts (Springer and Shi 2021).

Finally, based on scale of FDI, as well as composition, the CGP Database shows that Chinese SOEs tend to have large and carbon-intensive portfolios compared to smaller private companies, many of which focus exclusively on renewable energy. Further research is needed to understand how SOEs are changing and could change their global power portfolios to meet China's no-overseas-coal announcement.

REFERENCES

Boston University Global Development Policy Center. (2022) China's Global Energy Finance Database. http://www.bu.edu/cgef.

Boston University Global Development Policy Center. (2021) Database Methodology Guidebook. https://www.bu.edu/gdp/2021/03/23/gdp-center-database-methodology-guidebook/.

Intergovernmental Panel on Climate Change (IPCC). (2022) Climate Change 2022, Mitigation of Climate Change, Summary for Policymakers. https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf

International Energy Agency. (2019) World Energy Outlook. Paris. https://www.iea.org/reports/world-energy-outlook2019.

Li, Z., Ma, X. Gallagher, K. (2020.) "China's Global Power Database – Methodology Note." Boston University Global Development Policy Center. Retrieved from https://www.bu.edu/gdp/2020/10/19/chinas-global-power-database-methodology-note/.

Ma, X., Springer, C., Shao, H. (2022) "Outlier or New Normal? Trends in China's Global Energy Finance." GCI Policy Brief. Boston University Global Development Policy Center. https://www.bu.edu/gdp/2022/03/11/outlier-or-new-normal-trends-in-chinas-global-energy-finance-2/.

Springer, C., Ma, X. (2021) Up in the Air: Potential Implications of Xi Jinping's Green Energy and No-Overseas-Coal Announcement. GCI Policy Brief. Boston University Global Development Policy Center. https://www.bu.edu/gdp/2021/11/09/up-in-the-air-potential-implications-of-xi-jinpings-green-energy-and-no-overseas-coal-announcement/.

Springer, C., Shi, D. (2021) "Sharing Water and Power: China's Hydropower Development in the Mekong Region" in *Essays on the Rise of China and Its Implications*. The Wilson Center. https://chinafellowship.wilsoncenter.org/2020-21-essay-collection.

Tong, D., Zhang, Q., Zheng, Y. et al. (2019) Committed emissions from existing energy infrastructure jeopardize 1.5 °C climate target. *Nature* 572: 373–377.

World Resources Institute. 2022. Climate Watch: Global Historical Emissions. https://www.climatewatchdata.org/ghg-emissions?end_year=2018&gases=co2&sectors=energy&start_year=1990

Yi, S. (2021) "China to stop building new coal power projects overseas." The Third Pole. https://www.thethirdpole.net/en/energy/china-to-stop-building-new-coal-power-projects-overseas/

APPENDIX

Updates to the China's Global Power Database Methodology

The initial methodology used to create the China's Global Power (CGP) Database is described in the CGP Database Methodology Note published in 2020 (Li et al. 2020). This update follows the same basic approach, with some updated source data and minor methodological adjustments, noted below.

We used an updated version of the S&P Global World Electric Power Plants database (WEPP) through December 2021 that is used to identify project physical attributes. We followed the same methodology for estimating annual CO_2 emissions, but updated the assumed capacity factor to be specific for each fossil fuel type according to data from IEA World Energy Outlook scenarios (IEA, 2019). The assigned capacity factor for coal-, gas- and oil-fired power generators are 56 percent, 39 percent and 23 percent, respectively. We also re-coded regions to match the United Nations Statistics Division first tier for geographical regions (Africa, Americas, Asia, Europe and Oceania). We also checked and updated the list of Chinese companies investing in power generation overseas.

As many power plants have multiple generating units, some of which may be built across years, with different financing sources, we fully disaggregated the CGP Database to the power generating unit level. We also note when individual units are part of a larger plant, but the capacity noted in the CGP Database corresponds to Chinese-financed units and not the total capacity of every plant. The updated downloadable data now has two naming columns that follow a standard naming convention: Unit Name and Plant Name. We also assigned a BU ID for tracking entries that are shared across Boston University GDP Center databases.

We checked and updated source links used to verify financing arrangements. The updated downloadable data now has two source link columns. For units involving Chinese policy bank finance, we reference the China's Global Energy Finance (CGEF) Database (BU GDPC 2022). For units involving FDI, we strove to provide one Chinese source and one international source, with a priority for host country sources. The GDP Center Database Methodology Guidebook has more information on double verification and source prioritization (BU GDPC 2021).

Finally, we explicitly note that for units with M&A investment only, the year noted for the entry represents the year of the financial transaction, not the year of commission of the plant. In a few cases, this leads to units that have an assigned year, but a status that is still "under construction" or "under planning". This approach to assigning a year for M&A investments was used for the initial release of the CGP Database, but was not explicitly spelled out in the Methodology Note.

Analysis of Differences from the China's Global Power Database, 2020

Key differences between the 2020 release of the CGP Database and the 2022 updated data are summarized in Table A1 below. The differences are driven by the addition and deletion of Chinese companies providing FDI and, for the emissions estimation, the updated capacity factor data (see above section).

From the CGP Database 2020 version, we deleted 57 projects with policy bank finance (a mix of plant and unit level data). Of these, 40 were deleted from the CGEF Database and were thus also removed from the CGP Database to harmonize the scope of GDP Center databases. These removals are documented in the policy brief accompanying the 2022 update of the CGEF Database (Ma et al. 2022). Ten projects were deleted because they did not meet our current definition of development finance (see Ma et al. 2022). Five projects were deleted because the power plants were suspended

Table A1: Comparison of CGP Database 2020 and 2022 versions

	2020 version	2022 version
Total capacity (GW)	186.5	171.6
Number of power projects	777 projects	1423 units (648 plants)
Number of countries	83	92
Number of investing companies	63	72
Annual CO_2 emissions from operating units (Mt)	314	245
Coal capacity share (%)	39.6	33.6
Solar and wind capacity share (%)	10.8	11.7

Source: China's Global Power Database: 2022 Update, China's Global Power Database 2020.

or Chinese finance was withdrawn, and two projects could not be matched to power generating units in WEPP or verified with internet searches. Eighteen of the deleted projects were co-financed with FDI, and for these we deleted the policy bank finance information, but kept the units in the database as FDI-only. We added 80 power generating units that received policy bank financing commitments, based on updates to the CGEF Database.

We deleted 179 projects receiving FDI from the previous version. These were deleted because the financing companies were miscoded as Chinese; the projects were suspended or canceled or the units could not be matched to WEPP. Approximately 276 new FDI-financed power generating units were added.

The prior accounting separates policy bank-financed and FDI-financed units, 18 of which were co-financed, yielding a total of 218 projects that were deleted, or for the co-financed entries, changed from FDI + Policy Bank to FDI only for their deal type. These projects are detailed in Table A2 below. Note that the projects in Table A2 follow the formatting convention of the 2020 version of the CGP Database and the projects include a mix of unit and plant-level information.

Finally, we checked all entries with WEPP to update attribute information, namely project status and year of commission. These documented changes are available upon request.

Table A2: Entries Removed from the CGP Database in the 2022 Update

Plant Name	Capacity (MW)	Year of Commission	Technology	Country	Deal Type
Adjarala (Mono River)	147	2020	Hydropower	TOGO	Policy bank only
Aguascalientes Potencia-1	67.8	2019	Solar	MEXICO	Greenfield
Alto Da Coutada-Ii	44	2013	Wind	PORTUGAL	Greenfield
Anpara-C	1200	2011	Coal	INDIA	Policy bank only
Aomori Rokunohe	10.2	2016	Solar	JAPAN	Greenfield
Arica Solar	18	Pending	Solar	CHILE	Policy bank only

Table A2: Entries Removed from the CGP Database in the 2022 Update *(continued)*

Plant Name	Capacity (MW)	Year of Commission	Technology	Country	Deal Type
Aroeira	33	2015	Wind	BRAZIL	M&A
Attarat Um Ghudran	470	2020	Oil	JORDAN	Policy bank only
Aura Caetité 1	29.4	2025	Wind	BRAZIL	Greenfield
Aura Caetité 2	29.4	2026	Wind	BRAZIL	Greenfield
Aura Caetité 3	29.4	2027	Wind	BRAZIL	Greenfield
Aura Caetité 4	21.2	2028	Wind	BRAZIL	Greenfield
Aura Queimada Nova 01	30	2029	Wind	BRAZIL	Greenfield
Aura Queimada Nova 02	29.4	2030	Wind	BRAZIL	Greenfield
Aura Tanque Novo 01	21.2	2031	Wind	BRAZIL	Greenfield
Aura Tanque Novo 02	15.9	2032	Wind	BRAZIL	Greenfield
Aura Tanque Novo 03	12.6	2033	Wind	BRAZIL	Greenfield
Aventura-I	28	2015	Wind	BRAZIL	M&A
Aventura-II	21	2023	Wind	BRAZIL	Greenfield
Aventura-III	25.2	2023	Wind	BRAZIL	Greenfield
Aventura-IV	29.4	2023	Wind	BRAZIL	Greenfield
Aventura-V	29.4	2023	Wind	BRAZIL	Greenfield
Banjul New	60	Pending	Oil	GAMBIA	Greenfield
Barren Ridge	60	2015	Solar	USA	M&A
Bengkulu Coal	200	2019	Coal	INDONESIA	FDI + Policy bank
Bini A Warak	75	2020	Hydropower	CAMEROON	Greenfield
Bio Energia	45	2017	Biomass	BRAZIL	M&A
Boqueirão I (antiga Jerusalém VII)	42	2023	Wind	BRAZIL	Greenfield
Boqueirão II (antiga Jerusalém VIII)	37.8	2023	Wind	BRAZIL	Greenfield
Bruceville	19	2015	Solar	USA	M&A
Budhi Gandaki	900	Pending	Hydropower	NEPAL	Policy bank only
Cafayate Solar	97.6	2019	Solar	ARGENTINA	Greenfield
Callide	920	2003	Coal	AUSTRALIA	M&A
Camaçari Muricy II	143.08	2019	Oil	BRAZIL	M&A
Carioba	32	2017	Oil	BRAZIL	M&A
Catanduba RN I	42	2025	Wind	BRAZIL	Greenfield
Catanduba RN II	46.2	2025	Wind	BRAZIL	Greenfield
Catanduva I (Antiga Cerradinho)	75	2015	Biomass	BRAZIL	M&A
Celukan Bawang	426	2015	Coal	INDONESIA	FDI + Policy bank
Cherganovo	29	2012	Solar	BULGARIA	FDI + Policy bank

Table A2: Entries Removed from the CGP Database in the 2022 Update *(continued)*

Plant Name	Capacity (MW)	Year of Commission	Technology	Country	Deal Type
China Power Hub	1320	2019	Coal	PAKISTAN	FDI + Policy bank
Chittagong Coal-2	1320	Pending	Coal	BANGLADESH	Greenfield
Christchurch Solar	18	2015	Solar	UK	Greenfield
Columbia Mojave-3	11	2015	Solar	USA	M&A
Coombe Solar	7.3	2015	Solar	UK	Greenfield
Cornwall Trina	11	2014	Solar	UK	Greenfield
Costa das Dunas	28.4	2024	Wind	BRAZIL	Greenfield
CPFL Centrais Geradoras	3.91	2017	Hydropower	BRAZIL	M&A
Crimson Solar	350	Pending	Solar	USA	Greenfield
Csj Tottori	27.3	2017	Solar	JAPAN	Greenfield
Daesan Works-3	1000	Pending	Gas	SOUTH KOREA	Greenfield
Diamante (antiga Camargo Corrêa)	4.2	2017	Hydropower	BRAZIL	M&A
Dillard Solar	12	2015	Solar	USA	M&A
Duyen Hai-2	1200	2021	Coal	VIETNAM	FDI + Policy bank
Edevu	51	2020	Hydropower	PAPUA NEW GUINEA	Policy bank only
El Gaili	190	2003	Gas	SUDAN	Policy bank only
El Mayo	99	Pending	Solar	MEXICO	Greenfield
El Tambolar	77	2020	Hydropower	ARGENTINA	Policy bank only
Eólica Canoa Quebrada	10.5	2017	Wind	BRAZIL	M&A
Farol dos Touros	21	2024	Wind	BRAZIL	Greenfield
Figueira Branca	10.5	2024	Wind	BRAZIL	Greenfield
Francisco Sá 1	30	2022	Solar	BRAZIL	Greenfield
Francisco Sá 2	30	2023	Solar	BRAZIL	Greenfield
Francisco Sá 3	30	2024	Solar	BRAZIL	Greenfield
Gameleira 1	30	2025	Solar	BRAZIL	Greenfield
Gameleira 2	30	2025	Solar	BRAZIL	Greenfield
Gameleira 3	30	2025	Solar	BRAZIL	Greenfield
Gameleira 4	30	2025	Solar	BRAZIL	Greenfield
Garland Solar	200	2016	Solar	USA	Greenfield
Gillespie Solar	20	2015	Solar	USA	M&A
Good Light	10	2014	Solar	CANADA	Greenfield
Gunma Aramaki	19	2017	Solar	JAPAN	Greenfield
GWADAR POWER 1	150	2023	Coal	PAKISTAN	Greenfield
GWADAR POWER 2	150	2023	Coal	PAKISTAN	Greenfield

Table A2: Entries Removed from the CGP Database in the 2022 Update *(continued)*

Plant Name	Capacity (MW)	Year of Commission	Technology	Country	Deal Type
Hai Duong-2	1200	Pending	Coal	VIETNAM	Policy bank only
Hai Phong Thermal-Ii Phase I	600	2011	Coal	VIETNAM	Policy bank only
Horus Solar Ags	95	Pending	Solar	MEXICO	Greenfield
Imboulou	120	2011	Hydropower	CONGO	Policy bank only
Indonesia Morowali Industrial Park Captive Coal-Fired Power Plant	300	2019	Coal	INDONESIA	Policy bank only
IS-42	92	2017	Solar	USA	Greenfield
Jaguari	11.8	2017	Hydropower	BRAZIL	M&A
Jaiba 3	33	2023	Solar	BRAZIL	Greenfield
Jaiba 4	33	2023	Solar	BRAZIL	Greenfield
Jaiba 9	22.5	2023	Solar	BRAZIL	Greenfield
Jaiba SE1	40	2023	Solar	BRAZIL	Greenfield
Jambi Bungo	400	Pending	Coal	INDONESIA	Policy bank only
Jericó	30	2015	Wind	BRAZIL	M&A
Jerusalém II	29.4	2024	Wind	BRAZIL	Greenfield
Jerusalém III	29.4	2024	Wind	BRAZIL	Greenfield
Jerusalém IV	29.4	2024	Wind	BRAZIL	Greenfield
Jerusalém V	29.4	2024	Wind	BRAZIL	Greenfield
Jerusalém VI	29.4	2024	Wind	BRAZIL	Greenfield
Jhampir Wind Farm	99	2017	Wind	PAKISTAN	Policy bank only
Kaiser Permanente (Ca)	10	2015	Solar	USA	M&A
Kamchay-1	180	2012	Hydropower	CAMBODIA	FDI + Policy bank
Kamchay-2	10	2009	Hydropower	CAMBODIA	Policy bank only
Kamchay-3	4	2011	Hydropower	CAMBODIA	Policy bank only
Kammerer	19	2015	Solar	USA	M&A
Kammwamba	300	Pending	Coal	MALAWI	Policy bank only
Karlovo Solar	5	2011	Solar	BULGARIA	FDI + Policy bank
Karot-Jhelum	720	2022	Hydropower	PAKISTAN	FDI + Policy bank
Kendari-3 Dssa	100	2019	Coal	INDONESIA	Policy bank only
King Power	1380	Pending	Gas	USA	Greenfield
Kirirom-I	11	2002	Hydropower	CAMBODIA	Policy bank only
Kirirom-Iii	18	2013	Hydropower	CAMBODIA	FDI + Policy bank
Kohala-Jhelum	1100	Pending	Hydropower	PAKISTAN	Greenfield
Kpone Asogli	180	2015	Gas	GHANA	Greenfield
Kpone Coal	700	Pending	Coal	GHANA	Greenfield

Table A2: Entries Removed from the CGP Database in the 2022 Update *(continued)*

Plant Name	Capacity (MW)	Year of Commission	Technology	Country	Deal Type
Lapa 2	30	2019	Solar	BRAZIL	M&A
Lapa 3	30	2019	Solar	BRAZIL	M&A
Lavras 1	27	2022	Solar	BRAZIL	Greenfield
Lavras 2	27	2022	Solar	BRAZIL	Greenfield
Lavras 3	27	2022	Solar	BRAZIL	Greenfield
Lavras 4	27	2022	Solar	BRAZIL	Greenfield
Lavras 5	27	2022	Solar	BRAZIL	Greenfield
Longreach Solar	17	2018	Solar	AUSTRALIA	Greenfield
Luiz Gonzaga II	30	2025	Solar	BRAZIL	Greenfield
Macaco Branco	2.363	2017	Hydropower	BRAZIL	M&A
Mambilla	3048	2023	Hydropower	NIGERIA	Policy bank only
Mariveles Coal	600	2014	Coal	PHILIPPINES	Policy bank only
Mascarenhas	198	2011	Hydropower	BRAZIL	M&A
Mashiki Solar	47.7	2017	Solar	JAPAN	Greenfield
Mazar Dudas	7	2019	Hydropower	ECUADOR	Policy bank only
Mckenzie (Galt)	30	2015	Solar	USA	M&A
Mongla Solar	100	Pending	Solar	BANGLADESH	Greenfield
Monjolinho	0.6	2017	Hydropower	BRAZIL	M&A
Monte Verde Solar I	46.46	2024	Solar	BRAZIL	Greenfield
Monte Verde Solar II	49.68	2024	Solar	BRAZIL	Greenfield
Monte Verde Solar III	40.25	2024	Solar	BRAZIL	Greenfield
Monte Verde Solar IV	49.68	2024	Solar	BRAZIL	Greenfield
Monte Verde Solar V	49.45	2024	Solar	BRAZIL	Greenfield
Monte Verde Solar VI	37.2	2024	Solar	BRAZIL	Greenfield
Monte Verde Solar VII	31.05	2024	Solar	BRAZIL	Greenfield
Mustang Kings	100	2016	Solar	USA	Greenfield
Nagan Raya	220	2013	Coal	INDONESIA	Policy bank only
Nepc Barge	100	2016	Gas	BANGLADESH	M&A
Nova Olinda 10	30	2019	Solar	BRAZIL	M&A
Nova Olinda 11	30	2019	Solar	BRAZIL	M&A
Nova Olinda 12	30	2019	Solar	BRAZIL	M&A
Nova Olinda 13	30	2019	Solar	BRAZIL	M&A
Nova Olinda 9	30	2019	Solar	BRAZIL	M&A
Oakey Warrego	80	Pending	Solar	AUSTRALIA	Greenfield

Table A2: Entries Removed from the CGP Database in the 2022 Update *(continued)*

Plant Name	Capacity (MW)	Year of Commission	Technology	Country	Deal Type
Pecém II	143.08	2019	Oil	BRAZIL	M&A
Peixe Angelical	498.75	2011	Hydropower	BRAZIL	M&A
Pereira Barreto II	42.05	2022	Solar	BRAZIL	Greenfield
Pereira Barreto III	42.05	2022	Solar	BRAZIL	Greenfield
Pereira Barreto IV	42.05	2022	Solar	BRAZIL	Greenfield
Pereira Barreto V	36.72	2022	Solar	BRAZIL	Greenfield
Pinheirinho	0.636	2018	Hydropower	BRAZIL	M&A
Pltu Jawa-7	2100	2021	Coal	INDONESIA	FDI + Policy bank
Pobeda	51	2012	Solar	BULGARIA	FDI + Policy bank
Poro Solar	50	Pending	Solar	COTE D'IVOIRE	Greenfield
Port Qasim Datang	700	Pending	Coal	PAKISTAN	Greenfield
Port Qasim Thermal 1	1320	2017	Coal	PAKISTAN	FDI + Policy bank
Porto de Pecem I (antiga MPX)	720.274	2011	Coal	BRAZIL	M&A
Punagaya	405	2018	Coal	INDONESIA	Policy bank only
Quaid-E-Azam Solar-2	300	2016	Solar	PAKISTAN	FDI + Policy bank
Quaid-E-Azam Solar-3	100	2018	Solar	PAKISTAN	Greenfield
RAMU-2 NO 1	60	2025	Hydropower	PAPUA NEW GUINEA	Greenfield
RAMU-2 NO 2	60	2025	Hydropower	PAPUA NEW GUINEA	Greenfield
RAMU-2 NO 3	60	2025	Hydropower	PAPUA NEW GUINEA	Greenfield
Rattlesnake Wind Farm	160	2016	Wind	USA	M&A
Recurrent Astoria	175	2015	Solar	USA	M&A
Rio do Peixe (Casa de Força I e II)	18.06	2017	Hydropower	BRAZIL	M&A
Rio Grande Mojave	5	2015	Solar	USA	M&A
Rosamond	47	2013	Solar	USA	M&A
Russei Chrum Krom	338	2014	Hydropower	CAMBODIA	FDI + Policy bank
San Gaban-Iii	206	2021	Hydropower	PERU	FDI + Policy bank
Santa Luzia Alto	28.5	2017	Hydropower	BRAZIL	M&A
Santa Mônica	29.4	2017	Wind	BRAZIL	M&A
Santa Rosa e Mundo Novo II	29.4	2023	Wind	BRAZIL	Greenfield
Santa Rosa e Mundo Novo III	33.6	2023	Wind	BRAZIL	Greenfield
Santa Rosa e Mundo Novo IV	33.6	2023	Wind	BRAZIL	Greenfield
Santa Rosa e Mundo Novo V	25.2	2023	Wind	BRAZIL	Greenfield

Table A2: Entries Removed from the CGP Database in the 2022 Update *(continued)*

Plant Name	Capacity (MW)	Year of Commission	Technology	Country	Deal Type
Santa Úrsula	27	2017	Wind	BRAZIL	M&A
Santana	3	2017	Hydropower	BRAZIL	M&A
São Domingos	25	2017	Wind	BRAZIL	M&A
São Jose	0.788	2017	Hydropower	BRAZIL	M&A
São Sebastiao	0.68	2017	Hydropower	BRAZIL	M&A
Sasan Umpp 1-2	1320	2013	Coal	INDIA	Policy bank only
Sasan Umpp 3-5	1780	2014	Coal	INDIA	Policy bank only
Sasan Umpp 6	660	2015	Coal	INDIA	Policy bank only
Smiths Falls Lanark	36	2015	Solar	CANADA	M&A
Smiths Falls Leeds	32	2015	Solar	CANADA	M&A
Stanari	300	2016	Coal	BOSNIA-HERZE-GOVINA	Policy bank only
Stung Atay-1	120	2013	Hydropower	CAMBODIA	FDI + Policy bank
Stung Tatay	246	2014	Hydropower	CAMBODIA	FDI + Policy bank
Stung Veal	100	Pending	Hydropower	CAMBODIA	Greenfield
Sunflower County	100	Pending	Solar	USA	Greenfield
Sunningale	10	2015	Solar	CANADA	M&A
Taoussa	25	Pending	Hydropower	MALI	Policy bank only
Tastiota	100	Pending	Solar	MEXICO	Greenfield
Thang Long	600	2018	Coal	VIETNAM	Policy bank only
Thar Block-Ii Hub	330	2021	Coal	PAKISTAN	Policy bank only
Thar Block-Ii Nova	330	Pending	Coal	PAKISTAN	Policy bank only
Tiroda 1	1320	2012	Coal	INDIA	Policy bank only
Tiroda 2	660	2013	Coal	INDIA	Policy bank only
Tiroda 3	1320	2014	Coal	INDIA	Policy bank only
Tuzla	450	Pending	Coal	BOSNIA-HERZE-GOVINA	Policy bank only
Ufv Salgueiro	114	Pending	Solar	BRAZIL	Greenfield
Ugljevik-3	600	Pending	Coal	BOSNIA-HERZE-GOVINA	Policy bank only
Ulog	35	Pending	Hydropower	BOSNIA-HERZE-GOVINA	Policy bank only
Umbuzeiros	30	2015	Wind	BRAZIL	M&A
Upper Marsyangdi-A	50	2016	Hydropower	NEPAL	FDI + Policy bank
Vega Solar-1	400	Pending	Solar	MEXICO	Greenfield
Ventos da Andorinha	30	2019	Wind	BRAZIL	M&A

Table A2: Entries Removed from the CGP Database in the 2022 Update *(continued)*

Plant Name	Capacity (MW)	Year of Commission	Technology	Country	Deal Type
Ventos da Santa Beatriz	28	2018	Wind	BRAZIL	Greenfield
Ventos de Campo Formoso II	30	2019	Wind	BRAZIL	M&A
Ventos de Guarás I	30	2019	Wind	BRAZIL	M&A
Ventos de Santa Aparecida	28	2018	Wind	BRAZIL	Greenfield
Ventos de Santa Aurora	28	2018	Wind	BRAZIL	Greenfield
Ventos de Santa Emilia	28	2018	Wind	BRAZIL	Greenfield
Ventos de São Gabriel	28	2018	Wind	BRAZIL	Greenfield
Ventos do Sertão	30	2019	Wind	BRAZIL	M&A
Victor Phelan	22	2015	Solar	USA	M&A
Waubaushene	30	2015	Solar	CANADA	M&A
Yamaguchi Csi	24	2016	Solar	JAPAN	Greenfield
Zedm Solar	50	Pending	Solar	CUBA	Policy bank only

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