Emerging captive coal power: Dark clouds on Indonesia's clean energy horizon

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Centre for Research on Energy and Clean Air

Global Energy Monitor

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Metal needed for the renewable energy transition is processed using coal power, and Indonesia must commit to a new path forward

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South Kalimantan, Indonesia. Photo by Dominik Vanyi on Unsplash

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About CREA

The Centre for Research on Energy and Clean Air (CREA) is an independent research organisation focused on revealing the trends, causes, and health impacts, as well as the solutions to air pollution. CREA uses scientific data, research, and evidence to support the efforts of governments, companies, and campaigning organisations worldwide in their efforts to move towards clean energy and clean air, believing that effective research and communication are the keys to successful policies, investment decisions, and advocacy efforts. CREA was founded in Helsinki and has staff in several Asian and European countries.

About GEM

Global Energy Monitor (GEM) develops and shares information on energy projects in support of the worldwide movement for clean energy. By studying the evolving international energy landscape, and creating databases, reports, and interactive tools that enhance understanding, GEM seeks to build an open guide to the world's energy system. For more information, visit www.globalenergymonitor.org.

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Key findings

- Nearly 25% of operating coal capacity in Indonesia is for captive use, that is, generated by power stations that are operated and utilised off-grid by industrial actors. Despite this significant share, the government's efforts to transition away from coal are currently limited to the power sector.
- Operating captive power capacity has increased nearly eightfold from 2013 to 2023, from 1.4 gigawatts (GW) to 10.8 GW.
- Over half of proposed coal capacity additions (announced, pre-permit, and shelved) as of July 2023 is for captive use. Based on the latest dataset, 14.4 GW of captive coal capacity is proposed or in construction.
- Indonesia is a leading supplier of the critical metals needed for a renewable energy transition, but many operating and planned smelters are operated using coal power. The national industrial development plan for 2015-2035 considers metal processing to be "added value to natural resources", and developing coal plants is allowed when they will increase the "added value of natural resources". Smelters are currently located in 13 provinces.
- Coal capacity additions have been outpacing renewables additions, despite Indonesia's stated goal of peaking emissions by 2030 through the acceleration of renewable energy deployment.
- Future emissions from captive coal plants are a major threat that must be considered within the planned use of the USD 20 billion Just Energy Transition Partnership (JETP) funding. As the launch of the JETP investment plan has been delayed, Indonesia and international partners must negotiate commitments to clear, focused and ambitious targets.

Contents

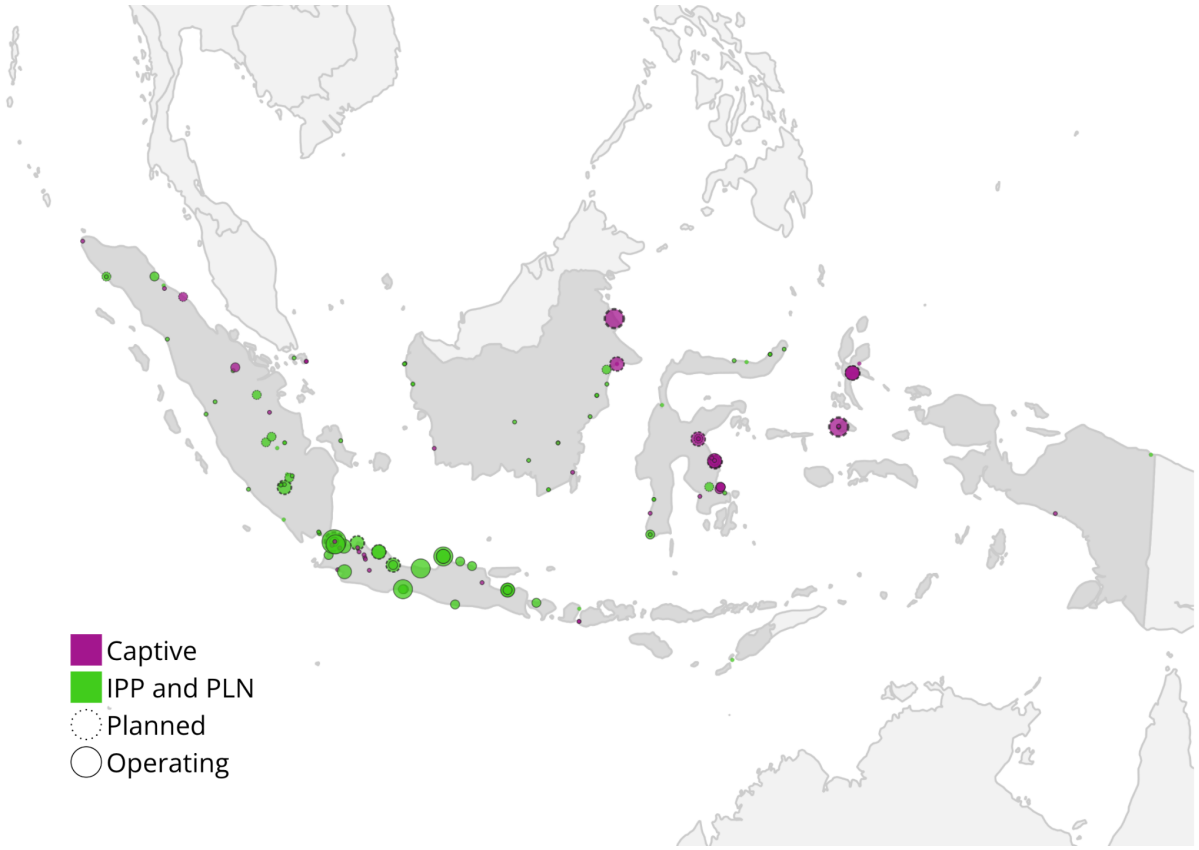
National overview

About two-thirds of Indonesia's electricity is currently generated from coal-fired power plants (CFPP) (PLN, 2023). Based on Global Energy Monitor's (GEM) *Global Coal Plant Tracker*[1] as of July 2023, and supplemental data on CFPP units below 30 megawatt (MW), the country has 249 units of CFPP in operation with a total installed capacity of 45,638 MW.

About three quarters (76.3%) of the country's coal power generation is dedicated to the utility grid, for which 45% of the total capacity (20,326 MW, 83 units) is owned and operated by *PT Perusahaan Listrik Negara* (PLN), a state-owned electricity provider, and the remaining 32% (14,491 MW, 49 units) by Independent Power Producers (IPP). The other quarter (23.7%) of the total capacity (10,821 MW, 117 units) is owned by industrial or commercial users and operated as off-grid plants for direct on-site industrial use or for other companies to reduce load on the grid (GEM, 2023, and supplemental data). Power stations that are operated and utilised off-grid by industrial actors are known as or referred to as captive plants.

Indonesia's coal fleet has a relatively young age at an average of 12 years[2], with 75% built after 2005 (IEA, 2020; Cui et al., 2022). Moreover, a total capacity of 28,749 MW is at various stages of consideration and development both for the grid and also industrial use: 14,499 MW (53 units) is under construction; 4,750 MW (13 units) is at various active development stages[3]; and 9,500 MW (32 units) is shelved[4], according to GEM's latest data. The majority of PLN and IPP plants are located in Java-Bali and Sumatra, while most of the captive plants are located in Sulawesi and Maluku. The distribution of planned and operating CFPPs across Indonesia is shown in Figure 1.

[1] https://globalenergymonitor.org/projects/global-coal-plant-tracker/
[2] 25.5 GW of coal capacity is 0 to 10 years old; 11.6 GW is 10-20 years old; 6.6 GW is 20-30 years old; and 1.8 GW is 30-40 years old. About 58% of all units are subcritical.
[3] Includes projects categorised as announced, pre-permit, and permitted.
[4] Meaning no progress has been identified on the proposed projects for at least two years, but not necessarily that the projects are no longer under development or consideration, or couldn't be revived.



Source: GEM, Global Coal Plant Tracker July 2023.
Note: Currently operating units represented by solid circles, and planned and under construction units by dotted circles; dot size represents capacity.

Figure 1. Distribution map of current and future PLN and IPP, and captive CFPPs in Indonesia

Overseen by Indonesia's Ministry of Energy and Mineral Resources (MEMR), grid power development over the coming decade has been outlined in *Rencana Usaha Penyediaan Tenaga Listrik* (RUPTL) 2021–2030, PLN's business plan for the next decade's electricity development in Indonesia. PLN, together with IPPs, will realise a total of 40.6 GW of additional capacity by 2030, where 52% comes from renewable energy and 48% comes from fossil fuels (MEMR, 2021). About 13.8 GW of capacity for utility power generation would come from coal, over one third of the total planned grid power capacity addition.

Trends and distribution of captive power

Captive power plants,[5] mainly dedicated to fulfilling industrial energy needs, are part of "national strategic" projects. There is limited information on detailed development plans for captive power plants because the units are independently owned and operated.

However, based on currently available data, there will be an additional 14.4 GW of capacity in the pipeline for captive power, roughly equivalent to the planned expansion by PLN and IPPs for the national grid. Information presented in this analysis summarises available data from GEM's database, compiled from publicly available information on current and forthcoming investments and partner organisations within Indonesia's civil society network. MEMR does not disclose plant-level listing of captive power plants.

As illustrated in Figure 2, PLN and IPP power capacities have grown significantly over the past several decades, particularly between 2010 and 2020. The dramatic trend is also apparent in captive CFPP expansion, with a nearly eightfold increase in captive power capacity in the last decade, from 1.4 GW in 2013 to 10.8 GW in 2023. The expansion of captive CFPP capacity in Indonesia in the last decade is nearly five times faster than the rest of the world.

[5] Captive coal power mentioned in this report refers to coal-fired power plants owned and operated by industrial and commercial users, for direct on-site consumption of own use which are typically linked to direct or own use licence (*Izin Usaha Penyediaan Tenaga Listrik Untuk Kepentingan Sendiri*, IUPTLS), or for the designated business areas (*Wilayah Usaha*, WU) of Private Power Utility (PPU) companies as determined by the Ministry of Energy and Mineral Resources for supply and/or distribution of electric power

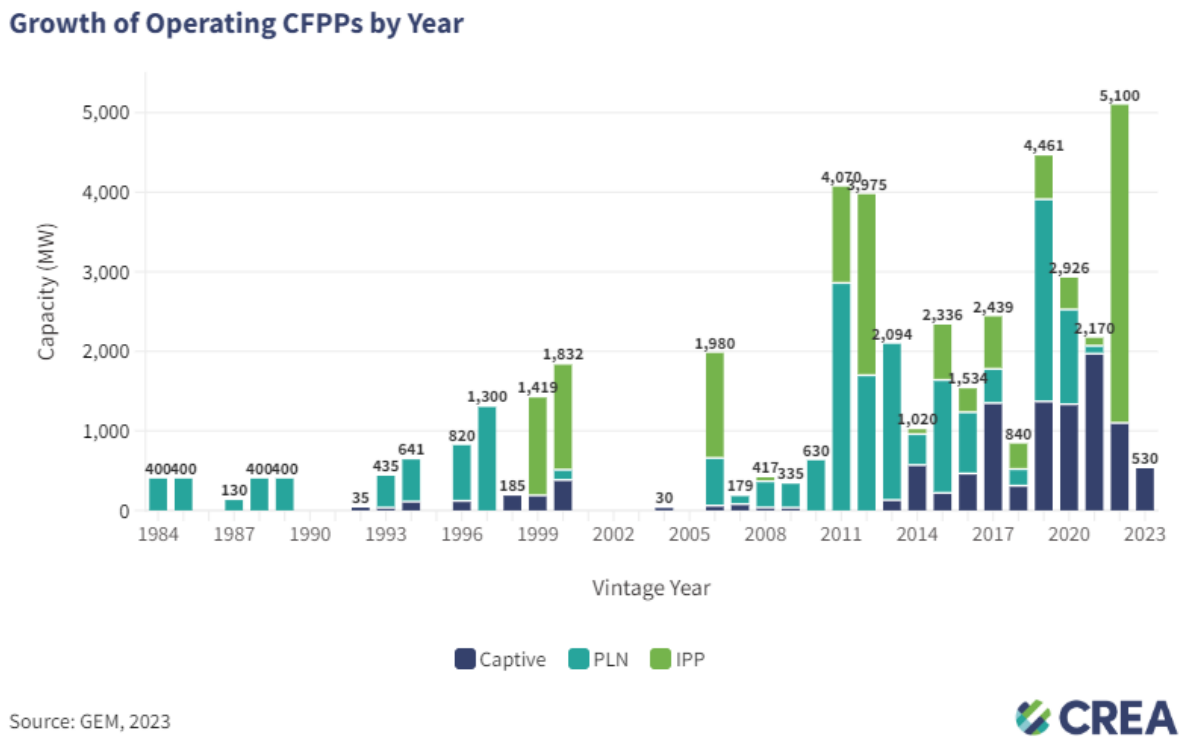


Figure 2. PLN, IPP, and captive CFPP growth over the years

Across the major island groups of Indonesia, Java has the highest CFPP capacity (see Figure 1). In Java-Bali, the majority of the total operating capacity, 27.6 GW or 95.1%, is owned and operated by PLN and IPPs for the national utility grid, and only 1.4 GW or 5.2% is for captive power operated off-grid by the private sector. A similar observation applies to Sumatra and Kalimantan, where only 22.4% and 16.8% of shares are attributed to captive power, respectively. The situation differs widely in the islands across eastern Indonesia, namely Sulawesi, Maluku, Nusa Tenggara, and Papua, where the majority (86.3%) of power generation is dedicated to captive power. The shares are illustrated in Figure 3.

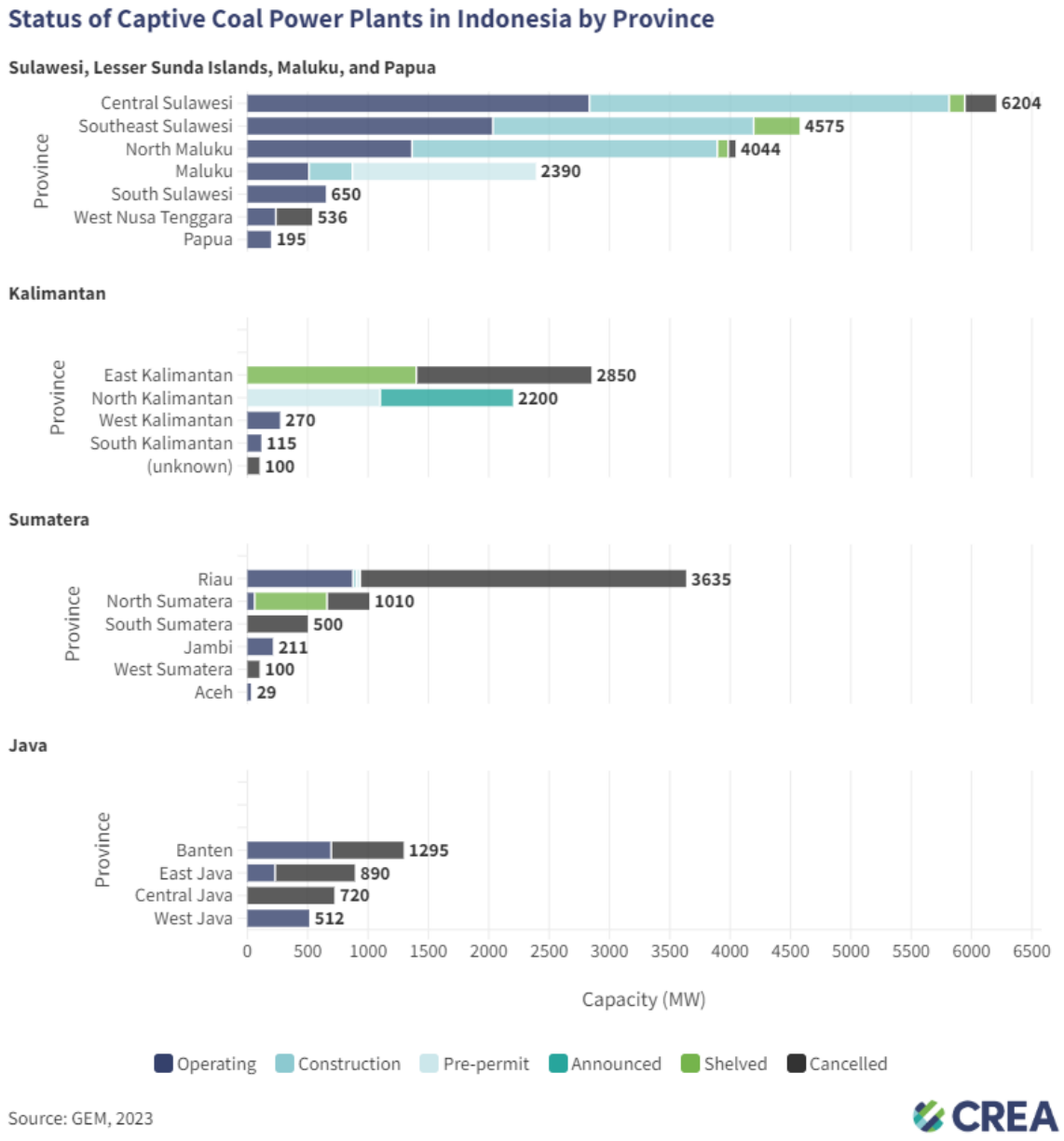


Figure 3. Distribution of captive CFPPs across the provinces by status

In 2022, the industrial sector was responsible for 43% of Indonesia's total energy consumption and consumed 87 million tonnes of coal (MEMR, 2023). At present, there are 117 units of operating captive CFPPs with a total capacity of 10,821 MW. About 76% (8,214 MW) of the operational capacity is dedicated to the metal industry. A significant share of 67% (7,273 MW) is powering nickel smelters, with the remaining 4% is used for aluminium smelters, and 5% for iron and steel, copper, and other metal and mining processing. The rest of the capacity, about 24% (2,607 MW), is dedicated to non-metal sectors power needs,

which are comprised of pulp and paper, cement, textile, chemical plant, and other industrial sectors. The shares are illustrated in Figure 4.

Figure 4. Capacity share of captive CFPPs grouped by status and sector

Due to Indonesia's abundance of natural resources, namely nickel, aluminium, iron, steel, and copper, the country has sought to build out its capacity to mine, process, and export these minerals. The total planned capacity of 14.4 GW captive CFPP has the potential to increase with additional projects in the pipeline. As of July 2023, 8 GW of capacity is under construction, 3.8 GW is at various active development stages, and 2.6 GW is shelved. Out of the total planned capacity, 9.8 GW would be used to power the nickel smelters, 3.2 GW for aluminium smelters, and the remaining 1.4 GW for other industrial sectors.

Insights on the metal industry

According to the Ministry of Industry, the base metal industry has shown stable growth due to increased production capacity in mining centres and rising commodity prices in the export market. The base metal industry contributes over 5% to the Gross Domestic Product (GDP) of the entire processing industry (Ministry of Industry, 2023). While the trend shows steady growth at an average of 8.3% compounded annual growth between 2010 and 2020, the highest growth has occurred since 2020. Sharp growth at 14% was first seen from 2020 to 2021, where the GDP reached IDR 137.6 trillion. In 2022, the GDP was recorded at over IDR 168.0 trillion, indicating 22% growth from 2021 (BPS, 2023).

To strengthen the domestic metal industry, Indonesia plans to integrate upstream and downstream sectors to boost economic growth and encourage higher domestic value added in exports (Nikel.co.id, 2023). This integration is one of the key policies listed in *Rencana Induk Pembangunan Industri Nasional* (RIPIN) 2015-2035, the national industrial development plan stipulated as Government Regulation (*Peraturan Pemerintah*, PP) No. 14 Year 2015. The main aim is to increase the added value of natural resources in the upstream sectors of agriculture, minerals, and oil and gas.

To realise this goal, the plan specifies national targets in production capacity increases, technology development needs, the industrial energy demand outlook, as well as the growth outlook for Java and non-Java Islands. The plan lists specific targets prioritising development outside Java to increase the contribution of non-oil and gas sectors[6] from non-Java islands from 27% in 2013 to 60% in 2035 and to develop up to 36 industrial estates requiring 50,000 hectares of land (Ministry of Industry, 2015).

As a concrete step, the Government has banned the export of nickel ore with a grade below 1.7% since 1 January 2020 through the issuance of Ministerial Regulation No. 11 Year 2019[7] (MEMR, 2019). A restriction on the export of bauxite was also introduced in the same policy, only allowing export of washed bauxite with Al_2O_3 content beyond 42% up to 11 January 2020. The issuance of Ministerial Regulation No. 17 Year 2020[8] reinforced a ban on washed bauxite exports, effective as of 11 June 2023.

[6] Non-oil and gas sectors include agriculture, forestry, fisheries, mining, manufacturing, and various other commodity-based sectors

[7] The Second Amendment to the Regulation of the Minister of Energy and Mineral Resources No. 25 Year 2018 regarding the Business of Mineral and Coal Mining

[8] Concerning the Third Amendment to the Regulation of the Minister of Energy and Mineral Resources Number 25 of 2018 concerning the Business of Mineral and Coal Mining

These moves showcase Indonesia's commitment to advance industrial downstreaming, essentially to accelerate domestic investment and expand production capacity. The nickel ore ban increased nickel exports' value by up to 19 times, from only IDR 17 trillion or USD 1.1 billion in 2014, increasing to IDR 326 trillion or USD 20.9 billion in 2021 (Kominfo, 2022a). Processing bauxite ore domestically to produce metallurgical grade bauxite and smelter grade alumina would increase its economic value by 5 and 15 times, respectively (Ministry of Finance, 2023).

Driven by the recent policies around ore exports, striking growth is apparent in the last few years. As shown in Figure 5, the biggest growth came from nickel exports, growing tenfold from 2017 to 2022, from IDR 8.7 trillion to IDR 88.8 trillion, or USD 0.64 billion to USD 6.18 billion. Iron and steel notably has the biggest portion of the entire metal industry exports, valued at IDR 59 trillion or USD 4.36 billion in 2017, which grew by nearly 7.5 times to IDR 439 trillion or USD 30.5 billion in 2022.

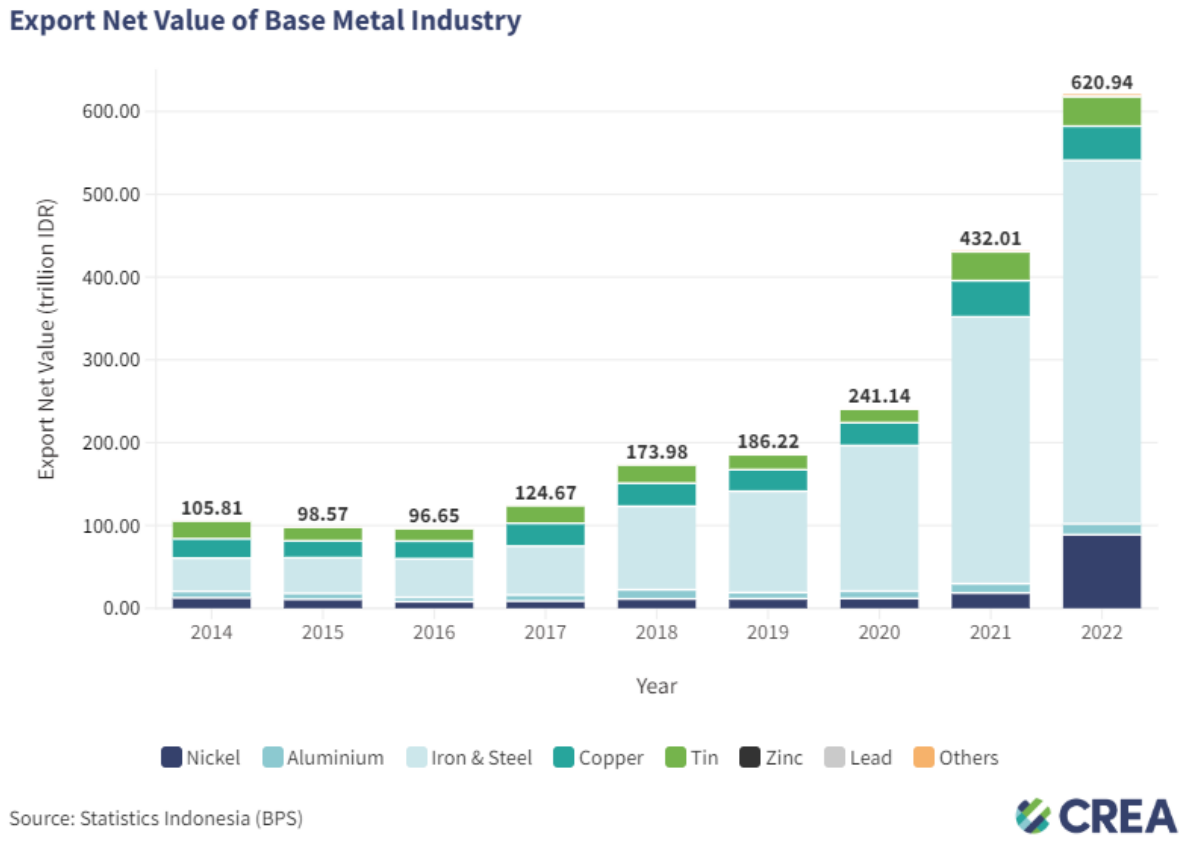


Figure 5. Export net value of base metal industry[9] between 2012 to 2022

[9] Based on two digits Harmonized System (HS-2) groupings, including [75] Nickel and articles thereof, [76] Aluminium and articles thereof, [72] Iron and steel, [73] Articles of iron or steel, [74] Copper and articles thereof, [80] Tin and articles thereof, [79] Zinc and articles thereof, [78] Lead and articles thereof, [81] Other

MEMR's database[10] shows that there are 20 units of currently operating metal smelters across Indonesia, with a total processing capacity of 4.7 million tonnes annually (MEMR, 2023a). Metal commodities covered on the database are nickel, aluminium, copper, iron, manganese, zinc, and lead. Operational production capacity for nickel is the highest at over 3 million tonnes per year, more than double the current capacity available for aluminium processing at 1.3 million tonnes per year. Current production capacity for copper is the third highest at 325 thousand tonnes per year. Iron and manganese follow with current production capacity ranging from 16 to 36 thousand tonnes per year. Zinc and lead smelters, however, have not been operating to date. The shares are shown in Figure 6.

The metal smelters are located in 13 provinces across Indonesia, spread across Java, Kalimantan, Sulawesi, Maluku, and Nusa Tenggara. Of the total operating production capacity, the most (2.1 million tonnes per year, or 44%) is located in Sulawesi; 1.3 million tonnes per year (28%) is in Kalimantan; 0.9 million tonnes per year (28%) in Maluku, and the remaining 3.7 million tonnes per year (8%) in Java. Additionally, there are still 33 units of currently-under-construction smelters in Indonesia, with an expected total processing capacity of 18.2 million tonnes per year. Of which, the most (12.7 million tonnes per year, 70%) will be located in Kalimantan; 2.7 million tonnes per year (15%) in Maluku; 1.8 million tonnes per year (10%) in Sulawesi; 0.7 million tonnes per year (4%) in Java; and the remaining 0.3 million tonnes per year (1%) will be in Nusa Tenggara.

base metals, [83] Miscellaneous articles of base metal. Accessed through https://www.bps.go.id/exim/ on 07-09-2023 09:25:10 WIB.

[10] Accessible through ESDM One Map, https://geoportal.esdm.go.id/, a web-based information system that displays various thematic maps of energy and mineral resources

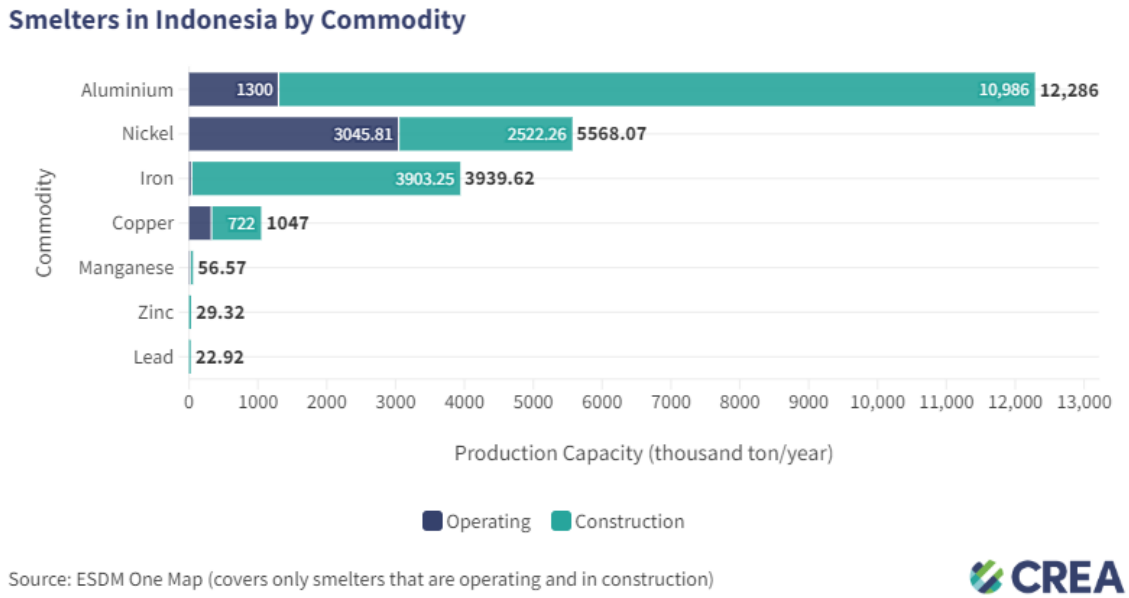


Figure 6. Status of metal smelters in Indonesia by commodity type

Nickel is fast becoming a strategic commodity in the global market for a wide range of end-use sectors (Republika, 2022). Class 1 nickel ore is a raw material for batteries, and Class 2 nickel is generally used for stainless steel products.[11] Both are crucial materials in the energy transition, creating great economic opportunities for nickel-producing countries (Ministry of Trade, 2023). Indonesia was the world's largest producer of nickel in 2022, accounting for 39% of global production (Mining Technology, 2023). The International Energy Agency (IEA) projects that nickel demand in the global market will grow by up to 20 times during the period of 2020 to 2040 (IEA, 2021).

Most nickel smelters have been built and are being built in the eastern islands of Indonesia, aside from some capacity in Banten, as summarised in Figure 7. As of 2022, MEMR reports 14 operating nickel smelters, with 3.05 million tonnes total annual production capacity, and 16 smelters under construction, with 2.52 million tonnes total annual production capacity.

Categorising the captive power plant owners by commodity, this study identifies 53 operating captive CFPPs with total power generation capacity of 7.28 GW, dedicated to powering the operating smelters. An additional 9.77 GW of captive power is still in the pipeline, with 7.65 GW (28 units) under construction, 1.52 GW (4 units) at various early development stages, and 0.6 GW (5 units) shelved. These additional capacities are mostly located and will be built in Sulawesi and Maluku. The shares are illustrated in Figure 8.

[11] Class 1 containing a minimum of 99.8% nickel, Class 2 containing less than 99.8% nickel (Nickel 28, 2023)

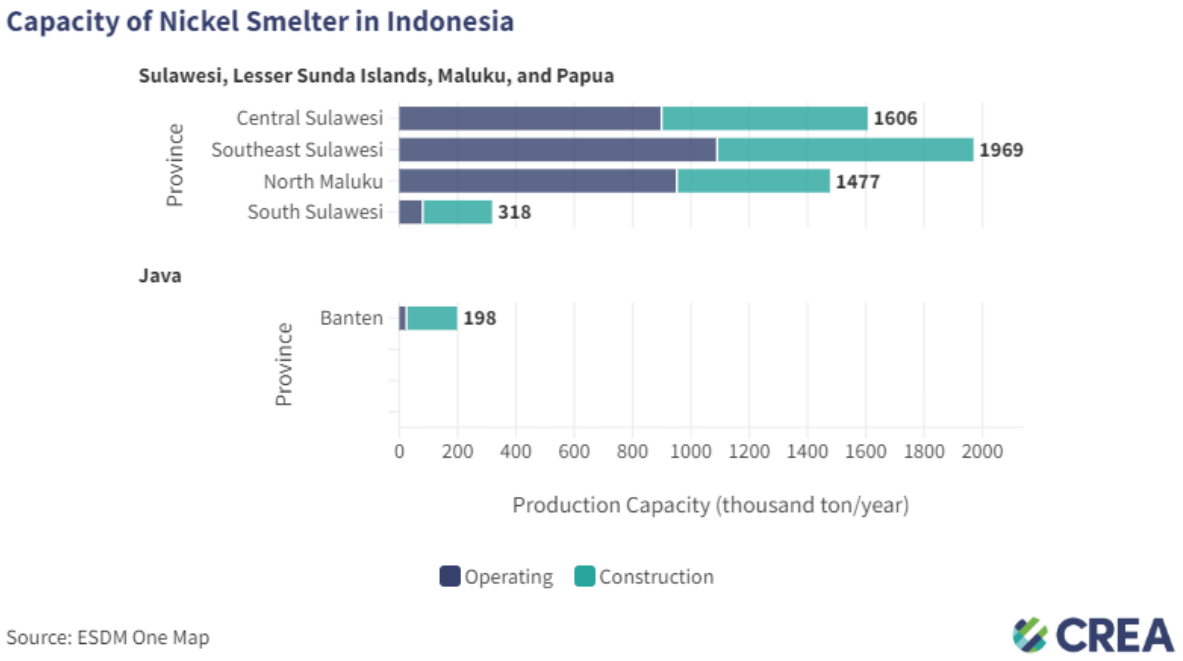


Figure 7. Capacity of nickel smelters in Indonesia

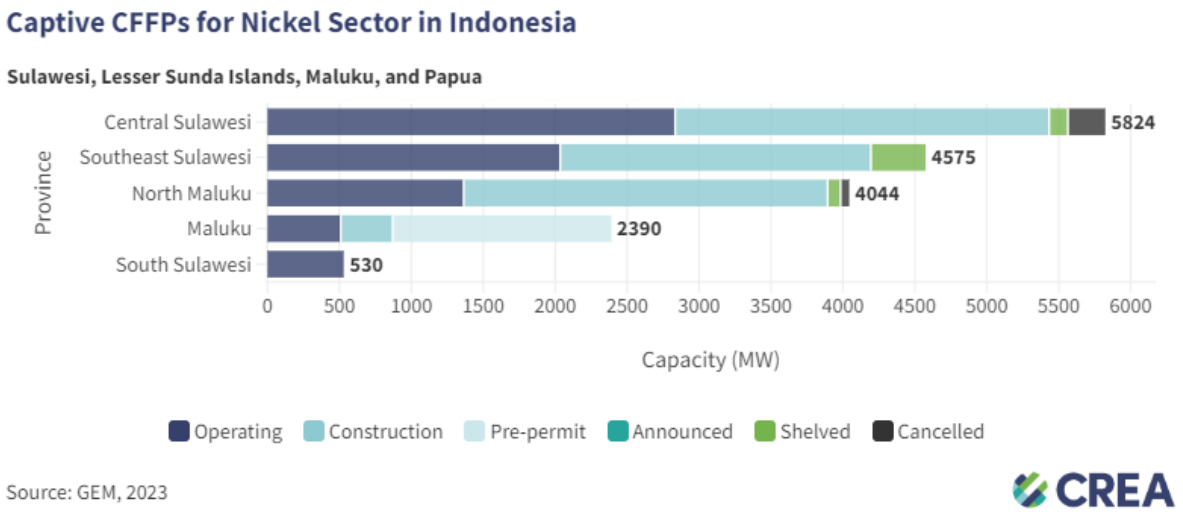


Figure 8. Captive CFPPs for nickel sector in Indonesia

Aluminium is now the second most used metal in the world after iron. Approximately 75% of the aluminium ever produced is still in use today, as it can be recycled endlessly without compromising any of its unique properties or quality (AAC, 2023). Based on the MEMR's *Booklet Tambang Bauksit 2020,* Indonesia has bauxite reserves of 1.2 billion tonnes, equivalent to 4% of the world's bauxite ore reserves of 30.39 billion tonnes (MEMR, 2020).

In 2019, Indonesia's bauxite ore production reached 16 million tonnes. Bauxite can be refined to obtain alumina and smelted to make aluminium, where 2-3 tonnes of bauxite will produce one tonne of alumina. While the national aluminium demand has reached 1 million tonnes, current domestic production capacity is at 250 thousand tonnes, which is only 0.37% of total world aluminium production (Kominfo, 2022b).

Based on the ESDM One Map, currently operating aluminium smelters are located in West Kalimantan. As shown in Figure 9, as of 2022, there were two operating aluminium smelters with a total production capacity of 1.3 million tonnes per year, and nine smelters under construction with a total production capacity of 11 million tonnes per year.

Linking to the captive power generation data for companies producing aluminium, there are 10 operating captive CFPPs with a capacity of 0.4 GW powering aluminium smelters located in West Kalimantan and Riau. Additional capacity of 3.24 GW is still expected, with 0.41 GW (2 units) under construction, 2.2 GW (3 units) at various early development stages, and 0.6 GW (2 units) shelved. A large share of additional captive power capacity is planned for North Kalimantan and Central Sulawesi, as illustrated in Figure 10. The linkage between this upcoming expansion and the additional smelting capacity that would be required for West Kalimantan is not made clear, leaving room for further investigation.

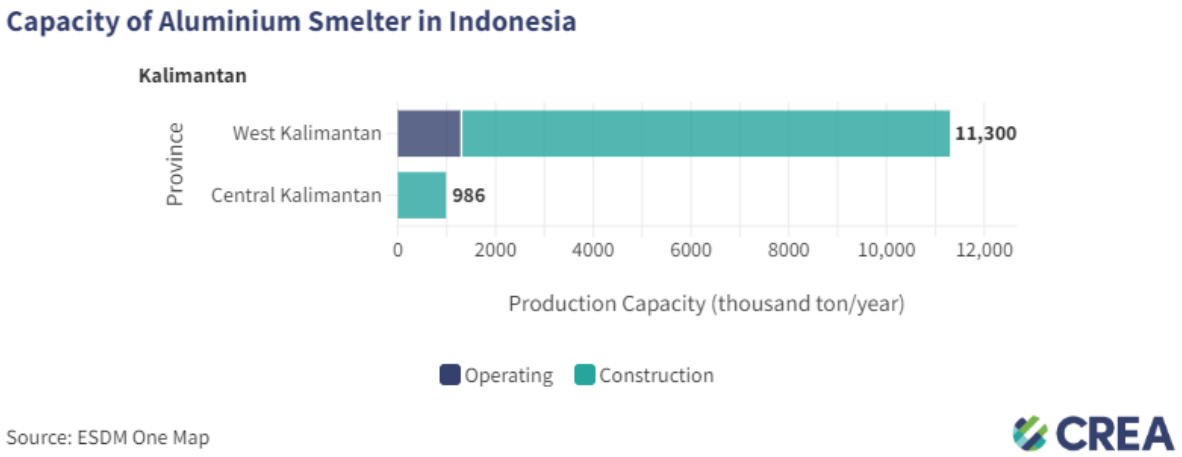


Figure 9. Capacity of aluminium smelters in Indonesia

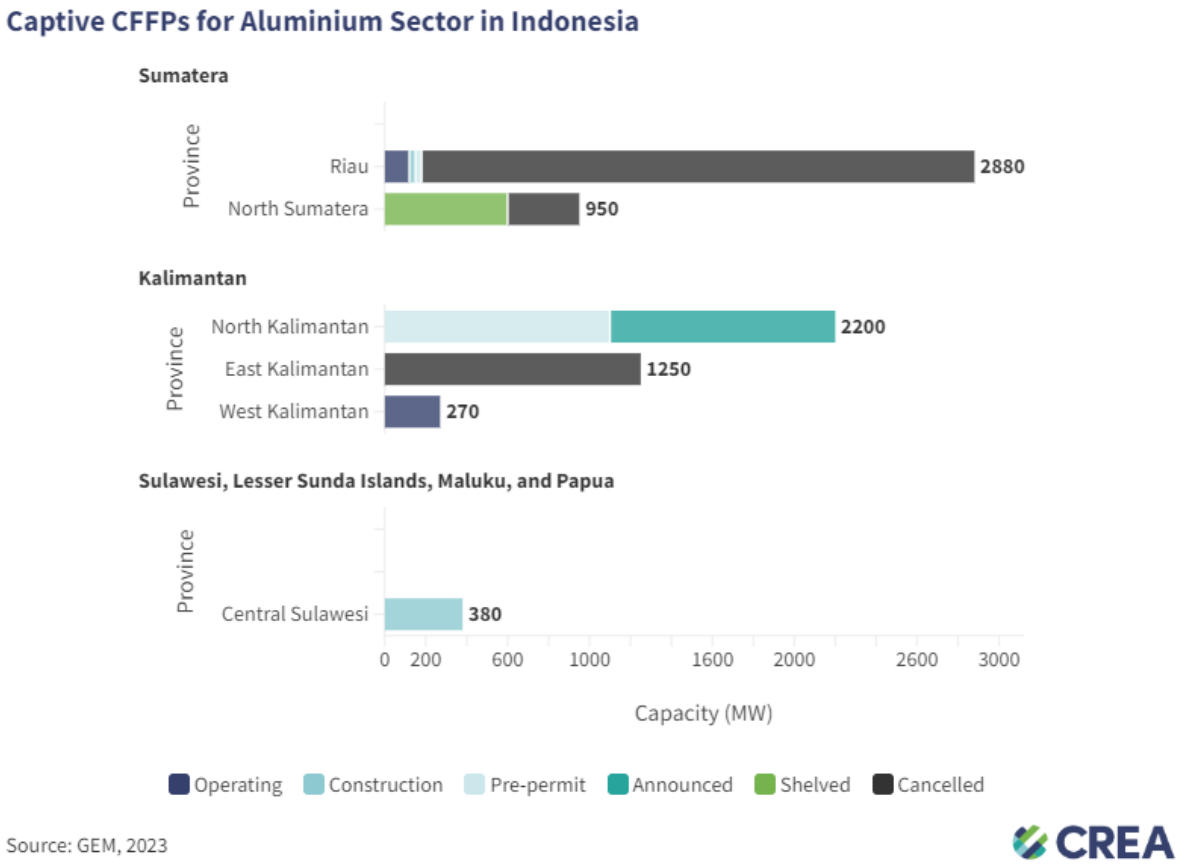


Figure 10. Captive CFPPs for aluminium sector in Indonesia

Iron is the most widely used and important of all metals in the world, as it is used to craft different types of steel which are used in a diverse array of applications, such as manufacturing, civil engineering, and everything in between (Jefferson Labs, 2023). Uses of iron and stainless steel in daily life include machinery and tools, kitchen cutlery, cookware, electronics, and hospital equipment. The Indonesian Iron and Steel Industry Association (IISIA) estimates that Indonesia's steel production will reach 15.8 million tonnes in 2023, an increase of 5.33% compared to the previous year. IISIA also estimates an increase in domestic consumption of this base metal in 2023, with 6.17% of growth projected, an increase to 17.2 million tonnes (DataIndonesia.id, 2023).

The currently operating iron smelter is located in West Java with a 3,640 tonne annual production capacity, but expansion is underway for North Maluku and South Kalimantan to add 3.9 million tonnes of annual production capacity, as shown in Figure 11. Based on the available data, there is no clear linkage showing whether additional captive power will be added to power the smelters that are currently in construction. Additional detail on whether the North Sumatra captive power plant, as shown in Figure 12, can be linked to iron and steel smelting would also be necessary for improved clarity.

Figure 11. Capacity of iron smelter in Indonesia

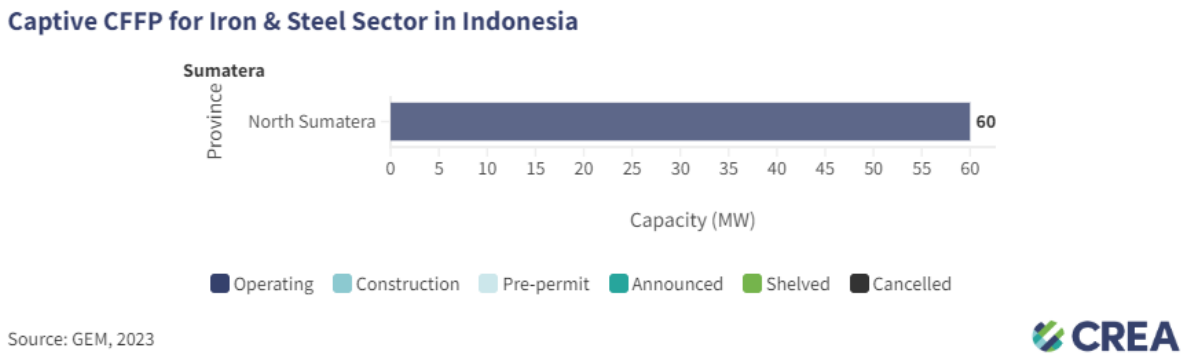


Figure 12. Captive CFPPs for iron & steel sector in Indonesia

In addition to the base metals, there are other industrial sectors that utilise captive CFPPs for their own or collective use within **industrial parks**, or designated areas dedicated for industry use. Based on the available data illustrated in Figure 13, there are five industrial projects with a total power generation capacity of 3.2 GW that can be identified in Kalimantan and Java. In Kalimantan, there are five captive CFPP units that could be linked to Tanah Kuning-Mangkupadi International Port Industrial Zone and Maloy Batuta Trans Kalimantan Economic Zone. As for Java, there are five units that could be linked to Kendal Industrial Park, Java Integrated Industrial Port Estate, and Jababeka Industrial Estate.

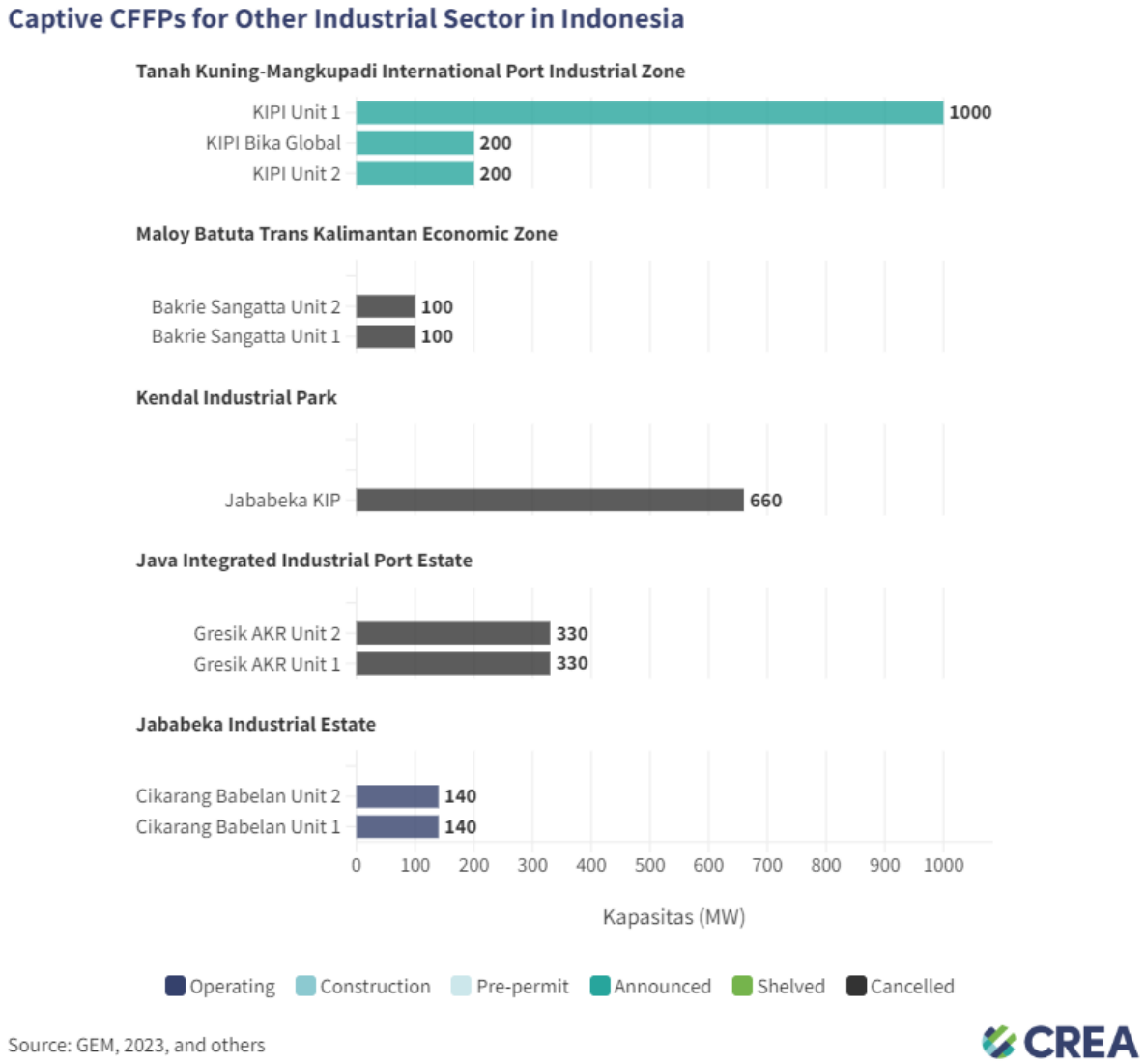


Figure 13. Captive CFPPs for other industrial sectors in Indonesia

Tanah Kuning-Mangkupadi International Port Industrial Zone (*Kawasan Industri Pelabuhan Internasional (KIPI) Tanah Kuning-Mangkupadi*) is one of the nationally strategic projects that will be built in Bulungan District, North Kalimantan, with hydrogen and ammonia production, an aluminium smelter, and electric vehicle battery factories among the industries expected to operate in this industry zone (Antara, 2022). In 2020, a total capacity of 400 MW CFPP was planned to be built in this KIPI zone (Tribunnews, 2020). In early 2023, there was also a plan to build another CFPP with the capacity of 1,000 MW to run as a "transitional fuel" while hydropower and solar assets were being developed in the area (Koran Kaltara, 2023). But, as of June 2023, it appeared the plants were to be shelved and replaced with 1,100 MW to 2,200 MW CFPP unit(s) dedicated to aluminium smelting (GEM, 2023a).

Maloy Batuta Trans Kalimantan Economic Zone (*Kawasan Ekonomi Khusus (KEK) Maloy Batuta Trans Kalimantan*) was established through PP No. 85 Year 2014 with an area of 557.34 hectares located in Kaliorang District, East Kutai Regency, East Kalimantan Province. The main industrial activities in this area will be palm oil processing and its derivative products and the energy industries such as mineral, gas and coal (Dewan Nasional KEK, 2023). In 2012, a two-unit 200 MW CFPP mine mouth was planned to be built to provide the electricity needs of this industrial area, as well as overcome the shortage of electricity supply to the East Kalimantan system (Antara, 2012). There has been little mention of the project since then, and it is unclear whether it is still active. With no developments in four years, it appears as of May 2016 that the project has been shelved (GEM, 2023b).

Kendal Industrial Park (*Kawasan Industri Kendal,* KIP) is the largest industrial township development in Central Java with a total development size of 2,200 hectares. KIP will be an operating ecosystem for many industrial clusters and a self-sustaining economic system. In December 2019, KIP was officially designated as a special economic zone regulated by PP No. 85 Year 2019. The main activities in this area will be for food, furniture, fashion, automotive, electronics, logistics, and the packaging industry (KIP, 2023). Initially, a 660 MW CFPP was planned to be built to power this park. The plants would be located on the west side of KIP, adjacent to industrial plots (CNN Indonesia, 2015). But, in 2017, it was reported that the power station would be fueled by natural gas and the planned CFPP appears to have been cancelled (GEM, 2023c). In October 2022, PLN announced a partnership with KIP electricity management company to upgrade the existing medium voltage network to 150 kV high voltage, to maintain a reliable power supply up to 40,000 kVA (PLN, 2022).

Java Integrated Industrial Port Estate (JIIPE) is the first integrated area in Indonesia, with a total area of 3,000 hectares consisting of industrial estates, multifunctional public ports, and residential cities. Located in Gresik, East Java province, JIIPE is a pilot area for industrial development in Indonesia and was established through PP No. 71 Year 2021 with the main activities being the metal smelter (nickel and steel), electronics, petrochemical and energy industries, and logistics (Dewan Nasional KEK, 2023a). In November 2014, a two-unit 600 MW CFPP, was announced to be built to provide electricity in this industrial area (Bareksa, 2014). But, an April 2016 presentation to analysts showed that there was a change to the planned capacity to a two-unit 330 MW CFPP. Per December 2018, there was no additional news about this project and it appears to have been cancelled (GEM, 2023d).

Jababeka Industrial Estate (*Kawasan Industri Jababeka*) lies in Kota Jababeka, West Java, covering an area of approximately 5,600 hectares (Jababeka, 2023). The estate is designated as an industrial complex for manufacturing and industrial operations, hosting more than 2,000 companies from 30 countries, including leading international and local companies namely Pertamina, Hitachi, Unilever, and L'Oréal. At the Indonesia Net Zero Summit 2022, B20 Indonesia 2022 side event, the factory group signed a joint statement and announced its plans to become Southeast Asia's first net zero industrial cluster—to achieve net zero carbon emissions by 2050 to support Indonesia's net zero targets by 2060 (Pertamina, 2022). Out of the two companies that manage the electricity supply for this industrial park, one that currently operates a two-unit 140 MW CFPP released a statement for decarbonization efforts, namely achieving 21.3 MW peak power from solar rooftop photovoltaic system and up to 20% share of biomass co-firing in the coal-fired boilers (Cikarang Listrindo, 2022).

Alignment with climate commitments

The Government of Indonesia has committed to carry out an early retirement of CFPPs. Presidential Regulation No. 112 Year 2022 on the Acceleration of the Renewable Energy Development for the Provision of Electricity mandates MEMR to develop a roadmap for the sectoral plan (BPK-JDIH, 2022). Despite the commitment to achieve Net Zero Emissions (NZE) by 2060, the Government has not set out a plan to retire captive CFPPs in the industrial sector in a timely manner and has not laid out a clear pathway for a clean energy transition.

This problematic gap is made obvious by existing policies and regulations, which allow the development of new CFPPs for integrated industries under certain conditions – if they are developed to increase the "added value" of natural resources, committed to decrease emissions by at least 35% within ten years of coming online, compared to 2021, and to not operate beyond 2050 (BPK-JDIH, 2022). Recent developments also indicate ongoing review by the Financial Services Authority (*Otoritas Jasa Keuangan*, OJK) for inclusion of CFPP in Indonesia's green taxonomy, which may classify certain projects as environmentally sustainable investments and therefore eligible for green financing (CNBC Indonesia, 2023).

In essence, the country allows for smelting capacity expansion, along with the necessary captive power generation. Although metal commodities such as nickel and aluminium contribute to the global clean energy transition, Indonesia will face difficulties in meeting the national climate targets and commitments if the metal industry remains reliant on captive CFPPs.

Policy recommendations

Addressing coal's role in the energy transition cannot be limited to the power sector. Captive CFPPs are a significant threat that must be addressed by the Just Energy Transition Partnership (JETP) requirements and plans. Provided access to USD 20 billion funding through JETP, Indonesia is able to set a firm and clear pathway to achieve the emissions trajectory. As set out in the JETP agreement, Indonesia will aim to reach the power sector emissions peak by 2030 (including on-grid and off-grid), not the previous deadline of 2037, cap carbon dioxide emissions levels at 290 MTCO2e (about one fifth lower than the previous baseline), achieve 34% renewables share in all power generation by 2030 through the acceleration of clean energy deployment, and reach NZE target in the power sector by 2050.

Inclusion of captive CFPP retirement in the national plan is crucial for a meaningful and just energy transition, since captive power is responsible for one-fifth of all health impacts of CFPPs in Indonesia. Exclusion of captive CFPP retirement from the national plan would cause 27,000 air pollution deaths and IDR 330 trillion or USD 20 billion of economic burden from health impacts. Given that the analysis was done based on the 2040 coal phase-out policy which aligns with the 1.5 degrees climate target, delayed captive retirement implies even higher impacts (Myllyvirta et al., 2023).

As a leading supplier of critical metals and minerals for the global clean energy supply chain, Indonesia's firm and proactive stance is crucial in advancing efforts to decarbonise energy intensive industries. There is urgency to set out a clear pathway for all captive power facilities—not only for future units in the pipeline, but also for the currently operating CFPPs and, most importantly, for those that are in planning and early construction phases. Intervention for early retirement scheduling and renewables integration would not only support the Government's energy transition and climate targets, but would also stimulate the nation's clean energy development.

Given the significant anticipated energy demand to power the metal industry, the country is entering a crucial window to accelerate the transition away from coal and implement timely solutions to balance the imperative of industrial development and economic growth with the NZE targets.

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