



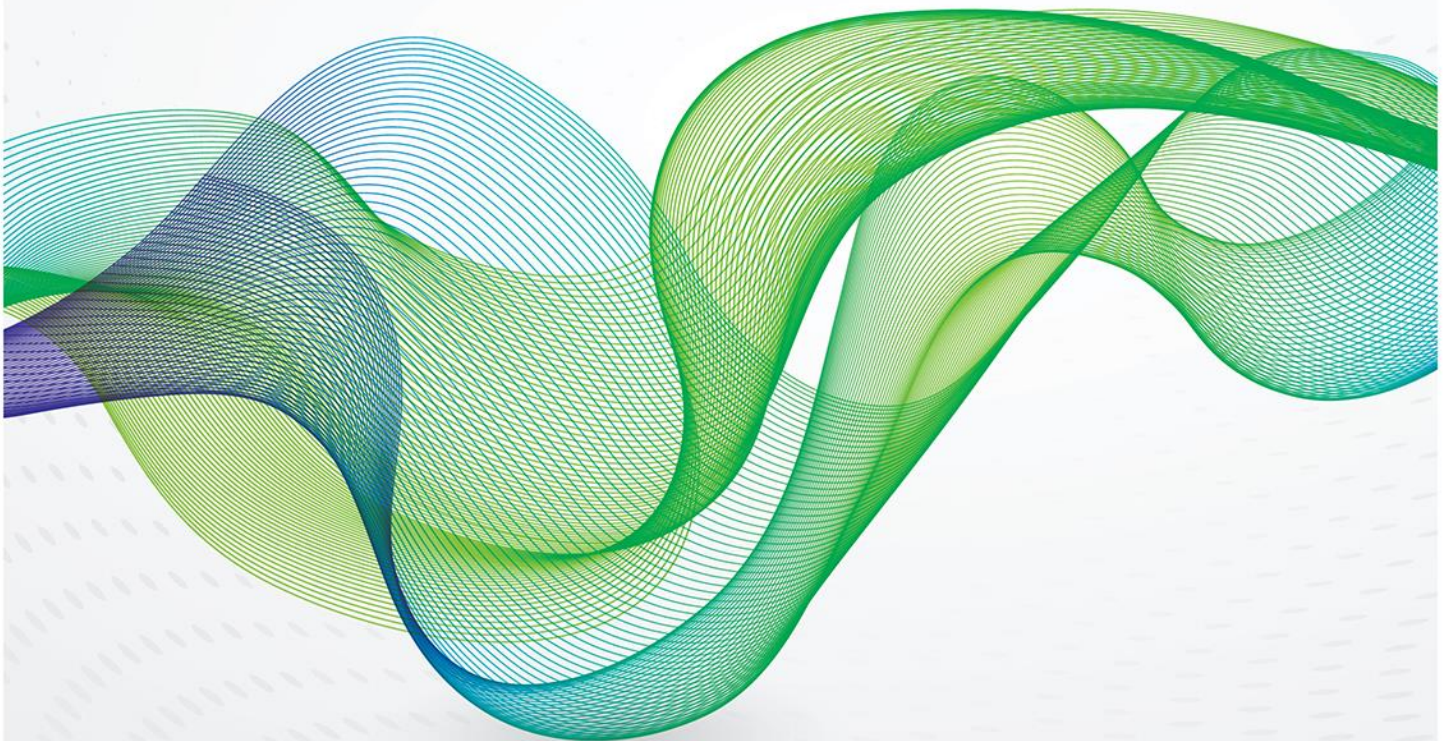
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Indonesia's Electricity Demand and the Coal Sector: Export or meet domestic demand?



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Glossary

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BAU	Business-as-Usual
CCGT	combined cycle gas turbine
CCoW	Coal Contract of Work
CCS	carbon capture and storage
CCT	Clean Coal Technology
CMM	coal mine-mouth
COP21	21 st Conference of the Parties
CO ₂	Carbon dioxide
DEN	Dewan Energi Nasional (National Energy Council)
DMO	Domestic Market Obligation
FDI	Foreign direct investment
FOB	Free-on-Board
FTP	Fast track programme
GAR	gross as received
GDP	Gross domestic product
GHG	Greenhouse gas
Gt	Gigatons
GW	gigawatts
HBA	Harga Batubara Acuan (Indonesian coal reference price)
IEA	International Energy Agency
IGCC	Integrated gasification combined cycle
INDC	Intended Nationally Determined Contribution
IPPs	Independent Power Producers
IUPs	Coal Mining Permits
KEN	Kebijakan Energi Nasional (national energy policy)
LNG	liquefied natural gas
MEMR	Ministry of Energy and Mineral Resources
Mt	Million tons
Mtce	Million ton of coal equivalent
Mtoe	million tons of oil equivalent
NPS	New Policy Scenario
NRE	New and renewable energy
PLN	Perusahaan Listrik Negara
RE	renewable energies
RPJMN 2015-19	Rencana Pembangunan Jangka Menengah Nasional, or National Medium-Term Development Plan for the period 2015-2019
RUKN	Rencana Umum Ketenagalistrikan Nasional, or General Plan for National Electricity Development
RUTPL	Rencana Usaha Penyediaan Tenaga Listrik, or Electricity Supply Business Plan
SC	supercritical
USC	ultra-supercritical
WEO 2016	World Energy Outlook 2016



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Executive Summary

Indonesia is the world's largest steam coal exporter and supplies half of Asia's steam coal imports. Due to its influence in the Pacific basin steam coal market, Indonesia plays a key role in shaping the market. The country is also a rising coal consumer and became the world's eighth largest consumer in 2014. So far Indonesian coal production has largely been driven by coal exports and only a small share has fed the domestic market. However, this is expected to change as coal demand by the power market is growing and the national energy policy prioritizes the sales of coal to the domestic market. Due to the sheer size of Indonesian coal exports on the Asian market, any rapid change in coal mining regulation and coal demand will significantly impact the availability of Indonesian coal on the export market, with a possible major spillover effect on international coal prices.

Despite being Southeast Asia's largest energy producer and consumer, Indonesia remains an energy-poor country. The energy system has been built on exports rather than domestic supply, and delivering adequate, affordable, and reliable energy to the local market has been a perennial challenge. The Indonesian government has an ambitious plan to complete the electrification of the country by 2019, whereas today 40 million of Indonesians still don't have access to electricity. To meet this target, the Indonesian government launched a fast-track programme in 2015 aiming to add 35 GW of power capacity by 2019. Coal, which currently provides more than half of the electricity generated in the country, is expected to dominate the future mix: 20 GW of the additional capacity is coal-based. Coal is considered as the quickest and cheapest way to increase power generation as the country holds significant coal resources at low production costs. The fast-track programme, and its acceleration through various policy incentives, are expected to double coal demand from the power sector, although more gradually than planned due to several challenges, such as land acquisition and financial issues that may slow progress. To reconcile growing coal consumption and its commitment to reduce greenhouse gas emissions, Indonesia is increasing the share of renewables in its energy mix and is implementing clean coal technologies. Most of the new coal-based capacity is based on ultra-supercritical technologies.

The rise in domestic coal demand will absorb a much higher share of national production than in the past and may limit the availability of Indonesia's coal for the export market. In addition to being a growing fuel for electricity, coal also plays an important role in supporting Indonesia's economy and is a major source of export revenues. The government therefore has to find a subtle balance between exports and domestic consumption.

On the supply side, Indonesian coal production almost doubled between 2008 and 2013. This impressive growth was mainly driven by import demand by China and India, which accounted for almost 90 per cent of the incremental Indonesian supplies. This made Indonesia highly reliant on import demand by its two major customers. Indonesian steam coal exports fell sharply in 2015 due to their reduced import demand. Low international coal prices and stricter regulation on mining forced higher-cost small miners to stop production. Domestic policy and regulation on coal mining and exports also restricted the availability of coal supplies for the export market. The increasing number of coal permits approved by state governments since the adoption of the Mining Law in 2009 led to rising illegal mining and export activities, which contributed to the over-supply which characterized the global steam coal market until mid-2016. The central government has responded by establishing more stringent regulations on the coal mining sector, such as coal production quotas by region and major producers, the introduction of a 'clean and clear' certification system and the requirement for coal mining companies to be registered as official exporters.

The international coal market turned from over-supply to tightness in the middle of 2016, mainly due to regulation on coal mining in China – which forced Chinese power utilities to raise their coal imports – combined with a lack of investment in the global coal mining sector. The recovery in international and Indonesia's export prices, which doubled in 2016, enabled Indonesia's coal miners to increase



their coal production and exports in the second half of the year, and offset losses recorded in the first half. However, the rise in Indonesia's coal exports in the second half of 2016 was almost entirely due to rising lignite import demand by China, which mainly benefitted Indonesia, the world's largest exporter of this type of coal.

Despite Indonesia's large coal resources, growing domestic demand and falling investment in the coal mining sector during the past five years calls into question the future availability of coal to fuel both domestic and export markets. In response to these concerns, the government has prioritized the sale of production to the local market. Its medium-term strategic plan projects a large increase in coal consumption, while a cap on coal production restrains the availability of coal supply for the export market. While Indonesia's abundant coal resources should enable it to meet the rising needs of the domestic market and coal exports, the coal mining sector faces many challenges. The sustainability of the recent price recovery and coal imports by China is not ensured. The prioritization of domestic coal as fuel for electricity production is therefore a lifeline for the Indonesian coal industry. Notably, it increases domestic demand for Indonesia's low-rank coal and lignite for which export demand is uncertain. Regulatory developments in major importing countries, but also economic considerations, have favoured the import of higher grade coal, a trend that is likely to persist in the future in view of more stringent environmental constraints.

To serve Asian and rising domestic demand, the cap on coal production, established by the government in 2014, has been exceeded in each of the past three years and the government is expected to review its annual coal production policy target to adapt it to the new market conditions. But in the medium and long term, future Indonesian export levels constitute a major source of concern for neighbouring ASEAN countries, which have built coal-fired power plants based on Indonesian coal quality, as well as for traditional importers in Asia due to the sheer size of Indonesia on the Pacific basin steam coal market. While Indonesian coal exports will be reduced by growing domestic demand, they are not expected to collapse as steeply as foreseen in the national medium-term strategic plan because coal demand by the power sector is expected to increase more gradually and the fast-track programme to be extended after 2019. However, a production control level at roughly 400 Mt per year in the medium and long term, if effective, would make less coal available for the export market and reduce coal exports significantly by 2025.

Due to Indonesia's current weight on the Pacific basin steam coal market, its coal exports remain key to the adjustment of the Pacific basin supply, as much as China's coal policy and import behaviour is key on the demand side. More than ever, the destiny of the global coal market is linked to China's import demand and Indonesia's exports.



1. Introduction

Indonesia is Southeast Asia's largest energy producer and consumer, and is also the world's largest exporter of steam coal, and still a large exporter of LNG. The rich potential of Indonesia's energy resources, including oil, gas, coal, hydro and geothermal, has played a critical role in the country's economic growth and export revenues. However, despite being rich in hydrocarbons, Indonesia remains an energy-poor country. The energy system has been built on exports rather than domestic supply, and delivering adequate, affordable, and reliable energy to the local market has been a perennial challenge: in 2015, per capita energy use in Indonesia was only 0.9 toe versus 1.8 toe in Thailand and 3.1 toe in Malaysia. The main energy policy challenge therefore is meeting the rising domestic energy demand of a growing population and economy. Declining oil, gas, and recently coal production, threatens to undermine the energy sector's capacity to support domestic economic growth and poses serious challenges to Indonesia's role as an important energy exporter.

To address these issues, the national energy policy (Kebijakan Energi Nasional - KEN), formulated by the National Energy Council (Dewan Energi Nasional – DEN), was revised in 2014 and introduced a number of important changes. It focuses on re-establishing Indonesia's energy independence by re-directing energy resources from export to the domestic market, and aims to rebalance the energy mix towards indigenous energy supplies.¹ One primary focus is energy security, particularly as production at existing domestic oil fields declines, leading to more oil imports. The policy translates into minimizing oil consumption, increasing the exploitation and consumption of coal and renewable energy (RE) sources, optimizing gas production and consumption, and consideration of nuclear energy as the option of last resort.² KEN stipulates that exports of natural gas and coal are to be reduced gradually, and phased out eventually at a future date to be specified. Coal is no more treated as a commodity for export revenues but also as a source of energy for domestic consumption. Therefore, Indonesia has to find a balance between exports and domestic utilization of coal.

The purpose of this paper is to analyse how Indonesia plans to achieve this balance and what could be the implications of rising domestic coal demand on Indonesian coal exports.

2. Ambitious Plan to Expand the Power Sector

Indonesian energy demand is expected to increase strongly driven by rising economic and social development and a growing population. Despite the focus on energy efficiency measures, KEN's initial projections for total energy demand by 2025 were revised in December 2015 from 380 Mtoe to 400 Mtoe (excluding traditional biomass). Proposed targets for how Indonesia can meet rising energy demand while sustaining the country's environmental outlook are remarkably ambitious. DEN plans to transform the energy mix by raising the share of new and renewable energy (NRE) sources to 23 per cent by 2025 (Figure 1). In order to meet the country's targeted energy mix for 2025, natural gas and coal use must more than double and renewable energy use must increase nine-fold. The new policy aims to complete the electrification of the country by 2019, which is a difficult undertaking considering Indonesia's complicated geography. The target is to raise power capacity to 137 gigawatts (GW) by 2025 and 430 GW by 2050, compared with 55.5 GW at end 2015.³ These targets are the point of reference for setting electricity sector policy, and both the Ministry of Energy and Mineral Resources (MEMR) and Perusahaan Listrik Negara (PLN), the state-owned power utility company, have adopted compatible targets in their respective power development plans.

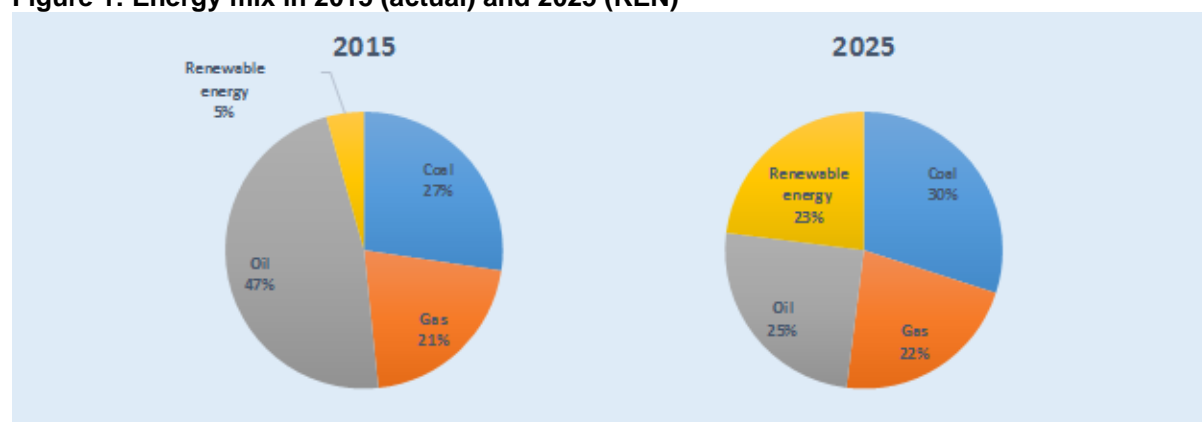
¹ Total primary energy supply was about 230 Mtoe in 2015, while net exports totalled 215 Mtoe, representing half of energy production. Primary energy supply mainly comes from fossil fuels: oil (38.4 per cent), coal (22.2 per cent), and gas (17 per cent). The share of renewable energy sources in the energy mix was below 5 per cent, coming mostly from hydropower, geothermal power and biofuel. In addition, traditional non-commercial biomass still accounts for 19 per cent of the energy mix. MEMR (2016a). Original data in million barrel oil equivalent (1,642 Mboe), converted on the basis: 1 boe = 0.14 toe.

² IEA (2015a), MEMR (2014).

³ Indonesia-Investments, 15 December 2015.



Figure 1: Energy mix in 2015 (actual) and 2025 (KEN)



Excludes traditional biomass

Source: MEMR

Indonesia is adopting wide ranging policy reforms to meet these ambitious targets. Since President Widodo took office in October 2014, he has launched several reforms to address corruption and informal markets, streamline the regulatory process for investors, and make domestic energy prices more competitive with international prices. These reforms include ending the oil subsidy and scaling down the electricity subsidy, which is now being phased out gradually, according to consumer class, until all but the poorest households receive electricity at market price by 2018.⁴ By cutting fuel subsidies, the government has been able to reallocate funds in the state budget toward investment in infrastructure development (ports, roads, power plants, and dams) which is crucial for meeting growing energy demand. There are, however, a number of structural and policy challenges that continue to complicate further progress. The biggest challenges include persisting energy subsidies, a lack of infrastructure, the regulatory environment, corruption, and ongoing questions about economic nationalism.⁵

Electricity demand

Electricity demand has grown at an average of 7.1 per cent per year since the end of the 2000s from 134.6 TWh in 2009 to 202.8 TWh in 2015.⁶ The islands of Java and Bali account for about three quarters of Indonesia's power consumption. At the end of 2015, Indonesia's total power generation capacity was 55.5 GW, of which 70 per cent was owned by PLN,⁷ 21 per cent procured by PLN from contracted Independent Power Producers (IPPs) and the rest by private power utilities and captive power plants. Power capacity has doubled over the past decade. Coal in particular has increased its role greatly, from 9.75 GW in 2005 to 27.2 GW at the end of 2015. Fossil fuels dominate the generation mix, accounting for 89 per cent of total generation, with coal generating 56 per cent (Figure 2).⁸ Since 2012, the share of diesel has been reduced in accordance with the government's policy to phase out the use of oil for electricity. The bulk of RE power generation comes from hydro and geothermal.

⁴ ADB (2015).

⁵ See National Bureau of Asian Research (2015).

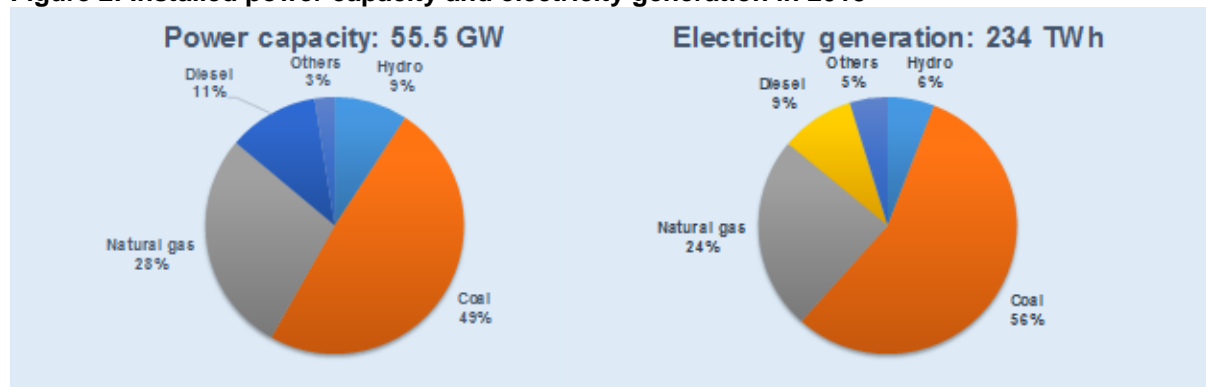
⁶ MEMR (2016a). Electricity sales slowed from a rate of 5.90 per cent in 2014 to 2.14 per cent in 2015. Decline in electricity sales growth was the result of customer electricity savings after a gradual increase of electricity tariffs throughout 2015, and a less conducive domestic economy.

⁷ The vertically integrated power utility, PLN, is the only state-owned power utility company in Indonesia and the most significant company in Indonesia's electric power sector. Since the passage of a new electricity law in 2009 (Electricity Law No. 30/2009), PLN no longer has a legal monopoly over electricity generation, transmission and distribution, but PLN is currently the only owner and operator of the transmission and distribution assets. PLN holds primary responsibility for achieving the government's accelerated generation targets through the fast track programmes.

⁸ MEMR (2016a).



Figure 2: Installed power capacity and electricity generation in 2015



Source: MEMR

About 88 per cent of Indonesia's population has access to electricity compared to less than 68 per cent in 2010. Despite this remarkable progress, Indonesia still has a low electrification rate compared to countries with similar income levels. Eastern Indonesia lags behind the western area of the country, with some provinces such as Papua only providing electricity to 43 per cent of its population. Even in grid-connected areas, electricity capacity additions have not kept pace with electricity demand growth, leading to power shortages. Power consumption per capita is also one of the lowest in the region with only 910 kWh/capita in 2015.⁹ Despite the huge call for infrastructure development across the value chain, development has been hindered by PLN's limited capacity and poor financial health, caused by rising subsidies stemming from controls over retail prices for electricity.

Therefore, a key priority for Indonesia is to increase the country's power generation capacity to complete the electrification of the country and meet increasing electricity consumption. The National Medium-Term Development Plan for the period 2015-2019 (RPJMN 2015-19) projects reaching nearly full electrification by 2019.¹⁰ Furthermore, for the government to maintain its annual economic growth target of up to 6-7 per cent, which it has achieved over the past decade, an estimated 35,000 MW will need to be added over the period 2015-2019. To achieve these goals, a fast track programme (FTP) was launched by the government in 2015.

The 35,000 MW programme

The 35,000 MW programme aims to add 35 GW of power capacity from 2015 to 2019, mainly coal-fired (56 per cent or 20 GW) and natural gas (36 per cent). From the government's perspective, coal is considered the quickest, easiest and cheapest way to provide millions of people with electricity. The abundance of coal resources in the country is the basis for the planning of coal-fired power plants. In addition, generating electricity from coal is considerably cheaper than generating it from either natural gas or oil products. Gas-based electricity is twice as costly as coal-based electricity, while electricity from diesel or fuel oil is four times as expensive.¹¹

The 35,000 MW programme requires \$73 billion of investment in generation, transmission and distribution. Most of the projects are to be developed by IPPs, while PLN will be responsible for the construction of transmission and distribution lines.

This is not the first time the Indonesian government has attempted to accelerate the development of power plants. The Yudhoyono government (2005–14) also pursued two fast-track electricity programmes to add 10 GW of power capacity each. These programmes, however, experienced delays because of licensing and land acquisition issues, lack of financing, delays in government-backed loans, grid infrastructure constraints, construction setbacks, and various technical difficulties.

⁹ MEMR (2016b)

¹⁰ BPKP (2015).

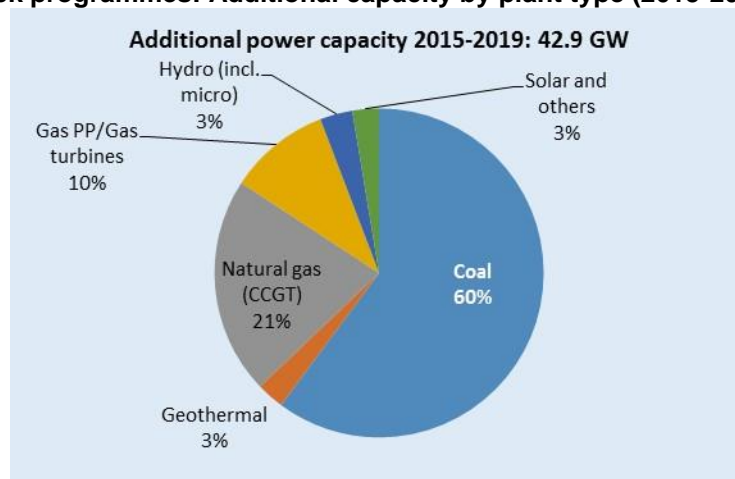
¹¹ National Bureau of Asian Research (2015). This does not include externalities coming from the burning of coal.



The first programme (FTP1), announced in 2006, aimed to build 10,000 MW of new coal-fired power plants by 2010, 75 per cent in Java and the remainder in other parts of the country. FTP1 was initially expected to be completed by 2010, but is still incomplete (85 per cent complete as of beginning 2016). Indonesia later announced plans in 2009 to build an additional 10,000 MW of new power plants under the FTP2 by 2014, this time with private sector participation. Since the initial tenders, FTP2's target has increased to approximately 17,500 MW of new-build projects. Nearly 67 per cent are to be developed by IPPs, and 60 per cent are planned to be coal-fired (10.5 GW). FTP2 too has faced severe delays: less than 5 per cent of FTP2 projects were completed as of beginning 2016.

The 35,000 MW programme does not incorporate projects committed under FTP1 and FTP2, of which 7.4 GW, mainly coal-fired capacity, were under construction at the beginning of 2015 and planned to be online by 2019. In combination, the three FTPs aim to bring 42.9 GW of generation online from 2015 to 2019 (Figure 3). Coal projects dominate the electricity development programme with 25.8 GW of capacity to be added over the period.

Figure 3: Fast track programmes: Additional capacity by plant type (2015-2019)



Source: MEMR

The 35,000 MW programme is very ambitious considering that the additional capacity (42.9 GW taking into account ongoing projects) represent 81 per cent of Indonesia's installed power capacity at end 2014. Many of the projects involved are still in their procurement or planning stage,¹² though the government has taken steps to shorten approval processes in order to accelerate the realization of the programme and facilitate private investment. Supporting regulations include MEMR Regulation No. 3/2015 about the pricing benchmark for the IPP and excess power, Presidential Regulation No. 30/2015 on the implementation of land acquisition for public purposes, as well as Presidential Regulation No. 4/2016 on the acceleration of electrical power infrastructure construction.¹³ The government also set up a "one stop shop" for infrastructure projects in 2015, which reduces the steps and time required to obtain necessary project licenses. In addition, power price reform continues, with PLN implementing monthly power tariffs adjustment for its customers from early 2015. But several challenges remain, and may hamper the development of the programme, in particular land acquisition, growing opposition to coal projects and financial issues.¹⁴

¹² As of June 2016, 8.2 GW (22 per cent of the planned 35 GW) were under construction, 9.8 GW (27 per cent) were approaching financial closure, 10.4 GW (28 per cent) were in the procurement stage, and 8.1 GW (22 per cent) in the planning phase. PLN (2016c).

¹³ Indonesian regulation requires that a power plant project be listed on the RUPTL in order to qualify for various incentives, including, in the case of Presidential Regulation No.4/2016, the provision of government guarantees.

¹⁴ See for instance Concord Review, 9 August 2016.

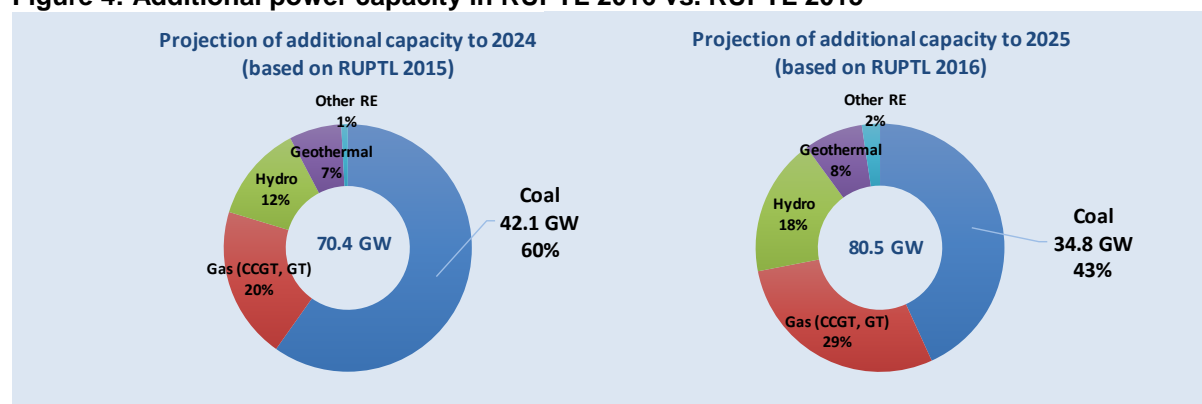


PLN's Power Development Plan 2016-2025

The Directorate General of Electricity (DG Electricity) in MEMR is responsible for developing the General Plan for National Electricity Development (Rencana Umum Ketenagalistrikan Nasional, or RUKN) which is the main policy document guiding electricity sector development in Indonesia, as PLN also uses it as a framework for developing its ten-year electricity supply business plan (RUPTL). The draft RUKN 2015-2034, published in July 2015, is built on three key policy pillars: 1) it maximizes the use of RE to 25 per cent of the electricity generation mix by 2025; 2) it limits the share of coal to 50 per cent by 2025, while that of natural gas (including LNG) is raised to 30 per cent and oil is almost completely phased out; and 3) it encourages energy conservation.¹⁵

RUPTL 2016-2025 significantly differs from the plan adopted in 2015. Electricity demand growth has been revised slightly downwards thanks to energy conservation measures. It is nevertheless projected to expand at 8.6 per cent per year from 224 TWh in 2016 to 457 TWh in 2025 (PLN's system only: does not include captive power). Additional generation capacity totals 80.5 GW over the period 2016-2025 or an average increase of 8.1 GW per year, compared with 7 GW per year in the previous plan. More capacity is needed to meet the target of 25 per cent of RE sources in the electricity mix by 2025, as set in the draft RUKN, and almost full electrification of the country. Despite the growing capacity additions, the projected additional coal capacity has been revised downwards (-7.3 GW, Figure 4). Several coal projects have been postponed¹⁶, and replaced by gas-fired power plants to meet the limit of 50 per cent of coal in the electricity mix in 2025. Nevertheless, coal still dominates additional capacity with 34.8 GW added over the period 2016-2025 (43 per cent of total additional capacity), followed by natural gas (23 GW), hydro (14.5 GW) and geothermal (6 GW).

Figure 4: Additional power capacity in RUPTL 2016 vs. RUPTL 2015



Source: PLN

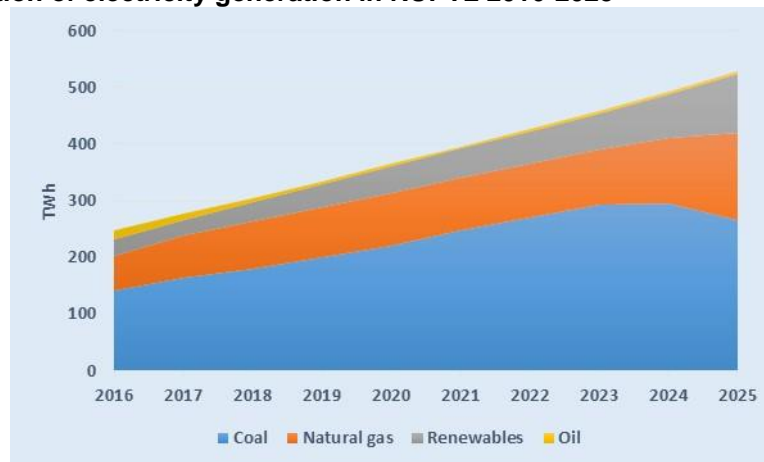
Despite the ambitious target for additional RE capacity, RUPTL 2016-2025 fails to meet the 25 per cent share of RE in power generation set in the draft RUKN, as the share is raised to just 19 per cent by 2025 (Figure 5). The share of coal in electricity generation rises to 60 per cent by 2019 and even reaches 64 per cent in 2023 before falling to 50 per cent in 2025. It should be mentioned that this decline – based on the fulfilment of the 50 per cent limit set in the draft RUKN - is not consistent with additions to coal capacity after 2020 (6 GW between 2021 and 2025). Alternatively, it would require that many old inefficient coal plants be retired by 2025.

¹⁵ PLN's business plan, adopted in June 2016 (RUPTL 2016-2025), incorporates the new policy targets set in RUKN and the 35,000 MW programme. The RUPTL is a key document for all investors in the Indonesian power sector as it indicates the projects PLN plans to develop, and those that are available for IPP investors. Direct selection or direct appointments for IPPs to build power plants are based on the RUPTL.

¹⁶ Namely, Java Power Plant-11 (1X600 MW), Java Power Plant-12 (2X1,000 MW) and Java Power Plant-13 (2X1,000 MW)



Figure 5: Projection of electricity generation in RUPTL 2016-2025



Source: PLN

Massive capital investment will be required to develop the electricity system. Total investment needed is estimated at \$153.7 billion during the period 2016-2025, of which \$120.1 billion is in generation (\$78.2 billion expected to come from IPPs and \$31.9 billion from PLN), \$29.1 billion in transmission and \$14.6 billion in distribution. Most large coal-fired power plants are expected to be developed and financed by IPPs.

There are many challenges associated with the implementation of RUPTL 2016-2025. In the past, IPPs were constrained by uncertainties over fuel supply, particularly gas, and sometimes by poor access to the grid. Land acquisition and permission to use were also major issues, as well as lengthy investment permit processes and uncertain regulations. There is also some concern in Indonesia about the availability of coal for the full time of the power plants' life (see below). Moreover, environmental risks, community demands for environmental issues such as health, waste, and pollution, as well as social issues, may challenge the building of several coal-fired power plants. Growing social and environmental opposition from the Indonesian population has delayed some coal projects. For instance, the development of the 2,000 MW Batang plant in Central Java was delayed by four years, having initially been scheduled to start construction in 2012. It finally reached financial closure in June 2016 and is expected to be commissioned in 2019.

The growing reliance on coal will have serious implications for Indonesia's ability to meet its greenhouse gas (GHG) emissions reduction targets and address climate change. Under the Paris Climate Agreement, Indonesia has committed unconditionally to reducing GHG emissions by 29 per cent in 2030 compared to business as usual. The target could be increased to 41 per cent if the country receives international support.¹⁷ Most of the reduction is to be achieved through land use and sustainable forest management, at least up to 2020.¹⁸ According to RUPTL 2016-2025, Indonesian power sector CO₂ emissions are projected to increase from 211 Mt in 2016 to 395 Mt in 2025, primarily due to the growth in coal-fired generation. The growth is however far less than in the BAU scenario which includes less RE and natural gas and brings CO₂ emissions to 507 Mt in 2025.

To reconcile growing coal consumption and its commitment to reduce GHG emissions, Indonesia is increasing the share of RE sources to a minimum of 23 per cent of the energy mix by 2025 and is

¹⁷ UNFCCC (2015).

¹⁸ In its INDC, Indonesia recalls its initial commitment, which is to reduce GHG emissions by 26 per cent by 2020 compared with a BAU scenario. This commitment will be implemented through effective land use and spatial planning, sustainable forest management, which include social forestry program, restoring functions of degraded ecosystems, improved agriculture and fisheries productivity, energy conservation and the promotion of clean and RE energy sources and waste management. By 2030, Indonesia is committed to reducing emissions by 29 per cent compared to BAU. The BAU scenario is projected to approximately 2881 Mt in 2030.



implementing clean coal technologies (CCT). While the existing coal power fleet uses subcritical technology, most of the planned coal-fired power plants are ultra-supercritical (USC) plants with a unit size of 1,000 MW.¹⁹ Indonesia commissioned its first supercritical (SC) power plants in 2011/2012 (the 660-MW Cirebon and 815-MW Paton 3 power plants) and intends to commission its first USC power plant in 2019 (Central Java IPP). Altogether, there are 16.5 GW of USC plants at different stages of development in Java, of which 9 GW are expected to come online by 2019. In addition, there are 4 GW of USC plants (with unit size of 600 MW) to be built in Sumatra. Integrated gasification combined cycle (IGCC) and carbon capture and storage (CCS) have not been planned in RUPTL 2016 as the technologies are not yet mature commercially. However, IGCC is expected to be introduced by 2025. In addition, PLN, jointly with the World Bank, has carried out a study on the construction of CCS-ready power plants.

Although RUPTL does not specifically plan for the retirement of inefficient coal capacity, it is likely that this policy, followed by China and India to improve the efficiency of their coal fleet, will also be adopted by Indonesia once its power supply adequately meets national electricity needs. As the Indonesian coal fleet operates at an efficiency well below its design value, improving existing capacity would require a programme of upgrading and retrofitting while, at the same time, closing the smallest, least efficient units. By reducing specific fuel consumption, it would notionally place less pressure on fuel resources and lessen the impacts of the coal supply chain on the environment.

Another area which will require special attention is the impact of coal mining on health, land and water. In particular, as a number of mines have stopped activity because of low coal prices, reclamation work will have to be done properly, in accordance with the Indonesian law. The law requires companies to earmark money for reclamation activities before the extraction process begins. However, numerous small mining license holders have not paid the reclamation funds they owe by law and have failed to restore the land.

3. The importance of coal supply in Indonesia

Indonesia is rich in coal resources. The MEMR estimated in January 2015 that the country has 127 Gt of total coal resources, mainly located in Kalimantan (68.1 Gt), and Sumatra (52.6 Gt).²⁰ Coal reserves are estimated at 32 Gt, of which 8.3 Gt are proven (Table 1).²¹ The largest reserves are found in East Kalimantan, which accounts for approximately two-thirds of the country's coal output. The region possesses 14 Gt (45 per cent of the country's total reserves), with the next largest contributor being South Sumatra, with 12 Gt (39 per cent of total reserves). The majority (64 per cent) of coal reserves are categorized as medium rank (caloric value of 4,700-5,700 kcal/kg on a gross as received [GAR] basis), followed by low rank (Figure 6).²² Indonesia holds limited high-rank and very high rank coal. The reserves-to-production ratio is estimated at around 70 years at current production levels. However, fast extraction has questioned the viability of coal reserves to support a growing domestic market and large exports (see below). In addition, while resources are huge, Indonesia's coal potential is relatively poorly developed in some regions (such as South Sumatra).

¹⁹ For the Java-Bali electricity system, PLN plans USC plants with unit-size of 1,000 MW to obtain better efficiency and lower CO₂ emissions. The use of such plants is also motivated by economies of scale and driven by the increasing difficulty of obtaining land to build large-scale power plants in Java.

For the Sumatra system, PLN also plans to use USC technologies with 600 MW unit-size. This size is better adapted to the Sumatra power system. For the system of Kalimantan and Sulawesi, PLN plans new 200 MW plants to get more efficiency than the existing (smaller) capacity.

²⁰ MEMR (2016a).

²¹ MEMR (2015b).

²² Indonesian Coal Mining Association (APBI)/PwC (2016).

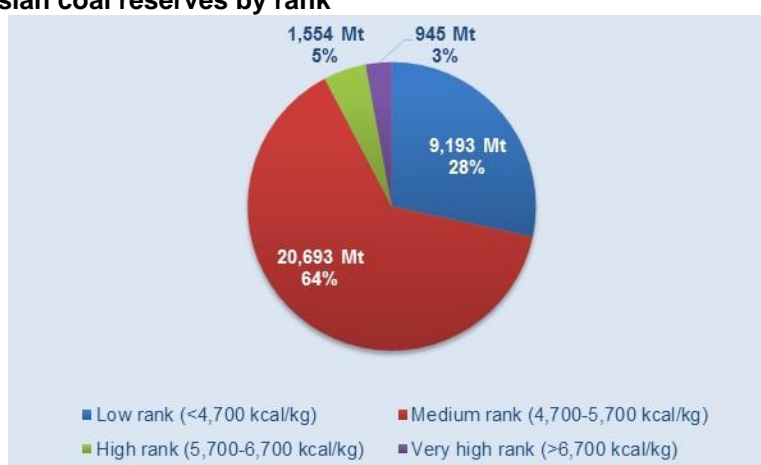


Table 1: Indonesian coal resources and reserves

	Resources (Gt)					Reserves (Gt)		
	Hypothetic	Inferred	Indicated	Measured	Total	Probable	Proven	Total
2010	34.89	32.20	15.81	22.29	105.19	15.60	5.53	21.13
2011	33.55	35.63	27.06	24.10	120.34	17.76	10.26	28.02
2012	32.95	35.41	26.40	24.69	110.45	19.36	9.62	28.98
2013	19.56	32.08	29.44	39.45	120.53	22.46	8.90	31.36
2014	19.45	36.51	29.31	39.52	124.80	23.34	9.04	32.38
2015	19.75	36.14	30.45	40.25	126.61	23.99	8.27	32.26

Source: MEMR

Figure 6: Indonesian coal reserves by rank



Source: PLN²³

East Kalimantan, with its mining operations in Kutai and Tarakan, is the country's main coal producing region. Together with Barito and Asam Asam in South Kalimantan as well as production from mines in Central Kalimantan, the island of Kalimantan accounts for around 90 per cent of Indonesian coal production. Around 8 per cent of Indonesian coal is mined in South Sumatra, and the rest in smaller mining areas such as Jambi on Sumatra.²⁴

Production includes a large quantity of sub-bituminous coal, as well as “off-spec” coal with a calorific value under 4,100 kcal/kg (GAR), as well as lignite. Coal is generally low ash (5-7 per cent) and low sulphur (<1 per cent) but also has a high moisture content (up to 20-30 per cent GAR basis). Its low sulphur content is a major advantage, in particular for blending purposes with higher sulphur coal. Notably, Adaro Energy, the second largest Indonesian mining company, produces a type of sub-bituminous coal trade-marked as Envirocoal. This high-quality, low-pollutant coal contains ultra-low ash, NO_x and sulphur, and has a low-to-moderate heat value ranging from 4,000 kcal/kg to 5,000 kcal/kg (GAR). Due to its low calorific value, a large share of Indonesian coal is sold at a discount on the international market once adjusted for energy content. In addition, a large share of low rank coal is not suitable for exports due to its high moisture content and therefore high-cost of transport and is typically used close to the mine at coal mine-mouth (CMM) power plants. Attempts to upgrade the quality of low rank coal to make it available for the export market have failed due to the cost of upgrading technologies and the low price of coal on the international market. The 35,000 MW programme may provide the impetus for developing the vast low rank coal resources of South Sumatra, which have not been developed thus far due to transportation infrastructure constraints and a lack of market.

²³ From Indonesian Coal Mining Association (APBI)/PwC (2016).

²⁴ IEA (2015b).



The Development of Indonesia's Coal Industry

The coal industry in Indonesia is relatively young compared with countries like the US or Australia. Production really started in the 1990s, and in just 25 years Indonesia's coal industry has transformed itself from being an unknown, minor player in Asia's coal markets to the world's largest exporter of steam coal. Indonesia created this world-scale industry in the 1990s and 2000s despite challenges created by widespread government corruption, a weak legal system, the Asian Financial Crisis of 1997, the fall of the Suharto government in 1998, and assorted adverse political events between 2000 and 2008.²⁵

The coal industry is characterized by five periods. During the formative period (1967 to 1988) laws and regulations were put in place to encourage foreign investment in the coal mining sector. Initially, coal exploration activity focused on the island of Sumatra and only resulted in the discovery of low-rank coal that could not compete against high-quality Australian and South African bituminous coals. During this period, nevertheless, coal contracts of work (CCoW) were signed that provided the legal basis for the formation of Indonesia's coal industry.

The take-off period occurred from 1989 to 1999 during which coal production grew by an average annual rate of 30 per cent from only 4.43 Mt to 81 Mt in 1999. During this period, the legal and regulatory framework was stable and until late 1997 the overall investment climate in Indonesia and external market conditions were positive. Production was focused on Kalimantan over Sumatra due to its favourable location close to North Asia's lucrative export markets — Japan, Korea, and Taiwan; good access to navigable rivers, allowing favourable internal transport logistics and costs (mainly by barge), or easy access to coastal areas where ports could be built to load the coal onto sea vessels; and better quality of Kalimantan coals when compared with Sumatran coals (higher calorific values and lower sulphur and ash contents). The impressive growth in coal production during that period was driven by coal exports which reached 55 Mt in 1999.

During the third period (the localization period from 2000 through 2008), domestic investors, with government support, gained majority ownership of Indonesia's largest coal producers. Provincial and regency governments gained regulatory control over the mining sector, especially over the issuance of new mining licenses. The localization period was also a time when Indonesia's coal industry faced challenges caused by the 1997 Asian Financial Crisis, the SARS outbreak, and adverse local political events, which negatively impacted the investment climate in Indonesia and the broader markets of the Asian Pacific region. Despite these political and economic challenges and the shift to local control, Indonesia's coal industry still expanded its production by 12 percent per year over this period and in 2005 became the largest exporter of steam coal (117 Mt exported that year). In 2008, Indonesia's exports of steam coal had increased to 198 Mt, outpacing Australian steam coal exports of 115 Mt (see Figure 10). During that period, as local districts assumed more power, the number of nationwide permits for mining activities (all commodities) soared — from 650 in 1999 to more than 8,000 in 2010.

The fourth period, from 2009 to 2013, is characterized by the steep growth of coal exports driven by surging demand from China and India. It is also a period of major regulatory changes with the adoption of the Law on Mineral and Coal Mining in 2009, which gave the central government greater control over licenses in the mining sector (see below). Despite the key changes introduced by the law, Indonesia was able to increase coal output by 68 per cent over the period, from 291 Mt in 2009 to 490 Mt in 2013 (Figure 7).²⁶ Most of the supply growth served the export market. Exports surged from 233 Mt to 424 Mt. China and India absorbed almost 90 per cent of additional coal supplies over the period, while only about 4 per cent of the growth was destined for domestic consumption. In a relatively short time, the Indonesian coal industry has therefore become one of the largest influences in the seaborne steam coal market in Asia, accounting for half of Asian steam coal imports. Consequently, the

²⁵ From Lucarelli Bart (2010).

²⁶ IEA (2016b). Production and exports data differ greatly from one source to another. One reason may be that Indonesian production and exports include large volumes of "off spec" low calorific value coal, which is closer to lignite than hard coal, and not accounted for in the hard coal statistical data. Another reason is that there are still numerous illegal mines in Indonesia, whose production/exports are not accounted for in the official data. The figures presented here are those published by the IEA.



Indonesian coal mining sector has become highly dependent on the export market with about 80 per cent of coal production exported. The reasons for this impressive growth are to be found in the availability of low-cost mines close to the ports as well as in Indonesia's advantageous geographic location to serve the coal demand centres of the last ten years, namely China and India.

The fifth period, from 2014 until now (beginning of 2017 at the time of writing), is characterized by a tighter control of coal production and exports by the central government. Stricter regulations on coal mining and exports (see below) were adopted to eliminate illegal mining and exports, which had expanded in the previous period and contributed to the over-supply of the international coal market, and depressed prices. The government therefore set up short and medium term targets for coal production. According to RPJMN 2015-19, coal production was foreseen to decrease from 425 Mt in 2015 (planned production) to 400 Mt by 2019 (Table 2).

Table 2: Planned coal production, domestic sales and exports, RPJMN 2015-2019

	2015	2016	2017	2018	2019
Production (Mt)	425	419	413	406	400
Domestic sales (DMO) (Mt)	102	111	121	131	240
Exports (Mt)	323	308	292	275	160

Source: RPJMN 2015-19

The period is also characterised by the volatility of international coal prices and import demand by major customers. Until June 2016, the continuous decline of international coal prices and lower import demand from China and India, have had a serious impact on Indonesia's coal industry. In contrast with previous periods, coal production decreased to 485 Mt in 2014 and to 469 Mt in 2015 (yet above the government target).²⁷ Despite the low cost of Indonesian coal,²⁸ many small companies experienced huge losses and were forced to suspend or stop production. Even the largest Indonesian companies that operate some of the country's least expensive mines, saw their margins squeezed. They were nevertheless able to maintain their output thanks to cost reductions.²⁹ Lower import demand by China and India significantly reduced Indonesian steam coal exports which fell by 13 per cent in two years to 368 Mt in 2015.

Similarly, the first half of 2016 was a difficult one for Indonesian coal miners. In addition to low prices, heavy rains resulted in significant production disruptions for many miners and exports continued their fall. However, the rise in international coal prices in the second half of the year allowed miners to raise their production and exports. In particular, exports to China rose significantly in 2016.³⁰ Overall, Indonesian coal production is estimated at about 480 Mt.³¹ The annual coal production target set in RPJMN 2015-2019 has been exceeded in each of the past two years and recent government forecasts indicate that production could reach 487 Mt in 2017, 18 per cent above the government-mandated target of 413 Mt.³²

²⁷ Based on IEA data. Official figures indicate a steeper fall: -14.2 per cent to 393 Mt in 2015. MEMR (2016c).

²⁸ Indonesian Free-on-board (FOB) costs have decreased from a weighted average of \$47.9/t in 2012 to \$39.8/t in 2015, making Indonesia one of the lowest-cost producers worldwide. However, costs vary substantially among Indonesian basins and operators. The lowest-cost coal in Indonesia is mined in Tarakan (east Kalimantan) at average costs below \$33/t. Mining costs in South Sumatra in contrast average at around \$42/t. Mining costs are strongly dependent on oil price movements. The decline in oil prices since July 2014 has contributed to mining cost decreases. However, the decline in coal prices has been higher than cost reductions, so the situation of coal producers has deteriorated despite the cost cuts. IEA (2015b).

²⁹ Recent cost estimates show that production costs have continued their decline. Bumi Resources indicate a production cash cost of \$26.8/t in H1 2016, compared with \$34.6/t in 2014 and \$30.2/t in 2015. Bumi Resources (2016)

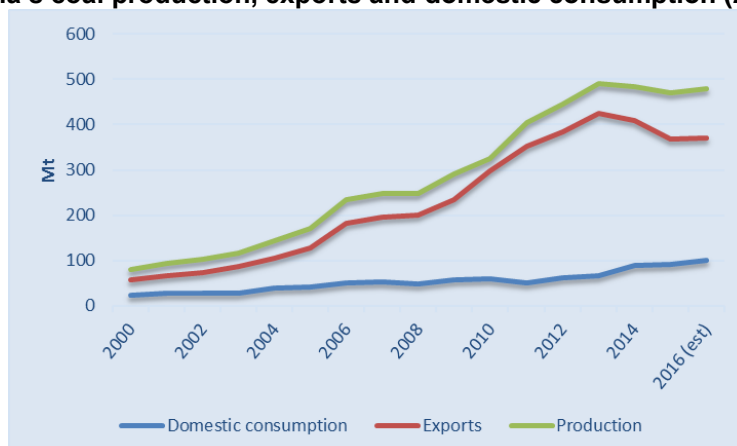
³⁰ The Chinese government strictly controlled domestic coal production in 2016, which resulted in a fall in coal output by more than 9 per cent. Rising demand by the power sector and increased domestic prices led Chinese coal utilities to increase their imports significantly in 2016: their steam coal imports (including lignite and anthracite) rose by 26 per cent to 197 Mt.

³¹ It should be mentioned that government first estimates indicate a decrease in coal production to 434 Mt in 2016 (Miningweekly.com, 13 January 2017). However, the decrease does not seem consistent with the rise in domestic coal demand and the recovery in coal exports in the second half of 2016.

³² Miningweekly.com, 13 January 2017.



Figure 7: Indonesia's coal production, exports and domestic consumption (2000-2016)



Source: 2000-2015: IEA, 2016: estimated

As a result of the laws adopted in the 1990s and 2000s, the pioneer foreign companies that developed Indonesia's coal industry have largely been replaced by domestic competitors. Foreign ownership still continues on a minority basis, with the exception of Thai Banpu which owned 65 per cent of Indo Tambora Raya Megah (ITM). The six largest producers in Indonesia are Bumi Resources (Kaltim Prima Coal and Arutmin Indonesia), Adaro Energy, Kideco Jaya Agung, ITM, Berau Coal and Tambang Batubara Bukit Asam, or Bukit Asam (Table 3). Together they account for slightly more than 50 per cent of Indonesian production. In addition, a multitude of small mining operators exist, often illegal and semi-legal operators, as well as communities and individuals mining for their own consumption.

Table 3: Production of major Indonesian coal producers

Mining company	2013	2014	2015
Production in Mt			
Bumi Resources	82.3	84.6	82.25
Adaro Energy	52.3	55.3	50.4
Kideco Jaya Agung	37	40	39
ITM (Banpu)	28.6	29.1	28.4
Berau Coal	23.5	24.2	26.55
Bukit Asam	15.1	16.4	19.3
TOTAL	238.8	249.6	245.9
Percentage of Indonesian production (%)	49%	51%	52%

Source: MEMR, Companies' Annual Reports

New coal mining regulation

The coal mining sector operates under the framework of the Law on Mineral and Coal Mining enacted in 2009. The basis of this law reflected dissatisfaction with the CCoW system and set up a new licensing system (Coal Mining Permits or IUPs) whereby the central government would have greater control over licenses in the mining sector. The law therefore introduced more transparent and standardized tenders and licenses for mining blocks. Although the law was meant to increase foreign investment in the sector, it actually sought to substitute the mining industry's foreign base with nationals.³³ The law increased the value-added of Indonesian mining industries by using more

³³ The Indonesian regulation of the sector has always been characterized by tension between nationalization versus openness to foreign investments. A new regulation, announced in March 2012, requires foreign investors in mining companies to divest 51 percent of their shares by the tenth year of production, although the government has attempted to provide some relief by



domestic commodities, services, technologies, and labour. CCoW contracts have been renegotiated in the fields of total area of work, operation continuity, state revenue processing and purification, divestment obligations, obligation to use domestic goods and services.³⁴ The law also set up the framework for determining the annual domestic market obligation (DMO) for producers which corresponds to the minimum amount of coal that Indonesian coal producers have to supply to the local market, thus restricting the percentage of coal available for export.

The law also clarified responsibilities among central, provincial, and district authorities and empowered local administrations to issue mining permits in their areas. After the adoption of the law, the number of mining permits issued by state governments increased sharply. This led to the uncontrolled rise in coal production and exports over the period 2009-2013, including rising illegal mining and exports. Informal production of steam coal stood at 50 Mt in 2013: one eighth of total Indonesian production.³⁵ Informal production and export of steam coal exacerbated the global market over-supply and fall in international coal prices. This has led the government to introduce stricter regulation in the sector and prioritize the sale of production to the domestic market. The government has focused on compliance issues to reduce over-exploitation of coal resources and crack down on illegal mining and exports.

To increase the value-added of coal (and mineral products), in 2010, the government issued a regulation requiring IUP holders to carry out in-country processing to increase the value of coal. The regulation, amended in 2014, clarifies that, in respect of coal, “processing” covers activities, such as coal crushing, coal washing, coal blending and upgrading.

A ban on exports of low calorific value coal was planned from 2014. But the government decided in January 2013 not to proceed with the proposed ban and instead to control coal output by giving each producing region an annual mining quota to avoid over-mining and preserve coal reserves for future consumption. The government already approves the annual production plans for all major coal miners and can cap their annual output if the mines have exceeded production plans.

Above all, the government has tried to cut down illegal mining and exports and the associated loss of government revenue. To address the issue, Indonesia has been consolidating its mining permit process over the past two years with the introduction of the “clean and clear” certification system. This process was initiated in October 2014 to ensure that all locally licensed mines were in compliance with basic laws, including conducting environmental impact assessments and paying taxes. It was estimated that more than a quarter of licenses for exploration and production of coal did not comply with the requirements of the new status.

The new regulation also requires companies to be registered as official exporters in order to reduce exports from illegal mining activities. The government has also imposed the use of letters of credit for

extending the divestment period and providing different divestment thresholds for mining companies which undertake underground and open pit mining, and those which have committed to development of onshore processing.

³⁴ All existing CCoWs continue until their expiry date and may be extended without the need for a tender. However, the extended license will be granted under the IUP system, rather than under the CCoW framework. Most of the production is still contributed by CCoWs. Seventy-three CCoWs had to be renegotiated. The renegotiations aim to adjust several points in the contracts to provide greater benefits to the government from mining activities throughout the period of the contracts before they shift to mining permits. Six main issues are on the table for renegotiation, namely adjustments to royalties, mining concession size, obligations for downstream activities, continuance of operation after contract expiry, divestment and the use of local goods and services. The renegotiation should have been completed one year after the law was passed. However, a complex mix of issues has led to the government's failure to meet its deadlines, which have been frequently extended, particularly because of contentious issues related to financial obligations. The renegotiation process is now expected to be finalized in 2017. Jakarta Post, 3 July 2015).

³⁵ Global Business Reports (2014).



coal export activities. In addition, since August 2015, the government has imposed a 1.5 per cent coal export tax on IUP holders and traders.³⁶

The government also plans to limit coal shipment from 14 designated ports, all located in Kalimantan and Sumatra. While this move is intended to better regulate the sector and also cut down on the sale of coal within the informal economy, many operations are located far from designated export ports and therefore would need to find new inland transportation routes, increasing the delivered cost of coal.

In addition, in order to raise fiscal revenues from the sector, the government has planned to increase royalties for coal mining companies that hold IUPs. There are significant differences between royalty rates (5-7 per cent for IUPs and 13.5 per cent for CCoW). While the increase has been proposed since 2014, it has not been implemented yet due to volatile market environment.³⁷

Moreover, in April 2016, Indonesia's President announced his plan to impose a moratorium on new coal mining permits as well as palm oil permits. He framed the licensing freeze as a continuation of the 2011 forestry moratorium, which banned new permits to develop on primary forests and peatlands.³⁸ Mining companies that already obtained concessions (prior to the moratorium) will still be able to develop their coal business as long as their expansion plans are in line with existing permits and regulations. The moratorium can provide the momentum to organize the coal mining sector in terms of mining permits and facilitate the consolidation of the fragmented Indonesian coal mining sector.

4. Indonesia's Regional Coal Exports

Indonesian coal exports had grown impressively in the first decade and a half of the 21st century, making Indonesia the largest coal exporter in the world up until 2015. However, in 2015, Indonesia was overtaken by Australia, though it remained the world's largest exporter of steam coal (Figure 8). Indonesian exports consist almost entirely of steam coal and lignite (less than 3 Mt of coking coal were exported in 2015). Indonesia was the main driving force behind the spectacular growth in the global steam coal trade between 2009 and 2013, accounting for 55 per cent of the incremental growth during the period. While the country produced less than 6 per cent of global coal, in 2013 it had a 38 per cent market share of global steam coal exports and accounted for half of Asian steam coal imports.

The trend for Indonesian coal production in recent years has been towards low rank sub-bituminous coals and lignite, which provide a significant cheap steam coal fuel source for power generation. This trend has spurred the Indonesian domestic power industry and many other Asian nations such as South Korea, Vietnam, Thailand, and the Philippines to build coal-fired power plants to utilize these cheap sources of coal. But the main driver of the dramatic growth in Indonesian exports was growing imports by China and India (Figure 9 and Figure 10).

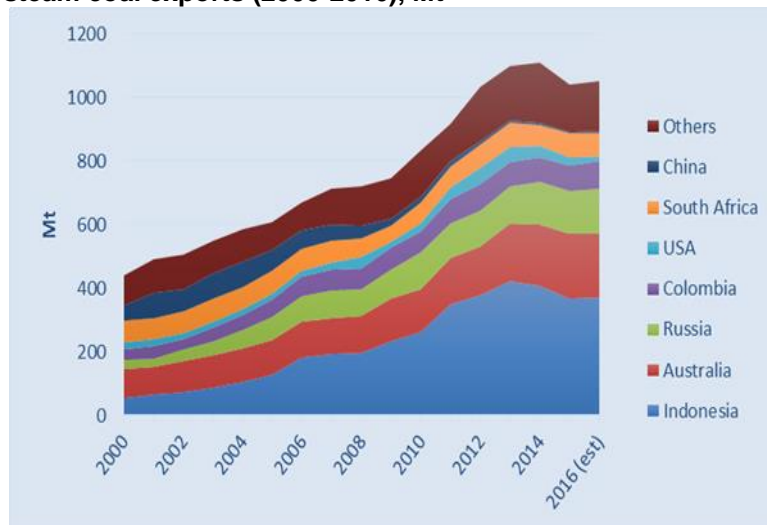
³⁶ Reuters, 6 July 2015.

³⁷ Apbi-icma.org, January 2017.

³⁸ Indonesia-Investments, 1 August 2016.

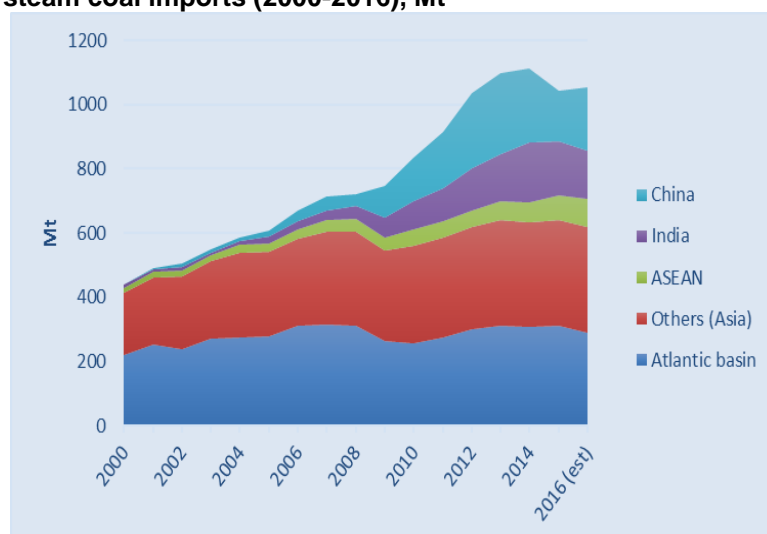


Figure 8: Global steam coal exports (2000-2016), Mt



Source: 2000-2015: IEA, 2016 estimated.

Figure 9: Global steam coal imports (2000-2016), Mt



Source: 2000-2015: IEA, 2016 estimated.

In 2014, however, Indonesian steam coal exports fell by 3.5 per cent to 407 Mt. Exports to China dropped 24 per cent as Chinese coal demand slowed due to new regulations restricting the use of coal. In 2014, the decrease in Chinese imports was only partly offset by higher exports to India, which grew by 15 per cent, making India the most important buyer of Indonesian coal.

In 2015, Indonesian steam coal exports fell sharply: down 10.2 per cent to 366 Mt.³⁹ The main reason was lower import demand by China and India, combined with the new regulations on coal mining and exports, as well as weak prices, which reduced production. Indonesian exports to China dropped 27 per cent as China again reduced its total coal imports in view of lower coal demand. Exports to India dropped 9 per cent as rising domestic output reduced India's steam coal imports. The Indian government plans to eliminate steam coal imports altogether by 2017, except to meet requirements of the power plants located near coastal areas. In addition, Indonesian coal is disadvantaged by the

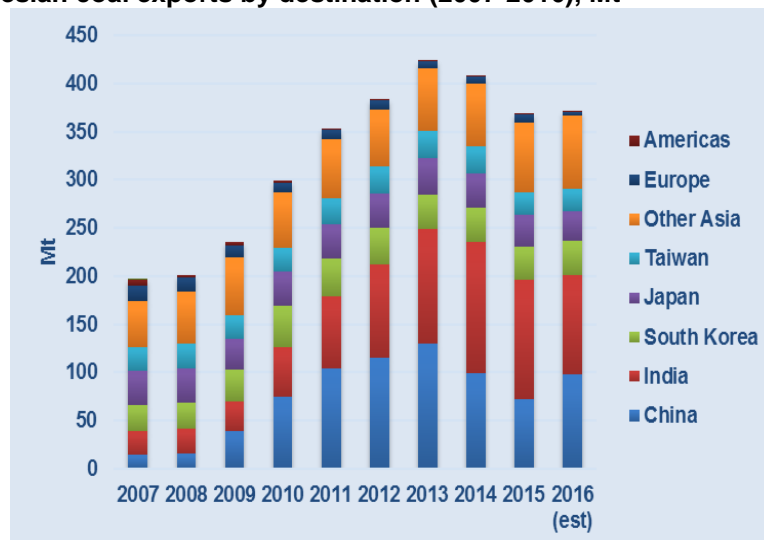
³⁹ Based on IEA data (2016b). According to MEMR (2016c), exports fell by 5 per cent (-17 Mt) to 382 Mt in 2014. In 2015, they fell sharply: -22.65 per cent to 295.45 Mt.



clean environment tax levied by India on coal (the cess tax). The tax is levied on coal tonnage, and not on energy content, which makes coal with a lower calorific value relatively more expensive than higher-grade coal. The tax was doubled in 2015 and again in early 2016, which negatively affected Indonesian coal exports to India compared with other India's suppliers. Indonesian exports to other countries also fell in 2015, with growing shipments to neighbouring ASEAN countries offset by a drop in exports to many developed Asian nations, such as South Korea and Taiwan.

Despite the fall, China and India still accounted for half of Indonesian coal exports. Consequently, Indonesia remains highly dependent on these two countries' import demand.

Figure 10: Indonesian coal exports by destination (2007-2016), Mt



Source: 2007-2015: IEA, 2016 estimated from BPS and import data by main markets.

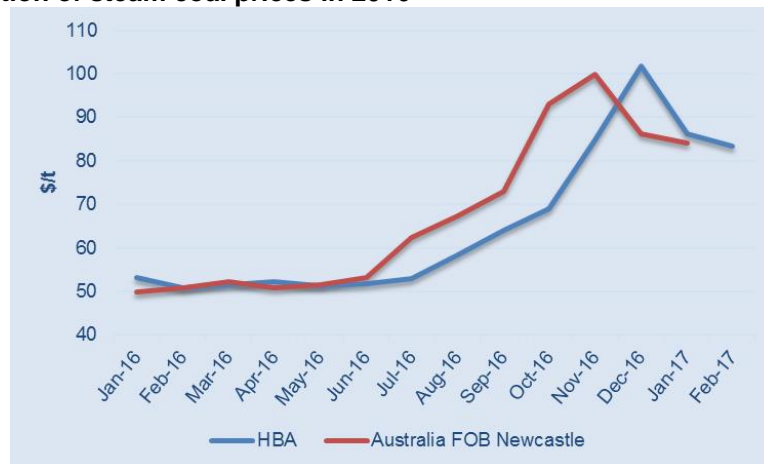
Against all projections, Indonesian coal exports rose slightly in 2016 (+1 per cent) to 371 Mt,⁴⁰ driven by a surge of imports from China. Despite a continued decrease in its coal demand, Chinese imports have increased since June 2016 due to a steep reduction in its domestic production. The Chinese government mandated coal mining companies to reduce working days from 330 to 276 per year, which resulted in a 9.4 per cent drop in coal output in 2016. To cover higher thermal power demand in summer 2016, Chinese power utilities had to call on the international market. They increased their steam coal imports by 26 per cent in 2016. The sudden and unexpected rise in Chinese imports has turned the global market from over-supply to tightness. After five years of cost reductions and closure of high-cost mines, global coal exporters were not able to quickly increase their supplies to respond to this sudden demand. This resulted in a doubling of coal prices between June and November 2016. The Australian steam coal price (Free-on-Board [FOB] Newcastle, the reference on the Asian market) rose from \$53/t in June to \$100/t in November 2016 (Figure 11). The Indonesian steam coal price (Harga Batubara Acuan, or HBA), which is based on domestic and international coal prices, rose from \$53/t in August 2016 to \$101.7/t in December 2016.

The rise in Chinese imports benefitted Indonesian miners as China increased its lignite imports significantly (+50 per cent to 72 Mt) and Indonesia is the main supplier of this product. Hence, while its hard coal (bituminous and sub-bituminous coal) exports declined in 2016, Indonesia increased its total exports as lignite exports were up 56 per cent in 2016 (Figure 12).

⁴⁰ First estimates based on the first eleven months of 2016. BPS, 2017.



Figure 11: Evolution of steam coal prices in 2016



Source: MEMR, World Bank

Figure 12: Indonesia's coal exports by type of coal



Source: BPS-Statistics Indonesia

China's import demand was the major factor behind the coal price rally in 2016, and behind the recovery in Indonesian coal exports, as India's import demand continued to fall in 2016. Import demand by ASEAN countries increased but they still represent a small portion of Asian coal imports. Indonesia's mining sector is therefore still highly dependent on China's coal policy and vulnerable to the volatility of the international coal market.

5. Domestic Coal demand to the rescue

Indonesian coal demand totalled 91 Mt in 2015, and is estimated at around 100 Mt in 2016. It is dominated by the power sector (88 per cent of total coal demand) and the cement industry (9 per cent).⁴¹ Coal consumption had doubled since 2010. In 2015, coal became the country's dominant source of fuel, accounting for 41 per cent of total commercial energy consumption (excluding traditional biomass). The DMO, determined each year by MEMR based on forecasts of domestic demand for the following year, guarantees the supply needs of the domestic market. Until now,

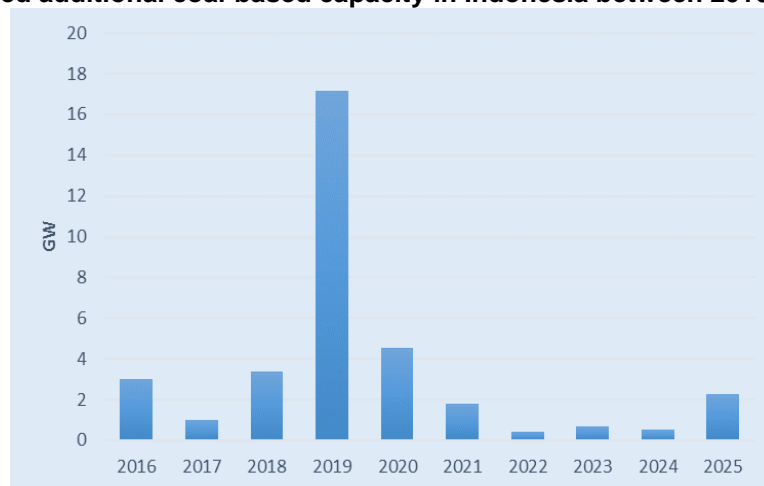
⁴¹ IEA (2016b). Data from Indonesian sources indicate a slightly lower figure: 80 Mt consumed in 2015 according to MEMR (2016c) and 86.8 Mt according to MEMR (2016a).



Indonesia has had difficulties achieving its annual DMO as coal demand has not grown as quickly as planned.

According to RPJMN 2015-19, domestic sales (power and industrial sectors) are expected to jump to 240 Mt in 2019, representing 60 per cent of total production by 2019 (see Table 2). The 35,000 MW programme is the main catalyst for domestic coal consumption growth. According to RUPTL 2016-2025, most of the 34.8 GW of additional coal capacity to be built between 2016 and 2025 is to be commissioned in 2019 (17 GW), in accordance with the completion of the 35,000 MW programme by 2019 (Figure 13).

Figure 13: Planned additional coal-based capacity in Indonesia between 2016 and 2025, GW



Source: PLN

If all projects were to go ahead and be completed on time, coal capacity would increase from 27 GW at end 2015 to 62 GW in 2025. Over the past five years, Indonesia has added 3 GW of coal capacity per year on average. The rate is expected to increase thanks to government incentives to speed up the implementation of the 35,000 MW programme. This means that a total addition of 34.8 GW over a ten-year period is feasible. However, the completion of the 35,000 MW programme by 2019 requires that 25.8 GW are built in just five years. This is unlikely to happen despite efforts by the government and PLN to accelerate the programme. As of the beginning of 2016, about 6 GW of coal capacity was under construction (Table 4). In addition, at the end of December 2015, PLN had signed power purchase agreements with IPPs for 13 GW of coal-based capacity.⁴² Most of this capacity involves large USC plants built by IPPs in Java and CMM power plants in South Sumatra.⁴³

The new coal plants will boost domestic coal demand significantly. According to PLN, the 20 GW of coal capacity included in the 35,000 MW programme requires about 70 Mt of coal per year when fully in operation. Considering the country's significant growth in power demand and recurrent electricity supply shortages, the government will prioritize pushing power projects through to completion. However, issues such as land acquisition, a lack of funding availability from international financial institutions, as well as opposition to coal projects in the populated areas of Java, are likely to delay the completion of the programme and extend it after 2019.

⁴² In total, as of end 2015, PLN had signed PPA for 17,340-MW of capacity (4,291 MW using gas, hydro and geothermal and 13,049 MW coal-based power plants). The contracts are worth around \$20 billion. Jakarta Globe, 24 December 2015.

⁴³ The development of CMM power plants is encouraged by MEMR by providing incentives, such as a special procurement process (direct appointment or direct selection), and a selling price of electricity based on "cost plus margin".



Table 4: Coal power plants under construction as of beginning of 2016

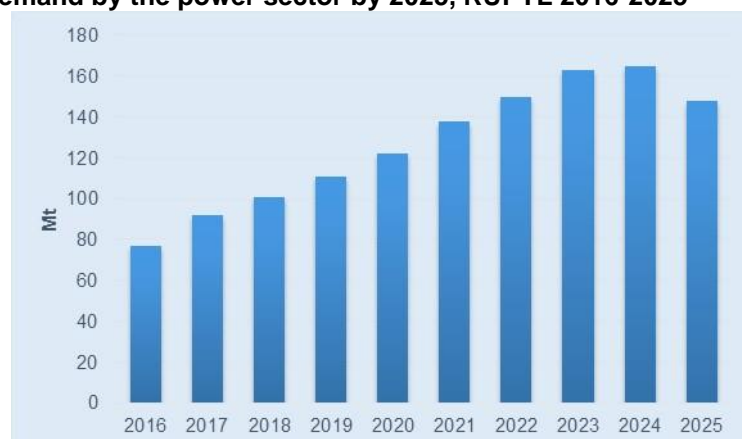
Region/Plant	Developer	Capacity (MW)	Expected commissioning date	Region/Plant	Developer	Capacity (MW)	Expected commissioning date
Sumatra				Eastern Indonesia (continued)			
Riau Amandemen FTP1 (Tenayan)	PLN	220	2016	Pulang Pisau (FTP1)	PLN	120	2016
Tarahan #4 FTP1 (Sebalang)	PLN	100	2016	Teluk Balikpapan (FTP1)	PLN	220	2016
Pangkalan Susu #3,4 (FTP2)	PLN	400	2018 & 2019	Sampit PLTU (2X25)	PLN	50	2018 & 2019
Keban Agung	Private	225	2016	Gorontalo (FTP1)	PLN	50	2017
Sumsel-5 (Bayung Lencir)	Private	300	2016	Punagaya (FTP2)	PLN	200	2018
Sumut-1	Private	300	2018	Lombok (FTP1)	PLN	50	2016
Sumbagsel-1 (2X150)	Private	300	2018 & 2019	Sintang (3X7)	PLN	21	2016 & 2017
Total Sumatra		1,869		Waii (FTP1) (2X15)	PLN	30	2021
Java Bali				Timika (4X7)	PLN	28	2018 & 2019
Tj. Awar-awar	PLN	350	2016	Atambua (4X6)	PLN	24	2018
Adipala	PLN	660	2016	Kaltim (MT) P (2X27.5)	Private	55	2017 & 2018
Lontar Exp #4	PLN	315	2018	Amurang (2x25)	Private	50	2017 & 2018
Banten	Private	625	2017	Mamuju	Private	50	2017
Cilacap exp	Private	614	2016	Tawaeli Ekspansi	Private	30	2016
Total Java Bali		2,564		Lombok Timur	Private	50	2017
Eastern Indonesia				Kupang (2X15)	Private	30	2016
Pantai Kura-Kura (FTP1)	PLN	55	2018	Total Eastern Indonesia		1,504	
Parit Baru (FTP1) (2X50)	PLN	100	2017 & 2018	TOTAL INDONESIA		5,937	
Parit Baru (FTP2)	PLN	100	2018				

Only plants with a power capacity above 20 MW are listed. Regional totals include these small plants. The table does not include power plants which started construction in 2016, e.g. the 2,000 MW Batang and Sumsel 8 (2X660 MW) power plants.

Source: PLN, RUPTL 2016

PLN expects coal consumption by the power sector to increase from 77 Mt in 2016 to 111 Mt in 2019 before peaking at 165 Mt in 2024. After 2024, coal consumption by the power sector is expected to decline to 148 Mt in 2025 (Figure 14).⁴⁴

Figure 14: Coal demand by the power sector by 2025, RUPTL 2016-2025



Source: PLN

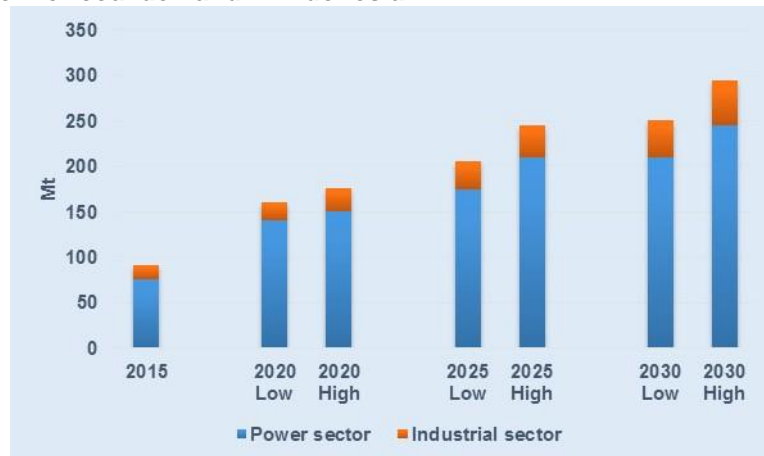
Assuming some delays in the implementation of the 35,000 MW programme, this paper has estimated an increase in coal capacity from 27 GW at end 2015 to 40-43 GW in 2020 (instead of 51 GW by end

⁴⁴ The decline at the end of the forecast period is somewhat artificial. It is explained by a decline in power generation from coal in 2025 to fulfil the limit for coal generation set in the draft RUKN. It is not consistent with the continued increase of coal capacity by 2025. Similarly, the expected surge in coal capacity in 2019 (17 GW) is not reflected in power generation from coal or coal demand which does not surge after 2019.



2019 expected in RUPTL 2016-2025), and to 60-70 GW by 2030. Based on these assumptions, coal demand by the power sector increases to 140-150 Mt in 2020 and 210-245 Mt in 2030.⁴⁵ As the government pushes infrastructure and industrial development, cement producers and other industrial companies are upgrading their capacity which would also fuel demand for coal. Coal consumption in cement, metallurgy and other industries is expected to increase from 15 Mt in 2015 to 20-25 Mt by 2020, and to 40-50 Mt in 2030.⁴⁶ Altogether, coal demand could increase from 91 Mt in 2015 to 160-176 Mt in 2020 and between 250 Mt and 295 Mt by 2030 (Figure 15).

Figure 15: Outlook for coal demand in Indonesia



Source: Author's analysis

To date, domestic coal consumption has accounted for only 20 per cent of coal production, but demand by the power sector will create new outlets for coal miners and isolate the coal mining sector from the volatility of the international coal market, and notably the uncertainty of Chinese and Indian import demand. At the same time, the expansion of coal demand will reduce the availability of supplies to the export market.

6. Coal exports or domestic consumption?

Other than being the most important source of energy for electricity generation, coal plays an important role in supporting Indonesia's economy. The coal sector accounts for around 85 per cent of mining state revenue. It makes a significant contribution to Indonesian GDP (estimated at around 4 per cent), exports, fiscal revenues, employment and the economic development of the remote regions where mining operations are located. In 2015, coal exports generated \$16 billion of export earnings (\$21 billion in 2014).⁴⁷ Indonesia's role as a coal supplier has begun to shift, however, as the country increasingly directs more resources toward domestic consumption. This trend could affect future supply to Asian importing countries while demand for Indonesian coal remains robust, notably in Southeast Asia. Indonesia is expected to be a major supplier for growing ASEAN markets thanks to its advantage over competing suppliers from Australia and South Africa, such as its strategic position and low transportation costs.

Indonesia's abundant coal resources should enable it to meet the rising needs of the domestic market and coal exports. The coal mining sector nevertheless faces many challenges.

⁴⁵ Based on the assumption that 1 GW requires 3.5 Mt of coal per year. The Indonesian Coal Mining Association (ICMA) also revised coal demand by new power plants by 2019 downwards. It now projects that the new power plants will add 75 to 100 Mt by 2019, compared with an earlier projection of 100-150 Mt. The lower estimate comes as power plants to be completed by 2019 are likely to be only 25 GW instead of 35 GW. Petromindo.com, 7 September 2016.

⁴⁶ Data for coal demand by the non-power sector differs greatly from one source to another.

⁴⁷ BPS, 2017.



Adequacy of coal reserves and pricing issues

The decline in international coal prices until June 2016 has significantly reduced investment in Indonesia's mining sector. Capital expenditures have dropped by 79 per cent since 2012 from \$1.9 billion to an estimated \$0.4 billion by end-2015.⁴⁸ This may slow reserves growth in the future and questions the adequacy of coal reserves to support a growing domestic market as well as large exports. Concerns over uncontrolled mining and the willingness to preserve coal reserves for future domestic consumption already prompted the government to cap coal production at around 400 Mt a year over the period 2015-2019 (RPJMN 2015-19, see Table 2). Some coal industry representatives have dismissed the government's concern over the finiteness of coal reserves, believing instead that additional coal resources can be found and/or more coal resources can be converted into coal reserves in the future.

That said, a recent study by the Indonesian Coal Mining Association (APBI) jointly with PwC suggests that in the long term, there may not be enough coal reserves at the current market price (the study was published before the recent jump in coal prices) to reliably supply the new coal-fired power plants included in the 35,000 MW programme.⁴⁹ The study suggests that proven reserves are currently only around 8.3 Gt.⁵⁰ This would last until only 2036 at projected rates of production (around 350-400 Mt per year), running out before the end of the operational lives of planned power plants (typically 25-30 years). The report recommends extending a cost-based pricing system such as the one in place for CMM power plants to other coal-fired power plants to stimulate investment in the mining sector and secure reserves for the full lifetimes of the new power plants.

In addition, the Indonesian mining investment environment has been challenging. Many investors view Indonesia as having significant geological potential in terms of its coal resources, but the regulatory uncertainties and, to a certain extent, the royalty and fiscal regimes have become key deterrents to investment.⁵¹ Therefore, there is a lot of uncertainty around the future level of Indonesian production as not only economics, but also regulations play a role. In order to maintain the level of investment required to sustain current levels of production, Indonesia must enhance policy clarity and reduce regulatory uncertainty.

Coal pricing to coal power plants also needs to be clarified. CMM pricing methodology has been revised several times in the past and twice in 2016 alone.⁵² The latest regulation has confirmed a cost-based pricing and a 15 to 25 per cent margin. It has changed the way in which the coal sales price is built up, with the aim of reducing the coal price to the CMM power plant owner. The CMM pricing ensures supply security as well as guarantees steady profit margins for coal suppliers. However, the disadvantage of this regulation is that suppliers may not be able to take advantage of any rise in coal prices as the coal base price is fixed. For non-CMM plants, it remains to be seen if the recent recovery in market prices will be sustained enough to attract investment in coal mining and transport to supply these plants. On the other hand, the key question remains whether PLN (as the

⁴⁸ Indonesian Coal Mining Association (APBI)/PwC (2016).

⁴⁹ Indonesian Coal Mining Association (APBI)/PwC (2016).

⁵⁰ The study highlights the fact that the MEMR reserves data are not published alongside a detailed methodology and underlying data sources, which makes it difficult to validate the information. At the same time, published reserves have not responded to large changes in the market price in recent years, as can be seen in Table 1.

⁵¹ PwC (2016).

⁵² In February 2016, MEMR passed a new regulation (Regulation No. 9 of February 2016) on pricing formula for coal supply to upcoming domestic CMM power plants. The power plants will now be procuring coal under term contracts at a price calculated based on production cost of the supplier plus a profit margin of 15 per cent-25 per cent, compared with a flat margin of 25 per cent imposed earlier. The new regulation ensures supply security as well as guarantees steady profit margins for suppliers, although they cannot benefit from increasing in coal price (Platt's, 8 April 2016). The regulation was revised in September 2016 (Regulation No. 24). There are two key changes introduced under Reg. 24:

a removal of the right of the mine owners to enjoy a profit margin on the coal production royalty element of the coal price, and a move away from a "prior MEMR approval" system to a self-compliance system — where mine owners and mine mouth power companies are free to reach a mutual commercial agreement on certain aspects of the coal price, and report the results to the MEMR, (Global Business Guide Indonesia, 6 October 2016).



ultimate bearer of the coal price in any power generation project) will be able to absorb the coal price, particularly if prices remain high (HBA stood at \$83.3/t in February 2017).

Future production and exports

Before coal prices started to fall in 2011, Indonesia's production was expected to increase significantly – driven in large part by new projects in South Sumatra and Kalimantan. In 2012, the Indonesian Coal Society projected coal production at 680 Mt in 2020 and 955 Mt in 2025.⁵³ In June 2011, Adaro Energy announced a medium-term plan to boost its production capacity to 80 Mt per year, almost double the 42 Mt it produced in 2010.⁵⁴ Notably, Adaro and BHP Billiton invested in the development of the IndoMet Coal (IMC) complex in Central and East Kalimantan provinces on Borneo, which comprises seven coal concessions and an estimated 1.27 Gt of coal resources, mainly coking coal. Despite the start-up of production from the Haju mining area in 2015, in June 2016, BHP withdrew from the project and sold its 75 percent share to Adaro for \$120 million. The lack of market support has cut expansion projects and new greenfield mines development in Indonesia as in the rest of the world. The current surge in coal prices may change the situation, however, the rise will need to be sustained over a long period to justify investment in new mines.

In its Indonesia Energy Outlook 2016 (IEO 2016), published in January 2017, DEN provides contrasting potential trajectories for coal production.⁵⁵ In a BAU scenario, production increases by 2.3 per cent per year on average from 461 Mt in 2015 to 1,033 Mt in 2050. This BAU scenario seems very unlikely, due to government concerns over coal reserves, environmental and social impact and lack of market support for such a production level. In the two alternative scenarios (ALT1 and ALT2), production is capped at 400 Mt per year and slightly increases at the end of the period. In contrast, the IEA's WEO 2016 projects a continued growth in Indonesian production. In the New Policies Scenario, Indonesian output expands by 162 Mtce over the outlook period from 389 Mtce in 2014 to 551 Mtce in 2040 (i.e. from 485 Mt to about 690 Mt), increasingly driven by rising domestic consumption.⁵⁶

Due to the uncertain level of coal production, future Indonesian coal exports are highly unpredictable. On one hand, should the government maintain a cap on coal production at 400 Mt per year – and is able to enforce it – growing domestic demand would reduce the availability of coal for the export market significantly. On the other hand, should international prices recover sustainably, Indonesian producers have the ability to increase their production and small producers with higher costs could re-enter the market. The IEA projects a decline in coal exports in the short term, but a recovery after 2025. Indonesian exports are expected to decline from 337 Mtce in 2014 to 327 Mtce in 2025, and then increase to 354 Mtce by 2040. The slowdown in the growth of Indonesia's exports stems, on one hand, from robustly growing domestic demand and, on the other hand, from the fact that Indonesia's coal quality is declining, while costs are rising. According to the IEA, smaller high-cost operations in Indonesia are becoming the swing supplier in the Asia-Pacific market.

The three scenarios developed in IEO 2016 illustrate the wide range of uncertainty about future Indonesian coal exports.

- In the BAU, as production continues to increase significantly, coal output available for exports increases from 350 Mt in 2015 to 411 Mt in 2025, before decreasing to 308 Mt by 2050.⁵⁷

⁵³ Sastrawinata T. (2012)

⁵⁴ The Coal Age, 10 June 2011

⁵⁵ IEO 2016 uses three scenarios for the projection period of 2016 to 2050, namely Business as Usual (BAU) scenario which assumes a moderate GDP growth of 5.6 per cent per year, Alternative 1 scenario (ALT1) which assumes a moderate GDP growth of 5.6 per cent per year and deployment of NRE and energy saving measures, and Alternative 2 scenario (ALT2) which assumes a high GDP growth of 7.1 per cent per year and deployment of NRE and energy saving measures. The outcome of BAU and ALT1 scenarios cannot be directly compared with ALT2 scenario due to the different GDP growth assumption. DEN (2017).

⁵⁶ IEA (2016d).

⁵⁷ Original data on production and consumption in Mtoe converted in Mt on the basis; 1 Mtoe = 1.7 Mt.



- In the ALT1 scenario, exports decline to 262 Mt by 2025 and to around 133 M in 2050.
- In the ALT2 scenario, which assumes a higher economic growth than the previous scenarios, exports are reduced to 214 Mt in 2025 and gradually phased out by 2050.

Due to the role of coal in state and export revenues and mining employment, the cap on coal production, established by the government in 2014, is expected to be adjusted to the new market conditions. In the short term, the Indonesian coal mining sector is still highly dependent on coal exports. To serve Asian and rising domestic demand, the cap on coal production has always been exceeded and the government is expected to review its annual coal production policy target to adapt it to increased production, and to get higher state and export revenues.⁵⁸ The steep rise of export prices has started to work. Bumi Resources, the largest Indonesian coal company, has announced an increase in its coal production in 2017 and other Indonesia's mining companies have followed suit. An increase in future coal exports nevertheless remains reliant on a sustained increase in international steam coal prices to incentivize investment in coal mining and transportation. The sustainability of the recent price recovery is not ensured as the surge is mainly due to regulation on coal mining in China combined with a lack of investment in the global coal mining sector in the past five years.

The level of exports also depends on the pace of growth in domestic coal demand. As seen previously, although coal demand is expected to rise fast, it is not expected to rise as steeply as foreseen in RPJMN 2015-19 (240 Mt in 2019). The building of the new 20 GW of coal capacity is expected to be more gradual and extended after 2019. Therefore, coal exports are not expected to collapse in the medium term as projected in RPJMN 2015-19 (a fall from 275 Mt in 2018 to 160 Mt in 2019). Based on this report's assessment of domestic demand (see Figure 15), exports could drop from 366 Mt in 2015 to 225-240 Mt by 2020 and 105-150 Mt in 2030, should the government maintain its cap on coal production at around 400 Mt per year, which seems unlikely under current market conditions. The fall of coal exports is therefore expected to be less pronounced.

Less demand for low-rank coal on the international market

Growing Indonesian exports are also conditional on demand for low-grade coal by Asian buyers and lignite imports by China. The characteristics of Indonesian coal (very low sulphur content, low calorific value and hence low price compared with other coals) created high demand for this coal product at the beginning of the 2010s and allowed Indonesian exporters to ramp up their exports. Most Indonesian low grade coal was exported to China and India. However, the market has changed. More and more buyers favour higher quality grade which emits less CO₂ per kWh generated, as less coal per kWh is required. As seen in 2015 and 2016, coal buyers are becoming more selective (with the notable exception of China in 2016). The decline of Indian imports was more pronounced for Indonesian suppliers than for other suppliers to the Indian market. Indonesia's ability to continue to export coal could therefore be further compromised by the fact that much of the country's remaining coal is low grade, which some buyers are more reluctant to use. Lignite is mainly exported to China, and therefore is highly dependent on China's import demand and government regulation.

Import demand for Indonesian coal may decrease due to new environmental regulations in importing countries. This may come in various forms: a ban on low-calorific coal imports (such as the regulation introduced in the most polluted regions of China), a tax on coal (such as the cess in India) or more generally new regulation on power plant emissions which presents a specific risk to Indonesia's coal due to its low calorific value and its higher CO₂ emissions per kWh than high-grade coal. The risk in the long term is that Indonesian low-rank coal has a more limited export market. In that case, the government's ambitious coal power plan development will provide the necessary domestic outlet to keep the Indonesian coal mining sector alive.

⁵⁸ Coal Asia, January 25-February 25, 2017.



7. Conclusion

Coal has become increasingly important to Indonesia's economy and power generation mix. To meet growing power demand and complete the full electrification of the country, the government has launched the 35,000 MW programme. The programme and its acceleration are expected to double power sector coal demand and provide some stability in the Indonesian coal market. Intended or otherwise, the prioritization of domestic coal as fuel for electricity production is a lifeline to a coal industry which has struggled with weak prices for the past five years. Not only does increased demand for Indonesia's coal provide additional local buyers for coal producers, but companies that develop CMM power plants are able to maintain their asset and business value by utilizing cost-plus-transfer pricing methodology rather than writing off the decreased market value of coal as a loss.

While Indonesian coal exports will be reduced by rising domestic demand, they are not expected to collapse as steeply as foreseen in the National Medium-Term Development Plan for the period 2015-2019. Coal demand by the power sector is expected to increase more gradually and the 35,000 MW programme to be extended after 2019. In the short term, Indonesia remains dependent on the export market and it can be expected that the government will review its annual coal production policy target to adapt it to the new market environment. In the medium to long term, however, the government may control coal production to ensure sufficient resources to the new coal power plants, which would make less coal available for the export market and reduce coal exports significantly by 2025. The uncertainty on future Indonesian export levels constitutes a major source of concern for neighbouring ASEAN countries, which have built or plan to build coal-fired power plants based on Indonesian coal quality, as well as for traditional importers in Asia due to the sheer size of Indonesia on the Pacific basin market. In the longer term, the global coal market remains challenging. International coal trade and demand for Indonesian low rank coal may fall due to stringent environmental constraints in several Asian countries. Despite the global uncertainty, domestic coal consumption, driven by the power generation sector, is likely to be the future saviour of the Indonesian coal mining sector. Large mining companies are already adapting their strategy to the national coal policy and integrating into the power sector to reduce their dependence on the export market.

Due to Indonesia's current weight on the Pacific basin steam coal market, its coal exports remain key to the adjustment of the Pacific basin supply, as much as China's coal policy and import behaviour is key on the demand side.



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