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IEEFA.org

The Case for System Transformation in Indonesia

Time for a Full Electricity System Audit

Executive Summary

Many Indonesians had begun to count on reliable electricity in their daily lives. That changed when a massive blackout hit Java in August 2019. The power outages lasted more than six hours in both the capital city Jakarta and the regions of West Java and Banten, including some parts of Central Java.

Almost one hundred million people were affected, and the political fallout was immediate.[1] The state-owned electricity monopoly, Perusahaan Listrik Negara (PLN) offered compensation to customers of up to IDR 865 billion (USD 61 million).[2]

PLN's lack of system-level planning coupled with its slow emergency response had resulted in the longest and probably most expensive blackout ever for Indonesia.

THE '2019 JAVA BLACKOUT' SHOULD BE A CATALYST FOR A FUNDAMENTAL RE-THINK OF PLN'S PLANNING PRACTICES.

PLN have engaged in an aggressive build-up of new, high-cost coal-fired capacity at the expense of investment in the grid and operational innovations.

Concerns about PLN's system operations and related planning disciplines have gained momentum over the past two years.

The 35 gigawatt (GW) vision of President Joko Widodo (Jokowi) gave PLN and its subsidiaries room to collaborate with private power developers in building new generation capacity. New regulations strengthened by the Ministry of Energy and Mineral Resources (MEMR) in 2017 allowed PLN to adopt a direct appointment system for mine-mouth power projects.

MEMR then directed PLN to build a number of mine-mouth coal-fired power plants close to the abundant lignite coal resources in Sumatera and Kalimantan based on the argument that bringing the power generation plant closer to the fuel source would save costs, specifically transportation and handling costs.

In theory, the plan sounded plausible. In practice however, the economics are not favourable as the overall cost of generation and transmission were not taken into account.

[1] Tirto.id. Durasi Listrik Padam Kemarin adalah yang Terparah Sejak 1991. 5 August 2019.
[2] CNBCIndonesia.com. Efek Blackout, PLN Beri Kompensasi Terbesar Sepanjang Sejarah. 3 September 2019.

To better understand PLN's planning decisions, IEEFA reviewed two significant mine-mouth projects—Riau 1 and Banyuasin. IEEFA also tested the financial impact of PLN's capacity planning processes by examining the full cost of two additional mine-mouth projects—Jambi 1 and 2—where incremental transmission costs are estimated to reach IDR 1.9 trillion (USD 134.5 million). Finally, to put these high-level planning decisions into an operating context, we extended our analysis to the systemic problems in the Java-Bali grid that have resulted from an over-reliance on baseload thermal coal generation.

This analysis shows that MEMR's regulation increased the speed of approvals at the expense of competition, transparency, and performance.

Based on IEEFA's analysis, many of PLN's mine-mouth projects planned for Sumatera and Kalimantan suffer from a legacy of opaque ownership interests and project approval practices, raising questions about the underlying economics. At the same time, grid management strategies focusing on delivering more resilience to fast changing power systems have simply not been prioritized.

THANKFULLY PLN IS NOT ASLEEP TO THESE PROBLEMS, but fresh policy leadership will be required to guide a change in system level processes.

In July 2019, the previous interim Chief Executive Officer of PLN, Djoko Abumanan publicly acknowledged that the mine-mouth program should be re-evaluated because of lower-than-expected electricity demand in Sumatera and Kalimantan.[3]

This type of candour from senior officials is crucial because PLN needs to re-evaluate not only its mine-mouth plans, but also its electricity planning at a system level. A holistic analysis will assist PLN and Indonesian ratepayers by reducing the risk of blackouts due to a lack of grid resiliency, while insulating electricity rates from the impact of volatile fossil fuel prices.

On October 23rd 2019, President Joko Widodo announced his new Cabinet members, with management changes at PLN expected to be announced in the coming month. The appointment of a new team will provide a much-needed opportunity for senior Cabinet policymakers to undertake a full review of PLN's operations. The sector outlook should be re-assessed in light of new cleaner technology options already reshaping power sector economics for Indonesia's regional competitors.

GOING FORWARD, IEEFA RECOMMENDS:

- **Conduct a full system audit of PLN.**
  Both PLN and investors need credible data and analysis in order to make the right decisions on long-term infrastructure investment. A full system audit would reveal the true performance of the whole electricity system. It would highlight unreliable generation units and transmission/distribution bottlenecks that are causing sub-optimal utilization. An audit would also permit PLN, investors and technology planners to address PLN's investment choices,

[3] Ni Putu Eka Wiratmini. PLN Atur Ulang Operasional Pembangkit. Koran Bisnis Indonesia. Tuesday, 16 July 2019.

including technology and investment pathways and the risk of stranded assets, in a more realistic way.

- **Enact system-level reform of Indonesia's electricity sector.**
  Based on the full system audit of the PLN, and using improved system-level planning processes, planners could evaluate the best power generation options for Indonesia's electricity sector, and then match this with the careful design of associated transmission and distribution requirements. This should be done with realistic technical and funding expectations to support alignment with the overall development goals of Indonesia.

- **Provide a healthy level of competition in project procurement.**
  Better system-level planning would support the right level of competition in the project procurement process. The goal is to achieve real price discovery appropriate to new technology solutions especially when foreign direct investment is involved. The government should put in place consistent policies that answer to market realities.

- **Transform the design of the national electricity planning document (RUPTL) into a more transparent process based on meaningful data and evidence.**
  It is crucial that public stakeholders be given relevant data in a way that permits them to make responsible choices about their power usage and investment decisions. Transparency in data and evidence will motivate new partners to bring PLN and the national electricity planning process their best strategies.

- **Set up a truly independent power regulatory body.**
  An independent power regulatory body would oversee the planning and operation of Indonesia's electricity sector to protect the long-term interests of stakeholders, including consumers. This body would progress transparency, accountability and good governance, and therefore provide confidence to international investors.

It is crucial to have a power sector planning process that is credible. Without that, the best investors and technology partners may look elsewhere, and stranded asset risks related to poor system decisions may impair PLN's ability to meet public expectations on an ongoing basis.

Finally, it is imperative that the newly appointed Minister of Energy and Mineral Resources, Arifin Tasrif, and Minister of State-Owned Enterprises, Erick Thohir work together with PLN management to oversee a much-needed upgrade of the systems and processes that govern the Indonesian electricity sector.

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Mine-mouth Power Generation

A Costly Short-Term Fix

Mine-mouth coal-fired power plants have been integral to Perusahaan Listrik Negara's (PLN) electricity generation capacity planning for more than 15 years, despite rapid changes in the technology and economics of power generation.

PLN's mine-mouth power purchase agreements (PPAs) date back to 2007[4] when President Soesilo Bambang Yudhoyono started his second 10 gigawatt (GW) fast-track power program. However, it was the 35GW vision of his successor, President Joko Widodo (Jokowi), that seemingly gave a new group of mine-mouth players a fast-track into PLN's procurement process.

The catalyst for their entry was Presidential Regulation No 4/2016 (which was then amended by Presidential Regulation No 14/2017): the Acceleration of Electricity Infrastructure Development.[5] This regulation, enacted by Jokowi to speed up power infrastructure development in Indonesia, gave PLN and its subsidiaries room to collaborate with private power developers in building new generation capacity.[6] The regulation was then strengthened by the Ministry of Energy and Mineral Resources (MEMR) via Regulation No 19/2017 which allowed PLN to legally adopt a direct appointment system for mine-mouth power projects.[7]

In 2017, MEMR issued its Electricity Supply Business Plan (Rencana Usaha Penyediaan Tenaga Listrik) (RUPTL). It marked the beginning of a serious push by government for PLN to prioritize mine-mouth coal power generation as the predominant fuel source for Indonesia's electricity generation.

MEMR directed PLN to utilise the abundant lignite (low-grade, brownish-black coal) resources in Sumatera and Kalimantan by building power plants as close as possible to the lignite sources, hence minimizing transportation costs and resulting, it was hoped, in cheaper power.

MEMR directed PLN to build power plants close to Sumatera's and Kalimantan's abundant lignite coal resources to save on transportation costs and hopefully provide cheaper power.

[4] The Banyuwangi mine-mouth coal power plant signed a PPA in 2007 according to Ministry of Energy and Mineral Resources. Presiden Saksikan Penandatanganan Proyek Kelistrikan dan Batubara. 21 March 2007.
[5] A comparison of regulations pertaining to mine-mouth coal power plants is given in Annex 2.
[6] Presidential Regulation No 4/2016 and Presidential Regulation No 14/2017.
[7] Ministry of Energy and Mineral Resources (MEMR) - Regulation No 19/2017.

In theory, the plan sounded plausible. In practice however, the economics were not favourable if the overall cost of generation and transmission were to be taken into account.

The Key Issues With Lignite Coal, the Fuel Source of Mine-Mouth Coal Power Plants

Lignite, or often referred to as brown coal, is a low rank coal with the lowest energy density of approximately 8-15 MJ/kg and can contain as much as 45% to 55% of moisture, high volatile matter and high amounts of sulphur.[i]

The high moisture content in lignite causes its power-generating efficiency to be considerably lower than that achieved by bituminous coal.

Having high moisture content and low calorific value also makes lignite uneconomical to transport over long distance, for that reason lignite coal is used in a power plant that is built adjacent to the mines.

Lignite also contains 20%-25% of oxygen, and when dried, lignite becomes prone to spontaneous combustion, making it difficult to handle.[ii]

According to Kobelco Technology Review, existing lignite-fired power generation also requires special boilers that are large in size and more expensive to build in comparison to bituminous-coal-fired boiler.[iii]

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[i.] Zactruba, John. What is Lignite Coal?
[ii.] Kay, Amanda. Coal 101: What is Lignite? 24 July 2018.
[iii.] Kashiwagi, Takeo, et al. Mine-mouth Power Generation System Based on Upgraded Brown Coal, Kobelco Technology Review No. 33 February 2015.

The technical and environmental drawbacks of lignite generation have long been well-known to power and infrastructure analysts.

Despite this, Indonesia's power sector planners granted the developers of mine-mouth projects a privileged position by allowing direct appointment via the MEMR regulation.[8]

The technical drawbacks of lignite generation are well-known to power and infrastructure analysts.

IEEFA finds a thorough calculation of the full costs of mine-mouth power was missing from the policy process, including the cost of bringing power to the nearest grid connection and the external costs rising from carbon emissions throughout the mine-mouth supply chain. As a result, decision-makers lacked the

[8] MEMR Regulation no 3/2015 which is then overruled by the MEMR Regulation no 19/2017.

information needed to make fully informed long-term capital investment decisions for Kalimantan and Sumatera.

IEEFA notes planning for investment in power generation infrastructures cannot be done in isolation. It is crucial to consider associated investment in the transmission and distribution infrastructure that provides the overall system supporting the transfer of electricity.

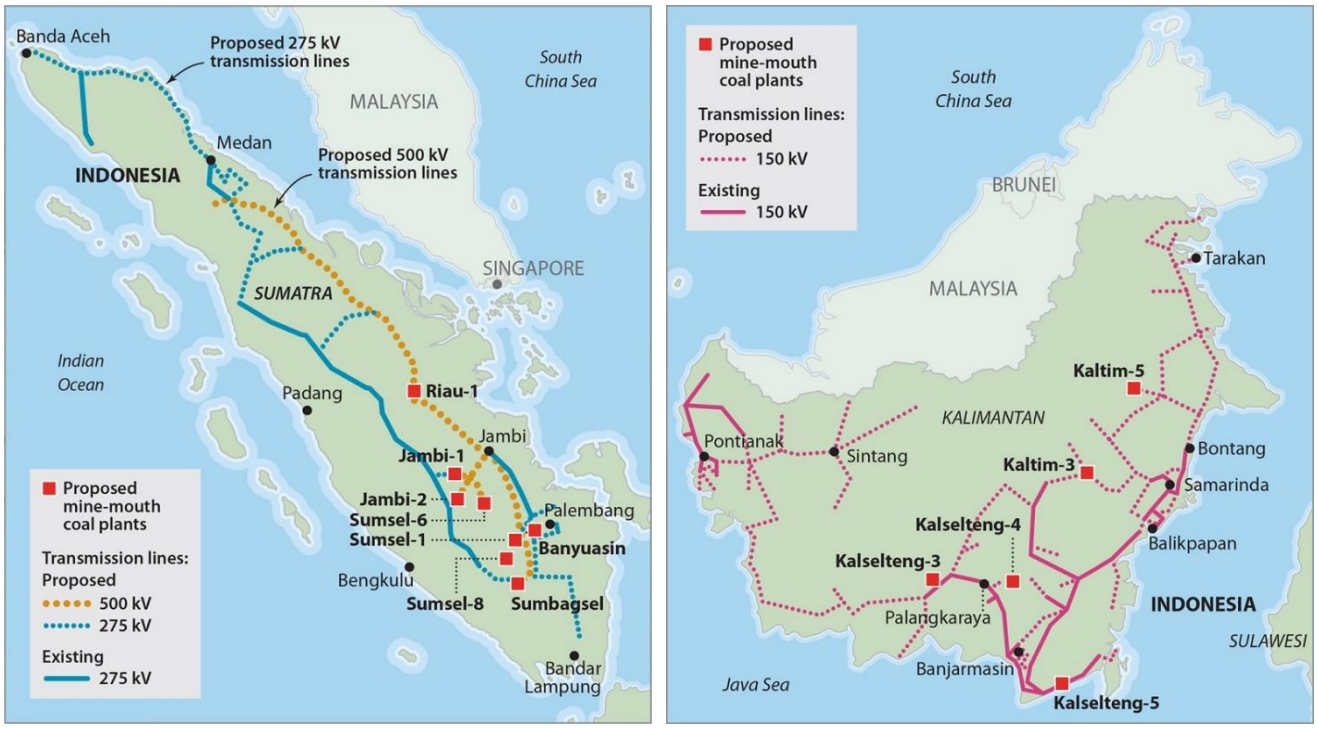
To better understand how PLN's planning decisions have played out in practice since the MEMR regulation took effect, IEEFA reviewed two significant mine-mouth projects—Riau 1 and Banyuasin. IEEFA also reviewed the financial implications of PLN's capacity planning processes by examining the full cost of two mine-mouth projects – Jambi 1 and 2. Finally, to put these high-level planning decisions into an operating context, we extended our analysis to assess some of the systemic problems in the Java-Bali grid that have resulted from an over-reliance on baseload thermal coal generation.

Mine-Mouth Coal Independent Power Producers

Weak Procurement Processes, Sponsors, and Projects

Indonesia's power development plan currently includes 5,794 megawatts (MW) of planned capacity from 14 mine-mouth coal plants in Sumatera and Kalimantan, based on the 2019 RUPTL. The size of the planned units range from 240MW to 1200MW, with seven assigned to PT Pembangkitan Jawa-Bali (PJB) and two to PT Indonesia Power (IP). Both companies are fully-owned subsidiaries of PLN.

Figure 1: Proposed Mine-Mouth Coal Power Plants in Sumatera and Kalimantan



Source: RUPTL 2019-2028 redrawn by IEEFA.

PLN assigned responsibility for developing Riau-1, Sumsel-1, Sumbagsel-1, Sumsel-6, and Kalselteng-3, -4 and -5 to PJB through its subsidiary Pembangkitan Jawa Bali Investasi (PJBI). PT IP was assigned responsibility to develop Jambi-1 and Kaltim-5. Other mine-mouth owners are untraceable or not yet assigned.[9]

When the MEMR Regulation No. 19/2017 on the Utilisation of Coal for Power Generation and Purchase of Excess Power was issued, the regulation appeared to have one major goal: to speed up investment in new generation capacity using the cheapest fuel options available. Mine-mouth coal and wellhead gas facilities were designated the least cost option, and the direct appointment mechanism was legally approved.[10]

Under this regulation, the mine-mouth independent power producer (IPP) must, as a prerequisite, have negotiated a fuel purchase agreement with the mine owners. In fact, the previous MEMR Regulation No 9/2016 already stated that the mine owners

[9] The 14 mine-mouth power plants and their details are listed in Annex 1. Information on these plants were obtained from various public documents such as PJBI website, IP website, RUPTL 2019-2028, and media outlets including kompas.com, cnbcindonesia.com, kumparan.com, tirto.id, etc.

[10] CNN Indonesia. Ramai-ramai Incar PLTU Mulut Tambang demi 'Cuan' Mengembang. 15 May 2017.

need to have an equity interest of at least 10% in the consortium of the mine-mouth power company.[11]

The outcome of the policy was to increase speed, at the expense of competition and transparency.

While the government's power sector policy placed a priority on rapidly meeting electrification goals, IEEFA notes speed does not always produce the best long-term outcomes for system operators. This is because direct appointment can be a challenge to traditional accountability mechanisms as it undermines the normal checks and balances that ensure that fuel choice and pricing is subject to competitive market conditions.

Direct appointment undermines the normal checks and balances that ensure competitive fuel choice and pricing.

Case Study 1: The 2 x 300MW Riau-1 Mine-mouth Coal Power Plant

The controversy around the Riau-1 mine-mouth coal power project has raised serious questions about PLN's management over the past year. After the bribery scandal was confirmed, so far, the prosecution of leading participants has resulted in the imprisonment of at least two politicians with oversight of the power sector and government, and one private individual linked to the project sponsor.

In July 2018, the Corruption Eradication Commission (KPK) charged the former deputy-chairwoman of Commission VII[12] of the House of Representatives, Eni Maulani Saragih over allegations of accepting bribes from the project sponsor of Riau-1. At the same time KPK detained the project sponsor's senior 'consultant', Johannes Budisutrisno Kotjo, who is also a shareholder of BlackGold Natural Resources Ltd. (BNR). Not long after that, the former Indonesian Minister of Social Affairs, Idrus Marham was also arrested on a similar charge.

The investigation ultimately went to the very top of PLN. In April 2019, following months of investigation, KPK arrested the former Chief Executive Officer (CEO) of PLN, Sofyan Basir, just a few days after the presidential election based on charges that he had deliberately facilitated meetings between the three people to expedite the Riau-1 project. In what was seen as an unusual loss for KPK however, Basir was subsequently found not guilty of playing a role in bribery on November 4th.[13]

[11] For comparison of previous and existing regulations on mine mouth, see Annex 2.
[12] Commission VII of the People's Representative oversees the energy and electricity sector in Indonesia.
[13] Jakarta Post: Ex-PLN Chief Walks Free in Riau Project Graft Trial

FROM A PURELY FINANCIAL PERSPECTIVE, MORE QUESTIONS SHOULD HAVE BEEN ASKED about the decisions made by PLN or PJBI in awarding the mine-mouth project to BNR at the outset.

If PLN had reviewed this project from a business perspective, financial due diligence would have found the following issues:

1. BNR is a project company that lacked a track record in power plant development.

   According to company disclosures available on the SGX-Catalist website, BNR was and remains a small (holding) company listed on the SGX-Catalist small company board, with a market capitalization of only SGD 10.04 million (or USD 7.37 million) as of 22 October 2019.[14] Although BNR owned mining rights, its very limited capital base made it an unlikely sponsor for a project like Riau-1 with an estimated project cost of USD 900 million.

   When BNR was selected as PJBI's partner for the Riau-1 project, BNR's liquid assets were only USD 5.2 million (in 2017). Meanwhile it was expected to provide USD 32.4 million worth of equity to cover its 12% share of the project cost.[15]

   On 30th November 2017, BNR announced it had entered into a non-binding Memorandum of Understanding (MoU) with an international financial institution with the intention to raise up to S$20 million in convertible bonds to finance its equity interest in the Riau-1 project[16]. This, however, was still not enough to cover the real amount required from BNR.

   In essence, BNR appears to have been little more than a special purpose project vehicle. The company's financials confirm the company had a very limited operating performance—something that should have been cause for concern. BNR reported a string of losses throughout the 2014-2017 period totalling USD 40.2 million. In fact, the company reported no revenue in 2014-2015 except for a modest contribution from interest income, and generated only USD 320,000 in revenue in 2016 from their first coal sales to PLN. Their annual reports also describe Riau-1 as the group's only significant project with the potential for future cash generation, given the limited market for lignite.

[14] SGX Catalist. BlackGold Natural Resources Financial Information. 22 October 2019
[15] Assuming 30% of equity is needed for a project cost of USD 900 million.
[16] BlackGold Natural Resources Announcement. Signing of MOU. 30 November 2017

Table 1: BlackGold Natural Resources Ltd. (BNR) Income Statement

In US$	2014	2015	2016	2017
Revenue				
Sales			320,307	4,096,803
Cost of sales			(265,769)	(4,211,310)
Interest income from time deposits & current account	10,400	11,234		
Other income		3,181	18,626	10,455
Currency translation (losses)/gains - net	124,402	(217,781)	(26,918)	159,986
Expenses				
- Administrative	(496,834)	(3,325,311)	(3,667,738)	(4,980,422)
- Finance	(927)	(1,976)	(332)	(186)
- Others	(978)	(25,659,163)	(12,541)	(2,129,379)
Loss before tax	**(363,937)**	**(29,189,816)**	**(3,634,365)**	**(7,054,053)**
Tax			(151)	(329)
Net loss after tax	**(363,937)**	**(29,189,816)**	**(3,634,516)**	**(7,054,382)**

Source: Blackgold Natural Resources Ltd. Annual Reports.

The company's track record indicates that management faced challenges in achieving revenue growth, presumably due to the low energy value of their coal and high transportation costs. In fact, the Independent Qualified Person's Report on the PT Samantaka Batubara Concession specifically stated that: "The estimation of Coal Reserves assumes and is dependent on the Company being successful with its bid to supply 3.5 million tonnes of coal per annum to the Riau-1 Mine-mouth Power Plant."[17] This suggests that the option of securing a mine-mouth PPA was the key to BNR's financial viability.

BNR's dependence on the Riau-1 project should not have come as a shock to either PLN or PJBI. Many owners and potential investors in remote mining concessions face a similar high-risk dynamic. These low-quality resources often lack a natural market and only have economic value if there is a credit-worthy long-term customer such as PLN to help them unlock affordable financing.

2. It is also hard to evaluate the commercial logic of the Riau-1 project from PLN's perspective.

   Neither PJB Investasi (PJBI) nor PJB (its holding company) had adequate capital to become the majority shareholder of the project. In fact, in its 2017 Annual Report, PJB stated that although it had sufficient funds to build new power

[17] BlackGold Natural Resources General Announcement: Independent Qualified Person's Report on the PT Samantaka Batubara Concession, 3 April 2018. BlackGold Natural Resources General Announcement: Independent Qualified Person's Report on the PT Samantaka Batubara Concession, 3 April 2018.

plants, "the proceeds were recorded as receivables from PLN, and it would be used for greater interest – to supply electricity demand in Indonesia". In addition, PJB cannot use its assets as collateral to support new debt issuance, as their assets are already consolidated under PLN assets and have been used to support global bonds guarantees[18].

To address this legal roadblock, PJB established an unrestricted subsidiary, PJB Investasi. PJBI was incorporated in 2015 to undertake special assignment by PLN to be the majority shareholder of a number of power plants. As an unrestricted subsidiary, PJBI has more flexibility to seek investment for their projects[19].

In 2017, PJBI's paid-up capital was IDR 3 trillion, which was then fully invested in three joint venture companies related to other power projects, not including Riau-1.[20] As a result, PJBI was not financially equipped to be a majority shareholder of Riau-1, nor the rest of the mine-mouth power plants in this case. This suggests the government would have had to inject more cash into PJBI via State Capital Inclusion (known as *Penyertaan Modal Negara*) through PLN. Or PJBI would have to think of creative ways to seek funding.

In fact, this is exactly what happened in the Riau-1 case. During the Riau-1 trials, it was disclosed that PJBI only had funding to cover 10% of its 51% equity stake. As a result, China Huadian Engineering Co. Ltd. (CHEC) was expected to cover an additional 41% of PJBI's portion[21]. CHEC was expected to source low-cost financing from Chinese financial institutions—a bargaining position that has secured the participation of many Chinese engineering, procurement and construction (EPC) companies in power sector transactions.[22]

Table 2: Ownership Structure of Riau-1: On Paper vs. Reality

	On Paper		Reality - capital cash contribution	
	USD	%	USD	%
PJBI	137,700,000	51%	27,000,000	10%
BNR	32,400,000	12%	32,400,000	12%
CHEC	99,900,000	37%	210,600,000	78%

Source: IEEFA estimates, assuming 30% of equity required from USD 900 million project cost.

[18] PJB Annual Report 2017.
[19] Ibid.
[20] According to the PJBI 2017 Annual Report, it has invested an equivalent of IDR 1.3 trillion in PT Shenhua Guohua Pembangkitan Jawa Bali (SGPJB) for development of 2 x 1000MW Jawa-7 coal power plants, IDR 1.95 billion in PT Guohua Taidian Pembangkitan Jawa Bali (GTPJB), and IDR 2.94 trillion in PT North Sumatera Hydro Energy for development of the 510MW Batang Toru Hydro Power Plant.
[21] The Court Decision of Johannes Kotjo, 31st January 2019.
[22] The Court Decision of Idrus Marham, 09 January 2019, and the Court Decision of Johannes Kotjo, 31st January 2019.

This deal structure naturally raises questions about the actual benefits to the various parties. On the face of it, CHEC agreed to sacrifice their ownership rights despite accepting virtually all of the financial risk, in an attempt to secure one last coal-fired deal.

Based on IEEFA's review of the deal terms, it appears that this arrangement between the parties was based on a plan to convert the additional 41% equity portion of PJBI into long-term loans from CHEC. The loan itself was set as junior debt for 15 years.[23] It was unclear how the loan would be reported by either PJBI or PLN.

The Riau-1 shareholding structure is a useful example of PJBI's reliance on partner's financial resources. It could be argued that the loan provided a 'free' equity position to PJBI on a concessionary basis that conferred benefits on third parties without appropriate market checks and balances. Instead of having BNR and CHEC compete on best price and quality to win projects like a normal IPP, PJBI oversaw a process that permitted BNR and CHEC to proceed with the project on the basis that they would finance PJBI's unfunded equity stake.

Case Study 2 – The Banyuasin 240MW Power Station

The Banyuasin 240MW mine-mouth offers another example of how the lack of transparency in PLN's procurement system has led to projects being awarded to questionable project sponsors.

The plant is still nowhere to be seen as a complex trail of financial arrangements call into question the project's viability.

In fact, IEEFA found that in the case of the Banyuasin project, there is so little confirmable information about the project that there are still questions to ask about who actually owns this project.

Based on IEEFA's review, the earliest information about the Banyuasin mine-mouth dates back to 2007. Based on an MEMR website, the Banyuasin coal power project developers signed a PPA for a 2 x 112.5MW project, witnessed by President Susilo Bambang Yudhoyono.[24] The project was described as being owned by a special purpose vehicle (SPV) called PT Banyuasin Power Energy (BPE) with a project cost of USD 225 million. The webpage had no information on whether Banyuasin would be a mine-mouth or a regular coal-fired power plant.

Fast forward 12 years and in 2019 the plant is still nowhere to be seen and there appears to be a complex trail of financial arrangements related to the project which raises questions about PLN's oversight and the project's viability.

[23] Merdeka. Sofyan Basir Tolak Proyek PLTU Riau 1 Dilakukan Secara Tender. 15 November 2018.
[24] Ministry of Energy and Mineral Resources. Presiden Saksikan Penandatanganan Proyek Kelistrikan dan Batubara. 21 March 2007.

Figure 1: Banyuasin Mine-Mouth Trail

⇒ March 2007	Banyuasin Coal Power PPA signed between PT Banyuasin Power Energy and PLN
⇒ 2008	PT Truba Alam Manunggal Engineering Tbk (TRUB) claimed to own the Banyuasin project in their management presentation to shareholders.[25]
⇒ 2013	TRUB ran into financial trouble. Its shares were suspended by the Indonesian Stock Exchange, and never recovered.
⇒ April 2015	The Banyuasin project appeared in the website of China Oceanwide Holdings Limited, a property investment company listed in Shenzhen Stock Exchange. Their website revealed that the Banyuasin project is jointly owned by Oceanwide Holdings Ltd (85%) through its Hong Kong listed company (Oceanwide 715 HK) and China Power Construction Group (5%) through its subsidiary (Shanghai Electric Power Construction Co. Ltd. - SEPC), and an Indonesian partner, PT Satya Abadi Semesta (10%).[26] It stated that the Group successfully acquired and reorganized the project company, PT Banyuasin Power Energy in April 2015. It also said that on 21st Dec 2015, the project company and PLN signed a PPA.[27] No attribute was mentioned on TRUB, nor any explanation about the relationship between TRUB and PT SAB.
⇒ Dec 2015	The project was mentioned in the Oceanwide 715 HK company's Annual Report 2015 for the following: • There was a payment from Oceanwide to SEPC in the amount of USD 39.5 million (HK$112.8 million) to buy main equipment for the Banyuasin plant. • As at 31st Dec 2015, construction and prepayment of USD 14.5 million (HK$112.8 million) was recognised as prepayment for Banyuasin.[28]
⇒ Dec 2016	Banyuasin project appeared again in the Oceanwide 715 HK Annual Report 2016, for the following:

[25] Truba Alam Manunggal Engineering Tbk, Management Presentation, accessed September 2019.
[26] Oceanwide Holdings, Indonesian Bayawatt Power Plant, accessed September 2019.
[27] China Oceanwide, Bayawa Letter 2×125MW Project, accessed September 2019.
[28] China Oceanwide Holdings Limited. Annual Report 2015.

		• As at 31st Dec 2016, construction and prepayment of USD 10.9 million (HK$84.9 million) was recognised as prepayment. This means Oceanwide has paid a total of USD 25.4 million so far for the project, and USD 14.1 million outstanding.
⇒	Dec 2017	Banyuasin project is featured in the Oceanwide 715 HK Annual Report 2017 as a subsidiary (85%), but there was nil recognised as prepayment.
⇒	May 2018	Banyuasin mine-mouth project appeared in the PLN UIP report, having a status "still in process of tariff approval."[29]
⇒	Mid year 2018	KPPIP report stated that land acquisition for Banyuasin mine-mouth is completed, while other mine-mouths are still in progress.[30]
⇒	Sept 2018	TRUB was delisted by the Indonesian Stock Exchange after having had continued losses for more than 5 years and did not have proper plan for their future business. Its shares had been suspended for the last 24 months, before finally being delisted.[31]
⇒	Dec 2018	Banyuasin project is featured again in the Oceanwide 715 HK Annual Report 2018 as a subsidiary (85%), but there seem to be no progress on its construction since nil was recognised as prepayment.
⇒	2019	RPUTL 2019 stated that the Banyuasin mine-mouth is under construction, with COD target for 2021. Yet, IEEFA has found no other indications of its existence.

Source: Various media outlets.

The timeline above highlights fundamental risks to the viability of the Banyuasin project and PLN's ability to monitor their project procurement process. Assuming Truba Alam Manunggal Engineering Tbk (TRUB) was the signatory of the Banyuasin mine-mouth agreement back in 2007, when it ran into financial trouble in 2013, PLN should have taken steps to ensure that the project sponsor was still capable of meeting its obligations.

The Banyuasin situation raises questions about the nature of the mine-mouth PPA and PLN's ability to provide oversight of a class of IPPs that have suffered performance problems. Specifically, there should be clarity about whether there are penalty clauses in the PPA for non-performing IPPs and whether the project should have been cancelled when no milestones were met after several years. Had PLN

[29] Laporan Progres UIP KITSUM Bulan Mei. 2018.
[30] KPPIP SEMESTER REPORT, 2015 - 2018.
[31] Kontan.co.id. Ini yang jadi penyebab Truba Alam Manunggal (TRUB) didelisting. 14 September 2018.

provided active oversight, it seems unlikely that there would have been an additional signing of the Banyuasin PPA in May 2018 with the same SPV.[32]

Unfortunately, market stakeholders have no way of knowing the status of these PPAs in Indonesia, as PPAs are not disclosed publicly and headline terms are not released despite their relevance to policymakers and market players.

It is also difficult to find data and public disclosure concerning the transfer of ownership from the previous signatory of Banyuasin to China Oceanwide in 2015. It is unclear who owns the coal mine, and whether ownership of the coal concessions was also transferred to China Oceanwide.

The complicated ownership structure of this Chinese holding company, combined with the lack of public information about the current status of the project, raises questions concerning PLN's process when amending the contracts. If Oceanwide is indeed the beneficial shareholder of PT Banyuasin Power Energy, PLN might want to keep a closer oversight on the viability of Banyuasin, considering Oceanwide Holdings' current financial condition remains weak and S&P has recently confirmed their sub-investment grade rating of CCC+ with a negative outlook. S&P in August highlighted risks to Oceanwide's strained debt profile due to uncertainty about refinancing options and significant debt-repayment pressure.[33]

Time to Get the Economics Right for Indonesia's Power Sector Choices

One of the most troubling analytical issues raised by PLN's mine-mouth policy is the question of how PLN defines the cost of power.

By divorcing power generation from the associated grid costs, PLN planners have adopted a financial framework that does not relate to how system costs actually express themselves over the life of a plant, or in the tariffs that ratepayers must pay.

The financial framework does not reflect how system costs express themselves over the life of a plant or in tariff rates.

This has the potential to bias planning decisions. In addition, given the geographical challenges of electrifying Sumatera and Kalimantan, any review of new capacity decisions should be stress-tested against a range of grid development scenarios that take into account the different costs involved in power generation versus grid development.

[32] It is still unclear whether the signing was an amendment or a completely different PPA for Banyuasin.
[33] S&P Global Ratings Bulletin: Oceanwide's debt reduction is not enough to aid tight liquidity. 29 August 2019.

Transmission Cost for Mine-mouth Power Plants

The Indonesian government's decision to leverage abundant supplies of lignite coal in Indonesia was based on the argument that bringing the power generation plant closer to the fuel source would save costs, specifically transportation and handling costs.[34]

What has been left out of this financial equation is the full cost of the transmission and distribution infrastructure needed to deliver power from these remote generation facilities to load centres. PLN's calculus had overlooked the cost of the high voltage transmission system needed to deliver such huge concentrated power.

As a rule of thumb, any power generated by facilities reaching 10MW can be distributed through a 20 kilovolts (kV) line (medium voltage), while anything bigger than that would need high or super high voltage (30kV-500kV) lines depending on the capacity[35].

All mine-mouth coal plants that are included in the RUPTL are well above 200MW. This means that all of the power produced by these plants needs to be transmitted through at least a 150kV or 275kV line, while bigger plants such as the 1,200MW Sumatera-8 and 600MW each of Jambi-1 and 2, and Riau-1 need to go through the super high voltage 500kV lines.

Building transmission lines is often a demanding process. In many countries, it is hard to secure the rights of way (RoW) and land for transmission and substation build-out. It often takes years of negotiation with communities and landowners before all the RoW is fully acquired. In fact, it took PLN 19 years to finish the first phase of Sumatera's 275kV transmission build-out. The 3,765 kilometre circuit (kmc) line will connect Lahat in the south to Pangkalan Susu in the north through Sarulla. According to PLN's public relations officer, Dwi Suryo Abdullah, the project actually commenced in year 2000 and after 19 years, it was finally planned to be commissioned in mid 2019.[36]

Difficulties in land acquisition due to tough negotiations over land prices and crop compensation also often result in stalled transmission projects. This happened to the Muara Teweh–Buntok and Buntok–Tanjung transmission project in the south and central Kalimantan system, which stalled the project for a couple of years.[37]

While the general lesson about risks to transmission project completion is well understood, it is not clear that this lesson has been extended to the assumptions used concerning specific projects. For example, IEEFA found that to connect both

[34] Republika.co.id. Pemerintah Minta Pengusaha Batu Bara Percepat Hilirisasi. 03 April 2019.
[35] Based on table 2.4 of the Buku 1 PLN Kriteria Desain Enjiniring Konstruksi Jaringan Distribusi Tenaga Listrik, maximum current for any specified 20kV cables is 800Ampere. This means at 20kV, for a cable with an area of 300mm^2 (read: very large diameter), it can carry 16MW. We use rule of thumb of 10MW as a middle point taking into account average distance (cable lengths) and cable sizes
[36] Bisnis.com. Tol Listrik Sumatra Tahap I Beroperasi Semester I/2019. 21 May 2019.
[37] Ebtke.esdm.go.id. Program 35.000 MW: PLN Telah Bangun 2.368 kms Transmisi dan 7.295 MVA Gardu Induk. 11 May 2016.

Jambi-1 and Jambi-2 mine mouth plants to the nearest grid, both of which are planned to have a total of 1,200 MW of capacity, PLN will need to build an additional new route for the 500kV transmission plan.

It is interesting to note that in the 2015 RUPTL, the Jambi coal power plant was not categorized as a mine-mouth power plant. There was no plan yet to build the 500kV transmission line to connect the locations of Jambi -1 and Jambi -2 to the New Aurduri line.

As the mine-mouth plans developed further, PLN had to cater for these needs. Later in the 2017 RUPTL, the new transmission line appeared.[38] In other words, PLN is required to allocate extra funding to build the additional 500kV line that would not have been needed without these two mine-mouth projects (Jambi-1 and Jambi-2).

The Sumatera 500kV super high voltage transmission line is planned to interconnect the whole Sumatera island and is expected to become the backbone for Sumatera's energy distribution from north to south. Riau-1, having a 600MW capacity, will also need to be connected to a super high voltage grid. The planning for having Riau-1 generation units resulted in the need to build the Aurduri 500kV line which would be 420 kilometre circuit (kmc) long.

PLN will need to spend at least IDR 4.41 trillion (USD 311 million) to connect these three mine-mouth plants.

In IEEFA's calculation, assuming each new 500kV line costs around IDR 6 billion per kmc[39] and each 275kV costs around IDR 4.5 billion per kmc[40], PLN will need to spend at least IDR 4.41 trillion (USD 311 million) to connect the three mine-mouth plants – i.e. Jambi-1, Jambi-2, and Riau-1.

These costs were seemingly left out of the financial equation by those supporting the mine-mouth power plants.

[38] Refer to the map in Figure 1 to see how the additional transmission line is needed to connect Jambi-1 and Jambi-2 to the Aurduri 500kV Substation.
[39] Liputan6.com. PLN Anggarkan Rp 2,3 Triliun Buat Bangun Saluran Listrik 386 Kms.
[40] Kontan.co.id. PLN targetkan tol listrik Sumatera 275 kV tahap I rampung semester I-2019. 9 May 2019.

Table 3: Transmission Plan to Connect Jambi-1, Jambi-2, and Riau-1

From	To	Transmission (kV)	Kmc	COD Target	Investment Cost (IDR billions)
New Aurduri/Jambi 2	Peranap/Riau 1	500	420	2020	2,520
New Aurduri	PLTU Jambi 2	500	160	2022	960
Bangko	PLTU Jambi 1	275	180	2023	810
PLTU Jambi 1	New Aurduri and Jambi-2	500	20	2023	120
Total					**4,410**

Source: RUPTL 2019-2028, IEEFA estimates.

On another note, it can be argued that additional lines needed to connect to the nearest load centre should have been evaluated at the time of project approval and borne by the IPP. What happened with the 1,200MW Sumsel 8 mine mouth when the project was renegotiated by PLN in 2017 is an expensive lesson learned for PLN and the project sponsors. The PPA amendment for Sumsel-8 included changes to planned transmission lines and changes in technology, from subcritical to supercritical. Previously, Sumsel-8 was planned to supply Java through HVDC (high-voltage direct current) subsea cables. However, due to over-capacity in Java, Sumsel-8's power will now be redirected to supply the northern part of Sumatera through a 500kV interconnection instead.[41]

The amended PPA required PT Bukit Asam (Persero) Tbk (PTBA) and its consortium to build an additional 45km transmission line, up from only 2.5km previously, to bring power from the Sumsel-8 plant to the nearest substation in Muara Enim. This has resulted in an increased investment cost of USD 100 million, and the project costs have risen from previously USD 1.6 billion to USD 1.7 billion.[42]

PLN's planning activities offer an example of how a disjointed planning process may overlook the financial consequences of building large capacity new baseload units in remote locations.

Considering low demand and modest economic growth forecasts, it would seem prudent to explore alternative solutions.

For example, Jambi and Riau provinces are known to have an abundance of hydro and mini hydro potential, according to mapping done by the World Bank.[43] In fact, both provinces also receive quite high solar radiation,

[41] Press Release PT Bukit Asam. 19 October 2017.
[42] Situs Energy. Project Cost PLTU Sumsel 8 Alami Pembengkakan Investasi. 26 February 2018.
[43] World Bank – ESMAP. Small Hydro Power Mapping Report. March 2017.

ranging between 4.3-6.1 kilowatt-hours per square meter per day (kWh/m2) throughout the year, according to GIS solar mapping.[44]

Considering the relatively low peak load demand in the area and modest economic growth forecasts for the region, it would seem prudent to explore alternative solutions reflecting more modular generation options.

A combination of renewable energy sources and battery storage in a distributed system could prove to be more desirable in a mountainous island like Sumatera. As an example, to connect power sources below 10MW, one would only need a 20kV line at an investment cost of around only IDR 400-500 million per km. Even if upgraded for connection to 150kV lines, it would still cost much less than large baseload capacity that will need to be connected to super high voltage transmission.

A combination of renewable energy sources and battery storage in a distributed system could prove to be more desirable.

External Costs of Coal

Externalities are another cost often left out of the financial equation. The external costs of coal include not only air and water pollution but also the environmental, social and health impacts created by the entire supply chain of coal. This a particularly meaningful issue when the fuel used is the lowest rank coal, such as lignite.

Mine-mouth power plant technology is typically either sub-critical or super-critical due to the nature of lignite. These types of technology produce more pollution compared to newer ultra-super critical technology which requires high quality, precision-monitored grades of coal.

Unfortunately, Indonesia's emission standards for coal-based plants are still far below those found in other countries. Even with the new Ministry of Environment and Forestry Regulations No. P.15/2019 - Emissions Standard of Thermal Power Plant, the standards are far lower than the countries listed below, especially for existing coal plants.

Due to weak standards, the high load of externalities associated with mine-mouth coal projects could result in tail risk for PLN, the mine-mouth project sponsors, and ratepayers.

[44] Rumbayan, Meita, et al. Mapping of solar energy potential in Indonesia using artificial neural network and geographical information system. Renewable and Sustainable Energy Reviews, 2011.

Table 4: Emission Standards for Coal-Based Power Plants in Major Countries vs. Indonesia (Updated)

	PM (mg/Nm^3)	SO_2 (mg/Nm^3)		NOx (mg/Nm^3)		Mercury (mg/Nm^3)
		New plants	Existing plants	New plants	Existing plants	
EU	50-100	200	400	200 (after 2015)	500 (until 2015)	0.03 (Germany)
US	22.5	160 (after 2005)	160 (1997-2005)	117	117 (after 2005) 160 (1997-2005)	0.001 - 0.006
China	30	100	200; 400*	100	100 (2004-11) 200 (before 2004)	0.03
India	100 (until 2003); 50 (2005-16); 30	100	600 (<500MW); 200 (>=500MW)	100	60 (until 2003); 300 (2004-16)	0.03
Indonesia (old regulation)	150-100	750	750	850	750	None
Indonesia (new regulation)	50-100	200	550	200	550	0.03

Source: Policy Brief - Regulating Emissions of Coal-based Power Sector, ICEL, Jakarta 23-24 May 2014 and Permen LHK P.15/2019.

Indonesia lags its global peers on pollution standards applied to new coal-fired power plants, and industry players have not been encouraged to take externalities into account in capacity planning. This has biased the market toward generation options that have a high pollution and carbon load that would not be acceptable in other markets.

Industry players have not been encouraged to take externalities into account in capacity planning.

Tail risk comes into the picture for PLN and project sponsors because there are now strong suggestions that the Ministry of Finance (MoF) may be studying options including a carbon tax for energy intensive industries such as cement,

petrochemicals, and power generation. According to press accounts, a carbon tax initiative may be paired with tax allowances for green industries.[45]

If this initiative moves forward, it would be the first time that the externalities related to Indonesia's reliance on coal would begin to be priced in—an outcome that would cast a shadow over pending mine-mouth coal projects due to their high carbon intensity.

Reforming PLN

Creating a New Culture Focused on Transparency and System-Level Solutions

The global energy landscape has changed tremendously in the past 10 years.

Utilities have to deal with a range of new realities related to the impact of new clean energy technologies and transportation options. They have had to fundamentally revise planning and market disciplines as renewables and storage systems have begun to undercut the economics of baseload fossil fuels. System operators are also moving quickly to accommodate the growing demand for electric vehicles and associated charging infrastructure.

In the face of global innovation, every country must look for ways to adapt local power market structures that often have country-specific complexities. There is no such thing as a one-size-fits-all solution.

Indonesians were reminded just months ago how PLN's lack of system-level planning, coupled with its slow emergency response, resulted in the longest and probably most expensive blackout ever for Indonesia. According to PLN's early investigation, power was lost in more than half of Java after faulty transmission circuits triggered "cascading voltage", causing power plants supplying electricity from the east to the west part of Java to disconnect. The cause? Some blamed trees growing taller than they should under the transmission lines as the cause for the 500kV transmission trip. Others blamed power swings and the mismatch of location between supply and demand in Java.[46]

Regardless, PLN is overdue for a detailed and impartial audit that can identify underperforming assets and recognize management processes that have degraded the system. PLN would benefit from a new set of financial and operational metrics to guide growth. These new metrics should be aligned with global best practice and the many new system solutions that are reshaping the power sector. An independent audit is needed to assess the effectiveness of PLN's overall system from planning to procurement and financing, construction and operations.

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[45] Kumparan. Kurangi Emisi Gas Rumah Kaca, Pemerintah Bikin Pajak Karbon di 2020. 21 November 2018.

[46] Investor Daily Indonesia. Blackout Bisa Terjadi Dimana dan Kapan Saja Bahkan di Negara Maju. Accessed 24 October 2019.

After the recent blackout incident in Java, PLN should be wary of continuing the same pattern of planning for transmission and distribution design for Sumatera and Kalimantan. PLN's plan to transmit bulk power from mine-mouth in the southern part of Sumatera to the north where demand is expected to be higher mirrors the grid planning strategy used in Java. The 500kV interconnection became Java's power backbone, but as we learned in August, PLN's grid was not ready to manage inevitable power swings that resulted in a cascading trip and difficulties in black-starting these huge coal-fired power plants. This made it impossible for PLN to respond to the blackout promptly, raising questions about the connection between operational challenges and grid design decisions.

A couple of months ago, Indonesians experienced the longest and probably the most expensive blackout in recent memory.

The pending mismatch between location of supply and demand, not to mention the complexity of relying on high capacity baseload power that must be transmitted through long lines in a mountainous route in Sumatera, will not be an easy thing to manage in the future. In an interconnected system, building concentrated bulk power in one part of an island poses questions about grid resiliency for the whole island.

When talking about grid management and planning, power analysts should differentiate between reliability and resilience. The North American Electric Reliability Corporation (NERC) defines reliability as the ability of the electric system to supply the aggregate electric power and energy requirements of electricity consumers at all times, taking into account scheduled and reasonably expected unscheduled outages of system components (adequacy) and the ability of the electric system to withstand sudden disturbances, such as electric short circuits or unanticipated loss of system components (operating reliability).[47]

Meanwhile, according to the U.S. Federal Energy Regulatory Commission (FERC), resilience refers to the ability of the electric system to withstand and reduce the magnitude and/or duration of disruptive events, which includes the capability to anticipate, absorb, adapt to and/or rapidly recover from such an event.[48]

It is crucial for PLN to re-design its planning disciplines to deliver a system-level solution for Sumatera and Kalimantan focusing not only on reliability but also the resilience of the system.

[47] NERC, 2018 Long-term reliability assessment. December 2018.
[48] FERC Grid Resilience Order. 8 January 2018.

Industry best practice now places a priority on coordinated grid planning strategies that rely on solutions including smaller distributed generation units, real-time facility monitoring, smart weather forecast tools, and storage solutions. Creating enough redundancy to provide for adequate spinning reserve and ensuring flexible capacity to support fast ramping is also key for stable grid management. Meanwhile, to achieve resilience, proper planning for back-up transmission and black start generation should be considered, along with having reactive and predictive awareness tools that would create better oversight during any major disruption.

Resilience includes the capability to anticipate, absorb, adapt to and/or rapidly recover from disruptive events.

IEEFA Recommendations

With the new Cabinet coming online, it is imperative that the newly appointed Minister of Energy and Mineral Resources, Arifin Tasrif, and Minister of State-Owned Enterprises, Erick Thohir work together with PLN management to oversee a much-needed upgrade of the systems and processes that govern the Indonesian electricity sector.

PLN's credibility as a system operator will be increasingly important due to PLN's reliance on the international bond market for funding. Any power company, because of the rapid pace of change in technology, is currently facing new challenges. Embedding the right balance of reliability and resilience in electricity system policies should be PLN's focus. Based on IEEFA's review of PLN's recent operating challenges, we believe the following initiatives should be prioritized:

First and foremost, **a full system audit of PLN should be undertaken**. To make the right decisions about long-term investment infrastructure, PLN and the government need to have a clear view of how the systems perform. A full system audit will reveal the true performance of the whole electricity system – highlighting generation units that are underperforming, and transmission/distribution bottlenecks that result in sub-optimal utilization

System level reform should start with better system-level planning. An overarching view is needed to evaluate the best power generation options and these options should be assessed alongside detailed transmission and distribution plans. This should be done with realistic expectations and in line with the overall development goals of Indonesia. It is crucial to have a power sector planning process that is credible. Without that, investors and technology partners will stay away, and stranded asset risks related to poor system decisions may impair PLN's ability to meet public expectations on an ongoing basis.

Reform should continue by **providing the right level of competition in project procurement.** The goal is to achieve price discovery for cheaper new technologies. The government should put in place consistent policies that align with market realities. This is particularly important in a period when dramatic new technology developments globally are shifting the boundaries between hard asset generating solutions and new system-management strategies which can leverage off new storage and peak shaving tools.

In an Indonesian context, it is crucial that the process of designing the national electricity planning document (**RUPTL**) **be transformed into a more transparent process based on data-rich evidence** that will motivate new partners to bring PLN their best strategies. It is also crucial that the public be given relevant data in a way that permits them to make responsible choices about their power usage and investment decisions.

To backstop any progress on transparency, accountability and good governance, it is also be **the right time to consider setting up a truly independent power regulatory body** that would oversee the whole system planning and operations of Indonesia's electricity sector. Energy ministries globally have proven themselves to be poor managers of the power sector, especially during periods of rapid technology and system change. Their policy lens is often too narrow to make the kind of tough-minded decisions that may cause short-term pain as markets reprice assets. Nevertheless, it is clear that markets that manage to prioritize the long-term strategic needs of users have been rewarded with more resilient systems that meet public expectations.

Annex

List of Mine-mouth Coal Power Plants

Plant	Location	Capacity (MW)	Target COD (based on RUPTL 2019)	Status as per RUPTL 2019	Project Company/Project Sponsor
Riau-1	Sub-District: Peranap District: Indragiri Hulu Province: Riau Island: Sumatra	600	2028	PPA signed (but in RUPTL 2019 changed to unallocated)	SPV: NewCo A Consortium of PT PJB Investasi - PT PLN Batu Bara (51%), and BlackGold Natural Resource Ltd. through PT Samantaka Batubara and China Huadian (49%)
Jambi-2	Village: Pemusiran Sub-district: Nipah Panjang, District: Tanjung Jabung Timur Province: Jambi Island: Sumatera	600	2022	Procurement	PT PP Energi (unclear)
Jambi-1	Sub-District: Mandiangin District: Sarongalun Province: Jambi Island: Sumatera	600	2023/2024	PPA signed Feb 2018 ground-breaking 1 Feb 2018	SPV: PT Jambi Power A Consortium of PT Indonesia Power and PT Sumber Segara Primadya
Banyuasin	Sub-district: Gunung Megang and Talang Ubi District: Muara Enim District: Banyuasin Province: South Sumatra Island: Sumatera	240	2021	PPA signed: (original) 21 March 2007 (amendment III) 20 Oct 2017 - latest status by end of May 2018 Under construction	SPV: PT Banyuasin Power Energy shareholding structure is unclear. PT Truba Alam Manunggal Engineering, Oceanwide Holdings Co. Ltd. (85% shares, issued/registered capital is Rp 150 billion), and Power Construction Corporation of China (Power China - owner of Sinohydro)

Plant	Location	Capacity (MW)	Target COD (based on RUPTL 2019)	Status as per RUPTL 2019	Project Company/Project Sponsor
Sumsel-1	Village: Tanjung Menang Sub-district: Rambang Dangku District: Muara Enim Province South Sumatera Island: Sumatera	600	2021	PPA signed on 12 Dec 2016 (according to PLN progress report) FC 31 Oct 2017 Under construction (6% progress)	SPV: PT Shenhua Guoholian power A Consortium of PT PJB Investasi and China Shenhua Energy
Sumsel-8	Sub-district: Rawas Ilir District: Musi Rawas Utara Province: South Sumatra Island: Sumatera	1,200	2022/2023	PPA amendment signed 19 Oct 2017 Under construction (3.75% progress)	SPV: PT Huadian Bukit Power Asam A consortium of China Huadian (55%), PT Bukit Asam (45%)
Sumbagsel-1	Province: South Sumatera Island: Sumatera	300	2023	PPA signed end of May 2018 Under construction	Project is assigned to PT PJB Investasi (appointed partner is unclear)
Sumsel MT (Ekspansi)	Province: South Sumatera Island: Sumatera	350	2023	Planning (in RUPTL 2019 - planned)	Not yet decided
Sumsel-6	Village: Tanjung Enim Sub-district: Lawang Kidul District: Muara Enim Province: South Sumatera Island: Sumatera	300	2027	PPA	Project is assigned to PT PJB Investasi (partner is not yet appointed)
Kalselteng 3	Province: Central Kalimantan Island: Kalimantan	200	2024/25	(according to RUPTL 2019 Planned)	Project is assigned to PT PJB Investasi (partner is not yet appointed)
Kalselteng 4	District: Kutai Kartanegara Province: East Kalimantan Island: Kalimantan	200	2026/27	(according to RUPTL 2019 Planned)	Project is assigned to PT PJB Investasi (partner is not yet appointed)
Kalselteng 5	Sub-district: Jorong District: Tanah Laut Province: South Kalimantan Island: Kalimantan	100	2028	(according to RUPTL 2019 Planned)	Project is assigned to PT PJB Investasi (partner is not yet appointed)

Plant	Location	Capacity (MW)	Target COD (based on RUPTL 2019)	Status as per RUPTL 2019	Project Company/Project Sponsor
Kaltim 3	Province: East Kalimantan Island: Kalimantan	200	2025/26	(according to RUPTL 2019 Planned)	Bhakti Energy and China Shenhua Overseas Development and Investment (Adaro Indonesia (49%) and Shenhua Group (51%)
Kaltim 5	Province: East Kalimantan Island: Kalimantan	200	2027/28	(according to RUPTL 2019 Planned)	Previously was assigned to PT Indonesia Power (51%) and Adaro (49%), but as of April 2019, Adaro backed out of the project.

Regulatory Framework on Mine-mouth Coal Power Plants

MEMR Regulation No 10/2014	• Regulate procedures for the supply and pricing of coal for mine mouth power plants • The availability of the coal supply is guaranteed by the coal mining company throughout the operation of the plant; • The coal mining company needs to obtain a clear and clean status, has coal reserve and quality appropriate to the power plant, obtained approval from MEMR on basic coal price • The coal mining company and its affiliate needs to be in the consortium of the mine mouth coal power company, having a minimum equity interest of 10% of the mine mouth power company • The price of coal is calculated based on the basic price of coal plus an escalation. Basic price of coal is calculated through a formula which will consider production cost plus margin. • The production cost is set by MEMR, which considers the cost of overburden stripping, mining, transportation from mine to processing site, coal processing cost, environmental monitoring and management, reclamation and post-mining cost, health and safety, community development, land acquisition/clearance, overhead cost, depreciation and amortization, and fixed cost and or royalties • Production cost also includes tax and other processing costs, excluding transportation cost from processing site to stockpile area of the mine mouth power plant • Margin is set at 25% from the total production cost • Basic coal price remains in effect for the duration of the coal purchase agreement or the power purchase agreement • This regulation is cancelled by MEMR Regulation no 9/2016
MEMR Regulation No 03/2015	• Regulate procedures for power purchase and benchmark prices for purchasing electricity from coal mine mouth power plants, coal power plants, gas power / gas wellhead power plants, and hydro power plants by PLN through direct selection and direct appointment • Purchase of electricity from coal mine mouth power plants can be made through direct selection or direct appointment, as long as it meets criteria as set below. • Criteria for direct selection: ⇒ Energy diversification for non-diesel power ⇒ To Increase existing generation capacity • Criteria for direct appointment: ⇒ Purchase of electricity (and purchase of excess electricity) from coal mine mouth, coal power, gas and well-head gas power, and hydro if the local electricity system is in critical condition, or ⇒ To increase generation capacity in the area • Price of electricity purchase is capped by the ministry, based on levelized generation cost according to capacity, heat rate, and calorific value of the coal. • This regulation is cancelled by MEMR Regulation no 19/2017
Presidential Regulation No 4/2016 • *Signed January 2016*	• Sets the guidelines for acceleration of electricity infrastructure development • Development of electricity infrastructure shall be in accordance to the Electricity Supply Business Plan (RUPTL) as set by the MEMR • The development of electricity infrastructure is signed to PLN, through PLN own self-management, and cooperation for electricity supply. • Cooperation for electricity supply is done through PLN's subsidiaries (if it involves a foreign state-owned entity), or through Independent Power Producers.

	• Cooperation with a foreign state-owned entity through PLN's subsidiaries can be done if the foreign entity obtains strategic value for PLN which includes provision of funds needed by PLN, and or obtain availability of energy which will be used by PLN. • PLN subsidiaries here are subsidiaries owned a minimum of 51% by PLN, directly or through another subsidiaries of PLN
MEMR Regulation No 9/2016 - Signed April 2016	• Regulate the procedures for the supply and pricing of coal for mine mouth power plants • The coal to be used is economically feasible for utilisation in a mine-mouth power project • The availability of the coal supply is guaranteed by the coal mining company throughout the operation of the plant • The power plant is no more than 20 km from the location of the coal mine • The coal price does not include transportation costs except from mine location to the power plant's stockpile • The coal mining company needs to obtain a clear and clean status, has coal reserve and quality appropriate to the power plant, obtained approval from MEMR on basic coal price • The coal mining company or its affiliate needs to be in the consortium of the mine mouth coal power company, having a minimum equity interest of 10% of the mine mouth power company • The price of coal is calculated based on the basic price of coal plus an escalation. The price of coal is the price calculated at the point of sale of the mine mouth power plant stockpile. • Basic price of coal is calculated through a formula which will consider production cost plus margin • The production cost is set by MEMR, which considers the cost of overburden stripping, mining, transportation from mine to processing site, transportation cost from processing facility to the power plant stockpile, coal processing cost, environmental monitoring and management, reclamation and post-mining cost, health and safety, community development, land acquisition/clearance, overhead cost, depreciation and amortization, and fixed cost and or royalties • Production cost includes tax and other processing costs • Margin is set at a minimum 15% and maximum 25% from the total production cost. Margin is determined based on agreement between the coal mining company and the coal mine mouth power plant company. In the even that price agreement is not reached within 60 days since the regulation is issued, the Ministry will decide the margin. • This regulation is amended by MEMR Regulation no 24/2016
MEMR Regulation No 24/2016 - Signed 13 Sept 2016	• This regulation amended a few clauses registered in the MEMR Regulation no 9/2016 • Added a clause: price of coal is calculated based on basic price of coal plus production cost/royalties • Added a clause: basic price for coal is set by agreement between coal mining company and coal mine mouth power company • Added a clause: production cost as set in the MEMR Regulation no 9/2016 will be determined by its own Ministerial Decree • Deleted a clause: In the even that price agreement is not reached, the Ministry will decide the margin. • Deleted chapter 11 which sets procedures for application for basic coal price approval from the ministry.

	• Changed a chapter: that now all PPAs that have been signed, and or coal price for coal mine mouth that has been agreed by the Minister, must be adjusted according to this regulation
Presidential Regulation No 14/2017	• This regulation amended a few clauses registered in the Presidential Regulation no 4/2016 • Added a clause: provision regarding cooperation in the supply of electricity as assigned by the government will follow guidelines set by the Ministry of State-Owned Enterprise Regulations • Added a clause: Cooperation with a foreign state-owned entity through PLN's subsidiaries can be done if the foreign entity obtains strategic value for PLN which includes provision of funds needed by PLN, and or obtain availability of energy which will be used by PLN, or transfer of technology, and or increasing local production capacity.
MEMR Regulation No 19/2017	• Any holder of electricity business supply permit (IUPTL) that holds a business area permit are allowed to buy electricity from coal power plant (both mine mouth and non-mine mouth). Electricity purchase from mine mouth cola power plants can be done through direct appointment. • For mine mouth power plants, PLN and IPP needs to ensure allocation/reserves of the coal is appropriate as required in the PPA • Coal reserves and allocation is based on agreement between coal mining company with coal mine mouth power company • PPA is 30 years since Commissioning Operation Date (COD) • Electricity purchase price is determined as follows: a) Where local electricity supply cost (local BPP) is at par or lower than the National supply cost of electricity (National BPP), then tariff is capped at no more than 75% of local BPP, or b) Where the local BPP is higher than the National BPP, then tariff is capped at no more than 75% of National BPP • Electricity purchase tariff is set with an 80% Capacity Factor (CF) assumption • Grid infrastructure development needed to connect to the nearest PLN Grid can be borne by the IPP based on mutually beneficial business to business mechanism • Power purchase agreement should use a Build, Own, Operate and Transfer (BOOT) mechanism • Power purchase from an expansion of generation units in the same location can be done through direct appointment, with a capped tariff as above. • In terms of purchasing power from an expansion units in a different location but in the same system, a direct selection process can be done, with a capped tariff as above

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