

# **A Foreseeable Planning Mismatch**

**Indonesia's Industry 4.0 Plans Require  
Grid Modernization**



**Institute for Energy Economics  
and Financial Analysis**  
IEEFA.org

**September 2018**

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# Introduction

In April 2018, President Joko Widodo unveiled a roadmap to drive Indonesia into the world's top 10 largest economies by 2030. The roadmap is dubbed “Making Indonesia 4.0”, a reference to the fourth industrial revolution sweeping the world via innovations in digital technology, artificial intelligence and 3-D printing, among other areas. The plan is focused on spurring growth in five sectors of the Indonesian economy— food and beverages, textile & clothing, automotive, chemicals and electronics— and improving Indonesia's global competitiveness and export potential.

The intent is noble, but it ignores the necessary foundation that would make it possible— a modernized, efficient and reliable electric system, one that is designed to accommodate a more sophisticated future supply and demand, rather than focusing only on adding more generation capacity. Improvements should be prioritized on the system design first. If Making Indonesia 4.0 is to become a reality, the government needs first to embark on an Energy 4.0 campaign, one that will enable the country's electricity system to meet the digital needs of the new era affordably and reliably.

## The Key Problems in Indonesia's Outdated Power System

### PLN is Ill-Prepared to Meet Future Needs

PLN, Indonesia's state-owned utility, is not equipped, either in terms of its existing infrastructure or human resources, to meet the more sophisticated power system needs (particularly high-level reliability and power quality) envisioned in the new 4.0 plan.

The utility's sprawling existing transmission and distribution system (which included 48,901 kilometres of transmission lines, 1,028,679 kilometres of distribution lines and 113,791 megavolt amperes of transformer capacity at the end of 2017<sup>1</sup>) already is hard-pressed to maintain stable supplies in areas with high load densities, including Jakarta, Bandung and Surabaya.

A WRI-Prayas study conducted in 2017 showed that power cuts and interruptions are still common in Indonesia. The study, which collected data from 25 sampling points in the Jakarta area, found that power voltage levels are uniformly low. Using 220 volts as the preferred level, the study defined low as anything at 210 volts or below; high voltage levels were defined as being 250 volts or above. Ranges outside the norm are a serious problem for existing users, negatively affecting the performance of electronics across the board and leading to quicker operational degradation. Looking ahead, poor power quality could undercut any push for greater use of the sophisticated electronics that are an integral part of the 4.0 plan.

The study also found that in sample sites including residences, small businesses, public buildings and farms, installed electric capacity was more than adequate to meet users' demand; in other words, power cuts and interruptions should not still be occurring. Yet many

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<sup>1</sup> PLN Statistics 2017.

buildings continue to experience these problems.<sup>2</sup> This study confirms that just having the necessary capacity is meaningless if the T&D system is not updated and well-maintained.

Outside Java and Bali, the supply issues are even more troubling. There, energy dispatch operations are often still done manually, which is a major impediment for any hoped-for digital transition. Inevitably, PLN must improve its balancing, frequency control and dispatch capabilities.

The government also needs to acknowledge that, in the era of automation, energy demand growth likely will not be as dramatic as in years past and might be harder to forecast. Industries are continually looking to adopt more energy-efficient processes and technology and, increasingly, are seeking to purchase renewable energy, due both to concerns about climate change and the sharp deflationary trends pushing solar, wind and other renewable prices downward. Indonesia will need more power supply in the long term, but it likely will not need as much or as soon as previously expected.

Traditionally, PLN has always forecast that demand will closely track expected economic growth. But evidence suggests that the more advanced an economy becomes, the more energy intensity of said economy will decline as energy usage decouples from growth and productivity per unit of energy increases.

Finally, if the country hopes to shift to a more digital future, one where demand ramps more frequently than in the past, PLN must revisit its plans to rely on inflexible coal generators. Modernizing the T&D sector is imperative going forward to account for changing demands on the system.

The recent plunge of the rupiah's value, which prompted the government to temporarily halt 15.2GW of power plants that have yet to reach financial closing, might be a blessing for PLN. It should give the company time to step back, rethink its current growth plans and study the efforts of other economies that already have entered the beginning stages of the 4.0 transformation.

## **Lack of Transparency Hurts the Nation's Electricity Market**

Lack of transparency is one of the most urgent problems across the Indonesian electricity sector. Making outcomes impossible to predict, it creates an uneven playing field for private companies trying to enter the sector.

First, verifiable data is difficult to find. This is a particular problem regarding the data used to calculate the most influential number of all, the cost of PLN's electricity production or the BPP (*Biaya Pokok Produksi*).<sup>3</sup> The BPP is used as a basis for everything, (i.e., IPP tariffs, basic

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<sup>2</sup> WRI Indonesia. [Beyond A Connection: Improving Energy Access in Indonesia with Open Data](#). March 9, 2017.

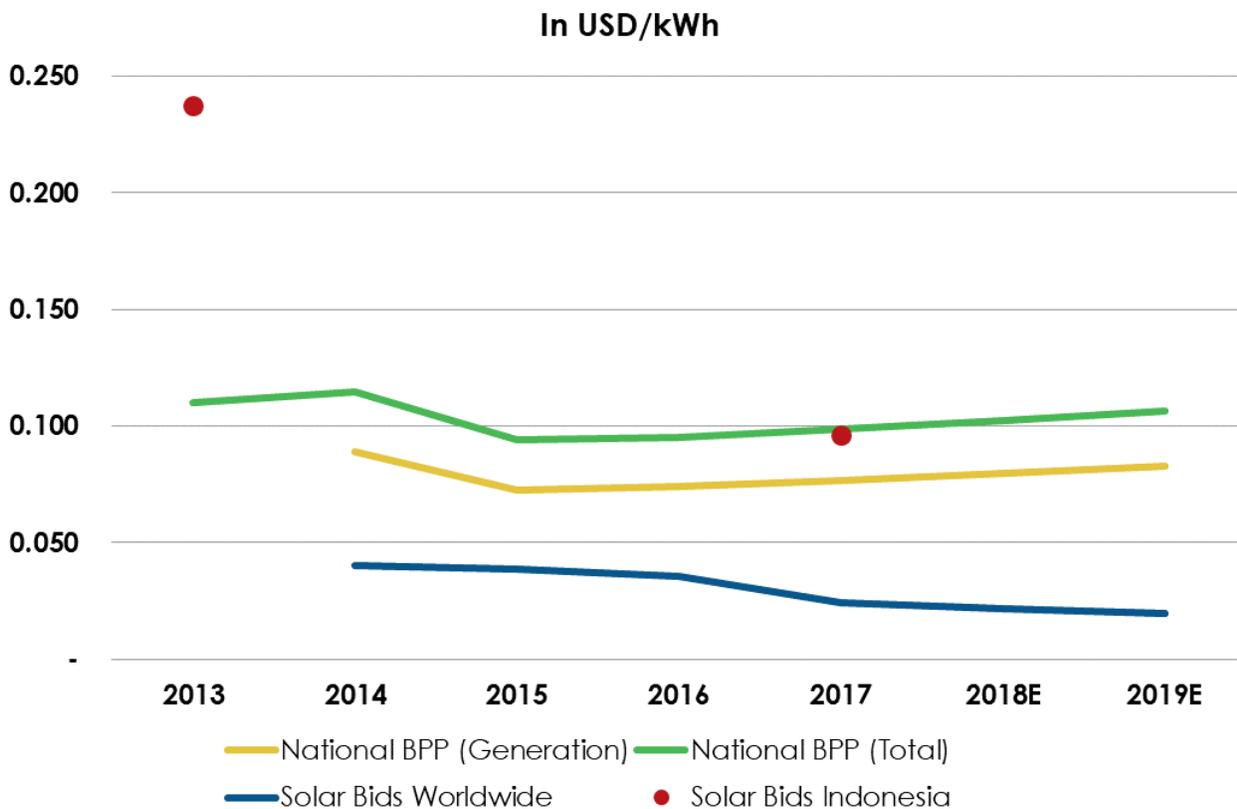
<sup>3</sup> According to RUPTL, BPP total is the basic cost of electricity production calculated based on a certain formula by taking into account the calculation of the transmission and distribution network losses, set by the Minister of Energy and Mineral Resources, specifically the Directorate General of Electricity. In the last 2 years, the MEMR also set a yearly "*BPP Pembangkitan*" or the cost of electricity generation (without transmission and distribution cost), which is used as the base number to calculate IPP tariff.

electricity pricing for consumers, and even to derive subsidy calculations), but the data used to calculate the figure is hidden. This lack of transparency calls into question virtually everything the utility does.

It is also difficult to find data related to the T&D system and operation of the country's generation facilities. The limited available information on such basic data makes it hard for potential investors and others to analyze the real performance of Indonesia's power system. In turn, this makes it impossible to study where future investments would have the most impact or how to boost the system's operational efficiency.

This lack of transparency has been a boon for the nation's coal industry. Despite outside studies showing how high the real costs of coal-fired generation are, government officials and PLN have continued to back coal as the cheapest source of electricity and have insisted on building more coal-fired generation. The graphic below clearly shows how outdated those government/utility assertions are.

**Figure 1: PLN Electricity Production Cost vs. Historical Solar Bids**



Source: PLN Annual Reports 2014, 2015, 2016, 2017. Other data gathered from BNEF, ministerial briefings and PWC Power in Indonesia: Investment and Taxation Guide 2017, and IEEFA estimates.

It is clear from the chart above that PLN's coal-dependent electric generation costs have been well above the price of solar bids in other parts of the world for the past five years. The slight dip in the BPP in 2015 was consistent with the decreasing fossil fuel price during that period, and the slight rise since can also be linked to rising international coal prices.

Another study, by India's Centre for Science and Environment, shows that grid parity for solar (versus conventional fossil fuels) is coming much faster than previously thought. According to their research, solar in Indonesia will match coal's costs in the next two to three years.<sup>4</sup> Many other studies, including ones published by IRENA, IEA and BNEF also support this transition. Elena Giannakopoulou, head of energy economics at BNEF, also stressed "Some existing coal and gas power stations, with sunk capital costs, will continue to have a role for many years, doing a combination of bulk generation and balancing, as wind and solar penetration increase. But the economic case for building new coal and gas capacity is crumbling, as batteries start to encroach on the flexibility and peaking revenues enjoyed by fossil fuel plants."<sup>5</sup>

Clearly, in the near future the cost of wind, solar and batteries are going to fall below the cost of fossil fuel generation. The only remaining question now is when? Considering coal prices are likely to remain high over the next few years, the future might arrive faster than predicted.

PLN's procurement system is also marked by a lack of transparency. The utility has used a direct appointment or award system for many mine and coal-fired power plant projects. This system is legally allowed, but it has created opportunities for corruption, collusion and nepotism—and includes no incentives for keeping costs down or providing reliable supplies. The recent corruption case surrounding the Riau 1 IPP is emblematic of challenges facing Indonesia due to its over-reliance on coal IPPs backed by a revolving cast of coal producers that are highly motivated to push speculative projects that will benefit narrow interests.<sup>6</sup>

Even the utility's power supply auctions, which are designed to be open, suffer from a lack of transparency. Based on several complaints from participating IPPs, tender results sometimes leave potential bidders uninformed and confused. While tenders are always better than a simple award, Indonesia should study the successful open tenders held recently in India and Mexico. These tenders have almost always pushed prices downward and helped keep bidders interested in the market and future opportunities.

Lack of transparency also hurts the adoption of clean, but new renewable technologies, since there is no verifiable cost for bidders to beat, just PLN and government assertions.

One such assertion, also advanced by fossil fuel proponents in general, is that variable renewable generation is expensive and will not be able to meet the needs of the country's sprawling territory. But a study by the Australia-Indonesia Centre found that distributed energy technology, particularly solar PV and pumped hydro storage might be the best solution for Indonesia.

Dr. Ir Tri Desmana Rachmildha of ITB's Electrical Power Research Group argues that only a tiny fraction of Indonesia's landmass would need to be used to meet the country's entire energy requirements. "We calculated that our solar potential is enough for our energy needs for a whole year for Indonesian people, by installing only 0.1 percent of our land area," said Desmana.

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<sup>4</sup> Kumarankandath, Aruna et.al, A Case for Solar Rooftop in Indonesia: A Centre for Science and Environment Assessment, 2017.

<sup>5</sup> Bloomberg NEF. [Tumbling Costs for Wind, Solar, Batteries Are Squeezing Fossil Fuels](#). March 28, 2018.

<sup>6</sup> Melissa Brown (IEEFA). [A Bad Month for the Southeast Asian Coal Power Juggernaut](#). August 2, 2018.

The centre's research also confirmed that due to Indonesia's mountainous landscape, the country is well-suited to using pumped hydro technology— where generated power is stored as potential energy using reservoirs at different altitudes.<sup>7</sup>

Sometimes, waiting for a technology to mature and reach its lowest stable price is a sensible strategy. But given the recent price declines in the renewable sector and predictions of continued deflationary trends, PLN's waiting strategy is no longer valid, particularly as it implies a continued willingness to build outdated, expensive and inflexible coal-fired plants that would only create losses for the country in the future.<sup>8</sup> Worse, that inflexible generation system may make it impossible to reach the country's ambitious 4.0 goals. Now is the time to start designing in RE and to optimize the system design, so Indonesia can benefit from existing renewable technology trends.

## Indonesia's Energy 4.0 Options

There are three possible solutions to the energy monopoly and resulting inefficiency problems confronting Indonesia: establishing an independent body to run the system, creating competition for PLN or turning the utility into a publicly traded entity.

First, to avoid conflicts inherent within the current regulators for electricity sector, there is a need to establish an independent body to oversee Indonesia's entire electricity sector. This organization would be responsible for supervising PLN and its performance as well as the other relatively small independent utilities that have been given business permits.<sup>9</sup> The organization also would be responsible for ensuring data transparency and reliability for the benefit of the public.

Secondly, a 2004 Constitutional Court ruling, which essentially held that the electricity sector must remain under the exclusive control of the government, complicates the choices, but does not prevent change entirely.

For example, the government could opt to create some competition for PLN by establishing another state-owned enterprise to go head to head with the current monopoly. While not full competition, the two companies likely would be forced to improve operational efficiency, boost customer service and perhaps even strive harder to roll out innovative solutions. Here, the case of the Indonesian telecommunications sector is a good example, with Telkom moving aggressively to cut prices, improve service and introduce new products after Indosat, Exelcomindo and others were created to challenge the incumbent. While not a certainty, a similar change could take place if a state-run competitor to PLN was established, leading to better service, lower prices and more innovation across the board.

The third option would be to turn PLN into a publicly listed company. Listed companies inevitably need to be more transparent and efficient, as they are monitored by a diverse range of shareholders. Considering the Constitutional Court ruling, this option might be the least preferred, but it would still be an option if the government retained a majority stake in

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<sup>7</sup> The Australia-Indonesia Centre. [What is the future of renewable energy in Indonesia?](#) July 12, 2018.

<sup>8</sup> Please see further explanation in the IEEFA report: [A Bad Month for the Southeast Asian Coal Power Juggernaut](#).

<sup>9</sup> Indonesia has nine special integrated electricity business permits issued to industrial zones that are running independently, not through PLN.

PLN. Examples of this option include PT Bank Mandiri Tbk in the banking sector and PT Wijaya Karya Tbk in the construction sector). That said, consideration of going private has a caveat of its own, as becoming regulated companies would do little to change outcomes other than putting pressures on disclosure and increasing pressures to generate positive cashflow and profits, and to pay dividends. This would only be appropriate when there is an intention to run the company to benefit shareholders, and in the end, it could imply much higher tariffs for ratepayers.

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