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Accelerating Investments in Renewables in Indonesia

Drivers, Risks, and Opportunities

Report | July 2019

Arjun Dutt, Kanika Chawla, and Neeraj Kuldeep

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The **CEEW Centre for Energy Finance** (CEF) is an initiative of the Council on Energy, Environment and Water (CEEW), one of South Asia's leading think tanks. CEF acts as a non-partisan market observer and driver that monitors, develops, tests, and deploys financial solutions to advance the energy transition. It aims to help deepen markets, increase transparency, and attract capital in clean energy sectors in emerging economies. It achieves this by comprehensively tracking, interpreting, and responding to developments in the energy markets while also bridging gaps between governments, industry, and financiers.

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CEEW Centre for Energy Finance

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The need for enabling an efficient and timely energy transition is growing in emerging economies. In response, CEF focuses on developing fit-for-purpose market-responsive financial products. A robust energy transition requires deep markets, which need continuous monitoring, support, and course correction. By designing financial solutions and providing near-real-time analysis of current and emerging clean energy markets, CEF builds confidence and coherence among key actors, reduces information asymmetry, and bridges the financial gap.

Financing the energy transition in emerging economies

The clean energy transition is gaining momentum across the world with cumulative renewable energy installation crossing 1000 GW in 2018. Several emerging markets see renewable energy markets of significant scale. However, these markets are young and prone to challenges that could inhibit or reverse the recent advances. Emerging economies lack well-functioning markets. That makes investment in clean technologies risky and prevents capital from flowing from where it is in surplus to regions where it is most needed. CEF addresses the urgent need for increasing the flow and affordability of private capital into clean energy markets in emerging economies.

CEF's focus: analysis and solutions

CEF has a twin focus on markets and solutions. CEF's market analysis covers energy transition–related sectors on both the supply side (solar, wind, energy storage) and demand side (electric vehicles, distributed renewable energy applications). It creates open source data sets, salient and timely analysis, and market trend studies.

CEF's solution-focused work will enable the flow of new and more affordable capital into clean energy sectors. These solutions will be designed to address specific market risks that block capital flows. These will include designing, implementation support, and evaluation of policy instruments, insurance products, and incubation funds.

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Arjun Dutt is a programme associate at CEEW. His work spans renewable energy finance, policy and markets, and is geared towards analysing risks constraining renewable energy investments and enhancing the flow of finance to the renewable energy sector. Prior to his association with CEEW, Arjun worked for over three years in equity research. He has a BE in Electronics and Communication Engineering from Delhi College of Engineering, and an MBA from Management Development Institute, Gurgaon.

"While solar and wind energy have so far played a minor role in serving Indonesia's energy needs, under the right regulatory and market conditions these could advance key national priorities of affordable electricity, energy security and energy access. Making the case for solar and wind energy in the Indonesian context, this report presents a broad-ranging perspective on current challenges hindering investments and potential solutions for unlocking investments at scale."

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Kanika Chawla is a policy specialist working at the intersection of renewable energy and financial markets. She is the Director of the CEEW Centre on Energy Finance and also manages the Council's research and outreach in renewable energy policy, regulation, markets, and socio-economic value. She is actively engaged with private and public enterprises within and outside India in designing and developing financial de-risking instruments. Kanika has an MSc in Economics and Development Economics from the University of Nottingham, and an undergraduate honours degree in Economics from Miranda House, University of Delhi.

"Indonesia is in the early stages of variable renewable energy adoption, but has significant resource availability and market opportunity to scale up its use of solar and wind energy. As Indonesia advances down this path, there are multiple learnings that it could take from the Indian experience, especially on market design, price discovery, and financial structures that can enable the flow of private capital to build an energy system of the future."

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Neeraj Kuldeep is a Programme Lead at the Council on Energy, Environment and Water (CEEW), where his research revolves around renewable energy markets. He has worked and published extensively on the impact of the Goods and Services Tax (GST), long term assessments of grid electricity tariffs, risks in the renewable energy sector in emerging economies, assessment of jobs and skills gap, energy storage technologies and wind energy market. He is currently leading the rooftop programme and piloting new utility-led business model to accelerate rooftop solar deployment. Neeraj holds an undergraduate degree in Energy Science and Engineering, and an M. Tech in Energy Systems from the Indian Institute of Technology (IIT), Bombay.

"Indonesia is blessed with large renewable energy resources, though the renewable energy sector is currently struggling due to restrictive regional and national policies. Lack of coordination among concerned government departments has resulted in conflicting policy and regulatory priorities. Favourable changes in tariff setting mechanism, land ownership, domestic content requirement etc, would provide the required impetus to the renewable energy sector in Indonesia."

Image: Shutterstock

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Abbreviations

ADB	Asian Development Bank
AFD	Agence Francaise de Development
AMC-MF	asset management company – mutual fund
BKF	Fiscal Policy Agency
BKPM	Investment Coordinating Board
BOOT	build-own-operate-transfer
BPP	electricity generation cost
COD	commercial operation date
CEEW	Council on Energy, Environment and Water
CEF	Centre for Energy Finance
CPSU	central public sector undertaking
DCR	domestic content requirement
DEG	Deutsche Investitions- und Entwicklungsgesellschaft
DEN	National Energy Council
DGE	Directorate General of Electricity
DGNREEC	Directorate General of New, Renewable Energy, and Energy Conservation
DMO	domestic market obligations
DPT	list of selected providers
DRE	distributed renewable energy
EIB	European Investment Bank
EVA	ethylene vinyl acetate
FIT	feed-in-tariff
FMO	Nederlandse Financierings-Maatschappij voor Ontwikkelingslanden N.V.
GATT	General Agreement on Tariffs and Trade
GCA	government contracting agencies
GCF	Green Climate Fund
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GW	gigawatt
IFC	International Finance Corporation
IIGF	Indonesia Infrastructure Guarantee Fund
INR	Indian rupee
IO-Non BBM	non-fossil fuel operating license
IPP	independent power producer
IRR	internal rate of return
IUPTL	Electricity Supply Business License
JBIC	Japan Bank for International Cooperation
kWh	kilowatt-hour
LCOE	levelised cost of electricity
MDB	multilateral development bank
MEMR	Ministry of Energy and Mineral Resources
MoF	Ministry of Finance
MoI	Ministry of Industry
MoSOE	Ministry of State-owned Enterprises
MW	megawatt
KEN	National Energy Policy
NFM	natural force majeure
NRE	new and renewable energy
NTT	East Nusa Tenggara
OSS	online submission system
PLN	Perusahaan Listrik Negara
PPA	power purchase agreement
PPU	private power utility
PT SMI	PT Sarana Multi Infrastruktur
PV	photovoltaic
RE	renewable energy
RUEN	National Energy General Plan
RUKD	Regional Electricity General Plan
RUKN	National Electricity General Plan
RUPTL	Electricity Supply Business Plan
SCADA	supervisory control and data acquisition
SMBC	Sumitomo Mitsui Banking Corporation
TRIMs	Trade-Related Investment Measures
USD	United States Dollar
UNDP	United Nations Development Program
WTO	World Trade Organisation

Executive summary

A majority of countries around the world are witnessing, and advancing, an energy transition. This transition is not homogenous. While the energy transition does present opportunities for nations to learn, collaborate, and share with each other, its success is also deeply dependent on domestic priorities and challenges. In this context, it is critical to analyse the risks and opportunities in each economy before identifying solutions to further enable their energy transition. This report is part of an emerging economies series which assesses the impediments to the flow of capital in renewable energy markets in these countries and identifies opportunities for collaboration and learning.

Indonesia is an emerging economy characterised by low per capita electricity consumption compared to regional and global peers, but robust long-term economic growth prospects. With rising income levels and nearly full electrification, electricity consumption is set to rise rapidly. Key national priorities with respect to electricity planning and implementation are ensuring affordable electricity, implementing energy security, and expanding energy access. Endowed with plentiful coal resources, Indonesia has relied on coal-fired generation, supplemented by gas-, hydro- and geothermal-based generation, for its electricity needs. Besides these resources, the country has plentiful solar and wind potential, though these sources have only played a minor role in serving Indonesia's electricity needs thus far.

Under current regulatory and market conditions, solar and wind tariffs are not competitive compared to thermal generation. Their potential impact on the affordability of supply has prevented the large-scale deployment of solar and wind capacity. While current plans for new and renewable energy (NRE) capacity (this includes hydro in addition to other renewables such as solar, wind, geothermal, and biomass) addition incorporate only a small proportion of solar and wind capacity, these sources of generation could play a major role in advancing the key national priorities pertaining to electricity planning and implementation.

> **Under supportive market and regulatory conditions in international jurisdictions, solar and wind tariffs have dipped considerably below Indonesia's average generation costs of USD c 7.66/kWh**

Under supportive regulatory and market conditions, solar and wind tariffs have dipped considerably below Indonesia's 2017 average generation costs—USD c 7.66/kWh—to as low as USD c 2 /kWh and 3 /kWh for solar and wind respectively in international jurisdictions. These tariffs have stabilised around the USD c 4 / kWh mark in India. Thus, under the right market and regulatory conditions, solar and wind generation could help achieve the goal of energy security at affordable tariffs.

A number of challenges have heightened risks for investors, thereby constraining the pace of solar and wind capacity addition. Uncertainty over the project pipeline is one of the major barriers to renewable energy (RE) investments. Demand risk, stemming from the overestimation of the growth in electricity demand and subsequent reductions in planned capacity addition, has made long-term investment planning based on the Electricity Supply Business Plan (RUPTL) of Perusahaan Listrik Negara (PLN), Indonesia's state-owned integrated electricity utility, challenging for RE investors. This uncertainty has been exacerbated by delays and cancellations in the RE tendering process, leading to a lack of predictability in power procurement.

> **Several regulatory provisions have together impacted the viability and bankability of solar and wind projects, including the tariff regime, local content requirements for solar modules and the BOOT scheme.**

Several regulatory provisions have together negatively impacted the viability and bankability of solar and wind projects. The tariff regime for solar and wind generation benchmarks these tariffs to regional average power procurement costs for PLN. This forces solar and wind power to compete with thermal generation, which benefits from government-controlled coal prices. On the one hand, for solar and wind tariffs to be viable, they would have to exceed regional tariff caps in most regions, and on the other, adequately high tariff caps are usually found in remote regions with inadequate transmission infrastructure. Besides tariff regulation, it is challenging to ensure that solar photovoltaic (PV) modules used in projects conform to the 60 per cent local content requirements for two reasons: first, the local solar PV manufacturing industry lacks the backward integration to meet local content requirements. Secondly, domestically produced modules are more expensive than imports, translating into challenges in meeting tariff caps.

Further, the build-own-operate-transfer (BOOT) scheme for renewables necessitates land acquisition, which itself is problematic, besides making the financing and refinancing of projects challenging. In addition, new principles of natural force majeure allocation in power purchase agreements (PPAs), which effectively transfer these risks to developers, could create cash flow difficulties for developers in case of disruptions.

Due to the fragmented nature of Indonesia's grid infrastructure, only a few grids are capable of absorbing intermittent renewables at scale. Limits imposed on the grid penetration of intermittent renewables by PLN further constrain the plant size and the location of potential RE deployment. In addition, existing contracted thermal capacity, characterised by high capacity charges and take-or-pay fuel supply contracts, incentivises the dispatch of conventional over renewable power, translating into risks of curtailment of RE generation. The existing overcapacity of thermal power plants heightens this risk.

In order to accelerate RE investments, policy- or market-based solutions must systematically address the risks associated with the Indonesian RE ecosystem. Some lessons from India may be adapted to the Indonesian context.

> **Empowering MEMR in its role as the electricity regulator or greater inter-ministerial coordination between MEMR and MoSOE is necessary to ensure greater accountability from PLN in electricity planning and implementation.**

An important first step is ensuring greater accountability from PLN pertaining to its performance in terms of electricity planning and implementation. One possible means to achieve this outcome is empowering the Ministry of Energy and Mineral Resources (MEMR) in its role as the electricity regulator to enforce PLN's compliance with energy planning at the policy level. Alternatively, greater inter-ministerial coordination between MEMR and the Ministry of State-owned Enterprises (MoSOE), which directly monitors and supervises PLN's corporate performance, could also ensure compliance between energy planning at the policy level and electricity planning and implementation by PLN. In addition, the restructuring of PLN's operations by the separation of the distribution, transmission and generation business under separate corporate entities could enable the resolution of the inherent conflicts of interest of PLN operating as an integrated electricity utility, including the transmission system operator and the lone offtaker for power generation in Indonesia. These steps could go a long way towards addressing investor concerns pertaining to capacity planning, power procurement, and grid management and dispatch strategies.

The uncertainty pertaining to the project pipeline may be addressed through the announcement of multi-year RE tendering schedules that could act as advance market commitments for industry and investors alike. Such commitments have helped attract investors in the Indian context. This must be complemented by regularising RE procurement through the elimination of delays and cancellations. The phased introduction of renewable portfolio standards, first for commercial and industrial consumers, where latent demand for reliable and affordable power exists, and then for PLN, could create certainty of demand for investors. Renewable portfolio standards have been successful in creating certainty of demand for investors in the Indian context.

Existing capacity-planning methodologies and assumptions must be reviewed to rationalise thermal capacity addition in order to avoid exacerbating the existing overcapacity, mitigate the burden of the associated capacity payments for PLN, and lower curtailment risks for investors. There are a number of steps that can mitigate land- and transmission-related constraints. Considering their regional distribution, flexible sources of generation such as gas, hydro, and geothermal may be leveraged to enable RE integration beyond the currently imposed limits in grids connected to adequate flexible generation sources. The modernisation of grid infrastructure through the deployment of automated monitoring and control systems could further facilitate the integration of renewable energy into the grid.

> **Offering a plug-and-play model to developers by setting up solar or wind parks could help mitigate land and evacuation infrastructure risks.**

Offering a plug-and-play model to developers by setting up concentrated zones of project deployment, such as solar or wind parks, could facilitate investments. Solar parks, which provide land and evacuation infrastructure to developers for a fee, have been successful in driving solar investments in India, particularly from foreign investors. In order to conform to the BOOT scheme and ensure seamless transfer at the end of the PPA, these would need to be developed on PLN land.

Other measures may be considered to boost the viability of RE projects. With local PV manufacturers unable to produce modules meeting local content requirements, policymakers could consider allowing the usage of imported modules in projects or simply applying local content requirements to goods and services collectively instead of to modules specifically. Alternatively, they could create a separate, open category of projects to permit the use of imported modules. This could facilitate the realisation of competitive tariffs for renewable power. To support local manufacturing, the government may set up a category of projects which mandates the use of domestically produced modules for electricity consumption by government or state-owned entities. Such a scheme is compliant with World Trade Organization (WTO) rules and has been implemented in India to support domestic PV manufacturing.

> **Public money should be used to enhance the capacity of infrastructure financiers to underwrite risk.**

Finance continues to be a growing challenge for emerging economies, especially as the scale of their ambition grows. This makes the role of public money critical; public money should be used to enhance the capacity of infrastructure financiers to underwrite risk. This would enable the crowding in of private-sector investments and the scaling up of deployment of renewable energy assets in Indonesia.

1. Introduction

Motivations for the project

Renewable energy (RE) now accounts for the majority of global investment flows into power generation, driven by investments in solar and wind energy.[1,2] A combination of favourable policy support and market developments has improved the competitiveness of solar and wind generation and has increased RE investment flows. However, the distribution of investment flows is skewed towards specific markets—particularly among developing countries. While China, India, and Brazil collectively account for close to 80 per cent of RE investment flows in developing countries, investments lag behind in a number of other developing countries, including large emerging economies.[3] A number of risks limit RE investment flows in these economies.

With emerging economies expected to account for a significant share of the global incremental growth in energy demand, the decarbonisation of their respective power generation mixes is critical for the success of global climate change mitigation efforts.

To facilitate this process, it is essential to systematically identify major risks impeding RE investments in these countries. These risks may then be mitigated through a combination of policy- and market-based interventions. Lessons learnt from other countries at more advanced stages of the energy transition could inform these interventions. Towards this end, the Centre for Energy Finance (CEF) at the Council on Energy, Environment, and Water (CEEW) studied the risks constraining RE investments in two emerging economies in Asia and Africa, namely Indonesia and South Africa. The analysis by CEF focussed on solar and wind energy, the major drivers of global RE investments.

> **The systematic identification of risks for RE investments in emerging economies can enable their mitigation through policy- or market-based interventions, which is necessary for accelerating investments.**

An interim report published in June 2018 captured the early findings of CEEW's analysis of RE investment risks in Indonesia and South Africa. Building upon the early findings, largely drawn from desk research and remote consultations with key stakeholders, CEEW engaged extensively with major stakeholders in the RE sectors of the two countries to validate the early findings and delve deeper into the challenges constraining RE investments. The result was a more nuanced picture of the RE ecosystem, including the challenges constraining RE investments.

This report captures CEEW's findings regarding the risks constraining RE investments in Indonesia. It could help policymakers and market participants understand the major challenges constraining RE investments in Indonesia. The report also recommends measures to mitigate these risks. These recommendations draw upon lessons from India's energy transition, but keep in mind the policy and regulatory dimensions of Indonesia's RE ecosystem. Policymakers could consider these recommendations when devising interventions to accelerate RE investments in Indonesia.

1 International Energy Agency, *World Energy Investment*, 2018.
2 Frankfurt School-UNEP Centre and Bloomberg New Energy Finance, *Global Trends In Renewable Energy Investment*, 2018.
3 Ibid.

Structure of the report

The report begins by describing the methodology adopted for performing the study. Before diving into a detailed analysis of the Indonesian ecosystem, it summarises the key findings pertaining to the Indonesian RE market from the interim report. In order to set the context for a more detailed analysis of risks, the report then proceeds to provide a snapshot of the political economy of RE in Indonesia. This incorporates the national priorities pertaining to electricity planning and implementation, the country's RE potential and pace of capacity addition, and a description of the key stakeholders in the RE ecosystem and their roles. In light of Indonesia's national priorities, the report presents an alternative to the status quo represented by the country's coal-dominated power sector. Building upon this context, the report then presents a detailed analysis of the major challenges constraining RE investments in Indonesia. The report concludes with the identification of potential interventions geared towards accelerating RE investments in Indonesia.

2. Methodology

The preliminary analysis of Indonesia's RE ecosystem was carried out through detailed secondary research. This involved identifying the major players in Indonesia's power sector, developing an understanding of Indonesian regulations relating to RE, and analysing the challenges constraining RE investments. The early findings were recorded in the interim report published in June 2018. Building upon the interim report, telephonic conversations with a select group of experts on Indonesia's RE ecosystem were used to seek clarifications. Complemented by additional secondary research, this process helped refine CEEW researchers' understanding of the challenges facing RE investments in Indonesia.

The aforementioned research was followed by an extensive round of stakeholder consultations in Indonesia, including a roundtable discussion organised by the Ministry of Energy and Mineral Resources (MEMR), as well as separate consultations with other stakeholders. Organised by MEMR, the roundtable discussion was attended by a number of delegates from the ministry itself, the Indian Mission to Indonesia, RE developers, RE industry associations, and an Indonesian state-owned enterprise which is also a RE developer. In addition, separate consultations were held with a range of additional stakeholders, including representatives from four solar and wind developers; three financiers; the Ministry of Finance; ex-PLN officials; civil society organisations, including four policy research organisations and one industry body representing PV manufacturers; and four Indian companies operating in Indonesia, including two power plant equipment manufacturers, a power generation company which is also engaged in coal mining, and a consulting firm operating in the energy sector. These stakeholder consultations were useful for validating the findings from previous rounds of research, developing a deeper understanding of the political economy of the electricity sector in Indonesia, and identifying the major interventions needed to accelerate RE investments.

3. Key findings of the interim report

The interim report identified a range of risks that limit investments in solar and wind generation. These spanned risks stemming from regulation, including the RE tariff regime and local content requirements for solar energy, demand risk, transmission and land acquisition risks.

The tariff regime for RE introduced under MEMR Regulation 50/2017 was identified to have adversely impacted the attractiveness of returns for solar developers. While the pre-existing feed-in-tariff (FIT) regime provided for solar tariffs in the range USD c 14.5–25/kWh, the new tariff regime translated into tariff caps in the range USD c 7.08–17/kWh for regions with a regional electricity generation cost (BPP) greater than the national BPP. In conjunction with local content requirements for solar modules, which stipulate minimum local content requirements of 50 per cent and 60 per cent for solar modules deployed in projects in 2018 and 2019 respectively, these tariff caps made most solar projects unviable. Indonesia's local PV manufacturing industry is characterised by much higher production costs relative to imported modules, making it challenging for most solar projects to meet tariff caps.

Demand risk was identified as a major challenge for RE investments in the country. The overestimation of electricity demand growth in recent iterations of PLN's Electricity Supply Business Plan (RUPTL) has resulted in sharp downward revisions in planned capacity addition. This introduces uncertainty pertaining to the pipeline of potential RE projects available for investors in the country.

Transmission risk was identified as another major challenge for RE investments. Due to the fragmented nature of Indonesia's grid, only a few large grids have the capacity to absorb RE generation at scale. Limited

requirements for generation forecasting and monitoring of power plants under existing regulations further restrict the scale of intermittent RE generation that may be integrated into the grid.

The freezing of retail electricity tariffs over 2018 and 2019 was identified as a threat to the financial health of PLN, if accompanied by delays in the receipt of government subsidies. This was considered likely to adversely impact the ability of PLN to invest in strengthening transmission infrastructure.

Challenges in land acquisition have hampered several infrastructure projects in Indonesia. The lack of clarity over land ownership, particularly in rural areas, and resistance from local communities over land acquisition for infrastructure projects were identified as causes of the challenges pertaining to land acquisition.

4. Political economy of the Indonesian RE Ecosystem

In order to contextualise the challenges restricting RE investments in Indonesia, this section elaborates upon key national priorities concerning electricity planning and implementation; Indonesia's RE potential, targets, and capacity addition; and the key players in Indonesia's RE ecosystem.

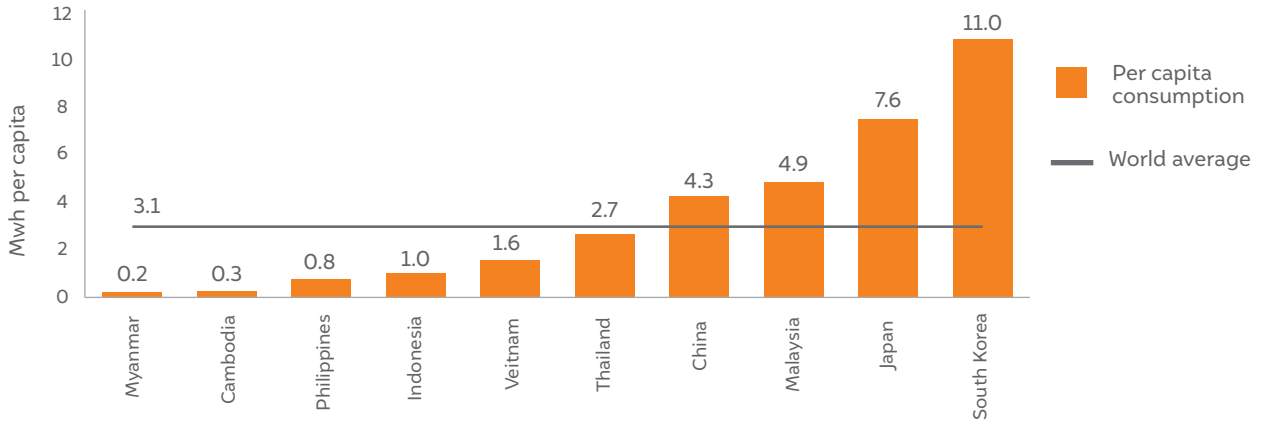
4.1 Priorities in electricity planning and implementation

Indonesia is characterised by relatively low levels of per capita electricity consumption compared to its developing and developed peers in the Asia-Pacific region and the world average (Figure 1).

However, both per capita and overall electricity consumption are set to rise rapidly in the country. A large emerging economy, Indonesia is characterised by robust long-term growth prospects, and is expected to become the world's fourth-largest economy by 2050.[4] This growth is expected to lead to sustained long-term growth in the demand for electricity. Electricity planning strives to cater to this rising demand. In addition, Indonesia is also striving to expand access to electricity, aiming to achieve 100 per cent electrification by 2020. The rate of electrification stands at 98.3 per cent as of March 2019.[5]

> **While incorporating a larger share of clean power into Indonesia's energy mix is an important consideration for policymakers, it is secondary to the priorities of ensuring affordability of supply, enhancing energy access and energy security**

Figure 1: Indonesia's annual electricity consumption per capita compared to regional peers



Sources:

1. Per capita consumption for 2017 sourced from PwC, Power In Indonesia, 2018
2. World average for 2014 sourced from World Bank data on electricity consumption.

4 Pwc, The World in 2050: How will the global economic order change?, 2017.

5 PLN, RUPTL, 2019–2028.

From the perspective of national priorities pertaining to electricity planning and implementation, Indonesia strives to maintain a delicate balance between the 'energy trilemma' of energy security, energy equity and environmental sustainability.[6] However, given the developmental priorities of the country, energy security and energy equity, in terms of the affordability of electricity and energy access, have been prioritised.[7,8,9]While incorporating a larger share of clean power into the country's energy mix is also an important consideration for policymakers[10], it becomes secondary in the event that it clashes with the aforementioned priorities, particularly if it raises the average generation cost.[11]

Reliance on fossil fuel-based generation

Indonesia is characterised by considerable reserves of thermal coal and is also the world's largest exporter of the commodity.[12] In addition, coal miners in Indonesia are subject to domestic market obligations (DMOs), or the obligation to sell a portion of their production in the domestic market.[13] DMOs for coal miners stand at 25 percent of total production.[14] PLN is the dominant consumer of coal, accounting for the consumption of around 20 percent of the overall domestic production of the commodity. In order to maintain affordability of supply, the country has supported its coal-fired generation through caps on coal prices (currently effective beginning 2018 till the end of 2019)[15,16,17] Under the present regulatory and market conditions, the lack of competitiveness of viable tariffs realised with solar and wind generation relative to thermal energy is one reason for the slow deployment of RE capacity.

The Indonesian landmass includes a number of remote islands, unconnected to major PLN grids. A number of these remote islands are reliant on diesel-based generation (which accounts for around six per cent of overall generation) for their electricity needs.[18]

4.2 RE resource potential, targets, and pace of capacity addition

Indonesia has considerable solar (208 GW) and wind (61 GW) generation potential, which add up to around four-and-a-half times Indonesia's current installed power capacity of 62.9 GW.[19,20]

There is a recognition of the opportunity that renewable energy presents, with the National Energy Policy (KEN) 2014 targeting at least a 23 per cent share of new and renewable energy (NRE)[21] in Indonesia's energy mix by 2025,[22] which translates to a 25 per cent share in the electricity generation mix by 2025.[23] PLN's 2019–2028 RUPTL targets 23 per cent NRE in the electricity generation mix by 2025, and a planned NRE capacity addition of 16.7 GW over the period 2019–2028. However, planned solar and wind capacity addition over 2019–28 stands at only 908 MW and 855 MW respectively.[24]

In contrast to Indonesia's sizeable solar and wind potential, actual capacity addition has been limited. Its grid-interactive solar installed capacity stands at around 24 MW.[25] This is complemented by close to 100 MW of off-grid decentralised solar systems.[26] The installed capacity for wind energy stands at around 150 MW.[27]

Besides a small installed capacity, the pace of new solar and wind project awards has been slow. In 2017, PLN signed 70 PPAs for 1.2 GW of NRE capacity, which included only 45 MW (six PPAs) of solar capacity.[28] No new solar or wind PPAs were signed in 2018.[29] Moreover, NRE projects in general are struggling to achieve

6 Based on stakeholder discussions
7 ibid
8 Pwc, Indonesian Power Industry Survey 2018
9 Indonesia's National Energy Policy 2014, http://ditjenpp.kemenkumham.go.id/arsip/terjemahan/2.pdf, Accessed on 16-4-2019
10 ibid
11 Based on stakeholder discussions.
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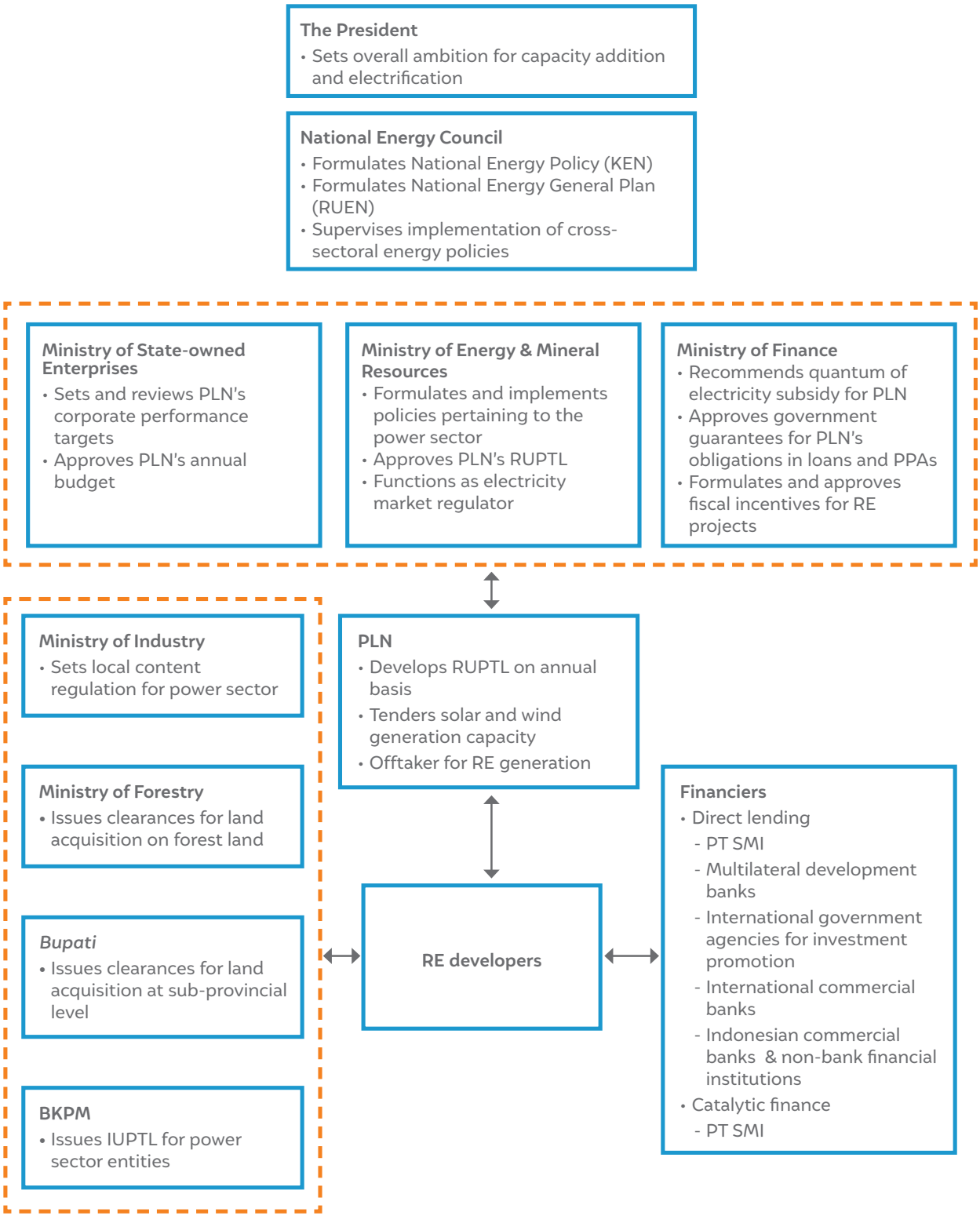
24 PLN, RUPTL 2019–2028, 2019.
25 IEEFA, Indonesia's Solar Policies Designed to Fail?, 2019.
26 Pwc, Power In Indonesia Investment and Taxation Guide, Sixth Edition, November 2018.
27 This figure includes Vena Energy's 72 MW plant in Jeneponto, which has been commissioned but is yet to begin commercial operations.
28 PLN, Renewable Energy Development Plan, 2018.
29 Based on stakeholder consultations.

financial closure – as of November 2018, as many as 32 of the 70 NRE PPAs signed by PLN in 2017 had not achieved financial closure.[30] The challenges in achieving financial closure and the slow pace of project awards are symptomatic of the issues impeding the scaling up of solar and wind investments in Indonesia.

4.3 Key players in Indonesia's RE ecosystem

This section elaborates upon the role of key players in Indonesia's RE ecosystem, as illustrated in Figure 2.

Figure 2: Indonesia's RE ecosystem



30 Ibid.

The President

Electricity generation is a key part of President Joko Widodo's infrastructure push. Originally, 35 GW of capacity addition was planned between 2015 and 2019, with the ending date coinciding with the last year of President Widodo's first term in office.[31] However, capacity addition under the programme was running behind schedule. The government has since modified the targeted end dates—it is now aiming for 20 GW to be operational by 2019 and 15 GW more by 2024.[32] Lower capacity addition requirements as a result of slower economic growth have been cited as reasons that support the deferment of the commissioning dates for part of the capacity to 2024.

Table 1: Status of 35 GW programme (end 2018)

	Operational	Under construction	Yet to begin construction	Tendering process underway	Under preparation
Capacity (MW)	2,899	18,207	11,467	1,683	954

Source: RambuEnergy, "Indonesia Govt Now Expects 35 GW Program Fully Completed in 2024", https://www.rambuenergy.com/2019/01/indonesia-govt-now-expects-35-gw-project-fully-completed-in-2024/, accessed on 8-4-2019

The National Energy Council (DEN)

Established under the mandate of Law No. 30 of 2007, the National Energy Council (DEN) comprises the President, ministers from seven ministries (Finance, Development Planning (Bappenas), Transportation, Industry, Agriculture, Environment and Forestry, and Research, Technology and Higher Education) responsible for the provision, transportation, distribution and utilisation of energy and eight experts from diverse fields such as academia, technology, industry etc.[33] The DEN is tasked with designing and formulating the National Energy Policy (KEN) and the National Energy General Plan (RUEN), a cross-sectoral implementation plan to operationalise the KEN. The DEN also supervises the implementation of cross-sectoral energy policies.

Ministry of Energy & Mineral Resources (MEMR)

MEMR formulates and implements policies pertaining to energy and natural resources in Indonesia, including the power sector. Within MEMR, the Directorate General of Electricity (DGE) is responsible for matters related to the power sector, while a separate Directorate General of New, Renewable Energy, and Energy Conservation (DGNREEC) is responsible for renewables. Based on the KEN and RUEN, MEMR develops the National Electricity General Plan (RUKN), a 20-year projection of electricity demand and supply, investment and funding requirements, and planned utilisation of renewable sources.[34] The most recent version is the 2015–2034 RUKN. It is reviewed every three years.[35] Based on the RUEN and RUKN at the national level, each provincial government formulates a Regional Energy General Plan (RUED) and a Regional Electricity General Plan (RUKD).

In addition to its role in planning and implementation, MEMR also functions as the overall power sector regulator through the DGE and the DGNREEC, including regulation of electricity tariffs for consumers. Further, MEMR also approves PLN's RUPTL.

Ministry of State-owned Enterprises

As a state-owned enterprise, PLN is subject to the oversight of the Ministry of State-owned Enterprises (MoSOE), which oversees the company's management, sets and reviews its corporate performance targets, and approves its annual budget.[36]

Ministry of Finance

The Ministry of Finance (MoF) recommends the extent of electricity subsidy to be provided to PLN and approves any government guarantees for PLN's obligations in loans and PPAs.[37] It also approves guarantees that the Indonesia Infrastructure Guarantee Fund (IIGF) provides to infrastructure projects.[38] Further, the MoF formulates and approves fiscal incentives such as tax concessions and accelerated depreciation provisions for RE projects. In addition, the Fiscal Policy Agency (BKF) of the MoF

31 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
32 RambuEnergy, "Energy Ministry: 35GW Power Plant Program Still on Track", https://www.rambuenergy.com/2018/03/energy-ministry-35-gw-power-plant-program-still-on-track/, accessed on 8-4-2019
33 National Energy Board of the Republic of Indonesia, "About the National Energy Council", https://www.den.go.id/index.php/statispage/index/6-tentang-den.html, Accessed on 15-6-2019
34 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
35 Ibid.
36 Ibid.
37 Ibid.
38 Ibid.

is currently engaged in designing a proposed fund to support the deployment of RE.[39] However, the exact nature of the interventions to be deployed using the proposed fund is yet to be finalised.

Perusahaan Listrik Negara (PLN)

PLN is Indonesia's state-owned integrated power utility. Though private participation is permitted in electricity generation, transmission, and distribution under Indonesia's 2009 Electricity Law, in practice, significant private participation is only limited to power generation.[40] However, PLN accounts for the largest share of installed capacity (Table 2). PLN also functions as the transmission system operator in Indonesia's power system.

customers, PLN, which enjoys the sovereign backing of the Indonesian government, raises a portion of its financial resources through international bond markets.

> **While PLN is subject to the regulatory jurisdiction of MEMR, its management is accountable to MoSOE for its corporate performance; with this structure of ministerial supervision, in practice MEMR cannot enforce PLN's compliance with specific performance standards.**

Table 2: Indonesia's installed generation capacity by investor type

	PLN	IPPs	PPUs	IO Non-BBM	Total
Installed capacity (GW)	43.2	14.9	2.4	2.4	62.9
Share of installed capacity (%)	68.7	23.7	3.8	3.8	100

Notes:
1 IPP—Independent power producer
2 PPUs—Private power utilities (these are private generations companies dedicatedly supplying power to industries)
3 IO Non-BBM—Holders of non-fossil fuel operating licenses (captive generation)

Source: MEMR, Laporan Kinerja Tahun, 2018.

Based on the RUKN, PLN develops a ten-year Electricity Supply Business Plan (RUPTL), which is revised on an annual basis. It covers the operating areas or *Wilayah Usaha* of PLN, and includes projections of electricity demand and future plans of capacity addition for generation, transmission, and distribution, and sometimes investments needed over the forecast period. Planned generation capacity addition forecasts also include a split between projects to be developed by PLN and IPP investors respectively, as well as those that have not been allocated to either category. Capacity addition forecasts also contain those for NRE.

As an integrated electricity utility, PLN's revenues are largely drawn from end consumers of electricity. However, a portion of its customers—specifically those with connected loads of 450 VA and 900 VA (only those not classified as high-income households)—receive electricity at subsidised rates.[41] As a result, PLN is not able to fully recover its costs through the normal course of its operations; instead, its losses are made whole by a subsidy from the MoF. Besides revenues from its

PLN is subject to supervision by MEMR, MoSOE, and MoF for various aspects of its operations, as described above. While PLN is subject to the regulatory jurisdiction of MEMR (in the ministry's capacity as Indonesia's electricity regulator), its management is accountable to MoSOE for its corporate performance. Given this structure of ministerial supervision for PLN, in practice MEMR cannot enforce compliance with specific performance standards for PLN in case of deviations between energy planning at the policy level and implementation at PLN's level.[42] In view of the limitations of the present regulatory structure, PLN's performance is contingent upon the extent to which it is able to meet its own targets.

Financiers

PT Sarana Multi Infrastruktur (PT SMI)

PT Sarana Multi Infrastruktur (SMI) is an Indonesian government-owned financier established in 2009 to catalyse infrastructure development in the country.[43] The mandate of PT SMI includes providing a range of flexible financing solutions—ranging from senior

39 Based on stakeholder consultations.
40 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
41 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
42 Based on stakeholder consultations.
43 PT SMI, "Annual Report 2017", https://www.ptsmi.co.id/wp-content/uploads/2017/09/Annual-Report-PT-SMI-2017.pdf, accessed on 8-4-2019

debt to equity investment—to support infrastructure development.[44] This includes a USD five million fund for de-risking infrastructure projects.[45] PT SMI is also mandated to provide project preparation (it implements the MoF's Project Development Facility), advisory services, and capacity-building initiatives to government contracting agencies (GCAs) for public–private partnership (PPP) projects.[46,47,48] PT SMI also manages the MoF's Geothermal Support Fund (capitalised in 2013 with IDR 3 trillion or USD 210 million), which is aimed at financing both the exploration and exploitation phases of projects.[49]

PT SMI is an accredited entity for channelling climate change related funds from the Green Climate Fund (GCF), and also channels financing from the Agence française de développement (AFD), United Nations Development Programme (UNDP), Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), and World Bank (WB) into Indonesia for RE, energy efficiency, and climate change projects.[50] PT SMI provides financing for the RE sector through its SDG Indonesia One platform. This includes direct financing, products for de-risking, project preparation, and technical assistance support. In the RE sector, PT SMI has directly financed mini-hydro and biomass projects. It has limited investments in solar and wind, including a 4.92 MW solar plant in East Sumba.[51] In addition, it has a EUR two million de-risking fund for RE supported by a grant from the AFD.[52] It provides de-risking support to projects that are nearly bankable to enable them to attain financial closure. At the time of writing this report, this support had been deployed in only one instance – in the form of a first-loss guarantee fora mini-hydro project.[53]

PT SMI is also the largest shareholder in PT IIF, a non-bank financial institution focussed on infrastructure financing, which has multilateral, development finance institutions and an international financier as the remaining shareholders—the International Finance Corporation (IFC), Asian Development Bank (ADB), Deutsche Investitions- und Entwicklungsgesellschaft (DEG), and Sumitomo Mitsui Banking Corporation (SMBC).

Other financiers

Most power projects in Indonesia, including RE projects, have been financed by international commercial banks; multilateral development banks (MDBs) like the ADB, WB, and European Investment Bank (EIB); and government agencies for investment promotion, such as the Japan Bank for International Cooperation (JBIC), China Exim Bank, Korean Exim Bank, and the Nederlandse Financierings-Maatschappij voor Ontwikkelingslanden N.V. (FMO).[54] Domestic lending to solar and wind projects has been limited owing to the perception that these involve high risks.[55]

Ministry of Industry

The Ministry of Industry (MoI) formulates and implements policies in Indonesia's industrial sector. This includes stipulating local content requirements for the power sector, including for power generation. The MoI stipulates local content requirements for goods and services used in solar and wind generation, including specific requirements for PV modules used in solar projects.

Ministry of Forestry and Bupatis

Clearances from the Ministry of Forestry are necessary for power projects to be set up on forest land.[56] In some cases, when projects are set up on land owned by provincial governments, clearances from sub-provincial levels of government are required. These are granted by local regents or *bupatis*.[57]

Investment Coordinating Board (BKPM)

Entities operating in the power sector, including generation companies, must first apply for an Electricity Supply Business License (IUPTL).[58] The Investment Coordinating Board (BKPM) issues this license after applications are submitted on its online submission system (OSS). This authority is delegated to BKPM by MEMR.

44 Ibid.
45 Based on inputs from stakeholder consultations.
46 PwC, *Power In Indonesia,* 2018.
47 PT SMI, "Annual Report 2017", https://www.ptsmi.co.id/wp-content/uploads/2017/09/Annual-Report-PT-SMI-2017.pdf, accessed on 8-4-2019
48 PT SMI, "The Role of PT SMI in Renewable Energy Projects", https://www.ptsmi.co.id/wp-content/uploads/2015/10/PT_SMI_Renewable_Energy_Event_Seoul.pdf, accessed on 8-4-2019
49 PwC, *Power In Indonesia,* 2018.
50 PT SMI, "Sustainable Financing", https://www.ptsmi.co.id/three-business-pillar/financing-investment/sustainable-financing/, accessed on 8-4-2019
51 PT SMI, "Annual Report 2017", https://www.ptsmi.co.id/wp-content/uploads/2017/09/Annual-Report-PT-SMI-2017.pdf, accessed on 8-4-2019
52 Based on stakeholder consultations.
53 Ibid.
54 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018
55 Based on stakeholder consultations.
56 Ibid.
57 Ibid.
58 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018

5. Why accelerate RE investments?

Solar and wind generation have so far played a minor role in serving Indonesia's energy needs, with the aforementioned challenges precluding deployment at scale. However, there are compelling reasons to change the status quo and facilitate the deployment of solar and wind generation.

Under the right policy and market conditions, these sources of generation have considerable potential to help further the major national priorities of

- Affordable power and energy security
- Enhancing energy access.

In addition, accelerating RE investments could enable PLN to

- Address the risks of financing a coal-heavy portfolio of energy generation assets
- Address the risks of partial grid defection by consumers and rationalise its capital expenditure requirements

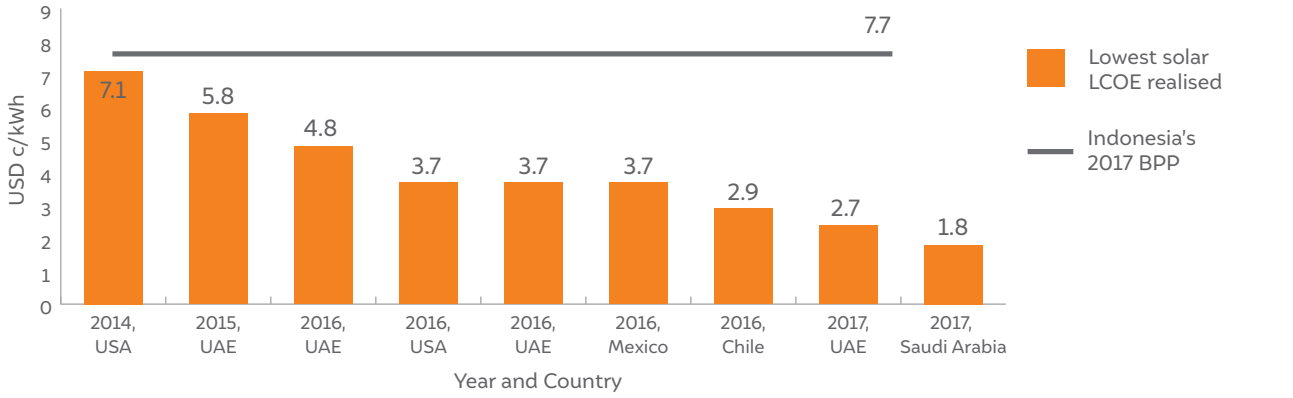
5.1 Competitiveness of solar and wind generation

While solar and wind tariffs under the current regulatory and market conditions in Indonesia are not comparable to thermal generation, they have demonstrated far greater competitiveness in other geographies. The lowest solar levelised cost of electricity (LCOE) achieved is USD c 2/kWh (Figure 3), while the corresponding figure for wind generation is USD c 3/kWh,[59] both much lower than the average BPP in Indonesia.

However, the realisation of competitive tariffs requires the presence of an ecosystem of supportive policy and market conditions that lower risks for investors. This is exemplified by the Indian energy transition where, aided by declining technology prices, favourable policy support has driven a sharp decrease in solar and wind tariffs without any significant subsidy support (Figure 4).

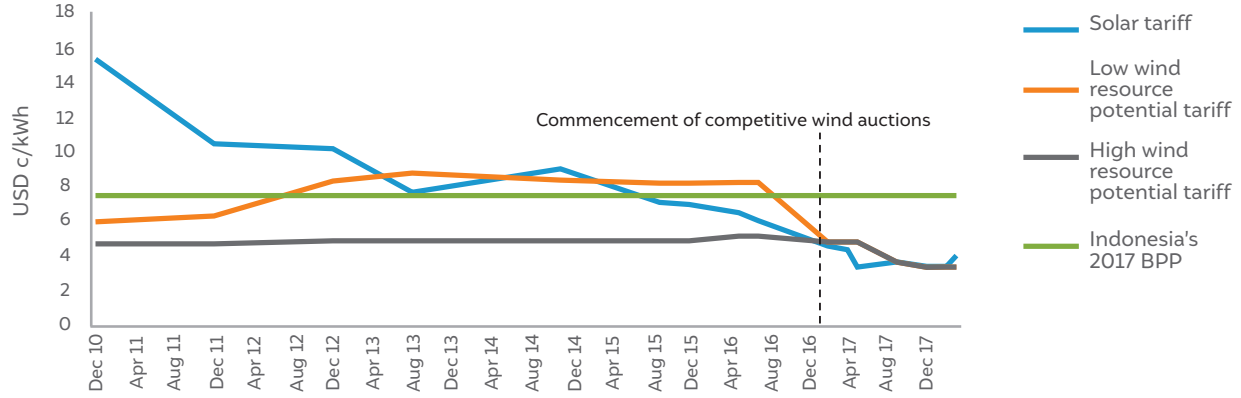
Considering that solar and wind tariffs realised internationally are much more competitive than

Figure 3: Progressive improvement in competitiveness of solar generation



Source: Progressive improvement in competitiveness of solar generation

Figure 4: Solar and wind tariffs in India have stabilised around USD c 4 /kWh



Source: CEEW analysis, tariffs converted from INR to USD assuming a USD/INR exchange rate of 70.

59 IRENA, *Renewable Power Generation Costs in 2017.*

Indonesia's average BPP of USD c 7.66/kWh, favourable policy measures that result in similar reductions in tariffs could greatly enhance the affordability of electricity in Indonesia.

5.2 Enhancing energy access using DRE

While Indonesia is nearing 100 per cent electrification, the duration of supply in several remote regions remains inadequate.[60,61] In addition, a few regions, such as East Nusa Tenggara (NTT) and Papua, are still characterised by low electrification rates.[62] Moreover, many of the remote islands in Indonesia use expensive diesel-based sources to generate electricity.[63]

> **Distributed renewable energy systems can enhance energy access by providing a complement to grid electricity in remote regions characterised by inadequate duration of grid supply.**

Depending on the status of grid infrastructure, off-grid distributed renewable energy (DRE) solutions, such as solar home systems, solar lanterns, and micro grids or their grid-connected counterparts, could help enhance energy access by providing a useful complement to grid electricity. Further, by displacing diesel-based generation systems, DRE solutions could potentially supply electricity at more affordable prices.

5.3 Risks of financing a coal-intensive portfolio and lost export revenues

With sovereign backing, PLN raises debt capital from international bond markets and through loans from international lenders to fund its capital and operating expenses. While improvements in Indonesia's sovereign credit rating[64] bode well for PLN's borrowing costs, a systematic and gradual exclusion of coal-fired generation from the investment portfolios of global financial institutions represents a risk to the financing of PLN's own coal-heavy generation portfolio.

> **A systematic exclusion of coal-fired generation from the investment portfolios of global financial institutions represents a risk to the financing of the coal-heavy generation portfolio of PLN, which extensively relies on international bond markets.**

Since 2013, more than a hundred financial institutions, each with assets under management greater than USD 10 billion, have announced firm plans to systematically divest their portfolios of coal assets.[65] These financial institutions span pension funds, insurance/reinsurance funds, MDBs, export credit agencies, and development financial institutions.[66] This move is in response to the concern that thermal generation plants may become stranded assets as a result of climate change mitigation policies.[67] This shift represents the risk of a rapidly diminishing pool of debt capital willing to invest in PLN if it remains characterised by a coal-dominated portfolio.

> **Controlling costs of thermal generation through regulating prices of domestically consumed coal translates into lost export revenues for Indonesia.**

Further, Indonesia is currently relying on controlling generation costs by regulating the prices of thermal coal used by the power sector. This strategy could result in a significant loss in export revenues for Indonesia, since coal sourced through DMOs cannot be exported. Moreover, though around 20 per cent of Indonesia's coal production is currently routed towards power generation at controlled prices, a coal-dominated power mix could result in a higher share being consumed domestically at controlled prices, and by extension, lost export revenues.[68] While stakeholders did comment on the strategy of controlling generation costs through the regulation of coal prices, they did not seem to have identified the opportunity costs of lost export revenues due to domestic coal consumption. Foregone export revenues are another reason for policymakers to wean Indonesia off of a coal-dominated generation portfolio.

60 Based on stakeholder consultations.
61 Pwc, *Indonesian Power Industry Survey*, 2018.
62 PLN, *Diseminasi RUPTL 2019-2028 PT PLN (Persero)*, 2019.
63 Based on stakeholder consultations.
64 Moody's Investor Service, "Rating Action: Moody's upgrades Indonesia's rating to Baa2, changes outlook to stable", https://www.moodys.com/research/Moodys-upgrades-Indonesias-rating-to-Baa2-changes-outlook-to-stable--PR_381846, accessed on 23-5-2019.
65 Tim Buckley, *Over 100 Global Financial Institutions Are Exiting Coal, With More to Come*, IEEFA, 2019.
66 Ibid.
67 Ibid.
68 Reuters, "Indonesia wants to export more coal, buyers ignore the call: Russell", https://www.reuters.com/article/column-russell-coal-indonesia/column-indonesia-wants-to-export-more-coal-buyers-ignore-the-call-russell-idUSL4N1WR24R, accessed on 24-5-2019

5.4 Rationalisation of capital expenditure and risk of future grid defection

Grid-connected DRE systems could play a meaningful role in lowering PLN's capital expenditure. With generation close to the point of consumption, rising rooftop solar penetration could help lower capital expenditure requirements in additional transmission infrastructure. In addition, with consumption near the point of generation, rooftop solar systems are characterised by negligible losses compared to the transmission losses from utility-scale generation systems.

While the rising penetration of rooftop solar systems could result in some revenue losses owing to reduced demand from consumers, this must be weighed against gains from avoided investment in capital expenditure and savings from lower transmission losses. Moreover, with declining storage costs and PV module prices, PLN, like all utilities, risks partial grid defection by consumers in the future. This is especially relevant for commercial and industrial consumers, such as large global corporations that have committed to sourcing 100 per cent of their electricity needs from renewable power (RE 100 companies).[69]

Instead of risking future grid defection, a utility-led rooftop solar business model could enable PLN to service the pent-up demand and simultaneously generate additional revenue through providing complementary services like bill collection for developers under the operating expenditure (opex) model.

6. What challenges restrict RE investments in Indonesia?

A range of challenges have resulted in heightened risks for investors, thereby constraining the pace of RE investments. These include uncertainty over a pipeline of projects, regulatory provisions impacting project viability and bankability, transmission-related risks, challenges in land acquisition, shortages in skilled manpower, and challenges in obtaining domestic debt for RE projects. The following sections describe these challenges in detail.

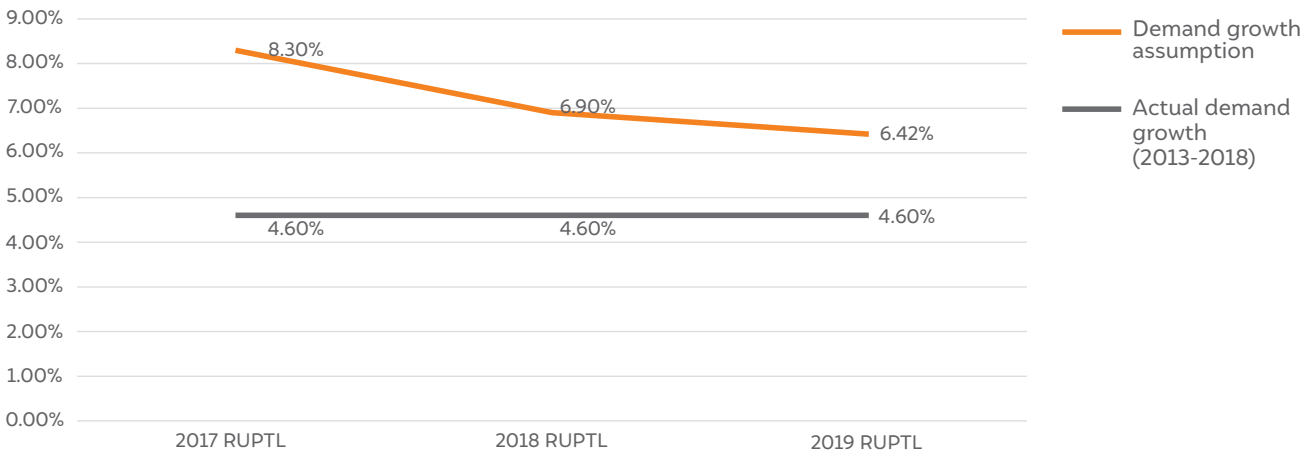
6.1 Uncertainty over solar and wind project pipeline

The lack of certainty of demand for RE projects is a deterrent for long-term investment planning and disincentivises RE investments in Indonesia. This uncertainty stems from demand risk and the lack of predictability in RE procurement.

Demand risk

From the investors' perspective, there is considerable uncertainty with respect to a pipeline of solar and wind projects, which precludes long-term investment planning. This stems from the recent, drastic changes in Indonesia's planned power capacity addition and

Figure 5: Demand growth assumptions in PLN's RUPTL have exceeded actual demand growth



Source:

1 Demand growth assumptions sourced from PLN's RUPTLs.

2 Actual demand growth represents an average value for the period 2013 to 2018, sourced from IEEFA.

69 RE 100, "Companies", http://there100.org/companies, accessed on 24-5-2019

reservations among investors about the accuracy of the demand growth assumptions factored into PLN's planning.

Planned overall power capacity addition fell from 78 GW over the period 2017–2026 (as per PLN's 2017 RUPTL) to 56 GW over the period 2018–2027 (as per PLN's 2018 RUPTL).[70] Though the 2019 RUPTL did not include any drastic changes to the overall planned capacity addition, planned solar capacity addition declined by 13 per cent from 1045 MW in the 2018 RUPTL to 908 MW in the 2019 RUPTL. However, planned wind capacity addition increased by 45 per cent from 589 MW to 855 MW.[71]

The reduction in planned capacity addition was largely due to downward revisions in projections of the growth rate of electricity demand from 8.3 per cent in the 2017 RUPTL to 6.9 per cent in the 2018 RUPTL (Figure 5).[72] Projections of demand growth were further reduced to 6.42 per cent in the 2019 RUPTL.[73] Given that demand growth stood at 5.1 per cent in 2018 and averaged 4.6 per cent over 2013–2018, there are concerns over further changes to demand growth estimates and capacity addition targets.[74]

Considering that actual capacity addition in recent years has generally been lower than the targeted capacity,[75] investors are hesitant about relying on the RUPTL as an indicator of a future project pipeline. The lack of a credible pipeline of solar and wind projects dampens investor interest.

> **Overestimation in electricity demand growth and subsequent reductions in planned capacity addition have translated into investor reservations about using PLN's RUPTL as a credible indicator of a future RE project pipeline.**

70 MEMR, *Executive Summary RUPTL 2018–2027, PT PLN (Persero),* 2018.
71 PLN, *Diseminasi RUPTL 2019-2028 PT PLN (Persero),* 2019.
72 MEMR, *Executive Summary RUPTL 2018–2027, PT PLN (Persero),* 2018.
73 PLN, *Diseminasi RUPTL 2019–2028, PT PLN (Persero),* 2019.
74 IEEFA, "IEEFA Indonesia: 2019 energy plan falls short", http://ieefa.org/ieefa-indonesia-2019-energy-plan-falls-short/, accessed on 17-4-2019
75 Pwc, *Alternating Currents: Indonesian Power Industry Survey 2018 July 2018, Second Edition,* 2018.

Lack of predictability in power procurement

There have been long delays in the procurement process for solar and wind power. These delays have occurred at various stages in the procurement process. A tender for the procurement of 168 MW of solar capacity in Sumatera has not proceeded beyond the pre-qualification stage since June 2017 (see Box 1 for a description of the power procurement process).[76,77]

Box 1: Power procurement process for solar and wind energy

Under MEMR Regulation 50 of 2017, the procurement process for solar and wind generation is a direct selection process based on capacity quota.[78] This method entails a limited tender (consisting of at least two bidders, as opposed to an open tender) among a set of pre-qualified bidders.[79] For the selection of pre-qualified bidders, PLN invites applications from RE developers who wish to be on a list of selected providers (DPT). The criteria for inclusion capture both the operational and financial track record of the applicant.[80]

Delays in determining the list of pre-qualified bidders or DPT (see Box 1) have also hampered the power procurement process. The results of PLN's pre-qualification process initiated in October 2017 were announced only in November 2018, with no solar or wind procurement in the interim.[81] Further, there have been concerns relating to the transparency of the selection process. Letters of intent signed by PLN in 2017 for the development of 100 MW of solar capacity in Bali were subsequently cancelled due to concerns over transparency in the selection of the winners.[82] These projects are to be re-tendered.[83] There have also been instances of PPA renegotiation. Such instances of delays, cancellations, and renegotiations have undermined the predictability of power procurement in Indonesia.[84]

76 Ibid.
77 Renewables Now, "Indonesia's PLN Opens Tender for 168 MW of PV", https://renewablesnow.com/news/indonesias-pln-opens-tender-for-168-mw-of-pv-571094/, accessed on 20-1-2019.
78 MEMR, "Regulation No. 50 of 2017", http://ditjenpp.kemenkumham.go.id/arsip/terjemahan/41.pdf, accessed on 17-4-2019
79 Baker McKenzie, "PLN Invites Blanket Prequalification for Future Indonesian Renewable IPPs", https://www.bakermckenzie.com/en/insight/publications/2017/09/pln-invites, accessed on 13-2-2019.
80 Based on stakeholder consultations.
81 Baker McKenzie, "PLN Re-opens Prequalification Process for Indonesian Renewable Projects", https://www.bakermckenzie.com/en/insight/publications/2019/01/pln-reopens-prequalification, accessed on 18-5-2019
82 Based on stakeholder consultations.
83 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
84 Pwc, *Indonesian Power Industry Survey*, 2018.

6.2 Regulatory provisions that impact the viability and bankability of projects

The interplay between a number of regulatory provisions governing solar and wind generation, including the tariff regime, local content regulations, the BOOT scheme, and provisions for the allocation of natural force majeure (NFM) risks, adversely impact the viability and bankability of projects. These are described in detail below.

Inadequacy of the tariff regime

Under MEMR Regulation 50 of 2017, tariffs for solar and wind energy procurement are subject to maximum benchmark tariffs, which vary by region and are linked to PLN's average cost of power procurement for the region (Table 3).[85]

Table 3: Benchmark RE tariffs

	Maximum benchmark tariff	
RE technology	Regional BPP > national BPP	Regional BPP ≤ national BPP
Solar	85% regional BPP	Negotiations between IPPs and PLN
Wind		

Source: MEMR, Regulation 50 of 2017.

Based on figures for regional and national BPP for 2017, this translates into tariff caps of USD c 7.08–17/kWh for regions with a regional BPP greater than the national BPP.[86] These tariffs are far less attractive than the pre-existing FIT regime for solar energy, characterised by FITs ranging from USD c 14.5/kWh for Java to USD c 25/kWh for Papua.[87] There was no specific tariff regime for wind before the present regime based on MEMR Regulation 50 of 2017.[88]

Given that thermal generation accounts for the bulk of PLN's power procurement portfolio, the tariff regime forces RE tariffs to compete with thermal generation costs. However, thermal generation costs do not reflect the full cost of generation, as the sector benefits from state subsidies for coal production[89] and support for thermal generation (such as caps on coal prices effective at least during 2018–2019).[90] The benchmarking with regional BPPs translates into tariffs for RE generation that may not be sufficient to cover risks in generation.[91]

> **RE tariff caps in Java-Bali have been deemed unviable by the industry, whereas regions with viable tariff caps are usually in regions with poor transmission infrastructure.**

In the Java–Bali region, which accounts for 80 per cent of Indonesia's electricity demand, industry players deem solar and wind tariff caps under current regulations unviable.[92,93] Developers have indicated that solar and wind tariffs of USD c 8 /kWh could be viable in Java, but this region is characterised by average BPPs in the range of USD c 6–7/kWh.[94,95] Regions with tariffs that could be viable are characterised by poor transmission and distribution infrastructure.[96]

Net metering regulation for rooftop solar generation

MEMR Regulation No. 49 of 2018 governs net metering regulation for rooftop solar generation. The net metering scheme under this regulation stipulates that electricity exported to the grid will only be compensated at the rate of 65 per cent of applicable electricity tariffs.[97,98] This is in stark contrast to the previously applicable regulation, which compensated the exported electricity at the full applicable tariff.[99] The new regulation lowers returns for consumers, extends payback periods, and constitutes an inadequate incentive for deploying rooftop solar systems.

85 MEMR, "Regulation No. 50 of 2017", http://ditjenpp.kemenkumham.go.id/arsip/terjemahan/41.pdf, accessed on 17-4-2019
86 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
87 IRENA, *Renewable Energy Prospects: Indonesia,* 2017.
88 Ibid.
89 International Institute for Sustainable Development, *Financial Supports for Coal and Renewables in Indonesia,* 2017.
90 International Institute for Sustainable Development, *Missing the 23 Per Cent Target: Roadblocks to the Development of Renewable Energy in Indonesia,* 2018.
91 Ibid.
92 IESR, *Indonesia Clean Energy Outlook Reviewing 2018, Outlooking 2019,* December 2018.
93 International Institute for Sustainable Development, *Missing the 23 Per Cent Target: Roadblocks to the Development of Renewable Energy in Indonesia,* 2018.
94 Based on stakeholder consultations.
95 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
96 Based on stakeholder consultations.
97 IESR, *Indonesia Clean Energy Outlook Reviewing 2018, Outlooking 2019,* December 2018.
98 MEMR, "Regulation 49 of 2018", https://jdih.esdm.go.id/peraturan/Permen%20ESDM%20Nomor%2049%20Tahun%202018.pdf, accessed on 11-3-2019
99 ICED, "Solar Panel Regulation to Protect PLN, Says Expert", http://www.iced.or.id/solar-panel-regulation-to-protect-pln-says-expert/, accessed on 17-4-2019

Local content requirements for solar modules

Indonesia has been historically dependent on imported Chinese and Japanese modules for its limited solar deployment. However, in order to encourage local manufacturing of PV modules, Indonesia has put local content requirements in place. While previous regulation stipulated a local content requirement of 30.14 per cent for solar home system modules and 25.63 per cent for communal solar PV system modules, amendments to the local content requirement regulations in 2017 increased the share of local content requirement for solar PV modules to 50 per cent by 2018 and 60 per cent by 2019.[100]

Indonesia's PV module manufacturing capacity stands at around 500 MW.[101] However, most of the module production involves the assembly of imported cells into modules. Only one manufacturer has integrated cell and module manufacturing facilities that can produce modules using imported wafers as inputs.[102] Besides cells, Indonesian module manufacturers also have to rely on imports for other critical raw materials like tempered glass and ethylene vinyl acetate (EVA) sheets.[103] These inputs (including cells) for the manufacture of standalone module account for close to 90 per cent of the overall selling price of PV modules.[104] Given the lack of vertical integration in the manufacturing supply chain, producing modules with 60 per cent local content is extremely challenging for the domestic industry.

> **Local content requirements raise project costs and make it challenging for developers to meet tariff caps; domestically produced modules are priced at USD c 39-41/W, as compared to USD c 20-24/W for imports.**

Besides the absence of vertical integration, Indonesian PV manufacturing is characterised by a lack of scale, and low levels of capacity utilisation stemming from the lack of investment in solar energy projects.[105] These reduce their cost-competitiveness vis-à-vis imports—while locally produced modules are priced at USD c 39–41 /W, international modules are priced at USD c 20-24 /W.[106] Local content requirements raise project costs for developers and, along with the tariff caps on solar generation, limit the feasibility of projects. This is a hindrance for deployment of solar energy projects at scale. Financiers are also concerned about the quality of locally produced modules; this leads to difficulties in the bankability of projects themselves.[107]

Build-Own-Operate-Transfer (BOOT) scheme

The BOOT scheme emerged as a response to a ruling of the Constitutional Court of Indonesia, which mandates that electricity, a strategic commodity for the nation, should remain under state control, consistent with the provisions of Article 33 of the Indonesian constitution.[108] Under MEMR Regulation no. 10/2017 as modified by MEMR Regulation no. 50/2017, all RE projects in Indonesia are subject to the BOOT scheme.[109] According to this provision, all RE generation assets must be transferred to PLN at the end of their PPAs. This is problematic for developers for the following reasons:

- As the assets are to be eventually transferred to PLN, this creates challenges for developers when pledging them or the land on which the project is set up as collateral for availing loans, since they cannot be liquidated by banks in case of default. Since non-recourse loans for solar and wind projects are rare, this hinders financial closure for many projects.
- The BOOT scheme does not specify whether the price at which the project land is transferred to PLN at the end of the PPA accounts for appreciation in land prices.[110] Uncertainty about the valuation of land at the time of transfer further lowers returns—and therefore project viability—for developers.
- The length of PPAs has been reduced from 25 or 30 years to 20 years.[111] As the asset has to be transferred to PLN at the end of this period, internal rates of returns (IRRs) in the reduced time frame are unattractive to developers.[112]

100 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
101 Based on stakeholder consultations.
102 Ibid.
103 Ibid.
104 Arjun Dutt, Manu Aggarwal, and Kanika Chawla (2019) 'What is the Safeguard Duty Safeguarding? Analysis of the Impact of Safeguard Duty on Domestic Solar Manufacturing and Deployment,' May
105 Based on stakeholder consultations.
106 Ibid.
107 IEEFA, *Indonesia's Solar Policies Designed to Fail?,* 2019.
108 International Labour Organisation, "The 1945 Constitution of the Republic of Indonesia", https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---ilo_aids/documents/legaldocument/wcms_174556.pdf, accessed on 22-5-2019
109 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
110 Based on stakeholder interactions.
111 Ibid.
112 Ibid.

As RE assets are to be transferred to PLN at the end of the PPA under the BOOT scheme, it creates challenges for developers in pledging project assets or land as collateral for availing loans, hindering the financial closure of projects in some cases.

- The BOOT scheme also limits opportunities for refinancing or selling operational projects, limiting exit options for investors.[113]
- Under the BOOT scheme, project construction on leased land is problematic, as assets have to be transferred to PLN at the end of their lives. This necessitates land acquisition, which increases project costs and risks during the pre-operational stage of the project.

NFM[114] risk allocation

There have been changes to the allocation of force majeure risk due to natural disasters (NFM) in power sector PPAs under MEMR Regulation no. 10/2017 as modified by MEMR Regulation nos. 49/2017 and 10/2018.[115,116] While these regulations do not explicitly apply to intermittent renewables, in the absence of specific provisions governing NFM risk for intermittent renewables under MEMR Regulation 50/2017—which applies to intermittent renewables—market participants expect that NFM risk provisions under MEMR Regulation 10/2017 could also apply to solar and wind PPAs.[117]

Based on pre-existing regulations, PLN was expected to bear the risk for NFM events through deemed dispatch payments and compensation in the form of termination payments to IPPs in case of long-term interruptions. However, under the changes to the principles of risk allocation in power sector PPAs, PLN is no longer expected to make deemed dispatch payments to developers in case it is unable to offtake power due to NFM events.[118] Now, in case of such an event, a PPA may be extended by the duration of time lost due to the NFM event and associated repairs. In case the NFM event happens before the commercial operation date (COD), the COD may be extended by the corresponding length of time.[119] This can create cash flow difficulties for RE developers, who need steady cash flows in order to service debt. Moreover, this requires developers to purchase insurance products for NFM events, raising their expenses.

6.3 Transmission infrastructure-related constraints

The characteristics of Indonesia's grid infrastructure and considerations governing the dispatch of RE generation negatively impact the scale of intermittent RE generation that may be integrated into the grid.

The fragmented nature of Indonesia's grid infrastructure

Being an archipelago, Indonesia lacks a unified national grid; instead, it is characterised by fragmented grid infrastructure. It consists of eight major grid networks and 600 isolated grid systems.[120]

While studies on the capacity of the Indonesian grid to absorb intermittent RE generation are not available in the public domain, the inadequacy of the transmission system to absorb intermittent generation is manifested in restrictions on RE penetration into the grid. PLN has imposed a limit of 10 per cent variable RE penetration from the daytime peak load to ensure grid stability.[121]

The Java–Bali grid, with around 40 GW or nearly two-thirds of the country's installed capacity, is the largest grid system in the country.[122] Though the largest grid in the country should be most suited to absorb intermittent RE generation, overcapacity has reduced its suitability for integrating renewables at scale.[123,124] The South Sulawesi grid, which accounts for the entirety of Indonesia's installed wind capacity (around 150 MW once Vena Energy's 72 MW Jeneponto plant commences commercial operations), is nearing the 10 per cent RE penetration limit as the overall installed capacity stands at around 1.2 GW.[125]

113 IEEFA, *Indonesia's Solar Policies Designed to Fail?,* 2019.
114 Force majeure risk due to natural disasters.
115 Umbra Strategic Legal Solutions, "MEMR Regulation 10/2018: A Game Changer for PPAs Bankability?", https://umbra.law/2018/02/24/memr-regulation-10-2018-a-game-changer-for-ppas-bankability/, accessed on 20-1-2019
116 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
117 Based on market intelligence.
118 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
119 Ibid.
120 ADB, *Indonesia Energy Sector Assessment, Strategy and Road map,* 2016.
121 ADB, *Indonesia Energy Sector Assessment, Strategy and Road Map,* 2016.
122 IRENA, *Renewable Energy Prospects: Indonesia,* 2017.
123 Based on stakeholder consultations.
124 IEEFA, *Overpaid and Underutilized: How Capacity Payments to Coal-Fired Power Plants Could Lock Indonesia into a High-Cost Electricity Future,* 2017.
125 Based on stakeholder consultations.

These characteristics of the grid thus constrain intermittent RE penetration, from the perspective of both plant size and location.[126]

PLN's grid-management practices

Capacity charges associated with coal- and gas-based generation and take-or-pay fuel supply contracts for gas-based power plants incentivise PLN to favour the dispatch of conventional sources over intermittent renewables.[127,128] These factors raise investor concerns regarding the curtailment of RE generation and discourage investments.

> **High capacity charges associated with thermal generation disincentivise the dispatch of intermittent RE, translating into heightened curtailment risks for investors.**

6.4 Land acquisition risks

Land acquisition has been a challenge for Indonesian infrastructure projects in general.[129] This has also impacted the pace of deployment of RE projects. Often this has resulted from problems of land zonation – with competing claims over the same piece of land by various ministries and state-owned enterprises or ownership of contiguous pieces of land by different entities.[130] There have also been delays in obtaining clearances from the Ministry of Environment and Forests.[131] In many cases, the land acquisition process is subject to the jurisdiction of the head of the local regency (*Bupati*) – which also necessitates clearances from the sub-provincial level of government.[132] While existing laws mandate the completion of the land acquisition process within 583 working days, it has often been a far more protracted process for infrastructure projects.[133,134]

126 Ibid.
127 IEEFA, *Indonesia's Solar Policies Designed to Fail?,* 2019.
128 IRENA, *Renewable Energy Prospects: Indonesia,* 2017.
129 Global Business Guide, *Indonesia's Land Acquisition Laws; On Paper Only?,* http://www.gbgindonesia.com/en/property/article/2016/indonesia_s_land_acquisition_laws_on_paper_only_11365.php; accessed on 6-6-2018
130 Based on stakeholder consultations.
131 Ibid.
132 Ibid.
133 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
134 Asean Today, "Widodo's Infrastructure Drive Is Close to Spiralling Out of Control", https://www.aseantoday.com/2017/12/widodos-infrastructure-drive-is-close-to-spiralling-out-of-control/, accessed 6-6-2018

6.5 Shortage of skilled manpower

While there are no detailed studies in the public domain on jobs and skills requirements in Indonesia's solar and wind industry, stakeholders have raised concerns about the shortage of skilled manpower. This shortage is particularly severe in the operation and maintenance of distributed renewable energy (DRE) systems and less prevalent in PV manufacturing.[135]

> **The shortage of skilled manpower for operations and maintenance activities has adversely affected the performance of distributed solar systems deployed in remote regions.**

Though Indonesia has deployed close to 100 MW of solar capacity through off-grid decentralised solar systems in remote regions, a large proportion of this capacity is operating sub-optimally or is non-functional as a result of inadequate maintenance activities.[136] Assessing the severity of the shortage of skilled manpower would necessitate a detailed assessment of the jobs and skills requirements of Indonesia's power sector against the available manpower. Nonetheless, the shortage of skilled manpower is a risk to Indonesia's energy transition.

6.6 Challenges in obtaining domestic debt financing

Most of the debt financing for Indonesia's installed solar and wind capacity has come from international sources—international commercial banks, MDBs (ADB, WB, EIB), and government agencies for investment promotion (Japan Bank for International Cooperation, China Exim Bank, Korean Exim Bank, FMO).[137] While the lack of a pipeline of bankable projects is cited as the most significant roadblock for the flow of debt financing from local financial institutions, there are concerns about the ability of local financiers to assess loan proposals for solar and wind projects.[138] Often, bank staff do not have the requisite technical training to conduct these assessments, adding to existing risk perceptions around solar and wind energy and further

135 Based on stakeholder consultations.
136 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
137 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition*, November 2018.
138 Based on stakeholder consultations.

limiting the flow of domestic debt capital towards RE projects.[139,140]

7. Accelerating RE Investments in Indonesia

In order to accelerate RE investments in Indonesia, policy- or market-based solutions must systematically address the risks constraining investments. This section describes a range of measures that could be useful in this regard, drawing on measures taken to support India's energy transition.

7.1 Reviewing existing regulatory structures and addressing PLN's conflicts of interest

Given the pivotal role of PLN in Indonesia's power sector, the fortunes of the power sector are to a great extent contingent upon its performance. As discussed in section 5, investors have several concerns on this front: capacity addition planning and demand growth assumptions factored into PLN's RUPTL, the transparency and predictability of power procurement, grid management and dispatch strategies, and the renegotiation of PPAs. These issues heighten risks for investors and undermine their confidence. Two steps could be considered to address these concerns.

The first involves a review of existing regulatory mechanisms. As mentioned in section 4.3, the electricity regulator (MEMR) currently has limited authority over PLN's operations. In order to instil greater accountability into PLN's operations, it is necessary to empower MEMR to enforce PLN's compliance with specific performance standards pertaining to electricity planning and implementation. Alternatively, better inter-ministerial coordination between MEMR and MoSOE could be another means to achieve the same outcome. One possible mechanism to achieve this is to assign the regulatory function for the power sector to a new entity with representation from both MoSOE and MEMR. These measures would also facilitate the implementation of both existing and any proposed RE regulation.

> **Empowering MEMR to enforce PLN's compliance with specific performance standards or better inter-ministerial coordination between MEMR and MoSOE are two possible mechanisms to instil greater accountability into PLN's operations.**

A second possible step could be the restructuring of PLN's business to separate out its generation, transmission and distribution operations into separate entities. As an integrated entity which also functions as the transmission system operator, PLN's operations are subject to inherent conflicts of interest. The separation of these business segments could enable the resolution of these conflicts, which would positively impact investor sentiment.

7.2 Creating certainty of demand for RE

Introducing greater predictability in the power procurement process

Uncertainty over the RE project pipeline makes long-term investment planning challenging for investors. In order to address these concerns, PLN could consider announcing an advance multi-year tendering schedule for RE capacity. This would act as an advance market commitment and create certainty of demand for investors. Along with regularising the tendering schedule, it must address delays in determining the list of eligible participants in the DPT and in conducting the tendering process. Long-term capacity addition targets complemented by announcements pertaining to planned multi-year tendering of solar and wind capacity have lent an element of predictability with respect to a long-term pipeline of projects in India.[141]

Renewable portfolio standards

In the Indian context, renewable portfolio standards are applicable to distribution utilities (discoms) and large industrial consumers. These portfolio standards include a separate category for solar energy. These have helped generate certainty of demand of RE generation.[142] MEMR could consider introducing renewable portfolio standards for large commercial and industrial consumers, where a pent-up demand for renewables exists. Several large global corporations are aiming to source 100 per cent of their energy from renewables.[143]

139 Ibid.

140 John Kimani Kirari, et al., *Supporting Indonesia's Renewable Energy Development in Remote and Rural Areas through Innovative Funding* (UNDP, 2018)

141 ET Energyworld, "India to Bid out 500 GW Renewable Energy Capacity by 2028", https://energy.economictimes.indiatimes.com/news/renewable/india-to-bid-out-500-gw-renewable-energy-capacity-by-2028/67418119, accessed on 20-5-2019

142 Manu Aggarwal, Arjun Dutt, (2018) 'State of the Indian Renewable Energy Sector: Drivers, Risks, and Opportunities', September

143 RE 100, "Companies", http://there100.org/companies, accessed on 24-5-2019

Portfolio standards for commercial and industrial consumers should be determined in consultation with these consumers. Subsequently, MEMR could also consider introducing renewable portfolio standards for PLN in order to further support the uptake of RE generation.[144]

7.3 Reviewing existing capacity-planning methodologies and assumptions

PLN's recent RUPTLs have been characterised by overly optimistic capacity addition forecasts that have undergone subsequent revisions. Such capacity planning could exacerbate the existing overcapacity in thermal generation sources, increasing the financial burden on PLN in the form of capacity payments under take-or-pay thermal generation contracts.[145] In addition, overcapacity in thermal generation also incentivises the curtailment of RE generation. In order to circumvent these challenges, a review of the present methodologies and assumptions used in PLN's capacity addition forecasts is necessary. This could also necessitate a review of the assumptions factored into the RUEN, since PLN's capacity addition planning takes its cues from national-level energy planning.

7.4 Addressing land- and transmission-related constraints

Facilitating RE grid integration using flexible sources of generation

Indonesia's current electricity mix consists of a number of flexible generation sources with higher ramp rates than coal-fired generation. These include gas, hydro, and geothermal, with the three sources combined accounting for around 35 per cent of Indonesia's current electricity generation.[146] These flexible sources should be leveraged to maximise the integration of intermittent RE generation. Taking into consideration their regional distribution, PLN could plan for greater RE penetration in grids with large shares of flexible sources.

> **Leveraging flexible sources of generation such as gas, hydro, and geothermal could enable greater RE penetration in grids with large shares of such connected flexible sources.**

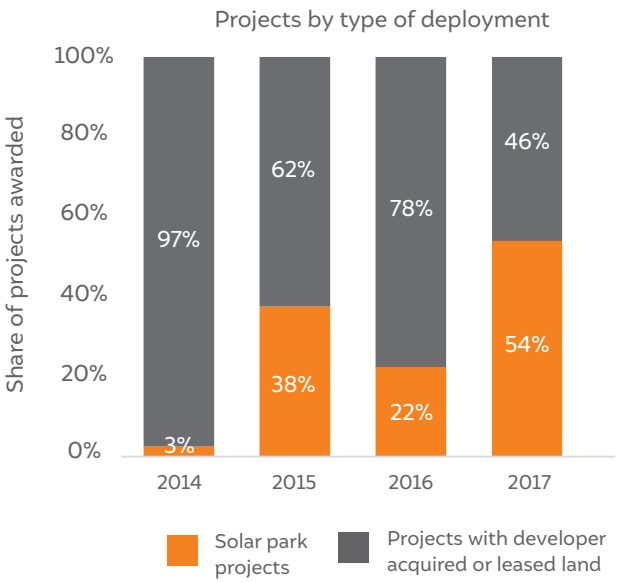
Strengthening existing transmission infrastructure

In order to facilitate the integration of utility-scale intermittent RE generation, PLN should strengthen its existing transmission infrastructure. While some major grids are equipped with supervisory control and data acquisition (SCADA) systems to monitor generation, these do not include systems for their control. However, some remaining grids have no monitoring systems at all. Strengthening the grid through monitoring and control systems could facilitate greater RE integration. PLN is in the process of modernising its grid infrastructure through its smart grid programme, which is a step in the right direction.[147]

Solar/wind parks

Solar parks have been instrumental in driving solar capacity addition in India (Figure 6). These concentrated zones of project deployment present a plug-and-play model for developers by making land and evacuation infrastructure available in exchange for a fee, thereby mitigating risks pertaining to land acquisition and evacuation infrastructure.

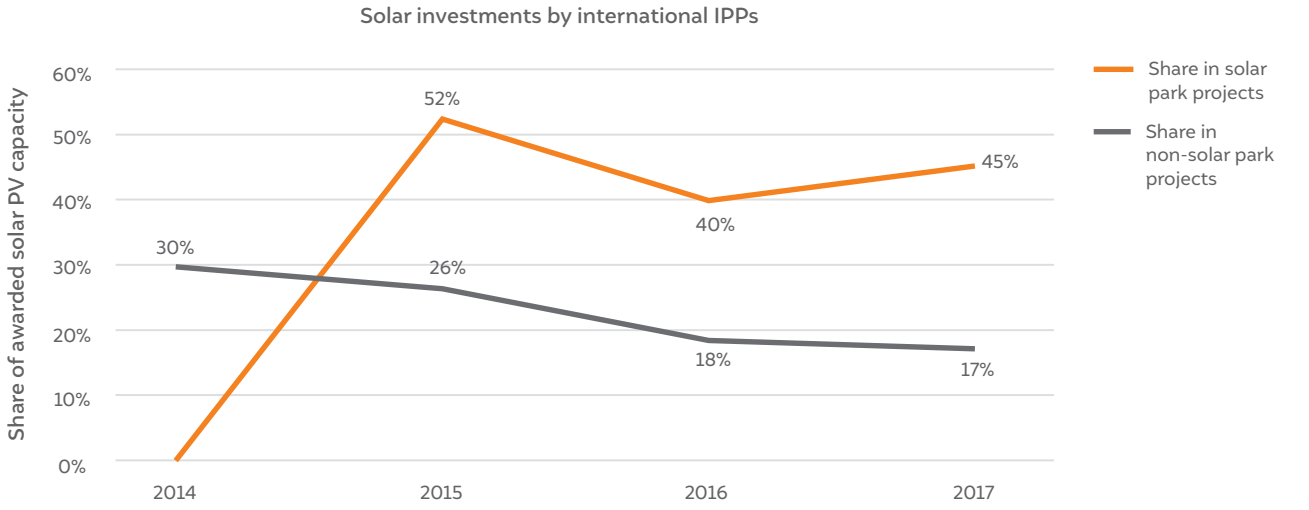
Figure 6: Solar parks have driven investments in solar energy in India



Source: CEEW & IEA, Clean Energy Investment Trends: Evolving Landscape For Grid-Connected Renewable Energy Projects In India, 2018.

144 PLN, *Diseminasi RUPTL 2019–2028, PT PLN (Persero),* 2019.
145 IEEFA, *Overpaid and Underutilized: How Capacity Payments to Coal-Fired Power Plants Could Lock Indonesia into a High-Cost Electricity Future,* 2017.
146 Pwc, *Power In Indonesia Investment and Taxation Guide, Sixth Edition,* November 2018.
147 PLN, *Diseminasi RUPTL 2019–2028, PT PLN (Persero),* 2019.

Figure 7: Solar parks have been the preferred mode of project deployment for foreign investors in India



Source: CEEW & IEA, Clean Energy Investment Trends: Evolving Landscape For Grid-Connected Renewable Energy Projects In India, 2018.

The plug-and-play model offered by a solar/wind park, which provides land and evacuation infrastructure to developers for a fee, can help mitigate land acquisition and evacuation infrastructure risks.

This simplified deployment model of solar parks has found favour with foreign investors (Figure 7), driving greater foreign investment into India's power generation sector.

MEMR and PLN could consider setting up similar parks for the generation of solar and wind capacity to lower land acquisition and evacuation infrastructure risks for investors. The park infrastructure could be developed either by PLN or a private entity. Solar or wind park charges, paid by the project developer, could become an additional source of revenue for PLN if it plays a role in the development of park infrastructure. This would also require suitable transmission planning, in order to facilitate the transmission of power from such zones to other load centres on the grid. To conform to the BOOT scheme, such parks would need to be set up on PLN land so that the project can be seamlessly transferred at the end of the PPA.

7.5 Boosting the viability of projects

Reviewing domestic content regulation

The modules produced by the domestic PV manufacturing industry currently do not meet the stipulated local content requirements (60 per cent). Thus, the local content requirement for modules currently hinders actual project deployment. The MoI should review the applicability of the local content regulation—it could remove module-specific local content requirements and consider extending these requirements to goods and services collectively. Alternatively, in the absence of domestically manufactured modules that meet the local content requirements, it could consider allowing the deployment of imported modules in solar projects.

Allowing the use of imported modules in solar PV projects could circumvent challenges to project deployment stemming from the absence of domestically manufactured modules with 60% local content and at the same time boost project viability.

Creating an "open category" of projects

As discussed in section 6.2, the lack of cost-competitiveness of locally produced modules raises capital costs for developers and makes it challenging to meet existing tariff caps. In order to boost project viability, the MoI could consider creating an "open category" for projects that are not subject to local content requirements. Enabling the use of imported modules could lower capital costs and would translate into improved competitiveness of tariffs.

A separate category of solar projects that mandate the use of domestically manufactured solar modules may be retained to support local PV manufacturing. However, policymakers need to be wary of possible violations of WTO regulations pertaining to national treatment obligations under the Agreement on Trade-Related Investment Measures (TRIMs Agreement) and the General Agreement on Tariffs and Trade (GATT) 1994. India's domestic content requirement (DCR) programme, which mandated the use of domestically produced modules for certain solar tenders, was successfully challenged at the WTO by the US.

In view of this development, India wound up most of its existing DCR programme,[148] barring the Central Public Sector Undertaking (CPSU) scheme. Under the CPSU scheme, state-owned enterprises may use domestically produced cells and modules to set up solar capacity for self-use or use by government entities, but not for commercial resale.[149] Such a mode of deployment by state-owned entities could be replicated in Indonesia to provide a dedicated market for local manufacturers.

7.6 Addressing the skills gap

The shortage of skilled manpower is a factor that could hamper the pace and efficiency of Indonesia's energy transition, particularly the deployment of DRE systems. MEMR should conduct a systematic study of jobs and skills requirements to support DRE deployment in Indonesia in order to assess the extent and types of skills in short supply. This should then be complemented by training programmes to produce skilled manpower that can support the energy transition.

148 MNRE, "Clarification in Respect of Domestic Content Requirement under the National Solar Mission", https://mnre.gov.in/file-manager/UserFiles/OM-clarification-on-replacement-of-DCR-Modules.pdf, accessed on 31-1-2019

149 Press Information Bureau, "CCEA Approves Proposal For Setting Up 12,000 MW Grid-connected Solar Photovoltaic (PV) Power Projects", http://www.pib.nic.in/Pressreleaseshare.aspx?PRID=1562963, accessed on 21-2-2019

7.7 Adopting new business models to adapt to ongoing technological shifts

Improving competitiveness of solar PV modules and storage technology make large-scale customer defection inevitable in the future—a threat that all utilities must grapple with. However, this also presents opportunities for new revenue streams for PLN. PLN could take up the role of a rooftop developer or provide complementary services like bill collection for other rooftop developers under an opex model. PLN could consider adopting such a strategy to benefit from ongoing shifts in technology. It could take a cue from Delhi-based distribution utilities that are adopting innovative business models to deploy rooftop solar.[150]

7.8 Adopting catalytic financing to facilitate the flow of RE investments at scale

While a number of structural challenges in the Indonesian RE ecosystem need to be addressed before investments can flow, catalytic financing mechanisms could support the scaling up of these investments. Contingent on the structural challenges being addressed, financing solutions geared towards risk mitigation could facilitate the financial closure of projects that require such support, thus crowding in private-sector finance flows. This could be particularly useful for enhancing the business case for off-grid solutions in remote areas.

At present, PT SMI has only limited funds to undertake the strategic de-risking of projects. Enhancing the capacity of PT SMI or other lenders to engage in such catalytic interventions could accelerate investment flows. In order to bolster the scale of capital available for catalytic financing, BKF's proposed RE fund could be tailored to operate as a catalytic financing solution geared towards risk mitigation.

> **Enhancing the capacity of public infrastructure financing institutions to underwrite risk can facilitate the crowding in of private sector investments and the scaling up of RE deployment.**

150 Neeraj Kuldeep, Selna Saji, and Kanika Chawla (2018) 'Scaling Rooftop Solar: Powering India's Renewable Energy Transition with Households and DISCOMs', June

Image: Emotivelens

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