ENERGY TRANSITION PARTNERSHIP

PHASE 3 REPORT SERIES

1 GW SOLAR MAPPING AND DEVELOPMENT PLAN : Review and Recommend Solutions of the Impediments of Solar PV Development

Report 1: Solar PV Procurement in Indonesia in JAMALI Region

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1. Glossary

Term	Definition
AMDAL	*Analisis Dampak Lingkungan* /Environmental Impact Assessments
BAPPENAS	Ministry of National Development Planning
BESS	Battery Energy Storage System
BOO	Build-Own-Operate
BOOT	Build-Own-Operate-Transfer
COD	Commercial Operation Date
DEAR	DOE Acquisition Regulation
DOE	The U.S. Department of Energy
DPPA	Direct Power Purchase Agreement
DPT	Daftar Penyedia Terseleksi/List of Selected Providers
E&S	Environmental and Social
EBTKE	*Direktorat Jenderal Energi Baru Terbarukan dan Konservasi Energi*/ Directorate General of New and Renewable Energy and Energy Conservation
EGAT	Electricity Generating Authority of Thailand
EIA	Environmental Impact Assessments
EMA	Energy Market Authority
EoDB	Ease of Doing Business
EPTC	Electric Power Trading Company
ETP	The Southeast Asia Energy Transition Partnership
EV	Electric Vehicle
FAR	Federal Acquisition Regulation
FY	Fiscal Year
GoI	Government of Indonesia
GW	Gigawatt
HEESI	Handbook of Economics and Energy Statistics of Indonesia
IEC	International Electrotechnical Commission
IESR	Institute for Essential Services Reform
IPP	Independent Power Producer
ISEREC	Indonesia Solar Energy Research Center
ITB	Institut Teknologi Bandung
IUPTLU	*Izin Usaha Penyediaan Tenaga Listrik Umum*/ Electric Power Supply Business License for Public Use
JAMALI	Power system supplying electricity to *Java, Madura, and Bali* islands. It is the largest electricity grid in Indonesia.
LCOE	Levelised Cost of Energy
LCR	Local Content Requirement
MEA	Metropolitan Electricity Authority
MEMR	Ministry of Energy and Mineral Resources
MoEF	Ministry of Environment and Forestry
MoF	Ministry of Finance
MoHA	Ministry of Home Affairs
MoI	Ministry of Industry
MoSOE	Ministry of State-Owned Enterprises
MW	Megawatt
NZE	Net Zero Emission
PEA	Provincial Electricity Authority

Term	Definition
PIK	*Program Infrastruktur Ketenagalistrikan*/ Electricity Infrastructure Development Program
PLN	PT Perusahaan Listrik Negara
PMK	*Peraturan Menteri Keuangan*/Ministry of Finance Regulation
PMN	*Penyertaan Modal Negara/* State Equity Participation
PP	*Peraturan Presiden/*Presidential Regulation
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PSN	*Proyek Strategis Nasional*/National Strategic Project
PTSP	*Pelayanan Terpadu Satu Pintu* / One Stop Integrated Service
PV	Photovoltaic
PVS	PV-plus-energy storage
R&D	Research and Development
RACI	Responsibility Assignment
RfP	Request for Proposal
RPO	Renewable Purchase Obligation
RUEN	*Rencana Umum Energi Nasional*/ General National Energy Plan
RUKN	*Rencana Umum Ketenagalistrikan Nasional*/National Electricity General Plan
RUPTL	*Rencana Usaha Penyediaan Tenaga Listrik/* Electricity Supply Business Plan
RUU EBET	Rancangan Undang-Undang Energi Baru
SDG	Sustainable Development Goal
SERIS	Solar Energy Research Institute of Singapore
SNI	Standar Nasional Indonesia/Indonesia National Standard
SPC	Special Purpose Company
SPT	*Surat Pemberitahuan Tahunan*/Annual Income Tax Return
SSP	*Surat Setoran Pajak*/Tax Payment Slips
TMAI	PT. Trina Mas Agra Indonesia
ToP	Take or Pay
UI	Universitas Indonesia
UN	United Nations
US	United States
VRE	Variable Renewable Energy

2. Executive Summary

The Southeast Asia Energy Transition Partnership (ETP), hosted by the United Nations Office for Project Services, is driving renewable energy initiatives in Southeast Asia to accelerate the transition from fossil fuels to cleaner energy sources. In collaboration with Indonesia's Ministry of National Development Planning (BAPPENAS), ETP is advancing solar photovoltaic (PV) technology to help the nation meet its renewable energy targets and achieve net-zero emissions by 2060.

Despite Indonesia's potential to reach 3,315 GW of solar PV installed capacity, based on the 2025-2060 National Electricity General Plan/ *Rencana Umum Ketenagalistrikan Nasional* (RUKN), only around 1 GW of solar power plants had been installed by 2024. The development of solar PV in Indonesia faces significant challenges, necessitating the implementation of risk-reduction measures to overcome these obstacles and advance renewable energy.

Four (4) reports have been prepared to assess the existing conditions of solar PV development in Indonesia, characterise its challenges, and identify measures to address them. The reports focus on the Indonesian islands of Java, Madura, and Bali, which compose the JAMALI power system, the largest electricity grid in Indonesia. The four reports are:

1. Report 1: Solar PV Procurement in JAMALI Region
2. Report 2: Financial feasibility of solar PV development in JAMALI Region
3. Report 3: Analysis of the Power Purchase Agreement (PPA) Terms for solar PV Development in JAMALI Region; and
4. Report 4: Environmental and Social (E&S) Risks of Solar PV Development in JAMALI Region.

This document is Report 1, which explores the specific challenges in Solar PV Procurement. The report is based on an analysis conducted through desktop research as well as discussions with relevant sector stakeholders, such as PLN and private developers.

Indonesia's solar PV procurement operates within a single-buyer electricity market led by PLN, involving multiple government stakeholders and governed by a complex, evolving regulatory framework aimed at increasing renewable energy adoption. Despite the progress, regulatory clarity, stakeholder coordination, and key reforms, such as accelerating the Renewable Energy Bill and easing local content requirements, are crucial to improve investment conditions and project implementation.

Table 3 outlines the major impediments to the development of solar PV from a procurement perspective and identifies potential measures to address them. To summarise, several challenges present significant obstacles that could impact both the procurement timeline and the cost of solar PV projects. These challenges range from the procurement process itself to factors such as LCR, land acquisition, and minimum share requirements in the IPP for projects assigned to PLN and/or its subsidiaries. To overcome these challenges, measures such as simplifying the procurement processes, expediting land acquisition, revising the minimum share requirement for PLN and/or its subsidiaries as a mandatory partner in an IPP, and enhancing local module quality could improve the procurement process for solar PV development in JAMALI.

This report also develops an action plan that details the strategic steps, timelines, and stakeholder roles using a RACI Matrix to guide the improvement of procurement implementation on solar PV development in Indonesia over a five-year timeframe. It highlights that PLN and MEMR are the main actors in addressing procurement challenges in Solar PV development in Indonesia.

. The order of the challenges reflects the discussion sequence in Chapter 3. The priority level and estimated time required to implement suggested solutions are defined in Table 1 and 2.

Table 1 Definition of Priority Level

Priority	Indicator
High	Red
Moderate	Yellow
Low	Green

Table 2 Definition of the Estimated Timeline to Implement the Suggested Measures

Estimated Timeline to Implement the Suggested Measures	Definition
Short term	Challenges that take 1-2 years to address, involving straightforward and non-complex solutions. These are the "low-hanging fruits".
Mid term	Challenges that take 3-5 years to address, involving more intricate solutions that may require additional effort
Long term	Challenges requiring long-term solutions that may take 5 years or more to address, involving complex changes and multiple stakeholders

Proposed improvements, responsible institutions, level of priority, and estimated timelines to implement the suggested measures are summarised in Table 3.

Table 3 Summary of Proposed Improvements to Challenges in Solar PV Procurement

Challenge	Proposed Measures	Proposed Responsible Institution	Priority	Estimated Timeline to Implement the Suggested Measures
Complex and lengthy procurement procedures	• Implement a robust system to regularly monitor the tender process • Implement bundled and capacity-based procurement models • Develop a comprehensive procurement timeline and project announcement schedule	PLN	High priority	Short term

Challenge	Proposed Measures	Proposed Responsible Institution	Priority	Estimated Timeline to Implement the Suggested Measures
	• Consider conducting pre-feasibility analysis on the potential sites before the tender process or utilise the output of this study during the planning of solar PV projects • Conduct market sounding or lenders briefing to gather inputs on the project's bankability			
Local Content Requirements (LCR)	• Develop a long-term plan to balance the support for local industries and the project feasibility • Set clear milestones and timelines for LCR compliance • Provide fiscal incentives based on the LCR achieved for IPP • Provide non-fiscal support such as training and technical assistance to RE technology manufacturers, particularly for solar PV • Establish collaboration opportunities with leading solar PV manufacturers • Provide incentives for research and development of local solar PV modules at a national level	Lead institution: MEMR Supporting institution: MoI, MoF	Moderate priority	Mid term
Lengthy and complex land acquisition processes	• Implement expedited land acquisition procedures for identified preferred zones • Implement Different Land Procurement Models (e.g., opening tenders for areas in which the land has been secured beforehand)	Lead institution: MEMR Supporting institution: MoEF, Bappenas, PLN, ATR/BPN,	High priority	Long term

Challenge	Proposed Measures	Proposed Responsible Institution	Priority	Estimated Timeline to Implement the Suggested Measures
	• Collaborate with The Indonesia Land Bank Authority • Utilise government-owned land for solar PV projects	The Indonesia Land Bank Authority		
The requirement for PLN or its subsidiary to own a minimum of 51% share in the SPC	• Revisit the minimum shares requirement in PLN or its subsidiaries • Explore available government support options (e.g., State Equity Participation, loans)	Lead institution: PLN Supporting institution: MEMR	High Priority	Mid term
	• Procure the projects without assigning PLN and/or its subsidiaries as mandatory strategic partner in the IPP	PLN	High priority	Short term
	• Reduce subsidy on the consumer's electricity tariff	Lead institution: PLN Supporting institution: MEMR	Moderate priority	Mid term

3. Introduction

3.1. Background

The Southeast Asia Energy Transition Partnership is a technical assistance programme, hosted by the United Nations Office for Project Services. ETP partners with governments, philanthropies, the private sector and civil society to harness the vast untapped potential of renewable energy into the energy mix in the Southeast Asian region.

The programme mobilises and coordinates the necessary technical and financial resources to create an enabling environment for renewable energy, energy efficiency, and sustainable infrastructures to support the transition from using fossil fuels to renewable energy sources to advance climate action in Southeast Asia. In Indonesia, ETP collaborates with BAPPENAS to advance solar PV technology, aiming to accelerate the implementation of solar PV projects and help the country achieve net-zero emissions in the power sector by 2060. The recently issued RUKN 2025-2060 targets a 49.5% of renewable energy (RE) in the energy mix by 2060 and is expected to start dominating the energy mix with 51.6% starting from 2044. The RUKN further mentions an investment need of almost USD 1 trillion for the addition of 443 GW of installed capacity.

Despite Indonesia's potential to generate solar power, only approximately 1 GW of solar power plants capacity had been installed by 2024 according to the 2025 RUKN. The development of solar PV in Indonesia faces significant challenges, necessitating the implementation of risk-reduction measures to overcome these obstacles.

The 1 GW Solar Mapping and Development project (the “Project”) provides insights to key stakeholders, including BAPPENAS, the Ministry of Energy and Mineral Resources (MEMR), and PT PLN (Persero) (PLN), as the state-owned electricity company. The project builds upon the previous ETP’s initiative, the Upgrading PLN JAMALI Load Dispatch Centre, leveraging the newly designed system capabilities to better integrate Variable Renewable Energy (VRE) into the grid.

The Project is divided into the following 3 phases:

1. Phase 1: Solar irradiance mapping.
2. Phase 2: Grid Integration Assessment.
3. Phase 3: Review and Recommended Solutions of the Impediments of Solar PV Development.

This report is part of the Phase 3 Report Series, where a series of reports have been developed to provide an understanding of the existing conditions of solar PV development in Indonesia, with a particular focus on the JAMALI region, and its challenges. A total of four reports have been prepared, as follows:

1. Report 1: Solar PV Procurement in Indonesia in JAMALI Region.
2. Report 2: Financial feasibility of solar PV development in Indonesia in the JAMALI Region.
3. Report 3: Analysis of PPA Terms for Solar PV Development in the JAMALI Region.
4. Report 4: E&S Risks of Solar PV Development in the JAMALI Region.

The reports are developed based on analysis conducted through desktop research and discussions with stakeholders, namely a PLN representative and 2 (two) solar PV private developers who have prior experience in developing solar PV projects in Indonesia[1].

[1] Both developers requested to not be named and therefore the discussion results will be presented anonymously

Please note that this document relies on information made available through 8 May 2025. Accordingly, changes in circumstances after this date could affect the contents of this document including any findings, conclusions or recommendations.

3.2. Envisaged Outcomes

This report is intended to help stakeholders involved in the procurement and implementation of solar PV projects in Indonesia address the major sector's barriers. This includes PLN, the national utility company, and MEMR, the energy sector regulators, who are seen as capable of intervening and improving the environment.

The proposed measures mentioned in this report aim to improve the investment environment for solar PV development in Indonesia. These include standardising procurement mechanisms, improving the capacity and quality of domestic manufacturing, and providing government-owned land for solar PV development, among other things.

4. Landscape of the Current Solar PV Development Procurement

This section discusses the current landscape of solar PV procurement procedures in Indonesia. The institutional setup of the electricity market, stakeholders relevant to the procurement process, the regulatory framework for the procurement process, as well as available incentives for renewable energy development, are explained respectively in more detail in the subsequent subchapters.

4.1. Institutional Setup of Indonesia's Electricity Market

Indonesia's electricity market is based on a single-buyer system, as shown in Figure 1, in which PLN, as the state utility company, holds a fundamental role.

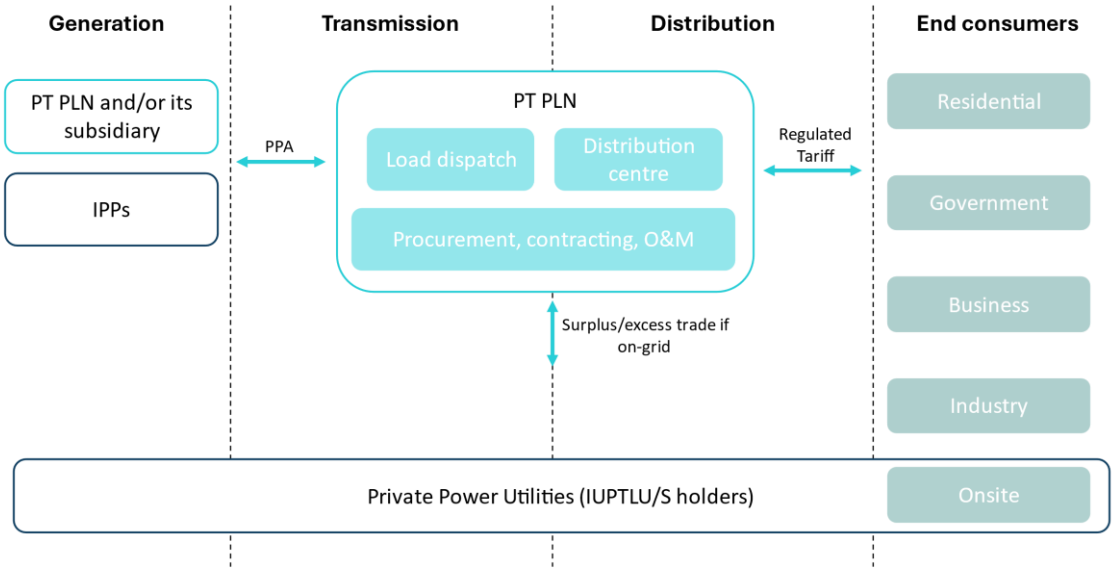

Figure 1 Indonesia's Electricity Market

The power generation sector in Indonesia is segmented into three main activities: transmission, distribution, and generation. The private sector's participation is limited to Independent Power Producers (IPPs), which are involved in the generation of electricity.

The competitive landscape for prospective developers is largely confined to the energy procurement phase. This phase is managed through tenders organised by PLN. During these tenders, prospective IPPs have the opportunity to submit bids to supply electricity. In some cases, selected investors may be required to collaborate with subsidiaries of PLN. The tenders organised by PLN usually follow the plan outlined in the Electricity Supply Business Plan (RUPTL), which is also developed by PLN. Given that PLN holds multiple roles within Indonesia's power sector, potential conflicts of interest could arise.

The relationship between the national planning documents and the RUPTL is illustrated in Figure 2 below.

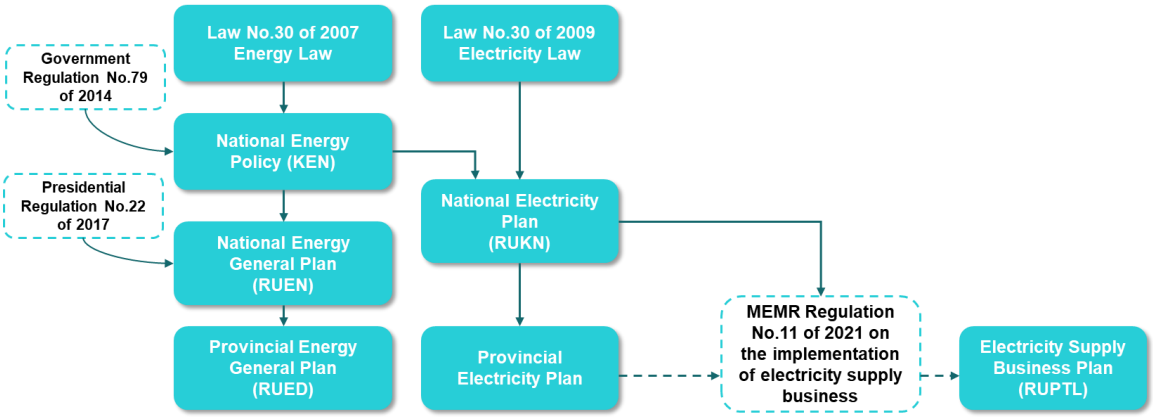

Figure 2 Relation Between National Energy Planning Documents in Indonesia

The process of electricity provision through an IPP includes the steps as shown in Figure 3.

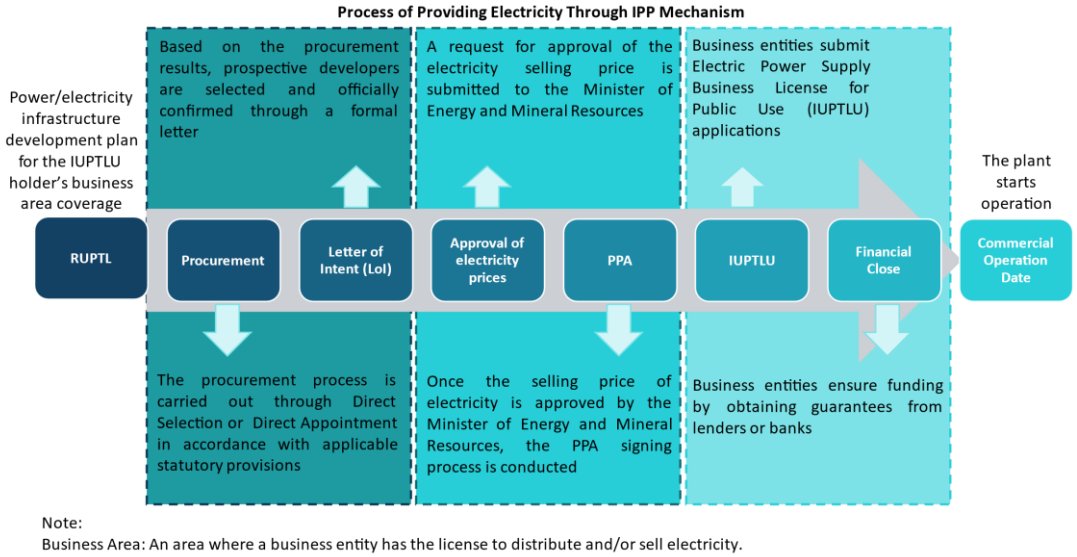

Figure 3 Process of Providing Electricity Through IPP Mechanism (prepared by the consultant based on MEMR presentation in 2022)

4.2. Stakeholders Relevant to the Procurement Process of Solar PV Development in Indonesia

The procurement process of solar PV development in Indonesia currently involves several stakeholders from ministries down to PLN. Other stakeholders who assist in addressing specific issues, such as financial incentives provision or land acquisition, are also presented in Table 4 below.

Table 4 List of Stakeholders

No	Stakeholder	Roles and Responsibilities
1	Ministry of Energy and Mineral Resources (MEMR)	• Develops, implements, and oversees implementation of policies and regulations for energy and mineral resources, including issued regulations that govern the procurement process, such as MEMR Regulation No. 50 of 2017. • Develops RUEN and RUKN guidelines, as stipulated in Government Regulation No. 73 of 2023 and MEMR Regulation No. 8 of 2021. • Responsible for the ratification of PLN's RUPTL.
2	Ministry of Finance (MoF)	• Provides financial incentives and subsidies for renewable energy projects, including solar PV initiatives. • Develops and implements policies related to renewable energy investments, such as the PMK No. 5 of 2025.
3	Ministry of Environment and Forestry (MoEF)	• Ensures that renewable energy projects adhere to environmental regulations • Facilitates the necessary permits for renewable energy projects that require the use of protected or forest lands, as stipulated in MoEF Regulation No.7 of 2021.
4	PT PLN (Persero)	• Organises the procurement of renewable energy projects, including solar PV initiatives and appoints the tender winner. • Purchases electricity from IPPs. • Develops the RUPTL, aligning with the RUEN and RUKN.
5	National Land Agency (ATR/BPN)	• Manages land use and spatial planning • Assesses the suitability of the proposed area utilisation activities in relation to its zoning classification concerning the *Izin Usaha Penyediaan Tenaga Listrik Umum*/ Electric Power Supply Business License for Public Use (IUPTLU) permit. • Issues building approval and functional eligibility certificates. • Head of Committee of the Indonesia Land Bank Authority

No	Stakeholder	Roles and Responsibilities
6	The Indonesia Land Bank Authority (*Badan Bank Tanah)*	• Manages state land • carries out land acquisition for development in the public interest or direct land acquisition, including energy projects.
7	Developers	• Participate in power plant tenders • Form and invest in an IPP after the tender is won
8	Independent Power Producers (IPPs)	• Develop, finance, and operate solar PV projects • Enter into PPAs with PLN or other off takers
9	Financiers (e.g., conventional banks, private equity firms, venture capitalists, etc.)	• Provide the capital needed to fund energy projects. • Assess financial viability and risks by evaluating PPA terms to ensure sufficient revenue streams and negotiating conditions to mitigate risks.
10	Development finance agencies (e.g., Asian Development Bank, International Finance Corporation, etc.)	• Support development projects, including power projects, by providing concessional terms, such as equity, loans or grants on more favourable terms than those available in the market, often with lower interest rates or more extended repayment periods • In some cases, it may also help to fund project preparation (e.g., feasibility study development, transaction advisory, etc.)

In addition to the regulation framework mentioned above, the GoI is currently developing the Draft Renewable Energy Bill (RUU EBET). Initiated by the Indonesian House of Representatives (DPR) in 2018, the bill is part of the 2019-2024 National Legislation Program (Prolegnas), with the most recent document dating back to 2022. RUU EBET is intended to provide a comprehensive legal framework for renewable energy. However, the development of the RUU EBET has faced significant delays. In September 2024, the Level I Decision Making Meeting during the Working Meeting of Commission VII of the DPR with the Minister of Energy and Mineral Resources was cancelled. Consequently, the ratification discussion of the RUU EBET is planned to be carried over to the 2024-2029 period.

Accelerating the ratification and implementation of the RUU EBET is necessary in order for Indonesia to harness its benefits. The regulation is expected to provide a solid foundation for the development and procurement of renewable energy, including solar PV projects, and hence has the potential to attract both domestic and international investors.

4.3. Regulatory Framework for Procurement of Solar PV Development in Indonesia

The procurement framework in Indonesia's renewable energy sector, including solar PV development, has undergone several changes over the years, marked by introducing numerous regulations. The first key regulation was the Minister of Energy and Mineral Resources (MEMR) No. 12/2017. This regulation established two procurement methods: tender based on lowest reference price (*harga patokan*) or direct selection by PLN for selected hydropower and biomass/biogas projects exceeding 10MW and tender based on a capacity quota by PLN for solar and wind energy. As further explained in Section 3.1.1, direct selection tender involves a competitive process inviting multiple qualified developers to

submit proposals, which are then evaluated based on predefined criteria. Capacity quota is defined as the maximum amount of generating capacity offered to a business entity in a period for a specified electricity purchase price. Based on the Electricity Supply Business Plan (RUPTL), the minimum total package that can be tendered under the capacity quota-based method is 15 MW, which could be distributed across multiple locations.

This regulation was superseded by MEMR No. 50/2017, which expanded the scope of the direct selection tender method to include hydropower, biomass, biogas, waste-to-energy, geothermal, and ocean energy. It also allowed for direct selection tender method based on solar and wind energy capacity quota. This broadened the range of renewable energy sources recognised within the procurement process.

In 2019, MEMR No. 53/2018 was introduced as the first amendment to MEMR No. 50/2017. This regulation introduced a new procurement method for liquid biofuel, a limited tender by PLN. For other types of renewable energy, the procurement methods outlined in MEMR No. 50/2017 remained applicable. This marked the first time a procurement method was specified for a particular type of renewable energy, indicating a more targeted approach.

The second amendment to MEMR No. 50/2017, MEMR No. 4/2020, introduced the direct appointment method by PLN for all types of renewable energy under certain conditions. These conditions include crises or emergencies, the purchase of excess electricity, increased generation capacity at the location of an operating power plant, or when there is only one candidate Independent Power Producer (IPP) for the relevant area. This regulation also maintained the direct selection tender method by PLN for all types of renewable energy and the direct selection tender method based on capacity quota for intermittent renewable energy sources.

The most recent regulation, Presidential Regulation No. 112/2022, introduces two distinct procurement methods for power plants, including solar PV, depending on whether they are wholly developed by a private entity or wholly or partially developed by the government, including through grants.

For power plants wholly built by a business entity, the procurement methods are as follows:

- Direct appointment by PLN for hydropower utilising dams owned by the Ministry of Public Works and Housing (MPWH), geothermal, and expansion.
- Limited tender by PLN for hydropower and hydropower peaker, solar PV, biomass, biogas, biofuel, and ocean/tidal energy.
- Direct appointment by PLN for power plants wholly or partially built by the government, including government projects that are funded by grants.

The regulation does not supersede MEMR No. 4/2020, but instead, it complements it by providing more detailed guidance on the implementation of the procurement process. While MEMR No. 4/2020 provides a comprehensive framework for the procurement of renewable energy, including methods of procurement and tariff stipulations, Presidential Regulation No. 112/2022 provides additional clarity and specificity in terms of the procurement methods for different types of power plants and the entities that build them.

The Presidential Regulation no. 112/2022 also formalises the GoI's commitment to renewable energy by limiting the procurement of new coal-fired power plants, with certain exceptions. It mandates the development of a roadmap for the early termination of existing coal-fired power plants. This regulation underscores the government's dedication to transitioning towards a more sustainable energy mix and reducing greenhouse gas emissions. The procurement mechanism of power plants is also regulated in Presidential Regulation No. 112 of 2022, as detailed in Chapter 3.1.

On the implementation level, PLN's Director Regulation No. 22 of 2020 regulates the procedure of procurement of goods/services, including the requirements and evaluation for the procurement of

energy. For procurement within PLN and its subsidiaries, PLN's subsidiaries may be chosen through a direct appointment mechanism. Further, PLN's Director Regulation no.62 of 2020 specifically governs the purchase of electricity from new and renewable energy sources, including the procurement process of renewable energy.

The GoI might assign PLN and/or its subsidiaries as a mandatory strategic partner in the IPP to develop certain projects. In the case where PLN forms a Special Purpose Company (SPC) (in this case, an IPP) with a developer, Presidential Regulation No. 14 of 2017 stipulates that PLN must have a minimum of 51% of shares in the SPC. Details of how this affects the procurement processes are explained in Chapter 3.4

Figure 4 and Table 5 below summarise the key regulations for solar PV procurement.

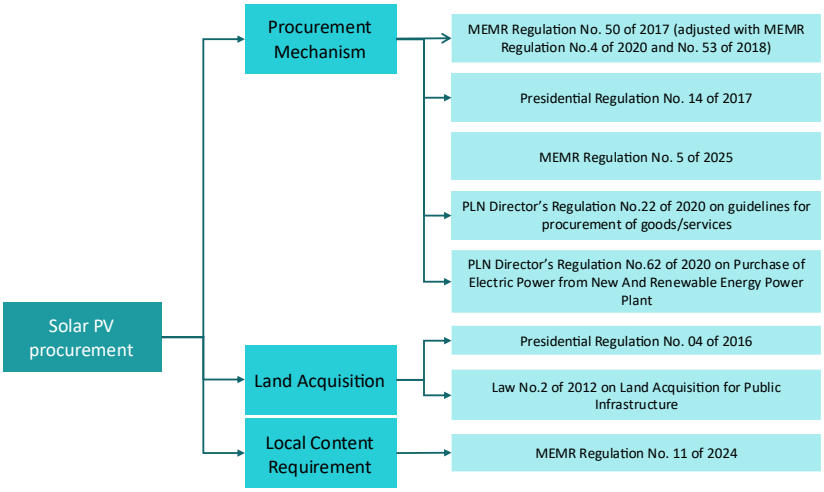

Figure 4 Summary of Key Regulations on Solar PV Procurement

Overall, the regulatory framework is designed to accelerate the adoption of solar energy while ensuring the process remains competitive, transparent, and supportive of the local industry. This approach aims to create an attractive investment landscape. However, adjusting specific regulations, such as the minimum share requirement for PLN and/or its subsidiaries in an SPC and the LCR, could improve the investment environment for solar PV development. Details on which regulations could be improved are discussed in Chapter 3.

Table 5 Summary of Regulations Related to Solar PV Procurement

No	Regulation/ Framework	Remarks
Electricity in general		
1	Law No. 30 of 2009 on electricity	Regulates various aspects of electricity in Indonesia, including generation, transmission, distribution, and sales.
2	Presidential Regulation No. 14 of 2017	This regulation amended Presidential Regulation No. 4 of 2016 concerning the Acceleration of Electricity Infrastructure Development. In the case where the GoI assigns PLN or its subsidiaries as a mandatory strategic partner in an IPP for specific projects, It stipulates that PLN must have a minimum of 51% of

No	Regulation/ Framework	Remarks
		shares in cooperation projects between PLN (or its subsidiaries) and project developers.
3	Presidential Regulation No. 112 of 2022	The latest regulation concerning the acceleration of renewable energy development for the provision of electricity is one measure to entice investments and accelerate the RE mix target, as well as reduce GHG emissions. This regulation includes a ceiling price for renewable energy, including solar PV.
4	MEMR Regulation No. 50 of 2017 (adjusted with MEMR Regulation No.4 of 2020 and No. 53 of 2018)	• Focuses on utilising renewable energy resources for electricity production, including solar PV. • Stipulates renewable energy sources' maximum tariff and minimum capacity/availability factor, the IPP selection/bidding process, and the power purchase scheme.
Procurement		
5	MEMR Regulation no 5 of 2025	This regulation provides comprehensive guidelines for PPAs involving renewable energy power plants.
6	PLN Director's Regulation No.22 of 2020 on guidelines for procurement of goods/services	This regulation provides comprehensive guidelines for PLN's procurement of goods and services, including procedures for competitive bidding, direct appointment, and direct procurement.
7	PLN Director's Regulation No.62 of 2020 on Purchase of Electric Power from New And Renewable Energy Power Plant	• Establishes the framework for purchasing electricity from new and renewable energy power plants, including the terms and conditions for PPAs between PLN and IPPs. • Specifies renewable energy projects' pricing mechanisms, contract duration, and technical requirements. • Provides a framework for PLN's power plant procurement process.
Local Content Requirement		
8	MEMR regulation No.11 of 2024	This regulation stipulates the minimum local content of equipment that should be used in solar PV power plants
9	Ministry of Industry Regulation No. 34 of 2024.	This regulation regulates the LCR weight of Solar Module Products.
10	DGNREEC Regulation	This regulation outlines procedures for calculating the fulfilment of the value of the combined domestic component level of goods and

No	Regulation/ Framework	Remarks
	(Kepdirjen EBTKE) No.150 of 2024	services within the scope of the electricity infrastructure development project for renewable energy power plants.
11	MEMR Ministerial Decree No.191.K/EK.01/MEM.E/2024	Regulates the minimum limit of combined LCR value of goods and services in the scope of electricity infrastructure development projects
Land Acquisition		
12	Law No.2 of 2012 on Land Acquisition for Public Infrastructure and Presidential Regulation 04/2016	Stipulates the legal framework for land acquisition for electricity infrastructure projects.
13	Presidential Regulation No. 62 of 2018, amended by Presidential Regulation No. 78 of 2023	This regulation regulates how to handle social impacts in providing land for national development.
14	Presidential Regulation No. 19 of 2021 as amended by Presidential Regulation No. 32 of 2023	This regulation supports the implementation of Law No.2 of 2012 and regulates in more detail the implementation of land acquisition, including location determination, compensation, and objection handling.
15	Government Regulation No.23 of 2021 and MoEF Regulation No.7 of 2021	This regulates forestry planning, changes in the allocation and function of forest areas, and the use of forest areas. At the same time, the MoEF regulation provides more detailed guidance on the procedures and requirements for the use of forest areas.
16	Government Regulation No. 64 of 2021	This regulation establishes the Indonesia Land Bank Authority, a special agency tasked with managing land to ensure its availability for various purposes. This regulation grants the Land Bank special authority to handle land for public and social interests, national development, economic equality, land consolidation, and agrarian reform
17	MoHA Regulation No. 7 of 2024	This outline covers the rent charged for regional government assets, including the base rent tariff and the rent adjustment factor, including for power plant projects.

No	Regulation/ Framework	Remarks
Incentives		
18	Government Regulation (PP) 78 of 2019; Minister of Finance Regulation (PMK) 130 of 2020 as amended by PMK 69 of 2024; 81 of 2024; PMK 21 of 2010; PMK 176 of 2009 as amended by PMK 188 of 2015 and PMK 76 of 2012	Provision of tax facilities to individuals and companies involved in RE investment: • Income tax deduction, • Investment tax deduction, • Accelerated depreciation, and amortisation, • Import duty exemption, • VAT exemption on imported goods, and • Tax holiday. Details of incentives regulation are explained in the following section.

4.4. Incentives for Renewable Energy Development

The GoI has introduced several incentives to encourage investment in solar PV. These include tax holidays and import duty exemptions. These measures aim to alleviate the financial burden on developers and make solar PV projects more attractive to investors. Discussions with developers indicate that these incentives, especially tax-related ones, are advantageous and aid in financing, thereby enhancing project feasibility. For instance, the Cirata Floating Solar Power Plant received a tax allowance incentive (IDN Times, 2024).

Tax allowances regulated by the Ministry of Finance under PMK No. 130 of 2020 are granted based on the investment amount and are exclusively available to pioneer industries. The entire process takes up to 10 working days: 5 days for calculating the score to meet the quantitative criteria for Pioneer Industry status and another 5 days for the decision's issuance. This procedure begins once the request is submitted through the OSS system. Table 6 outline available incentives for RE development in Indonesia.

Table 6 Available Incentives for RE Development

No	Type of Incentives	Regulation Basis	Remarks
1	Tax allowance	Government Regulation No. 78/2019	This regulation enhances tax allowances for companies investing in renewable energy, offering reductions in net taxable income, accelerated depreciation, and extended loss carry-forward periods.
2	Tax allowance	PMK No. 11/2020	This regulation provides technical guidance on implementing PP No.78 of 2019 on tax allowance facilities, detailing procedures for applying for and utilising these incentives.

No	Type of Incentives	Regulation Basis	Remarks
3	Tax holiday	PMK No. 130/2020	This regulation further stimulates investment by offering a 50% to 100% reduction in corporate income tax for a period of 5 to 20 years. For investments between IDR 100 billion and IDR 500 billion, companies can receive a 50% reduction in corporate income tax for 5 years. For investments exceeding IDR 500 billion, companies can benefit from a 100% reduction in corporate income tax for 5 to 20 years, depending on the investment amount.
4	Income tax deduction and import duty exemptions	PMK No. 21/2010	This regulation provides tax and customs facilities for renewable energy projects, including a 30% net income reduction over six years, accelerated depreciation, and exemptions from import duties and VAT for machinery and equipment.
6	Import duty exemptions	PMK Regulation No. 66/PMK.010/2015	This regulation provides incentives by exempting capital goods from import duties on those used to develop or expand electricity generation industries in the public interest.

Through various incentives, the GoI aims to reduce financial burdens and enhance the feasibility of solar projects, particularly large-scale developments like floating solar plants.

A 2023 study titled “The Impact of Fiscal Incentives on the Feasibility of Solar Photovoltaic and Wind Electricity Generation Projects: The Case of Indonesia” (Halimatussadiah, et al., 2023) found that tax holidays and tax allowances are particularly effective in reducing the electricity price of renewables, especially solar PV. By lowering overall costs, these incentives can attract more developers to renewable energy projects.

Discussions with IPPs indicate that these incentives from the GoI help make projects more financially viable. However, some developers have highlighted issues with the complex application process for these incentives. Although the process is streamlined through the Online Single Submission (OSS) system, several documents still need to be evaluated by different government bodies. A developer suggested that better socialisation is necessary to increase awareness among renewable energy developers about these government incentives.

The lack of incentives seems not to be the main factor in Indonesia's slow development of renewable energy; rather, it is the lack of awareness of the existing incentives and the complexity and uncertainty in the processes for obtaining them.

An example of a successful implementation of renewable energy incentives, particularly for solar PV, is the development of a solar PV project for the Nusantara Capital City (IKN), inaugurated in January 2025. This project benefits from two government incentives. The first incentive is the exemption of import duties for businesses engaged in the electricity generation industry (Ministry of Finance Regulation No. 66/PMK.010/2015). The second incentive is a reduction in corporate income tax for new investments of at least IDR 500 billion, as stipulated in the Ministry of Finance Regulation No. 130/PMK.010/2020.

5. Major Challenges and Measures to Address Key Issues of Solar PV Procurement in JAMALI

This chapter discusses the major challenges related to Solar PV procurement and identifies potential solutions.

5.1. IPP Procurement Process

5.1.1. Current Status

The procurement mechanisms for renewable energy projects in Indonesia are governed by a combination of Presidential Regulation No. 112 of 2022 and MEMR Regulation No. 50 of 2017, along with its amendments, MEMR Regulation No. 53 of 2018 and MEMR Regulation No. 4 of 2020. MEMR Regulation No. 50 of 2017 initially set the framework for utilising renewable energy resources through competitive bidding. This regulation ensures transparency and fairness by allowing multiple developers to compete based on predefined criteria.

However, significant changes were introduced with the amendments. MEMR Regulation No. 53 of 2018 and MEMR Regulation No. 4 of 2020 included a direct appointment mechanism permitting PLN to negotiate directly with a single developer under certain conditions, such as the need for rapid deployment or limited availability of qualified developers. Additionally, MEMR Regulation No. 4 of 2020 removed the requirement for renewable energy projects to be developed exclusively under the Build, Own, Operate, and Transfer (BOOT) scheme. Now, alternatives like the Build, Own, and Operate (BOO) scheme are permitted.

Presidential Regulation No.112 of 2022 allows PLN to conduct procurement processes through direct selection or direct appointment. The direct selection method involves a competitive process inviting multiple qualified developers to submit proposals, which are then evaluated based on predefined criteria. Alternatively, the method for direct appointment can be employed when specific conditions are met, such as the need for rapid deployment of renewable energy projects or when limited qualified developers are available. Table 7 shows the procurement mechanism under Presidential Regulation No.112 of 2022.

Table 7 Procurement Mechanism Under Presidential Regulation No.112 of 2022

Aspect	Direct Appointment	Direct Selection (Tender)
Applicable power plants	a. Hydropower plants b. Geothermal power plants c. Expansion of geothermal, **solar,** hydro, biogas, biomass, or wind power plants d. Excess power from geothermal, hydropower, biomass, or biogas power plants	a. Hydropower plants b. **Solar** or wind power plants with or without battery energy storage system (BESS) c. biomass or biogas power plants d. Hydropower plants as a peaker, biofuel power plants, or ocean energy power plants
Mechanism	Assignment from MEMR	List of Selected Developers (DPT)

Aspect	Direct Appointment	Direct Selection (Tender)
	PLN Tender	PLN Tender
Tariff	Tariff is determined based on negotiations but must not exceed the ceiling price	Tariff is determined based on the lowest price offered based on the ceiling price
Procurement lead time	90 days	180 days

The process of the selection mechanism can be seen in Figure 5, as stipulated by PLN Director Regulation No.62 of 2020.

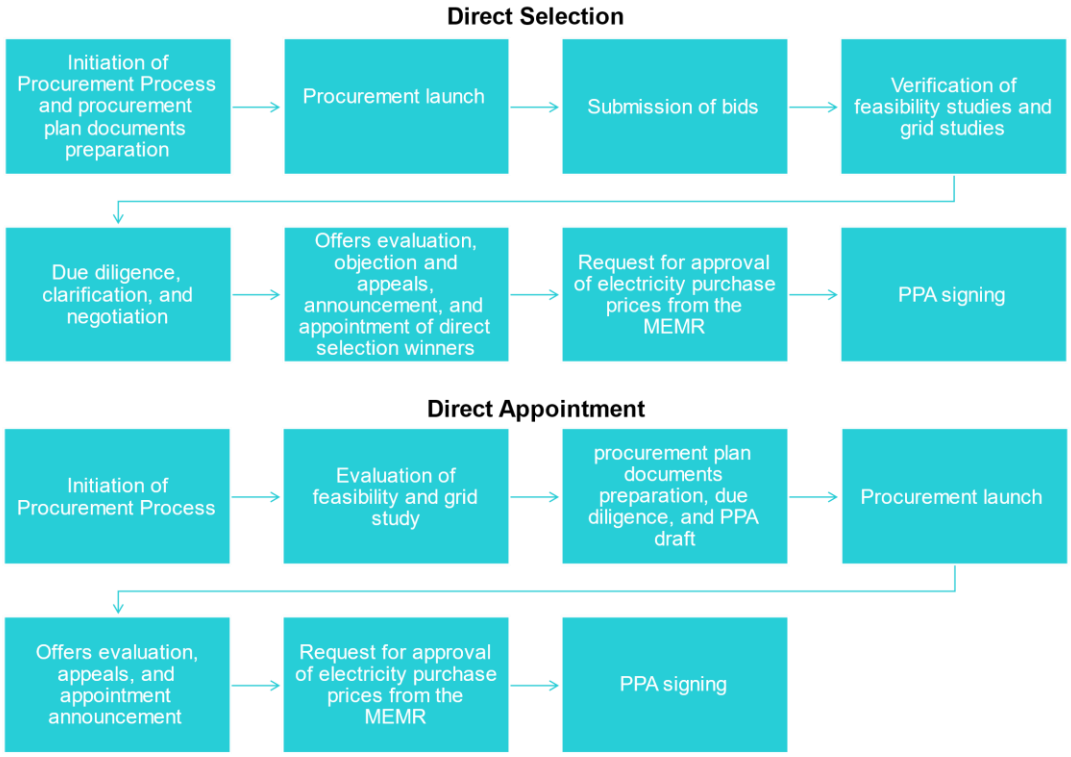

Figure 5 PLN's Procurement Process: Direct Appointment and Direct Selection Mechanisms (prepared by the consultant based on PLN Director Regulation No.62 of 2020)

Under Presidential Regulation No. 112 of 2022, developers participating in the direct selection process must meet specific technical and financial criteria. These include demonstrating relevant experience, sufficient financial capacity, and adherence to the technical specifications of their proposed projects. The regulation outlines an evaluation process that thoroughly reviews both the technical and financial aspects of each proposal to ensure the viability and capability of selected projects in achieving the country's renewable energy targets. PLN Director's Regulation No. 22 of 2020 provides detailed requirements and evaluation methods. The qualification requirements include:

- **Administrative Requirements:**
  - Possess a valid company establishment deed along with any subsequent amendments.
  - Obtain all necessary permits in compliance with applicable laws and regulations.
  - Maintain a clearly defined place of domicile.

- Ensure the company is not under court supervision, not bankrupt, and that business activities have not been suspended. Directors acting on behalf of the company should not be subject to any criminal sanctions.
- Directors or management representatives must have the legal authority to sign agreements or contracts.
- Ensure that directors or management representatives are not listed on any blacklist of goods or service providers.
- Fulfil the latest tax obligations, demonstrated by copies of the most recent annual income tax return (SPT) and tax payment slips (SSP) for the past three months.

- **Technical Requirements:**
  - Demonstrate experience in similar or equivalent work supported by a list of completed or ongoing projects. Exceptions may be made for simple, low-risk, low-cost work that does not require special expertise.
  - Possess the ability to provide the necessary facilities, equipment, and personnel for the job.
  - Additional requirements, such as special equipment, specialist experts, or specific experience, may be necessary for specialised, specific, or high-tech work.
  - Comply with regulations concerning the use of domestic production materials.
- **Financial Requirements:**
  - Demonstrate adequate financial capability, supported by audited financial statements or ratings from credible financial rating agencies.
  - For goods, construction work, or other services prioritised for micro and small providers, ensure financial capability is supported by audited financial statements from a public accounting firm or approved by company leadership.
- **Occupational safety and health requirements for goods/service providers:**
  - Demonstrate adequate financial capability, supported by audited financial statements or ratings from credible financial rating agencies.
  - For goods, construction work, or other services prioritised for micro and small providers, ensure financial capability is supported by audited financial statements from a public accounting firm or approved by company leadership.

Other qualification requirements are the guarantee for the best value for money for PLN.

PLN Director Regulation No.22 of 2020 outlines two methods of evaluation for proposals: an elimination system and a scoring system. The elimination system evaluates the fulfilment of the requirements set out in the Tender Document on a pass/fail basis. The process of the elimination system is presented in Figure 6 below.

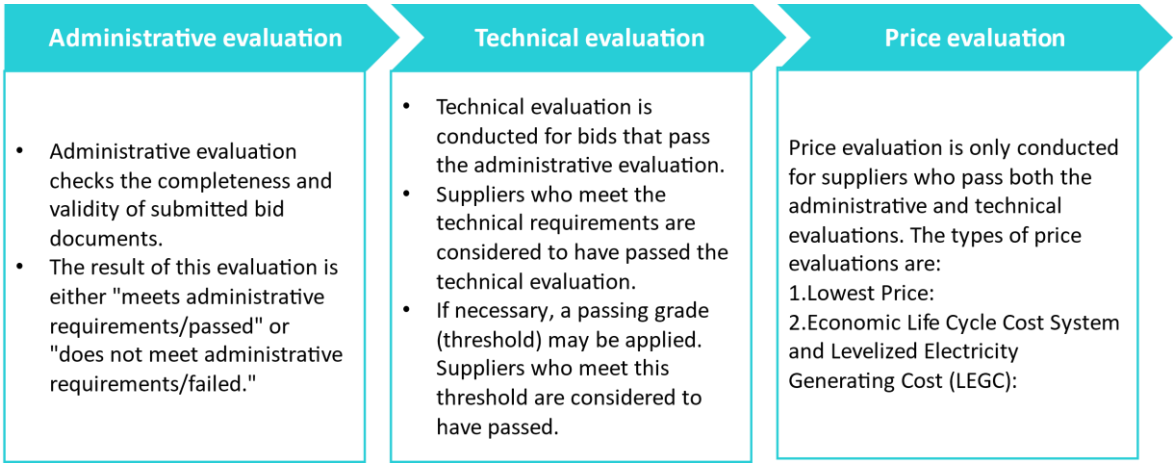

Figure 6 Evaluation Process for the Elimination System (prepared by the consultant based on PLN Director Regulation No.22 of 2020)

The scoring system evaluates bids by assigning specific numerical values to each evaluated element based on rated criteria outlined in the Tender Documents and then comparing the total scores of each supplier's bids with others. This scoring system is used for procurement when technical excellence is as important as price, as technical quality significantly influences the overall value of the offer. The evaluation process for the scoring system is presented in Figure 7 below.

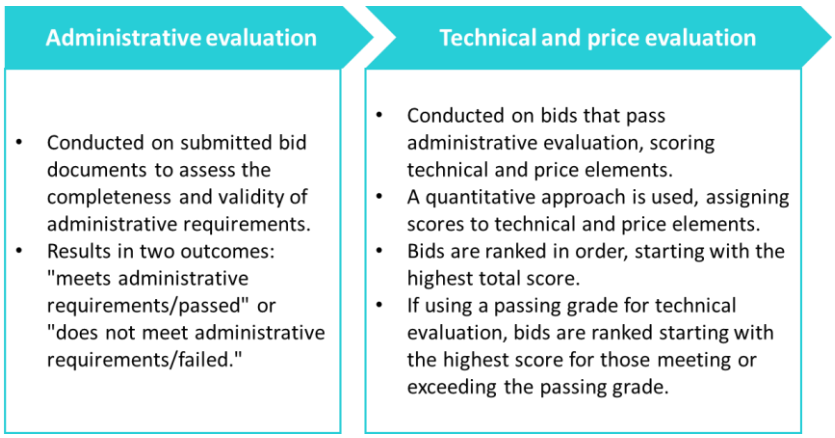

Figure 7 Evaluation Process for the Scoring System (prepared by the consultant based on PLN Director Regulation No.22 of 2020)

While the requirements and evaluation process are detailed, the specific criteria used in the elimination and scoring system are not further elaborated. They are highly likely to be determined on a case-by-case basis, depending on each project's scope and complexity.

5.1.2. Major Impediments

Table 8 below shows the challenges identified with each phase of providing electricity through the IPP mechanism.

Table 8 Challenges Identified Under Each Phase of The Process to Provide Electricity as IPP

Phase	Typical duration	Challenges	Consequences
Electricity Supply Business Plan (RUPTL)	Previously updated every year (2015-2019). Then, it started to be updated less regularly in 2021	• Despite the document's intention to cover a 5-year plan, in 2015-2019, RUPTL was updated annually. Although it has now been updated less frequently (i.e., RUPTL 2019 was updated in 2021, and RUPTL 2021 is currently being updated and is expected to be issued within this year[2]) • COD targets stated in the RUPTL are often non-realistic due to a lack of consideration of the project's feasibility	• The irregular update period provides uncertainty to the investors due to frequent changes • Project procurement and commencement are often delayed due to the unrealistic target
Procurement	90 days for direct appointment, 180 days for direct selection (Presidential Regulation No. 112 of 2022)	The procurement process may take more than the estimated duration in the regulation	Slow down the initiation and completion of projects, causing reduced productivity
Letter of Intent	Immediately delivered after the winner is appointed (PLN Director's Regulation No.22 of 2020)	No challenge identified	
Approval of electricity prices	7-14 days (MEMR Regulation No. 10 of 2022)	No challenge identified	

[2] https://industri.kontan.co.id/news/ruptl-2025-2034-akan-segera-terbit-fokus-pada-energi-baru-terbarukan

Phase	Typical duration	Challenges	Consequences
PPA	Max. 30 days since receiving the letter of approval for the Electricity Sales Price or Electricity Network Rental (MEMR Regulation No. 10 of 2022)	Back-and-forth PPA terms negotiation. Details on this matter are explained further in Report 3: Analysis of the Power Purchase Agreement (PPA) Terms for solar PV Development in JAMALI Region.	May cause delay in PPA signing
IUPTLU permit	5 working days after the applicant submits the application if complete and appropriate (Based on FAQ by MEMR). However, please note that the requirement to submit the IUPTLU requires a few phases with different durations of approval for each phase.	Separate application forms are needed for each requirement.	There may be a bottleneck in obtaining permits, causing potential project delays
Financial close	On a case-by-case basis, subject to the complexity of the projects	Challenges in securing financing and high interest rates	Project delays, increased financial costs, and potential project failure
Commercial Operation Date	On a case-by-case basis, subject to the complexity of the projects. According to data from MEMR[3], constructing a utility-scale, ground-mounted solar PV plant takes approximately half a year.	Prolonged construction of the power plant, issues with land acquisition, delay in delivery of components	Delay in operation of power plant

[3] Indonesia Technology Catalogue, 2024. Retrieved from: https://gatrik.esdm.go.id/assets/uploads/download_index/files/c4d42-technology-data-for-the-indonesian-power-sector-2024-annoteret-af-kb-.pdf

For solar PV development projects initiated by PLN, the targeted COD timeline is stated in the RUPTL, serving as a reference for investors to prepare for future potential project procurement. However, despite being designed for five-year planning, the RUPTL is frequently updated, including the targeted COD year for the listed projects. This creates uncertainty for the investors and disrupts their planning processes.

In practice, the procurement phase could be quite time-consuming. PLN must prepare comprehensive Requests for Proposals (RfP), and thoroughly review the proposals received. Although the RUPTL outlines planned CODs for various solar PV projects, PLN and its subsidiaries rarely adhere to these timelines.

Inadequate procurement planning often leads to frequent delays, extending project timelines for solar PV development. Submission deadlines may be frequently pushed back by PLN, hindering the overall progress. According to the Institute for Essential Services Reform (IESR, 2024), 66.7% of utility-scale solar projects in the PLN RUPTL experience delays from the targeted COD year, ranging from 1 to 3 years. These delays could be attributed to unrealistic targets set in the PLN RUPTL, highlighting a weak connection between planning and procurement realisation.

Discussions with developers confirm that the procurement process is often delayed, ranging from weeks to several months after the RfP is issued. This is primarily due to the necessity for PLN's Board of Directors (BoD) to approve tender results before they can be announced. This requirement extends to PLN's subsidiaries, which also need the parent company's approval, contributing to the prolonged procurement timeline.

Delays in the procurement processes not only slow project initiation and completion but also increase costs, reduce overall productivity, and generate uncertainty in project feasibility. Uncertainty affects cost forecasts, including land prices and human resources allocation. Fluctuations in raw material and equipment prices and land costs may require updated forecasts based on the new project timeline. Consequently, economic growth and development are hindered as projects take longer to deliver their intended benefits to the community and stakeholders.

Moreover, discussions with developers reveal that they frequently face issues related to resource misallocation. Delays or extensions in tender timelines might disrupt developers' resource planning, leading to inefficiencies and frustration. This could affect their ability to manage other projects effectively. Lenders' due diligence, focused on ensuring financial viability and risk management, also contributes to delays. Although Presidential Regulation No.112 of 2022 caps procurement lead time at 90 days for direct appointments and 180 days for direct selections, from document submission to PPA signing, bureaucratic hurdles in obtaining necessary permits and thorough risk assessments by lenders may extend these processes.

5.1.3. Measures to Address Impediments

The previous section highlighted the extent to which the procurement process experience for developers in JAMALI and Indonesia can be complex and lengthy.

Implementing the tender process with a robust monitoring system is essential for smooth execution and timely completion. This system should be designed to identify and address issues as they arise, preventing minor problems from escalating into significant delays. A key component of this system is establishing a dedicated monitoring team. This team should oversee the entire tender process, from initial planning to final submission and evaluation. Their responsibilities would include ensuring adherence to timelines, maintaining clear communication with all stakeholders, and promptly addressing any emerging issues.

Further, since the permitting process for solar PV projects can be lengthy and time-consuming, the procurement and licensing processes could be streamlined, requiring fewer steps and approvals. This

process typically involves multiple regulatory approvals, environmental impact assessments, and compliance with local and national regulations. This complexity can lead to significant delays, as each step requires careful review and approval from different authorities.

In addition to the complex procurement and permitting process, lenders are essential in financing solar PV projects. Their due diligence processes are necessary to ensure the projects' financial viability and risk management, but can be expensive and time-consuming. Lenders must thoroughly assess project feasibility, financial projections, and potential risks, which can delay the finalisation of financing and extend the project timeline.

To facilitate quicker due diligence, comprehensive and transparent project documentation, including detailed feasibility studies, financial projections, risk assessments, and compliance reports, is vital. By presenting a clear picture of the project, developers could help lenders assess its viability and risks more efficiently.

Another proposed solution is for PLN to conduct discussions and communication with potential investors and lenders before the procurement. This could be done through one-on-one discussions, market sounding, or lenders' briefing forums. Such discussions could provide PLN with initial feedback on the project's financial feasibility and bankability and insights into the market appetite. Lenders could provide feedback on improving project bankability, such as the potential loan interest or specific conditions needing consideration. Based on the feedback, project planning could then be updated, including the estimated procurement timelines and pre-feasibility analyses. These events could also serve as a matchmaking opportunity for developers and potential lenders. Discussions could be done for individual projects or for a group of projects that may be tendered simultaneously. This approach has been commonly applied to PPP projects in Indonesia. In one of the discussions with PLN, this approach was also applied to the dieselisation programmes, where PLN invited several potential lenders to understand their concerns regarding the projects and their interest in funding the projects. Interested lenders were then introduced to the project developer, who won the tender to be further approached for the projects. By having prior discussions with potential investors and lenders, the procurement processes are expected to be faster.

A simplified procurement process could be implemented for specific solar PV project capacities to achieve faster and more efficient project execution. Bundled procurement allows smaller-capacity solar PV projects to be procured more quickly, a strategy currently applied in PLN's de-dieselisation projects.

Developing a capacity-based procurement policy is also suggested. This process differentiates smaller solar PV projects (up to 10 MW) from larger projects (more than 10 MW). Smaller projects could have a streamlined procurement process with reduced procurement steps and standardised procedures. For example, if government bodies fail to respond within a given period, the step could be considered approved (silent procedure or tacit acceptance). Simplifications such as a pre-approved vendor list, differentiated for small projects (up to 10 MW) and large projects (more than 10 MW), including vendors with necessary criteria and an IUPTLU permit, could help eliminate bottlenecks and reduce procurement time. This list could replace the pre-qualification step at the beginning of the procurement process and could be used for multiple tenders. The vendor list could be updated annually, and if a tender occurs before the update period, bidders could be required to submit any updated documentation available up to that point (if there's any). The approved developers could also choose to update only when there is an actual tender. It is suggested to keep the process straightforward and simple so as not to burden the potential bidders.

Additionally, a comprehensive procurement timeline should be developed and published, including the key milestones and deadlines that adhere to the procurement lead time of 90 days for direct appointments and 180 days for direct selections, as stipulated in Presidential Regulation No.112 of 2022. A structured project announcement schedule could also be implemented, with a certain number

of designated windows per year. This approach may help PLN and private sector/bidders calculate resources effectively to prepare competitive bids and manage the overall process effectively.

5.2. Local Content Requirements (LCR)

5.2.1. Current Status

LCR mandates that a certain percentage of goods and services used in projects be sourced locally. These requirements aim to boost local industries and create jobs. According to the RUKN 2025-2060, domestic components are used in various sections of the electricity industry, including:

- Power Plants: Engines, generators, and control systems.
- Electric Power Transmission and Electric Power Distribution: Transformers, electrical cables, insulators, and other equipment.
- Electrical and Electronic Devices: Electrical and electronic devices such as electricity meters, switches, and other control systems.
- Other Components and Equipment

However, stringent LCRs have previously posed challenges in the power sector, leading to increased costs, reduced technological competitiveness, and an underdeveloped supply chain. Limited domestic capacity to produce key components, such as solar modules and wind turbines, has compelled developers to rely heavily on imports, increasing costs and creating supply chain bottlenecks.

Despite these challenges, the solar PV industry in Indonesia is growing, with several key players leading the market. Major companies include IDN Solar, SEDAYU, Xurya, Suntech Power Indonesia, Trina Mas Agra Indonesia, and LEN Industri. Although there are improvements in the solar PV production capability in Indonesia, stringent LCRs have sometimes hindered investment and development, particularly in the renewable energy sector. This may be caused by the limited high-quality (tier-1) solar PV modules. As of December 2024, according to Kompas, only PT. Trina Mas Agra Indonesia has achieved the global tier-1 rating (Kompas, 2024).

A study by UK MENTARI in 2024[4] identified 14 existing solar PV manufacturers planning to increase their production capacity over the next five years. The study projects that the annual capacity of solar modules produced in Indonesia may grow by 4.75 GW. Figure 8. This projection is illustrated alongside the projected installed solar PV capacity in 2029 from the RUKN 2025-2060, revealing a gap of 5.75 GW. However, this figure accounts only for the production capacity of the 14 manufacturers identified in the UK MENTARI study.

[4] UK MENTARI. (2024). Local Content Requirement Study – Market analysis and supply chain assessment for domestic manufacturers of solar photovoltaic modules and batteries (Studi Tingkat Komponen Dalam Negeri – Analisis pasar dan penilaian rantai pasokan untuk produsen dalam ne. Retrieved from https://mentari.info/id/2024/03/07/studi-tingkat-komponen-dalam-negeri-analisis-pasar-dan-penilaian-rantai-pasokan-untuk-produsen-dalam-negeri-dari-baterai-dan-modul-solar-photovoltaic/

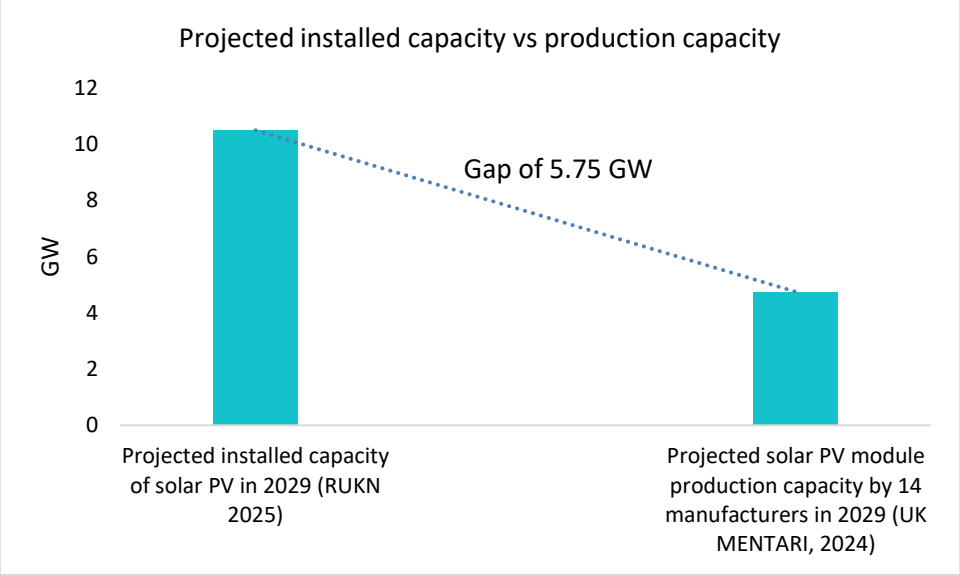

Figure 8 Projected Installed Capacity Vs Production Capacity of Solar PV in 2029

Bloomberg NEF's tiering system for PV module products categorises manufacturers into Tier 1, 2, and 3 based on bankability. This system provides a transparent differentiation among the many solar module manufacturers in the market. Tier 1 module manufacturers are those that have supplied their own-brand, self-manufactured products to six different projects, each financed on a non-recourse basis by six different (non-development) banks within the past two years (BleembergNEF, 2024). This highlights the quality of the solar PV modules and underscores the manufacturer's financial stability and reliability. Due to this, investors prefer Tier 1 solar PV modules. However, only Tier 1 ratings are published, while Tier 2 and 3 are not.

A price comparison between solar PV modules in the domestic market and the international market is shown in Table 9 below.

Table 9 List of Examples of Domestic and International Solar PV Module Prices

Market	Solar Module	Producer	Price approximates* (USD/Wp**)	Maximum Efficiency	Tier rating
Domestic Market	Solar Module SNI Trina Solar 500Wp Tier 1[5,6]	Trina Solar	0.64	21%	Tier 1
	Lensolar Risen – 335 Wp[7]	Lensolar	0.36	17.8%	No publicly available data
	SOLANA 24V 550Wp[8]	Solana	0.29	21%	No data

[5] https://pages.trinasolar.com/DE18M.html
[6] https://pages.trinasolar.com/DE18M.html
[7] Lensolar.co.id. Retrieved from: https://www.lensolar.co.id/product/risen-335-wp/
[8] Solana.co.id. Retrieved from: https://solana.co.id/mono/

Market	Solar Module	Producer	Price approximates* (USD/Wp**)	Maximum Efficiency	Tier rating
International Market	LONGi 555Wp Mono PERC Halfcut[9]	LONGi	0.17[10]	21.7%	Tier 1
	Jinko Solar 555 Wp Tier 1[11]	Jinko Solar	0.27	21-22%	Tier 1
	JA Solar Half-Cell Monocrystalline 540 Wp[12]	JA Solar	0.31[13]	21%	Tier 1

*Note: *) The price indicated in Table 9 is an estimate; the actual price for developers is unlikely to match it exactly and will most likely be lower due to economies of scale and business negotiation*
***)Watt-peak (Wp): a term used to describe the maximum electrical power output of a photovoltaic (PV) panel under standard test conditions.*

According to a 2022 study by UK MENTARI[14], LCR present a significant challenge in the procurement process. LCR mandates that developers and/or IPPs use locally produced technology and materials, which are often more expensive and may not meet global quality standards. However, the relaxation of LCR, as outlined in MEMR Regulation No. 11 of 2024, has provided project developers with greater flexibility in developing solar PV projects with reduced LCR.

MEMR Regulation No. 11 of 2024 introduces significant changes to the LCR for solar PV projects in Indonesia. This regulation sets an LCR value of 20% for solar power plants, compared to the previous 60% minimum LCR for solar modules stipulated in the Ministry of Industry Regulation No. 5 of 2017. Solar power projects with power purchase agreements signed by December 31, 2024, and planned to be operational by June 30, 2026, are eligible for these relaxed LCR criteria. Additionally, the regulation allows projects receiving at least 50% of their funding from foreign development banks or financial institutions to apply for an LCR waiver, aiming to attract more foreign investment by reducing the burden of meeting high local content thresholds.

This new regulation supports and heavily impacts renewable energy development in Indonesia. The reduced LCR threshold of 20% could lower the entry barriers for both domestic and international investors, encouraging a surge in investment that can drive innovation, reduce costs, and enhance the overall competitiveness of Indonesia's renewable energy market. The relaxed LCR requirements are anticipated to expedite the development of solar PV projects, thereby contributing to Indonesia's ambitious renewable energy targets. Furthermore, by easing the regulatory constraints, the government aims to accelerate the deployment of solar energy infrastructure, which is essential for reducing the country's reliance on fossil fuels and lowering greenhouse gas emissions.

[9] Longi.com. Retrieved from: https://static.longi.com/L_Gi_LE_T_TMD_059_107_LR_5_72_HPH_535_555_M_35_35_and_15_V14_895e6db05e.pdf
[10] Tokopedia. Retrieved from: https://www.tokopedia.com/suryaglora-e/longi-555wp-mono-perc-halfcut-solar-module-panel-surya-555-wp-580wp-79ace
[11] Jinko solar. Retrieved from: https://www.jinkosolar.com/uploads/619f4244/JKM555-575N-72HL4-(V)-F1-EN.pdf
[12] CSI solar. Retrieved from: https://www.csisolar.com/module/
[13] Bandarsurya. Retrieved from: bandarsurya.com/index.php/product/solar-panel-ja-solar-half-cell-monocrystalline-540-wp
[14]

The Directorate General of New, Renewable Energy, and Energy Conservation (DGNREEC) issued Regulation No. 150 of 2024, which details the methodology for calculating the LCR using a cost-based approach for goods and services. This regulation ensures a consistent application of domestic content measurement across all electricity projects, including those related to New Renewable Energy (NRE) and Transmission and Distribution (T&D). Additionally, it provides the format and criteria for evaluating LCR. The formula for calculating the project LCR is as follows:

$$Project\ LCR = LCR\ of\ goods\ and/or\ combination\ of\ goods * \frac{\%\ of\ costs\ incurred\ for\ payment\ of\ components\ of\ Goods, combined\ Goods\ and/or\ Services}{Total\ project\ Value}$$

The detailed weight of each component used in the calculation of the LCR scoring is detailed in the Ministry of Industry Regulation No. 34 of 2024.

The calculation of the LCR value for Solar Module products is done by weighting the production factors, which include:

- Direct materials are given a weight of 91%.
- Direct labour is given a weight of 5%.
- Factory overhead costs are given a weight of 4%.

Table 10 below shows the weight of each material. Solar cells account for 50% of the total weight of direct materials, followed by tempered glass, which accounts for 12%. Therefore, based on this weighting, Indonesia should improve its solar cells and tempered glass manufacturing, while in parallel starting to develop manufacturing of other components.

Table 10 Weight of Solar PV Material for LCR Calculation

Material	Weight (%)
Solar Cell	50
Solar cell material	
Silica Sand Procurement	2.5
Metallurgical Grade Silicon Manufacturing	7.5
Solar Grade Silicon Manufacturing	15
Ingot Manufacturing	5
Brick Manufacturing	2.5
Wafer Manufacturing	2.5
Blue Cell Manufacturing	7.5
Cell Printing	7.5
Other components	
Tempered Glass	12

Material	Weight (%)
Photovoltaic Junction Box	8
Backsheet/Bifacial	4
Frame	9
EVA Film	4
Photovoltaic Ribbon	2
Solar Silicon	2

While the immediate LCR requirements are relaxed to attract investment and expedite project development, the long-term focus could be on cultivating a robust local supply chain for renewable energy components. This dual approach balances the need for rapid progress with the strategic objective of strengthening local industries. As domestic manufacturing capacity and technological expertise grow, the local content requirements could be gradually increased.

Additionally, MoI Regulation No. 32 of 2024 aims to accelerate the capability development of local solar PV manufacturers. Instead of specifying a minimum LCR limit for solar modules, this regulation includes labour and production costs in the LCR calculation. Further, initiatives such as capacity building and knowledge transfer for the local market are required to foster the development of local solar PV manufacturers.

The implementation of the two regulations regarding LCR has boosted investment and the domestic solar module industry ecosystem (Kontan, 2024). An example of this growth is PT. Trina Mas Agra Indonesia (TMAI), Indonesia's first integrated solar cell and module manufacturing company. PT. TMAI is building a factory with an initial production capacity of 1 gigawatt peak per year and an investment value of more than USD 100 million. Additionally, PT. TMAI is the first solar PV manufacturer to achieve a tier-1 rating in Indonesia (Kompas, 2024).

5.2.2. Major Impediments

With the relaxation of LCR aimed at fostering the growth of the solar PV supply chain, several measures are necessary to support the domestic supply of solar PV components and elevate their quality. Indonesia's solar PV domestic supply chain faces several significant barriers that hinder its growth and development. A primary issue is the limited availability of high-quality Tier-1 solar PV modules, which are vital for attracting foreign investment and meeting international market standards. Additionally, the low production capacity of solar panels in Indonesia leads to higher costs and limits the ability to achieve economies of scale. However, an example from Trina Solar's solar PV manufacturing investment with Dian Swastika Sentosa and PLN Indonesia Power, which plans to produce tier-1 solar PV modules and up to 3 GW of solar cells and modules, proves that the situation is improving.

The substantial variation in the quality and cost between domestic and imported products may affect procurement decisions. According to imarcgroup.com, Indonesia’s solar energy market size is projected to exhibit a growth rate (CAGR) of 10.3% during 2024-2032 (imarc, 2024). With the government emphasising the use of domestic components through the LCR, there is more pressure to improve the quality of domestic products to compete with imported components. However, the efficiency and price of domestic solar panels at this stage do not meet the requirements of international financing bankability standards yet (IESR, 2022). China, where most solar panels are

imported, benefits from lower production costs. Indonesia would need to increase its solar PV manufacturing capacity to 1–5 gigawatts per year to become cost-competitive (McKinsey & Company , 2023).

5.2.3. Measures to Address Impediments

To enhance its solar PV supply chain, Indonesia must improve local manufacturing capabilities by investing in advanced technology and infrastructure to produce high-quality solar cells and modules domestically. This approach may help reduce reliance on imported components and boost competitiveness in the global market

To balance support for industries in Indonesia, a long-term plan for LCR requirements should be developed by adopting a phased approach to gradually increase LCR over time while continuing and monitoring the implementation of the current LCR regulation. This strategy should include clear milestones and timelines, similar to models used in other countries, enabling the government, developers, and local industries to build capacity sustainably and provide certainty for investors. A clear long-term plan may allow developers to prepare and invest in initiatives to meet targeted LCRs, fostering sustainable growth and development.

Both fiscal and non-fiscal incentives could be introduced to bolster domestic manufacturing capacity and quality. Drawing from the US experience, fiscal incentives, such as tax credits for using locally made products, could be implemented. This is further discussed in Chapter 5.2. For instance, projects exceeding the required LCR could receive tax credits based on the level of LCR achieved. Non-fiscal incentives, such as training and technical assistance, could support local manufacturers and enhance supply chain capabilities.

A key strategy to improve local manufacturing capabilities involves establishing collaboration opportunities with China’s solar panel manufacturers. These partnerships could facilitate the transfer of best practices and technological know-how and create joint ventures on projects impacted by Indonesia's LCRs. Such collaborations may help local manufacturers improve their production processes and product quality. Indonesia could offer several incentives to attract Chinese manufacturers to establish partnerships. These may include tax breaks and/or subsidies. Additionally, providing access to local markets and ensuring a stable investment climate may make Indonesia an attractive destination for foreign investors.

Investing in research and development (R&D) at a national level is also essential. By fostering innovation in solar PV technology, Indonesia may lower production costs while achieving high-quality outputs. This could be achieved by inviting international experts and partnering with university research centres. A notable example of existing partnerships between universities and research centres that could be leveraged to advance solar PV technology is The Indonesia Solar Energy Research Center (ISEREC), a collaboration between the Solar Energy Research Institute of Singapore (SERIS), the Indonesian Engineers Association (PII), and various Indonesian institutions like the Bandung Institute of Technology (ITB) and the University of Indonesia (UI). These partnerships aim to drive innovation and develop advanced photovoltaic technologies.

To encourage R&D of high-quality, locally produced solar PV modules, Indonesia could implement an incentive mechanism similar to that of the United States by offering tax subsidies and credits. In addition to fiscal incentives, Indonesia could also provide non-fiscal incentives to manufacturers. For instance, manufacturers that produce high-quality solar PV modules could be included in a list of approved suppliers prioritised for projects listed in the RUPTL. This recognition would enhance their market reputation and ensure a steady demand for their products, motivating them to maintain high standards of quality and innovation.

Additionally, standardising quality requirements for local manufacturers is critical. The government could promote the adoption of these standards in two ways: first, by establishing a national certification body to ensure solar PV components meet global standards, and second, by promoting Indonesian-made PV components for export. Currently, the quality standards in Indonesia for solar PV components are governed by the Indonesian National Standard (SNI). Specifically, the SNI for crystalline silicon photovoltaic modules includes SNI IEC 61215-1:2016, SNI IEC 61215-1-1:2016, and SNI IEC 61215-2:2016 (Ministry of Energy and Mineral Resources (MEMR), 2021). These standards align with international benchmarks the International Electrotechnical Commission (IEC) set. Exposure to international quality standards and demands may encourage local manufacturers to compete globally, improving their product quality.

5.3. Complex land acquisition processes

5.3.1. Current Status

Sometimes, the private sector may seek to use government-owned land for their solar PV projects. Under the BOO model, the developer is responsible for acquiring the necessary land for the project, granting them complete control over the land and assets. An example of a BOO project is the Ordi Hulu Mini Hydro Power Plant (Kencana Energy, 2022). Conversely, the BOOT model involves the transfer of land and power plant assets to the government or PLN after a specified period. In this model, the government may assist with land acquisition to facilitate the project, although the developer can also acquire the land. An example of a BOOT project is PLTS Likupang, which has a 20-year PPA (Panelsurya.co.id , n.d.).

Law No. 2 of 2012 provides the legal basis for land acquisition in the public interest, including power generation, transmission, substations, networks and electric power distribution. This law is further detailed by Government Regulation No. 19 of 2021 as amended by Government Regulation No. 32 of 2023. These regulations elaborate on the land acquisition process, including location determination, compensation, and handling of objections. Notably, Government Regulation No. 32 of 2023 introduces revised provisions for land acquisition planning documents and a new requirement for a destroyed land acquisition object for the public interest.

Law No. 2 of 2012 outlines a systematic procedure for acquiring land consisting of several key stages: planning, preparation, implementation, and handover. The government identifies the necessary land during planning and consults with affected landowners and stakeholders. The preparation stage involves detailed surveys to determine land boundaries and ownership, and asset valuation by independent appraisers to ensure fair compensation. The implementation stage is where the actual acquisition occurs. The land agency establishes a compensation base according to applicable laws, which is used in negotiations with landowners to reach an agreement. However, Law No. 2 of 2012 specifies that the government conducts the procedure, and the land becomes government property. Developers or IPPs must engage in direct transactions with landowners.

Presidential Regulation No. 4 of 2016, Article 33 complements Law No. 2 of 2012 by providing additional guidelines and procedures for land acquisition related to electricity infrastructure projects.

The land use of forests and conservation lands for energy projects is governed by Government Regulation No. 23 of 2021 and MoEF Regulation No. 7 of 2021, which complement each other. Government Regulation No. 23 of 2021 outlines the procedures and requirements for land acquisition for public interest projects, including energy projects. This regulation emphasises the importance of ensuring fair compensation and proper resettlement for affected landowners. It mandates a comprehensive planning process that includes public consultations and environmental impact assessments to minimise adverse effects on communities and ecosystems. The regulation also

specifies the roles and responsibilities of various government agencies in facilitating land acquisition and resolving disputes.

MoEF Regulation No. 7 of 2021 focuses on the environmental aspects of land use for energy projects. It sets guidelines for conducting environmental impact assessments (EIAs) and obtaining environmental permits. This regulation requires project developers to identify and mitigate potential environmental risks like deforestation, habitat destruction, and pollution.

Although the land acquisition process for renewable energy projects in Indonesia is comprehensively regulated, significant resistance from local communities persists. This resistance can be attributed to several factors:

1. **Loss of Land for Landowners:** Many landowners are reluctant to give up their land, which often holds both economic value and cultural and historical significance. Acquiring land for large-scale solar PV projects can lead to disputes, mainly when landowners feel inadequately compensated or excluded from decision-making processes.
2. **Potential Loss of Income for Farmers and Fishermen:** Converting agricultural land into solar farms can mean a direct loss of livelihood for farmers. Similarly, floating solar projects on water bodies can disrupt fishing activities, leading to economic losses for local fishermen.
3. **Disturbances to the Local Ecosystem:** Renewable energy projects, while environmentally beneficial on a larger scale, can have localised negative impacts. Installing solar panels on land or water can alter local ecosystems. For instance, ground-mounted solar farms can lead to habitat loss for local wildlife, while floating solar panels can affect aquatic ecosystems by changing water temperature and light penetration.
4. **Cultural and Social Factors:** Local communities often have deep-rooted cultural and social ties to their land. Projects that do not adequately consider these aspects can face strong opposition. Engaging with local communities and respecting their cultural heritage is vital for successfully implementing renewable energy projects.

A recent example of such resistance is the planned Singkarak floating solar power plant located in Singkarak Lake, West Sumatra. The opposition primarily comes from the communities living around the lake (Pikiran.rakyat.com, 2025). The environmental impact, including threats to the habitat of the *bilih* fish, an endemic species in Singkarak Lake, has worsened the community's perception of energy projects in the area. The *bilih* fish holds significant economic value in the region and is a primary source of livelihood for many families. Fears of ecosystem damage and reduced income from the fishing sector are strong reasons for the residents to oppose the floating solar power plant project.

To prevent losses for the surrounding community, international standards could be adopted. The International Finance Corporation (IFC) Performance Standard 5 on Land Acquisition and Involuntary Resettlement is designed to mitigate the adverse impacts of land acquisition and involuntary resettlement associated with development projects. This standard emphasises the importance of avoiding involuntary resettlement wherever possible. When avoidance is not feasible, it seeks to minimise the impacts through fair and transparent compensation, meaningful stakeholder engagement, and comprehensive livelihood restoration programs. Compensation must be provided at full replacement cost, covering the market value of lost assets, transaction costs, and any additional relocation-related costs. The standard also mandates that affected persons are fully informed and consulted throughout the process, ensuring their participation in planning and implementation. Additionally, a grievance redress mechanism must be established to address concerns or disputes.

5.3.2. Major Impediments

Land acquisition is a major hurdle in the development of solar PV projects, often hindered by lengthy and complex legal and administrative procedures. These challenges frequently lead to delays in acquiring land and may subsequently impact project timelines. A 2022 study by UK MENTARI[15] highlights that land acquisition processes may be delayed due to social issues that arise during negotiations. This process is critical because many financiers, especially international ones, prefer to invest in IPPs that have already secured all necessary land permits and approvals from local authorities and other relevant entities.

According to Law No.2 of 2012, the land acquisition process for power plants involves a systematic procedure, as shown in Figure 9 below.

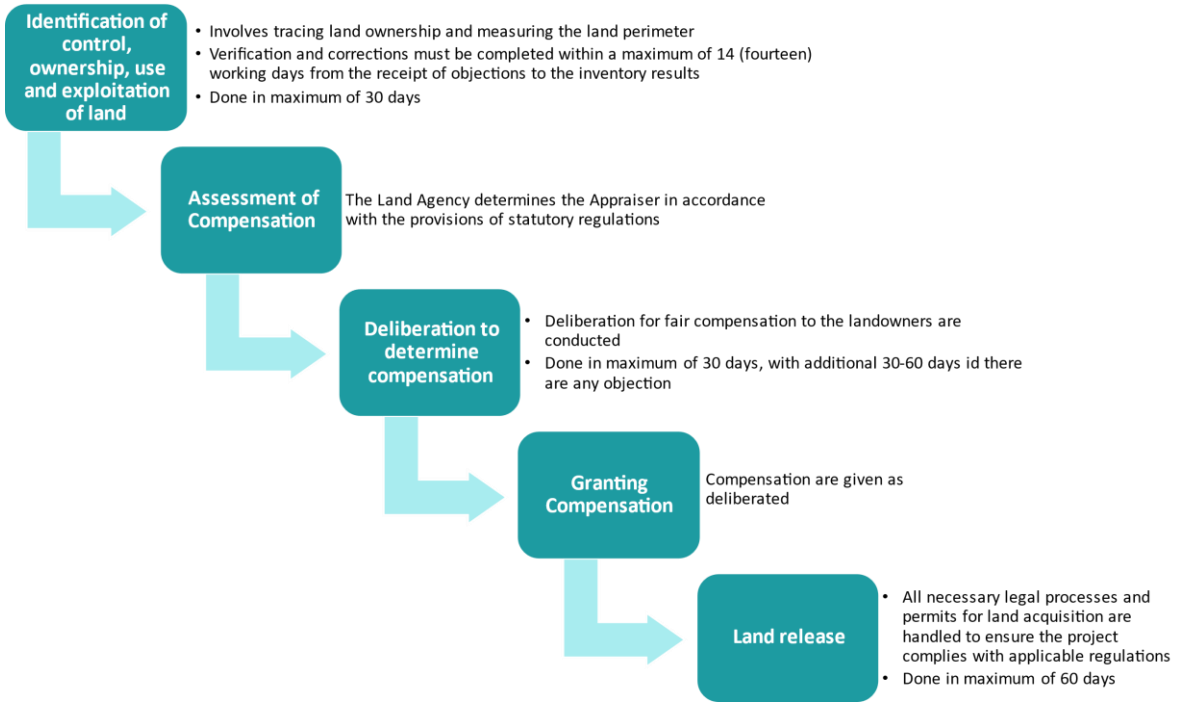

Figure 9 Process of Land Acquisition According to Law No.2 of 2012 (prepared by the consultant based on Law No.2 of 2012)

Fair compensation and community engagement are essential steps in the land acquisition process for solar PV projects, yet they introduce layers of complexities. When the government does not provide the land, developers must comply with various legal requirements, negotiate directly with landowners, and effectively address community concerns. These factors may significantly delay project timelines. To gain local support and prevent conflicts, developers must implement effective community engagement strategies and transparent compensation practices, necessitating careful planning and execution.

5.3.3. Measures to Address Impediments

As explained above, lengthy and complex land acquisition processes may stall the progress of solar projects, making it challenging to meet energy targets and deadlines. This may discourage investment in renewable energy projects, as developers perceive the process as too time-consuming and risky.

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To address this issue, an expedited land acquisition procedure is required. A fast-track process could be developed by setting clear timelines, simplifying documentation requirements, and speeding up the process. Projects could move forward more quickly and efficiently by reducing bureaucratic hurdles and providing a more straightforward path to land acquisition. This saves time and reduces costs associated with prolonged negotiations and legal challenges.

One potential measure is for the government to identify and designate preferred areas for renewable energy projects where the government and private sector could operate. These areas should have minimal environmental and social impacts, and existing grid infrastructure should be capable of supporting the interconnection of new plants. A comprehensive study such as the 1GW solar mapping and development, could serve as a key reference in determining these preferred zones. A high-level proposed land suitability criteria matrix has been developed as presented in Table 11 and could be used to determine the suitability of potential government-owned land.

Table 11 Criteria Matrix to Assess Solar PV Projects' Suitability

Criteria	High Suitability	Medium Suitability	Low Suitability
PV Production potential	High PV production potential (≥1,800 kWh/kWp)	Moderate PV production potential (1,100 – 1,700 kWh/kWp)	Low PV production potential (≤1,000 kWh/kWp)
Land Availability	Large, continuous land available	Moderate-sized land available	Small, fragmented land
Land Ownership	Government-owned or secured land	Land with clear ownership but requiring negotiation	Land with disputed ownership or complex legal issues
Proximity to Grid (de Luis-Ruiz, et al., 2024)	Proximity to existing electrical grid infrastructure (0-1 km)	Moderate distance to grid infrastructure (1-2 km)	Far from grid infrastructure (≥2km)
Environmental Impact	Minimal environmental impact (e.g., non-forested, non-agricultural land)	Moderate environmental impact (e.g., some agricultural use)	High environmental impact (e.g., forested, protected areas)
Topography	Flat or gently sloping land	Moderately sloping land	Steep or uneven terrain
Accessibility	Easily accessible by road and transport infrastructure	Moderately accessible	Difficult to access
Community Acceptance	High community support and acceptance	Moderate community support	Low community support or opposition

It is essential to consider that the cost factors, specifically transmission line cost, could be influenced by the distance of a potential location to the grid. The farther the distance from the solar PV site to the grid, the longer the transmission line is required, leading to higher transmission line costs. This topic is explored in more detail in Report 2: Financial Feasibility Analysis of Solar PV Development in the JAMALI Region, with further discussions in Report 4: Environmental and Social Challenges of Solar PV Development in the JAMALI Region.

In designated preferential zones, the procurement and licensing processes could be streamlined, requiring fewer steps and approvals since these areas are pre-classified for development. Landowner compensation in these zones could be standardised by establishing a base value for negotiations. Additionally, preliminary social and environmental studies could be prepared beforehand to expedite project development afterwards.

An alternative land procurement or acquisition model can be established, such as opening tenders for areas in which the land has been secured beforehand by PLN, financiers, or other parties to reduce risk and uncertainties for developers. This approach could avoid lengthy and uncertain negotiations on land prices and reduce the lead time for project construction.

Another strategy to expedite the land acquisition process is to consider using government-owned or state-owned enterprise-owned land by making it available for project developers to establish solar PV sites. Ministries with unused land could be required to allocate it for optimal uses, such as solar PV development, thereby optimising their idle assets and accelerating solar PV growth. Conditions for using these sites, such as prices and conditions (e.g. if government land is used, BOOT is preferred over BOO), could be standardised and predefined by the MEMR or ATR/BPN.

Government-owned land is expected to be relatively low-cost and have minimal environmental and social risks. According to the Ministry of Home Affairs Regulation No. 7 of 2024, power plants, excluding hydro-powered plants, are eligible for a rent adjustment factor of only 1% of the base price, a 1% adjustment factor for transmission networks, and a 0% adjustment factor for distribution networks. This could encourage investors as there are minimal additional costs for developers, thereby promoting the development of solar PV plants.

Government-owned land could be made available to developers through a dedicated platform, facilitating access to information. Existing platforms such as the Indonesia Land Bank Authority (*Badan Bank Tanah*/"Land Bank") could be utilised to accommodate the proposed solution. The Land Bank is a specialised government body established to manage and allocate land resources. Established under Government Regulation No. 64 of 2021, its primary objectives include ensuring the availability of land for public, social, and developmental purposes, as well as promoting economic equity and agrarian reform. Article 17 of this regulation states that the generation, transmission, substations, networks, and/or distribution of electric power for government projects are included to support and ensure the availability of land for the public interest. Thus, solar PV project developers could collaborate with the Land Bank to search for suitable land for solar PV projects.

The mechanism for working with the land bank is outlined in Government Regulation No. 19 of 2021, as amended through Government Regulation No. 39 of 2023. This allows the Land Bank to provide land for development for public interest or to agencies that organise land procurement. The regulation also applies to state-owned enterprises, regional-owned enterprises, and village-owned enterprises.

For government-owned areas occupied by certain communities for at least 10 years, Presidential Regulation No. 62 of 2018, amended by Presidential Regulation No. 78 of 2023, outlines the procedures and requirements for handling the social impacts of land provision for national development.

In addition to the regulations above, Article 55 of the most recent RUU EBET has mentioned that the central or local government could provide land and infrastructure to support the energy transition and/or facilitate in the licensing process for land and infrastructure procurement. This provision could therefore accommodate the proposed measure.

Other alternative is for the GoI or PLN to provide the developer with an in-principal tariff approval that is as close as possible to the ceiling price as regulated in the Presidential Regulation no. 112 of 2022 before the developer start to procure the land, as long as the calculated return for the developers is still within the reasonable range, so the developer could calculate the maximum land price they

could pay for that tariff level. This approach could provide certainty to the developer regarding the tariff that will be agreed upon in the PPA and a basis for the developer to secure the land and negotiate the price.

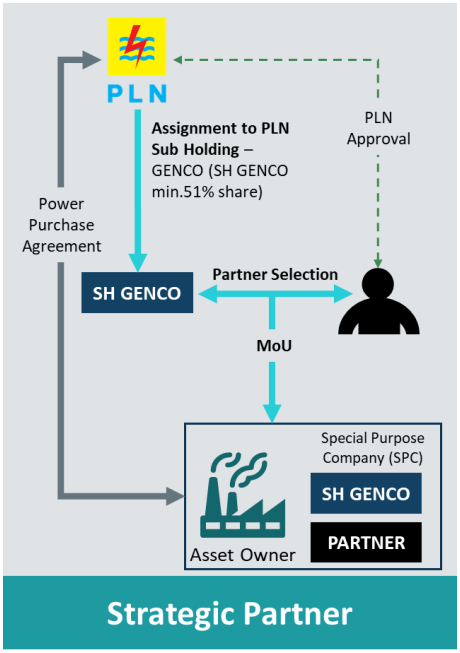
5.4. Minimum share requirement for PLN or Its Subsidiary

5.4.1. Current Status

Presidential Regulation No. 14 of 2017 amends the earlier Presidential Regulation No. 4 of 2016 on the Acceleration of the Development of Electric Power Infrastructure. The regulation allows PLN to appoint its subsidiaries, such as PT Indonesia Power or PT Nusantara Power, to hold shares in IPP projects. This structure enables PLN to participate in the project without bearing the full financial burden upfront. It also helps secure third-party financing, as the involvement of a state-owned entity could enhance the project's credibility and attractiveness to investors.

The regulation specifies that PLN or its subsidiaries can partner with a strategic company to establish an SPC, where PLN or the subsidiary must own at least 51% of the equity shares. While this framework aims to ensure PLN's dominant stake, it can raise concerns about transparency in the procurement process managed by PLN. This lack of transparency might affect fairness and competitiveness, as stakeholders may question the criteria and decision-making involved in the procurement selection. An illustration of the partnership scheme is shown below.

This regulation is subject to varying interpretations. PLN believes it requires one of its subsidiaries to



be the majority partner with at least a 51% ownership stake in the SPC. Conversely, some stakeholders interpret it to mean that a developer may partner with any PLN subsidiary in which the national utility holds at least 51% ownership (IEEFA, 2024).

In practice, PLN or its subsidiaries often face limitations in their financial resources, preventing them from funding their equity stake in projects. This situation necessitates funding from the developer, which can lead to additional costs. As a result, these costs must either be translated into higher tariffs

paid by PLN or reduce the project's feasibility and attractiveness to the private sector. Consequently, PLN or its subsidiaries need to find additional sources of funds.

Based on the Presidential Regulation No. 14 of 2017, there are several types of funding support to improve PLN's financing condition, namely:

a. State Equity Participation (*Penyertaan Modal Negara*/PMN);
b. forwarding of loans from Government loans originating from abroad and/or domestically.
c. loans from financial institutions.
d. provision of facilities in the form of incentives and tax facilities in accordance with the provisions of laws and regulations; and/or
e. other funding in accordance with the provisions of laws and regulations.

However, as opposed to exploring the options above, in the case where PLN and/or its subsidiaries form an SPC, PLN and/or its subsidiaries prefer to request another means, which is a shareholder loan from the strategic partner. A shareholder loan requires the strategic partner to cover part of PLN's equity portion. According to a developer representative, this shareholder loan requirement often burdens the strategic partner, as they must invest more, potentially increasing the project's overall cost.

Differences and examples of the equity share, shareholder loan, bank loan to fund equity, and project finance loan are explained in Table 12.

Table 12 Differences Between Equity Shares and Different Types of Loan

Aspect	Equity Share	Shareholder Loan	Bank Loan to Fund Equity	Project Finance Loan
Definition	Represents ownership in a company (the IPP) typically through shares of stock	A loan provided to a company by one of its shareholders	A loan from a financial institution (e.g., banks) or lender to a company.	A loan from a bank or other finance provider to a project company (IPP) to finance the project capex
Ownership rights	Equity shareholders are partial owners of the IPP.	Does not provide additional ownership rights	Not applicable	Not applicable
Example	Strategic Partner A owns a 40% stock shares in JVCo X (the IPP), leading to Strategic Partner A having a 40% ownership in the JVCo X	Strategic Partner A owns 40% stock shares in the JVCo X, while PLN owns the remaining 60% shares. However, PLN only has sufficient funds to purchase 40%, so it needs	Strategic Partner A owns 40% stock shares in the JVCo X, while PLN owns the remaining 60% shares. However, PLN only has capital to own 40%, so it	The shareholders form JVCo X which becomes the IPP. The IPP raises finance from Bank C, in addition to equity from the shareholders, to finance the project. Bank C may request guarantees from

Aspect	Equity Share	Shareholder Loan	Bank Loan to Fund Equity	Project Finance Loan
		additional resources. PLN then asks Strategic Partner A to lend some money for PLN to be able to have 60% of the shares in JVCo X. The loan provided by Strategic Partner A in this regard is the shareholder loan. Strategic Partner A still only has 40% stock shares despite the additional contribution to PLN.	needs additional sources. PLN then asks Bank B to lend some money for PLN to be able to have 60% of the shares in JVCo X. The loan provided by Bank B in this regard is the conventional company loan.	the shareholders as additional security against default by the IPP if the project fails.
Debt obligation	Not applicable	PLN has a debt obligation to repay Strategic Partner A	PLN has to repay the principal and interest to Bank B	The IPP has to repay the principal and interest to Bank C
Interest rate	Not applicable	Typically lower than the market interest rate	Typically has a market-based interest rate determined by the lender	Typically has a market-based interest rate determined by the lender

5.4.2. Major Impediments

The shareholder loan requirement often leads to the strategic partner taking on more debt than PLN, even though PLN holds the majority share in the partnership. An interview with a developer representative confirmed that the shareholder loan may increase project costs. This requirement affects the financial structure of the potential strategic partner by raising the overall cost of capital. Since shareholder loans are not classified as debt of the IPP, they do not benefit from the tax deductibility of interest payments, thereby increasing the taxable income and, consequently, the tax burden on developers.

Additionally, this regulation impacts the return on investment calculations, making projects less attractive to investors due to the higher perceived financial risk. As a result, only companies with very good financial conditions could meet this requirement. In addition, the potential strategic partner may face difficulties securing financing and maintaining competitive pricing for their energy projects.

5.4.3. Measures to Address Impediments

To address this issue, the government could revisit the minimum shareholding requirements for PLN or its subsidiaries for projects assigned to them in the regulations, and the available means to fulfil these requirements. While it is understood that, by regulation, PLN must hold the majority of shares in an IPP, it is also essential to explore the support needed by both the PLN group and potential partners, including assistance that the government could provide.

It is understood that a shareholder loan is a favourable option for PLN or its subsidiary due to its relatively low loan interest, flexibility, easy application to obtain capital without the need to change the project structure – such as the share division of PLN or its subsidiary and the partner – and the minimum complexities of dealing with an external third party. However, as explained in the previous section, shareholder loans give strategic partners higher financial risks than PLN or its subsidiary. Therefore, before asking for shareholder loans from potential partners, PLN is expected to explore the available government support, as explained in Section 3.4.1, to allocate the financial risk equally between the government, PLN, and/or the strategic partner. A more reasonable procurement planning may also affect the type of government support suggested to PLN, considering that the process to obtain the support may take time. Therefore, PLN could determine which projects may require specific types of government support, which ones may require shareholder loans from potential partners or a combination of both. However, further research is needed on the best financing means, considering each option's pros and cons. This may be addressed during the development of the Final Report.

Should shareholder loans still be required after the provision of government support, discussions between PLN and potential investors are needed to understand the maximum level of shareholder loans that the market could give to PLN. This topic is a priority for the next steps with PLN. The discussion could also act as a catalyst for PLN discussions with the government, specifically to revisit the minimum shares requirement under the applicable regulation.

An alternative is for the GoI to revisit the regulation on the minimum share requirement for PLN and/or its subsidiaries for projects assigned to them. The regulation could be eliminated for small-scale projects (up to a certain capacity), so either PLN or its subsidiaries do not need to own the majority shares in the SPC. Given that the regulation is presumably aimed at protecting ownership of strategic national assets, it would not logically need to apply to smaller projects, especially given that the effect of the requirement is that not so many projects get built.

For large-scale projects, the share requirement could be reduced, or the shares could be separate classes of shares with terms that protect the developer's rate of return when they have complied with the terms of their agreement with PLN. PLN could also procure the projects without assigning PLN and/or its subsidiaries as the mandatory strategic partner, subject to its strategic and commercial needs. Therefore, the minimum share requirement would not apply.

Another option is to improve PLN or its subsidiary's financials. This could be done by reducing the subsidy for consumers' electricity tariffs that align with the nation's economic condition; therefore, PLN could have a better operational cash flow, improving its financial capacity over time. Doing so may significantly reduce the financial burden on the potential strategic partner.

5.5. Summary of the Identified Challenges

Despite the policies and regulations in place to support solar PV procurement in Indonesia, significant challenges were identified in the procurement process. The identified challenges are categorised based on the level of priority, complexity and estimated time required to implement the proposed solutions, as defined in Table 13 and 14.

Table 13 Definition of Priority Level

Priority	Indicator
High	Red
Moderate	Yellow
Low	Green

Table 14 Definition of the Estimated Timeline to Implement the Suggested Measures

Estimated Timeline to Implement the Suggested Measures	Definition
Short term	Challenges that take 1-2 years to address, involving straightforward and not complex solutions. These are the "low-hanging fruits".
Mid term	Challenges that take 3-5 years to address, involving more intricate solutions that may require additional effort
Long term	Challenges requiring long-term solutions that may take 5 years or more to address, involving complex changes and multiple stakeholders

Table 15 below summarises the challenges identified in the procurement process.

Table 15 Summary of Challenges in Solar PV Development Procurement

Category	Description	Consequences	Priority	Estimated Timeline to Implement the Suggested Measures
IPP Procurement Process	Complex and lengthy procurement procedures	The lengthy procurement process hampers project developers due to delays in project procurement due to extended submission deadlines and multiple approval layers.	High priority	Short term

Category	Description	Consequences	Priority	Estimated Timeline to Implement the Suggested Measures
	Inadequate planning for tenders results in pushing back the submission deadline, disruption in the developer's resource allocation, etc.	Lack in planning often causes frequent delays, extending project timelines and pushing back submission deadlines. This slows the overall progress of solar PV development projects and increases costs due to prolonged resource use, inflation, and other factors.	High priority	Short term
	Complex and lengthy process of permitting, PLN's internal process, and the lender's due diligence	The complex and lengthy permitting process, along with PLN's internal procedures and lender due diligence, may cause significant delays in solar PV projects. Each step requires careful review and approval from various authorities. PLN's internal processes, including reviews, approvals, and inter-departmental coordination, further extend the procurement timeline. The lack of standardisation and efficiency in these procedures often leads to bottlenecks and prolonged decision-making.	Moderate priority	Long-term
LCR	Temporary nature of LCR relaxation	The temporary nature of LCR relaxation may result in uncertainty for developers and local industries, making it difficult for them to plan and invest in long-term projects. This lack of stability may hinder the growth and development of solar PV procurement and local industries, as they may not have the confidence to invest in building capacity and capabilities.	Moderate priority	Mid term

Category	Description	Consequences	Priority	Estimated Timeline to Implement the Suggested Measures
	Developers attribute the high market share of imported solar modules to superior quality, higher efficiency, and more competitive pricing.	The high market share of imported solar modules, which developers attribute to the superior quality, higher efficiency, and more competitive pricing may cause dependence on imports and potential supply chain disruptions.	Moderate priority	Mid term
Land Acquisition	Lengthy and complex land acquisition processes	Lengthy and complex land acquisition processes may stall the progress of solar projects, making it difficult to meet energy targets and deadlines. This may also discourage investment in renewable energy projects, as developers may perceive the process as too time consuming and risky.	High priority	Long-term
Minimum Share Requirement in the SPC by the Strategic Partner	The requirement for PLN or its subsidiary to own a minimum of 51% share in the SPC	Shareholder loan requirement hampers the Strategic Partner as it may increase project costs by raising the overall cost of capital. Since these loans are not debt of the SPC, they don't benefit from the tax deductibility of interest payments against power sale revenues, so the net cost of this debt to the Strategic Partner is greater than the cost of the project debt.	High priority	Mid term

6. Action Plan to Improve Solar PV Development Procurement

The following action plan outlines the strategic steps and estimated timeline for advancing solar energy development in Indonesia from 2025 to 2030. It addresses key challenges and proposed solutions identified in previous sections. The plan includes a series of actions, each accompanied by stakeholder roles defined using the RACI (Responsibility Assignment) Matrix. This matrix designates stakeholders as Responsible (R), Accountable (A), Consulted (C), or Informed (I) for each action.

The RACI Matrix clarifies stakeholder involvement for each key area, specifying who performs the work, who oversees it, who should be consulted, and who needs to be informed. Multiple roles may be assigned to a single task, ensuring clear communication and collaboration among involved parties. Table 16 presents the action plan and RACI Matrix for solar PV development in Indonesia.

Table 16 Action Plan and RACI Matrix for Solar PV Development

Action Plan	Year					Role of Stakeholder						
	1	2	3	4	5	MEMR	PLN	MoF	MoEF	MoM	Developer/ IPP	ATR/BPN and Indonesia Land bank Authority
IPP Procurement Process												
Create a bundled or capacity-based procurement mechanism						A	R	-	-	-	C	-
Conduct feasibility analysis (pre-FS) based on the identified potential sites from this study						A	R	C	C	-	I	-
Establish a dedicated monitoring team for the tender process						A	R	C	-	-	I	-
Streamline the permitting process and continuously implement comprehensive and transparent project documentation						A	R	-	-	-	I	-
Develop a comprehensive procurement timeline and project announcement schedule						A	R	-	-	-	I	-
LCR												

Action Plan	Year					Role of Stakeholder						
	1	2	3	4	5	MEMR	PLN	MoF	MoEF	MoM	Developer/ IPP	ATR/BPN and Indonesia Land bank Authority
Develop a long-term plan to balance support for local industries and project feasibility						A	C	C	-	-	C	-
Set clear milestones and timelines for LCR compliance						R/A	C	-	-	-	C	-
Provide fiscal incentives based on the LCR achieved						C	C	R/A	-	-	C	-
Provide non-fiscal support such as training and technical assistance to manufacturers						A	C	C	-	R	I	-
Establish collaboration opportunities with leading solar PV manufacturers						R/A	R	-	-	I		
Provide incentives for research and development of local solar PV modules at a national level						A	I	R	C	I		
Complex land acquisition process												
Implement expedited land acquisition procedures for identified preferred zones						A	I	C	R	-	C	-
Utilise government-owned land and/or collaborate with The Indonesian Land Bank Authority for solar PV projects						R/A	C	C	C	I	C	R
Minimum share requirement for PLN or its subsidiaries in a SPC												
Revisit the minimum shares requirement in PLN or its subsidiaries						C	R/A	I	-	-	C	-

Action Plan	Year					Role of Stakeholder						
	1	2	3	4	5	MEMR	PLN	MoF	MoEF	MoM	Developer/ IPP	ATR/BPN and Indonesia Land bank Authority
Consider procuring the projects without assigning PLN and/or its subsidiaries as mandatory strategic partner in the IPP												
Explore available government support options						C	R/A	C	-	-	-	-
Reduce subsidy for consumers' electricity tariffs that align with the nation's economic condition						A	R	C	-	-	-	-

7. Case Studies

7.1. LCR

1.1.1. India and the United States

Table 17 shows the LCR value in different countries. Countries implementing LCR typically use a phased approach, gradually increasing the LCR over time to allow local industries to adapt and grow. This phased approach helps to balance the need for immediate growth with the long-term goal of developing a robust domestic manufacturing sector.

Table 17 LCR Value in Different Countries

Country	LCR Value (%)
Indonesia	20
US (Norman, 2023)	40
South Africa (European Commission, 2024)	45
India (Government of India, Ministry of New and Renewable Energy, 2021)	50

India has implemented its LCR regulations in phases, starting in 2010 with a domestic content requirement of 30%. Under the "Make in India" initiative, the mandate has increased to 50% for government-supported projects. Similarly, South Africa has adopted a phased approach to LCR, with the latest value at 45% and a target of reaching 60%.

In the United States (US), the LCR is also applied in phases, depending on the year of construction, as shown in Figure 11 below.

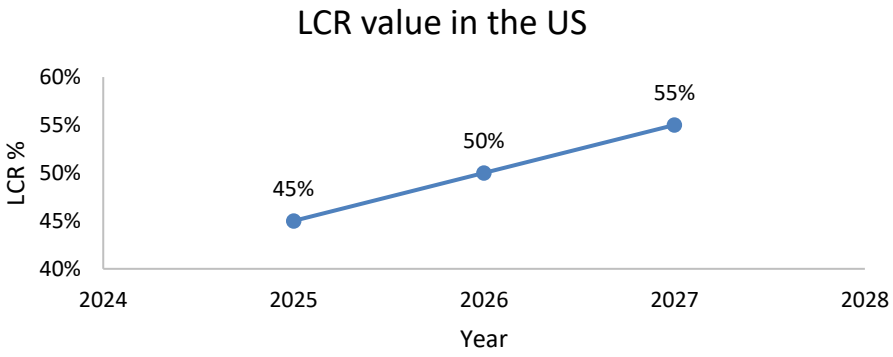


Figure 11 LCR Value in the US Depending on Year of Construction

The US promotes LCR through an incentive mechanism in the Inflation Reduction Act, which offers a 10% bonus tax credit for new power plants that generate renewable or carbon-neutral electricity and meet the domestic content requirements. The domestic content requirement in the U.S. varies, starting at 40%.

1.1.2. Lessons Learnt

The LCR initiatives described above successfully boosted each country's domestic market. The "Make in India" initiative was deemed successful as India ranked among the top 100 nations in the Ease of Doing Business (EoDB) index in 2024 (Ministry of Commerce & Industry, 2024). Foreign Direct Investment (FDI) inflows have also steadily risen, with total inflows amounting to $70.95 billion, with equity inflows reaching $44.42 billion in fiscal year (FY) 2023-2024 (Ministry of Commerce & Industry, 2024).

Meanwhile, in the US, according to the US Department of the Treasury, the incentive on surplus domestic content enhances American manufacturing of iron, steel, and other products used in clean energy projects such as solar and wind farms. Under the Biden-Harris Administration, this initiative has led to companies announcing over US$196 billion in clean power investments and US$92 billion in clean energy manufacturing (U.S. Department of the Treasury, 2025).

The insights from these two countries suggest that Indonesia's LCR regulation could also stimulate the country's domestic market. However, it is important to note that both countries have implemented incentives for LCR compliance. In alignment with the proposed measures in Section 3.2.3, it is recommended to provide both fiscal and non-fiscal incentives for LCR compliance.

1.2. Feed-in-Tariff

Electricity sectors in Southeast Asia span a wide range of market models. Thailand and Vietnam, like Indonesia, operate single-buyer electricity markets. They have also adopted feed-in tariffs (FiT) schemes for their tariff mechanism. The subsequent subsections discuss the FiT mechanism in the respective countries.

1.2.1. Thailand

In Thailand, FiT schemes have driven the growth of solar power since 2007. These schemes take two main forms: premium-price FiT payment, also known as Adder, and fixed-price FiT (pre-specified tariff) payment. Adder involves a normal tariff combined with an additional premium rate, which was initially used to drive the growth of utility-scale solar power. In Thailand, determining the appropriate FiT payment varies by energy source: solar and wind projects use only the fixed FiT (FiTf) rate, which covers the construction costs of power plants and their operation and maintenance (O&M) expenses.

The latest round of renewable energy procurement under the FiT scheme for the period 2022-2030 involved fixed pricing (pre-specified) payments with a contract term of 20-25 years, projects undergoing corporate qualification and technical assessment based on five readiness criteria (land availability, technology suitability, fuel accessibility, financial viability and project implementation planning), with scores being given for each area. Each project type receives FiT throughout the project duration.

Previously, Indonesia implemented a FiT scheme, which set a predetermined price for electricity generated from renewable energy sources, reflecting production cost components.

However, the regulations that established the FiT scheme, namely MEMR Regulation No. 19 of 2015 and MEMR Regulation No. 12 of 2017, have been revoked. They were replaced by Presidential Regulation No. 112 of 2022, which does not reinstate the FiT scheme.

1.2.2. Vietnam

Since 2011, Vietnam had offered attractive FiT to solar and wind developers. A FiT of VND 1,614 (approximately cUSD 6as of the currency exchange rate on 8 May 2025 based on Trading Economics) per kWh was introduced for wind power plants in 2011, following the promulgation of Decision 37/2011/QD-TTg. In 2018, with the amendment of Decision 37/2011/QD-TTg with Decision No. 39/2018/QD-TTg, the rate was further increased to VND 1,928 (approximately cUSD 7) per kWh for onshore wind and VND 2,223 (approximately cUSD 9) per kWh for offshore wind plants that could commence operations by 1 November 2021. Similarly, the launch in 2017 of a feed-in tariff mechanism for solar developers in accordance with Decision 11/2017/QD-TTg aimed to spur rapid deployment of solar capacity. Under this mechanism, all types of grid-connected solar projects that could come online by 30 June 2019 would enjoy a fixed 20-year FiT of VND 2,086 (approx. cUSD 8) per kWh.

To accommodate renewable projects that failed to meet the commercial operations date (COD) deadline, the solar FiT mechanism was extended for a second phase until December 2020 (Decision No. 13/2020/QĐ-TTg) , albeit with new, lower rates that varied for different types of solar installations – VND 1,644 (approx. cUSD 6), VND 1,783 (approx. cUSD 7) and VND 1,943 (approx. cUSD 7) per kWh for ground-mounted, floating and rooftop solar projects respectively. The FiT mechanisms were bolstered by supportive measures such as land rent reductions and preferential tax treatments that collectively contributed to a substantial increase in variable renewable energy (VRE) capacity, particularly in solar energy. However, the FiT scheme encountered challenges, notably in its alignment with broader power sector planning, including the Power Development Plan (PDP) and grid development strategies. The rapid concentrated development of solar projects in regions with high solar irradiance, like Ninh Thuan and Binh Thuan provinces, created important grid congestion, presented curtailment risks, also weakened grid stability operational efficiency. Additionally, the fixed FiT mechanism lacked the flexibility with which to adjust to the declining technology costs and also did not effectively control project sizes. System management faced oversupply risks in certain areas. The FiT was attractive and did strengthen competition for land in these high-potential areas because developers rushed for land to secure solar projects that pushed land prices higher while they created conflicts involving other land uses. This misalignment led to integration issues, affecting the bankability of renewable projects.

There are also significant challenges associated with the misapplication of FiT pricing. In Vietnam, certain solar power projects were granted preferential FiT rates despite failing to meet the eligibility criteria outlined in Government Resolution 115/2018. As a result, Vietnam Electricity (EVN) made overpayments based on these incorrect classifications. However, the prospect of recovering these funds presents a complex dilemma, including retroactive recovery that could undermine investor confidence and deter future investments, while choosing not to recover the funds may set a precedent for regulatory leniency and weaken policy enforcement. In early 2024, new regulations on tariff ranges for solar and wind power projects were introduced, aimed at establishing a clear post-FiT framework. The new Circular 19 sets out methods for determining tariff ranges annually for different regions based on irradiation data for solar projects. It introduces the concept of standard power plants to determine ceiling tariffs. This framework aims to create a more structured and transparent pricing mechanism that reflects the true generation costs.

On April 10, 2025, the Ministry of Industry and Trade (MOIT) issued Decision 988/QD-BCT (“Decision”), updating Vietnam’s FiT rates for solar power projects. These tariffs, effective under the framework of Circular 09/2025/TT-BCT issued on February 1, 2025 (“Circular”), will apply throughout 2025. While FiTs have been part of Vietnam’s renewable energy policy toolkit for several years, the latest update introduces some notable changes to how tariffs are structured and calculated.

The newly released FiT rates for 2025 distinguish between ground-mounted versus floating solar projects and whether or not they include battery energy storage. The inclusion of Battery Energy

Storage Systems (BESS) in the tariff framework is a new development for this year and reflects a policy shift toward encouraging storage integration to support grid stability.

However, despite these adjustments, concerns remain within the industry about the overall sufficiency of the new tariffs. Given rising construction and financing costs, the 2025 rates, may not provide enough financial margin to justify new investments. Projects that include battery storage, which require additional capital expenditure and involve more complex engineering, are especially sensitive to tariff ceilings that may not adequately reflect their full cost structures.

The government's continued reliance on maximum pricing, rather than a more dynamic or auction-based system, may also limit its ability to fully align investor incentives with policy goals. While the regional differentiation of tariffs continues to reflect geographical realities, and the addition of BESS-specific rates is a positive step in theory, the practical impact on investment decisions will depend heavily on how these tariffs compare with project-level economics.

However, Circular 19 does not provide guidance on the selection of renewable energy projects or specific tariff determination for individual projects. This remains a significant area of uncertainty that needs to be addressed for further clarity and stability in the renewable energy sector.

Notably, Circular 19 applies to new solar and wind projects but does not cover plants already operating under existing PPAs with effective FiTs. It introduces the concept of "Standard Power Plants" as benchmarks for setting tariff ranges, which are intended to ensure fair pricing that reflects the true costs of generation. The RE tariff design in Circular 19 treats the contract prices for technologies like biomass, hydrogen and ammonia in much the same way as those for coal-fired and LNG-to-power projects, including both fixed and variable components. In contrast, solar and wind power projects feature contract prices comprising only a fixed price. These prices are capped at the ceiling price of the base year to maintain cost predictability and investment attractiveness. The contract price calculations exclude investment costs for transmission lines and substations and assume that these costs may be recovered separately, ensuring the capping does not hinder the infrastructure development necessary for integrating VRES into the grid.

1.2.3. Lesson Learnt

FiT has been the chosen tariff scheme for both Thailand and Vietnam to drive the growth of their renewable energy sector. However, the FiT scheme has encountered challenges, notably in its alignment with broader power sector planning, which led to integration issues and affected the bankability of renewable projects. While Thailand still uses the FiT scheme, Vietnam has started to establish a post-FiT tariff framework called Circular 19, which determines tariff ranges based on irradiation data for each site and is done annually, which could offer a more transparent pricing mechanism and reflect the true cost of energy generation from each site. These frameworks could provide Indonesia with a blueprint for a more comprehensive tariff scheme to ensure fair pricing for each site.

2. Conclusion

Indonesia's goal of generating 23% of its energy from renewable sources by 2025 requires the expedited development of solar PV projects. However, several challenges present significant obstacles that could impact both the timeline and cost of these projects, namely the complexity and length of procurement processes, the LCR requirement, difficulties in land acquisition, and the minimum share requirement that leads to the implementation of a shareholder loan, which raises costs for developers.

To overcome the procurement challenges in Solar PV development, the procurement process should be simplified by bundling and capacity-based procurement. Adopting a capacity-based procurement procedure could accelerate the process for smaller solar PV projects by allowing them to be bundled together for faster procurement. Moreover, implementing a robust system for regular monitoring and issue resolution would ensure smoother execution and timely completion of projects. A timetable or project announcement schedule could also be published with a certain number of windows each year to allow predictability in tender announcements.

Further, expediting land acquisition processes is required. Implementing fast-track procedures with clear timelines and simplified documentation could accelerate project timelines. Additionally, identifying and designating preferred zones for renewable energy projects, where environmental and social impacts are minimal, could further streamline procurement and licensing processes.

From a financial perspective, the GoI needs to revisit the minimum shareholding requirement for PLN or its subsidiaries for projects assigned to PLN and/or its subsidiaries. Eliminating the minimum share amount for PLN and/or its subsidiaries for small-scale projects could be applied by not requiring PLN and/or its subsidiaries to have the majority shares. For large-scale projects, the share requirement could be reduced, or the shares could be separate classes for PLN and the developer, structured to give priority to the developer's expected level of return. Otherwise, alternative sources of funds could be explored instead of relying on shareholder loans from the strategic partner. Additionally, conducting comprehensive feasibility studies and providing financial assurance to investors could mitigate uncertainties and attract more investment. Another alternative is for PLN to procure the projects without assigning PLN and/or its subsidiaries as the mandatory strategic partner. Therefore, the minimum share requirement would not apply.

Enhancing the quality of domestic solar PV modules is essential on the technical front. This could be achieved by fostering collaboration between local and international manufacturers and conducting research and development to innovate solar PV technology.

Addressing the challenges in solar PV procurement through the outlined measures can significantly boost investment in solar PV projects while enhancing both regulatory and non-regulatory aspects of solar power development. These improvements reduce uncertainties and risks, drawing in more capital and increasing confidence from investors.

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