ISSN: 2599-1086 | e-ISSN: 2656-1778 | Vol. 8 | No. 1 | DOI: 10.35166/jipm.v8i1.97

Unlocking Indonesia's Floating Solar Potential: A PPP Regulatory Review

Muchlis Ahmad Tri Setiawan[1], Achmad Sofwan[1], Dahwin Ferry Harahap[1]

[1] The Indonesian Ministry of Public Works, South Jakarta, Indonesia

Corresponding author:
Muchlis Ahmad Tri Setiawan | muchlisahmad@pu.go.id

ABSTRACT

Indonesia possesses significant potential for the development of Floating Solar Power Plant, or Floating Photovoltaic (FPV) systems, with an estimated capacity of 14,701.71 MWp. Nevertheless, the actual utilization of FPV remains very low. The Ministry of Public Works (MPW) seeks to optimize the use of multipurpose dams as FPV sources through the Public-Private Partnership (PPP) scheme. According to the data released by the Directorate of Dams and Lakes, Directorate General of Water Resources, 257 out of 259 dams nationwide are considered suitable for FPV development. Despite this potential, the implementation of PPP schemes for FPV projects has encountered stagnation. The preliminary evaluations reveal regulatory misalignment between MPW and PT PLN (Persero), which has resulted in a two-stage procurement process that is inefficient and legally ambiguous. These inefficiencies have led to adverse impacts on the government, private sector entities, and society. This study employs a qualitative approach with a Normative Legal Review Gap Analysis framework. The findings highlight the need for regulatory harmonization among MPW, the Ministry of Energy and Mineral Resources, and PT PLN (Persero). Such harmonization would facilitate the establishment of joint Contracting Agencies, a single-stage procurement process, and greater tariff certainty. The study offers policy recommendations that serve as a reference for cross-sectoral regulatory integration and enhance institutional coordination in the development of FPV infrastructure on MPW dams, thereby contributing to Indonesia's Net Zero Emissions target by 2060.

Keywords: Dams; Floating Solar Power Plant; PPP; Procurement; Regulation

ABSTRAK

Indonesia memiliki potensi Pembangkit Listrik Tenaga Surya (PLTS) Terapung dengan estimasi kapasitas listrik yang dihasilkan mencapai 14.701,71 MWp. Namun, pemanfaatan PLTS Terapung masih relatif rendah sehingga Kementerian Pekerjaan Umum (PU) mendorong optimalisasi pemanfaatan bendungan multiguna sebagai sumber PLTS Terapung melalui skema Kerja sama Pemerintah dan Badan Usaha (KPBU). Data Direktorat Bendungan dan Danau, Direktorat Jenderal Sumber Daya Air, menunjukkan sebanyak 257 dari 259 bendungan yang tersebar di seluruh Indonesia memiliki potensi besar untuk dikembangkan sebagai PLTS Terapung. Namun, terdapat beberapa kendala yang menghambat pelaksanaan KPBU PLTS Terapung sehingga mengalami stagnasi. Berdasarkan evaluasi awal terhadap pelaksanaan KPBU PLTS Terapung yang sedang berjalan, terdapat disharmoni regulasi pengadaan antara Kementerian PU dengan PT PLN (Persero), sehingga proses pengadaan dilakukan 2 (dua) tahap dan berjenjang. Akibatnya, terjadi inefisiensi proses dan ketidakpastian hukum yang memicu kerugian bagi seluruh pihak termasuk Pemerintah, Badan Usaha, dan masyarakat. Penelitian ini menggunakan pendekatan kualitatif dan kerangka Normative Legal Review Gap Analysis. Hasil penelitian menunjukkan perlunya harmonisasi regulasi antara Kementerian PU, Kementerian ESDM, dan PT PLN (Persero) agar dapat mengakomodasi pelaksanaan PJPK Gabungan, pengadaan 1 (satu) tahap, dan kepastian besaran tarif. Penelitian ini menawarkan rekomendasi penyusunan regulasi lintas sektor dan koordinasi kelembagaan dalam pengembangan infrastrukutur PLTS Terapung untuk mendukung program Net Zero Emission tahun 2060.

Kata Kunci: Bendungan; KPBU; Pengadaan; PLTS Terapung; Regulasi

ARTICLE HISTORY

Received: April 29, 2025
Revised: June 14, 2025
Published: June 23, 2025

CITATION (APA 7TH)

Setiawan, M. A. T., Sofwan, A., & Harahap, D. F. (2025). Unlocking Indonesia's floating solar potential: A PPP regulatory review. *Journal of Infrastructure Policy and Management, 8*(1), 1–20. https://doi.org/10.35166/jipm.v8i1.97

INTRODUCTION

Indonesia has formally committed to achieving Net Zero Emissions (NZE) by 2060. To realize this target, the government has applied five key principles: (1) expanding the use of New and Renewable Energy (NRE); (2) cutting back on fossil fuels; (3) promoting the adoption of electric vehicles in the transportation sector; (4) increasing electricity consumption in residential and commercial sectors, and (5) utilizing Carbon Capture and Storage (CCS) technologies (Ministry of Energy and Mineral Resources Press Release dated October 8, 2021 on *Principles and Government Roadmap to Achieve Net Zero Emission*).

In line with the first principle—enhancing the utilization of NRE—the National Electricity General Plan (*Rencana Umum Kelistrikan Nasional* or RUKN) for the period of 2024–2060, as stipulated in the Decree of the Minister of Energy and Mineral Resources of the Republic of Indonesia Number 85 of 2025, outlines progressive targets for the renewable energy share in the primary energy mix: 21% by 2030, 41.3% by 2040, 64.7% by 2050, and 73.6% by 2060.

Indonesia, as a country rich in natural resources, has enormous potential for the development of NRE sources. According to the National Energy General Plan (*Rencana Umum Energi Nasional* or RUEN), as outlined in Presidential Regulation No. 22 of 2017, the country's NRE potential is estimated at 443.2 GW, with the largest share of 207 GW deriving from Solar Power Plants (SPP). This potential is attributed to Indonesia's equatorial position with an average solar radiation intensity of around 4.8 kilowatt-hours per meter square (kWh/m2/day). Despite this favorable solar profile, the current utilization of solar power remains extremely low, at merely 0.04%. Consequently, the development of solar power plants, including Floating Solar Power Plants (FSPPs), represents a major opportunity for expanding the country's renewable energy portfolio.

A comprehensive study by IESR (2025) maps Indonesia's solar energy potential in detail, strengthening the argument regarding the vast untapped resource. The report identifies a technical potential of 336.5 GW of ground-mounted solar power plants spread across 781 potential locations throughout the country. Following a financial feasibility analysis that considered various economic parameters, 165.9 GW of this total potential was found to be economically viable for development at 290 locations.

The Ministry of Public Works (MPW), as the government agency responsible for integrated and sustainable water resources management, promotes the optimization of multipurpose reservoirs and dams as sources

of electricity generation, including Floating Solar Power Plants, also known as Floating Solar Photovoltaic (FPV) systems, in support of the NRE mix target of 21% by 2030. According to data from the Directorate of Dams and Lakes (Dit. Benda), Directorate General of Water Resources (DJSDA), as of March 2025, MPW oversees 259 dams across Indonesia, 11 of which were constructed after 2024. Of these, 257 dams are identified as suitable for FPV installation, with a combined inundation area of 73,508.54 hectares and an estimated electricity generation capacity of 14,701.71 megawatt-peak (MWp) (Directorate of Water Resources Infrastructure Financing [Dit. PPISDA], 2025).

To optimize the utilization of dams for FPV development, MPW collaborates with private entities through the Public-Private Partnership (PPP) scheme. According to the Regulation of the Minister of National Development Planning/Head of the National Development Planning Agency Number 7 of 2023 concerning the Implementation of Public-Private Partnerships in Infrastructure Provision, PPP refers to a collaborative arrangement between the government and private sector entities for infrastructure development in the public interest. This partnership is implemented in accordance with technical specifications predetermined by the relevant Minister, Head of Institution, Regional Head, State-Owned Enterprise, or Region-Owned Enterprise. The scheme may involve the partial or full mobilization of private sector resources and must ensure an equitable allocation of risks between the parties. Through this mechanism, business entities are expected to play an active role in government infrastructure projects, thereby reducing reliance on the state budget.

However, challenges persist in the implementation of the PPP scheme, particularly during the transaction phase. A primary concern lies in the procurement process for the Implementing Agency (*Badan Usaha Pelaksana* or BUP), which will be further examined in the discussion section. This process involves the selection of a private entity to serve as the cooperation partner of the Government Contracting Agency (GCA) in executing the PPP project. The procurement follows the procedures outlined in the Regulation of the Government Procurement Policy Agency (*Lembaga Kebijakan Pengadaan Barang/Jasa Pemerintah* or LKPP) Number 1 of 2025 concerning Procurement Procedures for Public-Private Partnerships in Infrastructure Provision.

According to Presidential Regulation of the Republic of Indonesia Number 112 of 2022 concerning the Acceleration of the Development of New and Renewable Energy for Electricity Supply, Article 14 Paragraph 4 stipulates that the purchase of electricity generated by Floating Solar Power Plants, where the land is provided by the government, shall be carried out through a direct selection mechanism. This process includes a series of activities ranging from document submission to the signing of the Power Purchase Agreement (PPA), including document evaluation and electricity tariff negotiations.

As a result, following the procurement process conducted by the Ministry of Public Works, the selected Implementing Agency is required to undergo a second selection process at PT PLN (Persero), in which it must compete with other bidders. This dual-stage procurement mechanism reflects inefficiencies and procedural redundancies, contributing to legal and investment uncertainties. Such conditions may discourage private sector participation in PPP initiatives for dam-based renewable energy

projects, particularly in the development of floating solar power plants.

This regulatory misalignment may hinder the government's efforts to increase the share of NRE in pursuit of the NZE target by 2060. Thus, this study seeks to examine the regulatory inconsistencies between the Implementing Agency procurement process at the Ministry of Public Works and PT PLN (Persero). To address these challenges, the study proposes potential solutions aimed at streamlining the regulatory framework and enhancing institutional coordination. This research adopts a qualitative approach, specifically the Normative Legal Review and Gap Analysis method.

LITERATURE REVIEW

Public-Private Partnership (PPP)

The World Bank (2021) defines PPP as a long-term contract between a private party and a government entity for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance.

PPP constitutes a collaborative arrangement between the government and private sector entities to deliver public infrastructure based on specifications predetermined by the Minister, Head of Institution, Regional Head, State-Owned Enterprise (SOE), or Region-Owned Enterprise (ROE). This collaboration may utilize partial or full resources of the business entities, with an emphasis on equitable risk-sharing among stakeholders, in compliance with Presidential Regulation Number 38 of 2015 on Public-Private Partnership in Infrastructure Provision.

Kurdi and Syafitri (2024) identify several key roles played by PPP in Indonesia's infrastructure development. First, the scheme helps address government budget constraints by reducing reliance on the State Budget (APBN). Second, it enables the procurement of complex infrastructure projects by optimizing private-sector capabilities in design, construction, and operation—competencies that are often beyond the government's reach. Third, PPP facilitates risk-sharing between the public and private sectors, ensuring that the government does not bear the full burden in the event of project failure. Last, private sector involvement in infrastructure management fosters a check-and-balance mechanism that promotes more optimal and efficient management.

In addition, PPP schemes contribute to improved budgeting by reducing unforeseen expenditures and mitigating the risk of project delays. They also enhance the quality of public services through innovations and efficiencies introduced by private entities. Moreover, PPP increases accountability by involving various stakeholders in oversight processes, including the Government Contracting Agency (GCA), business entities, and lenders (Zainuddin & Hasanah, 2025).

There are two primary PPP funding models based on the source of investment returns: (1) user charge schemes, in which revenue is generated directly from service users, and (2) availability payment schemes, wherein payments are made by the government based on the availability of the service, irrespective of usage levels.

A wide range of infrastructure types can be developed under PPP schemes, including economic and social infrastructure, such as roads, water resources and irrigation systems, potable water supply, wastewater management systems, telecommunications and information, electricity infrastructure, and other categories of public infrastructure,

as per Regulation Number 7 of 2023 issued by the Minister of National Development Planning/Head of the National Development Planning Agency concerning the Implementation of Government and Business Entity Cooperation in Infrastructure Provision.

There are two types of PPP schemes: solicited and unsolicited. A solicited PPP is initiated by a public authority—such as a Minister, Head of Institution, Regional Head, or Director of an SOE—while an unsolicited PPP is proposed by a business entity.

The **solicited PPP** process comprises four main phases: planning, preparation, transaction, and management. The *planning* stage includes activities such as identifying potential PPP projects, determining appropriate funding schemes, and planning the budgets. It also encompasses public consultation processes, proposing projects for inclusion in the PPP project list, and preparing the official PPP plan list. The *preparation* stage involves conducting a feasibility study, implementing supporting activities, and exploring market interest. The pre-feasibility study typically comprises strategic, economic, commercial, financial, and managerial analyses. Upon the completion of the feasibility study and the necessary supporting activities, the Government Contracting Agency (GCA) may advance to the *transaction* stage. This phase includes determining project locations, selecting an Implementing Agency, executing the PPP contract, and completing financial arrangements for infrastructure provision. Once the Implementing Agency secures the necessary project financing, the *management* phase begins. This stage involves administering and supervising the PPP agreement, managing the construction process, overseeing service delivery, and planning for the project's termination and asset handover at the end of the contract.

The **unsolicited PPP** process consists of three stages: preparation, transaction, and management. The *preparation* phase begins with the submission of a Letter of Interest (LoI) and supporting documents by a potential private proponent. If the proposed PPP project is approved, the GCA issues a letter of approval to proceed; otherwise, a rejection notice is sent to the business entity. Following approval, the prospective proponent prepares a feasibility study along with additional supporting documentation. These documents are then evaluated by the GCA, which includes assessing market interest and conducting public consultations. If the evaluation results are favorable, the GCA issues an initiative approval letter; otherwise, a rejection letter is provided.

The transaction and management stages of unsolicited PPPs mirror those of solicited PPPs. The *transaction* stage includes determining the project location, procuring the Implementing Agency, signing the PPP agreement, and securing the financing necessary for infrastructure provision by the Implementing Agency. Furthermore, during the *management* stage, activities involve overseeing and supervising the implementation of the PPP agreement, which includes the construction process, service delivery, and the transition phase at the end of the agreement period.

To ensure the success of a PPP project—particularly during the transaction stage, where achieving financial close is critical—adequate risk allocation alone is often insufficient. Thus, additional support mechanisms are required to enhance the project's attractiveness to investors and lenders. Government guarantees are key components of Indonesia's PPP framework, designed at mitigating specific risks and strengthening private sector confidence. For this purpose, the government provides a

centralized guarantee facility through *PT* Penjaminan Infrastruktur Indonesia (Persero), also known as the Indonesia Infrastructure Guarantee Fund (IIGF), a state-owned enterprise under the Ministry of Finance.

IIGF's primary role is to provide guarantees for financial risks arising from the actions or omissions of the GCA, including political risks and the risk of contract default. With such guarantees, the creditworthiness and bankability of PPP projects can be substantially enhanced. This support can ultimately lower the cost of capital for private entities and offer assurances to lenders, thereby encouraging greater private sector involvement in strategic infrastructure development, such as Floating Solar Power Plants. As emphasized by Wibowo and Puspita (2024), government support—particularly in the form of infrastructure guarantees—is vital to ensuring the financial viability of PPP projects. This facility not only serves as a risk mitigation instrument but also acts as a strong signal of government commitment, which enhances investor and lender confidence and helps prevent technically feasible strategic projects from becoming unbankable.

Table 1. Literature review framework

Theme	Subtheme	Literature
PPP Projects	-	- Presidential Regulation Number 38 of 2015 concerning Government Cooperation with Business Entities in the Provision of Infrastructure - Regulation of the Minister of National Development Planning/Head of the National Development Planning Agency Number 7 of 2023 concerning the Implementation of Government and Business Entity Cooperation in the Provision of Infrastructure - Regulation of the Minister of Public Works and Public Housing Number 2 of 2021 concerning Procedures for Implementing Government Cooperation with Business Entities in the Provision of Infrastructure - Regulation of the Public Procurement Policy Agency Number 1 of 2025 concerning Procurement Procedures for Government and Business Entity Cooperation in the Provision of Infrastructure
Water Resources	-	- Law Number 17 of 2019 concerning Water Resources
	Dams	- Regulation of the Minister of Public Works and Public Housing Number 7 of 2023 concerning the Second Amendment to the Regulation of the Minister of Public Works and Public Housing Number 27/PRT/M/2015 concerning Dams
Electricity	-	- Presidential Regulation Number 112 of 2022 concerning the Acceleration of Renewable Energy Development for Electricity Supply - Decree of the Minister of Energy and Mineral Resources Number 85 of 2025 concerning the National Electricity General Plan

Utilization of PU Dams for Floating Solar Power Supply

Indonesia possesses a solar power potential of 207 GW, as outlined in the National Energy General Plan (RUEN) under Presidential Regulation Number 22 of 2017. This substantial potential stems from the country's strategic position along the equator, which results in high levels of solar radiation across the archipelago. Despite this geographic advantage, the current utilization

of solar PhotoVoltaic (PV) energy remains limited—accounting for only 0.04% of the total potential. To address this significant gap, the development of Floating Solar Power Plants by optimizing the use of dams managed by the Ministry of Public Works is expected to contribute to the government's efforts in accelerating the development of sustainable and efficient energy infrastructure.

Projects such as the Cirata Floating Solar PV Plant with a capacity of 192 MWp / 142 MWac exemplify the potential of utilizing water resources to generate renewable energy while minimizing land use (Marupa et al., 2022). Compared to rooftop or ground-mounted systems, floating solar PV offers several key advantages: they optimize the use of reservoir space, can be operated in hybrid configurations alongside hydropower, reduce surface water evaporation, and increase energy yield efficiency up to 10% due to the lower ambient temperatures over water surfaces (Hidayat et al., 2022).

To support this initiative, the Ministry of Public Works has revised regulatory provisions through the Regulation of the Minister of Public Works Number 7 of 2023, which amends the previous Regulation Number 27/PRT/M/2015 on Dams. The amendment increases the acceptable limit for floating solar installations from a maximum of 5% to 20% of the reservoir's inundation surface area at the normal water level. This allowance is granted under the condition that key factors such as dam functionality, structural safety, and environmental, social, economic, and cultural impact assessments are carefully assessed. Additionally, the installation process must prioritize safety precautions to mitigate risks associated with structural failure, hydraulic failure, and seepage, especially under extreme conditions such as earthquakes, where structural loading risks may be higher (Rinaldi et al., 2021).

Marupa et al. (2022) emphasize that the placement of solar panels in floating solar power plants requires careful technical evaluation, including towards factors such as flow velocity, wave height, and sediment dispersion. These are vital to ensure the system's efficiency and resilience against environmental variability. Pujianto et al. (2024) argued that the performance of floating solar PV systems can be enhanced through simulation tools such as PVSyst. Their study found that simulations yielded superior performance ratios (PR) compared to manual calculations, highlighting the importance of a data-driven approach in evaluating the feasibility of solar PV projects in Indonesia.

To accelerate the optimization of dam utilization for floating solar power generation, the Ministry of Public Works has opened opportunities for cooperation with business entities through PPP schemes. This framework provides the necessary legal and institutional basis for developing NRE infrastructures. Supervision by government officials is important to prevent delays and failures, which are often attributed to prolonged concession periods. Shidqi and Firmansyah (2024) highlight the importance of accountability mechanisms in PPP projects to ensure that project objectives are achieved.

Furthermore, a solid understanding of applicable regulations and best practices in PPP implementation is crucial during the planning and preparation stages of infrastructure development (Maulana, 2021). This ensures the sustainability and efficiency of large-scale initiatives such as floating solar power plants. Kartikasari and Retnaningsih (2024) also argue that, as seen in the development of the National Capital City (IKN) under the PPP model, clear and consistent regulatory frameworks on PPP funding play a decisive role in attracting private sector investment.

The Toll Road PPP, one of the most successful Public-Private Partnership sectors in Indonesia, demonstrates that strong government commitment during project preparation, the presence of robust regulatory frameworks, and the implementation of transparent and competitive tender processes are critical success factors (Gaol et al., 2023). Supporting this view, the study by Atmo et al. (2017) reveals that PPP projects tend to outperform traditionally procured projects in terms of operational timing and service availability. These findings emphasize the importance of policy frameworks backed by larger international financing sources and reputable power plant developers.

The stages of delivering Floating Solar Photovoltaic (PV) infrastructure under a PPP scheme generally mirror those of other infrastructure projects. The distinction lies in the transaction stage, which involves dual procurement processes at both the Ministry of Public Works and PT PLN (Persero). In the Implementing Agency procurement phase for Floating Solar PV PPP projects, the bidding parameter is the contribution proposed for dam maintenance activities. Thus, the winner of the auction is determined based on the highest offered contribution.

Under Article 17 of Presidential Regulation Number 112 of 2022, PT PLN (Persero) publishes a list of selected renewable energy providers, known as the *Daftar Penyedia Terseleksi* (DPT) or Selected Providers List. The Implementing Agency designated by the Ministry of Public Works is expected to be registered in this list. Electricity procurement through the direct selection mechanism is conducted based on the lowest price offer, which is evaluated against the highest benchmark price. Once selected, the Implementing Agency proceeds to sign a Power Purchase Agreement (PPA) with PT PLN (Persero). Following the PPA signing, the Implementing Agency enters into a PPP Cooperation Agreement (*Perjanjian Kerja Sama* or PKS) with the Ministry of Public Works and subsequently seeks financial close by securing funding from financial institutions.

RESEARCH METHOD

This study employs a qualitative approach with a descriptive method. Specifically, the methodology used is a Normative Legal Review combined with a Gap Analysis. This methodology was selected to identify and evaluate inconsistencies within the regulatory framework governing the development of Floating Solar Power Plant (FSPP) projects under the PPP scheme on dams managed by the Ministry of Public Works.

The research methodology was implemented through the following systematic stages:

1. Establishment of the normative framework: The normative legal review involved identifying and analyzing relevant Indonesian laws and regulations as the benchmark (“norm”). Rather than comparing with international best practices, the study focuses on evaluating potential contradictions and disharmonies among domestic legal instruments. These include Presidential Regulations, ministerial regulations from the Ministry of National Development Planning (Bappenas), the Ministry of Public Works, and the National Public Procurement Agency (LKPP).

2. Identification and categorization of gaps: Regulatory gaps were identified by comparing existing practices with the intended legal and procedural standards. The primary criteria used to identify the regulatory gap include:

- Process inefficiency, such as the dual-stage, tiered procurement process required by the Ministry of Public Works and PT PLN (Persero).

- Legal uncertainty arising from the use of different procurement procedures and bidding parameters between the two institutions.

- Financial risk and project viability caused by tariff uncertainty, as electricity price negotiations only occur after the Implementing Agency is selected at the initial bidding process at the Ministry of Public Works.

3. Data sources and analysis: The research relies on a comprehensive review of primary and secondary documents, such as statutory regulations, project reports, academic articles, and publications from relevant institutions. This document-based analysis is enriched by the insights of the authors, who are directly involved as practitioners in the planning and implementation of PPP projects within the Ministry of Public Works. This professional experience enables a grounded understanding of how legal provisions are applied and how regulatory gaps impact project outcomes.

4. Limitations of the study: The authors acknowledge the limitations of this study. While the practitioner perspective provides valuable context and interpretations, no formal interviews were conducted with external stakeholders, such as regulatory bodies or private entities. Future research could be enhanced by incorporating such multi-stakeholder perspectives. Besides, given that this analysis is grounded in Indonesia's legal and institutional contexts, the results may not be directly applicable to other jurisdictions without careful consideration of local conditions.

DISCUSSION

PPP Contract Structure of Solar Power Plant Projects

Based on the list of projects included in the Public-Private Partnership (PPP) Plan List for 2024—commonly referred to as the PPP Book 2024—as outlined in the Ministerial Decree of the Ministry of National Development Planning Number 31 of 2024, the majority of PPP projects in Indonesia adopt the Design-Build-Finance-Maintain-Operate-Transfer (DBFMOT) contract structure. Variants such as DBFOM, DBFM, and other commonly used formats like Build-Operate-Transfer (BOT), Build-Own-Operate-Transfer (BOOT), and Build-Transfer-Operate (BTO) reflect similar project delivery mechanisms. In these models, the private sector not only constructs the project but is also responsible for its design, financing (through equity or debt), operation during the concession period, and eventual asset transfer back to the government at the end of the agreed term. Cost recovery for the private partner is typically achieved through user charges (APMG, 2016). According to the Presidential Regulation No. 112 of 2022, the concession period for renewable energy power plant projects is set between 25 to 30 years.

Institutional Structure of Hydropower and Floating Solar Power Plant PPP Projects

The successful implementation of PPP projects, particularly in the renewable energy sector, requires the government commitment, institutional capacity, and effective coordination among stakeholders. While private entities are responsible for executing the DBFMOT scope, the government remains accountable for ensuring that the quality and quantity of services delivered align with public interest as stipulated in the PPP agreement (World Bank, 2021).

In the case of Floating Solar PV and Hydropower PPP projects utilizing dams under the Ministry of Public Works, institutional mapping is carried out during the project preparation phase. The project's institutional structure is illustrated in Figure 1. The Minister of Public Works, serving as the Government Contracting Agency (GCA), delegates authority to the Director General of Water Resources to sign the PPP agreement with the selected Business Entity.

This implementing entity, typically a Special Purpose Vehicle (SPV) company, secures financing through a mix of equity (30%) and debt (70%) provided by lenders. As the entity responsible for project execution, the SPV enters into a Power Purchase Agreement (PPA) with PT PLN (Persero) for a capacity and concession period agreed upon by both parties. The SPV may then appoint contractors and consultants to manage construction, operation, and maintenance (O&M) activities for the hydropower or floating solar power plant, as well as for dam maintenance.

For dam O&M contractors, all activities must be approved, monitored, and evaluated by the local River Basin Authority. This oversight ensures that the proposed O&M activities are aligned with the functional needs of the dam or other water infrastructure and that they correspond to the contribution commitments made during the PPP auction process led by the Ministry of Public Works.

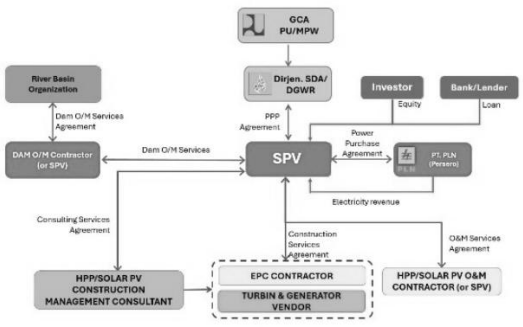

Figure 1. Institutional Structure of the PPP Project on Hydropower and Solar Power Plant at the Ministry of Public Works Dam

The Implementation Mechanism of Hydropower and Floating Solar Power Plant PPP in the Ministry of Public Works

Hydropower and Floating Solar PV PPP projects under the Ministry of Public Works are typically initiated by business entities (unsolicited). The procedure begins with the submission of a Letter of Interest (LoI) by the business entity to the Minister of Public Works, expressing its intention to develop a dam-based hydropower or floating solar power plant. This submission is accompanied by supporting documents that include: (1) a confirmation of conformity with the national water resources and electricity sector master plans; (2) an indication of the need for infrastructure provision; (3) a preliminary review of the project's technical, economic, and financial aspects; and (4) an initial identification of relevant project institutions.

In addition, the proposing entity must demonstrate its financial capacity through the submission of audited financial statements for the past three years and provide evidence of technical experience in implementing similar infrastructure projects. After receiving approval, the entity proceeds to prepare a feasibility study, which must include, at a minimum, five key studies: strategic, economic, commercial, financial, and management studies. The submission of this feasibility study must be accompanied by a draft prequalification document (Request for Qualification), a draft tender document (Request for Proposal), and a draft Government Cooperation Agreement with the business entity. Once these documents are deemed complete and compliant, the business entity is officially designated as the Project Proponent by the Minister of Public Works in their capacity as the GCA.

The next stage is the procurement of the Business Entities implementing PPP projects, which is conducted through two main stages,

i.e., pre-qualification (*request for qualification*) and auction (*request for proposal*). As the project initiator, GCA provides compensation in the form of the right to bid against the best bidder (right to match) during the auction. For hydropower and floating solar power plant PPP projects managed by the Ministry of Public Works, the auction is conducted using a single-stage format. The primary bidding parameter used to determine the winning business entity is the amount of proposed contribution to dam maintenance. The business entity that offers the highest contribution is selected as the winner of the PPP auction. Subsequently, the winning entity for hydropower projects will proceed through a direct appointment process with PT PLN (Persero), involving electricity tariff negotiations. In contrast, the winning entity for Floating Solar Power Plant projects is required to participate in a direct selection process (auction) at PT PLN (Persero).

Once the winning business entity is selected and signs a Power Purchase Agreement (PPA) with PT PLN (Persero), the Special Purpose Vehicle (SPV) formed by the entity signs a PPP Cooperation Agreement with the Minister of Public Works. The SPV is granted 12 months to reach financial close, signifying that the project is financially ready to proceed. At this stage, the SPV must secure the required funding, e.g., through loans or credit agreements, and ensure that the funds are available for disbursement.

Following the transaction stage, the PPP project enters the management stage, which is the final phase of the PPP lifecycle. This stage is designed to ensure effective oversight of the PPP agreement's implementation—from the construction phase, through service delivery during the concession period, to the termination and handover of the project. This stage includes monitoring the performance of the Implementing Agency (or Special Purpose Vehicle—SPV), evaluating the achievement of Key Performance Indicators (KPIs), managing associated risks, and resolving any disputes that may arise during the collaboration period.

The SPV is responsible for constructing the project, a process that typically takes between 1.5 to 2 years, depending on the project's scale and prevailing site conditions. This construction must adhere strictly to the technical specifications and timelines stipulated in the PPP agreement. Upon completion of the construction and commissioning phase, and after securing a Certificate of Operational Feasibility, the hydropower or floating solar power plant is officially declared commercially operational on the Commercial Operation Date (COD).

During the 25-year cooperation period, the SPV must deliver electricity supply agreed in the PPA document and fulfill the required dam maintenance contribution. At the end of the cooperation period, project assets and associated facilities will be transferred to the Minister of Public Works as the Government Contracting Agency (GCA). The transferred assets must be in the condition specified in the agreement and fully operational, with routine and periodic maintenance, as well as equipment replacement carried out based on the agreed schedule. Before the handover process, SPV will conduct training for GCA staff or those appointed so that they can operate and maintain these assets with at least the minimum service standards.

The Development of Floating Solar Power Plants in Indonesia

Many countries have started developing floating solar power plants on reservoirs and other water bodies, including Indonesia, which has initiated such a project at the Cirata Reservoir. This initiative represents the first and largest floating solar power plant in the ASEAN region, marking a significant

milestone in Indonesia's renewable energy landscape. The project is a collaboration between Masdar, a company from the United Arab Emirates, and PT PLN (Persero) through its subsidiary, PT PLN Nusantara Power (formerly known as PT Pembangkitan Jawa Bali or PT PJB Indonesia).

The SPV for the Cirata Floating Solar PV project was established under PT Pembangkitan Jawa Bali Masdar Solar Energy (PSME), with a shareholding composition of 51% owned by PT PLN Nusantara Power and 49% by Masdar. The plant has an installed capacity of 192 MWp / 145 MWac and required a total investment of USD 129 million, equivalent to IDR 1.7 trillion. The electricity tariff agreed upon in the Power Purchase Agreement (PPA) is USD 0.0582 per kWh (Hidayat et al., 2022).

The PPA negotiation process has proven to be one of the most significant challenges in the development of renewable energy projects in Indonesia. A report by Mongabay Indonesia, using the Cirata Floating Solar Power Plant as a case study, revealed that reaching a PPA agreement was time-consuming. Although the auction process and selection of the winning consortium (Masdar and PT PJBI) were completed in 2017, the PPA was only finalized in 2020, resulting in a delay of approximately three years. This extended timeframe—primarily attributed to tariff negotiations and risk-sharing arrangement—has been cited as a major impediment to investment and a source of uncertainty for clean energy developers (Iqbal, 2023).

The current Cirata solar power plant uses around 4% of the reservoir's surface area. A regulatory modification that limits reservoir/dam inundation area utilization from 5% to 20% or higher (Minister of Public Works Regulation No. 7 of 2024) allows increasing Cirata Floating PV's potential capacity up to 1 GWp.

The Implementation of Floating Solar Power Plant PPP Projects Utilizing Dams Owned by the Ministry of Public Works: A Gap Analysis

Institutional challenges are often a major barrier to the success of green PPP projects (Owojori & Erasmus, 2025). Their study highlights that many developing countries still lack a comprehensive policy and regulatory framework to support green infrastructure initiatives. This inadequate or ambiguous policy direction then creates significant uncertainty for both private investors and public authorities. In addition, weak government institutional capacity to design, manage, and oversee complex PPP projects can lead to delays, cost overruns, and poor project outcomes. Case studies of PPP implementation in developing countries such as Ghana's solar energy sector, also show similar institutional challenges. Awuku et al. (2022) have identified that the main challenges faced in Ghana include the lack of adequate legislation, issues of accountability and transparency, and politicization of the PPP project procurement process.

The analysis of regulatory gaps in the implementation of PPP for Floating Solar Power Plants is based on several case studies of projects at various stages of development. To provide a realistic picture of the current development landscape and provide empirical evidence of existing challenges, the following Table 2 presents a list of projects that are being prepared by the government, including their locations and development status. In particular, the "Status" column in the table highlights the project that have stagnated at the transaction and tariff negotiation stages. This directly illustrates the effects of regulatory misalignment and the inefficiencies inherent in the two-stage procurement process, which will be further discussed in this section.

Table 2. List of Hydropower **and** Floating Solar PV PPP Projects in Indonesia

No	Project Name	Location	Phase	Status
1	Bintang Bano Mini Hydro Power Plant 6.3 MW	West Nusa Tenggara	Transaction	PPA: Tariff Negotiation with PT PLN
2	Tiga Dihaji Hydro Power Plant 40 MW	South Sumatera	Transaction	Establishment of Implementation Agency
3	Leuwikeris MHPP 7.4 MW	West Java	Preparation	Feasibility Study
4	Bener MHPP	Central Java	Preparation	Feasibility Study
5	Cipanas Floating Solar PV & MHPP	West Java	Preparation	Pre-Feasibility Study
6	Tapin MHPP	South Kalimantan	Preparation	Pre-Feasibility Study
7	Lau Simeme MHPP	North Sumatera	Preparation	Pre-Feasibility Study
8	Pamukkulu MHPP	South Sulawesi	Preparation	Pre-Feasibility Study
9	Keureto FSPV & MHPP	Aceh	Preparation	Pre-Feasibility Study
10	Bulango Ulu FSPV& MHPP	Gorontalo	Preparation	Pre-Feasibility Study
11	Way Apu FSPV & MHPP	Maluku	Preparation	Pre-Feasibility Study
12	Mbay FSPV	East Nusa Tenggara	Preparation	Pre-Feasibility Study
13	Karalloe MHPP	South Sulawesi	Preparation	Pre-Feasibility Study

Public-Private Partnership (PPP) projects inherently operate at the intersection of public and private law, often creating regulatory and contractual complexities. From a public law perspective, the government as the GCA is bound by regulations and laws regarding government procurement of goods/services, state finances, and administrative law. The main principles are transparency, accountability, fair competition, and achieving the best value for money. On the other hand, private law regulates commercial relations between the parties, where the business entity as an investor operates based on the principles of contract and corporate law, and aims to achieve profit and certainty of return on investment. The main challenge in every PPP project is to align these two different legal logics and objectives into a coherent and mutually beneficial project structure.

The difference in mandate between public procurement law and the private investment framework directly complicates project structuring. Public procurement law, as stipulated in the Presidential Regulation and LKPP regulations, requires the government to carry out a transparent and competitive auction process to select the best partner. In this case study, such a situation is reflected in the auction process at the MPW which aims to obtain the highest dam maintenance contribution from potential investors. In contrast, the private investment framework requires contractual certainty and financial viability (bankability) to obtain funding from financial institutions. Business entities will structure projects that can maximize profits and mitigate risks. Complexity arises when these two mandates are not well integrated, as in the two-stage procurement process in the Floating Solar Power Plant project in Indonesia. The first stage at the PUPR Ministry fulfills the public procurement objective, while the second stage at PT PLN (Persero) is a separate commercial negotiation. This fragmented structure, which arises from an attempt to fulfill two legal frameworks sequentially, actually creates inefficiencies, high transaction costs, and significant legal uncertainty for investors, making it very difficult to effectively structure projects.

Ambiguity in the tariff-setting mechanism and the responsibilities of the GCAs are the main sources of potential disputes. The current mechanism—where tariff negotiations with PT PLN (Persero) occur only after a business entity wins the auction conducted by the Ministry of Public Works—poses a significant risk. Business entities, having secured the auction based on preliminary tariff assumptions, may confront a situation where the tariff approved by PLN is lower than expected. This discrepancy can jeopardize the project's financial viability, leading to failed PPA negotiations, investor withdrawal, or legal disputes related to the fulfillment of initial commitments.

Currently, the GCA in PPP projects that provide electricity infrastructure utilizing dams is carried out by the Minister of Public Works. However, referring to the implementation of the previous two hydropower PPP projects, which have now entered the transaction stage, the ideal, expected condition is the implementation of joint GCA between the Ministry of Public Works and PT PLN (Persero). In line with Law Number 30 of 2009 on Electricity, this takes into account PLN's participation as a single off taker in electricity projects derived from water infrastructure, such as hydropower plants and floating solar power plants in Indonesia. According to Regulation Number 7 of 2023 of the Minister of National Development Planning/Head of the National Development Planning Agency, Joint GCA may be implemented.

A combination of two or more GCA for one kind of infrastructure or two or more GCA for two or more types of infrastructure is one of the statements. The definition mentions that GCA is the minister/head of institution/regional head, or State-Owned Enterprise/Region-Owned Enterprise as the provider or organizer of Infrastructure based on laws and regulations. According to Article 9 of the previous regulations, the directors of SOEs can act as GCA in PPP projects as long as the implementation is regulated in the relevant sectoral laws and regulations. This shows that the authority of SOE directors as GCA is not absolute, but must be within the regulatory framework that has been established for a particular sector. This provision provides flexibility for SOEs to take a strategic role in infrastructure projects or public services, while still ensuring compliance with applicable regulations (Rahardjo et al., 2025).

To formalize a Joint GCA arrangement, a Memorandum of Understanding (MoU) must be signed by the Minister, Head of Institution, or Regional Head who holds jurisdiction over the infrastructure sector involved. The MoU must, at a minimum, define the lead GCA coordinator, outline the division of roles, responsibilities, and budgets across the planning, transaction, and management phases, and establish the duration of the PPP cooperation. Joint PPP arrangements must also account for a variety of specific risks, including operational risks, infrastructure-specific risks, project integration risks, and institutional risks.

The Ministry of Public Works can be proposed as the lead agency or coordinator for the Joint GCA scheme for several key reasons. These include the Ministry's ownership of dam assets, its legal mandate and technical expertise in ensuring dam safety, and its current role as the GCA for dam utilization projects in hydropower. It is important to emphasize, however, that this coordinating role does not supersede or diminish the authority of PT PLN (Persero). Rather, PLN retains full responsibility over all electricity-related components, particularly those related to tariff negotiations and the PPA.

Under the proposed Joint GCA scheme formalized through a Memorandum of Understanding (MoU), the division of responsibilities between the Ministry of Public Works (MPW) and PT PLN (Persero) would be explicitly clarified. The MPW would focus on the management of physical infrastructure and water resource regulation, including ensuring dam safety, establishing inundation limits, and managing the procurement process, particularly regarding the bidding parameter related to dam maintenance contributions. Meanwhile, PT PLN (Persero), acting as the sole off-taker, would bear full responsibility for the commercial and technical aspects of electricity procurement, including conducting upfront tariff negotiations and signing the PPA, which is a critical element of the project's financial viability.

This clear division of responsibilities enables a more efficient allocation of risks, whereby each party bears the risks it is best equipped to manage. The MPW would assume risks inherent to its physical assets, primarily structural safety risks of the dam and hydrological risks related to water availability. On the other hand, PT PLN (Persero) would manage market and commercial risks, including tariff payment risk, the challenge of negotiating prices below the Highest Benchmark Price (*Harga Patokan Tertinggi* or HPT), and technical risks related to electricity grid stability.

Risks that stem from the inter-institutional cooperation itself, including project integration and institutional coordination risks, would be jointly managed through a governance framework outlined in the MoU. The main objective of this joint structure is to integrate two previously separate processes to enhance efficiency and provide legal certainty for all parties involved.

The concept of Joint GCA between the MPW and PT PLN (Persero) will have a positive impact on accelerating the implementation of the Floating Solar PV PPP project because both institutions have been actively involved since the early stages of project planning. PT PLN (Persero) as the off-taker is expected to evaluate the tariff from the beginning so that the tariff negotiation process runs smoothly. The proposed formation of a Joint GCA regulated in an MoU is a direct effort to mitigate the risk of this dispute by clearly defining the roles, responsibilities, and risk allocation of each party from the start.

Moreover, under such a coordination, private sector entities would benefit from greater certainty regarding applicable electricity tariffs, with which they can submit more accurate and confident bidding offers, particularly in calculating maintenance contribution values as auction parameters. However, challenges remain—especially those stemming from the current provisions of Presidential Regulation Number 112 of 2022 on the Acceleration of Renewable Energy Development for Electricity Supply. Although this regulation permits electricity procurement from Floating Solar PV through a direct selection mechanism, it still requires a post-selection tariff negotiation process and thus reintroduces potential uncertainty. Therefore, a regulatory harmonization process is highly suggested, particularly to align Presidential Regulation Number 112 of 2022 with the specific legal and operational requirements surrounding dam-based Floating Solar Power Plants.

Challenges encountered during the procurement or tendering stage constitute a critical issue in the PPP literature. A review by Khaderi et al. (2019) confirms that the tendering stage is frequently the main point of failure in PPP projects. This is attributed to the greater complexity, longer duration, and

higher transaction costs compared to traditional procurement mechanisms. This complexity, which includes extensive preparation of tender documents and lengthy negotiations, is the main reason for project delays and even the withdrawal of some potential investors from the tender process.

Furthermore, the two-stage procurement process, namely procurement at the Ministry of Public Works and PT PLN (Persero), has also become a major issue in the development of Floating Solar PV PPP projects that utilize dams. This occurs due to differences in regulations governing the procurement process in each agency. The MPW conducts procurement based on LKPP Regulation Number 1 of 2025 issued by the National Public Procurement Agency, while PT PLN (Persero) operates under Presidential Regulation Number 112 of 2022. These procedures prolong the project development timeline and undermine the core advantages of PPP schemes, which are designed to offer greater efficiency and effectiveness than conventional public procurement.

In addition to the tiered procurement sequence, additional regulatory challenges arise concerning the procurement method for Floating Solar PV PPP projects. According to Presidential Regulation Number 112 of 2022, the purchase of electricity generated from government-provided land (including reservoirs) must proceed through a direct selection mechanism. Thus, even after successfully completing the MPW's PPP auction process and being declared the winner, a business entity must re-enter the auction process at PT PLN (Persero) and compete again with other pre-qualified entities listed in PLN's Selected Providers List (*Daftar Penyedia Terseleksi* or DPT). Only after securing selection by PT PLN (Persero) can the entity enter into tariff negotiations and sign the PPA. This uncertainty can significantly reduce investor confidence and discouraging participation in Floating Solar PV PPP projects.

Another challenge is the use of different bidding parameters by the two institutions. The MPW uses the amount of contribution to dam maintenance activities as its primary bidding parameter. This contribution refers to a monetary value committed by the business entity to support the maintenance of dams used for power generation. Such maintenance activities may include annual routine operations or major maintenance conducted every five years, supervised by the relevant River Basin Center (*Balai Wilayah Sungai* or BWS). The entity offering the highest contribution value is typically declared the winner of the Ministry's auction.

In contrast, PT PLN (Persero) bases its procurement decisions on the electricity tariff offered by the business entity, which must not exceed the Highest Benchmark Price. In this case, the lower the proposed tariff, the higher the chance of winning the bid. This difference creates a paradox. On one hand, business entities are incentivized to maximize their financial contribution to the MPW. On the other hand, they are required to minimize the electricity tariff offered to PT PLN (Persero), which directly limits their revenue potential.

This inconsistency poses financial and operational risks for business entities. Winning the PPP auction at the Ministry of Public Works does not ensure selection by PT PLN (Persero), leading to possible financial and reputational losses. Furthermore, the timing of the tariff determination process introduces additional risk. PT PLN (Persero) typically sets the tariff after the PPP auction at the MPW is completed. Consequently, business entities must develop financial models based on estimated tariffs that may differ significantly from the final tariffs

approved by PT PLN (Persero). This gap can lead to revenue shortfalls and undermine the financial feasibility of the project. In this context, the government's infrastructure guarantee facility becomes a relevant risk mitigation instrument. The guarantee can reduce the risk of payment default by the off-taker (in this case, PT PLN), which is one of the main concerns for lenders and investors.

With a government guarantee in place, despite the uncertainty in the early stages, the revenue risk of the project becomes more manageable. This will increase lenders' confidence to provide financing and make the project more attractive to investors, although the inefficient two-stage procurement process remains a challenge.

Such regulatory misalignment and procedural inefficiencies may reduce the attractiveness of Floating Solar Power Plant PPP projects among investors, despite their alignment with Indonesia's renewable energy development goals. Therefore, it is essential to establish a harmonized regulatory framework, a unified procurement process, and an integrated tariff-setting mechanism to support the successful implementation of floating solar PV projects that utilize dams owned by the Ministry of Public Works.

Table 3. Gap Analysis

Current Condition	Expected Condition	Gap	Strategy
GCA by Ministry of Public Works (MPW)	A joint GCA structure involving both the MPW and PT PLN (Persero)	PT PLN (Persero) operates under its own regulatory framework for electricity procurement	Harmonize regulations on electricity purchases from FPV on MPW-owned dams by PT PLN (Persero)
The procurement process is accomplished in sequential stages (at the MPW and PT PLN (Persero)	The procurement process is conducted in a single integrated stage by combining the procedures of the MPW and PT PLN (Persero)	Business entities are required to undergo a two-stage procurement process, which extends the overall project timeline and create inefficiency	Regulatory adjustments to accommodate a single stage procurement process
Procurement methods at PT PLN (Persero) through Direct Selection	Procurement methods at PT PLN (Persero) through Direct Appointment	The MPW-selected tender winner must undergo a Direct Selection process at PT PLN (Persero)	An adjustment to PT PLN (Persero)'s procurement regulations is proposed to allow for Direct Appointment
Bidding parameters differ between the MPW and PT PLN (Persero)	Single bidding parameter agreed upon by the MPW and PT PLN (Persero)	Winning the MPW tender does not guarantee success in the PT PLN (Persero) tender	Create a unified bidding parameter agreed by MPW and PT PLN to ensure consistency, avoid redundancy, and streamline procurement
Determination of electricity tariffs by PT PLN (Persero) after the procurement process at the MPW is completed	Ensuring tariff clarity before final project selection	The lack of a tariff agreement between the MPW-selected entity and PT PLN creates uncertainty in project viability and financing	The tariff-setting process should be adjusted to set tariffs before MPW's procurement begins

Policy Recommendations

Based on the challenges discussed above, several key recommendations are proposed to improve the implementation of Floating Solar PV PPP projects on dams owned by the MPW. These recommendations are essential for supporting the Government of Indonesia's target of achieving a 21% share of NRE in the national energy mix by 2030.

1. Establishment of a Joint Government Contracting Agency (GCA)

   The government should enact enabling regulations to formally establish a joint GCA between the MPW and PT PLN (Persero). Although SOEs are allowed to act as GCAs under Regulation of the Minister of National Development Planning/Head of Bappenas Number 7 of 2023, further regulatory support is needed from the Ministry of SOEs and the Ministry of Energy and Mineral Resources. These ministries must issue sector-specific guidelines that clarify and authorize the joint implementation of PPP projects in the electricity sector.

2. Streamlining the procurement process

   Simplifying the procurement stages into an integrated process will eliminate the inefficiencies of the two-tiered approach. This could reduce transaction delays, enhance cost-efficiency, and lower the risk of procurement failure—especially during the crucial transaction phase of the PPP lifecycle.

3. Upfront tariff determination

   Determining electricity tariffs before the procurement process begins is vital for ensuring project bankability. Certainty regarding tariff levels at the feasibility study stage allows business entities to evaluate investment returns more accurately, reduce uncertainties, and strengthen investor confidence.

4. Regulatory harmonization

   The government should prioritize harmonizing the various regulations that govern PPP implementation in the renewable energy sector, particularly for Floating Solar PV projects that utilize government-owned dams. The harmonization would reduce overlapping regulations, simplify procedures, and increase legal certainty for all parties involved, including the government, business entities, and lenders. Regulatory reform and harmonization in this sector would also create a consistent and coordinated legal framework that can increase the effectiveness and efficiency of PPP project implementation, strengthen project institutions, strengthen the principle of accountability, and create a more conducive investment environment for business entities to participate in encouraging the achievement of the new renewable energy mix in Indonesia.

CONCLUSION

The development of Floating Solar Power Plant projects through the PPP scheme on dams owned by the MPW is currently hindered by insufficient regulatory support. These regulatory limitations could give significant risk to the timely acceleration of renewable energy development, particularly in optimizing the use of dam infrastructure. To overcome these constraints, it is crucial to enhance the legal framework governing the implementation of a Joint Government Contracting Agency (GCA) between the MPW and PT PLN (Persero). Such a joint arrangement will enable PT PLN's early and active engagement from project preparation through to the transaction stage.

Moreover, the current two-stage procurement process—separately conducted by the MPW and PT PLN (Persero)—must be streamlined into a unified procedure. This consolidation will reduce administrative burden, minimize delays, and improve efficiency. Furthermore, early determination of electricity tariffs is vital for ensuring project bankability and attracting private sector investment, as project viability is closely tied to the electricity tariff determined in the power purchase agreement.

The advancement of Floating Solar Power Plant projects through PPP schemes has the potential to serve as a role model for the development of sustainable energy infrastructure in Indonesia. Achieving this potential will require the integration of robust technical planning, coherent regulation, investment viability, and strong institutional coordination. These elements are essential to ensuring the success of Floating Solar Power Plant development on dam infrastructure, while contributing meaningfully to Indonesia's renewable energy mix target.

ABOUT THE AUTHORS

The authors serve as functional officials at the Directorate of Water Resources Infrastructure Financing, under the Directorate General of Public Works Infrastructure Financing, Ministry of Public Works, Republic of Indonesia. In their professional capacity, they are actively involved in the planning and implementation of PPP projects in the Indonesian infrastructure sector, including the initiatives for Floating Solar Power Plant development.

REFERENCES

APMG. (2016). *PPP certification guide* (Vol. Chapter 3). https://ppp-certification.com/pppguide/download

Atmo, G. U., Duffield, C., Zhang, L., & Wilson, D. I. (2017). Comparative performance of PPPs and traditional procurement projects in Indonesia. *International Journal of Public Sector Management, 30*(2), 118–136. https://doi.org/10.1108/IJPSM-02-2016-0047

Awuku, S. A., Bennadji, A., Muhammad-Sukki, F., & Sellami, N. (2022). Public-private partnership in Ghana's solar energy industry: The history, current state, challenges, prospects, and theoretical perspective. *Energy Nexus*, *6*, 100058. https://doi.org/10.1016/j.nexus.2022.100058

Decree of the Minister of Energy and Mineral Resources of the Republic of Indonesia Number 85 of 2025 on the National Electricity General Plan. (2025). https://gatrik.esdm.go.id/assets/uploads/download_index/files/28dd4-rukn.pdf

Gaol, D. K. L., Damayanti, R. A., & Kusumawati, A. (2023). Critical success factor (CSF) of implementing PPP road sector in Indonesia. *Jurnal Perencanaan Pembangunan (The Indonesian Journal of Development Planning), 7*(2), 209–230. https://doi.org/10.36574/jpp.v7i2.507

Hidayat, A., Ramdani, S., & Romadhoni, S. (2022). Pembangunan pembangkit listrik tenaga surya di Waduk Cirata, Kabupaten Purwakarta. *Jurnal Inovasi Penelitian, 3*(6), 6701–6706. https://doi.org/10.47492/jip.v3i6.2132

Iqbal, D. (2023, November 11). *Berharap energi bersih terbesar di Asia Tenggara dari PLTS Cirata*. Mongabay Indonesia. https://mongabay.co.id/2023/11/11/berharap-energi-bersih-terbesar-di-asia-tenggara-dari-plts-cirata/

Kartikasari, M. D., & Retnaningsih, S. (2024). Kajian mengenai skema KPBU melalui perjanjian KPBU IKN. *Ranah Research: Journal of Multidisciplinary Research and Development, 6*(4), 933–941. https://doi.org/10.38035/rrj.v6i4.899

Khaderi, S. S., Shukor, A. S. A., Bakri, A. S., & Mahbub, R. (2019). Public infrastructure project tendering through public private partnerships (PPP): A literature review. *MATEC Web of Conferences, 266,* 01015. https://doi.org/10.1051/matecconf/201926601015

Kurdi, & Syafitri, C. Z. (2024). Prinsip ESG dalam regulasi hukum KPBU: Upaya peningkatan efektivitas pembangunan infrastruktur di Indonesia. *Diversi Jurnal Hukum*, *10*(2), 358–389. https://doi.org/10.32503/diversi.v10i2.5926

Marupa, I., Moe, I., Mardjono, A., & Malindo, D. (2022). PLTS terapung: Review pembangunan dan simulasi numerik untuk rekomendasi penempatan panel surya di Waduk Cirata. *Jurnal Teknik Pengairan, 13*(1), 48–62. https://doi.org/10.21776/ub.pengairan.2022.013.01.05

Maulana, M. R. (2021). Pemahaman dan pembelajaran tahap perencanaan dan penyiapan pembangunan infrastruktur di indonesia melalui skema kerja sama pemerintah dan badan usaha (KPBU) dalam penyediaan infrastruktur. *JISIP: Jurnal Ilmu Sosial dan Pendidikan, 5(*1), 86–107. https://doi.org/10.36312/jisip.v5i1.1646

Ministry of Energy and Mineral Resources. (2021, October 8). *This is the government's principle and roadmap to achieve net zero emission*. https://www.esdm.go.id/id/media-center/arsip-berita/ini-prinsip-dan-peta-jalan-pemerintah-capai-net-zero-emission

Presidential Regulation of the Republic of Indonesia Number 38 of 2015 on Public-Private Partnership in the Provision of Infrastructure. (2015). https://peraturan.bpk.go.id/Details/41764/perpres-no-38-tahun-2015

Owojori, O. M., & Erasmus, L. J. (2025). Public-private partnerships as catalysts for green infrastructure: A three-pronged analysis of economic, environmental, and institutional factors. *Frontiers in Sustainable Cities*, *7*, 1591278. https://doi.org/10.3389/frsc.2025.1591278

Pujianto, P., Aripriantoni, A., Sakey, P. A., & Waskito, W. (2024). Kinerja sistem array 13 PLTS terapung 145 Mw Ac Cirata dengan simulasi Pvsyst 7.4. *Indonesian Journal of Energy: Mineral, 4*(2), 57–66. https://doi.org/10.53026/ijoem.v4i2.2

Rahardjo, S. A., & Farudin, M. (2025). Evolusi normatif peran penanggung jawab proyek kerjasama (PJPK) dalam skema KPBU: Rekonstruksi hukum dalam tata kelola penyelenggaraan infrastruktur berkelanjutan di Indonesia. *Mandub, 3*(1), 144–160. https://doi.org/10.59059/mandub.v3i1.2171

Regulation of the Minister of National Development Planning/Head of the National Development Planning Agency Number 7 of 2023 on the Implementation of Cooperation between Government and Business Entities in the Provision of Infrastructure. (2023). https://peraturan.bpk.go.id/Details/271431/permen-ppnkepala-bappenas-no-7-tahun-2023

Regulation of the Minister of Public Works and Housing Number 7 of 2023 on the Second Amendment to the Regulation of the Minister of Public Works and Housing Number 27/PRT/M/2015 concerning Dams. (2023). https://peraturan.bpk.go.id/Details/257268/permen-pupr-no-7-tahun-2023

Regulation of the Public Procurement Policy Agency of the Republic of Indonesia Number 1 of 2025 on Procurement Procedures for Public-Private Partnership in Infrastructure Provision. (2025). https://peraturan.bpk.go.id/Details/314289/peraturan-lkpp-no-1-tahun-2025

Rinaldi, A., & Mulyono, J. (2021). Peluang pembangkit listrik tenaga surya (PLTS) pada genangan waduk. *OSF Preprints*. https://doi.org/10.17605/OSF.IO/DTBVQ

Shidqi, F., & Firmansyah, A. (2024). Bagaimana peran aparat pengawasan intern pemerintah dalam pengawasan akuntabilitas proyek kerja sama pemerintah dan badan usaha? *Jurnalku, 4*(1), 50–67. https://doi.org/10.54957/jurnalku.v4i1.722

Wibowo, A., & Puspita, C. (2024). The role of government support and guarantees in attracting financing for infrastructure public-private partnerships in Indonesia. *Journal of Construction and Project Management*, *14*(2), 88–102. https://doi.org/10.15294/jpcl.v6i1.35558

World Bank. (2021). *PPP reference guide version 31*. World Bank Group.

Zainuddin, Z., & Hasanah, H. (2025). Implications of implementing cooperation with KPBU scheme at Hang Nadim International Airport-Batam. *International Journal of Economics, Management, and Accounting*, *2*(10), 805–816. https://doi.org/10.47353/ijema.v2i10.245