

Navigating Indonesia's Utility-Scale Solar Program: A Strategic Management Perspective on PLN

Anna Maria Josephine Simatupang*, Harimukti Wandebori

Institut Teknologi Bandung, Indonesia

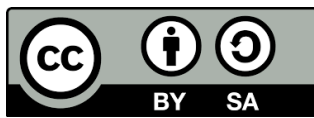
Email: anna.maria.js@gmail.com*

Keywords:

strategic management; utility-scale solar; pt pln (persero); swot-tows; vrio.

Abstract

Indonesia's transition toward a renewable-based electricity system has positioned PT PLN (Persero) at the center of an ambitious utility-scale solar program mandated by the Electricity Supply Business Plan (Rencana Usaha Penyediaan Tenaga Listrik [RUPTL]) 2025–2034. The program targets an increase in solar and wind capacity from 5 GW to 27 GW by 2034, contributing to the broader national target of 100 GW of solar power capacity. This study conducted a qualitative strategic analysis of PLN's readiness to implement the program using the Strategic Management Process framework developed by Hitt, Ireland, and Hoskisson. Data were collected through document analysis of government regulations, PLN corporate and sustainability reports, and strategic planning documents, complemented by primary insights obtained through discussions with PLN personnel involved in renewable energy planning, investment, and corporate strategy. External analysis using PESTEL, Porter's Five Forces, and competitor analysis indicated a policy environment that strongly supports solar deployment but remains constrained by high capital requirements, a concentrated global supplier base, and limited domestic manufacturing capacity. Internal analysis using the Resource-Based View (RBV), VRIO framework, and value chain analysis identified four sustainable core competencies: corporate and national strategic planning; electricity system planning and renewable energy integration; transmission and distribution operations; and stakeholder, regulatory, and partnership management. The SWOT–TOWS synthesis generated twelve strategic initiatives across four strategic quadrants. At the corporate level, PLN is recommended to pursue a related constrained diversification strategy supported by shared land resources, financing capabilities, and engineering activities across PLN Holding and its generation subsidiaries, together with selective backward integration through PT Trina Mas Agra Indonesia.



This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.

Copyright © 2026 by Author. Published by
Publikasi Indonesia

INTRODUCTION

Through the Asta Cita vision, the President of the Republic of Indonesia has directed the nation to strengthen its defense and security systems while advancing self-sufficiency in food, energy, and water, as well as promoting the development of creative, green, and blue economies. This direction is reflected in Law No. 30 of 2009 on Electricity, the draft Government Regulation on the National Energy Policy, and the General National Electricity Plan (Rencana Umum Ketenagalistrikan Nasional [RUKN]) 2025–2060. Together, these policies demonstrate Indonesia's commitment to transitioning from a fossil fuel-based economy toward a renewable energy-based development pathway, targeting a renewable energy share of 73.6% in the national energy mix by 2060.

In alignment with this direction, PT PLN (Persero) launched the Electricity Supply Business Plan (Rencana Usaha Penyediaan Tenaga Listrik [RUPTL]) 2025–2034 through the Decree of the Minister of Energy and Mineral Resources (Energi dan Sumber Daya Mineral [ESDM]) No. 188/2025, issued on May 26, 2025. The RUPTL targets an increase in solar and wind capacity from 5 GW to 27 GW by 2034, supported by smart grid deployment. The plan projects an additional 69.5 GW of generation capacity, increasing from 40.6 GW under the previous 2021–2030 RUPTL, with 76% expected to come from renewable power plants and energy storage systems. Renewable energy (Energi Baru Terbarukan [EBT]) capacity is projected to increase from 20.9 GW to 42.1 GW, complemented by 0.5 GW of nuclear power capacity and 10 GW of energy storage capacity. Within the broader Asta Cita vision, the Ministry of Energy and Mineral Resources has also established a national target of 100 GW of solar power capacity through solar power plants (Pembangkit Listrik Tenaga Surya [PLTS]), placing PLN at a strategic position in Indonesia's electricity planning. Therefore, this study conducted a strategic analysis of the utility-scale solar program using the Strategic Management Process framework developed by Hitt, Ireland, and Hoskisson (2019).

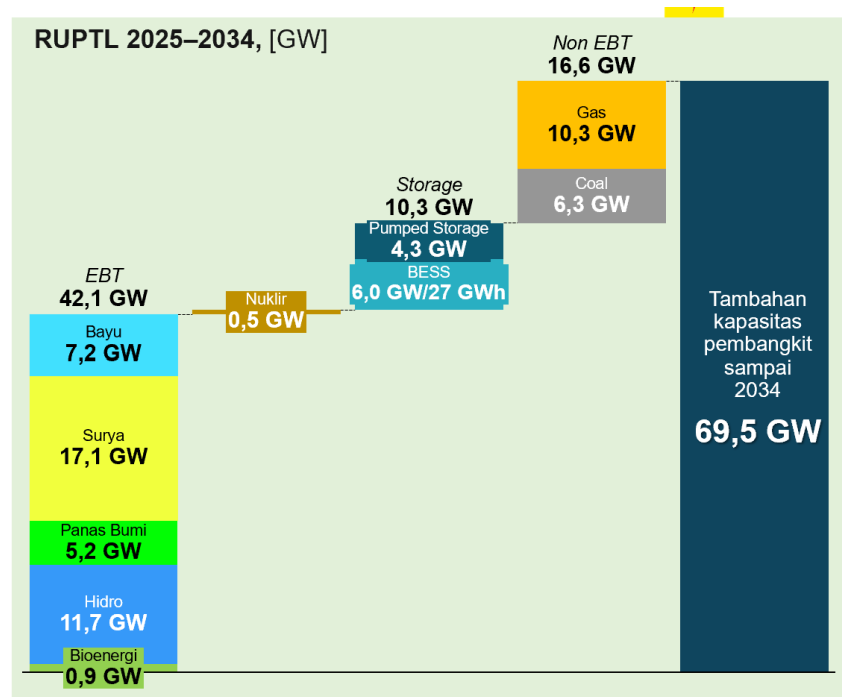


Figure 1. RUPTL 2025-2034 Planned Additional Generation Capacity by Source
Company Profile

PT PLN (Persero) is a state-owned enterprise established under Government Regulation No. 23 of 1994 and operates under an Electricity Supply Business License (Izin Usaha Penyediaan Tenaga Listrik [IUPTL]) to provide electricity services for public interest throughout the Indonesian archipelago. Its vision, established through Director Decree No. 0244.K/DIR/2020, is to become the leading electricity company in Southeast Asia and the preferred provider of energy solutions for customers. This vision is pursued through customer-oriented electricity services, quality-of-life improvement, economic development, and

environmentally responsible business practices (Arku et al., 2024; Lahmidi et al., 2026; Raha et al., 2026; Shen & Chen, 2026).

This research distinguishes between PLN Holding, which functions as the national electricity system planner, program orchestrator, grid operator, principal off-taker, and capital allocator, and PLN's generation sub-holdings, namely PLN Indonesia Power (PLN IP) and PLN Nusantara Power (PLN NP). These sub-holdings serve as utility-scale solar project developers responsible for project development, investment, construction supervision, asset ownership, and operations. External Independent Power Producers (IPPs) may compete with PLN IP and PLN NP for project development opportunities while also serving as joint venture, technology, or financing partners.

Table 1. Principal Strategic Roles of Key Entities in the Utility-Scale Solar Programme

Entity	Principal Strategic Role
PLN Holding	System planner, off-taker, grid operator, procurement authority, programme orchestrator, and capital allocator
PLN Indonesia Power	Solar developer, investor, asset owner and operator, primarily in Java-Bali
PLN Nusantara Power	Solar developer, investor, asset owner and operator, primarily outside Java
External IPPs	Competing developers, electricity sellers, joint-venture or co-investment partners
Module/BESS/EPC companies	Suppliers or contractors to the project developer

PT PLN (Persero) must establish a comprehensive corporate and business strategy to accelerate the development of utility-scale solar capacity (Anisah & Heriyanto, 2025; Firmansyah, 2025; Hanadya, 2026; Suryadinata et al., 2026). This challenge arises because PLN has historically relied heavily on coal-based generation, which accounts for nearly 65% of Indonesia's total electricity generation capacity, exposing the company to financing risks as international financiers increasingly require credible decarbonization roadmaps before committing funds. Addressing this challenge requires a structured external analysis encompassing the general, industry, and competitive environments, combined with an internal analysis of PLN's resources, capabilities, and competitive advantages, synthesized through a SWOT framework. At present, PLN still requires a more clearly defined corporate strategic plan for solar development and has not fully established the business-level strategy needed to secure a competitive position in the solar power generation market. Without such strategies, the program may face increased risks of cost overruns and implementation delays (Alshihri et al., 2022; Canesi & Gallo, 2023; Chadee et al., 2022; Daoud et al., 2023; Nguyen et al., 2024).

Building on the background and business challenges above, this study addressed four research questions: (RQ1) what external factors, including general, industry, and competitor environments, shape PLN's strategic opportunities and threats in developing the utility-scale solar program; (RQ2) what internal resources, capabilities, and competencies determine PLN's competitive strengths and weaknesses in supporting the development of the 100 GW solar capacity target; (RQ3) what corporate-level strategy, including diversification, value creation, and market positioning, should PLN adopt to ensure strategic and financial sustainability; and

(RQ4) what business-level strategy, based on target markets and customer value propositions, should PLN adopt to compete effectively in the solar power generation sector. Accordingly, this study aimed to analyze the external environment and identify critical opportunities and threats (RQ1); analyze PLN's internal strengths and weaknesses through resource, VRIO, and value chain analyses (RQ2); formulate PLN's corporate-level strategy (RQ3); and formulate an appropriate business-level strategy to establish sustainable competitive advantage in the solar energy segment (RQ4).

This research focused on PT PLN (Persero) as a corporate entity. PLN Holding was analyzed as the system planner, principal off-taker, grid operator, program orchestrator, and capital allocator, while PLN Indonesia Power and PLN Nusantara Power were analyzed as utility-scale solar and battery energy storage system (BESS) developers. Other subsidiaries were referenced only within the discussion of corporate-level strategy. This research did not cover power system engineering analysis, financial modeling, or detailed implementation roadmaps, as it focused exclusively on the strategic management dimension. Data and information referred to conditions up to early 2026, drawing on the RUPTL 2025–2034, the official ESDM presentation from March 2026, and PLN's Utility-Scale Solar Execution Strategy document from November 2025.

METHOD

This research adopted a structured qualitative methodology aligned with the Strategic Management Process framework of Hitt, Ireland, and Hoskisson (2019). The research process began with the identification of the business issue, followed by a literature review that established the theoretical constructs applied in the analysis. Data collection involved secondary sources, government publications, industry reports, and PLN internal documents, supported by observations of PLN's governance processes to ensure that the analysis was based on credible evidence.

Primary data were obtained through discussions and internal consultations with PLN personnel from divisions involved in renewable energy planning, generation investment, corporate strategy, organizational development, and human capital development. These discussions provided contextual and managerial perspectives that were not available in public documents. Secondary data were primarily obtained from the Electricity Supply Business Plan (Rencana Usaha Penyediaan Tenaga Listrik [RUPTL]) 2025–2034 (ESDM Decree No. 188/2025), the ESDM presentation on the Development of Utility-Scale Solar Power delivered by Minister Bahlil Lahadalia (March 2026), PLN's Utility-Scale Solar Execution Strategy document (November 2025), and PLN's annual reports, sustainability reports, and statistical publications. These sources were supplemented by peer-reviewed academic literature and reports from international development institutions.

Data analysis followed two complementary approaches. External analysis applied PESTEL to evaluate the general environment, Porter's Five Forces (Porter, 2008; Dobbs, 2014) to assess the industry environment, and the four-dimensional framework of Hitt et al. (2019) for competitor analysis to identify opportunities and threats. Internal analysis applied the VRIO framework (Barney, 1991; Barney & Hesterly, 2019) to classify PLN's capabilities into competitive disadvantage, competitive parity, temporary competitive advantage, or sustainable competitive advantage. This analysis was complemented by value chain analysis (Porter, 1985)

to examine how core competencies contributed to value creation. The internal and external findings were consolidated into a SWOT matrix and translated into SO, WO, ST, and WT strategic initiatives through the TOWS matrix (Weihrich, 1982). These initiatives informed the formulation of PLN's corporate-level and business-level strategies, with the latter incorporating the five generic strategies and the Strategy Diamond framework of Hitt et al. (2019).

RESULTS AND DISCUSSION

External Analysis

General Environment

Demographic. PT PLN (Persero) operates within a challenging archipelagic landscape. In 2026, Indonesia had an estimated population of 287,198,383 spread across 17,380 officially named islands, with an annual growth rate of 0.76-0.80% (BPS, 2026; BIG, 2025). Java alone accounts for 55.89% of the population, making it the most densely settled island.

Table 2. Estimated Population Distribution by Island, 2026

Island	Estimated Population (million)	% of Total
Java	160.52	55.89%
Sumatra	62.70	21.83%
Sulawesi	21.11	7.35%
Kalimantan	17.84	6.21%
Bali and Nusa Tenggara	15.94	5.55%
Papua	5.74	2.00%
Maluku	3.36	1.17%
Indonesia (total)	287.20	100.00%

PLN's customer base is dominated by households (90.9% of roughly 87.4 million customers), followed by business customers (5.8%), social customers (2.3%), government/public customers (0.7%), and industrial customers (0.3%). Yet revenue composition differs markedly: of PLN's total 2025 revenue of Rp353.49 trillion, household customers contributed 40.5% (Rp143.21 trillion), industrial customers 28.9% (Rp102.24 trillion), business customers 21.8% (Rp76.97 trillion), and government, social and other customers the remaining 8.8%. Between 2015 and 2025, total electricity-sales revenue grew from around Rp208 trillion to Rp347 trillion, a compound annual growth rate of approximately 5.25%. Under the RUPTL scenario, electricity sales are projected to rise from 323 TWh in 2025 to 396 TWh in 2029 (assuming 8% GDP growth), compared with 313-365 TWh under a 5% GDP-growth, natural-growth scenario, indicating the need for stronger demand-creation initiatives to reach the RUPTL target.

Table 3. PLN Customer Composition and Revenue Contribution by Tariff Category, 2025

Customer category	Share of customers	Share of revenue
Household	90.9%	40.5%
Industrial	0.3%	28.9%
Business	5.8%	21.8%
Government/public	0.7%	4.1%
Social	2.3%	3.1%
Others (traction, bulk, special)	0.04%	1.6%

Political/legal. Indonesia has established a coherent hierarchy of energy planning instruments, from the President's Asta Cita priorities, through the RUPTL 2025-2034 (ESDM Decree No. 188/2025, mandating that 61.2% of the 42.1 GW capacity addition come from green sources, with 24.3 GW from solar and wind by 2034), Law No. 30/2009 on Electricity, and the RUKN 2025-2060 (targeting 73.6% new-and-renewable energy by 2060), to Presidential Regulation No. 112/2022 (accelerating renewable development while restricting new coal plants) and MEMR Regulation No. 2/2024 (governing quota-based rooftop solar adoption). Several further regulations reinforce this framework.

Table 4. Selected Indonesian Energy Regulations Relevant to the Utility-Scale Solar Programme

Regulation/Roadmap	Content
Presidential Regulation No. 5/2006	Targets a balanced primary energy mix by 2025 through diversification of conventional and renewable sources.
Law No. 30/2007	Provides the legal framework for national energy policy, emphasising security, sustainability, and diversification.
Government Regulation No. 40/2025 (National Energy Policy)	Projects renewable-electricity shares of 19-23% (2030), 36-40% (2040), 53-55% (2050), and 70-72% (2060).
MEMR Regulation No. 12/2017	Provides pricing guidelines and feed-in tariffs for renewable sources such as solar, wind, and biomass.
Presidential Regulation No. 22/2017 (RUEN)	Details a 2016-2050 policy framework implementing the National Energy Policy across ministries.
MEMR Regulation No. 53/2018	Accelerates renewable adoption via simplified permits and investment incentives.
MEMR Regulation No. 9/2020	Sets efficiency and reporting targets for PLN's generation and distribution operations.

Global. PLN's financial performance is highly sensitive to exogenous variables because fuel purchases, power procurement, and debt service are substantially denominated in US dollars while revenue is collected in rupiah. RKAP 2026 assumes an exchange rate of Rp16,500/USD and an Indonesian Crude Price (ICP) of USD70/barrel, though the rupiah had already depreciated to roughly Rp17,800/USD by August. Sensitivity analysis shows that every

Rp100 depreciation raises operating costs by approximately Rp2.2 trillion and the cost of electricity supply (BPP) by Rp6.5/kWh; every USD1/barrel increase in ICP raises costs by about Rp1.4 trillion and BPP by Rp4/kWh; and every USD1/MMBTU increase in gas prices raises costs by about Rp4 trillion and BPP by Rp10/kWh.

Technology. Global solar-module prices fell from approximately USD7/W in the late 1990s to about USD0.25/W in 2024, a reduction of more than 95%. Indonesia's domestic module-manufacturing capacity reached approximately 10 GW per year in 2025 (IESR, 2025; Ministry of Industry, 2026), supported by domestic manufacturers and global Tier-1 players including Trina Solar, through PT Trina Mas Agra Indonesia (TMAI), and LONGi's planned facility.

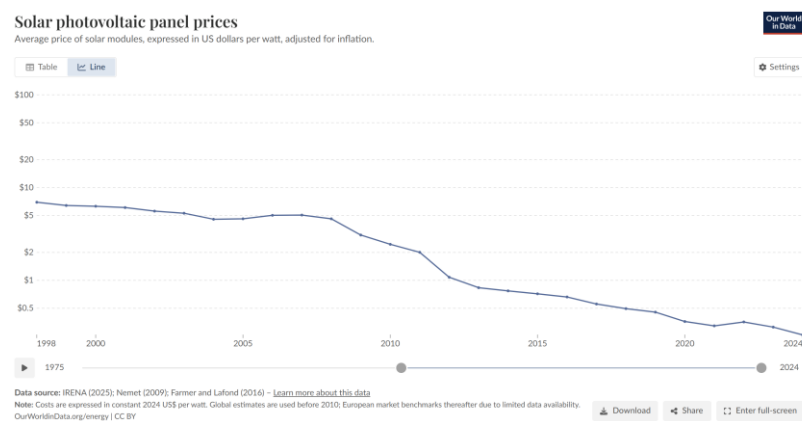


Figure 3. Global Solar Photovoltaic Panel Price Trend, 1975-2024

Industry Environment (Porter's Five Forces)

The threat of new entrants is moderated by high capital requirements, the Utility-Scale Programme requiring approximately USD71.3 billion in investment through 2034, and by RUPTL-mandated PPA tariff ceilings (5.5-25 cUSD/kWh) that structure the procurement market around PLN as sole off-taker. Supplier power is high: global module supply is dominated by a handful of Chinese manufacturers, JinkoSolar, LONGi Green Energy, Trina Solar, JA Solar, and Tongwei Solar, each shipping tens of gigawatts annually, while Indonesian domestic manufacturing covers only about 1 GWp per year and utility-scale monocrystalline panels have no functionally equivalent substitute. Buyer power is low to moderate because PLN is Indonesia's sole legal off-taker under the single-buyer model, although its bundling and tender mechanism under Permen ESDM No. 4/2020 allows competition among PLN IP, PLN NP, and external IPPs. The threat of substitutes is moderate: coal generation, supported by the Domestic Market Obligation subsidy, remains available at 3-7 cUSD/kWh, below large-scale solar (5.5-9 cUSD/kWh) and solar-plus-BESS configurations, while geothermal, hydro, offshore wind, and nuclear also compete for RUPTL allocation. Rivalry is moderate: the RUPTL opens 953 EBT tenders to domestic and international IPPs, with no single IPP holding a dominant share, and demand growth of 4-5% annually moderates competitive pressure.

4.1.3 Competitor Analysis

PLN faces competition from experienced domestic and international utility-scale solar developers, including Masdar, Sembcorp, SPIC, Medco Energi, and other qualified IPPs, which compete for project allocations based on tariff, financing capability, delivery experience,

and technology access. These competitors seek long-term, government-backed PPAs and assume that PLN's decade-long project pipeline and creditworthy off-taker position, underpinned by Danantara sovereign backing, will remain stable, and that local-content requirements can be managed through domestic manufacturing joint ventures. International IPPs hold advantages in manufacturer-direct procurement pricing and global financing, but lack grid ownership, remaining dependent on PLN's IUPTL-protected transmission and distribution network and lacking PLN's access to strategically located land near existing power plants, substations, and transmission infrastructure.

Internal Analysis

Tangible Resources

Financial resources. PLN's sales revenue grew from Rp193.4 trillion (2014) to Rp368.2 trillion (2024), while subsidy and compensation revenue nearly tripled from Rp58.0 trillion (2022) to Rp177.2 trillion (2024). Total assets increased from approximately Rp607 trillion (2014) to Rp1,772 trillion (2024). The debt-to-equity ratio declined sharply from 2.96x (2014) to a low of 0.45x (2016), stabilising between 0.54x and 0.70x and ending at 0.67x in 2024, indicating moderate leverage and potential borrowing capacity. Return on Investment and Return on Assets both declined from 1.82% (2014) to a low of 0.27% (2019), before recovering to 1.32% (2023) and moderating to 1.00% (2024), reflecting PLN's capital-intensive infrastructure and public-service obligations.

Table 5. Financial Indicator Benchmark: PLN vs. TNB, TEPCO, and KEPCO (2024)

Indicator	PLN	TNB	TEPCO	KEPCO
Revenue	USD 34.4 bn	USD 12.4 bn	USD 45.0 bn	USD 68.5 bn
Net income	USD 1.12 bn	USD 1.03 bn	USD 1.06 bn	USD 2.66 bn
Total assets	USD 111.8 bn	USD 44.8 bn	USD 98.9 bn	USD 181.1 bn
Total liabilities	USD 44.9 bn*	USD 31.1 bn	USD 73.9 bn	USD 150.7 bn
Total equity	USD 66.9 bn*	USD 13.7 bn	USD 25.0 bn	USD 30.3 bn
Equity ratio	59.9%*	30.5%	25.1%	16.8%
Liabilities/equity	0.67x*	2.28x	2.96x	4.97x
Net profit margin	3.3%	8.3%	2.4%	3.9%
ROA	1.0%	2.3%	1.6%	Approx. 1.5%

Compared with TNB, TEPCO, and KEPCO, PLN has the largest asset base (approximately USD111.8 billion) and the lowest liabilities-to-equity ratio (0.67x), indicating stronger book capitalisation, though its return on equity (approximately 1.7%) and return on assets (1.0%) remain below the comparator utilities. PLN's financial strength therefore derives primarily from its asset and equity base and government ownership rather than from superior profitability, so its additional leverage capacity should be assessed against operating cash flow, interest coverage, and capital-expenditure commitments rather than the debt-to-equity ratio alone.

Organisational resources. Programme governance is distributed across directorates and divisions, summarised in Table 6, ranging from the President Director, who chairs the Steering Committee Task Force, to specialised divisions for project management, licensing and financing, procurement, construction, system planning, technology, sustainability, and digital operations, together with the generation sub-holdings and EPC arm.

Table 6. Selected PT PLN (Persero) Organisational Units Relevant to the Utility-Scale Solar Programme

Unit	Role Description
President Director	Ultimate responsibility for the Programme; chairs the Steering Committee Task Force; sets strategic policy.
DIV PMO (Project Management Office)	Coordinates programme implementation, schedule, budget, quality, risk, and cross-stream escalation.
DIV PPP (Development, Financing & Licensing)	Manages licensing (IUPTL, AMDAL), financing structuring, and land acquisition.
DIV MEB (New & Renewable Energy)	Technical focal point for solar development, market intelligence, and IPP relationships.
DIV PPI (Power Plant & IPP Procurement)	Manages procurement, PPA contracts, and tender coordination under the GIGA ONE scheme.
DIV MKJ / DIV MKS (Construction, regional)	Oversees solar construction across Java and outer-Java regions respectively.
PT PLN Enjiniring	Delivers EPC and engineering services for PLN's solar projects.
DIV RSL (Electricity System Planning)	Plans integration of solar capacity into the national system; assesses grid readiness and BESS needs.
DIV TEN / DIV TEK (Technology/Sustainability)	Sets technical standards and ensures alignment with ESG and Net Zero Emission commitments.
DIV RKO (Corporate Strategic Planning)	Integrates the Programme into PLN's long-term corporate strategy and the RUPTL.
PLN Nusantara Power / PLN Indonesia Power	Sub-holdings leading solar development, construction, and O&M outside and within Java-Bali respectively.
SDTI (Digital & IT Unit)	Develops the centralised digital platform (SCADA, EMS) for monitoring 4,118 solar projects.

Physical resources. As of end-December 2025, PLN Group owned 47,464.24 MW of installed capacity across 5,985 generating units, of which solar, wind and biomass together contributed only 0.05%, underscoring the scale of transformation required.

Table 7. PLN Group Installed Generation Capacity by Power Plant Type, End-2025

Power plant type	Capacity (MW)	% of national total
PLTU (steam/coal)	21,278.90	26.54%
PLTGU (combined-cycle gas & steam)	14,300.60	17.83%
PLTA (hydro)	3,429.95	4.28%

Power plant type	Capacity (MW)	% of national total
PLTD (diesel)	3,289.56	4.10%
PLTMG (gas engine)	2,071.93	2.63%
PLTG (gas)	1,987.43	2.48%
PLTP (geothermal)	579.26	0.72%
PLTM + PLTMH (mini/micro-hydro)	453.59	0.57%
PLTS + PLTB + PLTBm (solar/wind/biomass)	37.03	0.05%
Total PLN Group	47,464.24	59.19%

PLN's transmission network extends 43,063.73 circuit-kilometres outside Java (Java figures are not separately reported in this dataset), while the medium-voltage distribution network totals 463,451.41 circuit-kilometres nationwide (275,832.32 outside Java and 187,619.09 in Java), providing an extensive physical platform onto which solar capacity must be integrated.

Intangible Resources

PLN's intangible resources can be classified into human, innovation, and reputational categories, following the structure proposed by Hall (1992) and Grant (1991).

Table 8. PLN's Intangible Resources in the Utility-Scale Solar Programme Context

Category	PLN's position
Human resources	Extensive institutional knowledge of Indonesia's electricity system built over decades, though concentrated in fuel-based generation rather than utility-scale solar and BESS.
Innovation resources	Strong engineering expertise in generation, transmission, system stability, and grid operations; more limited capability in advanced PV technology, long-duration storage, and solar forecasting.
Reputational resources	One of Indonesia's most recognisable institutional brands, carrying government, customer, and industry-partner trust built through its national electrification mandate.

This reputational capital extends across a wide network of government, financing, and civil-society stakeholders, including the President, the Ministry of Energy and Mineral Resources, the Ministry of Finance, the Ministry of Agrarian Affairs and Spatial Planning, provincial and regency governments, national banks, IPPs, investors, and the public, each holding a distinct regulatory or commercial interest in the Programme's execution. Maintaining this reputation as PLN scales up solar deployment requires deliberate, differentiated stakeholder management rather than reliance on its historical public-service standing alone.

Capabilities and Core Competencies

Following Hitt et al. (2019), PLN's capabilities emerge from the integration of tangible and intangible resources through organisational processes and accumulated routines. Thirteen such capabilities were identified, spanning corporate management, programme and project management, system planning, transmission and distribution operations, generation O&M,

engineering and innovation, procurement, finance, digital operations, human-resource development, stakeholder management, market development, and cross-entity coordination. Applying the VRIO framework to each capability yields the classification in Table 9.

Table 9. VRIO Analysis of PLN's Capabilities and Competitive Implications

Capability	Valuable	Rare	Costly to imitate	Non-substitutable	Competitive implication
Corporate management & national strategic planning	Yes	Yes	Yes	Yes	Sustainable advantage - core competence
Electricity-system planning & renewable integration	Yes	Yes	Yes	Yes	Sustainable advantage - core competence
Transmission & distribution operations	Yes	Yes	Yes	Yes	Sustainable advantage - core competence
Stakeholder, regulatory & partnership management	Yes	Yes	Yes	Yes	Sustainable advantage - core competence
Procurement & supply-chain management	Yes	Yes	No	No	Temporary advantage
Finance & investment management	Yes	Yes	No	No	Temporary advantage
Cross-entity coordination within PLN Group	Yes	Yes	No	No	Temporary advantage
Programme & project management	Yes	No	No	No	Competitive parity
Generation operations & maintenance	Yes	No	No	No	Competitive parity
Engineering, technology & innovation	Yes	No	No	No	Competitive parity
Digital operations & MIS	Yes	No	No	No	Competitive parity
Human resources & organisational learning	Yes	No	No	No	Competitive parity
Customer & renewable-market development	Yes	No	No	No	Competitive parity

Four capabilities satisfy all four VRIO criteria and constitute PLN's current core competencies: corporate management and national strategic planning; electricity-system planning and renewable integration; transmission and distribution operations; and stakeholder, regulatory, and partnership management. These are valuable because they let PLN exploit the solar opportunity while managing reliability, financing, and regulatory risk; rare because few organisations combine national-system responsibility, grid access, and institutional authority; and costly to imitate because they were built over more than 75 years of infrastructure investment and organisational learning. Procurement, finance, and cross-entity coordination provide temporary advantages that could, in time, be replicated by well-resourced IPP consortia or blended-finance structures, while programme management, generation O&M, engineering,

digital operations, human-resource development, and market development remain at competitive parity. Consistent with the dynamic-capabilities perspective (Teece et al., 2008), solar PV engineering, BESS integration, renewable-energy digital control, and solar-specific technical talent are identified as capability-development priorities rather than established core competencies.

Value Chain Analysis

PLN's four core competencies underpin its value chain, while its remaining capabilities serve as execution mechanisms. Supply-chain management (securing modules, inverters, BESS, and EPC services) draws on strategic-planning and stakeholder-management competence, exemplified by the 3.83 GW GIGA ONE bundling mechanism that aggregates demand for economies of scale. Operations (project development, construction, and commissioning) rely on system-planning and transmission competence supported by programme-management and engineering capabilities. Distribution (interconnection and reliable delivery) depends on system-planning and transmission-operations competence, since IPPs and EPC contractors ultimately depend on PLN's network to deliver electricity to customers. Marketing and sales (green tariffs, RECs, corporate renewable solutions) draw on strategic planning and stakeholder management, supported by PLN's access to more than 80 million customers, although commercial capabilities here remain under development. Follow-up service (monitoring, complaint handling, and restoration) depends on transmission-operations and stakeholder-management competence. Supporting these primary activities, finance, human resources, and management information systems provide capital, expertise, and information across the whole chain; a weakness in any one of them, for example inadequate financing or fragmented information systems, can constrain the entire Programme. PLN's principal value-creating strength therefore lies not in proprietary solar or battery technology, but in its ability to integrate core competencies and supporting capabilities to orchestrate the complete electricity value chain.

SWOT and TOWS Analysis

Table 10. SWOT Analysis - Strengths

Code	Strength	Strategic relevance
S1	Corporate management & national strategic-planning capability	Translates national energy policy into RUPTL targets, generation portfolios, and corporate plans.
S2	Electricity-system planning & renewable-integration capability	Determines solar locations, connection capacity, BESS requirements, and network reinforcement.
S3	National transmission & distribution operations capability	Maintains voltage, frequency and reliability while connecting dispersed solar projects.
S4	Stakeholder, regulatory & partnership-management capability	Enables licensing, land acquisition, financing, and public-private partnerships.
S5	Procurement and financing scale	Aggregates demand, standardises specifications, and structures blended-finance projects.
S6	Nationwide infrastructure and operational platform	Extensive generation assets, land, and engineering resources support national execution.

Code	Strength	Strategic relevance
S7	Strong institutional reputation and customer access	Recognised national brand with more than 80 million customers and a nationwide service network.
S8	Strong balance-sheet and capital-mobilisation capacity	Large asset base and access to debt markets enhance PLN's ability to mobilise financing beyond its balance sheet.

Table 11. SWOT Analysis - Weaknesses

Code	Weakness	Strategic relevance
W1	Limited advanced solar PV and BESS expertise	Constrains in-house capability in PV, storage analytics, and solar forecasting.
W2	Conventional-generation and coal-oriented legacy	Coal-heavy track record may affect perceptions among green financiers.
W3	Renewable-integration and grid-flexibility gaps	High variable-renewable penetration requires further smart-grid and storage investment.
W4	Insufficient balance-sheet capacity	Programme investment needs exceed what PLN can finance alone, requiring external capital.
W5	Dependence on imported components	Exposure to import reliance, TKDN requirements, and global supply-chain volatility.

Table 12. SWOT Analysis - Opportunities

Code	Opportunity	Strategic relevance
O1	Continuing electricity-demand growth	Average sales growth of 4.8% (2020-2024) creates demand for new capacity.
O2	Strong national renewable-energy mandate	RUPTL 2025-2034 requires 76% of new capacity from green sources, including 27 GW solar and wind.
O3	Declining solar-module costs	Global learning-by-doing has reduced module prices, improving programme economics.
O4	PLN's protected gateway position	Control of transmission and distribution makes PLN the mandatory delivery gateway.
O5	Large renewable-project pipeline	953 EBT tenders provide a decade-long pipeline for solar, BESS, EPC, and financing activity.
O6	Partnership and technology transfer from IPPs	International developers offer panel supply, EPC, and financing that can bridge PLN's gaps.
O7	Emerging demand for greener and distributed energy	MEMR Regulation No. 2/2024 enables broader rooftop-solar adoption.

Table 13. SWOT Analysis - Threats

Code	Threat	Strategic relevance
T1	Concentrated global supplier market	A small number of Chinese manufacturers dominate global module supply.
T2	Insufficient domestic manufacturing capacity	Domestic capacity remains far below programme requirements, raising import exposure.

Code	Threat	Strategic relevance
T3	Competition from coal and other generation technologies	Subsidised coal, geothermal, hydro, and offshore wind compete for capital and RUPTL slots.
T4	Superior capabilities of international IPPs	Manufacturer-direct procurement and global financing may outperform PLN's sub-holdings.
T5	Extremely high capital requirements	The programme requires approximately USD71.3 billion in investment through 2034.
T6	Growth of direct commercial and industrial solar	Domestic renewable companies developing direct C&I solar may erode PLN's market during 2027-2030.

The TOWS matrix (Wehrich, 1982) translates these findings into twelve strategic initiatives across four quadrants: SO (aggressive/growth), WO (turnaround/capability building), ST (defensive/protective shielding), and WT (retrenchment/risk realignment).

Table 14. TOWS Matrix - Summary of Strategic Initiatives

Quadrant	Code	Strategy
SO	SO-1	National Solar-BESS Portfolio Acceleration, using planning, grid, and infrastructure capabilities to meet demand growth and the renewable mandate (S1,S2,S3,S6 x O1,O2,O5).
SO	SO-2	Aggregated Green Procurement and Financing Platform, consolidating demand to capture declining costs and attract partners (S5,S8 x O3,O5,O6).
SO	SO-3	Integrated Green-Energy Customer Platform, leveraging grid position and customer base to expand green services (S3,S4,S7 x O4,O7).
WO	WO-1	Solar-BESS Centre of Excellence through joint ventures and knowledge transfer with international IPPs (W1,W3 x O5,O6).
WO	WO-2	Grid-Flexibility Transformation via investment in smart grids, storage, and forecasting (W3 x O2,O4,O5).
WO	WO-3	Domestic Solar Supply-Chain Development via long-term procurement and technology-transfer agreements (W5 x O3,O5,O6).
ST	ST-1	Strategic Supplier Diversification using procurement scale and financing capacity (S4,S5,S8 x T1,T2).
ST	ST-2	Controlled Co-opetition with International IPPs via competitive tenders and joint ventures (S1,S4,S5 x T4).
ST	ST-3	Grid-and-Land-Based Renewable Defence leveraging grid, land, and customer access (S2,S3,S6,S7 x T3,T6).
WT	WT-1	Capital-Light Programme Realignment via IPP, joint-venture, and blended-finance models (W4 x T5).
WT	WT-2	Selective Execution and Capability Segmentation, allocating project roles by demonstrated competence (W1,W3 x T4,T5).
WT	WT-3	Supply-Chain and Portfolio Risk Reduction through standardisation and supplier diversification (W2,W5 x T1,T2,T3).

Collectively, these initiatives position PLN not merely as off-taker and grid operator, but as the principal system planner, investment orchestrator, and renewable-energy platform for the Programme. The SO strategies provide the primary growth direction, the WO strategies strengthen technical and financial capability, and the ST and WT strategies protect the Programme's resilience by managing supplier concentration, competitive pressure from IPPs, and balance-sheet exposure.

Corporate-Level Strategy

PLN must progressively shift its corporate portfolio from a fossil-fuel-dominated generation mix toward a more diversified renewable portfolio, with solar photovoltaic as a primary growth engine, repositioning PLN from a conventional utility into an integrated clean-energy company offering renewable electricity, BESS, Renewable Energy Certificates (RECs), and digital energy services.

Level of Diversification

Following the Utility-Scale Programme, PLN's generation sub-holdings will operate a more technologically diversified portfolio, with solar and BESS contributing a substantially larger share of installed capacity, moving PLN toward a Dominant Business classification. However, because coal, gas, hydro, solar, and BESS remain closely connected through the same grid, dispatch system, and off-taker relationship with PLN Holding, this shift is best classified as a generation-portfolio transformation within the core electricity-generation business rather than full related constrained diversification, though it may open related-diversification opportunities in solar-project development, BESS and ancillary services, third-party EPC and O&M, and RECs.

Value-Creating Diversification

Value can be created through operational relatedness by sharing land and permitting, financing, and engineering activities across PLN Holding, PLN Indonesia Power, and PLN Nusantara Power. For land and permitting, the Distribution Unit provides local information and field verification, the PPP Division coordinates a central land-and-permit database and liaises with agrarian and environmental authorities, and the Legal Division prepares land-related agreements. For financing, the Development, Financing and Project Licensing Division prepares standard project-finance models and lender data rooms, the Corporate Business Development and Investment Division determines the appropriate ownership and investment model per project, the Finance and Investment Division acts as PLN's funding authority, and the PMO integrates financing milestones with implementation schedules. For engineering, the System Planning Division determines where and how much solar capacity can be integrated, the Renewable Energy Division conducts feasibility studies, the Technology and Engineering Division sets design standards, and project-level Engineering Units convert feasibility studies into constructible designs. Sharing these activities is expected to lower transaction and engineering costs, shorten development cycles, strengthen negotiating power with lenders, and reduce construction rework and delay risk across the programme's 4,118 planned projects.

Transfer of Core Competencies and Market Power

The transfer of core competencies is organised across three phases of the PLTS+BESS IPP development process: planning (operational modelling, technical optimisation, financial modelling, LCOE/LCOS quantification, and land acquisition), procurement (performance frameworks, request-for-proposal, and contracting), and execution (operations and asset-

performance management), each drawing on the relevant divisions identified above. To build market power through backward integration, PLN participates, via PLN Indonesia Power Renewables, in PT Trina Mas Agra Indonesia (TMAI), a joint venture with Trina Solar and PT Dian Swastatika Sentosa Tbk operating Indonesia's largest integrated solar cell and module manufacturing facility at Kendal Industrial Park, Central Java (inaugurated 19 June 2025). TMAI produces high-efficiency i-TOPCon N-type panels of up to 720 Wp with an efficiency of 23.2%, rated AAA-bankable by BloombergNEF, and has raised its domestic component level (TKDN) from approximately 41% to 60%, with an annual capacity of up to 1 GW. Because this capacity can supply only part of the Programme, PLN still requires several qualified domestic and international suppliers to manage supplier concentration risk.

Business-Level Strategy

Household customers account for more than 91% of PLN's customer accounts but only 43% of electricity-sales revenue, while industrial and business customers represent just 5.81% of customers yet contribute 48.38% of revenue. Household customers therefore constitute PLN's principal mass-market and public-service segment, while industrial and business customers form the most important commercial segment for differentiated solar products. PT Surveyor Indonesia's customer-satisfaction survey found three dimensions with a statistically significant influence on nationwide customer satisfaction, summarised in Table 15. In its role as a solar producer, PLN's generation sub-holdings serve PLN Holding as system planner and off-taker, whose requirements centre on competitive tariffs, project bankability, timely commercial operation dates, reliable output, grid-code compliance, TKDN compliance, and manageable project risk.

Table 15. Dimensions Significantly Influencing PLN Customer Satisfaction

No.	Dimension
1	Complaint-handling responsiveness
2	Services related to new connections, capacity changes, and temporary connections (PB/PD/PS)
3	Electricity safety and quality

PLN's customers expect electricity to remain affordable while also demanding reliable, safe, responsive, and increasingly sustainable service, expectations that are particularly relevant to the Utility-Scale Programme since PLN must expand renewable capacity without placing excessive pressure on tariffs, subsidies, or its financial position. This research therefore proposes an integrated cost leadership/differentiation strategy, through which PLN simultaneously pursues cost efficiency, via economies of scale, standardised engineering, consolidated financing, and the shared use of existing land, grid, and operational resources, and differentiation through dependable supply, effective solar-BESS integration, faster complaint handling, transparent digital services, and credible green-energy products consistent with the satisfaction dimensions identified above. The strategy is further operationalised through the Strategy Diamond in Table 16.

Table 16. Application of the Strategy Diamond to PLN's Utility-Scale Solar Programme

Element	Application to the Programme
Arenas (where)	Utility-scale and distributed solar plants supported by BESS across Indonesia, prioritising high-demand regions, isolated systems, PLN-owned land, and locations with strong solar resource and grid capacity.
Vehicles (how)	Implementation through PLN sub-holdings, IPP schemes, joint ventures, strategic partnerships, and EPC contracts, financed through a combination of PLN equity, commercial loans, concessional and blended finance, and guarantees.
Differentiators (why succeed)	PLN's nationwide grid, extensive land and infrastructure, large customer base, government relationships, project experience, and off-taker position, enabling integrated solar, BESS, REC, and digital energy services.
Staging (sequence)	Phased implementation, beginning with projects that have ready land, permits, grid access and financing, followed by larger and more complex projects as supply chains and funding capacity mature.
Economic logic (returns)	Value from economies of scale, bulk procurement, lower financing costs, and shared capabilities; returns from electricity sales, regulated investment returns, RECs, green-energy services, and operational savings.

CONCLUSION

External analysis showed that PLN's utility-scale solar program operated within a favorable policy and demand environment, supported by the RUPTL 2025–2034 mandates, declining module costs, and PLN's strategic gateway position. However, the program also faced challenges, including high supplier bargaining power, an estimated investment requirement of approximately USD 71.3 billion, and increasing competitive pressure from international Independent Power Producers (IPPs) and, during 2027–2030, direct commercial and industrial solar development. Internal analysis identified four sustainable core competencies: corporate and national strategic planning; electricity system planning and renewable energy integration; transmission and distribution operations; and stakeholder and partnership management. The analysis also identified temporary advantages in procurement, finance, and cross-entity coordination, while advanced solar photovoltaic (PV) and battery energy storage system (BESS) capabilities, grid flexibility, balance sheet capacity, and import dependency remained key limitations. PLN's primary advantage lies not in owning solar technology but in its ability to coordinate planning, financing, infrastructure, and strategic partnerships.

At the corporate level, PLN should pursue a related constrained diversification strategy based on shared land acquisition and permitting capabilities, financing resources, and engineering activities across PLN Holding, PLN Indonesia Power, and PLN Nusantara Power. This strategy should be complemented by selective backward integration through PT Trina Mas Agra Indonesia and diversified project structures involving IPPs, joint ventures, and blended finance mechanisms to maintain financial resilience. At the business level, PLN should adopt an integrated cost leadership and differentiation strategy by achieving operational efficiency through large-scale procurement and standardized engineering while differentiating its offerings through solar-BESS integration, green tariffs, rooftop solar solutions, and responsive digital services for customers.

To support implementation, PLN should establish clear governance structures, with PLN Holding functioning as the system planner, off-taker, and strategic coordinator, while its sub-holdings operate as project developers under the supervision of a centralized Project Management Office. PLN should align financing structures with each project's risk and bankability profile, integrate project planning and monitoring through a shared program database, and develop solar-BESS capabilities through a dedicated Center of Excellence involving universities, manufacturers, and international partners. Future research should evaluate these strategies through project-level financial modeling and scenario analysis using data from the first implemented projects.

REFERENCES

- Alshihri, S., Al-Gahtani, K., & Almohsen, A. (2022). Risk factors that lead to time and cost overruns of building projects in Saudi Arabia. *Buildings*, 12(7), 902.
- Anisah, S., & Heriyanto, D. S. N. (2025). Aligning Indonesia's energy-market competition law with the Sustainable Development Goals: Pathways to a just energy transition. *Prophetic Law Review*, 284–315.
- Arku, J. K., Shao, Y., & Ankrah, S. T. (2024). Building a hierarchical enablers framework for service business model innovation for sustainable performance: Evidence from Ghana's electricity sector. *Sustainability*, 16(8), 3191.
- Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- Barney, J. B., & Hesterly, W. S. (2019). *Strategic management and competitive advantage: Concepts and cases* (6th ed.). Pearson.
- Canesi, R., & Gallo, B. (2023). Risk assessment in sustainable infrastructure development projects: A tool for mitigating cost overruns. *Land*, 13(1), 41.
- Chadee, A. A., Martin, H. H., Mwashia, A., & Otuloge, F. (2022). Rationalizing critical cost overrun factors on public sector housing programmes. *Emerging Science Journal*, 6(3), 647–666.
- Daoud, A. O., El Hefnawy, M., & Wefki, H. (2023). Investigation of critical factors affecting cost overruns and delays in Egyptian mega construction projects. *Alexandria Engineering Journal*, 83, 326–334.
- Firmansyah, M. (2025). *Individual project: INFIEN Energy's business plan and strategies in the Indonesian renewable energy market*. Institut IPMI.
- Grant, R. M. (2022). *Contemporary strategy analysis*. Wiley.
- Hanadya, A. (2026). *Feasibility study of solar PV rooftop using capital budgeting method in PLN's new business model*.
- Hitt, M. A., Ireland, R. D., & Hoskisson, R. E. (2019). *Strategic management: Competitiveness & globalization: Concepts and cases* (13th ed.). Cengage Learning.
- Lahmidi, W., Jouali, Y., & Lahmidi, Z. (2026). The intersection of social entrepreneurship and green entrepreneurship: A pathway to sustainable development. In *Incentives and benefits for adopting green entrepreneurship practices* (pp. 307–340). IGI Global Scientific Publishing.
- Law on Electricity*. (2009). Number 30.
- Ministry of Energy and Mineral Resources (ESDM). (2026). *Development of utility-scale solar power* [Presentation by Minister Bahlil Lahadalia]. Jakarta, 5 March 2026.
- Nguyen, T., Chileshe, N., Ho, D. T., Nguyen, V. T., & Tran, Q. P. (2024). Significant risks that trigger cost overruns and delays in urban rail projects: A typical case study of Vietnam. *Built Environment Project and Asset Management*, 14(2), 278–295.

- Porter, M. E. (1985). *Competitive advantage: Creating and sustaining superior performance*. Free Press.
- Porter, M. E. (2008). The five competitive forces that shape strategy. *Harvard Business Review*, 86(1), 78–93.
- Presidential Regulation for the Acceleration of Renewable Energy Development for Electricity Supply. (2022). Number 112.
- Presidential Regulation for the Establishment of the National Energy Council and Procedures for Selecting National Energy Council Member Candidates. (2008). Number 26.
- Raha, A., Citroni, G., & Windsperger, J. (2026). Value co-creation in green start-ups: A stakeholder approach to sustainable entrepreneurship. *The International Journal of Entrepreneurship and Innovation*, 14657503261451118.
- Shen, P., & Chen, Y. (2026). Customer-oriented strategy and AI social responsibility performance: A resource-based view. *The Service Industries Journal*, 46(5–6), 416–448.
- Suryadinata, W., Saga, R., Putri, S. A., Brilian, V. A., & Octaviani, F. (2026). Multi-criteria decision analysis of Sumatra's development potential for the ASEAN Power Grid South Sub-System. *IOP Conference Series: Earth and Environmental Science*, 1654(1), 12021.
- Teece, D. J., Pisano, G., & Shuen, A. (2008). Dynamic capabilities and strategic management. In *Technological know-how, organizational capabilities, and strategic management* (Vol. 18, pp. 27–51). https://doi.org/10.1142/9789812834478_0002
- Wehrich, H. (1982). The TOWS matrix—A tool for situational analysis. *Long Range Planning*, 15(2), 54–66. [https://doi.org/10.1016/0024-6301\(82\)90120-0](https://doi.org/10.1016/0024-6301(82)90120-0)