



Program Information Document (PID)

Concept Stage | Date Prepared/Updated: 18-Nov-2023 | Report No: PIDC293395

**BASIC INFORMATION****A. Basic Program Data**

Country Indonesia	Project ID P180992	Parent Project ID (if any)	Program Name Indonesia - Electricity Network Transformation (I-ENET) Program
Region EAST ASIA AND PACIFIC	Estimated Appraisal Date 25-Jun-2024	Estimated Board Date 04-Dec-2024	Does this operation have an IPF component? No
Financing Instrument Program-for-Results Financing	Borrower(s) PT PLN (Persero)	Implementing Agency PT PLN (Persero)	Practice Area (Lead) Energy & Extractives

Proposed Program Development Objective(s)

To prepare the electricity distribution grid in the Java-Madura-Bali region for energy transition.

COST & FINANCING**SUMMARY (USD Millions)**

Government program Cost	12,400.00
Total Operation Cost	1,200.00
Total Program Cost	1,200.00
Total Financing	1,200.00
Financing Gap	0.00

FINANCING (USD Millions)

Total World Bank Group Financing	500.00
World Bank Lending	500.00
Total Government Contribution	500.00



Total Non-World Bank Group and Non-Client Government Financing	200.00
Trust Funds	50.00
Private Capital and Commercial Financing	150.00
of which Private Capital	150.00

Concept Review Decision

The review did authorize the preparation to continue

B. Introduction and Context

Country Context

- 1. Indonesia achieved impressive economic growth and poverty reduction in the past two decades.** Economic growth over this period averaged five percent per year—contributing to income convergence that accelerated rapidly relative to peer countries since 2009. The poverty rate concurrently fell from 19 percent in 2000 to 9.5 percent by 2022. Indonesia has remained stable amid inflation and other global shocks. Projections suggest continued growth of 4.9 percent through 2025¹.
- 2. Indonesia’s development transition moved in parallel with increased levels of carbon emissions.** Indonesia accounts for about 3.5 percent of global greenhouse gas (GHG) emissions. Indonesia has the fourth largest population, the 16th largest economy, and accounts for 1.25 percent of the world’s GDP. Indonesia’s emissions—1,495 million tons of carbon dioxide (CO₂) equivalent (MtCO₂eq) annual average in 2018-2020—exceed those of its structural peers in absolute terms but encouragingly show signs of slowing—including in per capita terms. The underpricing of carbon in land and energy resources leads to relative inefficiency in the use of these resources. Emissions from the energy sector could overtake deforestation and land use change as the highest contributor to GHG emissions in Indonesia by 2030².
- 3. The country is extremely vulnerable to the effects of climate change, with significant impacts on the economy, lives, and livelihoods of its population.** Indonesia is currently the 49th most climate-vulnerable country in the world³, with risks from flooding, drought, cyclones, tsunamis, volcanic and seismic activities, wildfire, and extreme heat events. Potential economic losses from climate change could amount to as much as IDR554 trillion⁴ (approx. US\$37.8 billion)

¹ Indonesia Economic Prospects. World Bank. (June 2023).

² Indonesia Climate Change and Development Report. World Bank. (April 2023).

³ European Commission (EC). (2023). *INFORM Risk Index 2023*. Available at: <https://drmkc.jrc.ec.europa.eu/inform-index/INFORM-Risk/Risk-Facts-Figures>

⁴ Antara. (2022). *Climate change losses could touch Rp544 trillion in 2020--2024: gov't*. Available at: <https://en.antaranews.com/news/243525/climate-change-losses-could-touch-rp544-trillion-in-2020-2024-govt>



between 2020-2024. Concerningly, this cost is likely to continue to increase, with losses estimated to culminate in 2.5 to 7 percent of GDP by 2100 – a majority of which will impact the poorest segments of the population.⁵ Energy transition is a key step to mitigate the impact of the climate crisis, meet the Nationally Determined Contribution (NDC) targets⁶, and realize Indonesia’s ambition to build a high-income, low-carbon economy by 2045.

Sectoral (or multi-sectoral) and Institutional Context of the Program

4. **Indonesia’s electricity sector was a key driver of economic growth and poverty reduction over the last decade, but the expansion of the power system was largely driven by fossil fuels.** PT Perusahaan Listrik Negara (PLN), the vertically integrated electricity utility, connected 33 million new consumers, increasing the electrification rate from 66.5 percent in 2010 to 99.6 percent in 2022. The per capita electricity consumption increased from 630 kWh in 2010 to 1122 kWh in 2021⁷. From 2014 to 2019, Indonesia moved up from 101st to 33rd among 190 countries in terms of the ease of accessing electricity⁸. The improved availability and reliability of electricity supply contributed significantly to Indonesia’s rapid economic growth in this period, but the gains were driven by fossil fuels, especially coal. The share of coal generation in total electricity production rose from 44 percent to 63 percent, while the share of renewables declined from 12 percent to 11 percent⁹.
5. **The government is committed to shifting to a more sustainable path in the electricity sector.** It has pledged to reduce emissions by 43.2 percent with international support by 2030 under the Enhanced NDC. Furthermore, its Long-Term Strategy for Low Carbon and Climate Resilience, submitted to United Nations Framework Convention on Climate Change (UNFCCC) in 2021 explores options to achieve net-zero emissions by 2060 or earlier. With the Indonesia Just Energy Transition Partnership (JETP), Indonesia has announced its ambition to achieve net-zero emissions in the power sector by 2050 and increase the share of renewable energy to at least 34 percent by 2030 and in return, the International Partners Group announced financial support of US\$20 billion.
6. **The electricity demand is projected to grow five-fold by 2050 to enable Indonesia to meet its economic growth and decarbonization targets¹⁰.** The industrial sector would account for the largest part of the electricity demand in 2030 due to electrification of process heating. In the residential and commercial sectors, space cooling and cooking will lead to the growth of electricity use. Similarly, the transport sector will see a significant increase in electricity uses as Electric Vehicle (EV) sales increase to 25 percent of car sales by 2030 and 100 percent of car sales by 2040¹¹. In the long-term, electrolysis for hydrogen production could also have a significant impact on energy demand growth, requiring the expansion of renewable power alongside measures to better integrate and optimize power surplus and deficit regions.

⁵ World Bank and Asian Development Bank (ADB). (2021). *Climate Risk Profile Indonesia*. Available at: <http://hdl.handle.net/10986/36379>

⁶ Indonesia has pledged to the Paris Agreement to cut emissions by 43% percent compared to business-as-usual (BAU) by 2030 with international support. For the energy sector, the expected GHG emission reduction is about 400 MtCO₂e/year with international support by 2030.

⁷ World Development Indicators, World Bank. (October 2023).

⁸ World Bank Group. (2015). *Doing Business 2014. Economy Profile Indonesia*. Washington DC; and World Bank Group. 2020. *Doing Business 2019*.

⁹ Ministry of Energy and Mineral Resources (MEMR), *Handbook of Energy & Economic Statistics of Indonesia 2021*.

¹⁰ In the scenario consistent with the government’s JETP commitments, electricity demand is projected to increase by 6.4 percent annually from 2022 to 2030 and 5.8 percent from 2022 to 2050, Electricity demand in 2050 (1315 TWh) is projected to be five times higher than the electricity demand in 2022 (272 TWh).

¹¹ *Accelerating Just Energy Transition in Indonesia (Public Consultation Draft)*. Indonesia JETP Secretariat, November 2023.



7. **To meet these needs, Indonesia’s electricity networks will need to grow bigger, stronger, and smarter.** It is estimated that a two-to-three-fold increase in network investments will be needed¹² to ensure that transmission and distribution networks have adequate capacity and flexibility to meet the increase in electricity demand and achieve Indonesia’s decarbonization targets. According to the IEA, delays in grid investments and reforms in countries like Indonesia would increase global CO2 emissions, slowing energy transitions and putting the 1.5 °C goal out of reach¹³.
8. **The government prepared the National Electricity Supply Business Plan 2021-30, also known as the “Green RUPTL”, initiates the shift to a more sustainable electricity sector.** The “Green RUPTL,” includes US\$12.4 billion of investments over 2021-2030 in electricity distribution to deliver more electricity and to improve reliability and efficiency of electricity supply. PLN’s smart grid roadmap prioritizes network reliability and efficiency until 2025 and network resilience, customer engagement and network sustainability and self-healing beyond 2025. As part of its effort transform its electricity networks, PLN is considering investments in advanced metering infrastructure, System Control and Data Acquisition (SCADA), Advanced Distributed Management System (ADMS) and distributed energy resources such as rooftop solar PV and EV charging station.
9. **The Java-Bali-Madura region is most suitable to pilot investments in electrification, smart grid, and distributed energy resources.** The two provinces, Java, and Bali are the center of economic activity in Indonesia: together, they account for 61.5% of Indonesia’s population, 59% of national GDP, including a corresponding portion of the country’s micro and small enterprises, as well as several manufacturing zones. The region also hosts 61% of the country’s poor, and 0.6% of the population—mostly on remote islands—do not have access to electricity. Java-Bali-Madura is the largest of PLN’s seven electricity systems, generating 70% of electricity demand nationally, with a total generation capacity of 45.8 GW in 2022. However, the system is still largely operated manually, and lacks smart grid technologies needed for more flexible and efficient operation of the grid. The size and density make Java-Bali-Madura region a suitable candidate for rolling out grid enhancements for integrating electric mobility, piloting demand response programs as well as scale up business models for solar rooftop, which is in high demand by the manufacturing sector in Java.

Relationship to CAS/CPF

10. **The proposed Program fully aligns with the Indonesia Country Partnership Framework (CPF) FY21-25 (Report No. 157221-ID),** addressing one of the five key development challenges identified: the need to ramp up investments in infrastructure consistent with the decarbonization. More specifically, the proposed Program supports Engagement Area 2 “Improve infrastructure”, which encompasses Objective 2.1 “Improve infrastructure provision and quality of service”, and Objective 2.2 “Transition to low carbon energy and attain universal access to reliable and sustainable energy” by mobilizing commercial financing sources for the development of critical infrastructure required to decarbonize the power sector. The Program also aligns with Cross-cutting theme 3 “Climate Change” by contributing to increase renewable energy share in the country’s energy mix.

Rationale for Bank Engagement and Choice of Financing Instrument

¹² According to the net zero roadmap for the energy sector for Indonesia prepared by IEA and MEMR, investment in electricity networks must increase from about \$3 billion every year to \$6 to \$9 billion every year to achieve current climate aspirations for net zero by 2060.



11. There is a strong development rationale for public sector support and Bank engagement in the proposed operation.

- **Rationale for Public Finance.** PLN's current revenue model does not allow it to raise adequate funds for its future capital investments¹⁴. PLN leverages financing from Independent Power Producers (IPPs) in generation and taps into both domestic and international commercial debt markets to meet a share of its self-financing needs. But these sources of financing are not sufficient for meeting its large capex needs to support the energy transition, particularly for electricity network infrastructures that by law must be owned by PLN and currently have no pricing regime, making it difficult to mobilize private sector financing.
- **Bank's Value Added.** The Bank can support PLN with the next phase of its electricity network development by helping it access global knowledge and experience in new and emerging technologies in electricity distribution and technologies and measures to facilitate the integration of distributed RE generation, while also helping mobilize technical assistance funds and climate financing for climate mitigation and adaptation activities. The Bank is also preparing a proposed regional Multi-Phase Programmatic Approach (MPA) on Accelerating Sustainability Energy Transition, which will leverage regional institutions and operational efficiencies towards a common objective. This proposed project could be considered as a pipeline project in the MPA.

12. The proposed Program will help create enabling conditions for private sector investments in electricity generation and distributed energy resources. It will allow private owners of distributed RE generation to evacuate electricity supply efficiently and strengthen PLN's capacity to integrate distributed energy resources, enabling the deployment of private investments in areas such as rooftop solar PV and EV charging stations to scale.

13. The PforR instrument is appropriate because it incentivizes the achievement of results of the government program and strengthens PLN capacity to deliver the results. The instrument (i) provides stronger focus on accountability for results and outcomes while incentivizing the government's and PLN's ownership and implementation of activities and investments electricity distribution, (ii) improves the capacity of PLN's agencies to deliver an existing government program through their own systems and procedures, (iii) leverages PLN's strong track record with the results based lending instruments including the recently approved Indonesia Sustainable Least Costs Electrification PforR. The traditional investment approach, with focus on project-based implementation, is less suited to achieving the objectives of the program.

C. Program Development Objective(s) (PDO) and PDO Level Results Indicators

Program Development Objective(s)

To prepare the electricity distribution grid in the Java-Madura-Bali region for energy transition.

PDO Level Results Indicators

14. The following indicators will measure the achievement of results under the proposed Program:

- Network capacity increased (MVA)
- Delivery of electricity increased (GWh).

¹⁴ PLN's revenue model allows to cover historical operating expenses earns cost plus 7 percent margin, which is unsuitable for raising the significant amounts of new finance that PLN needs for future investments.



- Reduction in System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI).
- Integration of distributed RE generation (GWh)
- Distribution losses reduced (%)

D. Program Description

PforR Program Boundary

- 15. The government program covers electricity distribution network, smart grid, and distributed energy resource investments in the RUPTL from 2021-2030.** The government program includes investments in electricity network lines and transformers as well as the implementation of PLN's smart grid roadmap and distributed energy resources. It will require an estimated US\$12.4 billion over the program period. The program covers 17 Unit Induk Distribusi (UID) and 5 Unit Induk Wilayah (UIW) - the PLN regional units responsible for electricity distribution - that together supply electricity to PLN's 85 million customers. The program covers the entire country and comprises of three geographical divisions: (i) Java, Madura, and Bali ; (ii) Sumatra and Kalimantan, and (iii) Sulawesi, Maluku, Papua, and Nusa Tenggara.
- 16. The proposed PforR operation will support the implementation of the government program in the Java-Madura-Bali region during 2024-2030.** The Bank operation will focus on distribution network strengthening, expansion and rehabilitation to ease existing constraints and increase network capacity during 2024-2030. Network investments will be undertaken alongside investments in SCADA, ADMS, advanced metering infrastructure, distributed renewable energy resources such as rooftop solar PV, and EV infrastructure to improve reliability, efficiency, and sustainability of electricity supply and support the energy transition. PLN plans to take a phased approach to implementation of smart grid technologies, with the initial deployment in the Java-Madura-Bali to undertake through the Program.
- 17.** The following details a range of areas for potential action under the operation. Further and alternative options will be considered during the Program preparation guided by consultations with the government and the technical assessment.

Results Area 1: Increased network capacity and reliability of electricity supply

- 18. The Program will support electricity distribution network strengthening, and expansion** to increase the capacity of the distribution network to meet the increased demand for electricity reliably. PLN plans to install 52,000 kilometers of medium voltage lines, 149,000 kilometers of low voltage distribution lines and 9300MVA (megavolt amperes) of distribution transformers in the Java-Madura-Bali region between 2024-2030 in the RUPTL. PLN currently has an estimated financing gap of US\$1.3 billion in its US\$3.5 billion RUPTL investment plan for distribution lines and transformers in six UIDs in Java-Madura- Bali region, with Distribusi Jakarta Raya and Distribusi Jawa Barat accounting for more than half of the financing gap. The proposed Program will support PLN's efforts to expand and strengthen its distribution network infrastructure in two or three UIDs in the Java-Madura- Bali region.
- 19. The Program will enhance climate resilience of PLN electricity distribution network operations** through investments and operations and maintenance measures that are compliant with PLN climate resilience guidelines. This could include a package of management measures (such as changing maintenance schedules and including adaptive management to account for uncertainty in the future) and structural measures (e.g., hardening the infrastructure by



changing distribution network poles). PLN is currently developing with World Bank technical assistance comprehensive guidelines for assessing and addressing climate and disaster risks in both existing and new generation, transmission, and distribution assets. The guidelines will enable PLN engineers to design and build new assets and operate existing ones in a way that anticipates, prepares for, and adapts to changing climate conditions in Indonesia. The Program will support the implementation of these guidelines in electricity distribution in PLN's Java-Madura-Bali division.

Results Area 2: Increased flexibility of grid to integrate distributed renewable energy.

20. The Program will support the development of distributed energy resources such as BESS, EV charging stations and demand response program as grid flexibility options and support the integration of distributed renewable energy.

These investments will enable PLN to meet the demand for sustainable electricity, support the development of electric mobility in the country, defer network infrastructure investments, reduce distribution losses, improve reliability, make distribution networks more efficient, and contribute to the energy transition.

- **Distributed energy resources roadmap.** The Program will assist PLN in preparing and implementing a distributed energy resources roadmap. While PLN has technical guidelines for the implementation of, BESS and EV charging station, it would like to develop detailed implementation roadmaps based on technical and planning studies to determine the total absorptive capacity of grid, location of demand, required upgrades and other technical parameters, to implement these initiatives at scale. PLN plans to address this gap by preparing and adopting the roadmap for integration of distributed energy resources in PLN service areas. The roadmap will inform the implementation of investments in distributed energy resources as noted below.
- **Distributed solar PV and BESS.** The Program will support efforts by PLN and its subsidiaries to increase the adoption of rooftop solar PV and BESS in its service areas through investments, technical assistance, and training. PLN's subsidiary ICON plus is taking an increasing role in the deployment of rooftop solar PV systems in PLN service areas. It has entered joint ventures with ten private companies and has a pipeline of close to 190 MWs of rooftop solar PV projects with its partners across the country. By 2025, PLN and ICON plus are targeting to install 727 MW of rooftop solar PV in the country. As of September 2023, PLN has seen the deployment of 114MW of rooftop solar PV in the Java-Madura- Bali region and is expecting the installations to increase. Similarly, PLN also plans to develop distributed solar PV and BESS based smart micro-grids to connect the remaining isolated communities in Java-Madura-Bali to electricity. The Bank team will identify specific needs and targets for distributed solar PV and BESS in the Java-Madura-Bali region during the preparation of the technical assessment.
- **EV charging station.** The Program will support PLN efforts to develop charging infrastructure for EVs in the Java-Madura-Bali region through technical assistance and capacity building as well as associated investments. PLN's principal modality for developing EV charging station in its networks is through public-private partnership where the private sector partner purchases the land necessary for the charging station whereas the charging infrastructure can either come from PLN or the private partner. PLN has connected 375 public charging stations and 2213 home charging stations to its distribution network as of September 2023. The number of EV charging station connected to PLN's distribution network will increase as EV ownership increases in Indonesia. PLN estimates that Indonesia will have more than 335,000 electric vehicles by 2030 and is targeting to develop 1146 public EV charging station in the Java-Madura- Bali region by 2025. The Bank team will identify specific targets for EV Charging Station in the Java-Madura-Bali region during the preparation of the technical assessment.

Results Area 3: Increased digital transformation and efficiency of electricity supply



21. The Program will pursue digital transformation of PLN network operations to make electricity supply more efficient. These investments would also facilitate the scale up of distributed renewable energy. This will be achieved through the development and implementation of a SCADA/ADMS roadmap and implementation of pilot programs on advanced metering infrastructure.
- **Distribution SCADA/ADMS.** The proposed Program will support the adoption of PLN’s SCADA/ADMS roadmap and its implementation in the Java-Madura- Bali region. The roadmap will take stock of the current state of deployment and recommend an action plan to enhance the coverage of SCADA/ADMS including Outage Management Systems, Distributed Energy Resources Management Systems that integrates with the Energy Management System at the transmission level. The plan would help PLN transition from Distribution Network Operator function for on-way electricity supply to Distribution System Operator functions capable of handling bi-directional flow of electricity and information from customers. Upon the adoption of the roadmap, the Program could support the completion of feasibility studies and bidding documents for implementation as well as the associated investments in switching devices and equipment necessary for SCADA/ADMS implementation.
 - **Advanced metering infrastructure.** The Program will support the deployment of advanced metering infrastructure in Java-Madura- Bali region. PLN is using a public-private partnership to install, operate, and maintain the first 1.5 million advanced meters in its system. Under this arrangement, a private firm is financing the installation and then receiving ongoing monthly availability payments from PLN for the use of the advanced metering infrastructure system. PLN’s subsidiary ICON plus is responsible for managing the Head End System and Meter Data Management System for the advanced metering infrastructure in Indonesia. PLN is currently undertaking a review of its advanced metering infrastructure implementation. Based on the findings of the review, PLN plans to make improvements to its implementation plan. It plans to deploy up to 7.7 million advanced meters by 2026, 16.7 million advanced meters by 2029 and 34 million advanced meters by 2037. The Bank team will discuss and reach agreement on the targets for AMI in Java-Madura-Bali with PLN during preparation.

E. Initial Environmental and Social Screening

22. **The Program is expected to generate substantial and long-term positive social and environmental benefits by making clean energy available to many currently unserved population, and reducing GHG emissions and air pollution, while environment or social risks are overall Moderate.** All Category A type activities will be excluded from the Program boundary. PLN has considerable experience in executing Bank projects, with demonstrated capacity in managing environmental and social risk for similar activities. PLN is currently finalizing an Environmental and Social Management System (ESMS). Upon adoption, PLN will use the ESMS for managing the environmental and social impacts of the Program.
23. **The Bank will together with PLN undertake an Environmental and Social Systems Assessment (ESSA) of the Program during preparation.** Towards this, the ESSA for I-ENET will build on the ESSA of recent World Bank PforR operations with PLN such as Power Distribution Development Program (PDDP) and ISLE-1. The ESSA will i) review the policy and legal framework related to management of environmental and social impacts; ii) assess the institutional capacity for environmental and social management systems; iii) assess PLN’s performance regarding existing similar activities; iv) identify gaps, if any, in the effective implementation of the Program, and outline actions and measures to fill those



gaps. The Bank will undertake consultations on the draft ESSA with representatives of government, civil society, the private sector, the development community, and energy experts and will be publicly available before appraisal. The Program Appraisal Document, and PAP will reflect the recommended measures for managing environment and social risks in the ESSA.

CONTACT POINT**World Bank**

Name :	Bipulendu Narayan Singh		
Designation :	Senior Energy Specialist	Role :	Team Leader(ADM Responsible)
Telephone No :	5720+82135 /	Email :	bsingh2@worldbank.org
Name :	Jenny Jing Chao		
Designation :	Senior Public Private Partnerships Specialist	Role :	Team Leader
Telephone No :	62-21-529930	Email :	jchao@worldbank.org
Name :	Maria Ayuso Olmedo		
Designation :	Senior Energy Specialist	Role :	Team Leader
Telephone No :	5781+82210 /	Email :	mayusoolmedo@worldbank.org

Borrower/Client/Recipient

Borrower :	PT PLN (Persero)		
Contact :	Sinthya Roesli	Title :	Director of Finance
Telephone No :	62217261122	Email :	pln.offshorefunding@pln.co.id

Implementing Agencies

Implementing Agency :	PT PLN (Persero)		
Contact :	Sinthya Roesly	Title :	Director of Finance
Telephone No :	62217261122	Email :	pln.offshorefunding@pln.co.id



FOR MORE INFORMATION CONTACT

The World Bank
1818 H Street, NW
Washington, D.C. 20433
Telephone: (202) 473-1000
Web: <http://www.worldbank.org/projects>