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Report No: PAD4154

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT  
ON A  
PROPOSED LOAN

IN THE AMOUNT OF  
US\$380 MILLION

TO THE  
REPUBLIC OF INDONESIA

FOR A  
DEVELOPMENT OF PUMPED STORAGE HYDROPOWER IN JAVA BALI SYSTEM PROJECT

August 3, 2021

Energy & Extractives Global Practice  
East Asia And Pacific Region

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## CURRENCY EQUIVALENTS

(Exchange Rate Effective June 18, 2021)

Currency Unit = Indonesia Rupiah

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1 IDR = US\$ 0.000069

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US\$1 = 14,408 IDR

## FISCAL YEAR

January 1 - December 31

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## ABBREVIATIONS AND ACRONYMS

AIIB	Asian Infrastructure Investment Bank
BAU	Business-as-usual
BMP	Biodiversity Management Plan
BoP	Balance of Payments
BPP	<i>Biaya Pokok Penyediaan Pembangkitan</i> (Cost of Generation Provision)
CCT	Conditional Cash Transfer
C-ESMP	Contractors Environmental and Social Management Plan
CPF	Country Partnership Framework
CHMP	Cultural Heritage Management Plan
COVID-19	Coronavirus Disease 2019
CPI	Consumer Price Index
EIRR	Economic Internal Rate of Return
E&S	Environmental & Social
EPP	Emergency Preparedness Plan
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
ESIA	Environmental Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESRS	Environmental and Social Review Summary
ESS	Environmental and Social Standards
FIDIC	Fédération Internationale Des Ingénieurs-Conseils (International Federation of Consulting Engineers)
FY	Fiscal Year
FIRR	Financial Internal Rate of Return
FPF	Forest Partnership Framework
FS	Feasibility Study
FTP	Fast Track Program
FX	Foreign Exchange
GAP	Gender Action Plan
GBV	Gender-Based Violence
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GoI	Government of Indonesia
GRM	Grievance Redress Mechanism
GRS	Grievance Redress Service
GW	Gigawatt
GWh	Gigawatt hours
HPP	Hydropower plant
HQ	Headquarter
kWh	Kilowatt hour
kV	Kilo Volt
IBRD	International Bank for Reconstruction and Development
IDR	Indonesian Rupiah
IPF	Investment Project Financing
IPPs	Independent Power Producers
LARAP	Land Acquisition Resettlement Action Plan
LARF	Land Acquisition and Resettlement Framework
LiDAR	Light Detection and Ranging
LMP	Labor Management Procedures

MEMR	Ministry of Energy and Mineral Resources
MoF	Ministry of Finance
MoRA	Ministry of Religious Affairs
MP3EI	Masterplan for Acceleration and Expansion of Indonesia Economic Development
MPS	Matenggeng Pumped Storage
MtCO <sub>2</sub> e	Metric tons of Carbon Dioxide equivalent
MW	Megawatt
MWh	Megawatt hour
NBFI	Non-banking Financial Institution
NDC	Nationally Determined Contribution
NPV	Net Present Value
OHS	Occupational Health and Safety
OJK	<i>Otoritas Jasa Keuangan</i> (Financial Service Authority)
OMP	Operation and Maintenance Plan
PAR	Permanent Access Road
PCRMP	Physical Cultural Resources Management Plan
PDO	Project Development Objective
PIU	Project Implementing Unit
PLN	PT Perusahaan Listrik Negara (Persero)
PLN-E	PT Prima Layanan Nasional Enjiniring
PPA	Power Purchase Agreement
PPSD	Project Procurement Strategy for Development
PRP	Project Review Panel
PS	Pumped Storage
PSO	Public Service Obligation
PV	Photovoltaic
P4R	Program-for-Results
RCC	Roller Compacted Concrete
RE	Renewable Energy
RPF	Resettlement Policy Framework
RPJMN	<i>Rencana Pembangunan Jangka Menengah Nasional</i> (National Medium-term Development Plan)
SHA	Seismic Hazard Assessment
SCMP	Social Community Management Plan
SEA/SH	Sexual Exploitation and Abuse / Sexual Harassment
SEP	Stakeholder Engagement Plan
SOE	State-Owned Enterprise
UCPS	Upper Cisokan Pumped Storage
UIP	<i>Unit Induk Pembangunan</i> (PLN regional construction units for power generation and transmission)
UPP	<i>Unit Pelaksanaan Proyek</i> (PLN Project Implementation Unit)
VAC	Violence Against Children
VRE	Variable Renewable Energy
WB	World Bank

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## DATASHEET

**BASIC INFORMATION**

Country(ies)	Project Name	
Indonesia	Development of Pumped Storage Hydropower in Java Bali System Project	
Project ID	Financing Instrument	Environmental and Social Risk Classification
P172256	Investment Project Financing	High

**Financing & Implementation Modalities**

<input type="checkbox"/> Multiphase Programmatic Approach (MPA)	<input type="checkbox"/> Contingent Emergency Response Component (CERC)
<input type="checkbox"/> Series of Projects (SOP)	<input type="checkbox"/> Fragile State(s)
<input type="checkbox"/> Performance-Based Conditions (PBCs)	<input type="checkbox"/> Small State(s)
<input type="checkbox"/> Financial Intermediaries (FI)	<input type="checkbox"/> Fragile within a non-fragile Country
<input type="checkbox"/> Project-Based Guarantee	<input type="checkbox"/> Conflict
<input type="checkbox"/> Deferred Drawdown	<input type="checkbox"/> Responding to Natural or Man-made Disaster
<input type="checkbox"/> Alternate Procurement Arrangements (APA)	<input type="checkbox"/> Hands-on Enhanced Implementation Support (HEIS)

Expected Approval Date	Expected Closing Date
10-Sep-2021	15-Sep-2027
Bank/IFC Collaboration	
No	

**Proposed Development Objective(s)**

The objective of the Project is to support Indonesia's energy transition and decarbonization goal by: (i) developing the first large-scale pumped storage hydropower to improve power generation peaking and storage capacity of the Java-Bali grid; and (ii) strengthening PLN's capacity for hydropower development and management.

**Components**

Component Name	Cost (US\$, millions)
Development of the UCPS Plant	673.00
Environmental and Social Impact Management for the UCPS Plant	40.00
Provision of Technical Assistance and Capacity Building Activities	42.00

**Organizations**

Borrower:	Republic of Indonesia
Implementing Agency:	PT Perusahaan Listrik Negara (PLN)

**PROJECT FINANCING DATA (US\$, Millions)****SUMMARY**

Total Project Cost	755.00
Total Financing	755.00
of which IBRD/IDA	380.00
Financing Gap	0.00

**DETAILS****World Bank Group Financing**

International Bank for Reconstruction and Development (IBRD)	380.00
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**Non-World Bank Group Financing**

Counterpart Funding	145.00
Borrower/Recipient	145.00
Other Sources	230.00
Asian Infrastructure Investment Bank	230.00

**Expected Disbursements (in US\$, Millions)**



WB Fiscal Year	2021	2022	2023	2024	2025	2026	2027	2028
Annual	0.00	40.00	45.00	70.00	100.00	80.00	45.00	0.00
Cumulative	0.00	40.00	85.00	155.00	255.00	335.00	380.00	380.00

**INSTITUTIONAL DATA****Practice Area (Lead)**

Energy &amp; Extractives

**Contributing Practice Areas**

Climate Change, Gender

**Climate Change and Disaster Screening**

This operation has been screened for short and long-term climate change and disaster risks

**SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)**

Risk Category	Rating
1. Political and Governance	● Moderate
2. Macroeconomic	● Substantial
3. Sector Strategies and Policies	● Substantial
4. Technical Design of Project or Program	● Moderate
5. Institutional Capacity for Implementation and Sustainability	● Substantial
6. Fiduciary	● Substantial
7. Environment and Social	● High
8. Stakeholders	● Moderate
9. Other	
10. Overall	● High





## COMPLIANCE

### Policy

Does the project depart from the CPF in content or in other significant respects?

☐ Yes ☒ No

Does the project require any waivers of Bank policies?

☐ Yes ☒ No

### Environmental and Social Standards Relevance Given its Context at the Time of Appraisal

E & S Standards	Relevance
Assessment and Management of Environmental and Social Risks and Impacts	Relevant
Stakeholder Engagement and Information Disclosure	Relevant
Labor and Working Conditions	Relevant
Resource Efficiency and Pollution Prevention and Management	Relevant
Community Health and Safety	Relevant
Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Relevant
Biodiversity Conservation and Sustainable Management of Living Natural Resources	Relevant
Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Relevant
Cultural Heritage	Relevant
Financial Intermediaries	Not Currently Relevant

**NOTE:** For further information regarding the World Bank's due diligence assessment of the Project's potential environmental and social risks and impacts, please refer to the Project's Appraisal Environmental and Social Review Summary (ESRS).

### Legal Covenants

Sections and Description



Project Agreement, Schedule, Section I.A.2(c)

Timeline: 2 months after the Effective Date

The Project Implementing Entity shall contract the services of a supervision engineer.

#### Sections and Description

Project Agreement, Schedule 1, Section I.A.3(b)

Timeline: before and throughout implementation of corresponding activity under Part 3 of the Project

A focal point shall be designated for each unit contributing to the implementation of an activity under Part 3 of the Project to facilitate coordination between such unit and the Corporate Planning Directorate.

#### Sections and Description

Project Agreement, Schedule 1, Section I.A.5(a)

Timeline: 60 days before the declaration of effectiveness of the Contract Amendment Agreement

The Project Implementation Entity shall ensure that the Dispute Board is established in accordance with the provisions of the Construction Contract, and thereafter maintained throughout the implementation of the Project.

#### Sections and Description

(Project Agreement, Schedule 1, Section I.B.1)

Timeline: recurrent / continuous

The Project Implementing Entity shall ensure that the Project is carried out in accordance with the Environmental and Social Standards, in a manner acceptable to the Bank.

#### Sections and Description

(Project Agreement, Schedule 1, Section I.B.3)

Timeline: prior to the first impoundment of the Cisokan barrage under Part 1 of the Project

The Borrower shall, and shall cause the Project Implementing Entity to, ensure that the Action Plan for the LARAP has been implemented in a manner acceptable to the Bank.

#### Sections and Description

(Project Agreement, Schedule 1, Section I.B.6 and Loan Agreement, Schedule 2, Section I, B)

Timeline: not later than 3 months after the Effective Date

The Project Implementing Entity shall establish, publicize, maintain and operate an accessible grievance mechanism, to receive and facilitate resolution of concerns and grievances of Project-affected people, and take all measures necessary and appropriate to resolve, or facilitate the resolution of, such concerns and grievances, in a manner acceptable to the Bank.

#### Sections and Description

(Project Agreement, Schedule 1, Section I.C)

Timeline: not later than 1 month after the Effective Date



The Project Implementing Entity shall prepare and adopt the Project Implementation Manual in form and substance acceptable to the Bank.

#### Sections and Description

(Project Agreement, Schedule 1, Section I.D)

Timeline: once, as per the annual work plan and budget

The Project Implementing Entity shall provide not less than one hundred and forty-five million Dollars (\$145,000,000) as Counterpart Funds for the financing of the Project.

#### Sections and Description

Project Agreement, Schedule 1, Section II, C.1

Timeline: 24 months after the Effective Date

The Project Implementing Entity shall carry out jointly with the Borrower and the Bank, a midterm review of the Project to assess the status of Project implementation.

#### Conditions

Type Effectiveness	Financing source IBRD/IDA	Description (Loan Agreement, Article 5, Clause 5.01) (a) the Subsidiary Agreement has been entered into between the Borrower and the Project Implementing Entity; and (b) the Project Review Panel has been established in accordance with the provisions of the ESCP, with experts selected on the basis of terms of reference, qualification and experience acceptable to the Bank; and the Project Implementing Entity is in full compliance with its obligations to be satisfied at that time under the ESCP.
Type Disbursement	Financing source IBRD/IDA	Description (Loan Agreement, Schedule 2, Section III, B.1) No withdrawal shall be made: (a) for payments made prior to the Signature Date, except that withdrawals up to an aggregate amount not to exceed five million Dollars (\$5,000,000) may be made for payments made prior to this date but on or after January 1, 2021, for Eligible Expenditures under Category (2); (b) or under Category 1 (financing of Part 1.1(a) of the Project), until (i) the supervision engineer has been recruited; (ii) the Bank



		<p>has received documentary evidence in form and substance acceptable to the Bank that the Project Implementing Entity and its contractor for the works under Part 1.1 of the Project have finally resolved their grievances and that all conditions precedent to the resumption of the works are satisfied; (iii) the Project Implementing Entity is up to date and fully compliant with those planning and implementation provisions of the Action Plan for the LARAP to which the Borrower and the Project Implementing Entity have committed under the ESCP to plan or implement prior to a disbursement under Category (1), and all LARAP tasks to be completed and issues to be addressed in connection with the UCPS Plant by that time under the ESCP have been completed and addressed.</p>
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## I. STRATEGIC CONTEXT

### A. Country Context

1. **Indonesia has seen remarkable development progress and poverty reduction record in the last 20 years.** The country has maintained prudent macroeconomic policies in the face of various commodity and financial cycles and shocks. Economic growth averaged 5.5 percent over 2010-2019. Poverty rate halved to 9.4 percent during 1999-2019, taking 13.6 million people out of poverty. This period saw robust job growth, and the employment rate reached a two-decade high in 2019. Indonesia achieved the status of an upper middle-income country in 2020 and aspires to become the 5<sup>th</sup> largest economy in the world by 2030. During the first term of the Joko Widodo (Jokowi) administration, spending on energy subsidies was reduced and redirected towards infrastructure investments and the role of human capital in sustained and inclusive growth was increasingly recognized with a rise in expenditures on education, health, and nutrition. Economic and social policies during the second term starting in 2019 are defined in the 2020-2024 national medium-term development plan (*Rencana Pembangunan Jangka Menengah Nasional*, or RPJMN), which re-affirms the emphasis on human capital and infrastructure investments to raise productivity.<sup>1</sup>
2. **The Indonesian economy went into a recession for the first time since the Asian Financial Crisis due to the COVID-19 shock.** Indonesia has been reeling under the impacts of the pandemic, a twin supply and demand shock.<sup>2</sup> The economy contracted by 2.1 percent in 2020, while poverty is estimated to have risen. The national poverty rate increased from 9.8 to 10.2 percent between March and September 2020, reaching its highest level since 2017.<sup>3</sup> Recent national surveys have documented the huge fallout from the crisis also for firms and households: 74 percent of firms experienced more than 20 percent year-on-year reduction in sales and 75 percent of firms reported limited cash/ability to pay at least one production cost as of October 2020.<sup>4</sup>
3. **Indonesia's fiscal and monetary authorities responded boldly to cushion the impact of the COVID-19 shock.** The Bank of Indonesia cut its policy rate by 150 basis points to 3.5 percent between February 2020 and March 2021. It also eased monetary conditions through liquidity injections and relaxed monetary regulations, including a large local currency government bond purchase program to stabilize markets and help finance the fiscal deficit. The government suspended its 3 percent of GDP deficit ceiling and implemented a COVID-19 fiscal response package amounting to 3.8 percent of GDP in 2020. Further measures in 2021 are expected to reach 4.2 percent of GDP. This includes spending on increased social protection, micro, small and medium enterprises (MSME) support, tax relief, health services, and the COVID-19 vaccination campaign. Some of the higher spending on COVID-related measures will be offset by reductions to non-priority public spending. The financing plan has not been fully communicated, but some level of central bank deficit financing is expected to remain throughout 2021 with the central bank acting as a stand-by buyer.
4. **The government will rely in part on the private sector for infrastructure investment.** The government plans to

<sup>1</sup> World Bank. Draft Indonesia Country Partnership Framework for the period FY21-25. Approved by the WB Board on May 11, 2021.

<sup>2</sup> As of May 3, 2021, the Government reported over 1.68 million confirmed cases of COVID-19 and over 45,900 deaths.

<sup>3</sup> World Bank. Indonesia Macro and Poverty Outlook. April 2021.

<sup>4</sup> World Bank's COVID-19 Business Pulse Survey among firms.



allocate around US\$28 billion for infrastructure development to support economic recovery. This is laid out in its 2021 state budget. Investments will be directed towards labor-intensive infrastructure projects, among others. This is in the face of slowing net foreign direct investment (FDI) inflows compared to the pre-crisis level (US\$20.5 billion in 2019 versus US\$14.1 billion in 2020) due to weak economic activities and high uncertainty.<sup>5</sup> In line with the RPJMN, the government also aims to incentivize the private sector to take part in developing and financing the country's ambitious infrastructure projects amid state budget limitations.

5. **Continued reforms will be needed to maximize financing for infrastructure development in Indonesia.** The Government has relied heavily on state-owned enterprise (SOEs) to deliver its infrastructure agenda through providing capital injections or guarantees.<sup>6</sup> Meanwhile, the amount of capital available in the domestic market, in terms of both local banking assets and institutional investors, is not sufficient to keep pace of demand for infrastructure financing.<sup>7</sup> Given the long-lived nature of infrastructure projects, including in the energy sector, the availability of long-term finance is crucial for the development of the sector.<sup>8</sup> Further reforms will be key to mobilizing domestic and international private financing to support Indonesia's infrastructure goals, including but not limited to: (i) improving the regulatory framework for public private partnership (PPP) with a bankable project pipeline, adequate risk allocation, and good project preparation to international standards; (ii) providing for cost-reflective tariff arrangements that would support the utilities' capital expenditure and long-term financing needs; and (iii) introducing new capital market solutions that facilitate innovative financial products and hedging tools to appropriately mitigate risks.<sup>9</sup> The World Bank (WB) is preparing an Infrastructure Development Policy Lending (Infra-DPL) operation to support the Government of Indonesia (GoI) in implementing key reforms related to SOE governance and improvement of infrastructure financing. As the reforms are ongoing, many of the capital-intensive mega-projects are moving forward with public financing, especially through assignment to one of the 24 infrastructure-oriented SOEs to alleviate the acute infrastructure needs.
6. **In 2015, Indonesia pledged to cut emissions by 29 percent, and 41 percent with international support, by 2030 compared to business-as-usual (BAU) in its Nationally Determined Contribution (NDC) to the Paris Agreement.** The country was the fourth largest emitter of greenhouse gas (GHG). Emissions mainly stem from deforestation, peatland megafires, and to a lesser extent burning of fossil fuels for energy.<sup>10</sup> In balancing the need to maintain economic growth and weather the ongoing pandemic, the GoI has requested WB support in the development of medium- to long-term vision and pathways for the power sector development, including a grid decarbonization strategy.

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<sup>5</sup> The Jakarta Post. "Indonesia must derisk its infrastructure projects to attract foreign investors amid crisis," August 19, 2020.

<sup>6</sup> Local banks that dominate the market for IDR infrastructure loans are SOEs, predominantly lend to other SOEs, and do not have the experience in lending on a limited recourse basis, and therefore have often crowded out well established private sponsors.

<sup>7</sup> Most domestic bank loans have short-term (3- to 5-year tenure), and often occur on a corporate, on-balance sheet basis. Institutional investor base, such as pension funds, is small with negligible growth due to lack of clear incentives for long-term savings, such as penalties for early withdrawal.

<sup>8</sup> International Energy Agency. "Attracting private investment to fund sustainable recoveries: The case of Indonesia's power sector." World Energy Investment 2020.

<sup>9</sup> World Bank. Indonesia Infrastructure Sector Assessment Program. June 2018.

<sup>10</sup> The Carbon Brief Profile: Indonesia, March 27, 2019.



7. **The proposed Project will support Indonesia's energy transition and decarbonization goal by developing a first large-scale pumped storage (PS) hydropower, which will provide power generation peaking and storage capacity necessary for integration of variable renewable energy (VRE)** such as solar and wind into the national energy system. In doing so, the Project will help enhance the system flexibility and efficiency in balancing supply-demand and therefore the reliability of electricity services on the Java-Bali grid, which provides power to 70 percent of Indonesians and drives much of the national economy. As the first PS scheme to be developed in Indonesia, the Upper Cisokan pumped storage (UCPS) plant to be supported by the Project is most suited for public financing. As a market for ancillary services to the grid that will fully quantify the expected financial benefits from a PS does not yet exist in Indonesia, and such a large-scale project with significant environmental and social (E&S) impacts would be considered too high-risk for the private sector. Furthermore, the Project will also support extensive capacity building to PT Perusahaan Listrik Negara (PLN), the state-owned power utility company, and local governments for the management of a strategic infrastructure project in an environmentally and socially acceptable manner using the WB's Environmental and Social Framework (ESF).

## B. Sectoral and Institutional Context

8. **Indonesia has achieved great success in expanding the coverage of electricity supply and in meeting rapid demand growth.** Between 2009 and 2019, PLN connected 32 million new consumers, and electrification increased from 67.2 percent to 98.9 percent.<sup>11</sup> On Java-Bali, 99.2 percent of people have been connected to the grid. Between 2011 and 2019, power production grew at an annual compound growth rate of 5.4 percent. By the end of 2019, the total installed power generation capacity was 62,832 MW to meet a peak load of 41,670 MW. The total generation in 2019 was 278,942 GWh, of which coal accounted for 64 percent, gas and combined cycle gas turbine for 24 percent, hydropower for 5 percent, geothermal for 2 percent.<sup>12</sup> Meanwhile, the total renewable energy potential for power generation across Indonesia includes 75 GW of hydropower, 24 GW of geothermal, 207 GW of solar, and 60 GW of wind.<sup>13</sup> On Java-Bali, there is a potential of 10 GW of pumped storage capacity that can be economically developed.<sup>14</sup>
9. **Indonesia has primarily relied on fossil fuels to power its fast-growing economy in the recent decades.** In 2006, the Government launched a 10,000 MW Fast Track Program (FTP-I), which facilitated considerable addition of coal-fired generation capacity. In 2010, the FTP-II aimed to develop nearly 18,000 MW of generation capacity from renewable sources, most of which were expected to come from geothermal and to be built with private capital, although this has faced significant hurdles such as licensing, land acquisition, local content, and offtake pricing.<sup>15</sup> In 2015, the Government announced a 35,000 MW (35 GW) power capacity addition plan on the back of a 9 percent per year electricity demand increase projection. The GoI saw construction of new coal-fired power generation as a cost-efficient way of keeping up with the ever-expanding demand. The share of coal-based power generation in the total electricity production increased from 44 to 63 percent, while the share of renewables declined from 12 to 11.3 percent, far short of the target of 23 percent by 2025 as established in the

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<sup>11</sup> Director General of Electricity, Statistik Ketenagalistrikan Tahun 2019 and Tahun 2011.

<sup>12</sup> PLN Statistics 2020.

<sup>13</sup> Ministry of Energy and Mineral Resources presentation, May 2021

<sup>14</sup> Based on the 2011 Hydropower Masterplan for Indonesia supported by JICA and prepared by Nippon Koei.

<sup>15</sup> The Government's FTP-I and II have favored coal-based generation in a broader strategic shift to move away from imported oil and reduce exposure to fuel price fluctuations by deploying indigenous energy sources.



National Energy Policy. Meanwhile, demand growth has slowed somewhat in recent years,<sup>16</sup> and 2020 showed negative growth due to the impacts of the COVID-19 pandemic. This slowing growth has contributed to an over-supply with generation capacity reaching 63 GW in 2020 compared to a peak demand of around 41 GW.<sup>17</sup>

10. **Growing concerns about climate change and Indonesia's international commitments to reduce GHG emissions have led to a re-assessment of power generation priorities.** Limitations in the existing policies have made it very difficult for renewables to compete with fossil fuels on a level playing field. The major barrier to achieving the renewable energy (RE) target is the Ministry of Energy and Mineral Resources (MEMR) Regulation 50/2017, which caps the price PLN can pay for RE at the cost of generation provision (*Biaya Pokok Penyediaan Pembangkitan*, or BPP Pembangkitan) for the local grid – a policy intended to reduce the overall electricity subsidies and keep the end-user tariffs affordable to consumers. This has made it challenging for solar and wind projects to compete in coal-dominated power grids such as Java-Bali, where their offtake price is capped at 85 percent of the BPP Pembangkitan of around 6USc/kWh.
11. **The GoI has started to consider changes to the framework for support to RE.** A presidential regulation is being prepared, which is expected to provide for more economic tariffs that PLN will pay for RE generation, and in parallel a system that will gradually shift the budget subsidies to PLN toward viability gap funding in support of RE as a way to internalize global and local externalities into the pricing of fossil fuel-based power. Meanwhile, PLN is taking steps to improve its financial sustainability, which will be a prerequisite for a largely private sector-led scaling up of renewables, since for this, PLN will need to be a credible and reliable off-taker.
12. **A grid decarbonization strategy for power supply in Indonesia will also require increased investments, as well as removal of technology-specific barriers:**
  - Geothermal resource uncertainty requires significant risk capital in the face of limited upside;
  - Hydropower has long lead time and complex E&S impacts;
  - For solar, in addition to pricing constraint, there is an absence of an auction framework that has been a catalyst for achieving competitive low prices in many countries. Land requirements, especially in densely populated areas with other competing land uses, have been a major constraint, while the local content requirement of having minimum 60 percent Indonesian parts in the solar panels sold in Indonesia have cost manufacturers penalties that have ultimately increased the cost of panels by at least 50 percent.<sup>18</sup> Reform of coal subsidies and local content regulations and introduction of policies more favorable to RE sources will be key to decarbonize the energy mix; and
  - VRE penetration has also been limited due to PLN's concern over grid stability stemming from the existing suboptimal grid management practices and dispatch strategies<sup>19</sup> that would require an appropriate level of spinning reserves based on improved generation forecasting from VRE plants. The proposed Project will support the preparation of a Java-Bali System Masterplan that will identify the necessary reinforcements to support increased VRE integration.<sup>20</sup>

<sup>16</sup> Evidence from other middle-income countries also shows that a gradual decoupling of economic growth and electricity demand is likely with growing energy efficiency and changing economic structures.

<sup>17</sup> World Bank. Draft Issues Paper on Indonesia Power Sector, March 2021.

<sup>18</sup> The local content requirement is regulated by the Ministry of Industry Regulation No. 54/2012, No. 4/2017 and No. 5/2017, which have been strictly enforced.

<sup>19</sup> Due to previous experience, PLN is currently reluctant to go beyond 10 percent of VRE.

<sup>20</sup> In parallel, PLN is developing the detailed design of a new dispatch/control center for the Java-Bali system.





13. **A significant part of the grid decarbonization strategy will need to focus on greening the Java-Bali grid.** The Java-Bali grid<sup>21</sup> had an installed capacity of 39.1 GW in 2019 and provides for 70 percent of electricity demand in Indonesia. The RE potential on Java-Bali is estimated at nearly 70 GW from hydropower, geothermal, solar, and wind<sup>22</sup>, but 70 percent of the grid is powered by fossil fuels, of which 53 percent of its 200,000 GWh total power generation in 2019 was from coal-fired generation.<sup>23</sup> In the short term, the Java-Bali grid is experiencing a large overcapacity<sup>24</sup> due to the combined effects of slowing growth in electricity demand that was exacerbated by the COVID-19 pandemic and the addition of recent and under-construction coal-based power plants from the 35 GW program. With a projected average annual economic growth rate of 4.8 percent between 2021 and 2025, electricity demand and consumption are expected to increase accordingly. Given the long lead time of power projects, there is a need to plan for bringing new RE generation capacity online starting in 2025-2026 based on robust scenarios of demand projections and least-cost generation planning taking into account externalities of coal-fired power, so that electricity supply, or the lack thereof, does not become a constraint on economic growth and could be developed in a timely manner in line with a low-carbon pathway. Increasing the share of VRE in the energy mix necessitates additional measures to ensure system stability, efficiency, and reliability.
14. **Large-scale pumped storage hydropower is key to unlocking the VRE potential on Java-Bali and implementing the decarbonization agenda of the country.** Pumped storage hydropower makes use of two water reservoirs at different elevations. At times of low electricity demand or when there is abundant generation from clean power sources (such as solar), power from the grid is used to pump water to the upper reservoir. Power is generated during peak demand (e.g., evening hours) as water moves down to the lower reservoir using a turbine, when electricity price is high, creating arbitrage opportunities.<sup>25</sup> The timing of the pumping or generating mode can be optimized to take advantage of the different generation cost of electricity in the system throughout the day. A PS can flexibly switch between pumping and generating modes within minutes, allowing it to meet the system balancing need nearly instantaneously, especially to help manage the variability of solar generation.
15. **A PS scheme also improves system flexibility by adding peaking capacity and providing storage to support VRE integration.** It provides numerous ancillary services to the grid, such as peak-shaving and load-leveling, provision of spinning reserve, black-start, voltage and frequency control, and energy storage that support efficient system balancing and therefore greater absorption of VRE. See Figure 1.
- The flexibility and speed of hydropower turbine operations support *frequency control*, allowing for reduction in system operating cost and improving system-wide efficiency and stability.
  - Its ability to switch between pumping and generator modes and ability to absorb valuable reactive power at crucial points on the power system (when used as a Synchronous Condenser) help relieve network congestion and support *voltage control*, providing *network control* services that reduce the

<sup>21</sup> These islands together account for over 60 percent of the national GDP. Java is the most populous and industrialized region in the country, and Bali accounts for a third of Indonesia's revenues from tourism. Providing adequate infrastructure, including reliable electricity services, is crucial to maintaining and driving growth in the Java and Bali economies.

<sup>22</sup> MEMR Directorate General for New and Renewable Energy and Energy Conservation, New and Renewable Energy Statistics 2016.

<sup>23</sup> Of the 200,000 GWh generation in 2019, coal accounted for 105,000 GWh, gas for 35,000 GWh, hydro 5,000 GWh, and 52,000 GWh from rental/IPP, most of which are from coal, or coal and gas. PLN Statistics June 2020.

<sup>24</sup> In the Java-Bali system, reserve margin is expected to be about 50 percent in 2022, and around 20 percent in 2027-28 when UCPS will be commissioned.

<sup>25</sup> This is particularly true for commercial and industrial customers where there are peak and off-peak tariffs.



overall system operating cost and improve system-wide service quality and stability.

- iii. PS also provides rapid *system restart* (or black-start) in the event of black-out.
- iv. It can also provide *outage insurance* to cover unplanned outage of other generators or to provide contracted coverage for scheduled maintenance periods of other generators.

16. **Meanwhile, improvements in system stability, efficiency, quality and reliability delivered by PS and their associated benefits have often been classed as economic externalities and their financial benefits not easily quantifiable.** The nature of these externalities means that some of their benefits are spread across the system and / or captured by other plants. For these reasons, most PS schemes have been developed by system operators or vertically integrated utilities like PLN, rather than being on a merchant basis as IPPs. The current lack of peak and off-peak electricity tariff in Indonesia (except for large industrial consumers)<sup>26</sup> also makes it difficult to quantify the financial benefits of PS, including those of the UCPS.
17. **PS is a cheap form of long duration storage technology, cheaper than any battery storage,** in addition to being a technically well-understood, well-proven and reliable technology that can be built at large scale. Having been in use since the early 20th century,<sup>27</sup> PS schemes have a lifespan of 50-150 years<sup>28</sup> and can be cost-effective if topological conditions are favorable as is the case for UCPS, which can be constructed at around US\$170/kWh. Meanwhile, utility-scale battery energy storage, e.g. using lithium-ion technology, represents an emerging technology with the biggest project currently at 120 MW/1,200 MWh.<sup>29</sup> The latest battery projects have a cost benchmark of US\$400/kWh<sup>30</sup> but costs are projected to be reduced to half that value by 2030.<sup>31</sup> Utility-scale batteries have a lifespan of 15-20 years and the energy (and power) capacity degradation in batteries is typically 2 percent per year. After their lifespan, they will also need to be safely disposed and replaced, requiring significant and recurring new capital investments, which are not counted for in the prevailing battery cost figures.

<sup>26</sup> Under current tariff structure set by MEMR, for PLN large connection capacity customer (above 14kVA for Industrial customer, 200kVA for Commercial Customer), PLN is allowed to charge peak tariff based on a coefficient ranging from 1.4 – 2 times off-peak tariff determined by PLN Director Decree. For Java-Bali and Sumatera system, PLN apply 1.4 coefficient, 1.5 in Sulawesi and Kalimantan and 2 for Papua, Maluku and Nusa Tenggara, for electricity consumed during 5pm-10pm. Application of peak hour coefficient contribute around 6% of total PLN sales revenue.

<sup>27</sup> There are 69 existing projects of over 1,000 MW around the world, and another 40 projects of over 1,000 MW (and up to 3,600 MW in nameplate capacity) under development. The total installed capacity worldwide is estimated at 127 GW, making it the largest scale technology for energy storage.

<sup>28</sup> Immendoerfer, A., Tietze, I., Hottenroth, H. et al. "Life-cycle impacts of pumped hydropower storage and battery storage." International Journal of Energy and Environmental Engineering 8, 231–245 (2017). Though it is important to stress that proper operation and maintenance (O&M) of electro-mechanical (E&M) equipment, and civil work structures and periodic refurbishment and rehabilitation works, are critical for ensuring sustainability. The average life expectancy of plant parts and systems under normal conditions of O&M is indicated as 40 years for main generating equipment and main inlet valves; 10 years for turbine runners; 70 years for penstocks, gates, stoplogs, trash racks, per 2014 IFC Guide.

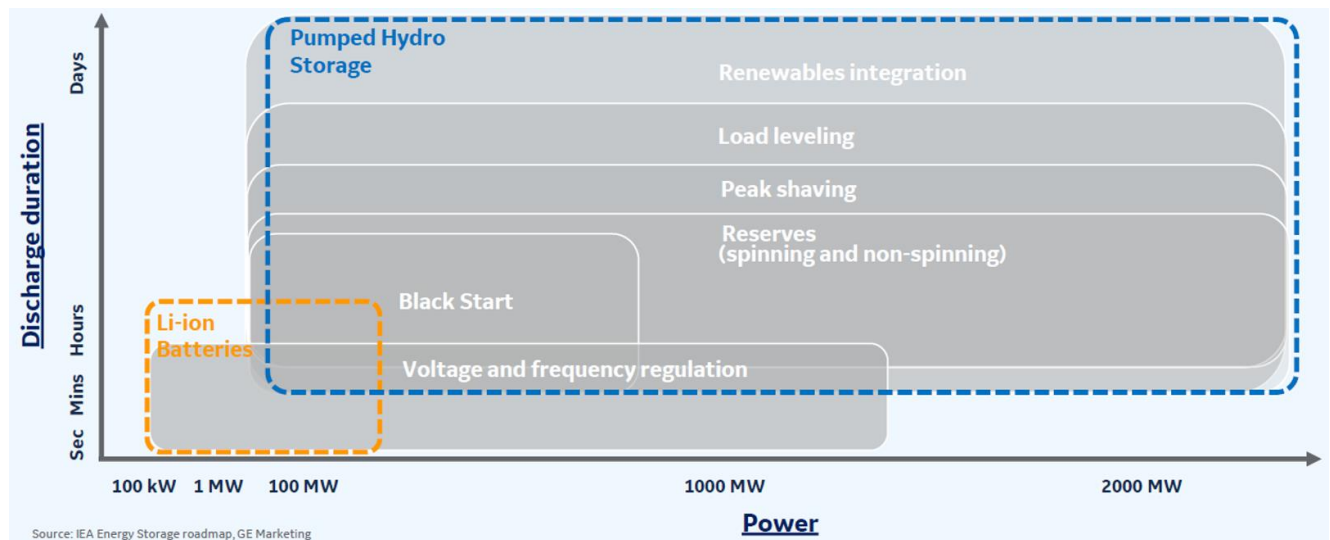
<sup>29</sup> The project is in Monterey, California, U.S., according to Energy Storage News, January 7, 2021.

<sup>30</sup> BNEF28 estimates that the total system cost in 2017 for a utility scale Li-ion battery energy system with 4 hours storage is US\$421/kWh. These costs are split roughly 50:50 between the battery pack costs (US\$209/kWh) and rest of system (or non-battery pack) costs (US\$212/kWh).

<sup>31</sup> US Department of Energy, Office of Scientific and Technical Information: Cost Projections for Utility-Scale Battery Storage: 2020 Update



Figure 1: Ancillary Services to the Grid of Storage Technologies at Different Scales<sup>32</sup>



18. **The UCPS scheme supported by this Project is part of the least-cost generation plan for peaking in the Java-Bali system.** With an installed capacity of 1,040 MW, UCPS will avoid installation of alternative peaking capacity from thermal generation at that capacity. Increasing VRE integration by the grid will improve the viability of VRE projects and make VRE projects more attractive to private investors. In addition, the least-cost plan also includes Matenggeng pumped storage (MPS) with an estimated capacity of 943 MW and an expected commissioning date in 2030.<sup>33</sup>
19. **UCPS will also support network management and reduce bottlenecks on the transmission system on Java-Bali.**
  - i. First, power flow in the Java-Bali grid is from the eastern to the western side of Java, served by a North-South double-circuit 500kV transmission system. During peak hours, the capacity of both transmission lines reaches its full capacity. The proposed UCPS to be located between Jakarta and Bandung will allow for significant power generation capacity to be deployed to meet peak demand, alleviating the increasingly acute transformer overloading issues on the grid.
  - ii. Second, while there is solar potential across the island, areas with the best irradiation and land availability will be mostly on the eastern parts, whereas much of the demand growth comes from Jakarta and Bandung in the west and central Java regions. UCPS provides storage capacity to enable absorption of solar power that can be integrated into the grid in future.
  - iii. Third, the extension of the 500 kV network has taken place in a section-by-section fashion to date without considering how the network typology will evolve in the long term due to a lack of a masterplan for Java-

<sup>32</sup> General Electric presentation. "Hydropower and Pumped Storage as an Enabler to Reliable Renewable Energy," 2020.

<sup>33</sup> There are other PS schemes that can be developed on the Java-Bali grid: i) Grindulu in East Java, which is in PLN's business plan and in the early stage of development, and ii) Puger, which is not yet in PLN's business plan but was included in JICA's 2011 Hydropower masterplan study. The study indicated a potential of up to 10 GW of PS capacity that is economical and can be developed in the Java-Bali power system.



Bali. The proposed Project will support the preparation of a Java-Bali System Masterplan with the objective to conduct long-term capacity expansion planning of the Java-Bali power system through an analysis of a number of plausible options to establish a power network of the future that is environmentally acceptable, reliable, economical, and high quality.

20. **The governance and unsustainable financing model of Indonesia's power sector have created growing risks and requires urgent reforms to improve PLN's operational and financial performance and to accelerate the energy transition.** There are significant structural issues in PLN's revenue model.
  - i. The sector remains heavily dependent on budget transfers due to tariffs at levels lower than cost recovery. PLN receives two main types of subsidies: i) Public Service Obligation (PSO), as a social measure, for specific categories of low-voltage customers; and ii) tariff subsidy to compensate for the non-automatic tariff adjustment. PLN also receives indirect subsidies: capital injections and foregone return on equity, Coal Domestic Market Obligations,<sup>34</sup> and provision of business viability gap letter to backstop project viability. However, the accrued compensation has so far been paid with significant delays of 18 to 24 months. The delayed payments have caused PLN to rely on market financing for its working capital needs.
  - ii. Since July 2017, the GoI decided to freeze fuel cost pass-through into tariffs for commercial, business, and industrial customers, resulting in cumulative under-recovery of approximately IDR 20-25 trillion per year for PLN,<sup>35</sup> and leading PLN to absorb cash flow deficits from operations.
  - iii. As investment increases with growing demand and with the need to invest in low-carbon alternatives, improve electricity access and maintain quality of service, the cost of direct subsidies will increase significantly. Guarantees for PLN's greater reliance on debt finance will require sovereign liabilities and increasing fiscal burden. These structural inadequacies in PLN's revenue model have significantly deteriorated its financial position and exposed major vulnerabilities for the sector, especially during the economic downturn induced by the COVID-19 pandemic.
  - iv. PLN's vulnerable financial position is due to the current lack of reconciliation between investment targets and revenue from regulated tariffs (both set by MEMR) and fiscal support (set by Ministry of Finance, or MoF). Indonesia does not yet have a framework for reconciling disparate – often competing – mandates in order to set a realistic and fully funded investment plan for the sector.<sup>36</sup>
21. **To address the power sector's financial viability and environmental sustainability, GoI has requested WB support on the preparation of a White Paper that would set the directions for the future of the power sector in Indonesia.** The paper will identify a package of near-term reforms to be implemented over the coming 24-36 months that will help PLN address its financial vulnerabilities and chronic issues that threaten the financial and environmental sustainability of the sector. This package of reforms will be anchored in a planned **multi-donor policy-oriented Program-for-Results (P-for-R)**, which will embody the first phase of a comprehensive energy

<sup>34</sup> The coal DMO obliges coal producers to sell 25 percent of their production to PLN at a fixed price that is below the market price, thereby incentivizing the use of coal in electricity generation.

<sup>35</sup> Equivalent to US\$1.4-1.7 billion. This includes IDR 23 trillion in 2018, IDR 25 trillion for 2019, and IDR 17.9 trillion in 2020.

<sup>36</sup> As PLN continues to be the GoI's vehicle for ensuring electricity supply to all Indonesians, it expects to invest about US\$80-100 billion in the next 10 years, which would roughly double its asset base. The dual need of increasing reliance on private investors to raise capital to support its ambitious investment program and continued dependence on the widespread expectation of financial backing from the state requires a reconsideration of its governance framework to reconcile PLN's stakeholders' objectives of ensuring affordable consumer tariffs, financial sustainability and fulfillment of power development targets in line with the pace of the economy. World Bank, PLN Corporate Financing Strategy Final Report, September 2019.



sector reform program covering pricing, planning and regulatory improvements that will accelerate energy transition and private investments and put PLN on a sustainable financial footing. This support will be complemented by technical assistance (TA) and advisory work related to proposal of optimal tariff framework, including peak and off-peak tariff, to capture the benefits of key generation assets with significant ancillary benefits like the UCPS, as well as support to implementation of the Government's plan for coal phase-out in line with the Just Transition for All framework.<sup>37</sup>

22. In addition, **COVID-19 outbreak has exacerbated PLN's structural issues and increased liquidity risks.** COVID-19 represents an external shock that impacted PLN's revenues and access to finance. PLN's revenues have been impacted by the policy responses, such as tariff holidays, to support certain categories of power customers. Contingent on early energy sector reforms moving ahead, the WB will consider: (i) supporting a short-term cash-flow recovery plan through a liquidity facility for PLN; and (ii) facilitating short-term reform actions focused on improving PLN's financial and environmental sustainability.
23. **In 2011, the WB approved a US\$640 million IBRD loan to support the development of the UCPS project,** and the Feasibility Study (FS) and Environmental and Social Impact Assessment (ESIA) for the MPS. The project faced significant delays related to land acquisition, resettlement, finalizing the mapping of biodiversity important areas, as well as timely hiring of the owner's engineer and completion of the UCPS plant design. By early 2016, all the main E&S issues had been largely resolved and procurement of the three main contracts for i) the upper and lower dams and civil works, ii) electro-mechanical equipment, and iii) hydraulic metal works successfully carried out. However, the permanent access road (PAR) was not fully completed, and a major landslide severely damaged it. The resulting contractual disputes between PLN and the dam and civil works contractor, including site readiness for mobilization of works, turned out to be intractable. As of May 2, 2017, only US\$33 million (5 percent) was disbursed, and due to the lack of progress on resolving the dispute, the Bank decided to cancel US\$596 million from the loan. The project has since then been restructured<sup>38</sup> to focus on the completion of the FS and ESIA for the MPS. The project will close on December 31, 2021 following the latest amendment for the closing date extension. Further explanation of the project history is provided in Annex 2.
24. **After two years, PLN requested WB support again on the development of UCPS.** The project remains a key part of the Java-Bali system least-cost expansion plan and would represent a turning point for Indonesia's grid decarbonization pathway. Since the partial cancellation, PLN has repaired the PAR and concluded the negotiations to resolve the contractual dispute with the dam and civil works contractor. PLN and the contractor signed the minutes of negotiation (MoN) and the contract amendment agreement (CAA) is ready to be signed, paving the way for works to start. Most of the land acquisition and resettlement has taken place under the first loan with many good practices. The project is located in an area that has been heavily degraded by human activities such as slash-and-burn, and remains home to several critically endangered species, where without the Project and good biodiversity and integrated catchment management that will come with it, these species are expected to become extinct. The project will be developed in line with high standards laid out under the WB ESF. While PLN has managed many hydropower projects and several at over 1,000 MW capacity, this will be the first PS scheme. Overall, the project will benefit from WB financing that comes with substantial capacity building

<sup>37</sup> The methodology begins with a pre-closure assistance to define transition strategies for coal regions and associated transition projects. During the closure phase, assistance focuses on workers and communities and good environmental practices. The regional transition phase, lasting many years, continues to implement the transition strategy by attracting investors into new low-carbon activities.

<sup>38</sup> The total amount of restructured Project, which has been renamed the Pumped Storage Technical Assistance Project, is US\$44 million.



and TA in procurement, contract and safeguards management in this first – of many – PS schemes in Indonesia.

### C. Relevance to Higher Level Objectives

25. **The Project contributes to the WB's Green, Resilient and Inclusive Development (GRID) framework** designed to support countries in COVID-19 recovery and beyond. Specifically, the Project will support GoI and its main power utility in developing a strategic mega-project and creating local employment. It is also part of the WB's **Energy Transition** initiative in Asia, which aims to assist countries with coal-dominated national grids in transitioning to a low-carbon development path, thereby supporting a more resilient economy and economic recovery. The Project also aligns with the principle of **Maximizing Finance for Development** by enabling deployment of RE, which is expected to be developed with mostly private financing.
26. **This operation is fully aligned with the Indonesia Country Partnership Framework (CPF) FY21-25**, specifically contributing to: (i) *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 energy*<sup>39</sup>, and to (ii) *Cross-cutting areas: 1. Gender and 3. Climate Change*. It is part of a broader menu of programmatic advisory services and analytics support to GoI to help provide reliable electricity services and mitigate the risk of long-term over-reliance on fossil fuels for power generation.
27. **The Project will contribute to Indonesia's NDC**, which outlines the country's commitment as part of the 2015 Paris Agreement to reduce GHG emissions by 29 percent on its own efforts and up to 41 percent with international support, compared to the BAU scenario, by 2030. The GHG emission level of the energy sector in 2016 was 619 metric tons of carbon dioxide equivalent (MtCO<sub>2</sub>e) and predicted to be 1,669 MtCO<sub>2</sub>e by 2030.<sup>40</sup> For the energy sector, the expected GHG emission reduction is 314 MtCO<sub>2</sub>e/year on its own efforts and 398 MtCO<sub>2</sub>e/year with international support by 2030. It is estimated that the UCPS will contribute to a GHG emission reduction of 7.30 MtCO<sub>2</sub> by 2040 and 13.6 MtCO<sub>2</sub> by 2053 (counting the full 25 lifetime of the plant).<sup>41</sup>
28. **The Project fits under Indonesia's 2005-2025 National Long-Term Development Plan (*Rencana Pembangunan Jangka Panjang Nasional, or RPJPN*)**, which places an emphasis on developing infrastructure and enhancing quality of life for its citizens. The Masterplan for Acceleration and Expansion of Indonesia Economic Development (MP3EI) has laid out a medium-term target for high economic growth towards 2025 driven primarily by attracting around US\$470 billion of private investments through PPP. Energy has been identified as one of the eight strategic areas for public support towards economic and innovation-driven growth.

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<sup>39</sup> Indonesia achieved 95-98 percent electrification as of 2020 and aims to achieve 100 percent electrification in the next few years. Java-Bali has more than 99 percent electrification, while poorer regions in the east such as Nusa Tenggara Timur has 59 percent and Papua 44 percent.

<sup>40</sup> GHG Monitoring, Reporting, and Verification Report, Ministry of Environment & Forestry 2017.

<sup>41</sup> The GHG emissions are calculated by performing least-cost system simulations with system planning software. The reductions are calculated by subtracting the emission **with** the Project from emissions **without** the Project using carbon emission factors based on real plant data.





## II. PROJECT DESCRIPTION

### A. Project Development Objective

#### PDO Statement

29. The development objective of the Project is to support Indonesia's energy transition and decarbonization goal by (i) developing the first large-scale pumped storage hydropower to improve power generation peaking and storage capacity of the Java-Bali grid, and (ii) strengthening PLN's capacity for hydropower development and management.

#### PDO Level Indicators

30. Achievement of the PDO will be measured by:
- (i) peaking capacity added to the Java-Bali grid from the UCPS (MW);
  - (ii) power storage capacity added to the Java-Bali grid from the UCPS (GWh);
  - (iii) reduction of the GHG emission enabled by the UCPS by 2040 (MtCO<sub>2</sub>e);
  - (iv) completion of the Java-Bali System Master Plan;
  - (v) satisfactory implementation of the Environmental and Social Management Plan for the UCPS;
  - (vi) preparation of operation and maintenance plan (OMP) for the UCPS; and
  - (vii) satisfactory implementation of the OMP.

### B. Project Components

31. The Project will support the development of the UCPS plant and capacity building for PLN in hydropower project preparation and management. The Project has three components with the detailed estimated costs and financing sources provided in Table 1.

#### **Component 1: Development of the UCPS Plant (US\$ 673 million)**

*(IBRD: US\$ 333 million; AfDB: US\$ 230 million; PLN: US\$ 110 million)*

##### ***Sub-component 1.1. Preparation, construction, and commissioning of the UCPS Plant (US\$ 607 million)***

*(IBRD: US\$ 322 million; AfDB: US\$ 230 million; PLN: US\$ 55 million)*

32. This Sub-Component covers the preparation, construction, and commissioning of the UCPS plant with an expected capacity of 1,040 MW. It is located about 150 km southeast of Jakarta at the upstream of the Cisokan River Basin in West Java Province. During off-peak hours, UCPS uses electricity from the grid to pump water from the lower reservoir to the upper reservoir. During peak hours, it generates electricity to meet the peak demand in the Java-Bali grid system, by conveying the stored water in the upper reservoir to the lower reservoir through hydraulic turbines. Power is evacuated by two 16 km double-circuit 500 kV transmission lines to connect to the backbone 500 kV transmission system.



33. Both reservoirs have been designed to have roller compacted concrete (RCC) gravity dams. The upper dam is to be constructed on the Cirumamis River, and the lower dam on the Cisokan River. The two dams will create reservoirs with active storage of around 10 million m<sup>3</sup>, sufficient to support the UCPS operating in its full capacity at generation mode for about 8 hours/days. Construction will require some 2.7 million tons of aggregate, which will be extracted from an existing quarry at Gurung Karang.
34. The Project will be developed with the following main works:
- (i) an upper dam with a maximum height of 75.5 m and a 375 m long crest;
  - (ii) a lower dam with a maximum height of 98 m and a 294 m long crest;
  - (iii) waterways connecting the two dams consisting of two intakes, two headrace tunnels each about 1.2 km long, two restricted orifice surge tanks, two inclined steel-lined penstocks, four short tailrace tunnels and outlet structures;
  - (iv) an underground powerhouse, 51 m high, 26 m wide and 156.6 m long, housing four pump-turbine units, each with a nominal generating capacity of 260 MW<sup>42</sup>;
  - (v) an outdoor 500kW switchyard; and
  - (vi) two 500kV double-circuit transmission lines with the length of 16 km each.
35. The UCPS will be developed with the multi-package contract strategy that was started under the previous IBRD loan. All procurement for the main works and equipment, except for the transmission line, was successfully completed with prices significantly below estimates.<sup>43</sup> The proposed Project will cover all three contracts awarded or signed under the previous loan: i) the two dams and civil works, ii) electro-mechanical equipment, and iii) hydraulic metal works, as well as the transmission lines that still need to be tendered.
36. Works will take place within six years, including one year for ensuring a safe first reservoir filling and commissioning and the defect liability period. It will also allow for confirming that all parts, including the PS facilities, dam safety, operation management structure and adequate staffing are fully in place and tested. The construction of temporary works, such as basecamps and temporary access roads, is expected to commence once the CAA between PLN and the dam and civil works contractor has been signed, Conditions Precedents are met<sup>44</sup> and an independent construction supervision consultant firm with international experience has been recruited and mobilized.

***Sub-component 1.2. Project Supervision and Support to the Project Implementation Unit (US\$ 66 million)***  
*(IBRD: US\$ 11 million; PLN: US\$ 55 million)*

37. The Sub-component will finance an **independent construction supervision consultant** (ICSC) to provide support

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<sup>42</sup> Variable speed technology not envisaged, as there is small variation between maximum and minimum heads between the two reservoirs.

<sup>43</sup> The prices for the winning bids for the three awarded contracts totaled US\$400 million, against a cost estimate of US\$534.47 million, a saving of 25 percent.

<sup>44</sup> PLN has constructed the PARs using its own funds. This entails widening of the existing road segments and construction of new road segments from the quarry at Gunung Karang to the construction sites. The quality of the PARs has been accepted by PLN, as well as by the dam and civil works contractor. Previously, there was a dispute over a third-party's production license using the quarry on PLN's land. The license has been revoked and the dispute has been resolved. PLN is in the process of obtaining the production permit for the quarry, but no challenge is foreseen. PLN is also finalizing an Action Plan to address outstanding LARAP issues.





on independent supervision of construction works.<sup>45</sup> The consultant will work closely with PT Prima Layanan Nasional Enjiniring (PLN-E), which is PLN's owner's engineer for the UCPS.<sup>46</sup> The consultant will support PLN-E in supervision of the implementation of the above construction activities, interface between the contractors, and management of contingencies related to potential time and budget implications of any delay or unforeseen events. This would include decision processing for procurement and contract management, technical supervision, financial management, quality and schedule control, and monitoring of issues related to health, safety, security, as well as environmental protection of all contract packages.

38. This Sub-component will also support the preparation of an **Operation and Maintenance Plan (OMP)** and an **Emergency Preparedness Plan (EPP)** to international standard, and provision of training and capacity building to PLN staff on these aspects, as well as sediment management, long-term asset management, and dam safety.
39. It will also finance a **Project Review Panel (including Dam Safety experts)** that will support PLN in undertaking periodic, comprehensive, and independent reviews of the design, construction, quality, and initial reservoir filling in line with ESF's Environmental and Social Standard (ESS) 4 annexure on dam safety. The reviews are to assure: (i) safe, economic, and state-of-the-art designs; (ii) efficient, expeditious, and high-quality construction; and (iii) proper provisions for initial filling and long-term operation and maintenance and emergency preparedness.
40. The Sub-component will also finance the costs associated with the **Project Implementation Unit (PIU)** and the tasks necessary for Project implementation, including support on preparation and control of implementation and construction schedule.

## **Component 2: Environmental and Social Impact Management for the UCPS Plant (US\$ 40 million)**

(IBRD: US\$5 million; PLN: US\$ 35 million)

### ***Subcomponent 2.1. Implementation of E&S plans (US\$ 35 million)***

(PLN: US\$ 35 million)

41. This Sub-component will finance implementation of the plans, and development and implementation of additional plans, to mitigate the adverse E&S impacts of the UCPS. Several plans have been developed under the previous loan in line with relevant government policies and WB's operational policies. To comply with the WB ESF and the latest relevant government policies, the following plans have been updated, and will be implemented under the proposed Project.
  - *Environmental and Social Management Plan (ESMP).*
  - *Biodiversity Management Plan (BMP).*
  - *Forest Partnership Framework (FPF), equivalent to Process Framework required under ESS5.* The updated FPF will be implemented as part of the BMP.
  - *Cultural Heritage Management Plan (CHMP).* An updated Physical Cultural Resources Management Plan will

<sup>45</sup> PLN is well advanced in the procurement of the consultant, and the contract amendment is expected to be signed by July 2021.

<sup>46</sup> PLN-E is a subsidiary of PLN. Following the termination of the contract with the original owner's engineer in 2017 due to poor performance, PLN appointed PLN-E to assume the role of the owner's engineer. Under this Project, PLN-E will be continued to be paid by PLN's own budget.



be implemented as part of the ESMP. The CHMP includes a chance find procedure.

- *Land Acquisition Resettlement Action Plan (LARAP)*. Three LARAPs for the reservoirs, the transmission line, and the access road respectively were prepared and implemented under the previous loan. PLN carried out an implementation completion review of the LARAPs, which identified outstanding tasks and new issues that have emerged during the LARAP implementation. PLN will carry out further planning and develop a detailed action plan in consultation with the communities and local authority to complete the remaining tasks and address the outstanding issues.
- *Land Acquisition and Resettlement Policy Framework (LARF)*. A LARF has been developed under the previous loan to guide resettlement planning to address any unexpected additional land acquisition and resettlement needs, particularly during construction. If required, mitigation planning and implementation will be conducted following the agreed LARF.
- *Social and Community Management Plan (SCMP)*. A SCMP was developed under the previous loan to address issues related to community relations and labor management. The SCMP has been updated and expanded to include a stakeholder engagement plan (SEP), labor management procedure (LMP), gender, and gender-based violence (GBV) action plan, and a project grievance redress mechanism (GRM).

**Sub-component 2.2: Independent Environmental and Social Monitoring (IESM) Consultant and Environmental and Social Panel (ESP)**

(IBRD: US\$ 5 million)

42. This Sub-component will finance an IESM Consultant and an ESP to provide quality control in the implementation of the E&S plans for UCPS. The role of the IESM Consultant will be to provide independent monitoring of compliance of the implementation of the E&S obligations related to the UCPS. These obligations are detailed in the ESMP. The ESP will review and ensure quality of the implementation of the ESMP, Contractors' ESMPs, FPF, LARAPs and the other plans.
43. **Contractor's ESMPs (C-ESMPs)**. Contractors for each package of works are required to develop and implement their C-ESMPs to address their construction-related E&S issues in full compliance with the Project ESMP and the relevant E&S plans. PLN and the ICSC will supervise and monitor the implementation of the C-ESMPs.
44. **Institutional setup, capacity strengthening and work management**. This component will support the development and delivery of a training program to build capacity of PLN's team, and the institutional setup and team mobilization for the successful implementation of the planned work. The Project will establish and maintain an E&S team within the UCPS PIU to coordinate and supervise the E&S implementation. The team will include experts of required training and professional experiences relevant to the E&S programs. The ICSC is also required to have a team of specialists to supervise the implementation of the C-ESMPs.
45. **E&S monitoring system**. The Project will support the setting up of a monitoring system for its various E&S programs. This system will include both internal and external monitoring. The PIU will establish an internal monitoring system for its regular management of the E&S programs. The IESM Consultant will support PLN in monitoring the implementation of the C-ESMPs. The IESM Consultant will also carry out regular monitoring missions per its terms of reference and submit its monitoring reports to the PIU and the WB.



### Component 3: Provision of Technical Assistance and Capacity Building Activities (US\$ 42 million)

(IBRD: US\$ 42 million)

46. This Component will finance technical assistance to strengthen PLN's capacity in hydropower development through support to the preparation of the Matenggeng pumped storage<sup>47</sup>, Poko hydropower<sup>48</sup> and the Java-Bali System Master Plan.

#### Sub-component 3.1: Preparation of the Matenggeng Pumped Storage (MPS) Plant

(IBRD: US\$ 18 million)

47. This Sub-component will support the preparation of the MPS plant.<sup>49</sup> Based on the Market Analysis and Procurement Strategy undertaken in 2018 as part of MPS' FS consultancy assignment, PLN decided to use multi-package approach with FIDIC Red Book for civil works, and Yellow Book for the electro-mechanical works, hydromechanical works, and the transmission line. The Sub-component will finance Stages II-V the Detailed Engineering Design, which will involve topographical mapping of the project area through LiDAR survey, extensive geological investigations, as well as preparation of the Geological Data Report, Geological Baseline Report, meteorological and hydrological surveys, feasibility-level design, and tender documents.
- (i) The detailed design of preparatory works shall include PARs (used both during construction and operation) and a permanent bridge over Cijolang River. It will include locations for camps (including offices and accommodation for PLN's supervision team), workshops, warehouses, spoil tips, telecommunication, electric power, water supply and sewerage facilities (the detailed design of such works is expected to be the responsibility of the contractor). Some of the facilities are permanent in nature and to remain for the use of the Client after construction. The detailed design for the civil works shall include river diversion works, dams, intake, headrace tunnels, upstream surge tanks, penstocks, powerhouse cavern, draft tube tunnels, downstream surge tanks, tailrace tunnels, outlet, switchyard, riverbank protection for quarry, and necessary auxiliary structures, such as administration building, and control buildings.
  - (ii) The tender documents will be prepared to establish a level playing field for fair international competitive bidding and for a contract. The documents will contain sufficient details to enable bidders to accurately price the works required.
48. The Sub-component will also support the preparation of the **E&S documents, including ESIA, ESMP, SEP, LMP, and LARAP**. Work on preparation of these documents started in 2016 under the restructured previous loan, including preparation of an SEP, public meetings, and biodiversity baseline studies; however, work stopped when the ESIA consultant's contract expired. PLN started a new procurement process in 2020 and expected to

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<sup>47</sup> The project will provide ancillary services to the Java-Bali grid similar to UCPS. The plant will be located in Cijolang River Basin (a tributary to Citanduy River) in West Java near the border with Central Java, about 300 km southeast of Jakarta.

<sup>48</sup> Poko is part of PLN's business plan 2019-2028 with the expected commissioning date in 2028-2029, where works are expected to start in 2024-2025.

<sup>49</sup> From 2015 to 2018, a Pre-feasibility Study Update and Feasibility Level Design (or Feasibility Study) was prepared for the Project with submission of the final report in July 2018 (to the satisfaction of PLN, the Bank team and the PRP). The Feasibility Study was divided into two stages, with Stage 1 consisting of an update of an earlier pre-feasibility study and Stage 2 involved topographical mapping of the Project Area through LiDAR survey, extensive geological investigations, and feasibility level design. A market research and an initial Project Procurement Strategy for Development for the MPSP has been submitted by the consultant and approved by PLN. In parallel, PLN has started preparation for the ESIA and LARAP for the project. These assignments are under procurement.



have a new consultant engaged by June 2021 to continue to prepare the required E&S plans, including the ESIA, ESMP, SEP and LMP. This Sub-component will support the remainder of that preparatory work and the implementation of those documents during the design and pre-construction phase of the MPS.

**Sub-component 3.2: Preparation of Poko Hydropower Project**

*(IBRD: US\$ 14 million)*

49. This Sub-component will support the preparation of the **detailed design and tender documents**<sup>50</sup> for Poko hydropower project (HPP), which is currently planned to be developed with public funds. The Sub-component will include financing of additional geotechnical investigations as identified in the FS for the project, topographic surveys of access roads and transmission line, and hydraulic model tests of the spillway. The project will be located in the central/western part of Sulawesi Island on Mamasa River some 22 km upstream of the existing Bakaru hydropower plant.
- (i) The “detailed design” of preparatory works shall include PARs (used both during construction and operation) and a permanent bridge over Mamasa River. It will include locations for camps (including offices and accommodation for PLN’s supervision team), workshops, warehouses, spoil tips, telecommunication, electric power, water supply and sewerage facilities. The detailed design of such works is expected to be the responsibility of the contractor, and some of the facilities are permanent in nature and to remain for the use of the Client after construction. The detailed design for the civil works, including preparation of technical specifications, shall include river diversion works, dam, intake, headrace tunnel, penstock, powerhouse cavern, draft tube tunnels, downstream surge tank, tailrace tunnel, outlet, switchyard, and necessary auxiliary structures such as administration building and control buildings. The “detailed design” for electro-mechanical equipment, hydro-mechanical equipment and the transmission line includes preparation of technical specifications for each item, while detailed design will be prepared by the suppliers.
  - (ii) The tender documents will be prepared to establish a level playing field for fair international competitive bidding and for a contract. The documents will contain sufficient details to enable tenderers to accurately price the works required.
50. The Sub-component will also support the update of the 2019 Draft ESIA, ESMP, Cumulative Impact Assessment (CIA), and SEP, and the preparation of the LMP, LARAP, and if necessary, Indigenous Peoples Plan.

**Sub-component 3.3: Project Review Panel (PRP) for MPS and Poko**

*(IBRD: US\$ 3 million)*

51. The Sub-component will finance a PRP to undertake periodic, comprehensive, and independent reviews of the design of the MPS and Poko plants, and an ESP to review and ensure quality control on the preparation and implementation of the ESIA, ESMP, CIA, LMP, SEP, and LARAP (and Indigenous People Plan as applicable), as well as provision of related capacity building to PLN. PLN will use the same PRP and ESP for MPS and Poko, which will focus on preparatory activities.<sup>51</sup>

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<sup>50</sup> This will build on the PPSD already prepared for Poko project.

<sup>51</sup> as opposed to construction activities and construction-specific issues for UCPS, though some members might overlap



**Sub-component 3.4: Preparation of the Java-Bali Masterplan**

*(IBRD: US\$ 2 million)*

52. The Sub-component will support the preparation of a Java-Bali System Masterplan. The objective will be to conduct long-term capacity expansion planning of the Java-Bali power system through an analysis of plausible options under scenarios of VRE penetration; advanced generation, transmission, and control center technology; demand from electric vehicles; and interconnection with neighboring islands, in order to establish a power network of the future that is environmentally acceptable, reliable, economical, and high quality. The Masterplan will also include a scenarios analysis for achieving net zero carbon by 2060.

**Sub-component 3.5: Capacity Building and Support to Project Implementation Management**

*(IBRD: US\$ 5 million)*

53. The sub-component will finance capacity building and provision of needed technical, financial, operational, and fiduciary assistance to support the PIUs.
54. **Project cost and financing plan.** The overall cost is provided in Table 1. The total Project Financing is US\$755 million, of which US\$380 million is from IBRD, US\$230 million from AIIB, and US\$145 million from PLN.



**Table 1: Project Cost Estimates and Indicative Financing Plan (in US\$ million)**

Components		Estimated Cost (incl. contingencies)	Financing Plan		
			IBRD	AIIB	PLN
<b>1.</b>	<b>Development of the UCPS Plant</b>	<b>673</b>	<b>333</b>	<b>230</b>	<b>110</b>
<b>1.1<sup>52</sup></b>	<b>Subcomponent 1.1</b>	<b>607</b>	<b>322</b>	<b>230</b>	<b>55</b>
	Dam and civil works <sup>53</sup>	351.5	201.0	143.0	7.5
	Electro-mechanical equipment	161.0	93.5	67.5	
	Hydraulic metal works	49.5	27.5	19.5	2.5
	Transmission lines	45			45
<b>1.2</b>	<b>Subcomponent 1.2</b>	<b>66</b>	<b>11</b>	<b>0</b>	<b>55</b>
	PIU administrative cost	9	2		7
	Engineering services	48			48
	PRP (incl. Dam Safety)	4	4		
	Just-in-time additional engineering services	5	5		
<b>2</b>	<b>Environmental and Social Impact Management for the UCPS Plant</b>	<b>40</b>	<b>5</b>	<b>0</b>	<b>35</b>
<b>2.1</b>	<b>Subcomponent 2.1</b>	<b>35</b>	<b>0</b>	<b>0</b>	<b>35</b>
	Social costs [Community infrastructures (US\$ 15 million) and remaining LARAP issues (US\$ 5 million)]	20			20
	Environmental costs [BMP (US\$ 10 million) and others]	15			15
<b>2.2</b>	<b>Subcomponent 2.2</b>	<b>5</b>	<b>5</b>	<b>0</b>	<b>0</b>
	Independent E&S Monitoring Consultant	3	3		
	ESP	2	2		
<b>3.</b>	<b>Provision of Technical Assistance and Capacity Building Activities</b>	<b>42</b>	<b>42</b>	<b>0</b>	<b>0</b>
<b>3.1</b>	Preparation of the Matenggeng Pumped Storage Project	18	18		
<b>3.2</b>	Preparation of Poko Hydropower Project	14	14		
<b>3.3</b>	PRP and ESP - MPS and Poko	3	3		
<b>3.4</b>	Preparation of the Java-Bali Masterplan	2	2		
<b>3.5</b>	Capacity Building and Support to Project Implementation Management	5	5		
	<b>Total</b>	<b>755</b>	<b>380</b>	<b>230</b>	<b>145</b>

<sup>52</sup> Dam and civil works, Electro-mechanical equipment, Hydraulic metal works are referred to as 1.1 a) and Transmission Line is referred to as 1.1 b) in the loan agreement to differentiate the main source of financing of the contracts.

<sup>53</sup> Counterpart financing of USD7.5 million for Dam and civil works and of USD2.5 million for Hydraulic metal works are related to claims for activities that were conducted between signing and the end of 2017 and cannot be financed by the IBRD or AIIB loans.



### C. Project Beneficiaries

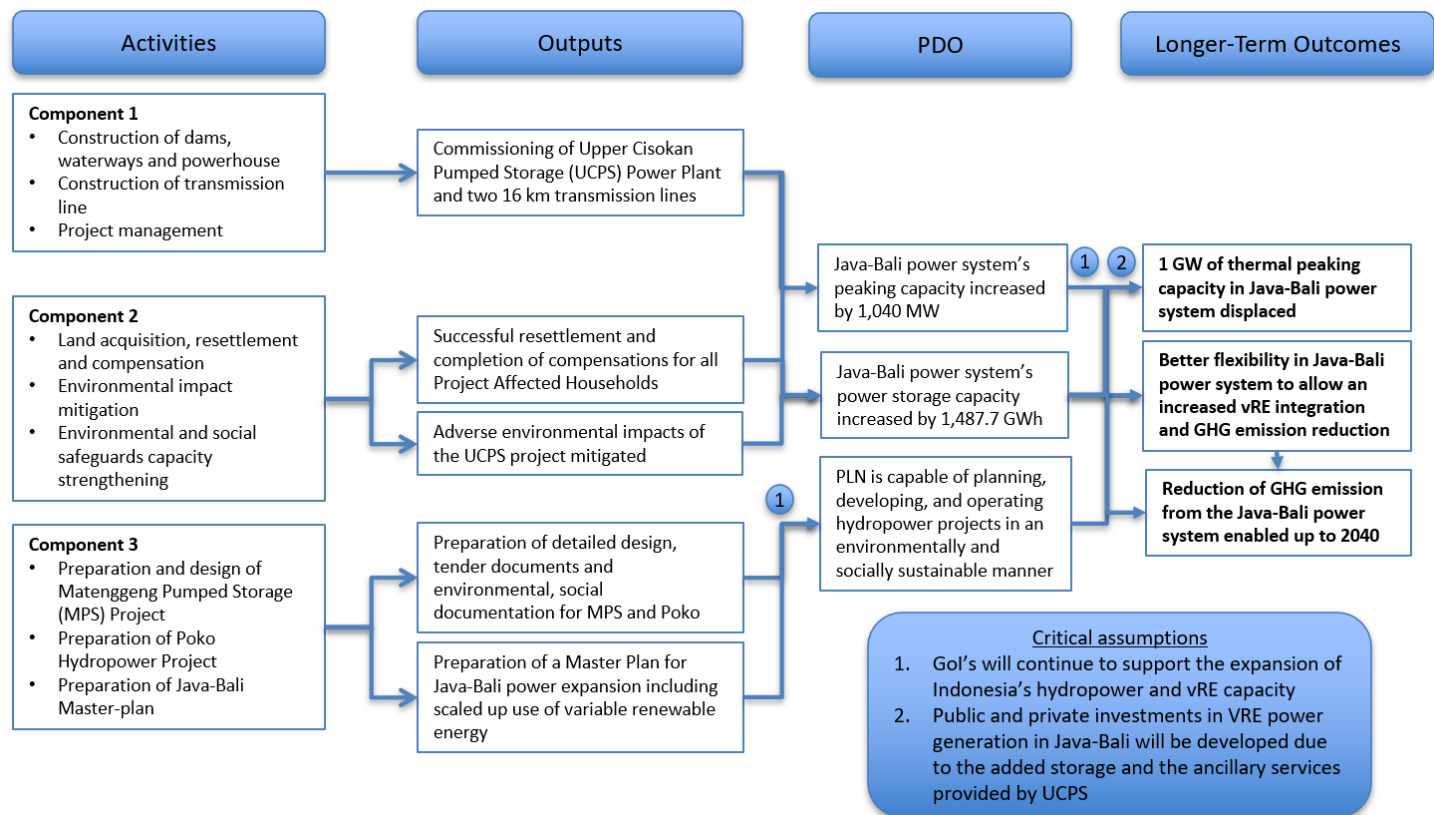
55. Beneficiaries are all electricity consumers on the Java-Bali islands, who will gain from more reliable supply of electricity. The Project will also contribute to socio-economic development of the communities. The local population nearby the UCPS site are expected to benefit from employment opportunities during the construction, as well as improvement of local infrastructure, provision of public services, and increased tourism/economic activities. PLN will benefit from the TA provided under the Project, and exposure to international expertise from expert consultants with highly specialized technical knowledge, in managing various complex aspects associated with hydropower development. As the Project enables VRE integration, it will also create investment opportunities for VRE developers and financiers and related local job creation. In the long-run, electricity consumers on Java-Bali will also benefit from power from cleaner energy sources and reduced pollutions.

### D. Results Chain

56. **Problem Statement:** Indonesia has relied on fossil fuels to power its fast-growing economy. The Java-Bali grid supplies power to 70 percent of Indonesians, but about 70 percent of power generation comes from fossil fuels. A key measure to support the country's decarbonization agenda is the development of energy storage to enable integration of VRE resources and avoid continued reliance on thermal generation. The Project aims to support Gol in developing PS and hydropower projects that would provide peaking and storage capacity to support VRE integration on the Java-Bali grid, and to do so in an environmentally and socially sustainable manner, while improving PLN's capacity to develop complex large-scale PS and hydropower projects. Ultimately, the Project expects to contribute to Gol's decarbonization efforts and climate commitments.



**Figure 2: Theory of Change**



## E. Rationale for Bank Involvement and Role of Partners

57. Pumped storage projects offer unique benefits in providing ancillary services to the power system. But these benefits are difficult to monetize, which makes it unattractive to the private sector. There are very few examples of privately owned PS in the world. Even in the U.S. as one of the most advanced markets with some of the largest PS schemes, to make PS commercially viable to private developers would require conducive market design and pricing mechanism that would value and pay for ancillary services to the grid with provision of a multi-year price lock-in, which has not happened yet. Therefore, PS schemes require large upfront capital investments, but do not guarantee long-term revenues for private developers. Most IPPs opt for less capital-intensive projects that have short construction timelines and quick returns. PLN has access to commercial financing, but these sources have short 3- to 5-year tenures. The Bank provides long-term financing that matches the long time required for PS project development and construction.
58. This is the first PS scheme in Indonesia. Both the Government and PLN have expressed strong interest in Bank financing and using the Bank's rigorous standards in terms of procurement and E&S management that would set the benchmark for how future PS and complex hydropower projects of such scale can be developed in sustainable ways with value for money. Bank financing also comes with significant capacity building and opportunities for exposure to internationally recognized and highly specialized experts in various technical,





environmental, and social aspects relevant and specific to PS and hydropower that would enable on-the-job knowledge transfer and enhance PLN's hydropower management capability over the Project life and beyond.

59. The Project is part of the Bank's broader program of engagement to support the GoI in its energy transition and grid decarbonization pathways. The Project implementation will be complemented by just-in-time TA to facilitate deeper structural reforms, including dialogues around pricing, regulatory framework, and sector governance, as well as providing support to enable VRE integration onto the grid. These reforms will be anchored in a planned multi-donor policy-oriented Program-for-Results (P-for-R) that is under preparation. In addition, the use of public financing for PS to improve the integration of VRE in the grid creates a strong case for utilizing storage technologies to demonstrate the techno-economic viability of a low-carbon transition for Indonesia. The Bank could provide assistance to GoI in a valorization of the manifold economic benefits of PS projects, with an ultimate goal to further enhance the economic case for PS in the long-run, which can be expected to attract more commercial and private finance.
60. The Project will be co-financed by the Asian Infrastructure Investment Bank (AIIB), which is financing PS for the first time. The joint due diligence and supervision of the Project will provide AIIB with exposure to the risk profiles associated with a PS and large-scale hydropower. It will expand the sources of long-term financing for PS projects across the region that can be developed sustainably to international standard.
61. Among the development partners, there have been several platforms, such as the Energy Transition Council<sup>54</sup>, the Energy Transition Partnership<sup>55</sup>, and the Friends of Indonesia for the development of Renewable Energy,<sup>56</sup> as well as close collaborations among multilateral institutions including the Asian Development Bank (ADB), the International Energy Agency, the Association of South East Asian Nations, and bilateral partners such as the UK, US, Germany, Canada, France, Korea, and Japan to advance dialogues to support GoI in accelerating the Energy Transition, while managing the other key objectives such as reliability and affordability of electricity. The WB has also begun to explore, with the ADB, the economics of coal power plant early decommissioning, its political economy dynamics, and impacts on local economic development. There is also a need to complement the support on an accelerated Energy Transition with engagements on the Just Transition for All framework, which would require a longer-time horizon.

## **F. Lessons Learned and Reflected in the Project Design**

62. The challenges under the original UCPS project and their resolution offer many lessons for the implementation of the proposed Project, including the need to have a strong design and supervision consultant onboard early on to support PLN in early work planning, to establish a Dispute Board for any contractual issues that might arise, to streamline PLN's internal processes for procurement, and to further improve PLN's capacity in safeguards planning and implementation, contract management, and overall project management.

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<sup>54</sup> Chaired by UK as part of COP-26 Presidency, the ETC includes all key development partners and works with the Bank team and ESMAP globally on COP26 *Principles for Just Transition*, utilizing the Bank's three-by-three matrix as an organizing framework to align multi-donor assistance on coal phase-out.

<sup>55</sup> Implemented by UNIDO and initiated as part of ETC, the ETP expands the dialogue to civil society, media, and philanthropies on the clean energy transition.

<sup>56</sup> The Friends of Indonesia for the development of Renewable Energies (FIRE) is a multi-stakeholder platform managed by UK bringing together donors, partner governments and philanthropies, and providing support for technical assistance and regional knowledge platform.



63. First, the delay in PLN's hiring of the owner's engineer and the delay in finalizing the dam design during the original WB financing had severe negative consequences to the project implementation. Having a highly competent supervision engineer in place will help PLN better control project timeline and work schedule, as well as handling contract management issues, including managing contractors' interface on site to ensure synergies and minimize impacts and disruptions to the works. During the period after the WB cancelled the loan and before it agreed to finance the project again, PLN appointed PT PLN-E, as Owner's Engineer for the UCPS construction, who has been supported by three competent international consultants to closely review and update the dam design, taking into account Indonesia's new earthquake design code, to ensure the design is best aligned with the latest Indonesian national regulation. Under the proposed Project, PLN has a plan to bring on board an international Supervision Engineer to support it in construction supervision, contract management and quality and schedule control, that is expected to come on board by June 2021. No works are expected on the ground until the Supervision Engineer is fully on board and operational.
64. Second, there are many good practices and procedures related to safeguards management developed under the original WB financing that will be continued and expanded under the proposed Project, which are highlighted below.
- (i) A first-of-its-kind forest partnership was developed between PLN and Perhutani, the state-owned forestry company, to replant trees cut down for construction of the UCPS and aim to restore habitat loss from the development. Biodiversity data collection and assessment during the implementation of the first financing identified the significance of critical habitat within the catchment areas of the dam that was home to small population of endangered mammal species. The process of consultation and engagement with the communities and Perhutani over many years further identified the need for community-based forest management as part of a broader biodiversity conservation solution. A 2019 review of the implementation of the BMP prepared under the original WB financing indicates that PLN and Perhutani do not have the capability to implement the necessary habitat conservation and without the incentive of the UCPS project, the biodiversity in the project area will continue to decline under the pressure of land conversion, exotic forestry, housing and agriculture. Under the proposed Project, the partnership will be renewed, strengthened, and supported in line with the FPF that has been prepared and will be implemented.
  - (ii) PLN demonstrated strong commitment to support local district infrastructure development under the first Bank financing. Specifically, PLN provided budget allocations and supported social infrastructure and facilities in the new residential areas for people affected and displaced from the resettlement process under the Project. It also implemented its Corporate Social Responsibility programs in providing various assistance to local communities, including the relocated population. To the extent applicable, the initiatives that have proven effective in ensuring adequate community compensation and bringing additional economic development benefits to the community surrounding the Project will be deployed under the Project.
  - (iii) PLN requires experts' technical support to implement the LARAP, the complex ESMP, and other E&S plans. Previously, the small PLN environmental teams in UIP (*Unit Induk Pembangunan*, or PLN regional construction units for power generation and transmission) and UPK (*unit pelaksana konstruksi*, or construction execution unit) were supplemented by experts in the former Owner's Engineer team and a range of consultants and university teams. With the expanded E&S programs, PLN needs to substantially strengthen the existing E&S setup and its capacity for implementation of these plans. Under the proposed



Project, strong support on E&S implementation, such as (i) that from the Supervision Engineer team to focus on the Contractor's compliance, technical experts to assist with finalization and implementation of complex programs under the BMP and RPF, and (ii) support from the ESP experts and an independent monitoring consultant, will continue to be crucial to successful development of the UCPS.

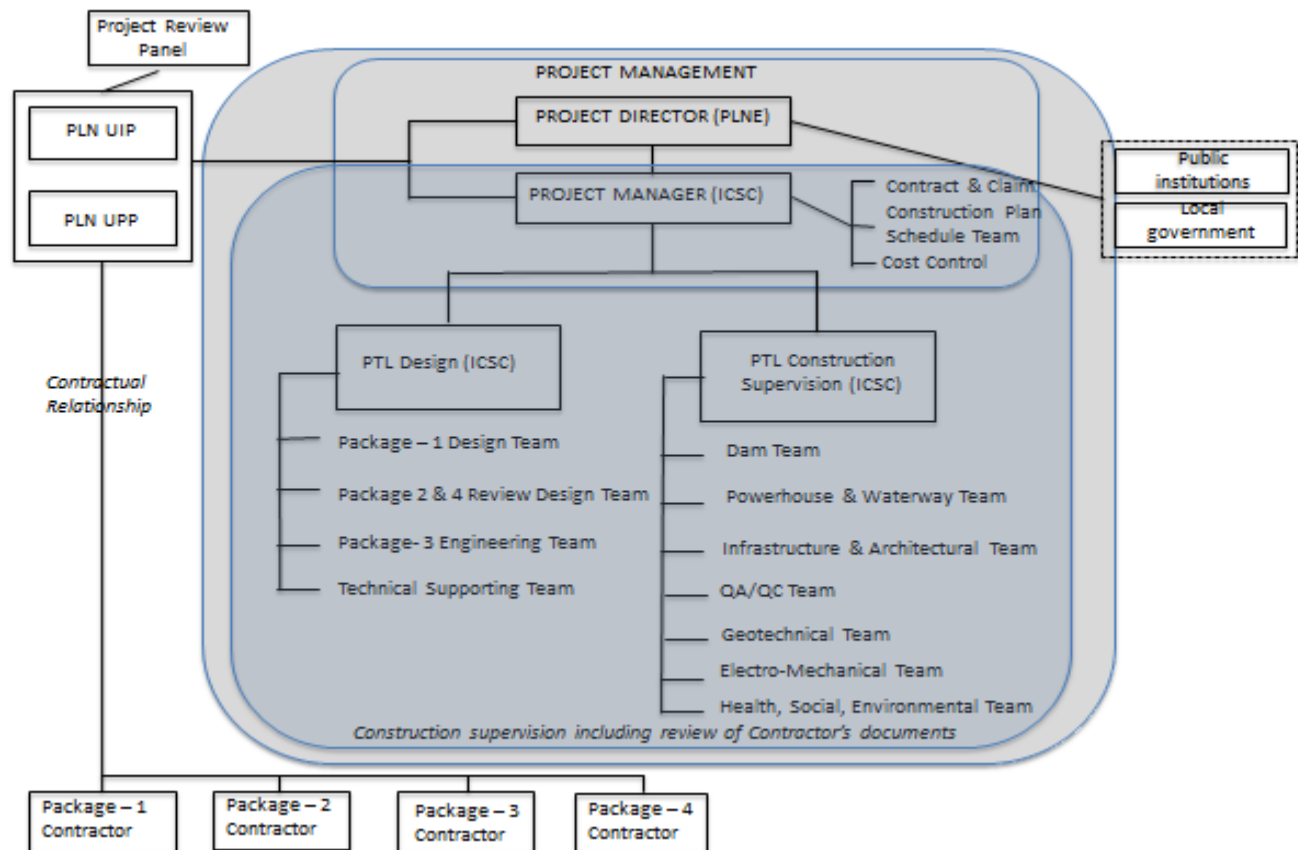
### III. IMPLEMENTATION ARRANGEMENTS

#### A. Institutional and Implementation Arrangements

65. **PLN will be the implementing agency (IA) for the Project.** PLN will use experienced staff with long-standing knowledge and understanding of the UCPS from the various directorates within its organizational structure for Project implementation. PLN will have a Project Management Office (PMO) under the newly created Mega-Project Directorate that will coordinate the reporting on the overall Project. Two PIUs will manage the implementation on the ground and coordinate reporting from all relevant departments of PLN.
66. **UCPS Project Implementation Unit (UCPS PIU).** Activities under the Components 1 and 2 supporting the development of the UCPS will be implemented by the UCPS PIU, which is under the Mega-Project Directorate. The UCPS PIU has been established and is already operational with adequate staffing. To assist it in the implementation of activities under the Component 1, the UCPS PIU has contracted PLN-E, as Owner's Engineer for the UCPS construction, to conduct the remaining preparatory work and ensure supervision of constructions works, quality control, contractor management, and satisfactory implementation of C-ESMPs, including the LMP. PLN-E will be supported by an independent international Supervision Engineer Consultant to support it in reviewing and updating the detailed design, preparing construction drawings, contract management including claim management, supervising and monitoring the contractors' work, C-ESMPs and implementation of health and safety plan for all packages, as well as risk and overall project management. PLN-E will also support the UCPS PIU in interface and coordination with the relevant local government authority and other involved public entities. PLN has prepared a Project Implementation Manual (PIM) to guide the Project implementation with the support of PLN-E and the Supervision Engineer.
67. To ensure quality control, the UCPS PIU will also retain a PRP consisting of international and nationally reputable experts with specializations relevant to hydropower. These may include but are not limited to geology, rock mechanics and geotechnical engineering / underground structure design and facility management, hydrology, and sedimentation management, RCC dam design and hydraulic modelling, seismology / dam safety, environmental risk management, and social and resettlement management. The overall dam design was reviewed by the PRP under the original WB loan, though the recent update will be reviewed by the PRP and found acceptable before works can start on the ground. The internationally reputable experts on the ESP will provide independent advice on E&S aspects of the UCPS plant design and implementation, as well as measures to enhance the E&S outcome of the Project.



Figure 3: Schematic Organizational Chart for UCPS Implementation



68. For E&S implementation, the UCPS PIU will establish and maintain an E&S team to coordinate and supervise the E&S work. The team will consist of two units, i.e. Environmental, Social, Health, Safety and Security (ESHSS) unit and another LARAP Unit. The team will include experts of required training and professional experiences relevant to the E&S programs. Perhutani, together with the Forest Management Unit, is responsible for the implementation of the BMP and FPF, and they will be equipped with required expertise and experiences. The E&S team will be supported by the ICSC, which is required to have a team of specialists, to supervise the implementation of the C-ESMPs. UCPS PIU will also be supported by an IESM Consultant in monitoring the overall implementation of the ESIA, ESMPs, BMP, FPF, CHMP and SCMP. It will also be advised by the ESP for quality control. The UCPS PIU will set up a monitoring system for its various E&S programs. This system will include both internal and external monitoring. The PIU will establish an internal monitoring system for its regular management of the E&S programs. The IESM Consultant will support PLN. The IESM Consultant will carry out regular monitoring missions per its terms of reference and submit its monitoring reports to the PIU and the WB.
69. **Technical Assistance Project Implementation Unit (TA PIU).** Activities under Component 3 supporting the preparation of Matenggeng and Poko and the Java-Bali masterplan will be coordinated by the Corporate Planning Directorate (TA PIU), and implemented by units-in-charge (UICs) that come from specific directorates



within PLN: preparatory activities for Matenggeng and Poko by a UIC within the Corporate Planning, and the Java-Bali Masterplan by a UIC within the System Planning. In particular, the UICs will manage the implementation of the activities, including the procurement, the contracts, and their successful implementation.

## B. Results Monitoring and Evaluation Arrangements

70. The results framework is provided in Section VII and lays out the Project's indicators, targets and monitoring and evaluation arrangement. In addition to tracking the progress towards achieving the outcomes of the PDO, it includes indicators to track progress on GHG emission reduction, gender, and citizen engagement.
71. The PIUs will be responsible for collecting and verifying data and providing inputs to the periodic progress reports to be submitted to WB and AIIB on all work progress and achievement of all indicators.

## C. Sustainability

72. GoI is committed to developing the UCPS with support from WB and AIIB, following extensive discussions on the Project risks, mitigation measures, and tasks to improve implementation readiness and efficiency. PLN is fully committed to a successful implementation, operation and maintenance of Indonesia's first PS hydropower scheme that will serve as a model for others that are also being planned. The UCPS is part of the least-cost power system expansion plan and will play a critical role in enabling VRE integration and decarbonization of the Java-Bali power system.

## IV. PROJECT APPRAISAL SUMMARY

### A. Technical, Economic and Financial Analysis

#### (i) Technical Analysis

73. **UCPS will be the first pumped storage hydropower in Indonesia.** While PS is a proven technology worldwide, it will be the first time PLN manages a PS power plant. In its capacity building plan, the proposed Project will focus in particular on operation and dispatch of the PS power plant to maximize benefits, and operation and maintenance of the PS/pump-turbine equipment. Also, UCPS includes large underground works (2 headrace tunnels, 4 tailrace tunnels and an underground powerhouse) and significant geotechnical investigations and extensive analyses were undertaken during the design phase. Additional investigations might be required during the construction and significant time and budget contingencies have been included.
74. **The technical design of UCPS has been prepared by competent consultants according to international standard and reviewed extensively by a PRP** consisting of world-leading experts on a full range of issues pertinent to the development and operation of a pumped storage hydropower scheme, such as rock mechanics and geotechnical engineering, engineering geology, RCC dam and construction materials, seismic structural design, electro-mechanical equipment, hydraulic metal works, and environmental and social management. This



includes hydrologic analysis, hydraulic analysis, seismic analysis, sedimentation studies. On recommendation of the reinstated PRP some additional field work and a revised Seismic Hazard Assessment (SHA) is being carried out to take into account the new seismic hazard map of Indonesia (2017) that also indicates the possibility of an active fault close to the dam sites.

75. In addition, the proposed Project will build long-term capacity to design and manage hydropower investments (including PS), as well as establishing platforms for robust community engagement.
76. **UCPS is well advanced in terms of readiness for implementation** with all key construction contracts already awarded and the contract of the ICSC expected to be signed soon. The ICSC will provide guidance on technical, design and construction as well as social and environmental aspects during the construction period.

## **(ii) Economic and Financial Analysis**

77. *Project Economic analysis:* the basis for the project economic analysis is a modeling of the Java-Bali power system with and without the Project. The analysis consists of a long-term (LT) capacity expansion analysis as well as more detailed short-term (ST) chronological production cost simulation in finer granularity of hourly or sub-hourly resolutions. The analysis presents an economic evaluation of UCPS taking into account both **energy arbitrage value** as well as the value of the **ancillary services** it provides.
78. The LT analysis has modeled the Java-Bali power system from 2020 to 2040 with the following results: (i) it has been determined that UCPS is part of the least-cost development plan for the system, and (ii) it has provided an estimate of the impacts on system costs of UCPS. In the LT analysis, the impacts on costs from UCPS result from not only the energy arbitrage services it can provide—consuming power for pumping water at times of lower demand and generation costs that can then be stored for use in generating power at times of higher demand but also from the investments in peaking generation alternatives that are being displaced, as well as from the increased VRE penetration that is being allowed by the system flexibility provided by UCPS. These impacts were measured by comparing the total present value of the system operating and new investment costs over the time horizon of the study with UCPS and without UCPS.
79. The results from the LT analysis show that photovoltaic systems (PV) will be installed in the system to the maximum extent (because it is least cost) and that the PV penetration is only limited by the lack of flexibility of the Java-Bali grid. This lack of flexibility comes mostly from the limited ramping rates and the need to maintain coal plants at minimum operating load. The results of the ST analysis show how UCPS helps relieve part of these constraints: UCPS provides a large amount of reserve during the evening peak, allowing hydropower plants and combined cycle gas turbine (CCGTs) to generate more during this time and displacing very high-cost peaker plants. In turn, UCPS generates during the early morning displacing CCGTs and allows pumping during the day when PV is generating.
80. Based on the modeling results, a cost-benefit analysis has been carried out to estimate the Economic Internal Rate of Return (EIRR) and the Net Present Value (NPV) of the proposed Project. Sensitivity test was carried out to assess the robustness of the economic viability of the Project in relation to application of a carbon price. The results of the analysis are presented in the Table below (with more details available in Annex 3).



**Table 2: Project Net Benefit Scenarios**

<b>Net Benefits without Carbon Price</b>	
NPV of Net Benefit	\$315million
EIRR	11.7%
<b>Net Benefits with Low Carbon Price</b>	
NPV of Net Benefit	\$463million
EIRR	14%
<b>Net Benefits with High Carbon Price</b>	
NPV of Net Benefit	\$611million
EIRR	16.1%

81. **Project Financial Analysis:** Due to the absence of market for storage and ancillary services, as well as peak and off-peak tariff in Indonesia, it has not been possible to fully account for the financial benefits of the UCPS.<sup>57</sup> Nevertheless, as demonstrated in the economic analysis, the Project will generate considerable benefits through the effective provision of peaking and reserve capacity as well as storage capacity in the Java-Bali grid. The UCPS plant will be owned by PLN, who on one hand will monetize the mentioned benefits in the shape of lower cost of generation (due to the postponement of some new peaking capacity and improvement in overall power system operating efficiency) and spinning reserve (due to reduced gas consumption) and on the other hands will have to service the debt. The financing offered by IBRD and AIIB will result in a weighted average cost of capital (WACC) of under 5 percent, which is lower than the estimated Financial Internal Rate of Return (FIRR) of 10-12 percent. The FIRR has been assumed to be roughly equal to the EIRR since there are few price distortions and taxation plays a very minor role as well as the difference in environmental benefits is minor between the scenarios with and without UCPS (see details in Annex 3). In conclusion, the UCPS will be profitable and will marginally contribute to reduce PLN's operational deficit and thereby the need for state subsidies.
82. **PLN's finance is reliant on government's subsidies.** As a SOE, PLN has a regulated revenue model with a significant subsidy component. PLN's revenue model allows the company to recover operating expenses plus depreciation, interest on debt and 7 percent margin. This revenue model is not related to the financing need, and will not ensure sufficient revenues to cover the high level of investment that PLN will have to finance in the coming 10-years to support demand growth, improve the quality of service and accelerate its energy transition. In addition, since 2017, PLN has been running losses<sup>58</sup> from power sales because of restrictions on tariff adjustments for non-subsidized customers. To cover this under-recovery, PLN is entitled to a compensation from State Budget, but the timing of payment by MOF is unpredictable and may take over two years compared to when it is accrued, resulting in cash flow challenges. In addition, budget subsidies (Public Service Obligation or

<sup>57</sup> This is expected to be addressed in the context of the P-for-R and associated advisory work that are under discussion with PLN and the government of Indonesia, which will support a more conducive tariff framework in order to, among others, enable PLN to fully quantify and capture the financial benefits of future pumped storage schemes.

<sup>58</sup> The decision to freeze fuel cost pass-through into tariffs since July 2017 resulted in under-recovery of approximately IDR 20-25 trillion per year.





PSO<sup>59</sup>) are allocated to consumers with selected low power connections. In total, PLN relies on budget subsidies (PSO and compensation payments) for 21 percent of its operating revenues (in 2019), representing 5 percent of central government spending.

83. PLN revenue has been growing at 5-7 percent per annum in line with the demand increase, but its overall financials remain vulnerable to both fuel costs and subsidy payments. Consequently, PLN relies on market financing to pay for its capex investments and repay or refinance existing debts.
84. **COVID-19 represented an external shock, which has impacted PLN's revenues and cash-flow.** PLN's revenues have been further negatively impacted by policy responses to support certain categories of power customers with tariff holidays. The key factors that are impacting PLN's financial situation are: (i) revenue loss created by lower demand due to the crisis; (ii) emergency tariffs holidays in place since April 2020; (iii) currency and fuel price volatility given that most of PLN's PPA and debt service payments are in foreign currency; and (iv) international market access risks with PLN's international bond yields doubled at the height of the COVID-19 related market turmoil.
85. **To mitigate the impact of the COVID-19, PLN has downsized its investment plans and identified cost savings.** In 2020, PLN has streamlined and re-prioritized its investment program to save IDR24 trillion in 2020 and managed to reduce operating expenditures for staff worth IDR13 trillion.<sup>60</sup> PLN also received a compensation payment of IDR45.4 trillion from MOF as a payback for the arrears accumulated in 2018 and 2019. By the end of the year, PLN had also managed to raise IDR 67 trillion of financing, which – when combined with the cost savings and compensation payments – not only helped to keep PLN financially solvent, but also allowed for significant debt prepayment of approximately IDR 30 trillion.
86. **While PLN was able to manage the demand decline due to COVID-19 lockdowns thanks to internal savings, Government transfer, lower fuel prices and reducing investments, cash flow management will continue to be an issue in the foreseeable future.** As the economic downturn is expected to dampen demand growth, PLN will face a number of challenges: (i) *fuel price rebound* with oil price back up above \$60/barrel to pre-COVID prices, (ii) *increase in power purchase cost* from IPPs that had their commissioning delayed and are now expected to start production in 2022 and 2023, and (iii) *increase in Investments* to continue capital investments and rehabilitation of assets to maintain their operational capacity and safety of the grid, limiting their ability to reduce or defer these expenses further and drive their funding requirement. PLN recognizes these challenges and has prepared a funding strategy for 2021, which includes equity injection from the Government and MIGA guarantee for a US\$500 million facility to secure payments for seven RE IPPs to partially fill the financing gap for the year 2021, which was estimated at approximately IDR 59 trillion.<sup>61</sup>
87. **As PLN is exploring market solutions, its market access risks have increased over time and exacerbated with the COVID-19 crisis.** In the past years, policy-driven prolonged negative cash flow from operations have resulted in cash management challenges that have been financed from Indonesian local banks. However, successive borrowing rounds started leading to shorter financing tenors, approaching single borrower limits at local banks

<sup>59</sup> Even if progress were made in 2017, approximately 45% of PSO is used to subsidise households who do not fall within the database for poor and vulnerable households (representing approximately 23 million households)

<sup>60</sup> Based on a baseline of payments to employees of IDR 30 trillion planned for 2020.

<sup>61</sup> Based on PLN Annual Budget Plan Year 2021. PLN is planning to raise approximately IDR 58 trillion in 2021.





and a deteriorating debt service coverage ratio that went below 1 between 2017 and 2019, and in 2020 managed to increase to 1.4 due to the compensation payment which substantially strengthened operating income as well as a reduced debt services as compared to historical levels. Despite these challenges, in 2020 PLN was still able to raise financing from the local market. This market access challenge was compounded at the start of the pandemic when international markets experienced considerable volatility. As market turmoil reached its heights in late March, PLN's international bond yields more than doubled compared to levels at the start of the year, signaling elevated market risk perception of PLN despite its investment grade credit rating. Since the second quarter of 2020, market conditions have stabilized, allowing PLN to tap the international bond markets with Global Medium-Term Notes (GMTN) for US\$1.5 billion at yields close to January 2020 pre-crisis levels. By the end of the year, PLN had managed to raise IDR 67 trillion of financing.

## B. Fiduciary

### (i) Financial Management

88. **PLN has extensive experience in implementing WB-financed projects** and Financial Management (FM) Risk is rated Moderate The FM arrangements will follow PLN's system, except for the budgeting under Sub-Loan Agreement (SLA) and payment processes with the State Treasury Service Office (*Kantor Pelayanan Perbendaharaan Negara*, or KPPN), which will follow the government system. The PMO will prepare semi-annually interim financial reports (IFRs) following the Bank requirements. PLN will also submit the entity's audit reports to the Bank annually within 6 months after the end of fiscal year during the loan period. The Notes to the Financial Statements will include the loan status. The WB carried out an assessment of the adequacy of FM arrangements and concluded that with the implementation of the mitigation measures, the FM arrangements will satisfy the minimum requirements under the Bank Policies. Delay of SLA budget availability and lengthy payment process may cause delays in contractors' payments and therefore delays in the Project implementation.
89. The PMO will monitor the commitments made (contract signed) and payments schedule based on information provided by the PIUs to ensure that the SLA budget allocation is adequate to cover the Project activities. The PMO will include information regarding the commitments (contract value) and estimated payment schedule in the IFRs. Based on previous experiences, the payment process that involves verification by KPPN *Khusus Investasi* (KPPN KI) and KPPN *Khusus Pinjaman and Hibah* (KPPN PH) may be delayed if there are incomplete supporting documents submitted by contractors and PIUs, and therefore delays in obtaining payment recommendation from the director level. The PIM will define the payment process and responsibilities of each division/unit, include supporting document requirements, and set a standard time for the internal processing of payment. The PIM will also include requirements for the necessary supporting documents in line with PLN's internal payment process and the State Treasury office's requirements.
90. **Disbursement Arrangements.** The applicable disbursement methods will be (1) Direct Payment, (2) Reimbursement, and (3) Special Commitment. No separate designated account will be established under the Project and advance disbursement method will not be utilized. Requirements for the supporting documents and the minimum application size applicable to Direct Payment, Reimbursement, and Special Commitment are detailed in the Disbursement and Financial Information Letter.
91. All documentations evidencing expenditures shall be retained by PLN and shall be made available to the auditors



for audit and to the Bank and its representatives if requested.

92. The Withdrawal Application (WA) submitted by the Borrower for the Bank's review and processing will cover the financing of both WB and AIIB. The same WA will be used for processing for both WB and AIIB parts under Sub-component 1.1(a). The other components will be financed by the Bank loan and counterpart fund. For each WA received by the Bank under Subcomponent 1.1(a), the Bank will process payment claims for the Bank and AIIB separately in line with the financing split based on respective contributions to this sub-component, i.e. 58.33% for the Bank and 41.67% for AIIB; while the Bank processes WAs on behalf of AIIB, AIIB will do payment transfers itself. In addition, in the event that AIIB funds become available at a later date, the Bank may finance Sub-component 1.1(a) at 100% until AIIB funds become available. Once AIIB funds become available, the financing split to be calculated (if necessary) based on then respective contribution commitments will be used for subsequent disbursement processing. Such financing split will be communicated in a notice to GoI and AIIB.
93. Special Commitment (SC): For contracts (or parts of contracts) to be entered under Sub-component 1.1(a) where the use of SC is required, such contracts will be financed by the Bank at 100 percent, as there are still some technical issues to be addressed by AIIB for special commitment under joint co-financing loans. The financing split between the Bank and AIIB may then be adjusted accordingly, if needed. Any adjustment to the financing split will be communicated to all parties involved in writing.
94. The Bank loan will fully finance Sub-components 2.2 and 3, and partially Sub-component 1.2. Counterpart funds of US\$145 million will finance PIU's administrative cost and all engineering services under Sub-component 1.2 and all activities under Sub-component 2.1. Disbursement categories for the Bank loan are presented in Table 3 below. A retroactive financing of up to \$5 million will be available under category (2) for payments made against eligible expenditures on or after January 1, 2021.

**Table 3: Disbursement Categories**

	Category	Loan Amount (in US\$)	Percentage of expenditures to be financed (inclusive of Taxes)
1	Goods, works, non-consulting services, and consulting services for Part 1.1(a) of the Project, expressly excluding Part 1.1(b) of the Project	322	100% of Bank Share of Total Lending
2	Goods, works, non-consulting services, and consulting services including Training for Parts 1.2, 2.2 and 3 of the Project (expressly excluding Part 2.1 of the Project)	58	100%
	TOTAL	380	

95. In Indonesia, project financing is dictated by MoF's *Daftar Isian Pelaksanaan Anggaran* (DIPA) (Budget Implementation List) and subsequent payment processing strictly follows what is stipulated in the DIPA. As such, eligible expenditures designated in the DIPA to be financed by specific financing source (WB or AIIB or counterpart funds for this Project) are always at 100%, inclusive of taxes. Project activities to be financed by the WB and AIIB loans are therefore budgeted under respective DIPA SLA, which is part of the government's integrated budget. The financing sources for project activities, including financing percentages, are detailed in



the DIPA. '100% of Bank Share' refers to 100% of the Bank's share of the financing split as determined between the Bank and AIB for the financing of Sub-component 1.1(a).

**(ii) Procurement**

96. Procurement of Goods, Works, Non-Consulting and Consulting Services under the proposed Project will be in accordance with the World Bank's Procurement Regulations for Investment Project Financing (IPF) Borrowers, November 2020.
97. A procurement assessment has been carried out. Based on the assessment, PLN has adequate experience and basic capacity to carry out procurement activities related to the proposed Project. PLN is familiar with Bank's procurement guidelines through its experience in implementing past projects financed by the Bank, but this would be the first project using the Procurement Regulations.
98. A Project Procurement Strategy for Development (PPSD) for the Project has been prepared by PLN and has been finalized, which forms the basis for the procurement plan (PP) for the contract packages that remain to be procured under the Project. The PPSP also identifies the risks and sets out mitigation measures and Key Performance Indicators for contract implementation, including the existing contracts awarded under the original WB financing for the UCPS project. The scope of the PPSP and PP for the Project would largely depend on the outcome of the discussions between PLN and the contractors and satisfactory resolution of the contractual issues under the awarded existing contracts.

**Box 1: Overview of the PPSP**

The PPSP submitted by PLN is based on a broad analysis of the merits and demerits of different procurement options. The PPSP concluded that the most suitable and **fit for purpose** option is to continue with the contracts awarded under the original WB-financed project (details in table below).

This approach will provide value for money based on the analysis carried out. This means to continue with the awarded contracts and to employ the Direct Contract method under this new Project. ***This approach of Direct Contracting is observed to be justified and the Fit for Purpose (FfP) selection method for these contracts.*** These contracts would be considered as advance procurement as provided for in the Procurement Regulations, and because the procurements were carried out following Bank guidelines and using the Standard Bidding Documents (SBDs), hence would meet the requirement and be consistent with the principle with Sections I, II and III of these Procurement Regulations and aligned with the Procurement Principles.

	Awarded Contracts	Cost (US\$ Million)
1	<b>Package 1:</b> Lot 1A Construction of Upper and Lower gravity dams; and Lot 1B Construction of underground powerhouse, waterways, and switchyard	110 147
2	<b>Package 2:</b> Supply and installation of Four pump-turbine units (260 MW), Generator-Motor and Auxiliary Equipment	153
3	<b>Package 4:</b> Supply and installation of Hydraulic Metal Works	35



The status of these contracts are as follows.

1. **Package 1: Lot 1A Construction of Upper and Lower gravity dams and Lot 1B Construction of underground powerhouse, waterways, and switchyard:** The Contract was signed with the Joint Venture (JV) of Daelim Industrial Co. Ltd. (Lead Partner), Astaldi S.p.A, and PT. Wijaya Karya (Persero) in October 2015.  
  
PLN and the JV have recently concluded negotiations for contract amendment and come to an agreement and signed minutes of negotiations and the CAA is ready to be signed. This is presently submitted to *Badan Pengawasan Keuangan dan Pembangunan* (BPKP) (Indonesia's State Auditor) for their review and approval, after which it would be sent across to the Bank. The claim, if any, will not be financed by the Bank.
2. **Package 2: Supply and installation of Four pump-turbine units, Generator-Motor and Auxiliary Equipment** – The recommended bidder for award is Andritz Hydro GmbH, wherein Letter of Acceptance and Contract Discussion Agreement has been concluded, but Contract is not signed due to uncertainty on the package 1 implementation and subsequent negotiations. The firm has confirmed its interest to continue with the Project and extended its bid validity and bid security.
3. **Package 4: Supply and installation of Hydraulic Metal Works** – The Contract was signed with China Gezhouba Group Company Limited, in March 2016, but the "Effective Date" from which the Time for Completion is measured was not realized because of delays on package 1. The firm had submitted advance payment guarantee, but PLN did not make any advance payment. There is a performance guarantee which is still valid.

The PPSD also provides details of procurement approaches and strategy:

There will be a few additional procurement packages, which are envisaged to be tendered of approximately US\$142 million (including contingencies). The key packages are as follows:

1. Supply and Installation of Two 500kV double-circuit Transmission lines with the length of 16 km each (US\$45 million);
2. Independent construction Supervision consultant (USD 48 million);
3. Consulting Services to support the preparation of the detailed design and tender documents for the MPS project (US\$18 million);
4. Consulting Services to support the preparation of the detailed design and tender documents for Poko HPP (US\$14 million);
5. Consulting Services for the preparation of a Java-Bali System Masterplan (US\$2 million);
6. Several small-value consultancies for various other consulting services.

The transmission line and the independent supervision consultant are going to be fully financed by PLN. In particular, the Transmission Line is planned to be procured using PLN's own procurement guidelines, with approach to national market, as there are enough contractors in the country for such works. Based on PLN's experience, there is sufficient capacity among contractors in the national market.

For the consultant services, the approach to the international market is envisaged.



**Table 4: Key Procurement Packages to be Financed and Their Status**

Package description	Status
Package 1: Main Civil Works - Lot A: Upper and Lower Dam and Lot B: Powerhouse and Underground Works)	Awarded under the previous Bank-financed UCPS project, and presently the contract is under suspension but not terminated. Negotiations between PLN and the contractor have concluded, the Minutes of Negotiations signed, and the CAA is to be signed, pending review by the BPKP. <b>Signing of the CAA for this contract will be critical to the overall Project implementation and timeline.</b>
Package 2: Electromechanical Equipment - Pump-Turbine, Generator-Motor and Auxiliary Equipment	Notification of award issued under the earlier UCPS project. Bid validity and bid security are still valid.
Package 3: 500 kV Transmission Line	Procurement to be initiated (fully financed by PLN)
Package 4: Hydraulic Metal Works	Contract signed but not made effective and performance guarantee submitted and kept valid. The advance payment guarantee submitted has expired.
Selection of a consultancy firm for Independent construction supervision	The contract amendment is expected to be signed around July 2021.
Selection of consultants for the detailed design and tender documents for the MPS project	This has been started under the ongoing PS TA project and the balance activities will be financed under this Project.
Selection of consultants for the detailed design and tender documents for Poko HPP	Procurement to be initiated. Terms of References (TORs) are under preparation.
Selection of consultant for preparation of a Java-Bali System Masterplan	Procurement to be initiated. TORs have been prepared and are under Bank's review.

99. The contracts already awarded under the original WB financing can be considered as Advance Procurement for possible financing under the proposed Project, subject to satisfactory resolution of the contractual issues and the Bank's prior review and provision of no-objection for any resulting contract amendments, which might require higher level review within the Bank based on the risks assessed.
100. Table 5 presents the risk mitigation measures as agreed with PLN.

**Table 5: Risks and Mitigations Measures**

Risks	Mitigation Measures
Conflicts between Bank Guidelines and PLN (and/or Government) Regulations including local content requirements	The PIM prepared and maintained by PLN will include adequate description of all procurement issues and mechanisms and processes to proactively resolve potential challenges. It will specify that procurement will follow the World Bank Procurement Regulations as will be specified in the Loan and Project Agreements. Changes to provisions related to



	procurement in the Manual will need to be reviewed and deemed acceptable by the Bank.
Complicated review procedures due to the high value of contracts	Detailed and realistic schedules of procurement activities to be prepared for monitoring and supervision.
Uncertainty over capacities of procurement committee members and the PIU	Competent and experienced staff will be designated for the procurement committees and PIUs. The Bank will provide training and experience-sharing will be provided for the committee members.
Delay in selection of an Independent Construction Supervision Consultant and related arrangements	Training and capacity strengthening will be provided to the procurement committees. Working procedures and requirements have been clarified in the PIM.
Delays in contract management and disputes	Dispute Boards will be appointed (as needed) before the contract effectiveness of all large value contracts. In addition, PLN will put a Standard Operating Procedure (SOP) for smooth implementation of variation orders and modifications in the PIM.

101. **Procurement Plan (PP):** A draft PP for the first 18 months of the project has been prepared by PLN, and received the WB's clearance, and published through the Systematic Tracking of Exchanges in Procurement (STEP) system. The PP will be updated annually, or as often as required, to reflect the Project implementation needs, improvements in institutional capacity, and adjustments in procurement risk. It will also be published on the website of the United Nations Development Business (UNDB) and on the Bank's external website. In implementing the procurement activities under the Project, PLN will use STEP to plan, record, and track procurement milestones. To be eligible for financing, all contracts shall be included in and procured in accordance with the PP, which defines the applicable procurement methods, estimated costs, prior review requirements, and timeframes.
102. **Frequency of Procurement Supervision.** During the first two years of implementation, there will be two supervision missions, including field visits. The frequency of procurement supervision, including special procurement supervision for post-reviews or audits, will be further defined after the first two years.

### C. Legal Operational Policies

	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Areas OP 7.60	No



#### **D. Environmental and Social**

103. **The E&S risk rating is high.**<sup>62</sup> The potential adverse impacts are wide-ranging, significant, long-term, permanent and irreversible. They include permanent changes to the hydrological regime and land use, extensive land acquisition and resettlement, direct and indirect impacts to highly modified but critical forest habitat, restrictions of access to natural resources, labor and labor influx risks, dam safety risk, occupational health and safety (OHS) and community health and safety risks from construction, community safety risks during operation of the pumped storage reservoirs, gender, sexual exploitation and abuse / sexual harassment (SEA/SH) risks from the influx of construction workers. Although the Project is not directly funding physical constructions and operations of MPS and Poko, potential E&S risks and impacts are expected to be significant and ESF compliance requirements will be considered in the detailed project design. Indigenous communities may be present in Poko project area.
104. The UCPS E&S impact assessment and mitigation planning was conducted in 2009-2011 for appraisal of the previous loan. Prior to cancellation in 2017, the physical progress was largely limited to the construction of the access road and implementation of the LARAPs. For this Project, the E&S assessment and plans have been reviewed and updated and additional plans prepared, in line with the socioeconomic development in the past decade, relevant government policy updates and the WB ESF.
105. The UCPS area of influence is highly modified forest and agroforestry habitat, which is critical habitat to the Critically Endangered Pangolin and Javan Slow Loris, Endangered Javan Gibbon, Grizzled Leaf Monkey, and Javan Leopard. The specific biodiversity mitigation measures to achieve net gain of critical habitat as outlined in the BMP and FPF would require technical expertise and engagement from Perhutani and the communities.
106. Discharges of sediment from construction activities will affect habitat in tributaries. Sediment from large earthworks within the Cirumamis and Cisokan Rivers will be captured by coffer dams and not discharged downstream. During filling, the Cisokan River flow will be affected for 3 – 5 months during the wet season (monthly average flows >15m<sup>3</sup>/s). The scheme will abstract a maximum of 6.21m<sup>3</sup>/s for filling, discharging the remainder to the river via the lower dam. The scheme will maintain sufficient water for the Cihea Irrigation Scheme 3km downstream. During operation, there will be minor changes to the hydrological regime in the Cirumamis and Cisokan Rivers since water is recycled in the scheme. Approximately 0.2m<sup>3</sup>/s will be retained to cover losses; all other flow will be passed through the dams. Changes to erosion and deposition patterns are expected downstream in the Cisokan River due to the reduced sediment load. The Cisokan River is modified habitat and there are no migratory species impacted, and therefore enabling fish passage is not necessary.
107. PLN prepared a dam safety package during the original WB-funded project including: i) Construction Supervision & Quality Assurance Plan, ii) Instrumentation Plan, iii) Preliminary Operation and Maintenance Plan (OMP), and iv) Broad Framework for Emergency Preparedness Plan (EPP). The final OMP and the EPP for dam safety will be prepared and submitted to the Bank and the PRP not less than 6 and 12 months prior to the initiation of reservoir filling.
108. Three LARAPs were prepared for the reservoir, access road and transmission line under the previous loan. The total number of households affected by land acquisition is 2,063, including 765 households who were to be

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<sup>62</sup> The full risks and proposed mitigation measures are documented at length in the ESRS.





resettled. Implementation of the three LARAPs continued after the cancellation of the previous loan. For the preparation of the new loan, PLN conducted a LARAP implementation completion review. As of February 2021, the project has acquired 721.92 ha of land, 98.65 percent of the total, largely completed compensation LARAP payment delivery and the implementation of the livelihood assistance activities planned under all three LARAPs. Nearly all relocating households have built new houses at their selected host resettlement sites and have moved into their new houses. The review indicates general satisfaction among the affected population regarding the LARAP implementation and their current livelihood status. The review also identified some outstanding tasks and issues that will need to be addressed: i) pending compensation for waqf land (land donated for religious purpose or public welfare), village land, and community land remaining above the inundation line and lands whose access will be affected after impoundment; ii) some households who have not moved from the reservoir area; and iii) delay in community infrastructure development at the host resettlement villages per the government policy. Resolution of these issues will require more time for investigation, planning and consultation with communities and local administration.

109. PLN has been working with local communities and governments to address these issues. PLN has agreed with the Bank to adopt a systematic effort to identify and address all such issues, including screening and identifying all such cases, determining their ownership and eligibility for compensation, reaching agreement on the rates and compensation package. A step-by-step strategy has been developed for the detailed planning to develop a time-bound action plan to complete all outstanding LARAP tasks. This has been reflected in the ESCP. The contractors may also need additional areas for construction operations, which could have new land acquisition impacts. An LARF has been developed to guide mitigation planning for such situations. The implementation of the BMP would have impacts upon communities' forest access and their livelihoods. To address this impact, an FPF was developed (in place of a process framework) and is being kept up to date.
110. UCPS is estimated to employ approximately 2,700 workers during the peak period of construction and there could be informal immigrants following the construction camps (estimated to be 4,500-6,000 at peak time). Risks with the large and diverse workforce relate to working conditions, OHS, child and forced labor, SEA/SH, possible conflicts with local communities, community health, safety, and security resulted from illicit behaviors of the construction workers. An LMP in the SCMP has described: (i) procedures relevant to each category of workers; (ii) overview of key labor risks; (iii) overview of Indonesia's labor legislation; (iv) grievance redress mechanism for project workers. The contractors will develop their C-ESMP in line with the LMP to manage their workforce.
111. Under the previous loan, several physical cultural resources, such as sacred graves, mosques, and family cemetery, were identified and a Physical Cultural Resources Management Plan was prepared in consultation and agreement with the communities who owned these assets. Some physical cultural resources have since been relocated, compensated, or protected. The updated CHMP includes a chance find procedure, mitigation measures and training programs.
112. There are potential indirect or downstream impacts for Component 3, mostly associated with subsequent physical investments. MPS is located in the Citanduy catchment, West Java, and is not connected to UCPS. The footprint is at the edge of the West Java Montane Rain Forest, a unique forest habitat and home to endangered species. Pumped storage will only create minor changes to river flow, but the erosion and sedimentation regimes will be changed, along with fish movement, due to the two dams.





113. A draft ESIA, ESMP, and CIA were prepared for Poko in 2019 under the WB's Operational Policies. Community consultations were held in the affected villages. The project is conventional hydropower scheme and will operate in cascade with the Bakaru Hydropower Scheme on the Mamasa River, Sulawesi. High environmental risks include a loss of critical forest habitat due to road access, river valley inundation and induced development, flow modifications affecting instream habitat & downstream irrigation systems and the dam creating a barrier to fish migration. Social impacts include resettlement, livelihood impacts, OHS risks from dam construction and health and safety risks from workers influx.
114. The ESIA has confirmed that there are no indigenous communities in the UCPS Project area as per the ESS7 definition. The Poko ESIA concluded that IP communities are present in project area. This issue is yet to be determined for MPS. Thus, ESS7 is relevant for Component 3.
115. PLN UIP will be the IA for UCPS. PLN UIP and PLN Headquarter (HQ) have worked on several WB projects and have experiences in managing the implementation of the ESMP, BMP, and LARAPs; and carrying out stakeholder consultations and supervision of C-ESMPs. They have also benefited from training on the ESF. Their overall capacity in E&S management for large complex projects requires substantial strengthening. The ESF is new to PLN, particularly with the increased emphasis on labor management and OHS. The supervision engineer will manage the contractor's compliance. The BMP and FPF are complex and will require specialist expertise and additional human resources. PLN UIP and UPK have small teams and will require additional human resources, in-house or through consultancy contracts, to manage the UCPS workload. The ESP and IESM Consultant will provide independent oversight and support.
116. PLN HQ will remain responsible for managing the E&S assessments for MPS and Poko, while the local UIPs for these projects (in Bandung & South Sulawesi) will support the field work and stakeholder consultations. PLN HQ and UIP have the capability to manage these processes but may require additional human resources to manage the workload. The ESP will provide independent oversight and support.
117. All safeguards instruments developed and implemented under the previous IBRD financing have been updated, and new instruments such as the Environment and Social Commitment Plan (ESCP) prepared, to align with the ESF. These instruments have been disclosed both in the World Bank WB Docs on February 28, 2021 and within PLN website on February 26, 2021. Updated documents have been redisclosed in the World Bank Image Bank on May 25, 2021 and within PLN website on May 21, 2021. The new E&S instruments and their planned implementation have taken into account new assessments of PLN's current E&S capacity, and the Appraisal Environmental and Social Review Summary (ESRS) has documented any gaps and mitigation measures.

#### **E. Climate Co-benefits**

118. The GHG emission reduction from UCPS will be based on: (i) the displacement of gas-based generation capacity that is currently required to meet peak demand, and (ii) VRE generation that can be absorbed avoiding the need for curtailment. In addition, the Project's climate co-benefits will also come from preparatory support to the development of MPS, which is another PS scheme with similar climate co-benefits to UCPS, and to the Poko hydropower project, which will provide a clean source of power generation. The Project's support to the preparation of the Java-Bali System Masterplan, which will help promote VRE penetration through improving the planning process that will guide future investments for a greener, more efficient, and more reliable electricity services, also constitute eligible mitigation activities.



## F. Gender

119. Currently, 54 percent of women participate in the labor force in Indonesia compared to 82 percent of men.<sup>63</sup> Only 12 percent of graduates with science, technology, engineering and mathematics (STEM) majors are women, and women constitute 12 percent of workers in the energy sector.<sup>64</sup> Addressing the gender imbalance would be an effective strategy to improve performance, as more gender-balanced teams are associated with productivity gains.<sup>65</sup> Increasing women in technical and leadership positions contributes to a more diverse workforce that fosters innovation<sup>66</sup> and access to public childcare has shown to increase women's employment in Indonesia.<sup>67</sup>
120. There are significantly more men than women working in PLN but hiring data in recent years show that there is consistently an increasing share of women being recruited into the company. Women represent 19 percent of staff, only 12 percent of middle management, and 7 percent of higher management. They account for 7 percent technical staff. Between 2016 and 2020, 24 percent women were recruited. In 2020 alone, women represent 30 percent of new recruits and 26 percent of entry-level technical staff. The company plans to keep overall female recruitment at a minimum of 30 percent over the next five years. Within UCPS PIU (also referred to as PLN Cisokan), 7 of the 17 staff are women, but only one woman works in a technical role, and current management consists of all men.
121. While PLN has started establishing policies to increase women's representation and support to female staff, implementation can further improve. The PLN head office issued the Day Care Official Note in 2010 to establish on-site day care (childcare services) and breastfeeding rooms for female staff with children. However, it has not been enforced consistently, as there is no breastfeeding room or on-site day care at the Cisokan project office.<sup>68</sup> PLN has issued a number of gender-related policies, such as a budget plan specifically for women's talent development and the formation of a gender focal point group for women. To create a safe working environment, PLN has also issued an Anti-Sexual Harassment Regulation, which includes protection for employees and non-employees. Mechanisms for dealing with sexual harassment including reporting, recovery support for victims, and imposition of sanctions are to be regulated by the Board of Directors. However, there is no indication of the existence of such implementing regulation yet. Finally, while PLN has targets to train at least 20 percent of all women employees on the energy transition, emerging technologies, new business development, and financial knowledge, it is unclear how the target was established; and if it is being met, no analysis has been undertaken to inform impact on promotion to technical and management positions.

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<sup>63</sup> Even though females achieve higher levels of educational attainment than males at all levels, according to World Bank Indonesia Country Gender Action Plan, 2019.

<sup>64</sup> PDB and National Labor Force Survey (SAKERNAS), 2017; The Ministry of Women Empowerment and Child Protection (MoWECP), and BPS, 2018

<sup>65</sup> McKinsey & Co. 2016. *'Women Matter – Time to accelerate – Ten years of insights into gender diversity'*.

<sup>66</sup> ESMAP, Getting to Gender Equality in Energy Infrastructure, <https://www.esmap.org/node/146269>

<sup>67</sup> EAP Gender Innovation Lab, 2019. Access to additional public preschool per 1,000 children raises the employment of mothers of eligible-aged children by 13 percent.

<sup>68</sup> The establishment of Baby Day Care is consistent with Law No. 36 of 2009 regarding Health, in which Article 128 paragraph (2) stipulates that mothers shall receive guarantees that during breastfeeding, the family, the government, local governments, and the community must fully support the mothers by providing time and special facilities. According to this Law, these special facilities shall also be provided at workplaces and public facilities.



122. Focus group discussions and informant interviews with female employees and HR suggest barriers to women's representation in technical and management positions are unclear. The HR strategy still appears to be geared towards recruiting men. PLN's 2019 Annual Reports and Talent Development documents respectively stated that "the composition of male employees is more than female employees solely because the majority of jobs in the company are in the field that require male employees" and "PLN is working in the technical industry, which is a male-dominated sector." Recent job descriptions used in the recruitment process mention preference for male employees. A number of studies have found that male-gendered words in job descriptions impact the willingness of women to apply.<sup>69 70</sup> In addition, gender-sensitive safety measures have not been implemented in PLN Cisokan: personal protective equipment sized for women are not generally available. Finally, female employees noted that more men are employed in divisions that are related to majors that are predominantly male, e.g., civil engineering and mechanical engineering. This is the same as the situation in PLN Cisokan, in which only one woman with a civil engineering background works on the site.
123. To address these gender gaps, the Project has committed to increasing the percentage of women in technical roles in PLN Cisokan from 5 to 20 percent. In addition, the following interventions could be supported by the Project:
- i. The Project will conduct an assessment of constraints in attracting, retaining, and promoting women to and in PLN, especially in technical and management positions.
  - ii. Based on these findings, PLN Cisokan will design interventions to address identified barriers to women's representation in technical and management positions. Examples of possible actions are: i) developing and funding implementation of an action plan for increasing women's recruitment, retention and promotion, especially in technical and management positions; (ii) integrating strategies to increase women's recruitment and promotion into human resource management (HRM), such as job descriptions encouraging female candidates; (iii) putting in place a mentoring program; (iv) supporting management and leadership training for high performing female staff; and (v) supporting an internship program for female STEM students.
  - iii. The Project will support PLN Cisokan to develop a workplace response to the risks and impacts of GBV and to women's security and safety concerns within the workplace. A workplace response to GBV may include: (i) development of a workplace policy that formalizes the support that can be provided to employees; (ii) training of a team within PLN Cisokan that can act as a first point of contact to affected employees, and organize the workplace response, including referral to professional services; and (iii) training provided to staff to ensure they are aware of the PLN GBV policy and which professional services are available if GBV is experienced at home or at the workplace. A gender-smart safety audit will assess how the workplace can best respond to safety issues from the different perspectives of male and female employees. It is expected that this process will identify safety and security obstacles, particularly to women's employment in technical roles. These might be in terms of safety equipment, site security (privacy, lighting, access), and facilities.
  - iv. PLN Cisokan will invest in basic and segregated sanitation facilities for both men and women and lactation room.

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<sup>69</sup> Gaucher and Friesen, Evidence that Gendered Wording in Job Advertisements Exists and Sustains Gender Inequality, 2011

<sup>70</sup> Reuben et al, The Emergency of Male Leadership in Competitive Environments, 2011



- v. PLN Cisokan will invest in on-site childcare services available to staff and implement quality standards that provide children with a safe, nurturing environment. The standards will be aligned with the national early childhood education standards under the Ministry of Education and Culture No. 146/2014 Regulation regarding the 2013 Curriculum on Early Childhood Education.
- vi. PLN Cisokan will document the actions from the pilot to draw lessons for implementation across PLN nationally.

124. The Project also examined the overall Project context for GBV and violence against children (VAC). Both West Java Province and the local regencies have a relatively high rate of violence against women and children according to publicly available data. The number of child marriages in the project area is quite high. Project activities and the influx of people, including Project workers and informal migrants, could exacerbate the situation and increase GBV and VAC risks. Based on the above analysis, PLN has developed a GBV action plan to manage the identified risks of GBV and VAC. The mitigation actions include establishment of GBV and VAC complaint team, GBV-sensitive approach in GRM, clear GBV requirements in the C-ESMPs and bidding documents, clear code of conduct in contractual arrangement, hiring a qualified GBV service provider, and a clear referral mechanism to respond to GBV cases, staff training, and community awareness raising. The GAP and GBV action plan will also propose their respective implementation arrangements.

## **G. Citizen Engagement**

125. Stakeholder engagement under UCPS started in 2009 under the previous loan and continued at different stages of the project in the past decade. Stakeholder engagement and public consultations were carried out for the ESIA and mitigation planning and continued through their implementation under the previous loan. All E&S documents were publicly disclosed prior to the appraisal of the original Bank financing. In the preparation of the proposed Project, PLN carried out extensive stakeholder consultations to inform them of the project planning status and collect their feedback for the updating and development of Project E&S plans. These consultations were conducted through partly face-to-face meetings and partly virtually during the COVID-19 pandemic. The key stakeholders consulted included governments of West Java Province, Bandung Barat and Cianjur Regencies, village officials, Perhutani, as well as the affected population, community leaders, teachers and students, CSOs, and universities.
126. The Project will continue stakeholder engagement throughout its implementation period. PLN has developed a SEP and a GRM. The SEP documents early consultations, provides an analysis of the stakeholders, describes various means of information disclosure and methods of stakeholder engagement, as well as its program to continue stakeholder consultation through the project implementation. The SEP is part of the SCMP and has been disclosed, and will be updated, as necessary, throughout the Project implementation. The Project has instituted two GRMs: one for the Project and one for the Project workers specifically.<sup>71</sup> To meet the citizen engagement requirement, the Project has committed to tracking “the share of grievances received that are processed within the stipulated service standards,” which will be part of the Results Framework.

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<sup>71</sup> An SEP was prepared for Matenggeng under the Operational Policies in 2017, but only some public meetings were held before the ESIA consultant's contract expired. The SEP will be updated and implemented under the current PSTA Project when the new ESIA consultant is engaged, along with a site-specific GRM. An SEP was prepared and implemented for the draft Poko ESIA, ESMP and CIA studies in 2018-2019. A number of community meetings, focus groups, and key stakeholder meetings were held during this time. An updated SEP will be prepared as part of the ESIA, ESMP and CIA updates under Component 3.



## V. GRIEVANCE REDRESS SERVICES

127. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit <http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service>. For information on how to submit complaints to the World Bank Inspection Panel, please visit [www.inspectionpanel.org](http://www.inspectionpanel.org).

## VI. KEY RISKS

128. **The overall risk associated with the Project is assessed to be high.** All risks below, except the Environment and Social risk, are rated for residual risks after mitigation measures. The E&S risk is rated as high. Substantial risks are: (i) macroeconomic risk, (ii) sector strategies and policies, (iii) institutional capacity for implementation and sustainability, and (iv) fiduciary. Measures to mitigate these risks are outlined below. The potential benefits of the proposed Project outweigh the residual risks and warrant IBRD's assistance.
129. **Macroeconomic risk is substantial with the negative economic effects of COVID and will increase with the duration of the outbreak.** As with most other countries, the pandemic has unleashed an unprecedented economic impact on Indonesia through both domestic and external channels. Given the severity of the fallout, there is a risk that reforms are delayed as Government refocuses its efforts and resources to cushion the negative economic effects of the infection on the economy and the population. Because of the economic growth slowdown, tax revenue growth will also weaken while expenditures will temporarily balloon, posing some risks to fiscal sustainability. The financing of the wider deficit will weigh on fiscal debt sustainability in the medium term. These risks will increase with the duration of the outbreak, which is still evolving locally and globally. The CPF to be approved soon will provide a framework to engage with the Government on macro-fiscal issues and on capacity enhancement programs aimed to support continued fiscal reforms momentum that will further mitigate fiscal risk.
130. **Sector Strategies and Policies risk is substantial.** The Government, specifically MEMR, is finalizing a Presidential Regulation that would revise the RE policy framework with a new remuneration scheme, fiscal support for a viability gap fund for RE projects, and other measures to improve the investment climate in the sector. With the COVID-19 pandemic and tightening fiscal space, priorities may change that would affect the timing of the introduction of such an important regulation and the pace of other urgently needed reforms in the sector. The WB has been supporting the Government in developing the Vision and Pathways papers that will set the direction for the sector development in the immediate, medium, and long terms. Such papers will take into account the demand projections, fiscal, and financial support to the energy sector and necessary reforms in the sector to support growth.



131. **Technical Design of Project risk was substantial but is moderate after mitigation.** This will be the first hydropower PS in Indonesia. While it is a proven technology worldwide, it will be the first time PLN manages a PS scheme. The technical design of the project has been reviewed extensively under the existing Pumped Storage Technical Assistance (PS TA) Project (P112158) by the PRP consisting of world-leading experts on a full range of issues pertinent to the development and operation of a PS, such as rock mechanics and geotechnical engineering, engineering geology, RCC dam and construction materials, seismic structural design, electro-mechanical equipment, hydraulic metal works, and environmental and social management. The Project will further provide TA to support PLN in efficiently managing the various risks, e.g., geological and dam safety, during construction, and planning for operation and maintenance for the UCPS, including but not limited to, knowledge transfer and on-the-job learning from PRP. The Project's support to the preparation of an OMP, including an optimal O&M model, and EPP will guide PLN in preparing early on for O&M and emergency situations. In addition, the engineering consultant and the PRP/dam safety experts are expected to be in place with sufficient capacity and the outstanding technical issues are expected to be finalized and confirmed by PRP in time.
132. **Institutional Capacity for Implementation and Sustainability risk is substantial.** PLN had been in compliance with WB requirements during the implementation of the original Bank financed UCPS project prior to the loan cancellation, in spite of its internal procedures that caused significant delays. PLN's capacity in contract management and managing contract interface risk will be ameliorated by the support from an international and competent engineer, as well as expertise from PRP and ESP. PLN has expressed commitment to backstop internal capacity gap with expert consultants to carry out the relevant activities as identified and agreed with the Bank team to meet the Bank's requirement for project readiness and for financing.
133. *Fiduciary:* The fiduciary risk is "substantial", with financial management risk rated as "moderate" and procurement risk rated as "substantial."
134. The FM assessment, which was carried in accordance with the applicable policies and procedures, concluded that risk is rated "moderate" because it is mainly due to (i) possible delay of SLA budget availability, and (ii) lengthy payment process. Both factors may delay payments to contractors and therefore delay implementation. To mitigate the risks, PMO will get information from PIUs and maintain a list of all commitments made (contract signed) and payments schedule to ensure adequate SLA budget allocation to cover Project activities. The information regarding the commitments made and estimate contracts payment schedule will be included as part of IFR. PIUs needs to ensure payment requests are submitted with complete supporting documentation. Payment recommendations (*Nota Dinas*) should be released in a timely manner. The PIM will define payment process and responsibilities of each division/unit, include supporting documents requirements, and set a standard time for payment process internally.
135. The Procurement residual risk, after mitigation measures, is rated as "Substantial". Before mitigation the risk was considered high due to the fact that the approach to go with the same contractors who were awarded contracts under the original WB financing was still to be confirmed. This approach has now been agreed and is considered as the most fit-for-purpose approach for the Project. The risk remains substantial as while there has been major progress in PLN's negotiations with the dam and civil works contractor, there remains some uncertainty with its satisfactory conclusion to be signified by the approval of the Indonesian authority and deemed acceptable to the WB, as well as agreement with the contractors/suppliers for the remaining packages.





136. The Bank team carried out a detailed procurement assessment of the implementing agency, PLN, the procurement risks were identified, and appropriate remedial measures proposed. Procurement of Goods, Works, Non-Consulting and Consulting Services under the proposed project will be in accordance with the World Bank's Procurement Regulations for IPF Borrowers, November 2020. This also applies to the existing contracts already awarded under UCPS project, which could be considered as Advance Procurement for possible financing under the proposed Project subject to satisfactory resolution of the contractual issues and the Bank's prior review and no-objection of any resulting revised contracts/amendments, which might require higher level review within the Bank. A PPSD has been prepared by PLN, which forms the basis for the preparation of the PP for the contract packages that remain to be procured under the Project. The PPSD also identifies the risks and sets out mitigation measures and Key Performance Indicators for contract implementation, including for the existing contracts awarded under the original UCPS project. The scope of the PPSD and procurement plan shall be updated in case the outcome of the discussions between PLN and the contractors and resolution of the contractual issues under the awarded existing contracts are not satisfactory.
137. *Environmental and Social:* The E&S risk is "high". The potential E&S risks of construction and operation of the UCPS under Component 1 and 2 are wide-ranging, significant, adverse, long-term, permanent, and irreversible. Key direct impacts include permanent changes to the hydrological regime and land use, land acquisition and resettlement impacts, restrictions of access to natural resources, labor and labor influx risk including GBV and VAC, occupational and community health and safety. The area to be affected is of high value and high sensitivity with key species of conservation concern. PLN will receive capacity building support to substantially strengthen its existing E&S setup and its capacity for implementation. This will be achieved through the implementation of a Stakeholder Engagement Plan (SEP) and the establishment of an ES Panel of Experts with the role of supporting the PLN to manage the ES risks.
138. With regards to the scale and nature of the UCPS, there are potential significant adverse impacts on modified habitats, which are home to at least ten key species of conservation concerns identified in the project area including a critically endangered species, e.g., Javan Slow Loris. Potential impacts also include downstream river impacts where discharges of sediment from construction activities will affect water quality and stream bed patterns. During inundation, the hydrological regime in the Cirumamis and Cisokan Rivers will be affected albeit temporarily; while during operation, there will be minor changes to the hydrological regime downstream of the two dams. Changes to erosion and deposition patterns are expected downstream in the Cisokan River, due to the reduced sediment load. The construction of the dams and its ancillary infrastructure will also entail potentially significant negative impacts on the Cihea irrigation scheme, environmental flows, bird collusion and electrocution due to the transmission lines. Communities may also be adversely affected by sediment runoff, fugitive dust, increased noise, increased traffic, pedestrian, and road safety risks, SEA/SH risks from influx of workers, and increased wastes from construction camps.
139. Although the Project is not directly funding physical constructions and operations of the MPS, there would also be potential indirect E&S risks and impacts or downstream implications, as the Project includes support for the development of detail design and tender documents. With regards to the downstream implications (potential loss of habitat and productive agricultural land, resettlement of people, changes to community structure and livelihoods and potential long term induced development into the forest of the Pembarisan Range), the Project will support to the appropriate degree the preparation of E&S instruments compliant to the ESF for subsequent investments.



140. Furthermore, the Project supports the preparation of the Poko hydropower project, which will have high E&S risks at the development phase, including resettlement, livelihood, construction-related risks, loss of critical forest habitat, and modifications to the Mamasa River flow and habitat between the Poko dam and the downstream of the Bakaru hydropower scheme. Indigenous people may also be affected by the development of Poko hydropower plant.
141. Overall, the potential environmental impacts from UCPS, MPS, and Poko are considered to be wide-ranging, significant, adverse, long-term, permanent, and irreversible with permanent changes to the hydrological regime. The area likely to be affected is of high value and high sensitivity with the presence of endangered and vulnerable species. The specific mitigation measures provided in the BMP will require complex and specific expertise for its implementation. Per the ESF, the environmental risk is classified as high.
142. The total number of households affected by land acquisition for UPCS is 2,063, including 765 households who were physically resettled. The LARAP has been under implementation since the old loan and continued on despite the loan cancellation. For the preparation of the new loan, PLN conducted a LARAP implementation completion review. The review identified some outstanding tasks and issues that need to be addressed during Project implementation, including pending compensation for individual and community land, relocation of the households who have not moved from the reservoir area, and delay in community infrastructure development at new resettlement sites. PLN has agreed to start planning and develop a time-bound action plan to complete all outstanding LARAP tasks. The contractor may need more lands during its construction operations.
143. The UCPS project is estimated to employ approximately 2,700 workers during the peak period of construction. There will be large number of informal immigrants following the construction camps into the project areas. Risks associated with the large and diverse workforce are related to working conditions, occupational health and safety, child labor, GBV, and conflict issues.
144. Some cultural assets were identified in the project area, including grave, mosques, and sacred sites. The project has relocated the graves and rebuilt the mosques under the LARAP, while the sacred area is protected by adjusting project design. During the construction phase, there is a likelihood to chance into other cultural assets and properties. The procedure to handle this has been prepared in the Chance Find Procedure and included in the CHMP that will be implemented under the Project.
145. *Other:* There is a moderate risk related to the delayed availability of AIIB Co-Financing, which is expected to materialize by October/November 2021. The team is mitigating this risk by including a dated covenant on March 1, 2022, whereby if AIIB does not materialize, the Bank will – in discussion with the client – seek another co-financier (or provide Additional Financing).





## VII. RESULTS FRAMEWORK AND MONITORING

### Results Framework

COUNTRY: Indonesia

### Development of Pumped Storage Hydropower in Java Bali System Project

#### Project Development Objectives(s)

The objective of the Project is to support Indonesia's energy transition and decarbonization goal by: (i) developing the first large-scale pumped storage hydropower to improve power generation peaking and storage capacity of the Java-Bali grid; and (ii) strengthening PLN's capacity for hydropower development and management.

#### Project Development Objective Indicators

Indicator Name	PBC	Baseline	Intermediate Targets						End Target
			1	2	3	4	5	6	
Improve system flexibility by adding peaking and storage capacity for VRE integration on Java-Bali									
Peaking capacity added to the Java-Bali grid from the UCPS (Megawatt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,040.00
Power storage capacity added to the Java-Bali grid from the UCPS (GWh) (Gigawatt-hour (GWh))		0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,478.70
(iii) reduction of the GHG emission enabled by the UCPS by 2040 (MtCO2e) (Number)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.30



Indicator Name	PBC	Baseline	Intermediate Targets						End Target
			1	2	3	4	5	6	
Strengthen PLN’s capacity in hydropower development									
Completion of the Java-Bali System Master Plan (Text)		Java-Bali System Master Plan not yet prepared	Java-Bali System Master Plan under preparation	Java-Bali System Master Plan under preparation	Java-Bali System Master Plan completed	Java-Bali System Master Plan completed	Java-Bali System Master Plan completed	Java-Bali System Master Plan completed	Java-Bali System Master Plan completed
Satisfactory implementation of the Environmental and Social Management Plan (ESMP) for the UCPS (Text)		ESMP not yet implemented	Satisfactory implementation of ESMP	Satisfactory implementation of ESMP	Satisfactory implementation of ESMP	Satisfactory implementation of ESMP	Satisfactory implementation of ESMP	Satisfactory implementation of ESMP	Satisfactory implementation of ESMP
Preparation of Operation and Maintenance Plan (OMP) for the UCPS (Text)		OMP not yet prepared	OMP not yet prepared	OMP not yet prepared	OMP not yet prepared	OMP not yet prepared	OMP has been prepared	OMP has been prepared	OMP has been prepared
Satisfactory implementation of the Operation and Maintenance Plan (OMP) (Text)		OMP not yet in place	OMP not yet in place	OMP not yet in place	OMP not yet in place	OMP not yet in place	OMP not yet in place	OMP has been satisfactorily implemented	OMP has been satisfactorily implemented

### Intermediate Results Indicators by Components

Indicator Name	PBC	Baseline	Intermediate Targets						End Target
			1	2	3	4	5	6	
Development of the Upper Cisokan Pumped Storage Hydropower Plant in the Java Bali System									
Construction of UCPS civil works (Percentage)		0.00	10.00	25.00	60.00	90.00	100.00	100.00	100.00



Indicator Name	PBC	Baseline	Intermediate Targets						End Target
			1	2	3	4	5	6	
Supply, erection and commissioning of equipment (Percentage)		0.00	10.00	30.00	70.00	90.00	100.00	100.00	100.00
Construction of the transmission line (Percentage)		0.00	0.00	0.00	30.00	60.00	100.00	100.00	100.00
Preparation of Emergency Preparedness Plan (EPP) (Text)		An EPP up to international standard one year before commissioning	EPP has not yet been prepared	EPP has not yet been prepared	EPP has not yet been prepared	EPP has not yet been prepared	EPP has been prepared	EPP has been prepared	EPP has been prepared
Preparation of an Reservoir Impoundment Plan (RIP) (Text)		RIP has not yet been prepared	RIP has not been prepared	RIP has been prepared	RIP has not been prepared	RIP has been prepared	RIP has been prepared	RIP has been prepared	RIP has been prepared
Trial run results of the UCPS meeting PLN's performance targets (Text)		Trial run results not yet started	Trial run results not yet started	Trial run results not yet started	Trial run results not yet started	Trial run results not yet started	Trial run results of the UCPS completed and meeting PLN's performance targets	Trial run results of the UCPS completed and meeting PLN's performance targets	Trial run results of the UCPS completed and meeting PLN's performance targets
Labor-related grievances registered under the Project grievance redress mechanism (Percentage)		0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Labor-related grievances registered under the Project grievance redress mechanism and addressed/resolved within the stipulated service standards for response time		0.00	0.00	80.00	80.00	80.00	100.00	100.00	100.00



Indicator Name	PBC	Baseline	Intermediate Targets						End Target
			1	2	3	4	5	6	
(Percentage)									
<b>Environmental and Social Impact Management</b>									
Project-related grievances registered under the Project grievance redress mechanism and addressed (Percentage)		0.00	0.00	90.00	90.00	90.00	100.00	100.00	100.00
<b>Technical Assistance and Capacity Building</b>									
Matenggeng Detailed Design and Tender Documents have been completed (Yes/No)		No	No	No	Yes	Yes	Yes	Yes	Yes
Matenggeng ESIA and LARAP have been completed (Yes/No)		No	No	No	Yes	Yes	Yes	Yes	Yes
Poko Detailed Design and Tender Documents have been completed (Yes/No)		No	No	No	No	Yes	Yes	Yes	Yes
Women in technical roles in PLN Cisokan (Percentage)		5.00	10.00	10.00	15.00	15.00	15.00	10.00	20.00



**Monitoring & Evaluation Plan: PDO Indicators**

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
Peaking capacity added to the Java-Bali grid from the UCPS	Capacity addition as verified by the commissioning date and formally reported by PLN Pusat	Bi-annually	UCPS PIU	PLN progress reports based on contractors' report	UCPS PIU
Power storage capacity added to the Java-Bali grid from the UCPS (GWh)	Annual storage volume based on an assumed daily peak generation of 4,500-6,700 MWh, and 90% percent reservoir to allow for 10% non-filling/down time.	Bi-annually	UCPS PIU	PLN progress reports based on contractors' report	UCPS PIU
(iii) reduction of the GHG emission enabled by the UCPS by 2040 (MtCO <sub>2</sub> e)	GHG emission reduction based on estimated 40GW additional VRE (solar) deployment in the Java-Bali system and curtailment avoided thanks to UCPS	Bi-annually	UCPS PIU	PLN progress reports based on contractors' report	UCPS PIU
Completion of the Java-Bali System Master Plan	Java-Bali System Master Plan aimed to guide future planning and investments has been approved by PLN and WB	Bi-annually	PIC under System Planning Directorate	PLN progress reports	PIC under System Planning Directorate
Satisfactory implementation of the Environmental and Social Management Plan (ESMP) for the UCPS	Implementation of ESMP in line with WB ESF	Bi-annually	UCPS PIU	PLN progress reports	UCPS PIU



Preparation of Operation and Maintenance Plan (OMP) for the UCPS	An OMP for a pumped storage project up to international standard to be prepared six months before commissioning	Bi-annually	UCPS PIU	PLN progress reports	UCPS PIU
Satisfactory implementation of the Operation and Maintenance Plan (OMP)	Staffing, resource, and organizational procedure in place to implement the OMP	Bi-annually	PLN progress reports	UCPS PIU	

#### Monitoring & Evaluation Plan: Intermediate Results Indicators

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
Construction of UCPS civil works	Work progress on construction of the dam as reported by the contractor/supervision engineer	Bi-annually	UCPS PIU	PLN progress reports based on contractor's reporting	UCPS PIU
Supply, erection and commissioning of equipment	Work progress of works reported by the equipment suppliers/supervision engineer	Bi-annually	UCPS PIU	PLN progress reports based on contractor's reporting	UCPS PIU
Construction of the transmission line	Work progress on construction of the transmission line as reported by the contractor/supervision engineer	Bi-annually	UCPS PIU	PLN progress reports based on contractor's reporting	UCPS PIU
Preparation of Emergency Preparedness Plan (EPP)	An EPP up to international standard one year before	Bi-annually	UCPS PIU	PLN progress reports	UCPS PIU



	commissioning				
Preparation of an Reservoir Impoundment Plan (RIP)	An Impoundment Plan up to international standard two years before first impoundment	Bi-annually	UCPS PIU	PLN progress reports	UCPS PIU
Trial run results of the UCPS meeting PLN's performance targets	Trial run results verified by the supervision engineer	Bi-annually	UCPS PIU	PLN progress reports based on engineer's reporting	UCPS PIU
Labor-related grievances registered under the Project grievance redress mechanism	Grievances registered	Bi-annually	PLN progress reports	UCPS PIU	UCPS PIU
Labor-related grievances registered under the Project grievance redress mechanism and addressed/resolved within the stipulated service standards for response time	Grievances registered and addressed	Bi-annually	UCPS PIU	PLN progress reports	UCPS PIU
Project-related grievances registered under the Project grievance redress mechanism and addressed	Grievances registered and addressed	Bi-annually	UCPS PIU	PLN progress reports	UCPS PIU
Matenggeng Detailed Design and Tender Documents have been completed	Design and tender documents prepared by consultants and approved by PRP, PLN and WB	Bi-annually	TA PIU	PLN progress reports, based on consultants' reporting	TA PIU
Matenggeng ESIA and LARAP have been completed	E&S documents prepared by consultants and approved by PRP/ESP, PLN and WB	Bi-annually	TA PIU	PLN progress reports based on consultants' reporting	TA PIU
Poko Detailed Design and Tender Documents have been completed	Design and tender documents prepared by consultants and approved	Bi-annually	TA PIU	PLN progress reports based on consultants' reporting	TA PIU



	by PRP, PLN and WB				
Women in technical roles in PLN Cisokan	Currently, 10 in 17 PLN Cisokan staff are female, but only one is in a technical role. This seeks to encourage more female technical staff being assigned to PLN Cisokan (up to 4).	Bi-annually	UCPS PIU	PLN progress reports	UCPS PIU





## **ANNEX 1: Implementation Arrangements and Support Plan**

**COUNTRY: Indonesia**

### **Development of Pumped Storage Hydropower in Java Bali System Project**

#### **I. Implementation Arrangements**

1. The Bank Team will be comprised of members primarily based in the Jakarta Office including Task Team Leaders, but also in Washington D.C., Singapore, New Zealand, and other regional country offices to ensure efficient and effective implementation support to the client. Timely monitoring and support to PLN will be provided by the team members throughout the Project implementation period, but especially in the first 18 months to help PLN put in place the staff resourcing and necessary consultancies to fill all identified gaps. Formal supervision and field trips will be carried out bi-annually or as often as needed for smooth implementation of the Project.
2. As the impacts of COVID-19 on face-to-face meetings and field-based visits remain uncertain in the coming year, virtual missions will be carried out with the potential use of drones for supervision of works and to support virtual site visits. The team will discuss with PLN and the supervision engineer on ways to start work and supervision taking into account the ongoing COVID-19 related constraints.
3. The primary responsibility for this support lies with the Task Team Leader (TTL) with key inputs from specialized Bank experts. Evaluation of the results indicators and focus on identified risk mitigation measures will be part of the regular supervision missions. Detailed inputs from the Bank Team are outlined below:
  - (i) **Technical inputs.** In addition to regular support from Bank's hydropower experts, the team will retain a hydropower engineer consultant to provide technical inputs in reviewing the bidding documents, reviewing the construction quarterly-progress reports from the ICSC, and reports from the PRP. The team will also review progress reports from PLN, anticipate potential implementation or contractual challenges, and proactively propose solutions to the client in a timely manner. During construction and commissioning, technical supervision is required to ensure contractual obligations are met on technical grounds. As necessary, field visits by the team's dam, hydraulic, and E&M engineers would be conducted at minima on a bi-annual basis throughout Project implementation.
  - (ii) **Safeguards.** A substantial team of E&S specialists of high caliber and experience has been dedicated to the Project. They will be supported by additional E&S expert consultants with knowledge of specialized areas, such as biodiversity, integrated catchment management, and livelihood programs, in advising the client and provide just-in-time reviews on any implementation issues related to the various E&S plans. Field visits are expected to take place bi-annually.
  - (iii) **Financial Management.** FM supervision will be consistent with a risk-based approach. The FM Specialist is based in Jakarta. The supervision intensity is based initially on the assessed FM risk rating and subsequently on the updated FM risk rating during implementation. Given the substantial residual risk rating, on-site supervision will be carried out at least once a year. On-site review will cover all aspects of FM, including internal control systems, the overall fiduciary control environment, tracing transactions from the bidding process to disbursements as well as statement of expenses review. Supervision activities will also include desk review of semester IFRs, quarterly internal audit



reports, audited Annual Financial Statements and management letters and timely follow-up of issues that arise, and updating the FM rating in the Implementation Status and Results Report and the Financial Management (FM) system. Additional target reviews may be conducted depending on emerging risks. The Bank's project team will support in monitoring the timely implementation of the action plan. Detailed FM reviews will also be carried out regularly, either within the regular proposed supervision plan or more frequently if needed, to ensure that expenditures incurred by the Project remain eligible. Regular reporting arrangement and supervision plan will also ensure that the implementation of the Project is closely monitored and that appropriate remedial actions are taken expeditiously.

- (iv) **Procurement.** The procurement specialist is based in Jakarta. In addition to the prior review supervision to be carried out by the Bank, the capacity assessment of the implementing agency has recommended that the Bank carry out supervision missions at least once a year to review procurement actions. These post-procurement reviews should cover at least 20 percent of the contracts that are subject to post-review. PLN has implemented many WB projects, and is familiar with Bank requirements related to procurement. The team is however available to help PLN identify capacity building needs to strengthen procurement management efficiency and contract management expertise.

## II. Support plan

4. The implementation support plan and staff skills mix are summarized in Table A1.1 and Table A1.2, respectively.

**Table A1.1:** Implementation Support Plan

Time	Focus	Resource Estimate	Staff Weeks
First Two Years of the Project	Technical review, procurement review, site review, bidding documents	Hydropower specialist	6
	Procurement and FM review	Procurement and FM Specialists	6
	Social safeguards supervision	Social Specialist/ RAP Specialist	13
	Environmental safeguards supervision	Environmental Specialist	14
	Project Management and Task Leadership	Task Team Leaders	15
Year 3 till completion	Construction supervision	Sedimentation management	2
		Dam safety	4
		Procurement and Contract management	4
	Environmental and social monitoring	Environmental Specialist	14
		Social Specialist	13
	FM, disbursement and reporting	FM Specialist, Disbursement Specialist	4
	Capacity building for PLN	Hydropower/Energy Specialist	4
	Project Management and Task Leadership	Task Team Leaders	15

**Table A1.2:** Requisite Staff Skills

Skills Needed	Staff Weeks (SW)	Number of Trips	Comments
Hydropower Engineer	4 SWs annually	Field trips as required	International
Dam Safety Expert	3 SWs annually	Field trips as required	International



Sedimentation Expert	3 SWs annually	Field trips as required	International
Procurement Specialist	4 SWs annually	Field trips as required	International, Country Office (CO)-based
Social Specialists (x3)	9 SWs annually	Field trips as required	CO based
Social Specialist	4 SWS annually	Field trips as required	International
Environmental Specialists (x2)	8 SWs annually	Field trips as required	CO based
Environmental Specialist	6 SWs annually	Field trips as required	International / Regional
Financial Management Specialist	4 SWs annually	Field trips as required	CO based
Task Team Leaders (x3)	5 SWs annually	Field trips as required	International/CO based



## ANNEX 2: Specific Project Design Analysis

### A. A Snapshot of Indonesia Power Sector

Indicator	Value
Population (million, 2017)	270.2
(% of which urban)	56.7%
GNI per capita	4,050
Income Group	High-Middle Income
Electricity access rate (% of population 2017)	98.89%
Per capita electricity consumption (KWh)	1,084 kWh
Installed capacity (MW)	69,678
of which: <i>Coal</i>	46.9 %
<i>Gas</i>	31.47 %
<i>Hydro</i>	7.98 %
<i>Other RE</i>	6.8 %
<b>RISE Scores out of 100</b>	<b>2017</b>
Overall	49
Energy Access	68
Energy Efficiency	28
Renewable Energy	54

Indicator		Value
Power Sector Reform	Regulator	No
	Restructuring	Vertically integrated with private participation as IPP in generation.
	Competition /Liberalization	Single Buyer
	Private Sector Participation	Generation only
Operational and Financial Efficiency	Average generation efficiency of power generation	~ 26%
	Collection rate	97%
	Total losses	9.41%
	Reliability of supply - SAIFI	11.51 (2019)
	Cost recovery levels	77%
	Large government transfers	Yes

### B. Key Design Features of the UCPS

- The key features of the UCPS are as follows.

(1)	Plant data	
	Description	Design Value
	Rated Installed Capacity (MW)	1,040 (260 MW x 4 units)
	Average Cycle Capacity (MW)	1,030 (257.5 MW x 4 units)
	Maximum Input (MW)	1,100 (275 MW x 4 units)
	Max. Turbine Discharge (m <sup>3</sup> /s)	108 per unit
	Maximum Gross Head (m)	301.5
	Minimum Gross Head (m)	278
	Loss Head, Generation (m)	10



	Rated Net Head, Generation (m)	276	
	Generation Duration (hrs)	6.5 hours, daily	
	Pumping Duration (hrs)	8.25 hours, daily	
<b>(2)</b>	<b>Reservoir Scale and Hydrology</b>	Upper Reservoir	Lower Reservoir
	Catchment's Area (km <sup>2</sup> )	10.5	355.0
	Reservoir Surface Area at HWL (km <sup>2</sup> )	0.8	2.6
	H.W.L. (m)	796.5	499.5
	L.W.L. (m)	777.5	495
	Effective Depth (m)	19	4.5
	Active Storage (10 <sup>6</sup> m <sup>3</sup> )	10	10
	Average River Discharge (m <sup>3</sup> /s)	0.4	14.9
	Design Flood (1:10000) (m <sup>3</sup> /s)	230	1,100
<b>(3)</b>	<b>Main Civil Structures</b>		
1)	<b>Dam</b>	Upper Dam	Lower Dam
	Type	Concrete Gravity (RRC)	Concrete Gravity (RRC)
	Height (m)	75.5	98
	Crest Length (m)	375	294
	Elevation of Crest (m)	800.5	503
	Volume of Dam Body (m <sup>3</sup> )	350,000	490,000
2)	<b>Spillway</b>		
	Type	Centre Overflow	Centre Overflow
	Discharge Capacity (m <sup>3</sup> /s)	230	1,100
	Gate Type	No Gate	Radial Gates
	Height x Width (m)	-	12.2 x 10.0
	Number	-	2
3)	<b>Intake</b>		
	Type	Side Intake	
	Gate	Steel Wheeled-type gate	
	Number	2	
4)	<b>Headrace Tunnel</b>		
	Length (m)	Approx. 1,220 m (No.1), 1,160 m (No.2)	
	Cross Section	Circular Section with inside diameter 7.4 m	
	Number	2	
5)	<b>Surge Tank</b>		
	Type	Restricted orifice type with upper chamber	
	Inside Diameter (m)	15.0 m (shaft)	
	Height (m)	78 m	
	Number	2	
6)	<b>Penstock</b>		
	Type	Embedded Steel Pipe	
	Length (m)	475 ~ 530	
	Inside Diameter (m)	5.9 ~ 4.17 ~ 3.1	
	Thickness (mm)	20 ~ 52	
	Number	2 (I.D. = 5.90 m), 4 (I.D. = 4.17 ~ 3.1 m)	



7)	<b>Underground Powerhouse</b>	
	Cavern Section Type	Bullet Shape
	Height (m)	51.15
	Max. Width (m)	26.0
	Length (m)	156.6
8)	<b>Tailrace Tunnel</b>	
	Length (m)	Approx. 270m (No. 1), 240m (No.2), 210m (No. 3), 190 m (No.4)
	Cross- Section Number	Circular Section With Inside Diameter 5.2 m 4
9)	<b>Outlet</b>	
	Type	Side Outlet
	Gate	Steel Wheeled-type gate
	Number	4
(4)	<b>Electro-Mechanical Equipment</b>	
1)	<b>Pump Turbine</b>	
	Type	Vertical, single stage Francis type reversible
	Rated Net Head/ Min Pump Head (m)	276 / 280
	Max. Turbine Discharge / Max. Pump Discharge (m <sup>3</sup> /s)	108 / 91.8
	Rated Out Turbine Shaft Output/ Max. Pump Input (MW)	269/275
	Rated Speed (rpm)	300
	Number of Units	4
2)	<b>Generator-Motor</b>	
	Type	Vertical Shaft, 3-Phase AC synchronous
	Rated Generator Output (MVA)	300
	Motor Input (MW)	285
	Rated Voltage (kV)	18
	Rated Power Factor	0.9 lagging
	Rated Frequency (Hz)	50
	Rated Speed (rpm)	300
	Number of Units	4
3)	<b>Generator Transformer</b>	
	Type	3-Phase Oil Immersed underground
	Rated Power (MVA)	300
	Rated Frequency (Hz)	50
	Rated Voltage	
	LV Winding (kV)	18 (Generator Motor Voltage)
	HV Winding (kV)	500
4)	<b>Switchyard</b>	
	Type	Outdoor (AIS) Breaker and Half
	Rated Voltage (kV)	500
	Number of Feeders	4



<b>(5)</b>	<b>Transmission Lines</b>	
1)	To Saguling – Cibinong Line	
	Voltage	500 kV
	Length	16 km
2)	To Tasik- Depok Line	
	Voltage	500 kV
	Length	16 km
<b>(6)</b>	<b>Preparatory Work</b>	
1)	<b>Land Acquisition</b>	
	Upper Reservoir	105 ha
	Lower reservoir	356 Ha
	Disposal Area	79 Ha
	Access road:	-
	a) existing road (6.7 km)	-
	b) New road (27.4 m)	107 Ha
	Transmission lines (31 km)	105 Ha
	Base camp	-
	Resettlement Area	40 Ha
2)	<b>Access Road</b>	
	Existing Road	6.7 km long, 8 m wide
	New road	27.4 km long, 8 m wide
3)	<b>Base camp</b>	
	Area of land	10 ha
	Area of building	5000 m <sup>2</sup>
4)	<b>Distribution Line</b>	
	Length of lines	35 km
	Voltage	20 kV

### C. Project History and Key Procurement

1. **In May 2011, the World Bank approved a US\$640 million IBRD loan to support the development of the UCPS project** as well as the feasibility study and Environmental and Social Impact Assessment (ESIA) for the Matenggeng Pumped Storage (MPS) Project. The project faced significant delays. The early implementation periods needed to focus on land acquisition, resettlement and finalizing the mapping of biodiversity important areas and finding sustainable ways to deal with these issues took longer than foreseen during project appraisal and was only completed after four years. Furthermore, it took almost two years before an owner's engineer was hired and the technical design process for the plant could start. Due to inadequate quality of work by the owner's engineer, the design of the plant also needed to be revised following the guidance of the Project Review Panel (PRP). This delayed the start of procurement for the main construction packages by about three years.
2. **By early 2016**, all the main environmental and social issues had been largely completed and procurement of the three main contracts successfully carried out – ending with contract signing for the construction of the civil works and hydraulic metal works; and award of contract for the E&M works. However, the access road which



was originally to be provided by PLN to the contractor was not completed at the time, and subsequently major landslides further deteriorated parts of the already incomplete access road. PLN considered to include the completion of the PAR within the civil works contract. Due to the inability of PLN and the contractor to agree on the contractual terms, start of construction of the main civil works contract (Upper and Lower Dams, Powerhouse and Underground Works) was severely delayed. While the Bank proactively encouraged for an early resolution of the resulting contractual differences between PLN and the contractor, those turned out to be intractable.

3. As of May 2, 2017, only US\$33 million (5 percent) was disbursed, and due to the lack of progress on resolving the dispute, the Bank decided to cancel US\$596 million off of the loan. The Project has since then been restructured<sup>72</sup> to focus on the feasibility study and ESIA for the MPS Project, as well as capacity building. The Project will close on December 31, 2021.
4. A key aspect of the restructured project is the Bank's continued role in supervision of resettlement activities in compliance with the project's LARAP, even as PLN was to continue to develop the project without Bank's financing. PLN has completed most resettlements and compensation payments to project-affected people (PAPs) for the affected assets and the resettlement assistance, consisting of moving costs and transitional costs and the economic programs establishing three cooperatives for the households affected by the clearance for the access road and the reservoirs.
5. **More than two years after the partial cancellation of the loan, PLN has expressed interest in having Bank financing for the Project again.** Several key reasons were considered by the Bank.
  - i. financing the Project allows the Bank to ensure that such a project would be developed in an environmentally and socially sustainable manner aligning with Bank's and international standards.
  - ii. PLN has successfully repaired the access road and the Bank has been informed that it is in discussion with the civil works contractor on the terms for the contract to restart.
  - iii. The LARAPs, which are a major and difficult task under any hydropower project, have been completed by PLN.
  - iv. The economic case for pumped storage has been strengthened with the imperative to integrate more VRE on Indonesia's most important power grid, and pumped storage is among the most cost-effective technologies given its size.
  - v. The Bank has unique knowledge to support PLN having worked with PLN in the past on the original Project and is well-positioned to support PLN in its successful implementation.
6. The Project will be implemented with four main packages.
  - i. **Package 1: Civil Works – Upper Dam, Lower Dam, Powerhouse, and Waterways:** This covers (i) the construction of an RCC gravity lower dam and an RCC gravity upper dam; (ii) construction of the power waterways connecting the two reservoirs; (iii) construction of an underground powerhouse; (iv) an outdoor 500 kilovolts (kV) switchyard; and (v) preparatory works, including construction of temporary access roads and base camps; and (vi) installation of a short 20 kV distribution line to assist with construction power needs. Under the original Project, the contract in the amount of US\$235 million was signed in December 2015 and the Notice to Proceed issued in March 2016 but the construction did not

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<sup>72</sup> The total amount of restructured Project is US\$44 million and was renamed the Pumped Storage Technical Assistance Project.





commence. PLN and the contractor envisage that works would commence in the second half of 2021, after the ICSC has been recruited and mobilized.

- ii. **Package 2: Electromechanical Equipment – Pump-Turbine, Generator-Motor and Auxiliary Equipment:** This covers the installation of the generator-motors and related electrical equipment with an installed capacity of approximately 4x260 MW, and the installation of the hydraulic pump-turbines and auxiliary equipment with an installed capacity of approximately 4x275 MW. Under the previous loan, the contract was tendered, and the Bank provided no-objection to the award recommendation in October 2016. PLN issued notification of contract award to the recommended bidder in the amount of US\$ 130 million, and the firm has since then extended its bid validity and bid security. The contractor has confirmed continued interest and is expected to sign the contract once issues on the civil works contract has been fully resolved.
  - iii. **Package 3: Transmission Lines:** This covers construction of two double-circuit 500 kV transmission lines of 15.6 and 15.9 km to connect the plant to the existing Java-Bali grid at the Cibinong-Saguling line. PLN is in the process of updating the bidding documents, which will be subject to the Bank's prior review, after which the bidding process will be started.
  - iv. **Package 4: Hydraulic Metal Works:** This covers the installation of hydraulic metal works at the dams (e.g. spillway gates), intake (e.g. gates), penstocks (steel-lining) and the outlet (e.g. gates). The contract for the amount of US\$35 million was signed in March 2016 under the original UCPS Project, the works did not commence. The contractor has expressed interest in proceeding with the contract.
7. **Independent Construction Supervision Consultant:** PLN awarded the contract under the previous loan to an international engineering consultant firm but terminated the contract when the Bank decided to cancel partially the original loan. Since then, PLN has appointed PLN-E as an engineer responsible for site supervision, quality control and contract management during project implementation. PLN-E has hired a capable engineering firm to update the design and prepare revised construction drawings for the civil works. It is expected that PLN and PLN-E will retain the service of a similarly high-caliber firm for the role of the ICSC for site supervision, quality control and contract management, of all four packages under component 1, during the implementation phase of the Bank-financed project.

#### **D. Detailed Technical Assessment**

8. To address the latest recommendations of the PRP, design of civil works has been reviewed by a recognized international Engineering Consultant recruited by PLN-E. There are still a few remaining areas that require additional work and review/approval by the PRP:

##### *Dam Structural Safety*

- **Seismic Hazard Assessment.** It had previously been agreed with the PRP to design the project structures for an MCE (Maximum Credible Earthquake) of 0.48g. A new seismic hazard map of Indonesia (2017), however, indicates an MCE of 0.52g at the project site. In connection with the work on the seismic hazard map, it was also found that a fault close to the dam sites is probably active. On the recommendation of the reinstated PRP, additional field work and a revised Seismic Hazard Assessment (SHA) will be carried out by the Engineering Consultant to determine the revised value of the MCE to be adopted for the final dynamic



analysis of the dam structures. The MCE to be adopted might be higher than 0.52g. The PRP will be involved throughout the revision of the SHA to ensure agreement on the value of the MCE ahead of the stability analysis

- **Dam Stability.** The Engineering Consultant has carried out a thorough analysis of the static and pseudo-static stability of the upper and lower dams, as well as the deformation of the dam structures at the crest, toe and heel. It has however been agreed to carry out 2D and 3D finite element dynamic analysis, as per the recommendations of the PRP, for the finally agreed value of the MCE. After the dynamic analysis has been completed, the results, including the static and pseudo-static stability analysis performed in the design review, will be reviewed by the PRP.
- **Lower Dam Spillway.** The revised design indicates that an energy dissipator is required for the Lower Dam to avoid uncontrolled scoring in the downstream river that could cause landslides in the riverbanks and consequently could jeopardize the safety of the dam. The Engineering Consultant consequently recommended an energy dissipator for the Lower Dam and studied the following three alternatives: Alternative 1: Plunge pool requiring 170 m riverbed excavation and concrete protection. Extension of the diversion tunnel by 130 m and additional land area would also be required. The additional cost is estimated at USD6.5 million. Alternative 2: Stepped chute and stilling basin. The additional cost is estimated at USD4.2 million. Alternative 3: Ungated long spillway crest (251 m), stepped chute and stilling basin. The additional cost is estimated at USD1.7 million. The Engineering Consultant considers Alternative 3 (ungated spillway) as the preferred option with respect to dam safety if the stilling basin performs satisfactorily. To confirm the preferred option, it has been agreed that the Bandung Institute of Technology will perform hydraulic model tests for Alternative 3 to ascertain that the stepped chute provides enough energy dissipation for the stilling basin to be hydraulically stable. The Engineering Consultant will prepare specifications and supervise the tests.
- **Bottom Outlet.** There is an agreement on the proposed design changes of the bottom outlet to facilitate emergency drawdown of the reservoirs.
- **Sedimentation.** While the dead storage for the Upper Reservoir seems to be sufficient, even with a higher erosion rate, the dead storage for the Lower Reservoir seems to be on the margin especially if a higher erosion rate is considered. To mitigate this identified risk, the sedimentation process in the Lower Reservoir will be further investigated by field investigations and sedimentation simulations, also by assuming higher erosion rates and impact from potential landslides. Based on the simulations, a sediment management plan will be prepared by the Engineering Consultant and mitigation measures to maintain the active storage in the long term will be proposed (countermeasures could be a combination of watershed management, construction of check dams and dredging).

#### *Dam safety monitoring and Instrumentation*

- The dam safety instrumentation has been developed as part of the detailed design of the dams. The dam safety monitoring procedures will be included in the operational and maintenance plan to be prepared by the Engineering Consultant.

#### *Emergency planning*

- An **Emergency Preparedness Plan (EPP)** to international standard will be prepared at least one year prior to the first filling of the dams to allow implementation of the emergency measures and consultation with



the population that would be impacted. A preliminary and broad framework plans was prepared under the original WB financing. The Project will provide training and capacity building to PLN staff on these aspects.

*Operation and Maintenance Plan (OMP)*

- An **OMP** will be prepared. The plan will in particular describe the role of UCPS in the system (peaking, storage, ancillary services). The Project will work very closely with PLN System Planning Division in the development of the OMP. The ongoing strengthening of PLN's dispatch center with regard to UCPS dispatch will also allow a much better integration of UCPS and future VRE. The Project will also provide technical assistance to support PLN in efficiently managing the plant and capitalizing on its greater economic benefits to the Java-Bali grid. It will also provide capacity building as UCPS will be the first PS Project managed by PLN. Capacity building will also be provided on sediment management, long-term asset management and dam safety.

*Management of hydrological risks and climate change impacts.*

- The climate change risk assessment for UCPS, prepared using International Hydropower Association guideline, found that the climate change impacts on energy generation will be negligible. From a water balance perspective, UCPS can essentially be considered as a closed circuit, with minor water losses (2.5 MCM per year) due to evaporation from the Lower and Upper Reservoirs. This equal some 12% of the combined active storages of both reservoirs and can – if deemed necessary – be compensated by slightly increasing the active storages at the beginning of the dry season. Therefore, hydrological regime changes due to climate change do not affect power generation by the project.
- At present the downstream Cihea irrigation system already suffers significant water shortages during the dry season, broadly estimated at 20 to 50 MCM for the season, which will only slightly be aggravated by climate change. The project adds a minor 1.5 MCM or less to these shortages, which can be compensated by a minor variation of the minimum and maximum operational levels of the Lower Reservoir. Thus, the Project is not sensitive to climate change, nor does it contribute significantly to downstream water shortages for irrigation.
- As a pumped storage, the project, unlike conventional hydropower, will not be subject to hydrological variability / inflow patterns that could be affected by climate change. In case of extreme floods, concrete gravity dams, as is the case for UCPS, are quite robust against limited overtopping, and additional resilience enhancement measures can be accommodated if needed. In addition, the design of the project has also considered and mitigated the potential risks of inundation of underground powerhouse in case of extreme flood level.



### **ANNEX 3: Economic and Financial Analysis**

#### **A. Economic Analysis**

1. This annex presents the economic analysis of the UCPS project. The analysis uses a cost-benefit framework to determine the development impact of the Project and provides a rationale for public financing as the appropriate vehicle for its delivery. It also presents the value-added of WB' support and how it maximizes the development impact of staff efforts.
2. The analysis shows that the Project is economically viable with an EIRR of 11.7% percent and an NPV of US\$ 315 million at a 6 percent discount rate. The NPV of the project increases to US\$463 million with an EIRR of 14 percent with climate benefits under the low-price scenario of carbon prices and US\$611 million with an EIRR of 16.1 percent under the high-price scenario of carbon prices.

#### **Project Rationale and Development Impact**

3. Indonesia is facing key challenges in its electricity sector, one of them being the need to green the carbon intensive Java-Bali grid. Indeed, the Java-Bali islands account for 70 percent of electricity demand in Indonesia and 53% of the grid is powered by coal-fired generation (70 percent of the grid is powered by fossil fuels). Greening the Java-Bali grid will mean bring more Renewable Energies online and more specifically bring more variable renewable energies (VRE). Yet, the current configuration of the power system is not flexible enough to enable a high penetration of VRE because of the lack of flexibility of coal power plants (and other voltage and frequency control issues) as well as the fact that most VRE are localized in the Eastern part of Java while demand is located in the western part of the island.
4. UCPS is very strategic in how it simultaneously addresses these problems. UCPS will increase the reliability and flexibility of the Java-Bali grid as well as enable the penetration of a higher share of least cost VRE, enabling a reduction of the power system costs as well as a reduction of GHG emissions.
5. UCPS will have multiple impacts on the Java-Bali grid: it will allow to do energy arbitrage (pumping power at times when demand and production costs are low and providing reserve and storing energy for use at times of high demand), it will enable the penetration of more VRE and reduce CO2 emissions, it will provide ancillary services ( frequency regulation through the provision of spinning reserve, non-spinning and operating reserves, black start, voltage support) and result on investment deferral in peaking capacity like e.g. OCGT.
6. This economic analysis currently focuses on the investment components of UCPS for which economic benefits can be clearly identified and measured: energy arbitrage, VRE penetration and CO2 emission reduction as well as investment deferral. A more detailed dispatch study is currently being performed and should allow to refine the current economic analysis.

#### **Methodology: Cost-Benefit Analysis**

7. The economic analysis follows a standard cost-benefit framework, which compares the present value of incurred costs to the stream of attributable benefits. The EIRR and NPV of the Project are used to determine the Project's



economic viability over its economic lifetime. The main decision-making criteria of the economic viability of the Project are the EIRR and NPV, with the Project deemed economically viable if the EIRR is greater than the discount rate and the NPV is positive (i.e., the benefit-cost ratio is greater than 1).

8. The economic benefits of the project are assessed using the avoided-cost approach. The net benefits of the Project are calculated by comparing the economic costs and benefits of the “*with Project*” and “*without Project*” scenarios while serving the same system demand. The avoided-cost approach estimates the lower bound of the economic benefits as it accounts mostly for energy arbitrage, CO2 emission reduction and investment deferral. These impacts are measured by comparing the total present value of the system operating and new investment costs over the time horizon of the study with UCPS and without UCPS. The long-term analysis is being complemented by a short-term analysis which investigates the operation of UCPS within selected years and, from this, the value of the ancillary services it provides. Also, this analysis does not consider indirect benefits such as improved air quality from increased VRE generation. Thus, the results from this economic analysis are conservative estimates of the economic benefits of the Project.
9. In order to capture the benefits of the enabling VRE, the economic model focuses on the difference in VRE capacity resulting from the least-cost generation expansion simulations both with and without the Project. In the “*with Project*” scenario, construction of additional VRE generation capacity compared to “*without Project*” is calculated as a cost and avoided generation capacity for new gas fired units and saved fuel costs are calculated as benefits. These incremental benefits are included because they are enabled by the higher VRE absorption capacity provided by the UCPS despite the fact that the actual financing of the VRE will happen outside the Project boundaries.

#### **Economic Benefits of the UCPS**

10. For the purpose of this assessment, the economic returns of the project are confined to the activities that generate benefits for which an economic value can be clearly identified and measured, i.e., the investment components (component 1 and 2). The benefits of the TA component are excluded from the assessment because of the difficulty in measuring and valuing the outcomes of such activities.

#### ***Component 1 and 2 (the figures will be updated with the recent analysis)***

11. **Benefits and Costs.** The main economic benefits from these components are the cost savings induced by energy arbitrage and the provision of reserve during peak hours as well as from increased VRE in the generation portfolio and investment deferral in coal and gas capacity, estimated by comparing the costs of the generation portfolios in the “*with project*” and “*without project*” scenarios. Based on an analysis performed by Castlerock, it was estimated that in the “*without project*” scenario (i.e., without UCPS) VRE represents around 11.5 percent of the installed capacity in 2028. However, with the Project, the share increases and reaches 14 percent in 2028. UCPS also allows to lower investment in gas capacity (around 1GW of investment avoided between CCGT and OCGT in 2028).



**Table 3.1: UCPS Project Benefits**

Results in 2028 when UCPS is commissioned		Without Project	With Project	Difference (with less without)
Total installed capacity	GW	53	55	2.1
Coal	% capacity mix	50.9%	48.9%	<b>-2.0%</b>
CCGT	% capacity mix	26.8%	24.3%	<b>-2.5%</b>
OCGT+DG	% capacity mix	1.4%	1.3%	<b>-0.1%</b>
Hydro	% capacity mix	5.1%	4.9%	-0.2%
Geothermal	% capacity mix	3.5%	3.4%	0.0%
VRE	% capacity mix	12.2%	15.2%	<b>3.0%</b>
Biomass	% capacity mix	0.1%	0.1%	0.0%
UCPS	% capacity mix	53	55	2.1
GHG emissions of energy mix	Mtons CO2	193.1	192.5	-0.6

12. **Project Costs and Net Benefits.** There are two main types of economic costs associated with the Project – the direct project costs and non-project costs which include fixed and variable operations and maintenance costs and fuel costs. See table 5 for details.

**Table 3.2: Economic Costs of Component 1 and 2 (undiscounted over 25 years)**

Cost (\$m/y)	Without Project	With Project	Savings (without UCPS - with)
<b>Project Costs</b>	0	800	-800
<b>Non-Project Costs</b>			0
Fixed O&M of overall system	165,417	166,690	-1,924
Variable O&M of overall system	365,770	362,171	3,600
<b>Total cost of the system</b>	531,187	529,661	1526

## Results

13. When comparing the cost of both systems, the results are as follows: (i) the savings from fixed costs (including investment costs) represent US\$ 3,481 million over 25 years, (ii) the savings from variable and fuel costs represent US\$ 2,782 million, (iii) the Net Present Value (NPV) without applying a carbon price for GHG emissions avoided is US\$ 1,726.4 million and with carbon price (with a Social Cost of Carbon of US\$ 57 and US\$114 per



ton as per the World Bank Guidelines) is US\$ 1780.8 million and US\$ 1835.2 million, and (iv) the economic internal rate of returns (IRR) are 24.8 percent without pricing GHG emissions and 25.3 percent and 25.8 percent with low and high social cost of carbon. See table 6 for results for component 1 and 2.

**Table 3.3: Summary of Result for Component 1 and 2**

<b>Net Benefits without Carbon Price (\$million)</b>	
Total Net Benefit (Not discounted)	1526
NPV of Net Benefit (\$million)	315
EIRR (%)	11.7
<b>Net Benefits with Low Carbon Price</b>	
Total Net Benefit (Not discounted)	1935
NPV of Net Benefit	463
EIRR (%)	14
<b>Net Benefits with High Carbon Price</b>	
Total Net Benefit (Not discounted)	2347
NPV of Net Benefit	611
EIRR (%)	16.1

## B. PLN Financial Analysis

### PLN revenue requirement and reliance on subsidy

14. **As an SOE, PLN has a regulated revenue model with a significant subsidy component.** PLN's revenue model allows the company to recover operating expenses plus depreciation, interest on debt and 7% margin. Despite tariffs being set below cost recovery under the existing regulatory regime, two adjustment mechanisms are in place to support PLN in meeting its revenue requirements: i) Public Service Obligation (PSO); and ii) Tariff pass-through mechanism. The PSO addresses the shortfall between PLN's costs and the tariffs it can charge to subsidized customers. The second mechanism is a pass-through mechanism adjusting the tariff PLN charges non-subsidized customers to reflect factors such as foreign exchange and cost of fuel.
15. However, **since 2017 the tariff pass-through mechanism is no longer working as originally conceived.** This is due to the Government's decision to freeze fuel cost pass-through into tariffs for commercial, business, and industrial customers since July 2017. While this has resulted in cumulative under-recovery of IDR 45.4 trillion (IDR 23.2 trillion in 2018 and IDR 22.3 trillion for 2019), PLN is being compensated for the tariff freeze through a Compensation subsidy from MOF. The timing of the subsidy payment is critical: especially the Compensation is paid by MOF with a significant time lag as compared to when it is accrued, resulting in cash flow challenges.
16. **As indicated earlier, PLN is heavily reliant on the PSO and Compensation subsidy transfers and is not entirely in control of its own financial condition.** Under these circumstances, the usual financial covenants applied by the WB to revenue producing entities – rate of return covenant or a self-financing ratio covenant – cannot apply. The most significant indicator of PLN's financial viability remains to be its liquidity, represented by debt service coverage ratio covenant as a proxy. A breach of the agreed 1.5x threshold does not by itself constitute





a liquidity problem for PLN – it requires a further analysis of the causes of the breach. As their cash flow is dependent on Government payment and timing of the PSO subsidy, the DSCR covenant should also serve as early indicator of PLN financial viability and need for Government to take corrective action. If GoI and PLN have taken action to address the problem, the Bank has the flexibility to consider the covenant as being in “partial compliance,” or “pending.”

## Past Performance

17. PLN’s financial statements and key financial ratios from 2017 – 2020 are summarized below in Table 3.4. The financial results during 2017 – 2019 are based on audited financial statements. The 2020 results are based on unaudited PLN financial updates, which are the latest available information at the time of drafting this document.

**Table 3.4: PLN Financial Statements and Key Ratios**

(IDR trillion)*	2017	2018	2019	2020**
<b>Income Statement</b>				
Sale of electricity	246.6	263.5	276.5	259.8
Other	8.7	9.4	9.5	2.2
<b>Total Revenues</b>	<b>255.3</b>	<b>272.9</b>	<b>286.0</b>	<b>262.0</b>
Fuel and lubricants	116.9	137.3	136.2	106.0
Purchased electricity	72.5	84.3	82.3	113.0
Other	56.9	55.9	60.4	65.9
<b>Total Operating Expenses</b>	<b>246.3</b>	<b>277.5</b>	<b>278.9</b>	<b>270.4</b>
<b>EBITDA before subsidy</b>	<b>9.0</b>	<b>-4.6</b>	<b>7.1</b>	<b>-8.4</b>
Public Service Obligation (PSO)	45.7	48.1	53.3	61.3
Compensation Income	-	23.2	0.0	45.4
<b>EBITDA after subsidy</b>	<b>54.7</b>	<b>66.7</b>	<b>60.4</b>	<b>98.3</b>
Other expenses	51.4	56.0	65.2	62.8
<b>NET INCOME</b>	<b>3.3</b>	<b>10.7</b>	<b>-4.8</b>	<b>35.5</b>
<b>Balance Sheet</b>				
Current Assets	93.8	113.4	129.7	150.0
Non-Current Assets	1,241.2	1,379.1	1,437.2	1,424.4
<b>Total Assets</b>	<b>1,335.0</b>	<b>1,492.5</b>	<b>1,566.9</b>	<b>1,574.4</b>
Current Liabilities	139.1	157.9	162.8	123.8
Non-Current Liabilities	326.5	407.2	482.5	463.0
<b>Total Liabilities</b>	<b>465.6</b>	<b>565.1</b>	<b>645.3</b>	<b>586.8</b>
Equity	869.4	927.4	921.6	987.6
<b>Total Liabilities and Equity</b>	<b>1,335.0</b>	<b>1,492.5</b>	<b>1,566.9</b>	<b>1,574.4</b>
<b>Cash Flow Statement</b>				
NET OPERATING CASH FLOW	56.8	35.0	41.1	104.8



NET INVESTING CASH FLOW	-87.1	-100.2	-101.0	-63.9
NET FINANCING CASH FLOW	30.6	55.6	75.0	-20.1
<b>NET CASH FLOW</b>	<b>0.3</b>	<b>-9.6</b>	<b>15.1</b>	<b>61.0</b>
<b>Financial Ratios</b>				
DSCR	0.7	0.8	0.8	1.4
Current ratio	0.7	0.7	0.8	1.2
Debt/Equity ratio	0.5	0.6	0.7	0.6

\* 1US\$ ~14,000 IDR

\*\* Unaudited from PLN update as of 30 March 2021

18. **PLN revenue has been growing at 5-7% per annum in line with the demand increase, but its overall financials remain vulnerable to both fuel costs and subsidy payments.** This is illustrated in 2018, when the oil prices hit a 4-year high, increasing cost of both fuel and power purchase for PLN. As is the case, the transfer of accumulated Compensation and equity injection by the Government in 2018 enabled PLN to continue their strong investment plans despite 38% decline in operating cash flow.
19. **For 2020, COVID-19 represented an external shock that impacted PLN's revenues and access to finance.** PLN's revenues have been further negatively impacted by policy responses to support certain categories of power customers with tariff holidays. The key factors that are impacting PLN's financial situation are:
  - **Revenue loss created by crisis:** reduced power demand and tariff reductions for targeted consumers resulted in PLN collecting IDR37 trillion less revenues from consumers than originally planned for 2020<sup>73</sup> (and IDR16.5 trillion less than the actual collections in 2019)
  - **Tariff holiday:** the emergency tariffs holidays in place from April to December 2020 (with tariff discounts of 50-100% for 31 million households) have reduced PLN annual cash inflows by \$1.6trillion/month on average
  - **Currency and fuel price volatility:** from January 1 to March 23, 2020, IDR/USD depreciated 16 percent; while the exchange rate has since recovered, such currency volatility directly affected PLN's operating payments, given that most of the its PPA and debt service payments are in foreign currency; similarly, volatility in fuel prices could increase operating costs, although the recent fall in crude oil prices have benefited PLN (with a temporary reduction in fuel costs in 2020), offsetting some of the operating revenue reduction
  - **International market access risks:** PLN's international bond yields doubled at the height of the COVID-19 related market turmoil, signalling elevated market risk perception even for an investment grade issuer like PLN. Market conditions have since recovered but remain vulnerable to further periods of global risk aversion.
20. **To mitigate the impact of the COVID-19, PLN has downsized its investment plans and identified cost savings.** In response to the revenue fall and borrowing constraints, PLN has already streamlined and re-prioritized its investment program to save IDR 13 trillion in 2020<sup>74</sup> and managed to reduce operating costs for staff worth IDR13 trillion<sup>75</sup>. PLN also received a compensation payment of IDR45.4 trillion from MoF as a payback for the arrears accumulated in 2018 and 2019. By the end of the year, PLN had managed to raise IDR 67 trillion of

<sup>73</sup> Based on a baseline of IDR 297 trillion annual revenues from customers estimated based on a pre-COVID demand forecast.

<sup>74</sup> Based on a baseline of IDR 88 trillion capex as originally planned for 2020

<sup>75</sup> Based on a baseline of payments to employees of IDR 30 trillion planned for 2020.



financing, which – when combined with the cost savings and compensation payments – not only helped to keep PLN financially solvent, but also allowed for significant debt prepayment of approximately IDR 30 trillion.

21. **Though Debt Service Coverage Ratio (DSCR) continues to be below the agreed covenant<sup>76</sup>, the 2018 and 2020 response by the Government in supporting PLN indicate that the covenant is serving its intended purpose as early warning flag.** In both 2018 and 2020, PLN was able to successfully arrange for government support to ensure it maintained its viability through extreme market externalities and unprecedented COVID-19 pandemic. This is also reflected in the fact that the credit rating and market funding cost for PLN has been comparable to the sovereign or even lower at times, and it has not been subject to any downgrade (See Table 3.5).

**Table 3.5. Credit ratings of PLN and Republic of Indonesia**

Credit Rating	PLN	Indonesia Sovereign
<b>Fitch</b>	BBB, stable outlook	BBB, stable outlook
<b>Moody's</b>	Baa2, stable outlook	Baa2, stable outlook
<b>S&amp;P</b>	BBB, negative outlook	BBB, <b>negative</b> outlook

## Financial Projection

22. Below is a summary of the PLN financial projection for 2021 – 2024. (Table 3.6) The projections are based on set of assumptions and discussions held with PLN staff. The financial model also assumes that PSO and Compensation transfers will be paid as accrued from 2022 onwards, whereas in 2021 no compensation is expected to be paid, given that no budget allocation was made at the point of the draft of this document. The financial model is work in progress and their assumptions would be refined in the current engagements.<sup>77</sup>

**Table 3.6: PLN Projected Financial Statements and Ratio (2021 – 2024)**

(IDR trillion)	2021	2022	2023	2024
<b>Income Statement</b>				
Sale of electricity	277.9	300.3	316.4	335.5
Other	9.6	5.1	5.3	5.4
<b>Total Revenues</b>	<b>287.4</b>	<b>305.5</b>	<b>321.7</b>	<b>340.9</b>
Fuel and lubricants	116.4	101.7	101.3	103.5
Purchased electricity	113.0	152.7	160.8	173.8
Other	62.3	67.8	75.1	79.9
<b>Total Operating Expenses</b>	<b>291.7</b>	<b>322.2</b>	<b>337.2</b>	<b>357.3</b>
<b>EBITDA before subsidy</b>	<b>-4.3</b>	<b>-16.7</b>	<b>-15.5</b>	<b>-16.4</b>
Public Service Obligation (PSO)	63.4	76.6	84.9	96.5

<sup>76</sup> This will be applied for initial financing and may be repeated.

<sup>77</sup> Financial Projection an ongoing work which would be updated once completed in the next two weeks or so.



Compensation Income	21.4	21.9	23.9	26.6
<b>EBITDA after subsidy</b>	<b>80.5</b>	<b>81.8</b>	<b>93.3</b>	<b>106.6</b>
Other expenses*	64.3	60.7	58.9	57.7
<b>NET INCOME</b>	<b>16.1</b>	<b>21.2</b>	<b>34.4</b>	<b>48.9</b>
<b>Balance Sheet</b>				
Current Assets	92.4	38.3	-2.8	-17.0
Non-Current Assets	1,463.3	1,497.7	1,532.3	1,563.1
<b>Total Assets</b>	<b>1,555.7</b>	<b>1,536.0</b>	<b>1,529.5</b>	<b>1,546.1</b>
Current Liabilities	123.6	133.9	143.7	157.2
Non-Current Liabilities	431.4	386.5	345.5	312.9
<b>Total Liabilities</b>	<b>555.1</b>	<b>520.5</b>	<b>489.1</b>	<b>470.0</b>
Equity	1,000.6	1,015.6	1,040.4	1,076.0
<b>Total Liabilities and Equity</b>	<b>1,555.7</b>	<b>1,536.0</b>	<b>1,529.5</b>	<b>1,546.1</b>
<b>Cash Flow Statement</b>				
NET OPERATING CASH FLOW	37.9	66.5	74.8	88.4
NET INVESTING CASH FLOW	-76.5	-73.1	-74.1	-71.2
NET FINANCING CASH FLOW	-31.8	-46.2	-42.4	-34.0
<b>NET CASH FLOW</b>	<b>-70.3</b>	<b>-52.8</b>	<b>-41.7</b>	<b>-16.8</b>
<b>Financial Ratios</b>				
DSCR	0.9	1.1	1.5	1.9
Current ratio	0.7	0.3	0.0	-0.1
Debt/Equity ratio	0.6	0.5	0.5	0.4

\*includes depreciation & amortization, interest income, interest expense, and hedging costs.

NOTE: These forecasts are based on forecasts and assumptions provided by PLN as of 30 March 2021. These are still under discussion and are subject to change.

23. **While PLN was able to manage the demand decline due to COVID-19 lockdowns thanks to Government transfer, lower fuel prices and reducing investments, cash flow management will become an issue from 2021 onwards.** As the economic downturn is expected to dampen demand growth, PLN will be in a more difficult financial position for below factors:

- *Fuel price rebound:* With crude oil prices coming back up above \$60/barrel to pre-COVID prices, fuel cost is expected to rise up as well,
- *Increase in Power Purchase Cost:* IPPs that had their commissioning delayed are expected to start production in 2021 and 2022, which were expected to handle the increasing demand for power. This is expected to drive the operating expenses up and hurt PLN profitability,
- *Increase in Investments:* While PLN was able to cancel or defer investments and maintenance during 2020, they will need to continue capital investments and rehabilitation of assets to maintain their operational capacity and safety of the grid. This will limit their ability to reduce or defer these expenses any longer and drive their funding requirement.



24. **Due to the above expected limitations, PLN is expecting to face difficulties in fully meeting the financing requirement of IDR 92 trillion in 2021<sup>78</sup>.** There is no allocation currently made to 2021 Government budget for Compensation payments to PLN, which raises the concern of PLN liquidity as fiscal space to provide support would also be limited. PLN recognizes this risk and have prepared a funding strategy for 2021 which includes equity injection from the Government and MIGA support for a \$500 million facility – to partially fill the financing gap for the year 2021 which was estimated at around IDR 59 trillion.<sup>79</sup>
25. **While PLN is exploring market solutions, its market access risks have increased over time and exacerbated with the COVID-19 crisis.** In the past years, policy-driven prolonged negative cash flow from operations have resulted in cash management challenges that have been financed from Indonesian local banks. However, successive borrowing rounds started leading to shorter financing tenors, approaching single borrower limits at local banks and a deteriorating debt service coverage ratio, that went below 1 between 2017 and 2019, and in 2020 managed to increase to 1.4 due to the compensation payment which substantially strengthened the operating income as well as a reduced debt service as compared to historical levels.. Despite these challenges, in 2020 PLN was still able to raise financing from the local market. This market access challenge was compounded at the start of the pandemic when international markets experienced considerable volatility. As market turmoil reached its heights in late March, PLN's international bond yields more than doubled compared to levels at the start of the year, signaling elevated market risk perception of PLN despite its investment grade credit rating. Since the second quarter of 2020, market conditions have stabilized, allowing PLN to tap the international bond markets with Global Medium-Term Notes (GMTN) for US\$1.5 billion at yields close to January 2020 pre-crisis levels. By the end of the year, PLN had managed to raise IDR 67 trillion of financing. However, given the structural financial issues, deteriorating debt-carrying capacity and financial uncertainties remaining due to the pandemic, PLN's liquidity challenges in 2021 and beyond could result in solvency concerns even if financial market conditions remain favorable. However, if markets were to destabilize again, PLN could again face sudden narrowing of its market access, similar to what happened in Q1 2020.
26. **Recognizing this risk, PLN has entered into a dialogue with the World Bank for liquidity support using Guarantee and sector reform program to address some of the underlying structural issues through P4R program in parallel.** The liquidity facility will provide short-term financing support towards PLN's projected financing gap in 2021. The facility is expected to be up to US\$ 1,000 million and have a tenor of 5-7 years with a possible option for extension. The target tenor is designed to alleviate PLN's working capital needs during the pandemic and the immediate recovery phase and provide financial breathing room for the company until structural reforms are implemented. PLN would be the borrower and commercial banks, or investors would be the lenders. WB and potentially Multilateral Development Banks (MDB) partners would provide credit enhancement to the lenders to improve the financing terms available to PLN.
27. **A comprehensive financial stabilization and reform plan is required to backstop PLN's immediate liquidity needs created by the pandemic, while addressing the structural financial challenges related to investment needs, revenue model, energy transition and subsidy dependence.** These reforms need to be anchored in a comprehensive medium to long-term vision for the energy sector with practical pathways to achieve the long-term objectives. The WB is currently working with the GoI and PLN in the preparation of a **White Paper** that

<sup>78</sup> Including IDR 70 trillion financing gap and IDR 22 trillion of internal cash requirements

<sup>79</sup> Based on PLN Annual Budget Plan Year 2021, PLN is planning to raise approx. IDR58 trillion in 2021



would set the directions for the future of the power sector in Indonesia. The policy actions being discussed currently includes:

- Forward looking revenue model – The current model is not suited to provide adequate resources for the fast growing investment needs of PLN as it is based on past expenses. The proposal will be to change the model to reflect the future operational and investment needs of PLN to reduce the gap
- Timely transfer of Compensation and transition to cost recovery tariff – As pointed out earlier, a timely and predictable transfer of Compensation would reduce the financial management burden of PLN significantly. In addition, a transition in phases to adjust tariffs to full cost recovery level to phase Compensation out would increase sustainability of PLN and sector as a whole
- Pass-through and Optimization of Tariff structure – Though pass through of certain costs are allowed under current regulation, it is not being implemented. It would be good to ensure its application. The Tariff structure is also overly complicated which can be further streamlined to better target the cross subsidy for the vulnerable
- Transition from PSO to direct subsidy – The subsidy could be better targeted if the subsidy to the vulnerable population can be directly provided rather than pass it through commodity prices, which also sends wrong pricing signal to the market

28. To set the stage for achieving this medium- and long-term vision, the White Paper will also discuss a comprehensive package of reforms (to be implemented gradually over the coming 24-36 months) to address PLN's structural issues that threaten the financial and environmental sustainability of the sector more generally. This package of reforms will be anchored through a **policy-oriented Program-for-Results (P-for-R)** that will support this comprehensive energy sector reform program including pricing, planning and regulatory reforms that incentivize energy transition, private investments and put PLN on a sustainable financial footing, as well as supporting the implementation of the *Just Transition for All* methodology to support coal phase-out. Some of the policy actions being discussed are as follows.

- Limited Concession Scheme – Such scheme will allow for private sector capital to be leveraged in improving the quality of public sector assets and services
- Sustainable Financial Framework – PLN could develop a strategic and comprehensive financing framework rather than reactive financial planning it operates under. This will increase the efficiency and efficacy of capital employed and increase the creditworthiness of PLN in the long run
- Improving Governance Structure – PLN governance structure includes overlapping mandates for different stakeholders and agencies, which will greatly benefit with an establishment of a formal mechanism to address the coordination and resolution of conflicts that may arise out of such structure
- Improve corporate and investment planning - Presently, the GOI's main planning process for PLN is the 10-year investment plan (RUPTL), and its main role is to set out the Government's policy assignment to PLN. RUPTL may be positioned as policy and coordination document, while a corporate and investment planning platform that reconciles with financial and commercial constraints within PLN would improve the system planning for PLN
- Decarbonization of the economy – Indonesia still uses coal fuel as its base load on many of its islands, which would benefit from transition to clean energy from both financial, operational and environmental perspective. It would be useful to change the tariff methodology and local content requirement to encourage renewable energy investments, remove Domestic Market Obligation which artificially keeps coal prices, and to adopt a comprehensive coal phase out strategy