Accelerating Just Energy Transition in Indonesia 2023

Public consultation draft
November 1, 2023

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Disclaimer: The Comprehensive Investment and Policy Plan is a document for the implementation of the Joint Statement agreed in November 2022. The CIPP is a strategy document that the Government of Indonesia will use as a basis for power sector planning and policymaking as part of the JETP process. It does not constitute a legally binding document. This public consultation draft is dated November 1, 2023.

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Authorship and Acknowledgement

The JETP Comprehensive Investment and Policy Plan (CIPP) was written by the JETP Secretariat team, with written contributions from the Boston Consulting Group, the Climate Policy Initiative (CPI), Global Green Growth Institute (GGGI), and the Tony Blair Institute for Global Change. The Asian Development Bank (ADB) provided institutional support to the JETP Secretariat.

Content for Chapter 5 was supplied by the Technical Working Group, led by the International Energy Agency and joined by the Danish Energy Agency, the Institute for Essential Services Reform, the Rocky Mountain Institute, and the World Bank.

Content for Chapter 6 was supplied by the Just Transition Working Group, led by the United Nations Development Programme and joined by the ADB, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the Indonesian Center for Environmental Law (ICEL), the International Labour Organization (ILO), and the World Bank.

Content for Chapter 7 was supplied by the Financing Working Group, led by ADB and joined by Agence Française de Développement (AFD), the Climate Policy Initiative (CPI), the Glasgow Financial Alliance for Net Zero (GFANZ), the Japan International Cooperation Agency (JICA), and KfW Development Bank.

Content for Chapter 8 was supplied by the Policy Working Group, led by the World Bank and joined by ADB, the International Energy Agency, Program Menuju Transisi Energi Rendah Karbon Indonesia (MENTARI), and the United States Agency for International Development Sustainable Energy for Indonesia’s Advancing Resilience (USAID SINAR).

The JETP Secretariat would like to extend special thanks to Coordinating Ministry for Maritime Affairs and Investment, Ministry of Energy and Mineral Resources, Ministry of Finance, Ministry of National Development Planning, Ministry of State-owned Enterprise, National Energy Council, the other counterparts in the Government of Indonesia and the International Partners Group led by the US and Japan for their feedback and support, to PLN for its close collaboration, to the Global Energy Alliance for People and Planet (GEAPP), UMBRA, Ford Foundation, United Nations Office for Project Services (UNOPS-ETP), and other organizations for their ongoing support.

Abbreviations and Acronyms

ACC	Advanced Control Center
ADB	Asian Development Bank
AFD	*Agence Française de Développement* (French Development Agency)
ALCBT	Asia Low-Carbon Buildings Transition
AMDAL	*Analisa Dampak Lingkungan* (Environmental Impact Assessment)
AMI	Advanced Monitoring Infrastructure
APS	Announced Pledges Scenario
ARR	Annual Revenue Requirement
ASEAN	Association of Southeast Asian Nations
ASET	Affordable and Sustainable Energy Transition
Bappenas	*Badan Perencanaan Pembangunan Nasional* (National Development Planning Agency)
BAU	Business-As-Usual
BBCA	Bank Central Asia
BBNI	Bank Negara Indonesia
BBRI	Bank Rakyat Indonesia
BMRI	Bank Mandiri
BCFP	Blended Climate Finance Program
BESS	Battery Energy Storage System
BMZ	German Federal Ministry for Economic Development Cooperation
BPS	*Badan Pusat Statistik* (Central Statistics Agency)
c/kWh	Cent per Kilowatt Hour

CAGR	Compound Annual Growth Rate
CAPEX	Capital Expenditure
CASE	Clean, Affordable and Secure Energy
CBAM	Carbon Border Adjustment Mechanism
CBDR	Common But Differentiated Responsibility
CCEFCF	Canada-World Bank Clean Energy and Forests Climate Facility
CCS	Carbon Capture & Storage
CCUS	Carbon Capture Utilization and Storage
CDM	Clean Development Mechanism
CEFIM	Clean Energy Finance and Investment Mobilization
CER	Certified Emission Reduction
CETP	Clean Energy Transition Program
CFPP	Coal-fired Power Plant
CIF	Climate Investment Funds
CIF-ACT	Climate Investment Funds Accelerated Coal Transition
CIPP	Comprehensive Investment and Policy Plan
CMMAI	Coordinating Ministry for Maritime Affairs and Investment
CO_2	Carbon Dioxide
COD	Commercial Operation Date
CPO	Crude Palm Oil
CPOS	Current Policy Scenario
CSO	Civil Society Organizations
DFC	United States International Development Finance Cooperation

DFI	Development Finance Institution
DIPA	Budget Implementation List
DSIF	Danida Sustainable Infrastructure Finance
EE	Energy Efficiency
EIB	European Investment Bank
EIFO	Export and Investment Fund of Denmark
ENDC	Enhanced Nationally Determined Contribution
EPC	Engineering, Procurement, and Construction
ESG	Environmental, Social, and Governance
ESMAP	Energy Sector Management Assistance Program
ETM	Energy Transition Mechanism
ETMCP	Energy Transition Mechanism Country Platform
ETP	Energy Transition Partnership
ETS	Emission Trading System
EU	European Union
EVA	Economic Value Added
FI	Financial Institution
FOB	Free On Board
FOLU	Forest and Other Land Use
FPIC	Free Prior Informed Consent
FS	Feasibility Study
G20	Group of Twenty
GDP	Gross Domestic Product

GECS	Green Energy Corridors Sulawesi
GFANZ	Glasgow Financial Alliance for Net Zero
GGGI	Global Green Growth Institute
GIZ	*Deutsche Gesellschaft für Internationale Zusammenarbeit* (German Agency for International Cooperation)
GoI	Government of Indonesia
GSS	Green, Social, and Sustainability
GW	Gigawatt
HBA	*Harga Batubara Acuan* (Coal Reference Price)
HSBC	Hongkong and Shanghai Banking Corporation
HVDC	High-Voltage Direct Current
IBRD	International Bank of Reconstruction and Development
ICB	International Competitive Bidding
IDClear	Indonesia Clearing and Guarantee Corp
IDX	Indonesia Stock Exchange
IEA	International Energy Agency
IEA CETP	International Energy Agency - Clean Energy Transitions Programme
IESR	Institute for Essential Services Reform
IFA	Investment Focus Areas
IFC	International Finance Corporation
IFU	Investment Fund for Developing Countries
IIF	Indonesia Infrastructure Finance
IIGF	Indonesia Infrastructure Guarantee Fund

ILO	International Labour Organization
IPCC	Intergovernmental Panel on Climate Change
IPG	International Partners Group
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
JCM	Joint Crediting Mechanism
JT	Just Transition
JET	Just Energy Transition
JETP	Just Energy Transition Partnership
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KEN	National Energy Policy
Kepmen	*Keputusan Menteri* (Ministerial Decree)
KMc	Kilometer-Circuit
KSEI	Indonesia Central Securities Depository
LCCP	Low Carbon Scenario Compatible with Paris
LCOE	Levelized Cost of Electricity
LCR	Local Content Requirement
LGR	Local Government Regulations
LTS-LCCR	Long-Term Strategy for Low Carbon and Climate Resilience
MCC	Millenium Challenge Corporation
MDB	Multilateral Development Bank
MEMR	Ministry of Energy and Mineral Resources

MoF	Ministry of Finance
MONEV	Monitoring and Evaluation
MRT	Mass Rapid Transit
MSME	Micro Small Medium Enterprise
MSOE	Ministry State-owned Enterprises
MT	Million Tons
MUFG	Mitsubishi UFJ Financial Group
MWac	Megawatt Alternating Current
MWp	Megawatt peak
NDC	Nationally Determined Contribution
NEC	National Energy Council
NEP	National Energy Policy
Norfund	Norwegian Investment Fund
OJK	*Otoritas Jasa Keuangan* (Financial Services Authority)
OIP	Government Investment Operators
OPEX	Operational Expenditure
O&M	Operation and Maintenance
Permen	*Peraturan Menteri* (Ministerial Regulations)
Perpres	*Peraturan Presiden* (Presidential Regulations)
PBL	Policy-Based Lending
PCG	Partial Credit Guarantee
PCT	Preferred Creditor Treatment
PD	Project Development

PIDG	Private Infrastructure Development Group
PLN	PT Perusahaan Listrik Negara (Indonesia's state-owned electricity company)
PP	*Peraturan Pemerintah* (Government Regulations)
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PPU	Private Power Utility/Captive Power Producers
PRG	Partial Risk Guarantee
PSOD	Private Sector Operations Department
PTA	Pre-transaction Agreement
PV	Photovoltaic
RBL	Results-Based Landing
RE	Renewable Energy
REEP2	Renewable Energy for Electrification Programme Phase II
RUEN	*Rencana Umum Energi Nasional* (National Energy General Plan)
RUKN	*Rencana Umum Ketenagalistrikan Nasional* (National Electricity General Plan)
RUPTL	*Rencana Usaha Penyediaan Tenaga Listrik* (Electricity Supply Business Plan)
SBL	Single Borrower Limit
SBTI	Science Based Target Initiative
SDG	Sustainable Development Goals
SEA ETP	Southeast Asia Energy Transition Partnership
SETI	Sustainable Energy Transition in Indonesia

SMI	PT. Sarana Multi Infrastruktur
SOE	State-owned Enterprise
STEM	Science, Technology, Engineering, and Mathematics
TA	Technical Assistance
THI	*Taksonomi Hijau Indonesia* (Indonesia Green Taxonomy)
ToP	Take-or-Pay
TVET	Technical Vocational Education and Training
TWh	Terra Watt-hour
UN	United Nations
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
VCM	Voluntary Carbon Market
VRE	Variable Renewable Energy
WACC	Weighted Average Cost of Capital
WB	World Bank

Section 1

Executive Summary

1. Executive Summary

For Indonesia, energy transition is a key step to mitigate the impact of the climate crisis, meet the Nationally Determined Contribution (NDC) targets, and realize its ambition to build a low-carbon economy. This transition actively supports Indonesia's industrialization trajectory while decoupling the long-standing historical correlation between economic growth and emissions. To do this, energy transition must decarbonize both the power sector and its interdependent demand-side sectors and industries. Given the uniqueness of each country's situation, energy transition needs to be country-led and country-owned.

On November 16, 2022, the Government of Indonesia (GoI) and the International Partners Group (IPG) launched the Just Energy Transition Partnership Indonesia (JETP Indonesia) on the sidelines of the G20 Summit in Bali, Indonesia. The IPG comprises the governments of Japan and the United States, who are co-leaders of the partnership, and Canada, Denmark, the European Union, the Federal Republic of Germany, the French Republic, Norway, the Republic of Italy, and the United Kingdom of Great Britain and Northern Ireland. At an initial commitment of US$20 billion, of which US$10 billion in IPG funding was pledged to catalyze US$10 billion of private financing from Glasgow Financial Alliance for Net Zero (GFANZ), JETP Indonesia marks the largest energy transition financing package in the world to date. Its immediate objective is to develop a Comprehensive Investment and Policy Plan (CIPP), a process that would be led by the JETP Secretariat. The CIPP is intended to be a "living document" that will be regularly evaluated and updated to reflect recent market developments and policy priorities.

The GoI and the IPG provide guidance to the JETP Secretariat, which in turn coordinates various working groups led by international institutions to produce a credible and workable CIPP. The JETP Secretariat receives institutional support from ADB with funding from the Government of Japan. The objectives for each working group are defined as follows:

- Technical working group, led by the International Energy Agency, with the main objective of consolidating the energy transition pathway for Indonesia's power sector and identifying priority projects to support the energy transition pathway;
- Policy working group, led by the World Bank, with the main objective of analyzing policy enablers and providing recommendations to support power sector decarbonization;
- Finance working group, led by the Asian Development Bank (ADB), with the main objective of identifying financing needs, requirements, and modalities for identified projects; and
- Just Transition working group, led by the United Nations Development Program (UNDP), with the main objective of synthesizing a Just Transition (JT) Framework to guide implementation.

It is envisioned that a fifth working group will be added after the launch of the 2023 version of the CIPP, with a focus on energy efficiency and electrification.

The Joint Statement by the GoI and the IPG announced a commitment to achieve groundbreaking climate targets conditional to international support. These targets provide recommendations that support Indonesia’s ambitious just energy transition pathway focusing

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on the power sector. Furthermore, the Joint Statement has defined the following joint conditional targets for decarbonization, as stated in the “Intends To” section:

- Achieving peaking power sector emissions by 2030 at an absolute value of no more than 290 MT CO2 (down from a 2030 baseline value of 357 MT CO2), and immediately declining thereafter on an ambitious trajectory, and achieving net zero emissions in the power sector by 2050, including with the accelerated retirement of coal plants, conditional on international support; and
- Accelerating the deployment of renewable energy so that renewable energy comprises at least 34% of all power generation by 2030.

The “Intends To” section of the Joint Statement sets out additional key strategies the fulfillment of which is critical for the achievement of the aforementioned joint conditional targets. These strategies include but are not limited to the mobilization of sufficient funding, including US$20 billion over the next several years as initial catalytic financing and accelerated retirement of coal-fired power plants.

Furthermore, JETP Indonesia must follow its key principles: (1) positively contributing towards Indonesia's economy and ensuring energy affordability; (2) guaranteeing energy security and stability, while ensuring a just transition; (3) ensuring energy sustainability; and (4) maintaining the long-term financial sustainability for PLN and subsidiaries.

Based on a deeper understanding of Indonesia’s energy sector and its broader development goals, analysis by the JETP Technical Working Group has suggested that reaching all the joint conditional targets may not represent a realistic decarbonization pathway. In particular, this assessment is based on the exceptionally high solar and wind capacity buildouts and rapid rates of transmission development required within the next six years if current plans for captive coal capacity are unaltered, which would render reaching some of these joint conditional targets exceedingly difficult. However, modeling and analysis on the off-grid systems and possible alternative pathways for providing needed captive power is not yet complete and the GoI and IPG cannot say anything definitive until the experts complete their work. The GoI and IPG will continue to maintain the ambition that underpins the JETP Joint Statement.

In response, the GoI and the IPG have agreed to focus on addressing targets for Indonesia’s on-grid system, recognizing that more work is required to develop a viable decarbonization plan for the off-grid captive power system. This CIPP, proposed by the JETP Secretariat, will accordingly only set out an on-grid emissions target and pathway that retains a level of ambition compared to a business-as-usual (BAU) condition as originally intended in the Joint Statement. The on-grid pathway that this CIPP features includes:

- Total on-grid power sector emissions peaking by 2030 with an emission target of no more than 250 MT CO_2 in 2030;
- A renewable energy generation share of 44% by 2030; and
- Achievement of net zero emissions in the power sector by 2050.

Equally important, it was also agreed that the JETP Secretariat will carry out a more detailed study and roadmap on decarbonizing Indonesia’s off-grid captive power systems. Hence, while the off-grid captive power systems are outside of the scope of the current CIPP, the GoI and IPG share a strong commitment to identifying and implementing viable solutions going forward. Like the CIPP, this captive power roadmap will be a strategy document that the Government of Indonesia will use as a basis for off-grid power sector planning and policy making as part of the JETP process to implement the JETP Joint Statement agreed in November 2022. It will not constitute a legally binding document.

To realize the on-grid power sector through the five investment focus areas (IFAs), an estimated investment cost of US$95.9 billion between 2023-2030 and US$580.3 bn between 2023-2050 is required. These figures exclude the full extent of the cost for just transition assessments and interventions, which are expected to cost at least US$0.2 billion by 2030. In correlation to the initial funding, the US$20 billion covers part of the requirements, but will require further financial resources. The five JETP investment focus areas (IFA) agreed in the CIPP are:

1. IFA 1: Transmission Lines and Grid Deployment; around 14.000 km circuit of transmissions costing up to US$19.7 Bn by 2030;
2. IFA 2: Early Coal-fired Power Plant (CFPP) Retirement and Managed Phase-out; coal flexibility retrofits requiring up to US$1.3 Bn by 2030;
3. IFA 3: Dispatchable Renewable Energy Acceleration; 16.1 GW built out by 2030, costing up to US$49.2 Bn by 2030;
4. IFA 4: Variable Renewable Energy (VRE) Acceleration; 40.4 GW built out by 2030, costing up to US$25.7 Bn by 2030; and
5. IFA 5: Renewable Energy Supply Chain Enhancement.

Based on approximately 1000 projects collected across the five IFAs from GoI, over 400 projects have been identified as JETP priority projects that would require investments amounting to a minimum of US$67.4 Bn. JETP priority projects are selected based on the criticality to the realization of the energy pathway, whether such projects have been included in the commitment of relevant institutions and jointly agreed by the related government institutions, have a start date up to 2030, and have not reached financial close at the time of writing. Out of the priority projects, the JETP Secretariat has identified nearly 50 top priority projects based on their strategic value to the JETP power sector pathway and Indonesia's energy transition.

Beyond the five investment focus areas, a sixth investment focus area, Energy Efficiency and Electrification, is planned to be added in the subsequent 2024 version of the JETP CIPP after the mobilization of the fifth working group. Energy efficiency can help better manage supply needs and to support ambitious decarbonization pathways. Nevertheless, the JETP Secretariat welcomes any interest in investments for the sixth investment focus area.

To optimize the utilization of JETP financing sources, matchmaking priority projects to the funding sources available under JETP financing is crucial. The basic financing philosophy of the JETP funds is to minimize the cost of the energy transition for Indonesia. As public funding is scarce, the use of such funds must be carefully directed to catalytic projects. Below are the financing principles in determining the type and methods of funding:

- Effective and efficient use of public funding to avoid market distortion and crowding out commercial finance should be ensured;
- Public funding allocation should follow the priorities of the JETP's five investment focus areas;
- Priority will be given to projects that are ready to finance during this JETP investment period window; and
- Selection criteria under the project readiness financing principle should be aligned with the recommendations contained in the technical assessment and the Just Transition Framework.

The JETP Secretariat shall use the 'prioritization of capital deployment approach' in project financing identification and selection. The capital deployment will be arranged and prioritized based on accessibility, cost of capital, and priority. Ideally, a blended finance scheme can be used to select projects where risk and returns could be balanced by combining the two sources of JETP financing. Projects that are traditionally low-yielding or deemed high-risk could be financed through concessional financing.

The flows of funds for JETP projects would use both direct and indirect options. Under the direct flow channel, financing from private financiers goes straight to project developers. Meanwhile, under the indirect flow channel, financing from public sources typically goes through either Development Financial Institutions (DFI), Multilateral Development Banks (MDBs), or PT SMI as the Country Platform. In cases of grant funding, it can also go through a select International Organization.

Achieving JETP ambitions will require the support of enabling policies. This document sets out recommendations of policy reforms to enable the execution of the energy transition while ensuring affordability, system stability, and sustainability. Eight overarching policy enablers are considered crucial to bringing forward Indonesia's ambition for energy transition, namely:

- Strengthening Domestic Supply Chain of Renewable Energy by reforming Local Content Requirement (LCR);
- Adjusting supply-side incentives.
- Improving RE procurement processes.
- Making power purchase agreements more bankable;
- Enabling early coal retirement and managed coal phase-out;
- Ensuring PLN's financial sustainability; and
- Strengthening financing policies to support Indonesia's energy transition.

Each of these seven enablers for the proposed policy addresses barriers that might hinder Indonesia's ambitious efforts in decarbonization. The policy reforms consist of comprehensive measures that cover the whole spectrum of short, medium, and long-term goals.

The energy transition is expected to bring positive direct and indirect impact on the Indonesian economy. Beyond driving economic growth, JETP investments can create jobs, contribute to reducing regional economic disparity, and positively impact a variety of sectors such as financial services and manufacturing. In addition, multiplier effects enable JETP investments to reverberate across the economy, spurring further investments that increase demand across sectors. Additional impacts can be expected for informal sector employment, though further analysis is required to understand the scale of the impact.

It is critical that Indonesia strive for a just energy transition in which the economic, social, and environmental risks and opportunities are shared equitably among stakeholders. Hence, the CIPP sets out a JT Framework that identifies a comprehensive set of potential risks and opportunities from JETP investments to ensure alignment with this principle. This JT Framework integrates existing safeguards in Indonesia and supplements them by adding one additional standard that addresses economic diversification & transformation, as well as one additional component to assessments that focuses on identifying and enhancing opportunities.

JETP governance plays a pivotal part in the success of the implementation of the CIPP as it is designed to ensure leadership and ownership that provides clear strategic direction, transparency, integrity, and accountability. It ensures a robust decision-making process to unlock and scale up funding from diverse sources that target appropriate financing instruments and JETP investment focus areas. The JETP Secretariat will coordinate with the GoI National Energy Transition Task Force, the Energy Transition Mechanism (ETM) Country Platform Steering Committee, and the IPG to receive input and endorsement, while liaising with the GFANZ working group members, project developers, other financiers, and various stakeholders on an implementation level.

The JETP Secretariat and the Government of Indonesia welcome all international investors, local investors, and donors to become partners in its pursuit of a just transition to a low-carbon, sustainable, and resilient economy.

Section 2
Comprehensive Investment and Policy Plan (CIPP) Overview

2. Comprehensive Investment and Policy Plan (CIPP) Overview

2.1 Background of Indonesia's Just Energy Transition Partnership

On November 16, 2022, the GoI and the International Partners Group (IPG) launched Just Energy Transition Partnership for Indonesia (JETP Indonesia) on the sidelines of the G20 Summit in Bali, Indonesia. The IPG comprises the governments of Japan and the United States, who are co-leaders of the partnership, and Canada, Denmark, the European Union, the Federal Republic of Germany, the French Republic, Norway, the Republic of Italy, and the United Kingdom of Great Britain and Northern Ireland (Government of the Republic of Indonesia and International Partners Group, 2022).

JETP Indonesia was launched one year after the first energy transition financing deal was agreed for South Africa in November 2021. Following the Indonesian deal, similar deals were launched in Vietnam in December 2022 and Senegal in April 2023. At US$20 billion, JETP Indonesia marks the biggest energy transition financing package in the world to date.

The Joint Statement issued in November announced the commitment to groundbreaking climate targets, particularly in the power sector, and associated financing to support Indonesia in an ambitious and just pathway that is aligned with the Paris Agreement goals and aims to contribute to keeping the 1.5°C global warming limit within reach.

In line with the commitment, the GoI and the IPG have agreed to develop a Comprehensive Investment and Policy Plan (CIPP) after the launch of the JETP Secretariat, to put Indonesia on the right path in achieving its energy transition targets and policies to reduce greenhouse gas emissions in the power sector while supporting impacted communities.

Since ratifying the Paris Agreement, Indonesia has named energy transition as one of the key strategies for achieving the greenhouse gas emissions reduction targets under the Nationally Determined Contribution (NDC). Consequently, JETP Indonesia was established against the backdrop of Indonesia's energy transition.

The NDC targets have recently been made more ambitious by the Enhanced Nationally Determined Contribution (E-NDC) as submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in 2022 (United Nations Framework Convention on Climate Change, 2021). Under the E-NDC, GoI committed to reducing its greenhouse gas emissions by 31.89% by 2030 from the 2010 business-as-usual (BAU) baseline unconditionally, and by 43.2% by 2030 from BAU conditional upon international assistance (Ministry of Environment and Forestry, 2022). About half of the emissions that are planned to be reduced originate from the energy sector. GoI has also submitted a Long-Term Strategy to 2050 to the UNFCCC, which has stipulated a net-zero emissions target by 2060 or sooner.

2.2 Content of JETP Joint Statement

Within the JETP Joint Statement, outputs have been explicitly defined in the "Intends To" section. Since then, the outputs have been delivered by the JETP Secretariat, including but not limited to:

- JETP Investment and Policy Plan to identify the investment requirements and opportunities to deliver on the just energy transition, led by the Government of Indonesia with administrative and technical support provided by a secretariat and with the collaboration of PT SMI. The Investment and Policy Plan will also provide an outline of the policy reforms necessary to address any regulatory barriers in the energy and financial markets that hinder private investment for a just energy transition;
- A roadmap for 2030 in the power sector in line with the net zero target to support a clear pathway to green development;
- A policy reform strategy in both the energy and financial sectors to catalyze investment, including from the private sector, in an efficient and market-driven manner, in support of the JETP goals;
- A plan to accelerate the early retirement or avoid construction of on and off-grid coal-fired power plants both before and after 2030 in a manner that substantially decreases emissions while maintaining stable and affordable power for the Indonesian people;
- Develop a strategy to leverage further financial resources, including from domestic institutions, to support Indonesia's just energy transition activities;
- Potential financing instruments and policies that will act to improve PT Perusahaan Listrik Negara's (PLN), and relevant subsidiaries, long-term financial sustainability; and
- Develop a roadmap for domestic renewable manufacturing capability that addresses local content requirements.

The Joint Statement states several joint conditional targets for the decarbonization of the Indonesian power sector, primarily comprising:

- Achieving peaking power sector emissions by 2030 at an absolute value of no more than 290 MT CO2 (down from a 2030 baseline value of 357 MT CO2), and immediately declining thereafter on an ambitious trajectory, and achieving net zero emissions in the power sector by 2050, including with the accelerated retirement of coal plants, conditional on international support; and
- Accelerating the deployment of renewable energy so that renewable energy comprises at least 34% of all power generation by 2030.

In the spirit of reaching the joint conditional targets that have been set, key strategies have been explicitly defined in the Joint Statement. Subsequently, such key strategies will require adequate international financial and technical support. In other words, the achievement of the joint conditional targets depends on the success of the following strategies:

- The accelerated retirement of coal-fired power plants (CFPPs) as prioritized and identified by GoI in the JETP Investment and Policy Plan as a necessary element in achieving the targets;
- The widespread deployment of energy efficiency and electrification tools, technologies, and reforms, including through standards to access the resulting energy and cost savings;
- The development of a vibrant and competitive local industry in renewable energy value chain and energy efficiency, as appropriate and as feasible, by investing in local technological capacity and knowledge;
- The development of a robust just energy transition plan, in consultation with relevant stakeholders, to identify and support the segments of Indonesia's population most vulnerable to potential negative impacts of the transition—workers and all societal groups with a special focus on women, youth, and vulnerable populations that earn a living in the coal industry or in jobs connected with the coal industry;
- The restriction of the development of captive CFPPs in accordance with the Perpres 112/ 2022 and collaborating to find and implement potential zero-emission and renewable solutions for power generation facilities outside Java-Bali, including captive power facilities, provided that the solutions are affordable (priced similar or better than the non-renewable alternatives), reliable (can provide base load), accessible, and timely (can be deployed within similar or better than the non-renewable alternatives) to balance the imperative of industrial development and economic growth of Indonesia with the commitment on net zero;
- The freezing of the existing pipeline of planned on-grid CFPPs included in the current Rencana Usaha Penyediaan Tenaga Listrik (RUPTL) for 2021–2030, and reaffirming a full moratorium on any new on-grid coal power generation capacity in accordance with Presidential Regulation on Renewable Energy (Perpres 112/ 2022);
- The alignment of local content requirements with the roadmap for domestic renewable manufacturing capability to achieve the renewable goals in RUPTL and to scale renewable deployment to support robust domestic renewable energy manufacturing capability. The progression of local content requirements should take into account the size and scale of a viable domestic market;
- The mobilization of sufficient capital to achieve the targets through a combination of instruments that may include grants, concessional loans, market-rate loans, guarantees, and TA, some of which will be used to de-risk and catalyze private investments; and
- The mobilization of US$20 billion over the next three to five years through the partnership, of which US$10 billion will be mobilized by the IPG members. Working closely with GoI and the IPG, the GFANZ Working Group members will work to mobilize and facilitate at least US$10 billion in private finance in support of an ambitious transition path and investment plan. Private sector finance will be subject to catalytic public finance and with collective ambition by all parties, including enhanced engagement by the multilateral development banks, the public sector finance has the potential to significantly generate more in private finance than the amount of US$10

billion. These resources are subject to concurrence on the JETP Investment and Policy Plan that includes a competitively tendered pipeline of projects, including continued progress in improvements to the country's policy and enabling environment, in line with budgetary procedures and terms, responsive to progress by GoI and relevant actors, and transparently reported. The continuation of the partnership is expected to be contingent on no new coal power capacity for instances where timely, zero-emissions, affordable, and reliable alternatives are available, including developing a strategy to avoid new captive coal and to successfully identify investments in renewable electricity supply as alternatives for all new captive projects.

The JETP Joint Statement also recognizes the importance of various considerations in the development and implementation of the CIPP. It is fully recognized that the urgency of decarbonizing energy systems by expediting a reduction in power sector emissions, increasing energy efficiency, and hastening renewable energy deployment, must be conducted hand-in-hand by strengthening efforts to reach universal, affordable, and reliable access to energy. The decarbonization efforts must also consider the long-term financial sustainability of PLN.

Beyond this, further emphasis is also set at the importance of the just transition measures that brings about opportunities for industrial innovation to create quality green jobs and considers all communities and societal groups affected directly or indirectly by an expedited reduction of power sector emissions. All these must be conducted in line with the Bali Declaration issued during Indonesia's G20 Presidency in 2022 that reiterates global support for energy transition in three priority areas—energy access, technology, and finance—to achieve better economic growth that is inclusive, sustainable, and equitable.

The achievement of the JETP joint conditional targets requires the mobilization of sufficient funding through a combination of various types of funds. In the near-term, approximately US$ 20 billion will be mobilized over the next three to five years through the partnership, of which half will be mobilized by the IPG members and the other half will be mobilized and facilitated by the GFANZ Working Group in the form of private finance. GFANZ working group members consisting of an initial set of financial institutions that include Bank of America, Citi, Deutsche Bank, HSBC, Macquarie, MUFG, and Standard Chartered. It is fully acknowledged that the US$20 billion committed will not be sufficient to meet the JETP joint targets, and thus will require additional financial resources.

2.3 CIPP Objectives and Guiding Principles

The CIPP is an output agreed upon in the Joint Statement and underpins the implementation of the partnership (Government of Indonesia and International Partners Group, 2022). Working groups led by international institutions comprising national and local stakeholders coordinated by the JETP Secretariat have been working together over the last six months to produce a credible and workable CIPP document. The document contains a consolidated energy transition pathway for the power sector, financing needs and requirements, policy reform recommendations, and JT framework.

The CIPP must align with the Government of Indonesia's policy priorities of decarbonization and just energy transition. The investment plan is a "living document" that should be regularly evaluated and updated to reflect recent market developments and policy priorities. The plan is expected to be updated annually, taking into account changes that occur in the state of the global economy, power sector developments, policy and regulatory changes, inclusion of other sectors in CIPP, and other relevant factors. Any future revision to the targets will not undermine the level of ambition in the joint statement.

In preparing the CIPP, the JETP Secretariat coordinates with various institutions and the following workings groups, with the respective objectives, as follows:

- Technical working group, led by the International Energy Agency (IEA), with the objective of consolidating the energy transition pathway for Indonesia's power sector. Members of the technical working group include Rocky Mountain Institute, The World Bank, Institute for Essential Services Reform (IESR), and the Danish Energy Agency;
- Finance working group, led by the Asian Development Bank (ADB), to identify financing needs, requirements, and modalities. Members of the finance working group include GFANZ, Climate Policy Initiative, KfW Development Bank, AFD, and JICA;
- Policy working group, led by the World Bank, to analyze policy requirements and provide recommendations to support power sector decarbonization. Members of the policy working group include MENTARI, USAID, ADB, and the IEA; and
- Just Transition working group, led by United Nations Development Programme (UNDP), with the objective of developing a JT framework to guide implementation. Members of the Just Transition working group include the ADB, the International Labour Organization, the World Bank, GIZ, and Indonesian Center for Environmental Law.

It is envisioned that a fifth working group will be added in the second CIPP, with a focus on energy efficiency and electrification. This working group will help assess the role and potentials of energy efficiency and electrification as the first step for the energy transition in Indonesia. This working group is expected to be established after the formal launch of the first CIPP.

In preparing the CIPP, the JETP Secretariat and working groups worked closely with various government institutions, among others the Coordinating Ministry for Maritime Affairs and Investment, Coordinating Ministry for Economic Affairs, Ministry for National Planning/BAPPENAS, Ministry of Energy and Mineral Resources, Ministry of Finance, Ministry of State-Owned Enterprises, Ministry of Industry, and the National Energy Council. The JETP Secretariat also worked closely with non-government stakeholders, including business associations, trade unions, civil society organizations, and environmental think tanks. Throughout the CIPP drafting process, the JETP Secretariat and working groups conducted more than 300 meetings inviting all these stakeholders during the preparation of CIPP.

In developing the CIPP document, the JETP Secretariat adopts the following principles. The CIPP needs to (1) positively contribute toward Indonesia's economy and ensure energy affordability; (2) guarantee energy security and stability, while ensuring a just transition; (3) ensure the energy sustainability; and (4) maintain long-term financial sustainability for PLN and subsidiaries.

The document consists of the following chapters:

- **Indonesia's Decarbonization Vision** – The context that underpins Indonesia's decarbonization ambition and stated strategies as well as the current landscape of policies and political statements supporting decarbonization;
- **Impact on Indonesia's Economy: A Case for The Energy Transition** – A deep dive into the potential positive impact of JETP on the Indonesian economy;
- **The JETP Pathway and Portfolio of Programs** – A breakdown of pathways and programs envisioned for the five investment areas under JETP;
- **Ensuring a Just Energy Transition** – A framework developed collaboratively to guide the socioeconomic and environmental aspects of transition and designed to mitigate transition risks to society;
- **Financing the Just Energy Transition** – The financing needs, designs the end-to-end financing process, and explores financing structure options in the context of JETP;
- **Enabling Policies for JETP Portfolio** – A deep dive into key policy reforms needed to enable just energy transition within JETP and beyond; and
- **JETP Governance and Implementation** – The institutional setup and governance structure proposed for the effective implementation of JETP.

2.4 Latest Developments Toward JETP Joint Statement Targets

When JETP was launched in November 2022, the landscape of private and captive power coming online was not comprehensively documented. There were several reasons for this. The demand for nickel has exploded over the past several years—partially because of the EV and batteries boom—and the industry is expanding rapidly, especially in nickel-rich Indonesia. This has resulted in a commensurate demand for power in Indonesia. This sudden increase in demand has shifted the captive power landscape radically. Since private companies own and operate these power plants, the Secretariat does not yet have full visibility into their planning processes—only have what was included in government paperwork.

Understanding where emissions are coming from is an important first step towards figuring out how to reduce them. Although the extent of the existing and planned captive power is yet to be wholly documented, the JETP Secretariat is shedding greater transparency of the full extent of emissions.

The captive power issue is extremely complex. Many industrial power users, such as those companies mining and processing nickel, require highly reliable, 24-hour power at a high volume. Further, these industrial operations are often located in remote and/or ecologically sensitive areas that are not within PLN's on-grid system. Providing viable renewable options for industrial power will be challenging, given the need for near 24-hour power at high volume on limited land. Some sites could require first-of-their-kind solutions. Such a complex issue requires additional time for study and modeling to develop a technologically feasible, lower carbon pathway for off-grid industrial facilities that will not impede Indonesia's economic growth.

As such, it was agreed that the 2023 version of the CIPP would only have an on-grid emissions target and pathway. The CIPP includes a technical pathway for the on-grid system with a 250 MT target for the on-grid power system in 2030. This target is extremely ambitious.

On the other hand, more time is needed to understand the extent of the current on-line and planned captive coal, develop strategies to better manage industrial energy demand (including energy efficiency), set out viable alternatives to meet this demand without coal, and determine an ambitious off-grid emissions target.

After the initial launch of the CIPP, the JETP Secretariat will begin conduct an extensive explorative study around the off-grid systems to provide a better understanding of the captive decarbonization strategies, with a goal to conclude the study within six months of starting this work. Like the CIPP, the study will provide some form of a target for the captive sector and will recommend the concrete steps the Indonesian government can take to limit captive emissions.

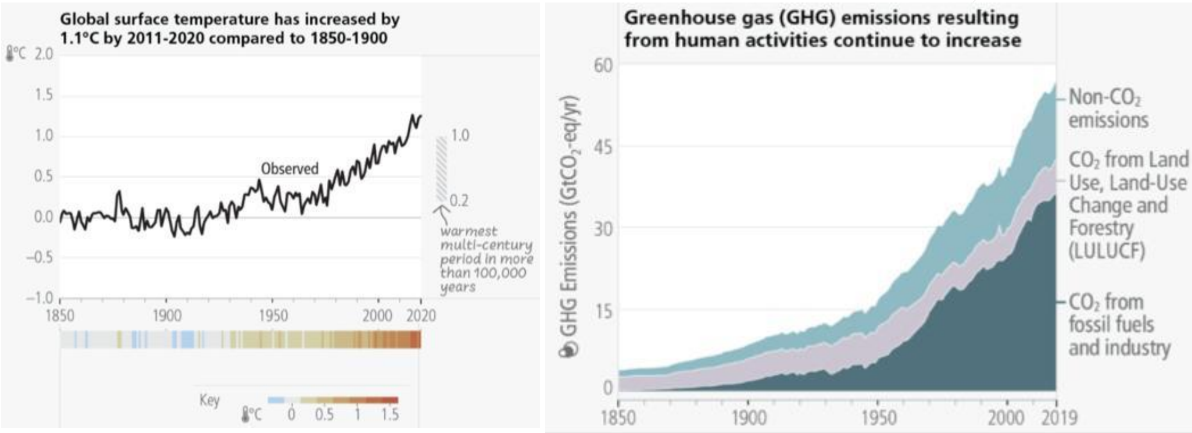
Based on the on-grid modeling – and, importantly, what is now known about the captive power landscape – peaking at 290 MT would be extremely difficult given existing and planned captive coal capacity. Indonesia's power sector, accounting for the full extent of off-grid captive power, is likely to exceed this target. However, modeling and analysis on the captive power sector is not yet complete, and we cannot say anything definitive until the experts complete their work. We will continue to maintain the ambition that underpins the JETP Joint Statement.

Section 3
Context – Achieving Decarbonization Vision of Indonesia Through JETP

3. Context – Achieving Decarbonization Vision of Indonesia Through JETP

3.1 Drivers for Indonesia's Energy Transition

The recently published IPCC 6th Assessment Report summarizes the global climate change situation. The report highlights that human activities principally through emissions of greenhouse gases (GHG) have unequivocally caused global warming. An increase of global surface temperature by 1.1°C between 1850–1900 and 2011-2020 may lead to the temperature reaching 1.5°C and could exceed 1.5° C. The increase in greenhouse gas emissions is mainly contributed by energy use, land use and land use change, industrial activities, and other activities across the regions (Figure 3.1-1). Human-caused climate change is already resulting in many weather and climate extremes and subsequently, widespread adverse impacts, losses, and damages to nature and people.

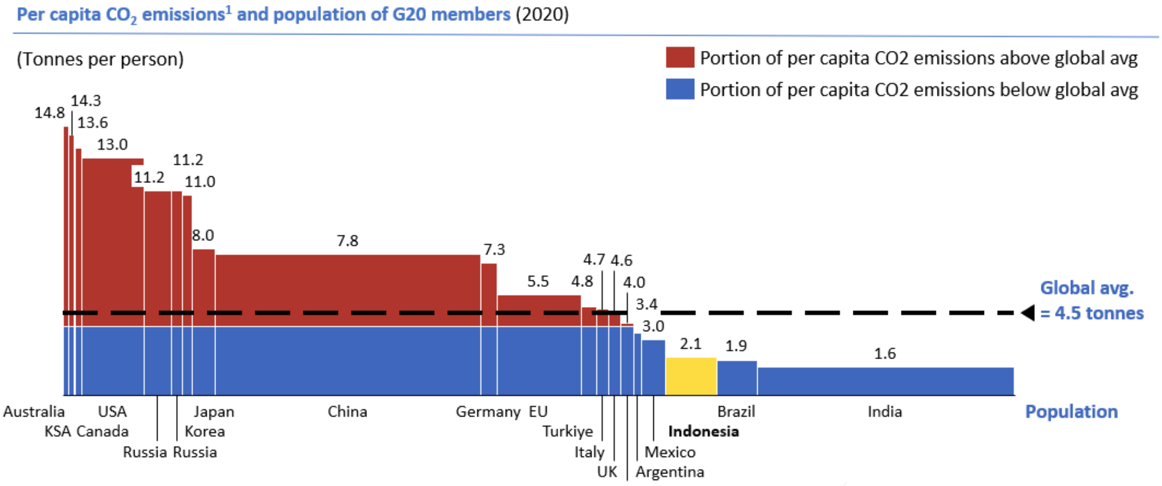


Source: (Intergovernmental Panel on Climate Change, 2023)

Figure 3.1-1 Global trends on surface temperature and greenhouse gas emissions

The climate extremes will continue to worsen and the impact will be a widespread threat to human well-being globally. While many global mitigation measures have been rolled out, there remains room for more rigorous measures to tackle the impact from climate change. These include integrated efforts to provide disincentive (e.g., Pigouvian tax) for externalities rising out of increased GHG emission, including fossil fuel, and a standardized global pricing on climate finance that depends on the impact from climate change rather than country-specific risk premium. While different countries will have different baselines and face different conditions, countries should strive to engage in energy transition and strive to reach a common global goal. Countries should then engage in energy transition under the principle of Common But Differentiated Responsibility (CBDR).

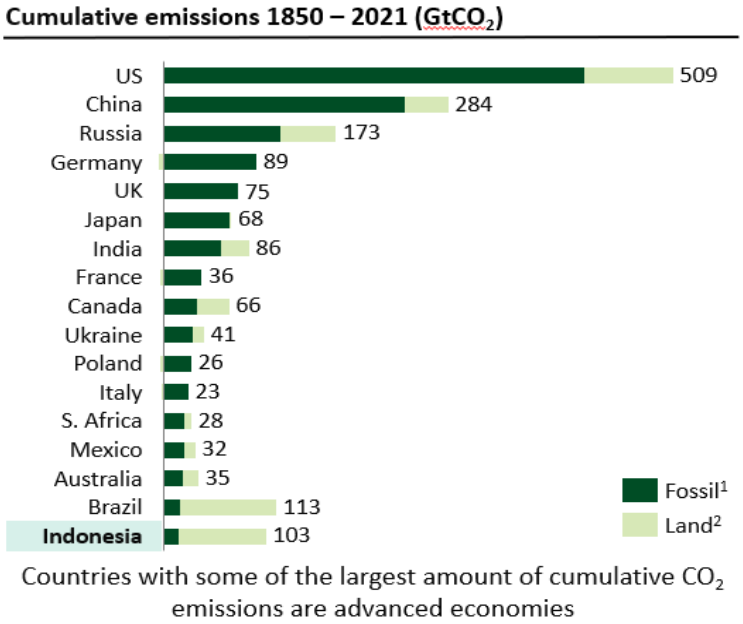
Indonesia's current carbon dioxide (CO_2) emission per capita stands at 2.3 tons/person, which is lower than the global average of 4.5 tons/person in 2019 (Figure 3.1-2). In total, this contributes about 2% of the total CO_2 emission across G20 countries. This is significantly lower than the contribution of developed countries, which stands at 82%. This contribution is also aligned when looking at Indonesia's proportion relative to global coal-based power generation. Indonesia coal-based power generation only contributes 2% of the global total coal-based power generation in 2021.



Source: (World Bank, 2022)

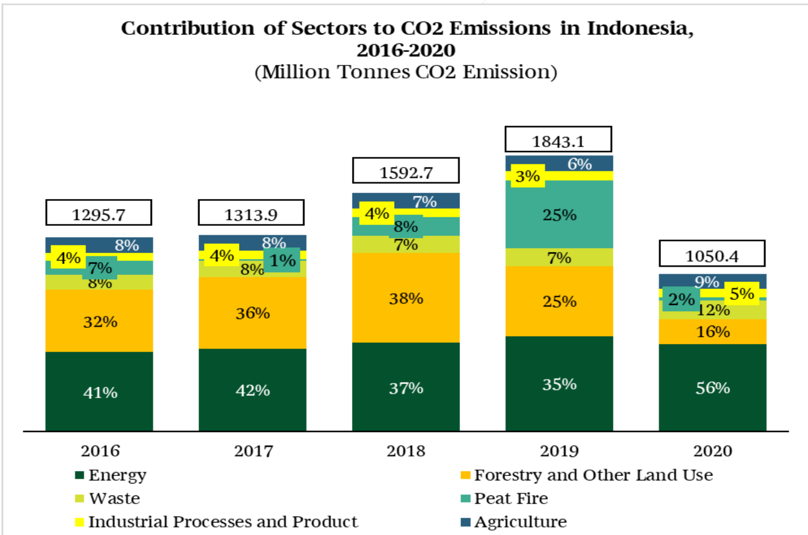
Figure 3.1-2 Per capita CO2 emissions and population of G20 countries in 2020

Historically, Indonesia's largest emission stems from forestry and other land use (FOLU), based on cumulative emissions from 1850–2021 (Figure 3.1-3). Improvement in deforestation control has decreased and curbed primary forest loss. However, continued drive toward industrialization has altered sectoral CO_2 contribution, with the energy sector becoming the largest contributor and FOLU the second largest. As of 2020, the energy sector contributes 56% of total CO2 emission nationwide—out of which around 50% comes from electricity generation (Figure 3.1-4). Furthermore, the growth of emission from electricity generation has exceeded the average growth in the overall energy sector (CAGR 6.0% vs. CAGR 4.2%) from 2016-2020 (Ministry of Environment and Forestry, 2022). It should be noted that the emission data shown in Figure 3.1-4 does not include emissions from captive power.



Source: (Carbon Brief, 2021)

Figure 3.1-3 Global cumulative emissions, 1850-2021



Source: (Ministry of Environment and Forestry, 2022)

Figure 3.1-4 CO2 emission per sector in Indonesia

In the power sector, the emerging theme is the increased development and proliferation of renewable energy technologies in both utility and small scales. The decreasing cost of renewables has mainly contributed toward their accelerated development. Furthermore, growing policy momentum has driven the rapid increase in renewables' deployment in power systems.

One enabling policy commonly adopted is carbon pricing, which aims to discourage high-emitting institutions from combusting fossil fuel. The proliferation of carbon pricing initiatives globally has accelerated in the past 10 years or so, as shown in the increase in the number of implemented carbon pricing initiatives from 16 to 73 from 2009 to 2023 (World Bank, 2023). This would cover 11.6 gigatons of carbon dioxide (GT CO_2) and represents 23% of global emission.

GoI enacted Law No. 7/2021 on the Harmonization of Taxation Regulation. One of the sections of the law is about the implementation of carbon tax that will be applied on the purchasing of goods contained carbon and on the activities that emit GHG. Under this law it is mandated to start the implementation of carbon tax on CFPP. However, to reduce tax burden CFPP management can participate in carbon trading. To implement the law, Ministry of Energy and Mineral Resources (MEMR) has issued the MEMR Regulation No. 16/2022 and launched the first ETS in Southeast Asia covering power sector in February 2023.

The ETS is implemented stepwise. In the initial phase, ETS will cover grid connected CFPP with the installed capacity of more than 100 megawatts (MW) in 2023, followed with CFPP with the installed capacity of more than 25 MW in 2024. Starting 2025, the captive CFPP will be included in the ETS. Other fossil-based power plants will be included in the ETS starting 2028. One important aspect of Regulation No. 16/2022 is that the regulated power plants must implement energy efficiency measures. However, with the current model where the coal price is set at US$70/ton for grid connected CFPP and the cost of coal is passed through to PLN, there will be less to no incentives to CFPP owners to improve efficiency, thus reduce emission (investment cost for energy efficiency vs. coal saving). In addition, according to the PPA signed between IPP and PLN, there is a clause of government force majeure – an action by government, such as change in policy and regulation, declaration of emergency, prohibition to access certain site, and other actions that will impact the execution of a contract. In the case of CFPP under PPA with IPP, there is change in policy or rational cost of CFPP then this cost increase will be passed through to PLN, and PLN will pass this through to the government, which in the end will increase subsidy, due to the fact that government still subsidize electricity to consumers.

As Indonesia continues its industrialization initiatives across multiple sectors, emission is expected to grow in line with the increased energy use if pursuing the conventional growth path. It is imperative that Indonesia’s energy transition pathway allows for economic growth and increased energy use without increasing emissions. The energy pathway must decarbonize the power sector through retirement or phase-out of coal-fired power plants (CFPP), acceleration of the development of dispatchable and variable renewables, and expansion and enhancement of the transmission grid. This needs to be coupled with the decarbonization of end-use industries through energy efficiency, electrification, and demand response as well as development of green industries, such as electric vehicles, batteries, and hydrogen. This development should also be supported with enabling policies that can accelerate energy transition and increase the competitiveness of Indonesia’s products.

Indonesia needs to closely monitor the global trends on energy transition and decarbonization in the industry in general. This is mainly because Indonesia’s energy system relies on fossil fuels, including the production of exported goods. This could decrease the value and competitiveness of Indonesia's goods, should it lag in decarbonization efforts compared to other countries exporting the same goods.

An example of a policy emerging is the Carbon Border Adjustment Mechanism (CBAM), which will be effectively implemented in the European Union by 2026. This policy encourages institutions exporting to the European Union to report their emissions and take mitigation actions to avoid heavy penalties. This policy encourages export-focus Indonesian corporations to take mitigation action and report on the carbon content of their products. It also provides additional impetus to carbon pricing as an instrument to promote decarbonization in Indonesia, as carbon prices paid domestically can be deducted from the CBAM obligation.

Currently, Indonesia's industrial sectors that are most impacted due to the European Union's (EU's) CBAM is iron and steel. Prices of iron and steel could increase by 16.8% after adjustment, according to the Ministry of Trade Indonesia. While the current volume of trade affected is not too large at 6.2% of total export, it is important for Indonesia to prepare its industries to compete in a decarbonization pathway, also in view of similar mechanisms being introduced, or additional sectors included.

In the end-use sectors, the emerging common themes of initiatives are energy efficiency (including shift to energy efficient technologies), electrification and demand response management, and utilization of renewable energy. Energy efficiency slows growth in the demand for energy consumption, while electrification intends to reduce the emission by shifting toward lower-emission technology within the demand industries. This needs to be supported by a key enabler on demand response management at end-use industries. Demand response refers to balancing of the demand from end-users to enable flexibility on the power grids and in doing so, optimizing the development of transmission and distribution infrastructure.

3.2 Indonesia's Climate Target

In September 2022, Indonesia submitted its Enhanced Nationally Determined Contributions (NDC) to the UNFCCC Secretariat, raising its emission reduction target from 29% in the First NDC and Updated NDC to 31.89% unconditionally; and from 41% in the Updated NDC to 43.20% conditional with international support (Table 3.2-1). Its latest NDC represents a significant step toward a more sustainable and climate-resilient future, which will be crucial for Indonesia's energy transition to meet both its climate and development goals.

Table 3.2-1 Enhanced Nationally Determined Contribution Indonesia

Source: (UK Mentari, 2022)

Sector	GHG Emission Level 2010* (MTon CO2-eq)	GHG Emission Level 2030			GHG Emission Reduction				Annual Average Growth BAU 2010-2030	Average Growth 2000-2012
		MTon CO2-eq			MTon CO2-eq		% of Total BaU			
		BaU	CM1	CM2	CM1	CM2	CM1	CM2		
1. Energy (incl. fugitive)	453.2	1,669	1,311	1,223	358	446	12.5%	15.5%	6.7%	4.50%
2. Waste	88	296	256	253	40	43.5	1.4%	1.5%	6.3%	4.00%

Sector	GHG Emission Level 2010* (MTon CO2-eq)	GHG Emission Level 2030			GHG Emission Reduction				Annual Average Growth BAU 2010-2030	Average Growth 2000-2012
		MTon CO2-eq			MTon CO2-eq		% of Total BaU			
		BaU	CM1	CM2	CM1	CM2	CM1	CM2		
3. IPPU	36	69.6	63	61	7	9	0.2%	0.30%	3.4%	0.10%
4. Agriculture	110.5	119.66	110	108	10	12	0.3%	0.4%	0.4%	1.30%
5. Forestry and Other Land Uses (FOLU)	647	714	214	-15	500	729	17.4%	25.4%	0.5%	2.70%
TOTAL	1,334	2,869	1,953	1,632	915	1,240	31.89%	43.20%	3.9%	3.20%

Energy is the second-largest source of emissions today considered under the NDCs and is expected to be the largest source by 2030. Under energy, the reduction of CO equivalent against BAU is 358 MT (or 12.5% of total BAU) unconditionally, and 446 MT (or 15.5%) conditional. The significant expected increase in energy-related emissions under BAU, from 453 MT in 2010 to 1,669 MT in 2030, reflects Indonesia's need to invest in energy for its economic growth. It is important to note that the baseline and the emission reduction trajectory shown in Table 3.2-1 already incorporates GHG emissions from captive power.

Indonesia's NDC has acted as a catalyst to the inception of various programs and policies. In 2021, the Ministry of Finance had estimated that the state fund (APBN) allocated for climate change funds would only cover 34% of funds required to reach NDC targets in 2030 and encouraged non-state actors to contribute to the NDC targets. PLN announced plans to reach net-zero emissions (NZE) in 2060. Furthermore, based on Kepmen No. 275 of 2022, the Ministry of Finance (MoF) had appointed PT Sarana Multi Infrastruktur (SMI), a special mission vehicle, as the Energy Transition Mechanism (ETM) Country Platform manager tasked with developing a financing and investment framework for the ETM program (Ministry of Finance, 2022).

For power generation under Indonesia's long-term low-carbon development vision in line with the Paris Agreement, Indonesia intends to reduce the utilization under its "LCCP" (Low Carbon Scenario Compatible with Paris) scenario significantly compared with its "CPOS" (Current Policy) scenario. The grid emission factor will be reduced significantly from around 500g CO_2/kWh under CPOS to less than 100g CO_2/kWh in LCCP. To follow up the commitment to meet net-zero emission target in 2060 or earlier, MEMR started to draft a roadmap for net-zero emissions in the energy sector. To meet the net-zero emission target MEMR has defined five key pillars in its implementation strategy:

1. Stepwise early decommissioning of CFPP;
2. Acceleration of renewable energy investment;
3. Utilization of more efficient technology;
4. Electrification in transportation, building, and household; and
5. Utilization of the smart grid.

In line with the development of draft roadmap for the net-zero emission in the energy sector, MEMR has also drafted the roadmap to net-zero emission in the power sector—as one of the largest contributors of emissions. The draft roadmap shows the gradual decommissioning of the CFPPs (last power plant to be decommissioned in 2056) and replacement of energy supply through accelerated build of renewable energy to meet net zero emission target maintains energy security, energy equity and accessibility, and environmental sustainability.

3.3 Indonesia's Regulatory and Institutional Landscape on Energy Transition

3.3.1 Energy Sector Regulatory Framework

Indonesia's national energy sector is regulated by two overarching laws: Law No. 30/2007 on Energy and Law No. 30/2009 on Electricity. These laws set out general principles on energy resources management and principles for power sector management. In November 2020, a new Omnibus Law was passed aiming to create a more conducive regulatory climate for job creation and investment, which also touch, among others, the power and energy sector.

Based on the two laws, energy policies are then followed up by implementing regulations such as Government Regulations (PP), Presidential Regulation (Perpres), Ministerial Regulations (Permen), and Local Government Regulations (Perda) as defined in Figure 3.3-1.

PP No 79/2014 on National Energy Policy (KEN) became the legal regulatory framework to formulate national primary energy mix with ambitions as follows:

- New and renewable energy at least 23% in 2025 and at least 31% in 2050;
- Oil should be less than 25% in 2025 and less than 20% in 2050;
- Coal should be minimum 30% in 2025 and minimum 25% in 2050; and
- Gas should be minimum 22% in 2025 and minimum 24% in 2050.

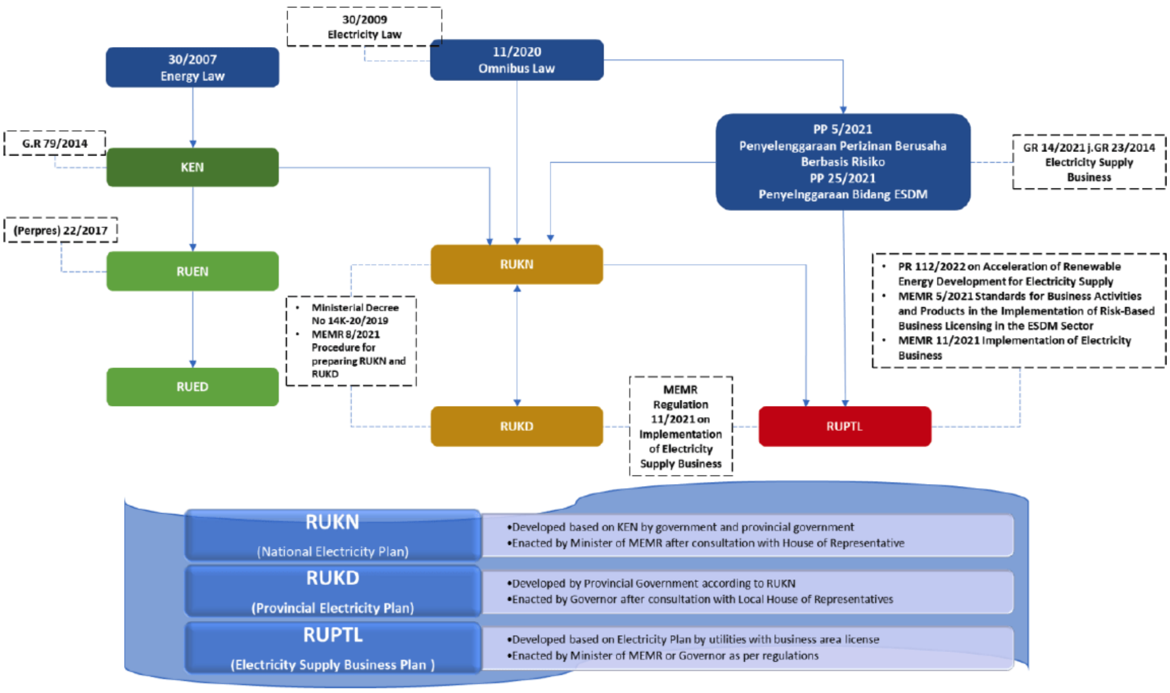
The KEN is an energy planning document that is approved by the House of Representatives and becomes the main document for any energy planning in Indonesia. Since the latest update in 2014, an amendment toward the KEN is currently in progress. Under the KEN, a National Energy General Plan (Rencana Umum Energi Nasional - RUEN) is established to provide detailed outline for cross-sectoral implementation strategy to achieve the target enacted in KEN. The preparation of revised draft KEN has been done in close coordination with the directors general (DGs) of the Ministry of Energy and Mineral Resources (MEMR) and with other government stakeholders.

Concurrently, DG Electricity of MEMR is preparing an updated draft of National Electricity Master Plan (RUKN), which will become the basis for the State Utility PLN, as well as other companies holding a business area license to make their business plan (RUPTL). The MEMR is currently expecting input from stakeholders. The new RUKN draft is in line with the draft of KEN and has been used as the baseline for the drafting of JETP scenario for the on-grid power sector.

Under PP 14/2012, RUPTL is defined as a ten-year electricity development plan that outlines the investment needs of business area holders. Every company holding an integrated electricity business area license needs to issue an RUPTL and conduct yearly updates.

One important regulation that has been used as a basis for decarbonization in the power sector is Perpres 112/2022 on Acceleration of Renewable Energy Development for the Provision of Electricity. Some important articles in this regulation include:

- Prioritization of renewable energy for the Indonesia power sector
- No new CFPP development, except CFPP pipelines that have already been included in the electricity business plan (RUPTL) 2021-2030; or
- New CFPP can only be developed for industries with the purpose of increasing added value of the natural resources with the caveat:
- After 10 years of operation the emission needs to be reduced by 35% and needs to be retired latest by 2050;
- A roadmap for CFPP early retirement will need to be prepared;
- Setting up tariff ceilings for each type of renewable energy technology and capacity as a basis for PLN to procure energy through direct selections or direct appointment from independent power producers (IPPs); and
- Support to be provided by relevant ministries.

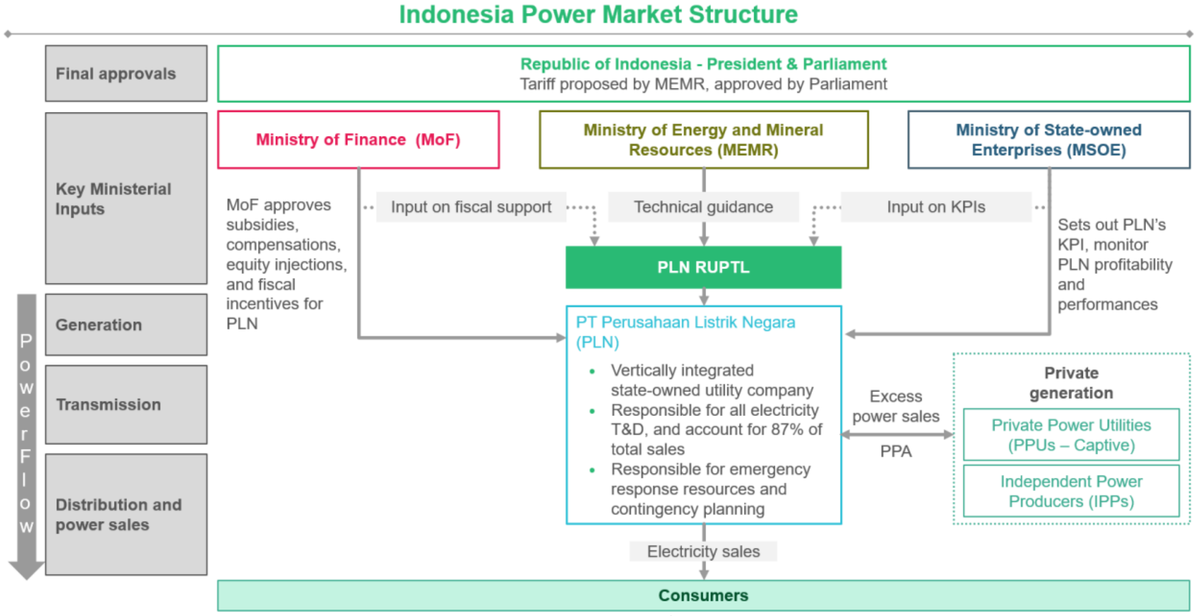


Source: (UK Mentari, 2022)

Figure 3.3-1 Indonesia energy sector regulatory structure

MEMR has prepared draft RUKN that will be used as basis for the development of power sector, both on-grid and captive. This draft has been presented to stakeholders and now is in finalization process. Also, as mandated by Perpres 112/2022 a draft MEMR regulation on Roadmap for CFPP early retirement is now under preparation in coordination with PLN. The roadmap includes CFPP early retirement targets and list of CFPP. Further details on this can be found in Chapter 5.

3.3.2 Indonesia Power Market Structure



Source: (JETP Secretariat and Working Groups, 2023)

Figure 3.3-2 Indonesia power market structure

Indonesia's Constitutional Law stipulates that the power sector is a strategic asset and therefore should be controlled by the government. Indonesia's power sector is highly regulated with a vertically integrated State Utility—PLN. The power market allows private players—independent power producers (IPPs)—to enter the generation side, while PLN maintains its role as the only off-taker, transmission, and distribution operator as well as retailer to customers. PLN retains ownership of the transmission and distribution infrastructure.

The only exception is given to captive power producers (PPUs) who, for the purpose of industries, are allowed to generate their own power. Some PPUs might be given an integrated business permit area (Izin Wilayah Usaha) which would enable them to sell their generated power to other customers, but this would require special permits from the MEMR. In general, IPPs are obliged to sell their power to PLN under fixed term agreements— normally for a PPA period of 20-30 years. Some PPUs might be given an integrated business permit area (Izin Wilayah Usaha) which would enable them to sell their generated power to other customers, but this would require special permits from the MEMR. On the other hand, other PPUs/captive plants can sell excess power to PLN with usually short-term agreement. Currently there are approximately 53 other business permit holders, most of which are special industrial or special economic zones.

Section 4

Impact on Indonesia’s Economy: A Case for The Energy Transition

4. Impact on Indonesia's Economy: A Case for The Energy Transition

Policies to drive the just energy transition will be a key factor to drive economic growth and social benefits in the coming years. With the right policies in place, significant investment flows will impact economic growth in three ways: Directly, where investment will expand output in the energy and renewable energy sectors; indirectly, where a multiplier effect will increase output further as suppliers and service providers will add complementary activities; and induced, where improved infrastructure and business conditions lead to further re-allocation effects in other economic sectors. This chapter looks at how these dynamics play out to affect the following areas: the ability of the government to stimulate economic growth; regional development; job creation and wider cross-sector economic impacts.

4.1 Improving Indonesia's Economic Growth

The Comprehensive Investment and Policy Plan complements existing plans of the government to achieve environmentally sustainable growth. Energy transition is already an important part of Indonesia's long-term economic vision, with low carbon development goals well embedded in Indonesia's medium and long-term development plan (Bappenas, 2019). Economic modelling of the Low Carbon Development Initiative (LCDI) demonstrates that investments to increasing the share of renewable energy to 23% by 2030 and further to 30% by 2045 – complemented by other policies such as increased energy efficiency, sustainable land-use, and forest protection measures - will not only result in lower GHG emissions, but also in sustainable economic growth rates. Green growth will also result in social benefits such as improved air quality, estimated to result in the avoidance of 40,000 deaths annually (Bappenas, 2019). Just Energy Transition Policies will accelerate the path toward low carbon development, eventually reaching Net-Zero Targets.

Policies to enable the energy transition will impact economic growth and social outcomes in direct and indirect ways. A direct impact will be on the fiscal capacity of the government to stimulate the economy. Government finances depend on income taxes collected from coal production and power generation. Reduced domestic demand for coal will decrease tax revenues from the energy sector. Income taxes from the electricity sector will decrease, as CFPPs will be shut down, while the government needs to increase public spending to incentivize renewable energy producers via fiscal incentives.

On the other hand, reduced demand for coal due to the retirement of CFPPs will incentivize coal producers to look to international markets for profit-making opportunities through an increase in exports - especially if the Domestic Market Obligation, requiring coal companies to sell 25% of their production domestically at locally set prices, is reduced or eliminated. International prices will depend on demand from India and China, traditionally Indonesia's largest markets, but now also undergoing their own energy transitions. Thus, in the short-term, tax revenues from coal-exporting producers might still be significant as it will take time to fully phase-out coal-fired generation in Indonesia's export markets. But in the long-term annual taxable income from the coal-sector should be expected to fall. Similarly, the revenue potential of any future carbon pricing instruments will depend on the speed at which the number of carbon producers will be reduced during the energy transition, but might be limited in the long run, as the share of renewable energy in the power sector increases. Similarly, the revenue potential of any future carbon pricing instruments will depend on the speed at which the number of carbon producers will be reduced during the energy transition, but might be limited in the long run, as the share of renewable energy in the power sector increases. Similarly, the revenue potential of any future carbon pricing instruments will depend on the speed at which the number of carbon producers will be reduced during the energy transition, but might be limited in the long run, as the share of renewable energy in the power sector increases.

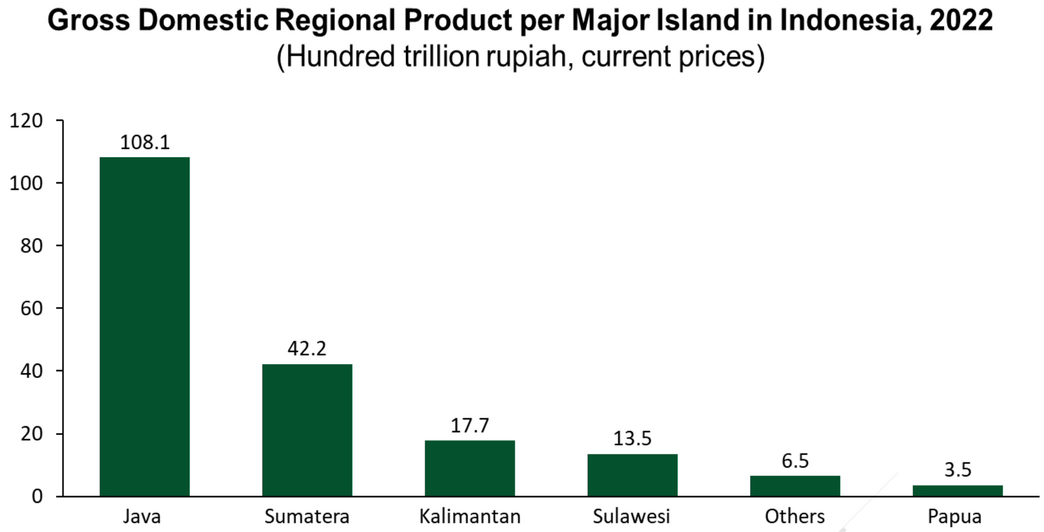
Given limited public resources, green fiscal policies need to be targeted to enable direct private investment into renewable energy projects. Much of this investment will have indirect and induced economic impacts, as money flows to industries, services, and infrastructure development to supply renewable energy projects. For example, Indonesia's aim to build value chains to support renewable investments industry will be expected to improve the transportation infrastructure as part of the nationwide investment in renewable energy, which will further drive consumption growth.

Investments channeled through JETP will increase renewable energy production and induce additional economic activities spilling beyond the power sector. Energy transition policies can support greater export competitiveness and enable Indonesia to move beyond mineral exports. In 2021, Indonesia's exports were led by coal (US$28.4 billion), palm oil (US$27.3 billion), petroleum gas (US$8.1 billion), ferroalloys (US$7.2 billion) and large flat-rolled stainless steel (US$6.7 billion) (The Observatory of Economic Complexity, 2022). The need for economic diversification can be assessed by the economic complexity index, which is a measure of a country or region's productive capabilities. Currently, Indonesia ranks 61st in the ECI Trade, based on the geography of trade and capturing the sophistication of exports. The investments detailed above, supported by investments in research and innovation, will diversify Indonesia's manufacturing base and improve its competitive positioning. Economic competitiveness will be increasingly determined by environmental sustainability criteria, as importing countries begin to tax the carbon embedded in goods at their borders and global companies increasingly monitor the carbon intensity of their own supply chains.

4.2 Overcoming Regional Economic Disparity

Energy transition can support regional economic growth through three key drivers: Direct investment in regions with renewable energy potential; improved access to energy; and economic diversification. These three offer significant opportunities across the country, particularly outside Java.

The acceleration of renewable energy deployment is expected to boost the regional economies beyond Java. Currently, Indonesia faces significant disparities between its major islands. As of 2022, the GDP per capita in Jakarta at IDR 298 million, which is more than four times the national average of IDR 71 million and more than 10 times that of the province with the lowest GDP per capita, East Nusa Tenggara at IDR 22 million (Central Bureau of Statistics, 2022).



Source: (Central Bureau of Statistics, 2022)

Figure 4.2-1 Gross domestic regional product per major island in Indonesia

Indonesia has significant potential for renewable energy across its islands and therefore provides direct investment opportunities in many regions. Geothermal and hydropower have potential in all major islands, including in the less wealthy eastern part of the country. Developing this energy potential means not only direct job creation opportunities in construction and operation but also indirect employment via infrastructure development, helping to drive regional economic activities further.

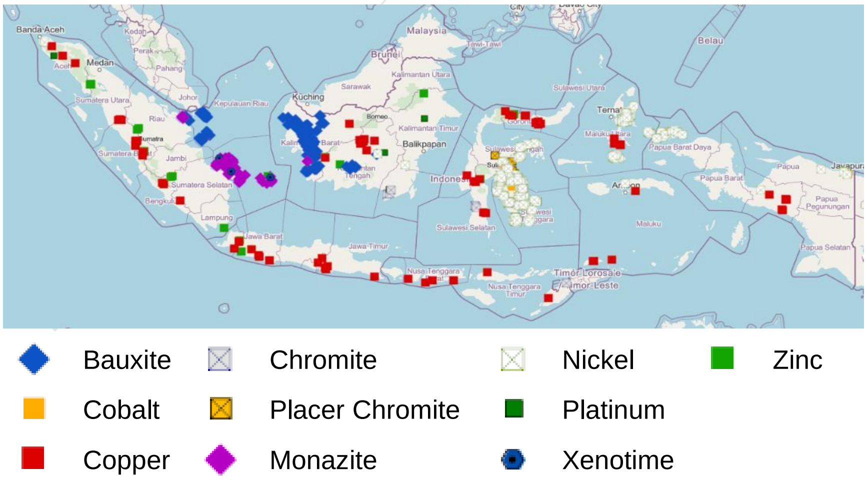
There is ample room for improving access to energy throughout the country. The eastern part of Indonesia has traditionally had less access to electricity and many areas on polluting diesel generators. While the government is implementing a de-dieselization program in these areas, reliance on single generators without grid connections still leaves electrical power unreliable and limited for many communities. The development of new renewable energy plants, linked to a more connected grid, and increased investment into decentralized renewable energy through solar PV, will create more reliable power supply, reduce dependence on imported fossil fuels and create new commercial opportunities that will reduce internal migration and geographic income disparities in Indonesia.

The energy transition will trigger economic diversification. One of the most direct ways for energy transition to facilitate economic diversification in Indonesia is through encouraging development of a renewable energy value chain within the country. As Indonesia's demand for renewable energy components – such as solar panels, wind turbines, inverters - increases, there will be a growing incentive for manufacturers of these products to establish production facilities within the country. Domestic production of renewable energy components will expand the country's high-tech manufacturing sector and diversify the structure of the Indonesian economy.

Energy transition policies can complement Indonesia's need to promote key strategic sectors and support regional economic growth. Mineral processing is a key strategic industry and can act as an important driver of regional economic growth by enabling industrial development near mineral resource deposits. Nickel and copper, important inputs to develop Indonesia's EV and battery manufacturing capacities, can spread Indonesia's industrial development more evenly across the country rather than the highly concentrated nature as of today. While Java's provinces generate between 30% to 42% of their gross regional domestic product (GRDP) from manufacturing, the figure for most provinces is under 20% and in Sulawesi's provinces, it is only between 7% and 11% (Statista, 2021).

Indonesia's mineral wealth is not solely concentrated in Java but is distributed throughout the islands. Papua, for example, has three of the five largest copper mines in Indonesia, as can be seen from Figure 4.2-2 (Global Data, 2023). As noted, the east of the country currently does not have the same access to reliable electricity as the rest of the country. Energy transition policies can support a planned and coordinated approach to help Indonesia's mineral sector, particularly the downstream industries, develop more evenly across the country. Improved access to renewable energy by either connecting to the grid or incentivizing captive power operators by fully utilizing the potential of decentralized solar PV will enable more green local processing—boosting regional economies and reducing income disparities.

Given the traditionally carbon-intensive nature of the mineral processing industry, energy transition policies can help ensure that industrial zones, where mineral processing occurs, are investing more in renewable energy to power their activities. Increased mineral extraction and processing, while essential to the global energy transition, does lead to environmental challenges including potential increases in emissions - hence the need to focus on green sources of energy as well as other efforts to reduce the environmental footprint of this development.



Source: (Ministry of Energy and Mineral Resources, 2023, with critical mineral list taken from IEA report "The Role of Critical Minerals in Clean Energy Transitions",2021)

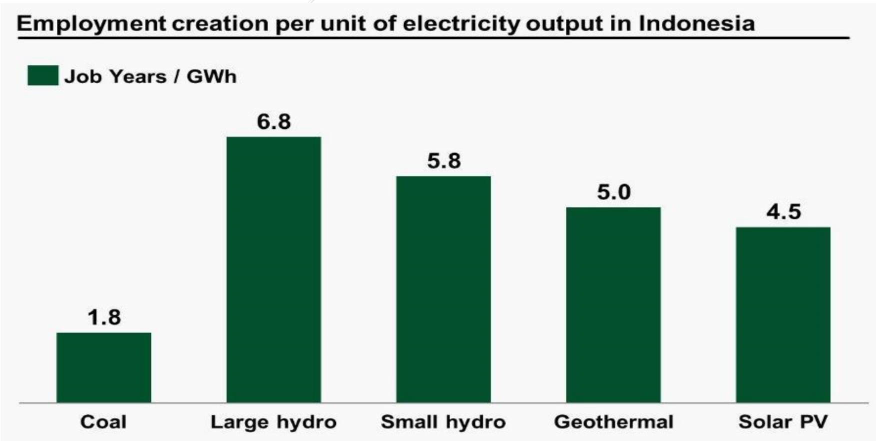
Figure 4.2-2 MEMR Map of Critical Mineral Deposits in Indonesia

4.3 Job Creation and Employment Impacts

JETP will involve investments into renewable energy and broader energy infrastructure, as well as decarbonizing Indonesia's power sector. This will lead to significant positive and negative impact on employment, with many jobs created but some existing jobs being lost. Programs such as the early retirement or phasing down of CFPPs will actively eliminate jobs that were previously associated with CFPP, a significant source of employment and economic activities in some communities. On the other hand, the construction of transmission lines and grid deployment alongside the accelerated development of renewable energy power plants will increase jobs both in the development or construction of the program and the operational years of the program.

Direct employment impacts in the power sector can be estimated across different generation technologies. Research conducted in Vietnam shows that replacing coal power with solar or wind will more than double the number of jobs on an average megawatt capacity (International Climate Initiative, 2019).

Similar positive employment effects can be anticipated for Indonesia. A study to assess the employment effects of renewable energy in Indonesia concluded that all renewable energy technologies analyzed can provide a higher return of job-years per GWh of electricity generated by new capacity compared to coal. Using the 2019 – 2038 General National Electricity Plan (RUKN) scenario as a reference scenario (which targets 43 GW of installed RE capacity by 2030), the study estimates that large hydropower generates 3.8 times more job-years per electricity output than coal, followed by small hydro at 3.2 times more than coal, and geothermal and solar both at 2.8 and 2.5 times more jobs per GWh respectively compared to coal. Reaching the RUKN scenario RE target by 2030 would require significant investments in RE of about US$49 billion, while it can generate around US$24 billion in value-added to the Indonesian economy (Global Green Growth Institute, 2020).



Source: (Global Green Growth Institute, 2020)

Figure 4.3-1 Empowerment creation per unit of electricity output in Indonesia (Job/GWh)

Beyond jobs created per megawatt of power plant built, an average of 9 to 14 jobs could be created for every US$1 million spent on the construction of alternating current (AC) transmission lines. Currently, the Indonesian power grids are reliant on AC lines, although some plans for transmission lines within the pipeline such as the high-voltage direct current (HVDC) Java-Kalimantan interconnection do feature high-voltage direct current (DC) lines. For DC transmission lines, an average of 3 to 4 jobs are created for every US$1 million spent on their construction.

Considering the figures for the number of jobs created and jobs lost, a preliminary estimation can be calculated to understand the net direct job creation that would arise from the result of the programs within the JETP portfolio. Using the JETP current investment scenario, an additional renewable generation capacity of 52.2 GW of renewable energy will be built as well as approximately US$19.7 worth of transmission infrastructure, translating into roughly 383,000 jobs between 2023-30.

Table 4.3-1 Amount of jobs created per investment focus area (JETP current scenario)

Source: (JETP Secretariat and Working Groups, 2023)

Investment Focus Area	Additional capacity (GW, 2023-30)	Employment factors (Jobs per MW) *	Estimated Direct Jobs Created or Lost
Transmission lines and grid deployment (AC)	US$19.7 billion spent	11.5 per US$ Million*	226.3 K jobs created
Early CFPP Retirement	0 GW retired by 2030	0	No jobs lost
Renewable energy power plant construction (Geothermal)	3.9 GW constructed	1.2	4.7 K jobs created
Renewable energy power plant construction (Hydro)	8.9 GW constructed	2.7	24.2 K jobs created
Renewable energy power plant construction (Solar)	27.7 GW constructed	3.5	97.0 K jobs created
Renewable energy power plant construction (Wind)	8.5 GW constructed	2.8	23.7 K jobs created
Biomass (standalone plants, not co-firing)	3.2 GW constructed	2.2	7.1 K jobs created
Total (excluding transmission)			383.0 K jobs created

Notes:

** Employment factor for transmission lines and grid deployment (AC) is expressed in jobs / million US$ because jobs / GW is not an appropriate measure for transmission infrastructure. Employment factor sourced from (Midcontinent Independent System Operator, 2015)*

Broader employment effects can be seen by looking at the employment intensity of economic growth. Historically, employment elasticity of economic growth is in the range of 0.34–0.47, depending on the choice of periods (Table 4.3-2). The economy's potential for job creation seems to have been stronger between 2011 and 2022, as each percentage of GDP growth would roughly translate into almost 500,000 new jobs across all sectors. Looking at the overall multiplier effect, GDP is generally more elastic toward investment in all periods and exceeding 1 in 2011–2022. Additional induced impacts can be expected for informal sector employment but detailed quantitative estimates – including indirect job impacts - are currently not being modeled as part of the CIPP. For example, adverse informal employment impacts can be expected for small-scale charcoal producers and for many jobs connected to coal transportation.

Table 4.3-2 Elasticities in various periods

Source: (JETP Secretariat and Working Groups, 2023)

Elasticity	1986-2022	1986-1996*	2000-2019**	2011-2022***
Employment to GDP	0.36	0.34	0.37	0.47
GDP to Investment	0.89	0.70	0.79	1.04

Notes: Using simple OLS regression, using employment data from (International Labor Organization, 2021).

** Pre-Asian Financial Crisis (1997-99)*

*** Pre-Covid (2020-22)*

**** Based on available sector-consistent GDP and employment data.*

Sector-specific employment elasticities reveal that more jobs would be created in the electricity sector compared to mining if sector income increased by one percent (See Table 4.3-3).

Table 4.3-3 Employment elasticities per sector

Employment – GDP Elasticities Per Sector	2011-2022	Employment in 2022	Employment Creation Potential
A. Agriculture, Forestry, and Fishing	-0.18	38,703,996	(6,918,362)
B. Mining and Quarrying	0.50	1,530,157	770,331
C. Manufacturing	0.68	19,172,397	13,132,272
D. Electricity and Gas	1.75	311,124	545,264
E. Water Supply, Sewerage, Waste Management, and Remediation Activities	2.63	511,150	1,342,287
F. Construction	0.56	8,481,349	4,786,246
G. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	0.71	26,193,890	18,606,076
H. Transportation and Storage	0.50	5,805,308	2,897,511
I. Accommodation and Food Service Activities	2.40	9,607,709	23,062,189
J. Information and Communication	0.89	1,009,091	895,851
K. Financial and Insurance Activities	0.27	1,626,460	432,991
L. Real Estate Activities	1.87	450,007	842,418
M, N. Business Activities	1.48	2,237,712	3,305,675
O. Public Administration and Defense, Compulsory Social Security	1.11	4,875,999	5,433,191
P. Education	0.61	6,512,249	3,940,946
Q. Human Health and Social Work Activities	0.85	2,234,153	1,900,876
R, S, T, U. Other Services Activities	0.96	6,033,962	5,789,247

As the transition to renewable energy involves high-skilled occupations and human resources, active labor market policy interventions to support education and vocational training programs could provide additional economic stimulus effects and mitigate concerns over structural unemployment. A skills assessment analysis for solar PV in Indonesia based on the National Energy Plan (RUKN) estimates for 2019-38 that more than 120,000 jobs will be in demand in project development (PD) by 2030. Furthermore, 64% of the PD employment will be created for management professionals, while technicians, engineers, and project nonprofessionals will be in higher demand in the other stages of the solar PV value chain (Global Green Growth Institute, 2020). Project planning and approval should take note of the roles required and feed into national planning for skills development.

A case study to assess the economic impacts from replacing Suralaya coal power with solar PV provides insights to potential job creation opportunities. The scenarios look at the impacts of rapidly replacing 3.4 GW of coal power with more than 10 GW of grid-connected solar PV to generate the same amount of 21 TWh per year. The required US$10 to US$16 billion in direct investment from 2021-2050 to implement this plan would result in up to 250,000 direct jobs per year mainly in construction, manufacturing, and professional service sectors, with further knock-on effects to create indirect and induced jobs. It is noticeable that the three scenarios do not include investment into physical power storage, as it is assumed that less costly approaches are available to effectively manage the variability of solar PV (van Tilburg, Fearnehough, Schiefer, & Ambarita, 2021).

Overall, labor force and social protection interventions need to be contextualized and tailored toward communities affected in the areas where CFFPs are being phased out. Job losses in the coal mining sector will occur and new job opportunities in renewables may not be in the same location as those communities affected by the transition away from coal-fired electricity production. Therefore, social assistance programs combined with r e-skilling and vocational training programs need to be part of long-term employment schemes and should be implemented at a relatively early stage of the JETP program. Technical vocational education and training (TVET) programs can have an impact over time on those who join them, and accelerated CFPP retirement will increase the demand for timely support. More systemic effects usually take 5–10 years to bear fruit and so early action will be essential as part of the JETP's longer-term goals.

Finally, investment into energy efficiency has significant job creation potential. It is estimated that US$1 million spent on energy efficiency can create between 6 and 15 jobs on average, depending on the sector (International Energy Agency, 2022). Many jobs related to energy efficiency are labor-intensive and can be mobilized quickly. Thus, fiscal policies to stimulate investment in energy efficiency can to some extent compensate for job losses during the energy transition.

4.4 Impact on Other Sectors

Accelerated deployment of renewable energy power plants and construction of transmission lines can have a significant impact on various industries outside of the energy industry. This includes both industries requiring significant energy, and industries that can establish or grow because of the significant increases in investment into renewable energy in the country. Increased demand because of the funds invested in the energy transition will affect all the industries involved across the value chain of the development and operation of every transmission line, power plant, and other programs. The lower costs of renewables will also add to increased energy security. Specifically, outside the energy sector, a significant impact is expected to be seen in the manufacturing industry, the construction industry, and the coal industry, as well as in the financial services industry.

First, the manufacturing industry will benefit from the increased demand for materials and products in building key components for power plants and transmission. For example, the increased demand for solar panels and other renewable energy infrastructure can grow the market for these materials, leading to increased demand for raw material manufacturing. As the underlying technology progresses, such as the development of battery energy storage systems (BESS) and new approaches to geothermal energy generation, this would also allow manufacturers to further diversify their product offerings and expand into new markets while supporting Indonesia's energy transition. Capturing this domestic demand will require production facilities to be built in Indonesia, using both international technology and domestic innovation and labor. The policies required to support this growth—which is likely to require the export of materials to achieve scale, and incubation of local challengers through a positive policy environment to help them become globally competitive—are discussed elsewhere in this report. Without appropriate support from government, financiers, and domestic and foreign investors, however, the opportunity for Indonesia in this domain could be lost.

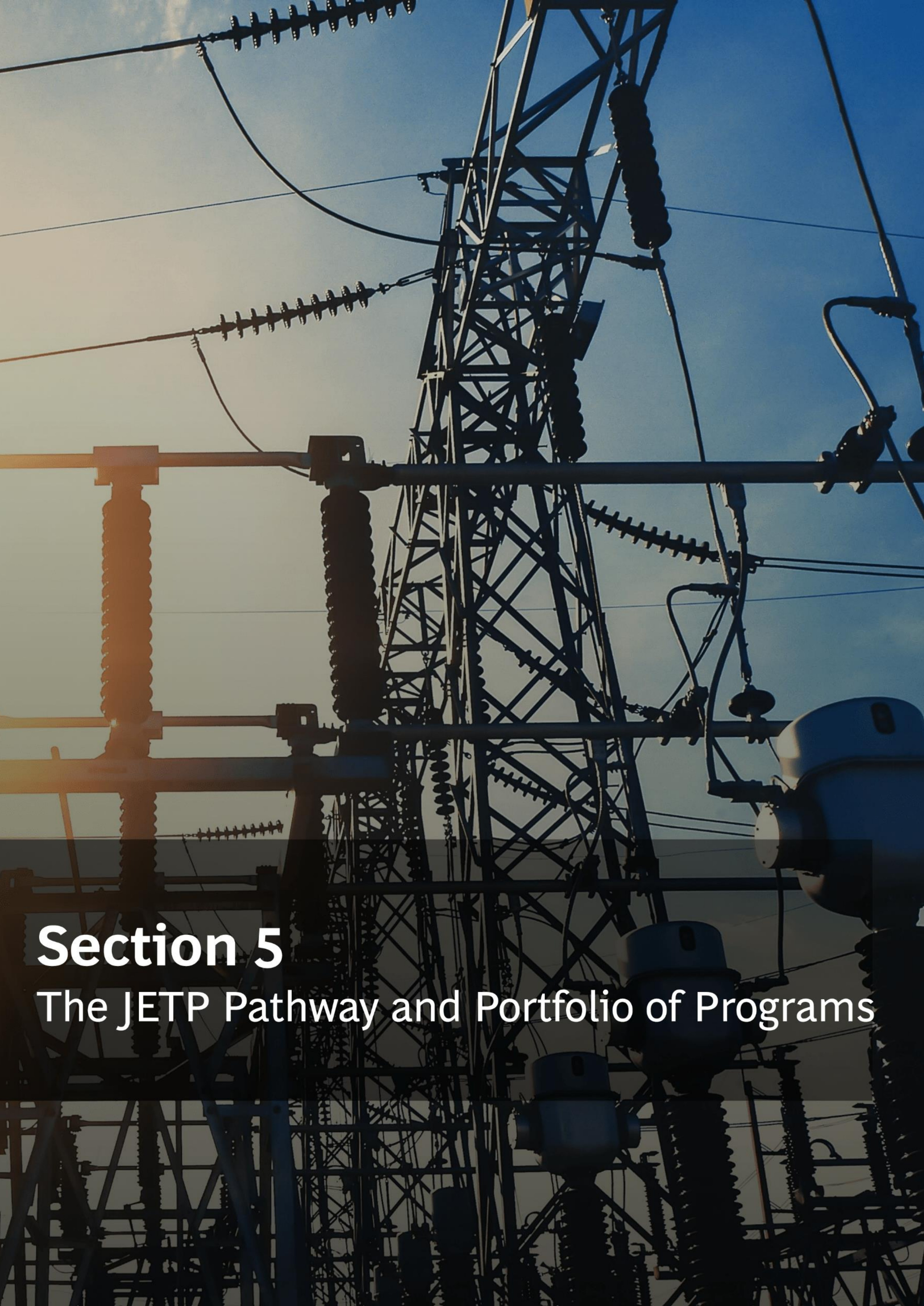
Second, electrification and renewable energy generation can help Indonesia's manufacturers win in new products and new markets. Efforts to price the externalities of carbon in global trade took a significant step forward with the EU's Carbon Border Adjustment Mechanism (CBAM), affecting products such as iron, steel, and aluminum exported by Indonesia. The use of renewable energy to produce these goods can impart a significant competitive advantage to Indonesia's exports to countries with such a regime and to global businesses that value low-carbon products as part of their own sustainability goals. This is reflected in businesses' own Net Zero pledges, which are taken both as part of their good corporate citizenship and for the market benefits such a pledge will be expected to bring. Meeting this opportunity requires a coordinated approach to Indonesia's industrial growth, with clear execution of the green industrial agenda and government support (both fiscal and non-fiscal measures) to encourage activity in this space.

Third, the construction industry will directly benefit from the accelerated deployment of renewable energy power plants and the construction of the transmission grid. As new renewable energy power plants are constructed, there will be a growing need for skilled workers to further utilize the output produced by the developments and growth of the manufacturing industry. These workers include both technical and labor-intensive workers such as electricians, engineers, and construction workers. Additionally, as the industry progresses and further breakthroughs are made in the field, renewable energy power plants will require different types of materials and techniques in the process of construction, leading to further innovation and change in the construction industry.

Fourth, given the very large sums of investment required for the energy transition, there will be impacts on Indonesia's financial services sector. Indonesia received a record US$43 billion in foreign investment in 2022, the highest in the country's history and an increase of 44% from 2021. Under the JETP investment scenario, US$140 billion of cumulative power sector investments, including both on- and off-grid systems, are required by 2030. Clearly this is beyond the budget of the government and PLN and will require mobilization of private sector funds. The establishment of the Indonesian carbon exchange in September 2023 is an important step to strengthening the domestic financial market to mobilize green capital. However, there is also the need to enhance the capacity of the financial services industry to identify and select green projects by applying adequate risk assessments and investment evaluations. The Financial Services Authority (OJK) has established the Sustainable Finance Roadmap and issued regulations to adopt ESG standards. Moreover, OJK has also released a green taxonomy in 2022 which classifies business activities as green if they meet certain environmental and social standards. These standards need to be further refined in the coming years to enable the financial industry to direct financial flows toward low carbon energy and prevent 'greenwashing' activities.

Fifth, energy transition will have a significant impact on Indonesian coal exports. Countries accounting for nearly 85% of the country's total coal export value have a pledge to reach net-zero emissions, although with various target dates and legal status affiliated with the pledges (International Energy Agency, 2022). Thus, coal mines and adjacent businesses face an uncertain but likely declining future internationally, while domestic commitments to reduce coal usage are clear. Coal production is also focused in particular provinces, with North Kalimantan alone producing 48% of the domestic supply. Overall mining employment in Indonesia reaches 250,000 people suggesting that reduction of mining activity could impact hundreds of thousands of Indonesians; the loss of local government revenue in affected provinces could impact services for even more (Institute for Essential Services Reform, 2022).

Further economic modeling with detailed economic and social impact analysis should be included in the next iteration of the CIPP to complement the power sector investment modelling, particularly focusing on the regions heavily relying on coal-based economic activities. This will involve working with partners and others to deliver, contextualize and incorporate such analysis. Mitigating these impacts on affected communities, and on Indonesia's fiscal position and trade balance, will require focused investments in the new sectors detailed above.



Section 5

The JETP Pathway and Portfolio of Programs

5. The JETP Pathway and Portfolio of Programs

5.1 Introduction

Meeting Indonesia's long-term emissions reduction goals while ensuring economic growth requires enhanced strategies to shift to a more secure and sustainable development pathway.

The power sector is central to these efforts. With heavy reliance on fossil fuels, especially coal, and rising demand spurred by industrialization and a growing middle class, electricity comprised over 70% of total energy emissions growth from 2010 to 2019. This reliance has increased subsidy burdens and inhibits opportunities from new clean energy industries. Without a shift to a renewables-based mix and reduce emissions, Indonesia risks not meeting its ambitious goals and locking itself into an unsustainable economic development model.

Previous plans and programs provide a basis for this shift. PLN's Electricity Business Plan (RUPTL) for 2021-2030 aims for a 23% share of renewable power by 2025 and 25% by 2030 in the power mix, with renewables accounting for 51.6% of overall capacity additions by 2030 (PT Perusahaan Listrik Negara, 2021). This represents the greenest RUPTL to date from PLN.

Based on the JETP Joint Statement (Government of the Republic of Indonesia and International Partners Group, 2022), the JETP targets aim to put Indonesia on an ambitious and achievable pathway, conditional to international support, to:

- Achieving peaking power sector emissions by 2030 at an absolute value of no more than 290 MT CO2 (down from a 2030 baseline value of 357 MT CO2), and immediately declining thereafter on an ambitious trajectory, and achieving net zero emissions in the power sector by 2050, including with the accelerated retirement of coal plants, conditional on international support; and
- Accelerating the deployment of renewable energy so that renewable energy comprises at least 34% of all power generation by 2030.

Plotting an enhanced energy transition pathway that accounts for Indonesia's grid conditions and meets the JETP joint targets is crucial toward understanding the required investments, as well as the financing and policy support to enable them. Indonesia's recent draft National Electricity Master Plan (RUKN) provides a pathway for achieving net-zero emissions in energy by 2060 and serves as the baseline for the JETP analysis. The IEA's Announced Pledges Scenario (APS) for Indonesia also provides a framework for expanding power generation while reducing emissions, increasing the role of renewables, and utilizing efficiency and smart grids to optimize consumption (International Energy Agency, 2022).

This chapter explores a new JETP pathway that Indonesia could take to transition to a low-carbon economy. It sets out the energy and investment requirements by key technology area. Notably, putting Indonesia's power sector on a path to meeting JETP targets will depend on the design and implementation of enhanced policy and financing approaches, with collaboration among domestic and international stakeholders that help ensure energy security while guiding the sector toward ambitious, long-term decarbonization. At the same time, attracting the right finance depends on setting out a credible transition pathway.

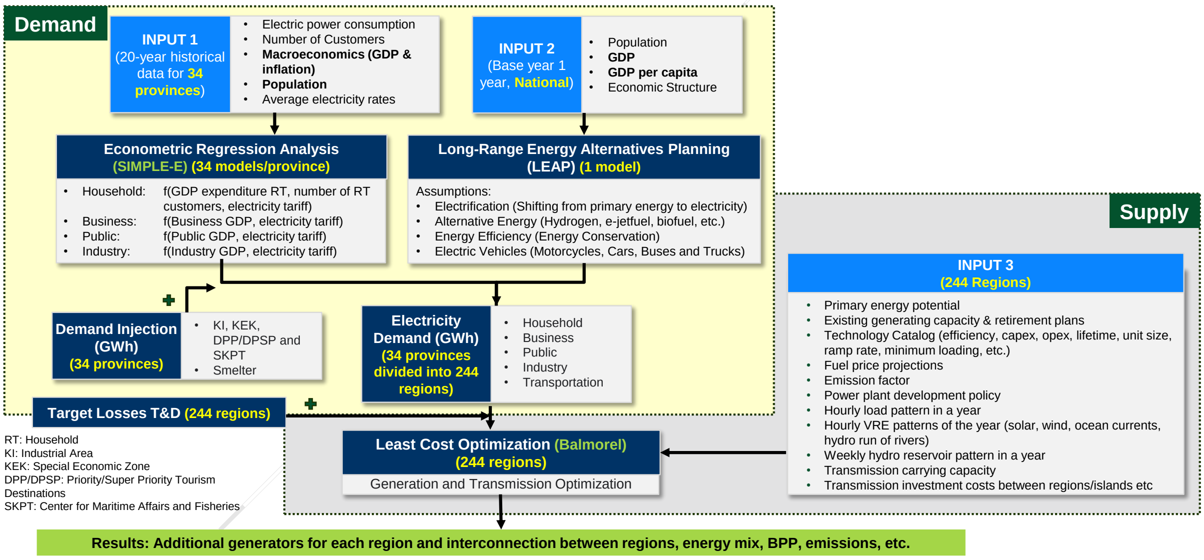
5.2 Clean Energy Transition Pathway for the On-grid Power Sector

5.2.1 Overview of the Transition Pathway

This subchapter presents a JETP scenario for the on-grid power sector to 2050, which is guided by the JETP joint targets and is unconstrained by existing financing and policy levers. It compares results with the draft RUKN Net-Zero Emissions by 2060 (low-demand growth) scenario. An overview of the modeling, assumptions, evolution of the JETP scenario and scenario design is provided in this subchapter.

5.2.1.1 Modeling Approach

The JETP technical modeling carries out a supply optimization using MEMR's Balmorel model. The scenario takes its demand projection directly from the draft RUKN, which is modeled using a combination of top-down—economic growth and prices—and bottom-up factors—electrification, energy efficiency, and fuel switching. Top-down projections across 34 provinces are consolidated and run through the LEAP model where bottom-up factors are introduced to produce a national projection. Based on an analysis of off-grid, captive industries, the JETP scenario adds additional demand from industrial facilities connecting to the grid in 2030, 2035 and 2040.



Source: *(Ministry of Energy and Mineral Resources, 2023)*.

Figure 5.2-1 Overview of the on-grid modeling approach used in the JETP scenario

The supply optimization is run in capacity expansion mode to generate annual power system results. The model finds the optimal dispatch of each generator, given the available transmission capacity and other defined restrictions between areas. The optimal dispatch represents the lowest total costs for the entire model area. The model considers future investments in generating technologies and potential locations. Local and global limitations of resources and geographical conditions are considered. Least-cost investment is made while fulfilling requirements about CO_2, renewable energy, firm capacity, and policies. Transmission interconnection decisions are made between regions within an island and between islands.

Given heavy computational requirements, the model is run in hourly dispatch mode with unit commitment for 2030 and 2040 only, which helps to evaluate the impact of adjusting technical parameters for power plant operations on system flexibility.

5.2.1.2 Key Assumptions

Macro and demand

The macroeconomic and demand assumptions are based on agreements made with MEMR and PLN on the approach for the JETP scenario. Both the RUKN and JETP scenarios assume that Indonesia's real GDP expands by nearly 6% annually on average to 2030, based on projections by BAPPENAS, and nearly 7% in the decade of 2030–2040. By 2045, Indonesia's per capita GDP converges with high-income countries as the population expands to nearly 315 million inhabitants. Consistent with the RUKN, the JETP scenario uses a discount rate of 10%, which remains constant across the projection period.

Table 5.2-1 Key macro and fuel price assumptions

Source: (Ministry of Energy and Mineral Resources, 2023).

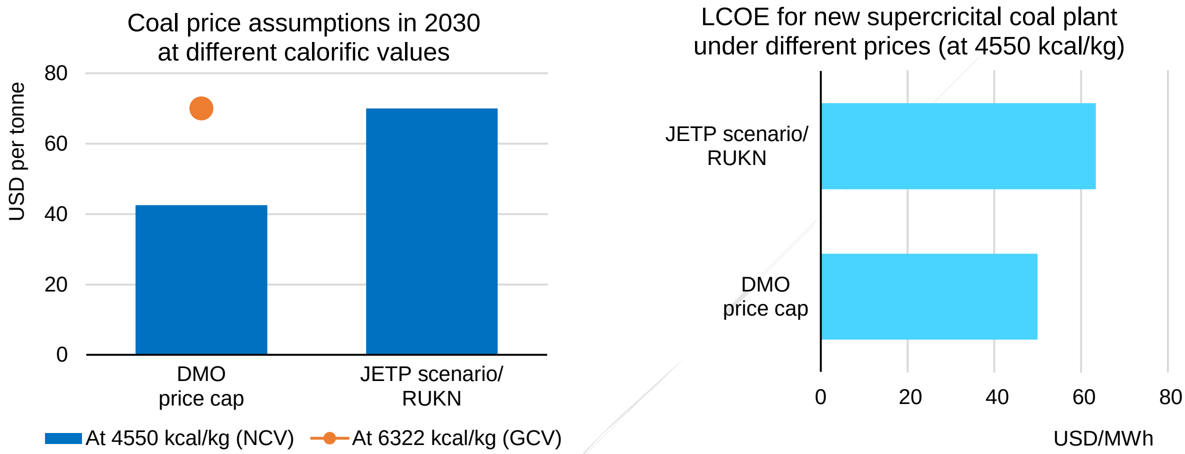
	2022	2030	2040	2050
Macroeconomic				
GDP growth rate	5.3%	6.0%	7.0%	4.7%
Population (million)	276	294	313	324
Discount rate	10%	10%	10%	10%
Fuel prices				
Biomass (US$/tonne)	70	70	70	70
Biomass price (US$/tonne) imported	85	85	85	85
Coal price (US$/tonne at 4550 kcal/kg)	70	70	70	70
Coal price (US$/tonne) mine mouth	37	37	37	37
Coal price (US$/tonne) captive	100	100	100	100
Natural gas price (US$/MMBTU)	12	12	12	12
Natural gas price (US$/MMBTU)	6	6	6	6
Oil price – fuel oil (US$/barrel)	88	98	97	95
Oil price – diesel (US$/barrel)	60	70	69	67

Fuel prices

In the JETP scenario, projected fuel prices are also used directly from the draft RUKN. These prices are introduced exogenously and are not determined through the supply optimization. In general, these prices remain constant across the projection period.

The JETP scenario uses a coal price that is significantly higher, on energy equivalent basis, than the price cap currently in force under Indonesia's Domestic Market Obligation (DMO) for coal sales. This price assumption aligns with the policy recommendation in Chapter 8 calling for the removal of the price cap to expose generators to market dynamics of coal.

Understanding the coal price assumption and how it relates to the DMO price cap requires adjusting the DMO price cap of US$70/tonne, which corresponds to a coal calorific content (6,322 kcal/kg, GCV) from the government's monthly coal price index, the *Harga Batubara Acuan* (HBA), to the average calorific value of coal used in the model (4,550 kcal/kg, NCV) and accounting for differences in other quality factors (e.g., water, ash, sulfur content). Doing so shows that the DMO price cap is equivalent to a price level of around US$43/tonne for the lower quality coal used in Indonesia's power plants. In contrast, the JETP scenario and the draft RUKN incorporate a coal price assumption (US$70/tonne) for this quality of coal, which is 65% higher on an energy- and quality-equivalent basis. As a result, generation costs for a new supercritical coal plant would be around a quarter higher in the JETP scenario compared with that under the current coal pricing regulation.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.2-2 Coal pricing assumptions and implications for generation costs

Notes: DMO = domestic market obligation; the current price for domestic coal sales is based on the government's monthly reference export price for high-quality coal—the Harga Batubara Acuan (HBA), which corresponds to a calorific value of 6 322 kcal per kg (gross as received) - and is capped at US$70/ton. LCOE is based on a new supercritical coal plant at 38% efficiency and 80% capacity factor.

The price of coal used in the power sector also depends on its location and source, as well as transportation costs. In the modeling, coal sourced at mine mouth plants benefits from much lower prices, while captive plants reliant on seaborne coal imports supply see much higher prices.

Technology cost and performance

Baseline assumptions for the cost and performance of technologies are taken from *Technology Data for the Indonesian Power Sector: Catalogue for Generation and Storage of Electricity* (Ministry of Energy and Mineral Resouces and Danish Energy Agency, 2021). The boundary for cost and performance data are the generation assets plus the infrastructure required to deliver the energy to the main grid. A learning curve approach is used by the catalog to project future investment costs. Levelized cost of electricity calculations are made within the model and those results are described further in subchapter on power generation costs below.

Table 5.2-2 Select technology investment cost assumptions

Source: (Ministry of Energy and Mineral Resouces and Danish Energy Agency, 2021)

US$ (2019)/kW	2020	2030	2050
Generation			
Bioenergy (palm oil/rice husk)	2000 (1300-2250)	1820	1600 (1200-2000)
Geothermal (large)	4000 (2700-5750)	3440	2840 (1700-4550)
Hydropower (large)	2080 (1650-2250)	2000	1850 (1400-2050)
Hydropower (medium)	2290 (1400-5200)	2200	2040 (1400-5200)
Solar PV (utility-scale)	790 (700-1200)	560	410 (310-710)
Solar PV (industrial)	1190 (1050-1800)	840	620 (470-1070)
Wind (onshore)	1500 (1200-2350)	1280	1080 (800-1850)
Wind (offshore)	3500 (2400-3700)	2980	2520 (1550-2900)
Coal power (subcritical)	1650 (1000-1700)	1600	1550 (1050-1700)
Coal power (supercritical)	1400 (1050-1750)	1360	1320 (990-1650)
with CCUS	+1950 (1600-2290)	+1790	+1420 (1170-1670)
Coal power (ultra-supercritical)	1520 (1140-1910)	1480	1430 (1070-1790)
Gas power (gas turbine)	770 (650-1200)	730	680 (550-1100)
Gas power (combined cycle)	690 (650-1000)	660	610 (550-900)
Storage			
Battery (utility-scale) (US$/kWh)	578 (455-920)	264	157 (75-398)
Pumped hydro storage	860 (600-6000)	860	860 (600-6000)

Notes: Range of uncertainty is expressed in ( ); ranges only available for 2020 and 2050. "+" corresponds to additional cost to the same technology without CCUS.

Key power supply assumptions

The power supply modeling employs a minimum reserve capacity margin of 30% in 2023, which declines gradually to 10% until 2040 and no minimum reserve margin thereafter. The modeling considers a reserve margin at a realistic level, which is less than that employed currently by PLN but does attempt to assess what an ideal reserve margin is. Dispatchable power (including storage) qualifies for meeting the reserve capacity requirement. More discussion on the system adequacy implications of the modeling is discussed in subchapter 5.2.3.

The modeling employs a climate policy in 2030, using an emissions constraint of 250 MT CO_2, with this constraint declining gradually to 175 MT in 2040 and no constraint thereafter. Emissions factors are aligned with the RUKN and the choice of emissions factor for coal is discussed more in the outlook subchapter on CO_2 emissions below.

The capacity expansion includes committed projects in PLN RUPTL 2021–2030, with investments modeled for 2026–2030 (only renewable energy and gas power) and 2031–2050 (only renewable and new energy [nuclear]) (Ministry of Energy and Mineral Resources, 2023). Investment is based on a least-cost expansion, subject to potentials, emissions constraint, firm capacity, and supply constraints. The hydropower and geothermal capacity build-out aligns with PLN's Priority Projects list for 2030. Specific capacity restrictions on variable renewables include:

- Solar PV constraint: 32 GW in 2030, rising to 270 GW in 2050; and
- Wind constraint: around 8 GW in 2030, gradually increasing to 55 GW in 2040 and 150 GW in 2050 (both on- and offshore).

These restrictions reflect MEMR's determination of realistic annual build-out rates, considering observed deployment rates of other countries, including Australia, the People's Republic of China, India, and Vietnam.

Except for early retirements, coal power plants are retired, based on the RUKN assumptions of when they reach natural retirement age (i.e., when their book value is zero), which roughly corresponds to 30 years for PLN-owned plants and 25–30 years for IPPs (at the end of their power purchase agreement [PPA]). More details are provided in the outlook subchapters below as well as in subchapter 5.5.

Generation is based on economic dispatch, subject to system-wide emissions constraint. The modeling approach also includes strategies to enhance more flexible utilization and operations of coal power plants. These strategies occur on two levels. On an annual utilization basis, the modeling does not impose any minimum dispatch for coal power plants to reflect contractual offtake obligations, but results are sense checked against PLN and MEMR guidance on national minimums, which are coal power capacity factors of 65% from 2024, 60% from 2034 and 50% from 2040 onward.

Operational parameters for hourly plant flexibility—notably reduction of technical minimum load—are relaxed to analyze system operations when the model is run in hourly dispatch mode with unit commitment. Operational parameters do not determine the power system capacity expansion in the results, as the default model is run in capacity expansion mode. Such a model run was performed for 2030 and 2040, to make sure the resulting power system is dispatchable, i.e., operations make sense.

5.2.1.3 Evolution of the JETP Scenario

The JETP targets in the joint statement were strongly informed by the IEA's Announced Pledges Scenario in its Energy Sector Roadmap to Net-Zero Emissions in Indonesia 2022. That scenario modeled the energy balance available from Indonesia, using all reported sources of electricity supply and demand, including on- and off-grid sources of power. Based on that starting point, the IEA assessed that Indonesia's power sector CO_2 emissions could peak at just over 290 Mt by the early 2030s and reach near net zero by 2050, supported by an increased role for energy efficiency, the rollout of renewable power generation (to a 34% share in 2030) and measures to phase-out coal-fired power.

Over the past year, the starting baseline for Indonesia's power sector has shifted, as evidenced by MEMR's own change in baseline for projected emissions. In the JETP joint statement that baseline was 357 Mt for 2030, now in the draft RUKN it is projected at 478 Mt. The upward shift is influenced in large part by the emergence of new plans for off-grid captive coal generation to power heavy industrial facilities, most for critical minerals processing, in support of Indonesia's industrial down streaming strategy (see subchapter 5.5) for more discussion on planned captive coal power).

An important objective for the JETP is for Indonesia to produce a credible and ambitious pathway for clean energy transitions in the power sector, with strong local buy-in. The development of Indonesia's JETP scenario aims to fulfill that objective, but with the added complexity of managing a growing new source of emissions from the off-grid power sector.

Given this context, the Government of Indonesia and International Partners Group agreed that the 2023 version of the CIPP would only have an on-grid emissions target and pathway. Hence, JETP has developed a new scenario for the on-grid power system. This pathway incorporates and builds upon many of the features of the IEA, MEMR, and PLN scenarios, including a strong role for new transmission interconnections, policy reforms to accelerate deployment of renewables (as in MEMR and IEA scenarios) and measures to reduce the role of coal in the power mix.

Recognizing the potential of policy reforms and financing support under the JETP to spur accelerated transitions and the importance of offsetting potential new emissions from the off-grid sector, the JETP scenario seeks to go beyond current domestic planning efforts by PLN and MEMR in reducing projected on-grid emissions to a lower level (250 Mt) by 2030. Moreover, the JETP plans to carry out a separate, dedicated study on decarbonizing the off-grid power sector in the first half of 2024.

5.2.1.4 Scenario Design and Key Comparisons

Table 5.2-3 Key scenario design features and comparisons for the on-grid electricity sector

Source: (JETP Secretariat and Working Groups, 2023)

	IEA – Announced Pledges Scenario (2021-2060)	**PLN – Accelerated RE Scenario** (2022-60)	**Draft RUKN - Retrofit Scenario** (2022-2060)	**JETP Scenario** (2022-2050)
Annual demand growth	5.2% (to 2050)	4.4% (to 2040)	5.6% (to 2050)	5.8% (including captive connections)
Demand in 2030/2050	461 TWh / 1200 TWh	409 TWh / 925 TWh	445 TWh / 1273 TWh	451 TWh / 1315 TWh
Electricity grid	Transmission aligned with RUPTL to 2030; large island interconnection from 2030	Transmission = RUPTL to 2030; large island interconnection from 2029	Transmission = RUPTL to 2030; large island interconnection from 2034	Transmission = RUPTL to 2030; large island interconnection from 2029
Coal power new additions	Announced projects in RUPTL	12.2 GW (2021-30); announced projects in RUPTL	11.2 GW (2021-30); announced projects in RUPTL, excluding those assumed canceled or not having reached financial close (2.7 GW)	
Early retirements of coal power	Yes, mostly from 2035	None	None	• 1.7 GW by 2040 (funded ETM) • Accelerated retirements 2045-50

Flexible utilization of coal power	Yes, with hourly dispatch analysis	Partial – application to IPPs	Not demonstrated in the annual results	Yes, with guidance on annual minimum and hourly dispatch analysis
Additional supply policies	• No renewables LCR • Renewables PPAs and procurement aligned with market standards • Coal price above DMO cap + carbon pricing	No renewables LCR	• No renewables LCR • Renewables PPAs and procurement aligned with market standards • Coal price above Domestic Market Obligation cap (on energy equivalent basis)	
RE share in 2030/2050	34% / 86%	25% / 61%	35% / 78%	44% / 92%
VRE share in 2030/2050	8% / 53%	3% / 48%	12% / 37%	14% / 36%
VRE capacity in 2030/2050	27 GW / 391 GW	8 GW / 162 GW	35 GW / 301 GW	38 GW / 309 GW
CO_2 emissions in 2030	293 MT	334 MT	305 MT	250 MT (with emissions constraint) 229 MT (with IEA coal emissions factor)
Net-Zero Emissions	2050	2060	2055	2050

Notes: Capacity values in the RUKN and JETP scenario are reported as net power capacity while PLN and IEA scenarios report nameplate power capacity; DMO = domestic market obligation; LCR = local content requirement; RE = renewable energy; VRE = variable renewable energy.

5.2.2 On-grid Electricity and Emissions Projections in the JETP Scenario

This subchapter describes the overall results from the JETP scenario on-grid modeling from both the demand and power system perspective. Summary tables with the scenario results for on-grid power generation and capacity are presented here, with analysis of the projections across key dimensions found in the subchapters that follow. A sensitivity analysis analyzing the impacts of climate policy and early coal power retirements is found at the end of this subchapter. Additional details and focused discussions on individual technologies are found in the Investment Focus Area chapters later in Chapter 5.

Table 5.2-4 JETP scenario generation by technology

Source: (JETP Secretariat and Working Groups, 2023)

	Generation (TWh)						
	2022	2025	2030	2035	2040	2045	2050
Coal	205.3	246.6	208.3	188.0	167.7	103.3	0.3
Natural Gas	56.1	63.6	90.6	54.2	19.8	68.4	38.3
Oil	6.1	2.6	0.0	0.0	0.0	0.0	0.0
Nuclear	0.0	0.0	0.0	9.7	57.1	78.8	78.8
Bioenergy	1.0	12.6	41.4	60.0	148.5	222.3	259.4
Geothermal	16.7	27.4	49.8	110.5	167.0	169.1	169.4
Hydropower	22.4	25.4	65.2	96.7	193.1	240.1	316.4
Hydrogen-based fuels	0.0	0.0	0.0	0.0	0.1	1.1	81.4
Solar PV	0.2	4.9	43.1	113.1	148.6	260.5	389.9
Wind	0.4	2.4	32.1	88.1	103.7	125.0	148.7
Total	**308.1**	**385.5**	**530.6**	**720.4**	**1005.6**	**1268.6**	**1482.6**

Table 5.2-5 JETP scenario capacity by technology

Source: (JETP Secretariat and Working Groups, 2023)

	Capacity (GW)						
	2022	2025	2030	2035	2040	2045	2050
Coal	32.8	39.4	40.6	39.4	36.8	24.8	0.0
Natural Gas	19.0	26.0	31.8	31.9	31.8	30.0	9.5
Oil	3.4	3.3	0.0	0.0	0.0	0.0	0.0
Nuclear	0.0	0.0	0.0	1.3	7.3	10.0	10.0
Bioenergy	0.1	0.7	3.5	6.3	19.9	29.2	34.1
Geothermal	2.3	3.5	6.4	14.1	21.2	21.5	21.7
Hydropower	5.2	6.5	14.6	21.3	40.6	50.1	65.4
Hydrogen-based fuels	0.0	0.0	0.0	0.0	0.0	2.6	31.4
Solar PV	0.1	4.1	29.3	77.1	100.1	177.6	264.6
Wind	0.1	0.7	8.6	24.7	29.2	36.3	44.0
Storage	0.0	0.1	4.3	5.5	7.6	15.3	38.0
Total	**63.1**	**84.3**	**139.3**	**221.6**	**294.5**	**397.4**	**518.8**

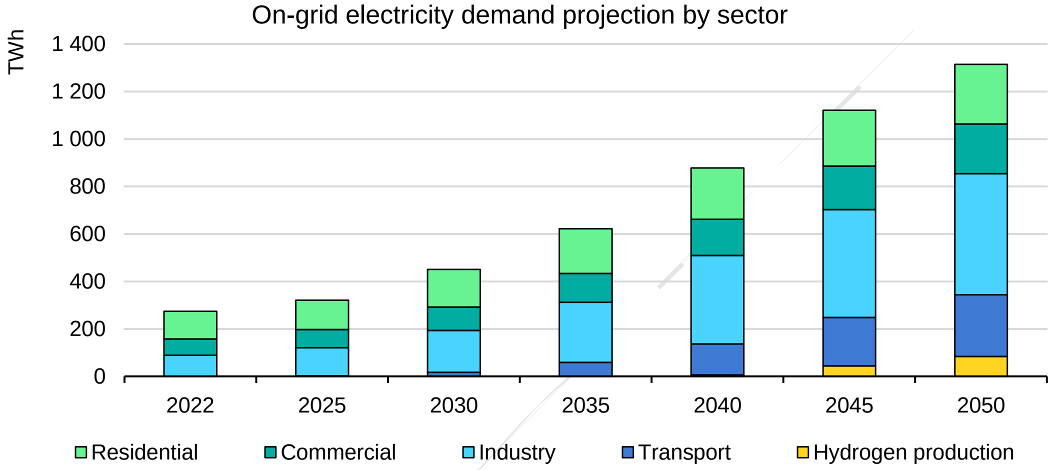
Notes: data correspond to net power capacity.

5.2.2.1 Outlook for On-grid Electricity Demand

In the JETP scenario, on-grid electricity demand is taken from the RUKN NZE low-growth scenario. To this baseline, the JETP scenario adds demand from off-grid industrial facilities who are assumed to connect to the grid in 2030, 2035, and 2040.

Projected on-grid electricity demand in the JETP scenario increases robustly, by 6.4% annually from 2022 to 2030 and 5.8% from 2022 to 2050, driven by rising incomes, industrialization, and increased electrification mobility and cooling services. Meeting this demand in a sustainable manner requires a major expansion of renewable power, along with measures to better integrate and optimize power surplus and deficit regions.

By comparison, PLN's Accelerated Renewables scenario sees annual average power growth for the on-grid power system at around 5.1% over 2022–2030 and 4.4% over 2022–2040. This growth incorporates lower assumptions for economic growth, as well as reduced expectations for electrification in transport, via electric vehicles, and the use of electricity for industrial process heat applications. In the IEA's APS, Indonesia's electricity demand is projected to grow on average by 6.2% per year from 2022–2030 and by 5.3% annually over 2022–2050.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.2-3 On-grid electricity demand by sector in in the JETP scenario

Note: The JETP scenario demand outlook is taken from the low-growth demand projection of the draft RUKN and adds additional demand from off-grid industrial facilities connecting to the grid in 2030, 2035, and 2040.

In the JETP scenario, the industrial sector accounts for the largest part of demand in 2030, as it expands by 9% per year from 2022 driven by an expansion of industrial activity—including connected captive facilities—and increased electrification of process heating. By 2030, electricity is projected to account for over 10% of process heating demand, with this share rising to 25% by 2050. The residential and commercial sectors remain the next largest sources of annual electricity consumption, with growth of around 4.0% in residential buildings and 4.5% in commercial buildings to 2030. In residential and commercial buildings, space cooling needs and cooking electrification provide support to demand growth, while efficiency measures, including Minimum Energy Performance Standards (MEPS) and labeling help to reduce average electricity consumption for appliances over time.

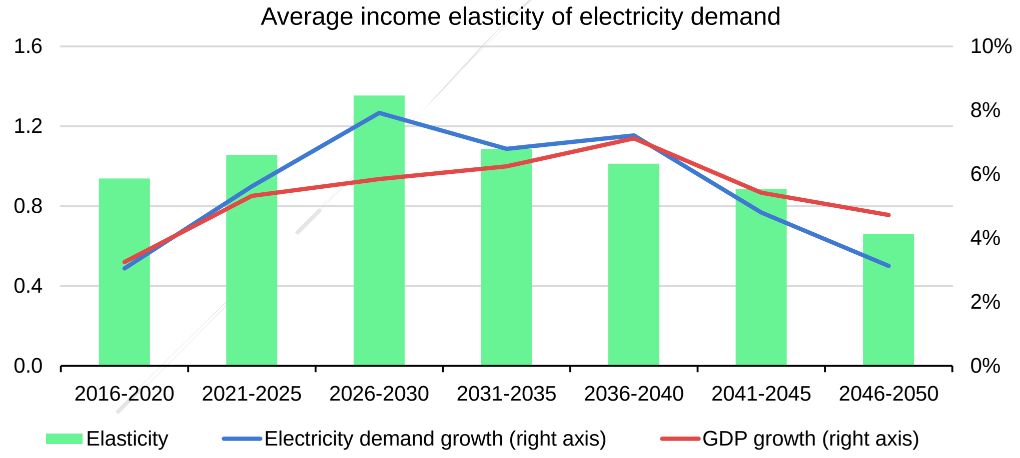
Table 5.2-6 Key electricity demand, efficiency, and electrification drivers in the JETP scenario

Source: (Ministry of Energy and Mineral Resources, 2023).

	Key electricity demand drivers
Macro	• Annual average GDP growth = 5.8% (2023-50)
Buildings	• MEPS and labeling for appliances. • Average electricity consumption per air conditioner declines by 50% by 2050. • Average electricity consumption per refrigerator declines by 30% by 2050. • Increased electrification of cooking (reaching above 70% in 2050).
Industry	• Energy efficiency improvements for motor driven systems (implementation of energy management and more efficient technologies) • Electrification of process heating, with share rising to 10% by 2030, 25% in 2050. • Connected captive power in 2030, 2035, 2040 (total of 42 TWh)
Transport	• Electric vehicles = 25% of car + 33% of two-wheeler sales by 2030; 100% by 2040. • Electric vehicles = 15% of truck sales by 2030 and rise to 70% by 2040.

Notes: MEPS = Minimum Energy Performance Standards.

While transport demand for electricity currently remains low in absolute terms, it grows rapidly over the projection period, driven by surging electric vehicles deployment, which is projected to account for 25% of car sales by 2030 and 100% of sales by 2040, in line with the Indonesia's net-zero emission target in the energy sector. From 2040 onward, clean hydrogen production is projected to emerge as an additional key source of electricity demand.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.2-4 Average income elasticity of electricity demand in the JETP scenario

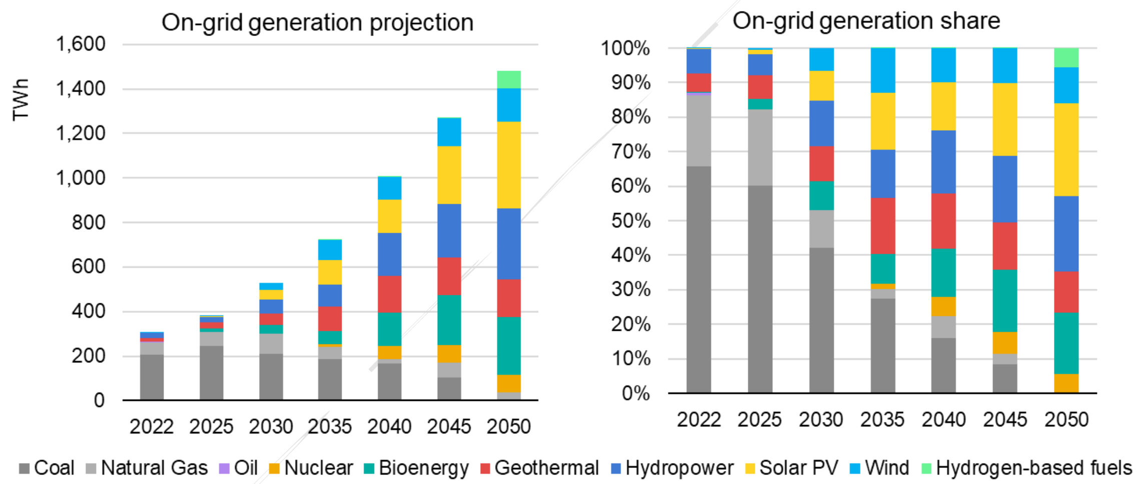
Based on these dynamics, the relationship between economic growth and electricity demand is projected to change, but with different trends over this decade compared with the period beyond 2030. Over the past two decades, the income elasticity of electricity demand, which measures the sensitivity of demand to economic growth, averaged 1.13 as electricity consumption expanded at a faster rate than the economy.

During the second half of this decade, as electricity demand is projected to expand strongly on the back of increased industrial activity and electrification in industry and transport, this average income elasticity is projected to rise to over 1.3. However, as energy efficiency measures kick in more strongly over time, the elasticity drops to around 1.0 by 2040 and continues to fall over the remainder of the projection period, even as the role of electrification in end-use continues to grow.

5.2.2.2 Outlook for On-grid Power Generation and Capacity

Indonesia's power generation mix is projected to shift significantly in the JETP scenario, as the share of fossil-fuel based power, at over 85% in 2022, declines in favor of renewables.

To date, the development of renewable power in Indonesia has centered on dispatchable renewable sources: hydropower, geothermal, and to a lesser degree, bioenergy. Variable renewable energy (VRE) sources, solar PV—which has the greatest potential of all renewable sources (see 5.2.2.1)—and wind power, have lagged deployment objectives. Over 2017-22, the renewable generation share stagnated between 11% and 13%, largely stemming from the continuous presence of significant coal generation and emerging over capacity in the power sector.



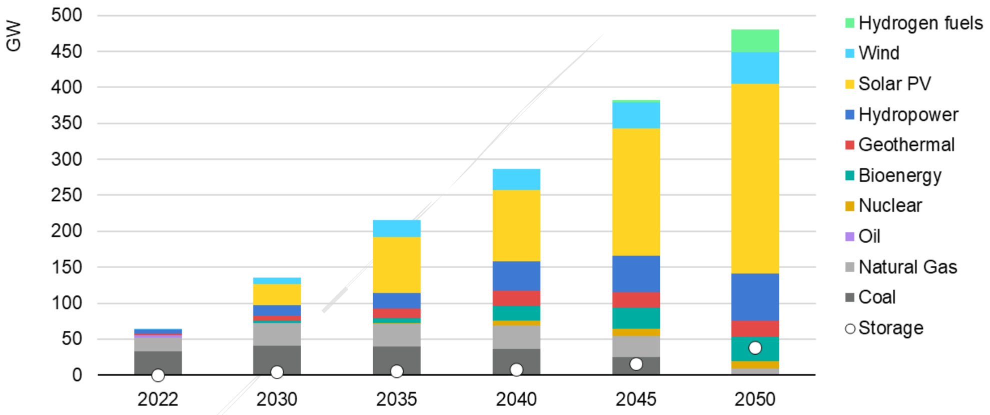
Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.2-5 On-grid power generation and power generation shares in the JETP scenario

In the 2030 projection, renewables account for 44% of total power generation and this share is seen rising to over 75% by 2040 and over 90% by 2050. Dispatchable renewable power, at nearly 30% of total power generation, accounts for the largest portion of the renewables share in 2030 and is seen rising to over 50% by 2040 and over 55% by 2050. The share of variable renewable energy (VRE) is projected to rise from less than 1% today to 14% by 2030, 25% by 2040, and 36% by 2050. Through 2040, renewables account for nearly all new growth in generation, led by hydropower, with VRE comprising nearly 45% of the change in generation, led by solar PV.

Hydropower represents the largest renewables generation contribution in 2030, at 12%. Its expansion over this decade is driven by 8 GW of new plants, which is in line with the PLN Priority Projects list and enabled by the early commissioning of the Java-Sumatra interconnector in 2029 and the realization of the Sumatra-Batam-Bintan interconnection, which help those islands to reduce emissions from generation while maintaining supply adequacy (see below). In the longer-term, hydropower accounts for the second-largest source of total generation growth as installed capacity are seen topping 65 GW in 2050 (not including large hydropower potential in Papua, which requires further study).

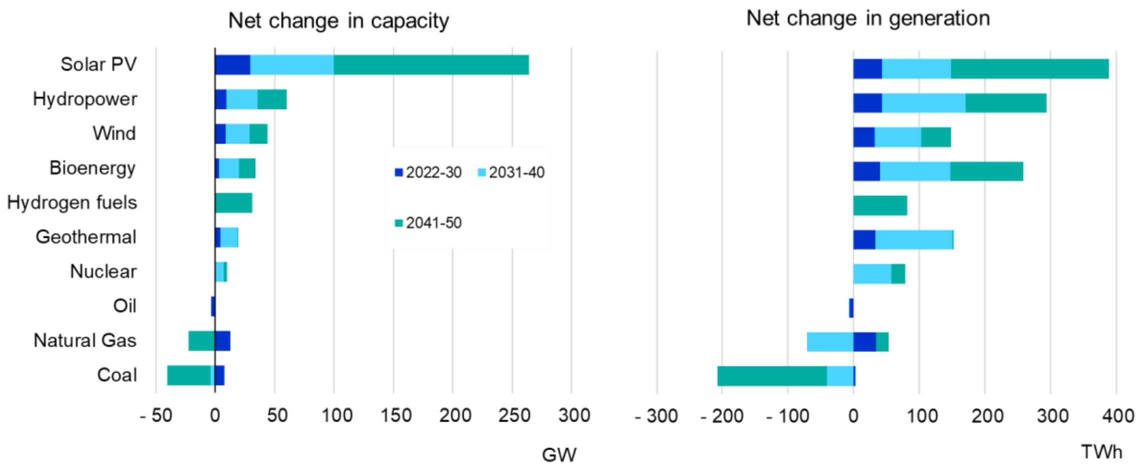
Geothermal capacity is projected to expand by 3 GW this decade, which is also in line with the PLN Priority Projects list and installed capacity is seen at nearly 22 GW by 2050. While stand-alone bioenergy capacity rises modestly this decade, it is projected to play a larger role in the power mix from 2040 onward, as a share of coal power plants which are retired early in the 2040s are repurposed to fully run on bioenergy. While most new bioenergy generation is projected to come from stand-alone plants, the role of bioenergy co-firing in coal power plants also increases, with the share of co-firing rising to 7% in 2030 and 9% after 2040. To avoid reliance on imported feedstock, deforestation, biodiversity destruction, and importing biomass from other locations without any visibility on source sustainability, and pressure on natural areas, an additional study will need to be conducted on land-use for clean energy technologies in the future, such as biomass, solar, etc.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.2-6 Installed on-grid net power capacity in the JETP scenario

Through 2040, VRE comprises 60% of power capacity additions. The expansion is led by the roll out of cost-effective solar PV, whose capacity rises from less than 1 GW today to 29 GW by 2030. Wind power complements the growth in solar PV but is more limited due to resource availability and requires the uptake of low-speed turbines in many locations. Overall, this ambitious development strongly depends on integration measures and investments to expand and upgrade grids and overall system flexibility to integrate variable renewables. It is also conditional upon policy enhancements for renewables procurement and power purchase agreements, without constraints imposed by local content requirements, which help to bring costs in line with international benchmarks.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.2-7 Net change in on-grid capacity and generation by technology in the JETP scenario

While the share of coal generation declines in the JETP scenario, coal power plants, which are young, continue to dominate the generation mix in 2030. Over this decade, coal power capacity is assumed to grow in line with the RUPTL 2021–2030 but excluding around 2.6 GW of capacity from that original plan, from plants that have been canceled or not yet reached financial close. From a base of 29.4 GW installed coal power (expressed in net capacity terms) in 2020 (MEMR, 2021), some 8.2 GW have been commissioned over 2021–2023 and a further 3 GW are expected to come online by 2030 (representing nearly 11.2 GW of coal power additions within the RUPTL planning period). This trend is illustrated in subchapter 5.5.

The JETP scenario employs strategies to reduce emissions from the coal fleet and facilitate renewables deployment. On-grid coal power plants are allowed to operate more flexibly than in the current Indonesian power system, without a model restriction on annual utilization rates. More flexible annual utilization is incentivized through a climate policy, which encourages a shift away from coal generation in economic dispatch decisions (see discussion on emissions). As the share of variable renewables increases in the scenario, the role of the coal power fleet also starts to shift from providing base load power to more of a load following function.

This has the effect of decreasing annual coal power capacity factors from over 70% today to 63% in 2030 and near 50% in 2040. Still, exercising coal plant flexibility has investment and financing implications that are assessed more below. At the same time, the JETP scenario sense checks the results to ensure they align with guidance from PLN and MEMR on annual minimum utilization, which reflects time required for carrying out control center and equipment upgrades at the system and plant level to enable more flexibility.

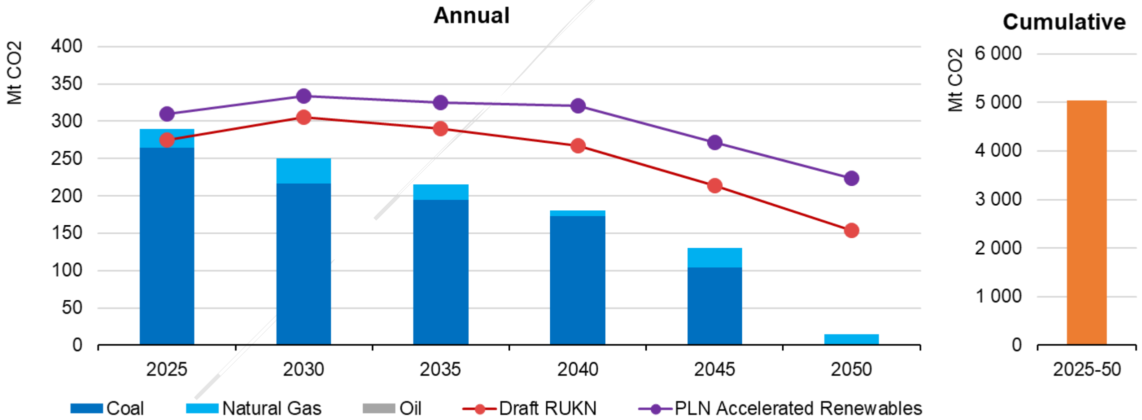
Changed operational parameters for coal plant-level flexibility—notably reduced technical minimum loads—and their role in helping to better manage demand and supply variability are also demonstrated through an hourly dispatch simulation for a week in 2030 and 2040 (see subchapter 5.2.3.3 on System Adequacy and Flexibility). That simulation suggests that intraday balancing challenges in 2030 are addressed more through the participation of natural gas and hydropower plants than the coal power fleet, with the commissioning of the Java-Sumatra interconnector in 2029 playing an enabling role for unlocking these sources of flexibility. The contribution of coal generation to system flexibility becomes more pronounced in 2040.

Early retirements of coal power plants also play an important role in the JETP scenario, but these start after 2035. In the RUKN, coal plants are retired when they reach their natural retirement age (i.e., when their book value is assessed to be zero). In the JETP scenario, early retirements are carried out for 1.7 GW of capacity by 2040, enabled by international financial support from the Energy Transition Mechanism.

After 2040, an increasing number of fossil-fuel based power plants (coal and gas) are retired and retrofitted to fully run on bioenergy or ammonia, for coal power, and hydrogen for gas power. To reach net-zero emissions by 2050, the retirement and repurposing of coal power plants reaching their natural retirement age during the 2050s in the draft RUKN (over 10GW) is accelerated to the period of 2045–2050.

5.2.2.3 Outlook for On-grid CO_2 Emissions

Based on the Indonesia's power sector evolution, as described above, on-grid CO_2 emissions would continue to grow over this decade, from around 230 Mt in 2021 to around 290 Mt in 2025. In the JETP scenario, emissions decline to 250 Mt in 2030 and reach near net zero by 2050. This trajectory is more ambitious than the draft RUKN, in which on-grid emissions reach around 305 Mt in 2030 and stand over 150 Mt in 2050. It is also more ambitious than PLN's Accelerated Renewables scenario, in which emissions rise to 334 Mt in 2030.

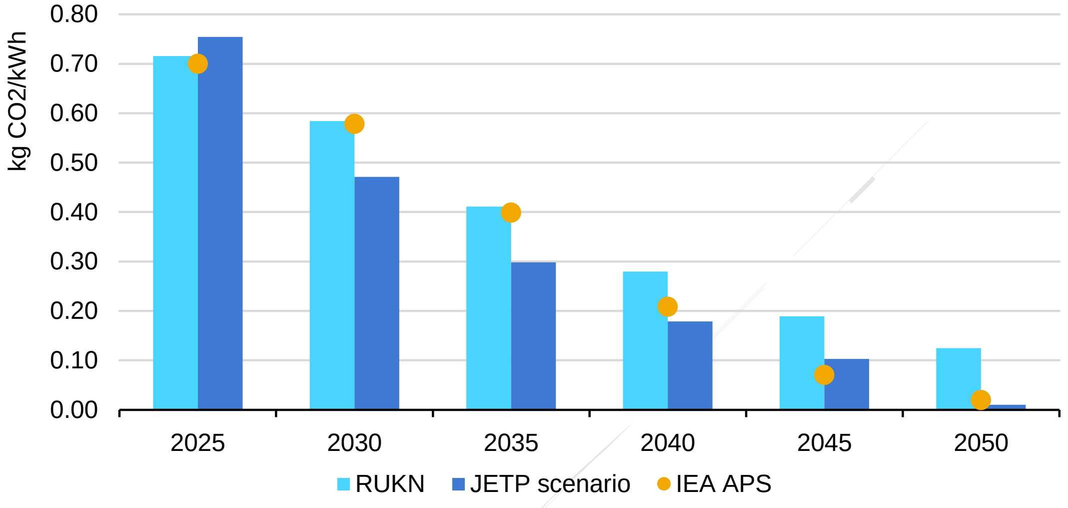


Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.2-8 Power sector emissions in the JETP scenario

Over this decade, actions to rapidly increase renewables and encourage more flexible utilization of coal power plants help to accelerate the decline in on-grid emissions from 2030 to 2040. These actions are enabled by a climate policy, which caps emissions in the model at 250 Mt in 2030 and reduces them gradually to 175 Mt by 2040. During the 2040–2050 decade an increasing number of coal and gas power plants are retired and retrofitted to run on low-carbon fuels, which, when combined with measures to repurpose plants to run on 100% renewables, helps the power system to reduce emissions to near net zero in 2050. On a cumulative basis, CO_2 emissions total just over 5 gigatons over 2025–2050, similar to the total emissions in the IEA APS, which are about 1% lower over the same period.

When comparing pathways, it is valuable to examine the emissions trends not only in absolute terms for, but also in emissions intensity of generation. Intensity is an important performance indicator that helps to normalize the emissions comparisons between scenarios given underlying differences in demand projections. Although the JETP scenario is associated with a higher level of absolute emissions it is comparable to the IEA APS on an emissions intensity basis and is lower than that for the RUKN.



Source: (JETP Secretariat and Working Groups, 2023)

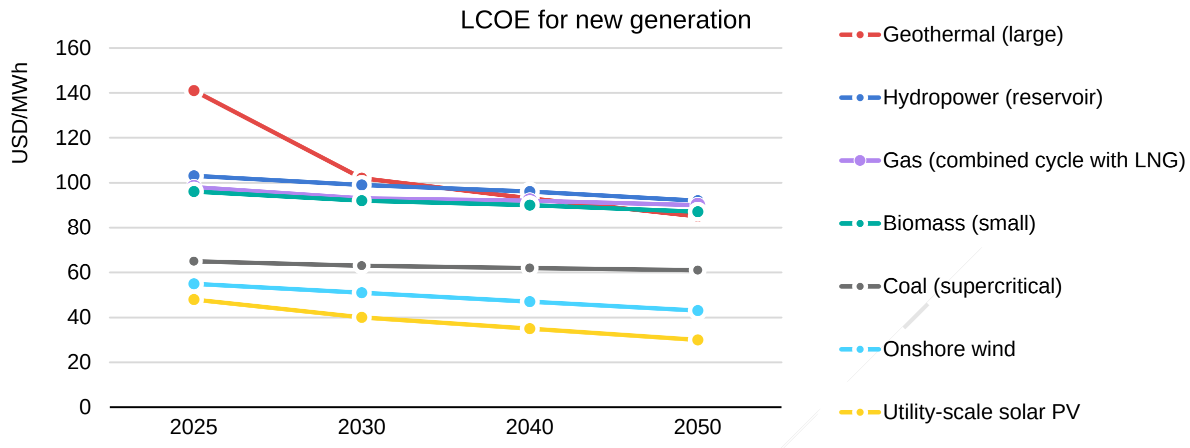
Figure 5.2-9 Power sector emissions intensity by scenario

Finally, it is important to note that the emissions calculations carried out in this modeling exercise are based on MEMR assumptions for the emissions factor of coal, at 106.476 kg CO2/GJ fuel, based on Pedoman Penghitungan dan Pelaporan Inventarisasi Gas Rumah Kaca (Ministry of Energy and Mineral Resources, 2018). The coal emissions factor used by the IEA is lower at 96.1 kg CO2/GJ fuel. IEA uses the Intergovernmental Panel on Climate Change (IPCC) Tier-1 value to ensure comparability with other countries, while MEMR has developed a local value using the Tier-2 methodology, which the IPCC recommends for estimating national emissions.

Using the IEA emission factor for coal would result in emissions from coal-fired power that are around 10% less than in the JETP scenario. In terms of overall emissions, applying the IEA coal emissions factor to the JETP scenario would translate to total on-grid emissions of just below 230 Mt in 2030, instead of the 250 Mt projected from the Balmorel model.

5.2.2.4 Outlook for On-grid Power Generation Costs

In the JETP scenario, average electricity costs on a per unit basis decline over time, primarily due to the cost-effectiveness of renewables sources compared with fossil fuels. By 2030, solar PV and onshore wind are projected to become the least expensive new sources of generation in Indonesia, as they have in many other regions. With policies to drive improved investment conditions and market development, the levelized cost of utility-scale solar PV falls significantly in Indonesia, with electricity generation costs dropping from 58 US$/MWh in 2022 to around 40 US$/MWh by 2030 and 30 US$/MWh by 2050. Onshore wind costs decline from over 80 US$/MWh in 2020 to around 55 US$/MWh in 2030 and 43 US$/MWh by 2050.



Source: Adaptation from (Ministry of Energy and Mineral Resources, 2023)

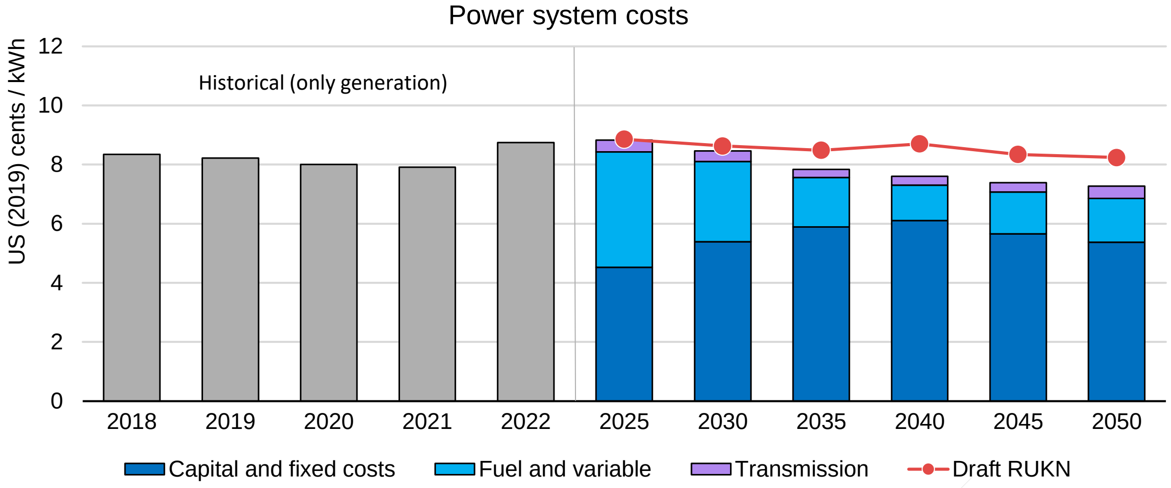
Notes: solar PV and wind cost estimates exclude battery storage.

Figure 5.2-10 Levelized cost of electricity (LCOE) for new generation in the JETP scenario

The costs of dispatchable renewables are generally more stable as the technologies are more mature. However, the economics of individual projects depend in large part on site-specific factors and local resource availability, including feedstock for bioenergy. The costs of reservoir hydropower range between 90-100 US$/MWh in the JETP scenario, while run-of-river hydropower costs are lower at 70-80 US$/MWh over the projection period.

The costs of a geothermal project are heavily influenced by the exploration and drilling phases and by the type of plant. While costs remain high in the early years, they are projected to decline with a reduction of risk and associated costs for exploration and project development, as project pipelines and experience grow, to a range of around 85-100 US$/MWh over most of the projection period. The LCOE of bioenergy power spans a wide range, depending on the type and delivered cost of bioenergy fuel – biomass plants sourcing domestic feedstock cost around 85-95 US$/MWh over the projection period, while those reliant on imported feedstock see costs around 5% higher.

As a result of the increased role of renewables in the power mix, projected total power system costs—including transmission investments—decline by around one-fifth from 2025 to 2050 to under 70 US$/MWh in the JETP scenario. On a generation basis only (i.e., excluding transmission), power costs fall by 7% from 87 US$/MWh in 2022 to 81 US$/MWh in 2030. The cost trajectory this decade is broadly in line with the draft RUKN. However, the JETP scenario demonstrates greater cost reductions over time, with total power system costs around 12% lower in 2050 compared with the draft RUKN.



Source: (PT Perusahaan Listrik Negara, 2022), BPP adjusted to US$(2019); Projections from (JETP Secretariat and Working Groups, 2023)

Figure 5.2-11 On-grid power system costs in the JETP scenario

The system costs in the JETP scenario include costs paid to generators regardless of their operating patterns, reflecting the fact that power purchase agreements with IPPs in Indonesia have tariff components that remunerate plants at a minimum level regardless of their level of generation (so-called take-or-pay clauses), so that investors can recover their capital.

Such clauses are assumed to kick in when plant output drops below a contractual minimum of 80% annual utilization (average value, as individual contracts may vary), based on feedback from PLN. While detailed more in subchapter 5.5, the potential compensation that PLN would need to pay to IPPs for more flexible utilization of their coal power plants in the JETP scenario is assessed to be up to US$1.4 billion annually in 2030 and up to US$31 billion cumulatively to 2050, under an assumption of US 3.2 cents/kWh for the value of take-or-pay clauses. The assumption of US 3.2 cents/kWh was provided by PLN and MEMR.

This top-down assessment of potential compensation should be treated indicatively. In practice, contract terms for individual IPPs are confidential and may differ from the estimate made here. In addition, plant owners may need to undertake investments in retrofitting plants to support more flexible utilization and operations (see investment chapters below).

The system cost modeling also excludes financial compensation associated with the early retirement of coal power plants, though the book values (the amount of capital remaining to be recovered) of plants to be potentially retired by 2030 are provided as part of the sensitivity analysis performed in subchapter 5.2.2.6. Managing financial and legal implications is critical to enabling managed coal phase-out—such themes are further examined in Chapter 8.

Transforming the power mix changes the nature of the underlying costs in the JETP scenario, as the power sector becomes more capital intensive. Capital and fixed costs for generation account for a rising share of the total costs, from about half in 2025 to around three-quarters by 2050. This stems mainly from the rapid growth of renewables, particularly solar PV, wind, hydropower and geothermal, where most costs are incurred during construction, fuel costs are zero and operation and maintenance costs are relatively low.

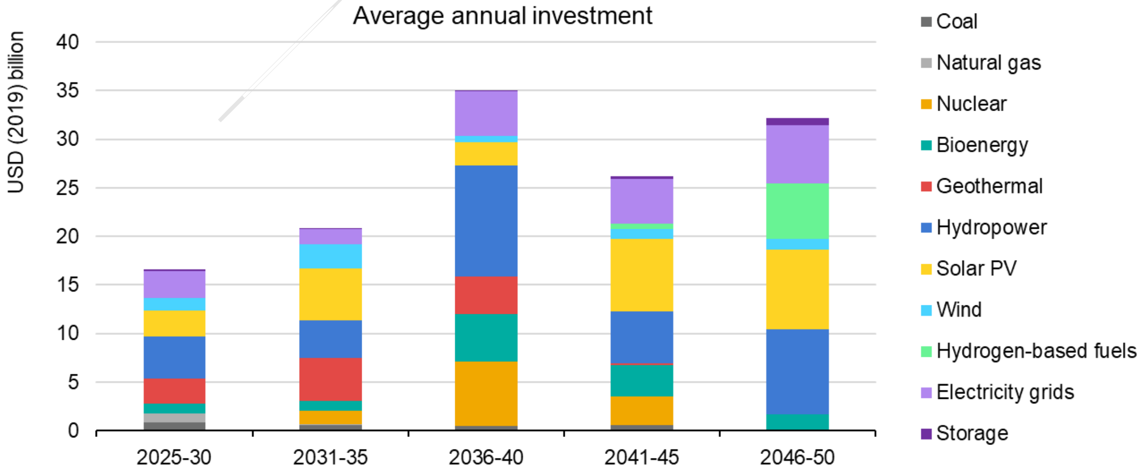
While fuel costs decline over time with reduced utilization of fossil-fuel plants and early retirements from 2035 onward, fuels comprise one-fifth of total costs in 2050, reflecting conversions of retiring coal and gas plants to run on bioenergy and hydrogen-based fuels. These cost calculations do not include potential additional financial compensation costs for accelerated coal power plant retirements over 2045–2050.

This new cost structure also offers more long-term predictability, with reduced exposure to fuel price volatility. Nevertheless, the increased capital intensity of power places greater emphasis on securing appropriate financing to manage the affordability of the transition (Chapter 7) and has also implications for assuring an appropriate revenue model for PLN (Chapter 8).

5.2.2.5 Outlook for On-grid Power Sector Investment

Under any scenario, Indonesia's power sector investments would need to rise dramatically over the next decade to expand supply options and securely meet demand needs. Over 2018 through 2022, power sector capital expenditures averaged around US$10 billion annually (International Energy Agency , 2023). Most capital spending has been directed to coal and gas power plants, as well as electricity networks. Renewables comprise only around one-fifth of capital spending.

Scaling up renewable power and enabling electricity networks in the JETP scenario requires annual average power sector investments to increase to over US$15 billion by 2030, over US$25 billion during the decade of 2031–2040 and to nearly US$30 billion over 2041–2050. While the US$20 billion of public and private financing committed under the JETP agreement provides an important catalyst, nearly US$110 billion of cumulative power sector investments, are required by 2030 under the JETP scenario. As the JETP funds represent only a fraction of the total investment needs, realizing the outlook depends on mobilizing much greater funding from diverse sources of capital.



Source: (JETP Secretariat and Working Groups, 2023)

Notes: data correspond to overnight investments.

Figure 5.2-12 Average annual power sector investments in the JETP scenario

Among renewable generation sources hydropower accounts for the largest part of capital spending over the next two decades, with cumulative investment of over US$100 billion by 2040. Geothermal and solar PV are the next largest sources of investment in renewable generation, each with over US$55 billion cumulative by 2040. Investment in electricity networks, which are critical to interconnect island systems and integrate renewables, total over US$50 billion by 2040, with US$42 billion in transmission and US$9 billion in distribution. While variable renewables require greater outlays in terms of network investments and system flexibility, their lower upfront costs compared with hydropower and geothermal help to manage the overall spending needs.

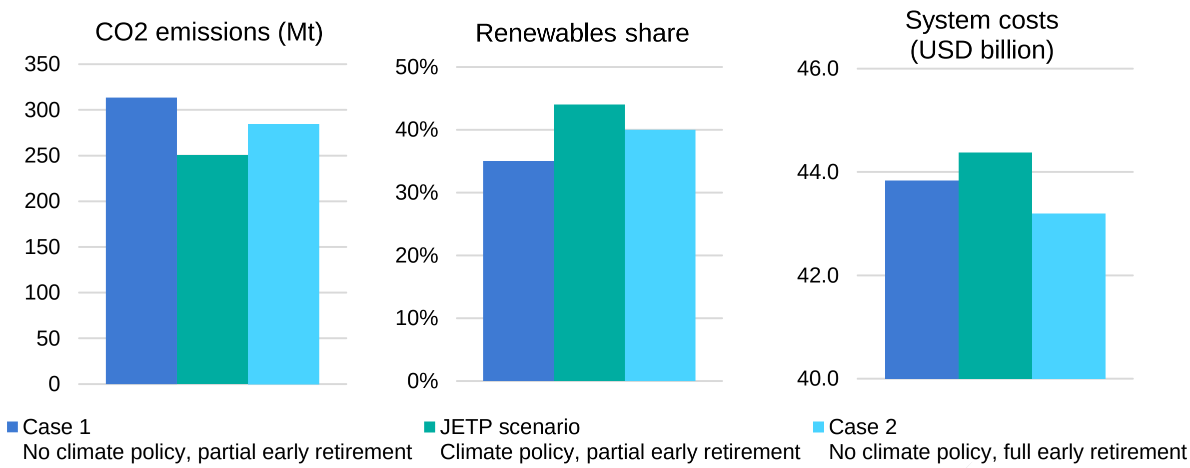
While there is minimal investment in new on-grid fossil-fuel plants after 2030, the retrofitting of the coal power plant fleet to enable more flexible operations is projected to require overnight investment of up to US$10 billion over the next two decades – such investments are not included in the total system costs described in the previous subchapter. Around 45% of these investments are projected to occur by 2035, with the remainder occurring during the period 2036–2045, as the contribution of coal power to system flexibility increases. More detail and assumptions behind this calculation are found in subchapter 5.5. Meanwhile, repurposing coal and gas power plants to fully run on bioenergy or hydrogen-based fuels requires annual average investments of over US$7 billion during the period of 2046–2050.

5.2.2.6 Assessing Impacts of Climate Policy and Early Coal Retirements in the Scenario

To more fully assess the impacts of a climate policy to limit emissions and the effect of including early coal power retirements by 2030, two scenario variants were analyzed.

The first case assesses the impact of removing the climate policy (CO_2 emissions cap of 250 Mt) in 2030, while keeping other scenario assumptions the same (notably partial early coal power retirements of ETM plants by 2040, but no early retirements by 2030). The results suggest the climate policy plays a significant role in curbing emissions in the JETP scenario through lower coal power annual utilization and higher renewables. Without it, emissions in 2030 would approach 315 Mt and the renewables share reaches only 35%, with system costs around 1% lower.

As such, the climate policy in the JETP scenario has the impact of reducing annual emissions by around 65 Mt. This comes with an abatement cost of around US$8/t per year, suggesting the strategy of more flexible annual utilization of coal power and increased deployment of renewables represents a cost-effective means to reducing emissions.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.2-13 Key indicators for 2030 in the JETP scenario and cases without climate policy and with full early retirements of coal power

The second case is identical to the first (i.e., it also excludes the climate policy) but includes the full list of potential early coal power plant retirements (5.2 GW by 2030 and 2.3 GW by 2040). This allows for analysis of the system-wide impact of early retirements by 2030, which were not included in the JETP scenario. The 5.2 GW retirement is based on a draft roadmap of early retirement by MEMR, while the 2.3 GW includes the 1.7 GW funded ETM plants, with an additional 0.6 GW coal power plant in the ETM pipeline.

This second case shows that the early retirement of 5.2 GW of coal power by 2030 results in emissions around 30 Mt lower and system costs around 1% below that of the first case. The early retirements reduce emissions at negative abatement cost. Emissions in the second case remain 35 Mt higher than in the JETP scenario and the share of renewables remains lower. So, while early retirements appear to have economic benefits from a system cost perspective, achieving the level of ambition in the JETP scenario would require additional emissions reduction measures, notably deploying more renewables and reducing the generation from existing coal plants.

To understand more fully the economic and emissions tradeoffs, it is necessary to consider additional financial costs not captured by the modeled system costs. More flexible utilization of the coal power fleet could require up to an additional US$0.16 billion in annual financial costs by 2030 to recover the capital associated with retrofitting assets to operate more flexibly, with this spending rising over time as more plants are included. Reducing utilization below contractual minimums (80% utilization rate) also requires compensation to IPPs to fulfill take-or-pay clauses. Lower utilization would also have a financial impact for PLN-owned coal power plants. Although such costs are assessed to be captured in overall system costs, an estimate of this annual compensation is broken out in the table below.

Table 5.2-7 Summary analysis of changes to climate policy and early coal power retirements

Source: (JETP Secretariat and Working Groups, 2023)

	Case 1 Partial Early Retirement; No Climate Policy	**Main Case** Partial Early Retirement; Climate Policy Partial Early Retirement; Climate Policy	**Case 2** Full Early Retirement; No Climate Policy
Early retirements of coal power	• 1.7 GW by 2040 (Funded ETM) • Accelerated retirements (2045-50)	• 1.7 GW by 2040 (Funded ETM) • Accelerated retirements (2045-50)	• 5.2 GW by 2030 • 2.3 GW by 2040 (Full ETM) • Accelerated retirements (2045-50)
Flexible utilization of coal power	Capacity factor in 2030: 78%	Capacity factor in 2030: 63%	Capacity factor in 2030: 80%
RE generation share in 2030/2050	34% / 92%	44% / 92%	40% / 92%
VRE generation share in 2030/2050	7% / 37%	14% / 36%	9% / 36%
CO_2 emissions in 2030	313 MT	250 MT	285 MT
Net-zero emissions		2050	
System Costs in 2030 / 2050 (US$2019 billion)	43.8 / 106.6	44.4 / 106.2	43.2 / 103.8
Potential additional financial costs in 2030 (US$2019 billion)			
Flexibility retrofit	0	0.2	0
Take-or-pay compensation (IPP only)	0.2	1.4	0
Book value of early coal retirements	0	0	4.7

Notes: CF= capacity factor, CFPP = coal-fired power plant; system costs do not include potential additional financial costs for early retirements.

By contrast, early retirement of coal power plants by 2030 could require additional financial payments for the recovery of around US$4.7 billion in book value (this valuation is as of June 2022 and includes 4.0 GW of PLN-owned plants but excludes 1.2 GW IPP-owned plants) to compensate plant owners for unrecovered capital.

When taking these costs and uncertainties into account, the system outcomes associated with a climate policy that incentivizes coal flexible utilization appear more compelling for 2030, but in the longer-term the early retirements of coal plants may become a more optimal strategy, as described further in subchapter 5.5. In any case, such top-down financial assessments carry limitations, pointing to the need for a more comprehensive portfolio analysis to better understand the financial, environmental, and energy tradeoffs between different strategies.

5.2.3 Key System-Wide Opportunities and Challenges from a Technical Perspective

Achieving the JETP scenario will hinge on harnessing key technical opportunities and addressing key system challenges, in addition to the financing and policy approaches outlined later in the CIPP. This subchapter highlights three such systemic factors, while the subchapters below provide a deeper dive on technology-specific and subsector issues.

5.2.3.1 Renewable Energy Potential

Indonesia's excellent renewable energy resource potential represents a huge opportunity to accelerate renewable power deployment and shift toward to a more sustainable generation mix. It also provides an important decarbonization lever for the captive power sector. Yet, despite this large potential, less than 0.3%, as of today, has been tapped so far for both on-grid and off-grid power generation.

A large part of the renewable energy potential is concentrated outside the biggest load centers, such as Java and Sumatra. In addition, geothermal and hydro potentials are normally located in remote areas. It is therefore crucial to develop transmission systems to evacuate renewable power to load centers, extend balancing areas and enable the sharing of flexibility resources. As further detailed in subchapter 5.4, interconnection between islands plays an important role in helping to unlock Indonesia's vast renewables potential.

Estimations of Indonesia's renewable energy potential have been made by several institutions, among them MEMR, the IEA and IRENA, the results of which are detailed in the table below. MEMR reevaluated the estimations of renewable energy potential for each region, providing valuable insights into the country's renewable energy landscape.

Table 5.2-8 Comparison of Renewable energy potential between different institutions and current installed capacity

Source: (Ministry of Energy and Mineral Resources, 2023), (IRENA, 2022), (International Energy Agency, 2022), (Institute for Essential Services Reform, 2021), (PLN, 2023).

	Potential according to MEMR	Potential according to IRENA	Potential according to IEA	Potential according to IESR	On-grid Capacity in 2022
Units	Gigawatts	Gigawatts	Gigawatts	Gigawatts	Gigawatts
Geothermal	23.8	29.5	24-40		2.5
Hydro	95	94.6	>70		5.6
Bioenergy	57	43.3		30.7	0.1
Solar PV	3,286	2,898	1,500*	7714.6	0.1
Onshore wind	60.4	19.6	500 (≥ 4.5m/s)	105.04	0.1
Offshore wind	94.2	589			0
Marine	20	17.9			0

Note: IEA's solar PV potential does not include rooftop solar.

Cost-effective variable renewables—solar PV and wind—provide the basis for much of the power capacity expansion in the JETP scenario. According to MEMR analysis, the solar PV potential in Indonesia is estimated to be substantial at 3,286 GW. Furthermore, the country possesses an estimated wind power potential of 154 GW, with a concentration of high wind speed resources observed in regions such as Nusa Tenggara Timur, Papua, Maluku provinces, and parts of Java Island (Ministry of Energy and Mineral Resources, 2023).

The realization of such potentials depends on the availability of land for the construction of ground-mounted solar PV, and accessing limited locations for wind, given the fact that there would be competition for land to be used for energy, crop, and city development. Also, for the on-grid system PLN needs to include the potential projects in the RUPTL before starting the procurement process.

One of the opportunities to overcome land challenges and better harness solar PV potential is to scale up distributed rooftop solar PV in the commercial and industrial and residential segments, if the regulation allows. Another opportunity is for more floating solar PV deployed on lakes or reservoirs. MEMR has mapped a total potential of 28.4 GW of floating solar PV. Such options are discussed in more detail in subchapter 5.7.

Variable renewables potential is unevenly distributed across the islands, especially for wind, which will impact the flexibility needs of the system. Locational mismatches between the best resources and demand centers requires strategies to develop grids and interconnections that can better enable system balancing of variable renewables output and the transport of clean electricity to demand centers, as discussed in the subchapters below.

Dispatchable renewables (hydropower, geothermal, bioenergy) can provide an important source of firm power and flexible generation.

The largest hydropower resources are in Kalimantan, Papua, Sumatra, and Sulawesi. According to MEMR, hydropower has potential for 95 GW, with the single largest potential concentrated in Papua and North Kalimantan (Ministry of Energy and Mineral Resources, 2023). In the JETP scenario, considering hydro potentials and the internal procurement process within PLN, there is opportunity to increase hydropower capacity, given that there are more than 13.1 GW worth of new projects that have passed prequalification and listed in the list of selected providers (Daftar Penyedia Terseleksi/DPT). These projects could be developed and start operating in 2030 on the condition that PLN includes these potentials in RUPTL 2023 – 2032 and starts procurement in 2024.

There is a need for new transmission from Kalimantan and Sumatra to Java as well as from Papua to other islands, such as Obi Island and Maluku, to enable greater hydropower development and supply to demand centers. The large hydropower potential in Papua could be developed to serve the industrial area or mineral processing and smelters in Maluku and surrounding area. Such an opportunity needs to be assessed in more detail as part of JETP.

The development of large-scale hydro in Papua and Kalimantan could face challenges due to their scale and the social and environmental impact. An example of 510 MW hydro project in Sumatra was temporarily stopped due to the biodiversity impact concerns in addition to environment and social issues.

MEMR also estimates the potential of geothermal resources and reserves at 23 GW. Most of the geothermal resources are in the protected forest and need substantial investments for the preparation of the projects. The utilization of geothermal resources should start with proper resources assessment. Such assessment will be time consuming, which raises challenges to achieve the increase in geothermal capacity in the JETP scenario within the next 6 years. Thus, to accelerate such development, the government may consider additional financing solutions and assign state-owned enterprises to launch geothermal drilling programs to get more reliable data prior to the tendering of working area. Development will also need to address potential social and environmental issues, as in the case of hydropower.

The resource potential of bioenergy electricity is assessed at around 57 GW. The main resources are palm oil and rice husks, as well as municipal solid waste, corn, and wood (International Renewable Energy Agency, 2022). About half of these resources are in Sumatra and one-third is in the Java-Bali-Madura region (PwC, 2018). Biomass and low-emission fuels co-firing at existing thermal power plants is a possibility to increase the share of renewables in the power system while providing flexibility from existing assets. Increasing these low-emission fuels depends on harnessing a growing amount of bioenergy fuel supply and continued development of a sustainable supply chain.

Most new bioenergy generation in the JETP scenario is expected to arise in the Java on-grid system while the bioenergy fuel supply is mostly available outside Java. This mismatch necessitates a focus on sustainable and cost-effective supply chains that address the potential economic and environmental issues, including land use and forestry impacts, from development and transportation of bioenergy feedstock.

Finally, Indonesia also possesses marine power resources assessed at around 18 GW. Given the nascent level of marine power technology development around the world, tapping into this potential would require innovation to support research, development, and demonstration projects in this area.

5.2.3.2 Overview of Power System Regions

Indonesia's power system is characterized by power capacity surpluses in the main population regions with deficits persisting in more remote areas, which often rely on diesel generators. While the system possesses technical flexibility, especially in the regions with surpluses such as the Java-Madura-Bali system, rigid contractual structures, and lack of interconnections across island systems inhibit the use of this. Current overcapacity and lack of flexibility increase system costs and act as a barrier to adoption of cost-effective renewable energy. Characteristics of the major four power systems that account for more than 95% of the electricity demand in Indonesia are described below.

- The Java-Madura-Bali system accounts for around 70% of electricity demand in Indonesia. The total generation capacity of the system was 45.8 GW in 2022. Majority of the power plants are coal-fired, while renewable energy penetration remains low. Two corridors of 500kV transmission lines in the northern and southern part of the island run east–west connecting major load centers and large-scale fossil power plants. The 150 kV network is used across the system to transmit power to the substations that serve the load in radial configuration. There is no intermediate voltage level such as 275kV or 220kV, which makes the system relatively weak despite its scale;
- Sumatra accounts for around 17% of the electricity demand, most of which stems from the residential sector. Coal plants are the main power resource among the total generation capacity of 12.7 GW in the system. The renewable energy share is

relatively higher than other islands in Indonesia, due to rich resources including hydro, geothermal, biomass, solar PV, and wind power. Historically, the Sumatra system has comprised 275 kV and 150 kV transmission lines connecting several subsystems in the island, while some new 500kV lines are under construction;

- Kalimantan is the largest island by area, but accounts for only around 5% of electricity demand served by total generation capacity of around 4.2 GW in 2022. Despite rich hydro resources in mountainous regions, development of renewable has been constrained, due to the weak grid interconnection as one of the main reasons. Kalimantan comprises three major subsystems, but the connection among the different systems has been weak. Apart from 275 kV interconnector with Malaysia side in West Kalimantan, the system is composed of lengthy 150kV transmission lines; and
- Sulawesi has total generation capacity of around 3.5 GW in 2022, where major demand locates in South Sulawesi sub-system. Most plants are coal-fired, even though Sulawesi has the higher renewable penetration than other islands in Indonesia. Despite its wide geographic area, there are only a few 275kV lines, while the system is mostly connected through long 150kV transmission lines. Some subsystems including Central Sulawesi, South Sulawesi, West Sulawesi, and Southeast Sulawesi are interconnected with weak 150kV lines, while the North Sulawesi and Gorontalo subsystems are isolated from other systems due to its far distance from others.

Apart from those four major systems above, Maluku, Papua, and Nusa Tenggara have only a few percent of electricity demand despite their huge geographic scales. These systems are relatively underdeveloped in terms of generation and grid infrastructure, although some parts of these systems have large potential of renewables.

5.2.3.3 System Adequacy and Flexibility

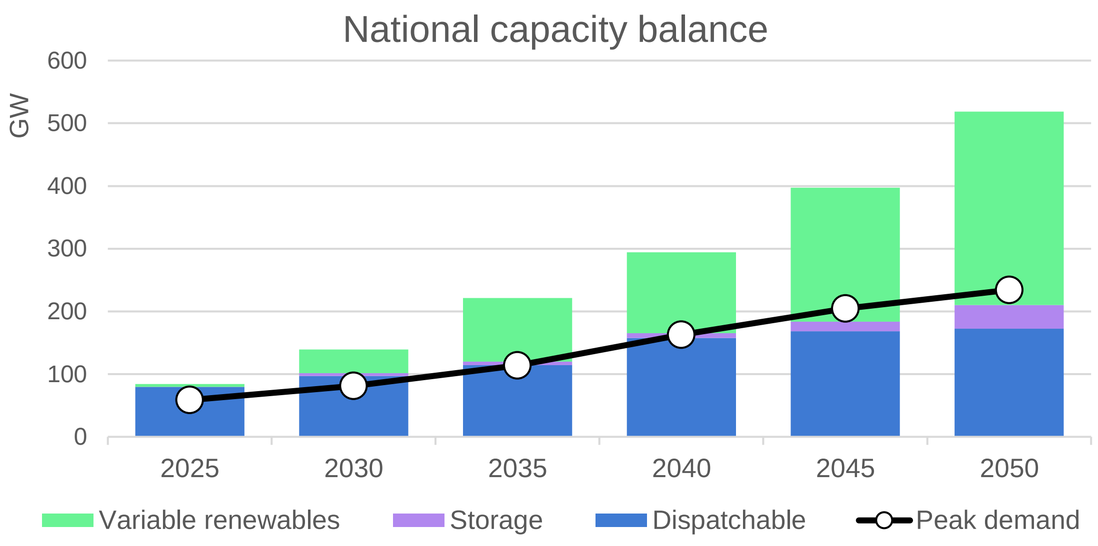
Fully harnessing Indonesia's renewable resources depends on sustained upgrades to power sector planning and operations to assure appropriate levels of supply adequacy and system flexibility over time, as well as upgrading the grid to support new demand and generation. The JETP scenario tackles issues related to system adequacy and flexibility with investments and new operational measures.

Historically, system adequacy has been assessed by reviewing the reserve margin in supply capacity (installed capacity minus peak load). However, this metric is inconsistent with the widespread adoption of VRE resources and other flexibility measures. Indonesia still uses this methodology during the planning process, setting a minimum reserve margin of 35% for the Java-Bali region and 40% for the remaining regions. This criterion is based on a loss-of-load probability (LOLP) of less than 0.27%, which translates to only allowing one day per year when peak demand cannot be met within a specific control center unit. Other factors in the criterion include the derating of existing power plants and probability of project delay.

Reserve margin criteria in Indonesia are higher than international standards for systems relying on fossil fuels, which has contributed to overbuilding of power plants in places. In the Java-Bali region, the 2022 reserve margin was 76%, more than twice the criteria.

More optimized planning for system adequacy could potentially reduce costs and better align with decarbonization goals. The modelling considers a reserve margin at a realistic level, which is less than that employed currently by PLN but does not attempt to determine an ideal reserve margin The JETP scenario employs a minimum reserve capacity margin of 30% in 2023, which declines gradually to 10% until 2040 and no minimum reserve margin thereafter which is in-line with the draft RUKN approach (only contribution from dispatchable capacity is considered). The resulting capacity balance of the system is assessed to be adequate to fulfill peak demand needs when considering contributions from non-dispatchable sources as well. Employing the use of probabilistic assessments that consider the contribution of variable renewables and the evolution of demand profiles would enhance the quantification of generation capacity adequacy and flexibility resources to ensure system reliability.

Over time, the JETP scenario optimizes capacity expansion in a way that reduces excess capacity from dispatchable power, with reserve margins converging toward the minimum levels. By 2040, peak demand slightly exceeds the dispatchable generation capacity and toward 2050 the system depends on variable renewables and storage to meet peak demand. Besides this, utilizing options for flexible demand such as electric vehicle charging can help reduce the peak demand and improving the system adequacy. In the Figure 5.2-14 below, demand-side measures are not considered in the shown peak demand.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.2-14 Indonesia on-grid power capacity balance in the JETP scenario

In Indonesia, as in many countries, variable renewables are not considered to contribute toward meeting reserve margins. In the JETP scenario, only dispatchable power (including storage) is considered to qualify. This assumption could lead to a more expensive expansion plan in a system that values reliability over decarbonization and cost optimization goals. Integration of higher shares of variable renewables requires new adequacy assessments based on detailed modeling, identifying loss-of-load expectations, and robust scenario assessment based on probabilistic weather patterns. International experience such as in the

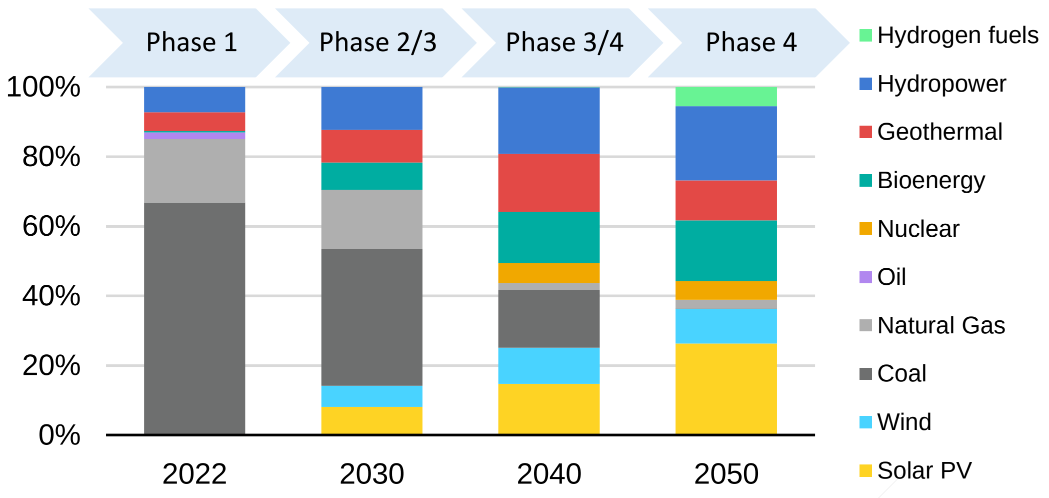
United States and the United Kingdom has shown that the contribution of variable renewables to peak demand can vary widely across different systems.

While the flexibility needs of Indonesia's current power system are relatively limited, unlocking greater system flexibility over time represents another key factor in the outlook. In the JETP scenario, the share of variable renewables in the system increases from less than 1% in 2022 to 14% by 2030, 25% by 2040, and 36% by 2050.

As the share increases, there will be an increased need for flexibility to operate the system. For example, the variability in supply due to changing weather conditions will need to be managed. Dispatchable generation, storage, demand response, expanding grids, the installation of flexible alternating current transmission assets (FACTS), electrification of new end-uses, which could be made flexible upfront are some of the options that could be used to accommodate more solar PV and wind in the system. Specific solutions are largely determined by the context of the power system, including its size, demand patterns, and operational and market practices.

Overall, unlocking flexibility depends on investments in extending power grids, largely through new transmission, upgrading networks and control centers with smart technologies, which enable real-time monitoring and dispatch of supply and demand-side assets. In the JETP scenario, new interconnectors (both interregional and interisland) and transmission reinforcements play a key role in enabling renewable power to be transferred and shared across larger areas and offer an alternative to local flexible generation. Balancing areas for operation are expanded and flexibility resources, such as thermal and hydropower are shared across wide regions. For example, developing a strong transmission backbone in Sumatra and connection with neighboring Java enable more renewables to be developed and shared (see subchapter 5.4).

As variable renewable generation rises, Indonesia will need to address potential implications for system operations. The IEA classifies the integration of variable renewable energy into six phases (Figure 5.2-15). This categorization can help identify relevant challenges and diverse strategies to enhance system flexibility. The experience of many countries around the world suggests that these objectives are ambitious, yet attainable with the right mix of policies, investments, and concerted efforts from various stakeholders. The key to realizing enhanced system flexibility lies in fostering a strong political will, international cooperation, and implementing innovative technologies and strategies that can help pave the way for a more sustainable and renewable energy future.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.2-15 Generation shares and indicative phases of system integration in JETP scenario

Notes: The IEA Phases of System Integration describe impacts from variable renewables. Indicative phases for Indonesia are based on VRE shares comparable with other countries in a given phase today.

Phase 1 – No relevant impact on the system;

Phase 2 – Minor to moderate impact on system operation;

Phase 3 – VRE determines the operational pattern of the system;

Phase 4 – VRE meets demand in some periods;

Phase 5 – Growing amounts of VRE surplus (day or more); and

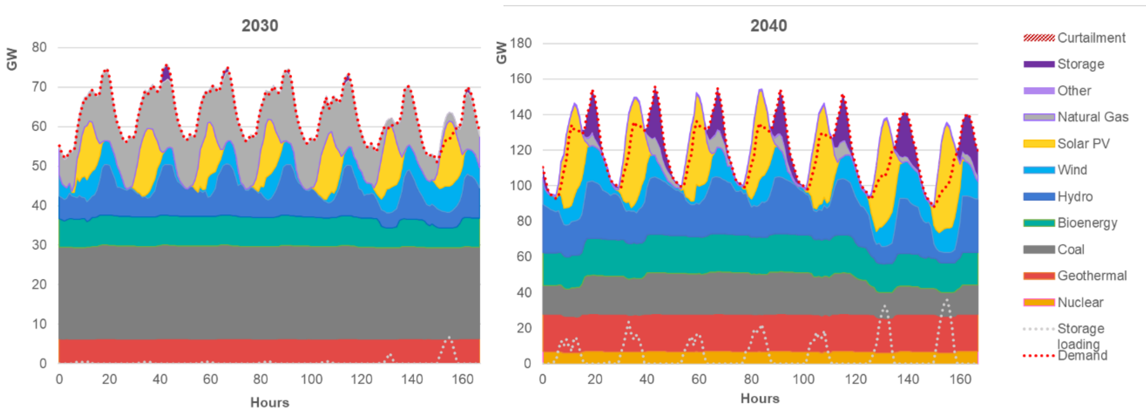
Phase 6 – Seasonal or inter-annual surplus or deficit of VRE supply.

In the JETP scenario, the main sources of supply flexibility initially involve enhanced operation of existing coal power plants. To date, IPP investment in Indonesia's coal power plants has been secured through physical power purchase agreements (PPAs), with purchase guarantees and rigid fuel supply contracts. This contractual inflexibility crowds out other generation sources. PLN also has an economic incentive to dispatch its own plants, which further entrenches coal generation.

As discussed in subchapter 5.5, improving coal plant dispatch and responsiveness, which also lowers overall utilization, is a key enabler of renewables integration and emissions reduction in the JETP scenario. In the JETP scenario, annual coal power utilization rates dip to 63% by 2030 (compared with an assumed contractual minimum of 80%) and to 50% by 2040. In the scenario's hourly dispatch simulations, the technical minimum load of coal power plants is reduced to enable them to operate more flexibly.

By 2030, Indonesia's power system is projected to reach variable renewable penetrations in line with those of countries today in phase 2 and phase 3 of system integration. Notably, intraday balancing challenges are addressed through the participation of natural gas and hydropower plants. These new sources of flexibility in the system rely on the Java-Sumatra HVDC interconnection, which is planned to come online by 2029.

Over time, the role of storage in system operations becomes increasingly significant, primarily absorbing intraday imbalances between VRE supply and demand, as shown in hourly dispatch analysis for a week in 2030 and in 2040 (Figure 5.2-16). In the modeling, storage consists of dedicated plants, such as utility-scale batteries and pumped hydro plants, as well as flexible charging of electric vehicles.

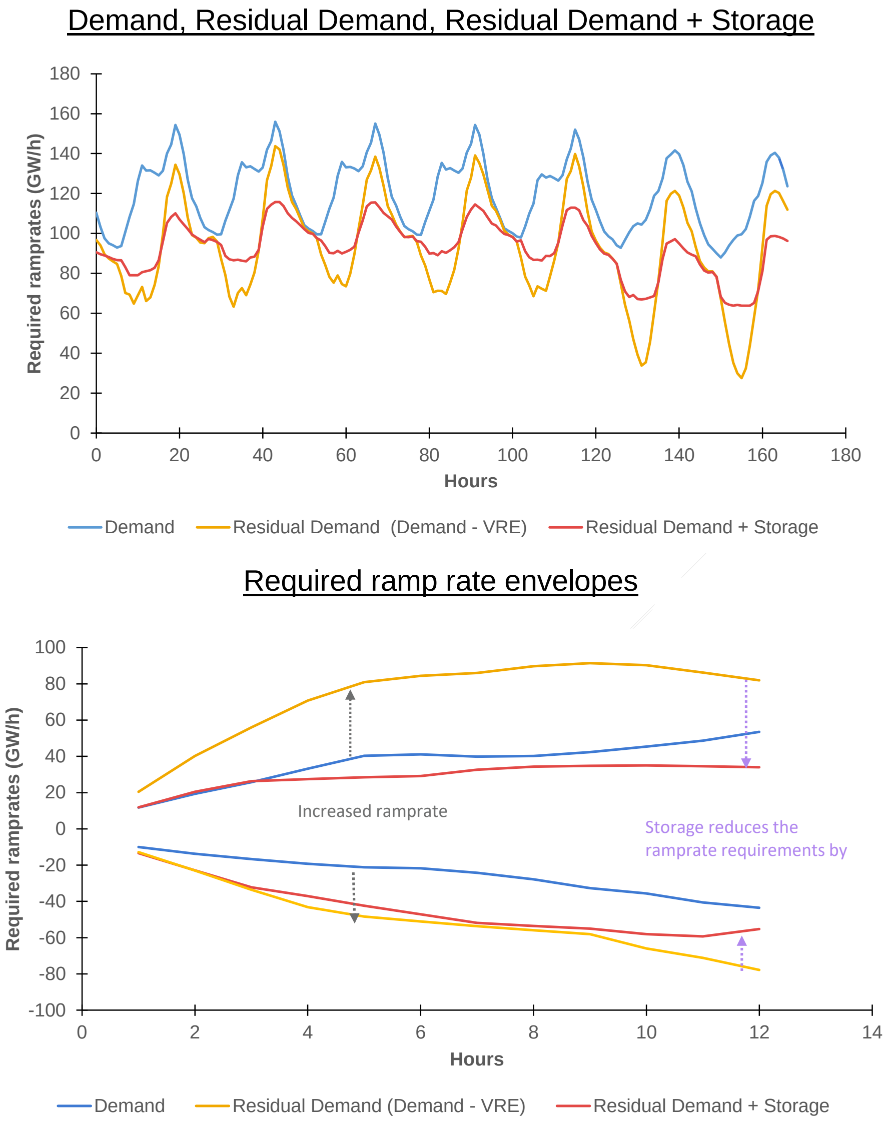


Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.2-16 One week of hourly dispatch in the JETP scenario for 2030 and 2040

By 2040, the power system is projected to achieve a level of solar PV and wind penetration comparable to countries currently in phase 4 of system integration. In this phase, variable renewables would account for most of the generation during specific periods.

The JETP scenario relies on storage, absorbing surplus energy—primarily during high solar PV production—and discharging it during peak evening demand. Storage resources take the lead in managing the flattening of demand and addressing ramp rate requirements, with hydropower also playing a vital role (see Figure 5.2-17). Another emerging source of flexibility is the flexible charging of electric vehicles, with the potential to reduce peak demand by around 10%–15% in a usual week. This highlights the importance of implementing measures that support demand-side flexibility, such as time-differentiated tariffs. Other types of demand-side measures are not modeled explicitly in the scenario but represent a potential source of flexibility which should be considered as well.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.2-17 Demand, Residual Demand, and Residual Demand + Storage (left) and multi-hour ramp requirements by the system the JETP scenario in 2040

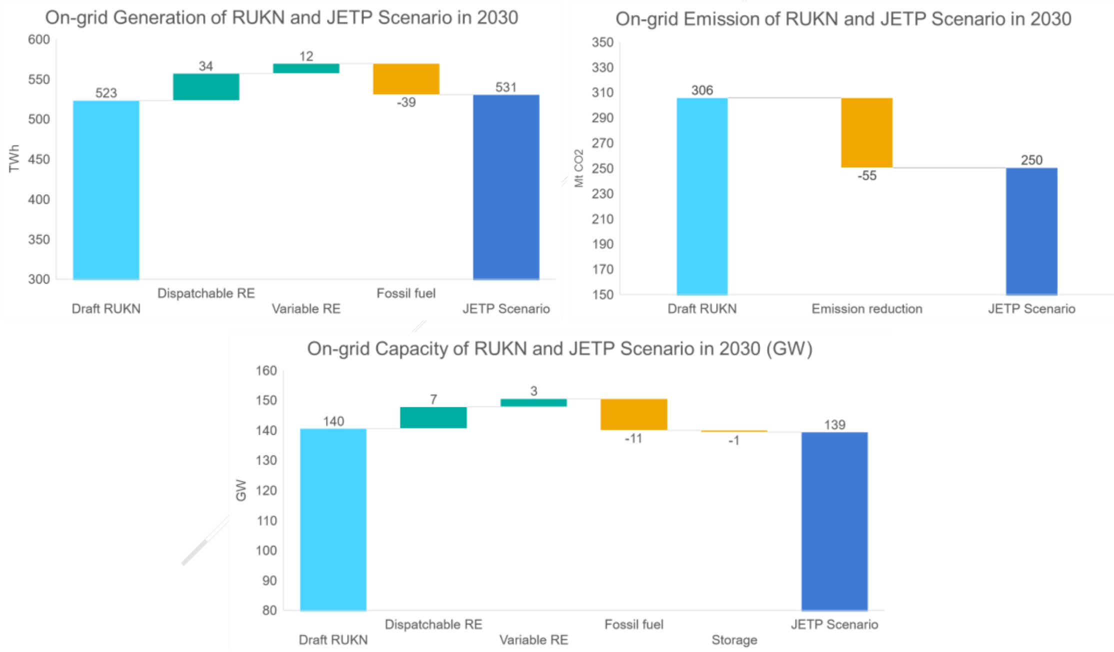
Importantly, these results should be viewed as indicative and require future investigation, including a full system flexibility and adequacy study based on stochastic methods. This study should consider stochastic methods for various factors, such as multiple weather conditions, power plant outages, EV charging, and demand-side response patterns, among other uncertainties.

5.3 Introduction to the JETP Investment Focus Areas

5.3.1 Key Elements in Guiding JETP Implementation

The premise of achieving the JETP scenario without compromising the guiding principles can be represented by the three main values that must be maintained, which consist of (1) the capacity of power generators in Indonesia, (2) the power generation that must fulfill Indonesia's need for energy in 2030 and beyond, and (3) JETP scenario CO2 emissions of 250 million tons.

Figure 5.3-1 showcases the conditions of the power sector in Indonesia in 2030 following draft RUKN projection as the baseline, followed by the interventions taken to reach the key figures associated with reaching Indonesia's demand for electricity in 2030. With draft RUKN projection, Indonesia is expected to produce 305 Mt of CO2 in 2030 alone should the existing and pipeline plans for fossil fuels in on-grid system fully materialize and operate as planned. To reduce the emissions, interventions in the forms of the JETP investment focus areas have been planned—dependent under the same conditionality as the achievements of the JETP joint conditional targets. This conditionality refers to the availability of adequate international financial and technical support, as further explained in subchapter 2.2.



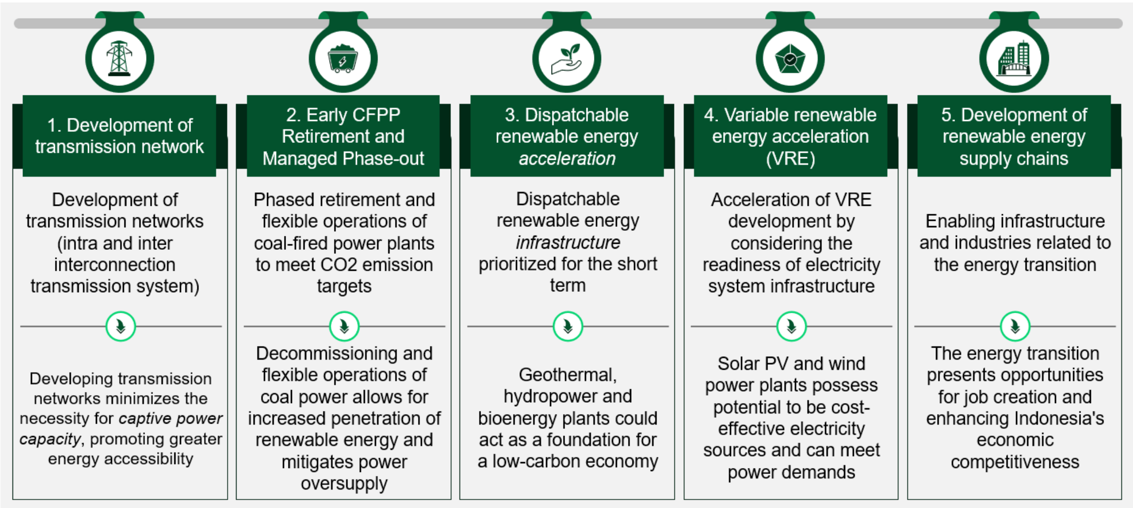
Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.3-1 Comparison of On-grid Capacity, Generation, and Emission between Draft RUKN and JETP Scenario in 2030

The interventions planned under JETP scenario will amount to a reduction of 55 Mt CO_2 in 2030 in on-grid system through lower coal power utilization, which paves the way for the acceleration of renewable energy development. The construction of transmission and distribution, as well as the development of renewables value chain are needed to ensure that the interventions do not compromise the fulfillment of national demand. Each of these interventions, categorized under the investment focus areas, are explained in-depth in the other subchapters in this chapter.

5.3.2 Investment Focus Areas

Key investment focus areas have been identified to accelerate Indonesia's power sector transition. The rapidly falling costs of renewable technologies provides an opportunity for Indonesia to shift to a more sustainable power system while ensuring the transition is affordable. The early retirement and managed phase-out of coal-fired power plants, including coal plant flexibility, provide an opportunity to reduce emissions while also harnessing a key source of system flexibility that can facilitate a more secure transition and provide room for renewables capacity to enter the power system.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.3-2 High-level list of programs in key investment focus areas

Two further supporting areas that act as an enabler, which are (1) transmission lines and grid deployment to connect power systems and upgraded control rooms and sensors to increase flexibility and support integration of new technologies, especially variable renewables, demand response, and electrical vehicles; and (2) renewable value chain enhancement to develop local manufacturing capabilities to support the anticipated massive renewable capacity addition.

Beyond the five investment focus areas, a sixth investment focus area, Energy Efficiency and Electrification, is planned to be added in the subsequent 2024 version of the JETP CIPP after the mobilization of the fifth working group. Nevertheless, the JETP Secretariat welcomes any interest in investments for the sixth investment focus area.

5.3.3 Prioritization Criteria for Projects and Programs

To prioritize the projects across the five investment focus areas, a standardized prioritization strategy has been developed to provide a fair comparison and clear focus for investment. The prioritization strategy aims to define a list of criteria that is aligned to the JETP guiding principles and the common understanding that has been established between GoI and the IPG on how the funds under JETP can be allocated in achieving the national energy transition goals set for Indonesia. To ensure the most optimal use of funds, the proposed criteria shown in Figure 5.3-3 will be applied at the project level rather than on an aggregated level.

	Selection Criteria Determining JETP compliant projects		Prioritization Criteria Prioritizing between JETP compliant projects	
	B1	B2	B3	B4
Criteria	Alignment to the five JETP investment focus areas	Alignment to GoI regulatory framework	Criticality to energy pathway and overall decarbonization	• Alignment to plans and development status of project
Key Metrics	• Qualitative assessment of alignment with the 5 JETP investment focus areas	• Alignment with national regulations (e.g., KEN, MoEF regulations) • If not currently in national docs, further studies will be made to ensure alignment	• Aligned with JETP proposed power sector pathway • Impact on CO_2 emission reduction • Additional RE generation in Indonesia's energy mix	• In line with the plans and communicated priorities of relevant parties (e.g. MEMR, RUPTL PLN) • Have not reached financial close (i.e., not under construction stage - RUPTL)
Type of Grading (Rating)	**Binary** YES – Pass NO – Not eligible for JETP funding	**Binary** YES – Pass NO – Not eligible for JETP funding	**Binary** YES - Critical NO – Not critical	**Binary** YES - Aligned NO – Not aligned
Data Source for Rating	JETP Analysis	KEN, E-NDC, GoI regulations	JETP power sector pathway	• PLN or Captive RUPTL • MEMR Docs.
JETP project prioritization is a continuous process to ensure programs are impactful and just				

Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.3-3 JETP prioritization criteria

Before projects are proposed to be funded by JETP, there are two key stages that occur toward all projects that are received. The first stage is the filtration of projects through the selection criteria – this stage eliminates projects that are outside of the JETP investment focus areas. The second stage is the active prioritization process of projects using the prioritization criteria – this stage aims to provide a clear distinction between projects are deemed to be among the most optimal use of existing funding in terms of the realization of Indonesia's power sector pathway.

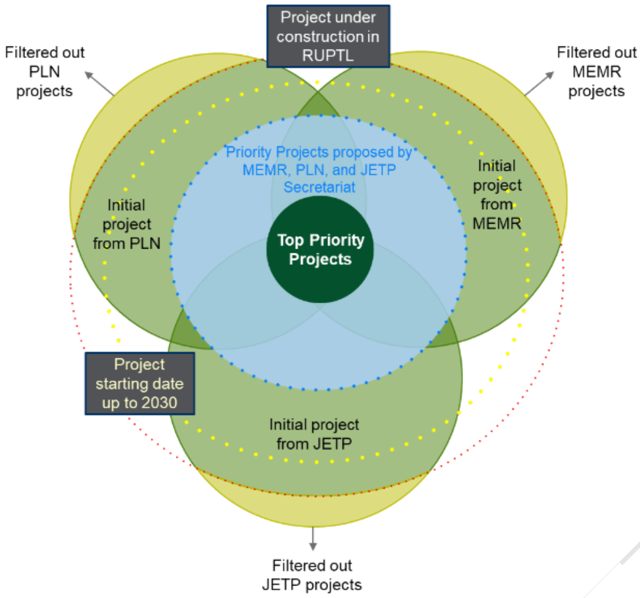
The first stage consists of two key criteria that must be fulfilled by any project before they can be considered. Having defined the five investment focus areas, the JETP secretariat and working groups must ensure that the projects are qualitatively aligned with what has been decided—the scope of JETP. Beyond the alignment to the investment focus areas, the projects must also comply with the regulatory framework that has been set by the various GoI institutions. For example, Kepmen no. 76 of 2015 published by the Ministry of Environment and Forestry specifically sets clear boundaries on zones that are designated for national parks. Hence, even if there is significant geothermal potential, no development of geothermal power plants is allowed in national park zones under current GoI regulations. Projects that have passed the first stage are considered as JETP-compliant.

The second stage also consists of two key criteria that help determine the priority between projects that have been deemed eligible for JETP funding. The first criterion refers to the criticality of the project toward the realization of the JETP proposed power sector pathway. In other words, as the projects are heavily associated with the pathway, the projects should build up toward the vision of the power sector. For example, if the development of a power plant in a certain province is mainly used to supply the demand in another province, the construction of the transmission lines between those provinces must be considered as a priority. Projects that have passed the second stage are considered as JETP priority projects.

Moreover, the second criterion refers to the alignment to the plans from key stakeholders in JETP, including but not limited to MEMR and PLN. Projects that have not reached financial close and are already acknowledged in official documents will be prioritized over projects that have already obtained finances or have not been acknowledged. This criterion operates under the understanding that historically speaking, projects that have been acknowledged in documents such as the PLN RUPTL tend to have better underlying evidence of the potential rather than if the project had not been acknowledged. Projects that are not yet included in national documents, for example pilot projects on new technology, may be included if identified as high impact. Using the established guidelines above, prioritized projects will be showcased in the respective chapters related to each investment focus area.

In the implementation period, the projects will need to follow a JT framework, which will be covered in detail in Chapter 6. Selecting impactful and just JETP projects is a process infused with just transition principles and standards. The selection and prioritization of projects will include filtering out of noncompliant projects, taking account their contributions to economic growth, criticality to Indonesia's overall decarbonization, alignment to the five investment areas, the regulatory framework which itself is informed by just principles, and the criticality to Indonesia's overall decarbonization, which will include the enabling or catalytic nature of the project. The application of the JT framework, which is expected to occur in the detailed FS phase of the project, will be the basis for review that just measures are properly incorporated and overseen. Projects that do not meet expectations in terms of application of the JT framework may be delayed until the process is followed.

Figure 5.3-4 illustrates the process of priority projects selection. The initial list of projects, which include proposals from MEMR, PLN, and JETP are filtered to exclude the ones that have already reached financial close and are already under construction. Projects with estimated starting data beyond 2030 are also excluded. Among the list of projects left after the filtering, the top priority projects are selected, using the prioritization criteria as the guideline.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.3-4 Selection methodology in choosing the JETP Projects

5.4 Investment Focus Area #1: Transmission Lines and Grid Deployment

5.4.1 Outlook and Trends for Grid Expansion and Investment

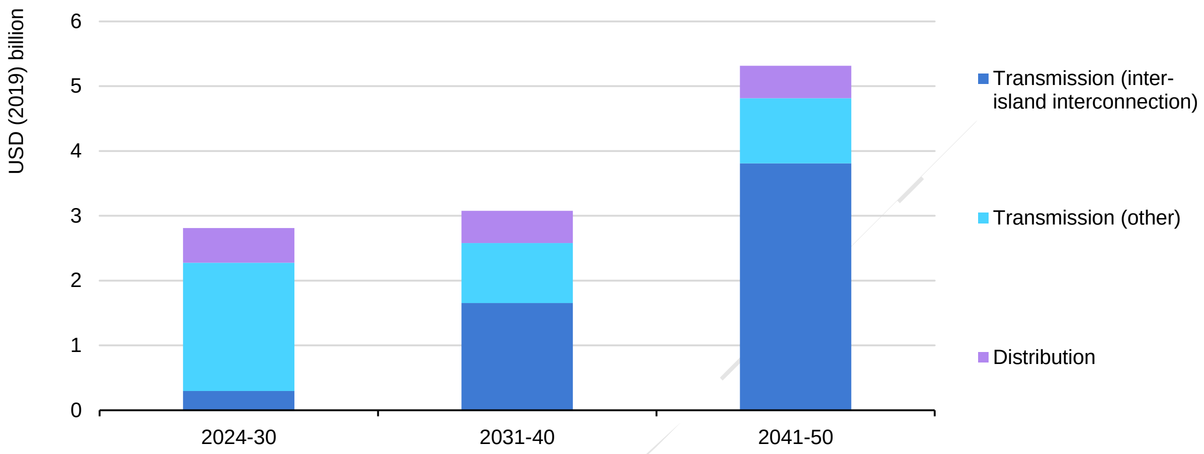
By the end of 2021, the total length of the transmission network reached 64,806 kilometers, consisting of 6,445 kilometers of 500 kV, 3,648 kilometers of 275 kV, 48,734 kilometers of 150 kV, 5,870 kms of 70 kV and 101 kilometers of 25 and 30 kV. The installed capacity of substation transformers was 155,968 MVA, while the number of substation transformers was 2,269 units.

The transmission system is mostly composed of 150kV transmission lines, with a limited number of extra-high voltage 500kV and/or 275kV lines found in large systems such as Java-Madura-Bali and Sumatra. Given the large geographical scale of the islands, most parts of transmission system are generally long and weak, which makes operational issues such as lack of capacity and grid instability.

Given the weakness of the existing grid compared to its scale of power system, Indonesia needs more aggressive development in transmission grid. In the recent development plan by PLN, it is estimated that around 6,000 km by 2030 and around 15,000 km by 2040 of transmission line expansion will be required.

In the JETP scenario, Indonesia needs to sustain electricity network investment of around US$3 billion annually by 2030, with cumulative capital expenditures of around US$50 billion until 2040, of which over 80% is required for transmission. The JETP scenario identifies investments for backbones in major islands to unlock the developments of renewables and maximize their usage across the island.

For transmission, around US$42 billion of cumulative capital investment is projected by 2040, to support island-level systems and interconnections between Java-Madura-Bali and other islands including Sumatra, Kalimantan, and Nusa Tenggara, which helps to bring renewables generation to Java-Madura-Bali system. The realization of the Java-Sumatra interconnection from 2029 helps to unlock greater renewables development, especially hydropower by 2030. In the JETP scenario, significant interisland HVDC interconnection (i.e., several gigawatts in total) will also be required in 2035–2050 to transmit clean power from Kalimantan to Java. Distribution network investment is projected at US$9 billion cumulatively to 2040.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.4-1 Annual average investment for electricity grids in the JETP scenario

Upgrading networks through smart grids is an essential part of networks investment. In this document, "Smart Grid" refers to a network that uses digital technologies, sensors, and software to improve the power system operation by enabling remote monitoring and control, automatization, and enhancing grid capability. As part of an expansion in transmission and distribution, the Smart Grid Implementation Roadmap was established by PLN to present its vision on the deployment of Smart Grid technology. Over the next decade (2023–2033) investments in smart grid technologies total US$2 billion for distribution, US$0.3 billion for transmission and US$0.5 billion for smart control systems to help digitally manage power generation and networks assets (PT Perusahaan Listrik Negara, 2023).

5.4.2 Key Issues in Expansion and Modernization of Power Grids

Among various solutions to support clean energy transitions in Indonesia, to increase the capacity of transmission grid to transmit power from renewable resource to the region where power demands exist is a crucial aspect to be addressed. As Indonesia pivots to renewable energy in the JETP scenario, the expansion and modernization of power grids acts as a major source of flexibility in helping to integrate variable renewables and maintaining supply adequacy when solar and wind resources are unavailable.

The development of transmission lines, especially those connecting among sub-systems with backbones or between islands, brings several benefits of interconnection. Such benefits include: (1) improved reliability among the systems; (2) avoiding construction of new power plants or decreasing mandatory operation of inefficient power plants in associated part of the grid – particularly in captive power; (3) improvement of the system flexibility and a load factor by combining a variety of load patterns, especially when connecting systems with different peak times; (4) reducing operating costs, optimizing system reserve margins and optimizing generator maintenance schedules; (5) utilization of energy sources from a variety of different locations, to benefit from energy security, diversity, and sustainability; (6) renewables-generated power can be shared across larger areas; and (7) improve cost-effectiveness of the power system by maximizing the usage of efficient power resources.

Despite the role and importance of the transmission facility, Indonesia's power grid is relatively thin and weak compared to its scale of the system capacity of tens of gigawatts. Consequently, some issues are found such as system stability and reliability. The combination of strong backbone and decentralized energy source is one of the required pathways to achieve the JETP scenario in Indonesia. Notably, the Sumatra system, where the demand is growing rapidly, requires a strong backbone with bulk transmission capacity, given its long geographical distance.

Apart from Java-Madura-Bali and Sumatra systems, the islands currently have relatively dispersed and separated power systems. However, in some locations, a rapid increase in power demand is expected. The typical case is the potential construction of new large-scale industrial loads such as nickel smelters in Sulawesi and other islands. Due to the recent government policy to ban the export of raw minerals, such as nickels, many industrial loads are expected to be raised in the region.

To decarbonize industrial customers with captive powers plants largely fueled by coal, connection to the grid with lower CO_2 emission factor would be an effective solution. To assess the feasibility of the grid connection of captive power plants, several factors for each regional grid system are considered including grid strength, adequacy of renewable resources, potential impact to the grid operation, etc. To enable those connections, some large-scale transmission investments are identified as crucial.

In addition to technical flexibility, which will be enhanced by the investments in grid infrastructure, modern system operational practices provide another mechanism to foster the more flexible use of technical assets, particularly on the supply side, which help to address technical and economic concerns about a high share of VRE. Some of the key operational practices include energy storage and smart grid technologies such as real-time monitoring and dispatch, and generation forecasting of VREs. This is important as the system operator can better assess the system performance and prepare for a wider array of scenarios.

PLN aims to respond to the challenges of the electricity system through the implementation of Smart Grid technology, namely: (1) optimization of network conditions monitoring; (2) improvement of system reliability including optimizing the reserve margin, reduction of frequency and duration of outages and improving responses to electrical faults; and (3) reduction in the use of fossil energy and the integration of renewable energy into the grid through managing the flexibility. PLN is currently upgrading control rooms to include load frequency control and automatic generation control in the Java-Bali system to balance supply and demand, but the updated system needs to be deployed throughout Indonesia. Moreover, deployment of advanced metering infrastructure (AMI) provides better insights into demand patterns, as well as more efficient operations and better modeling of the system.

With power becoming an increasingly prominent need, the need for automated self-monitoring and operating mechanisms will also be essential to build as means to optimize the operations of the entire power grid. Considering the potential impact and benefits that can be obtained by leveraging smart grid technology, Indonesia should look to quickly obtain and integrate it into the power system.

5.4.3 Nomination Criteria for Grid Expansion and Modernization Projects

Investments in grid facilities contribute to improvement of the quality of power supply and facilitate energy transition. Such investments will be required to allow the integration of more renewable energy in the power system and play a pivotal role in achieving the JETP scenario.

Investment in the transmission projects would be prioritized through this specific set of criteria, among others: (1) transmission infrastructures that can stimulate the development of renewable generations and maximize utilization of renewable based power across regions, (2) transmission facilities that can avoid the construction of new fossil power plants (including those to be constructed as captive power) or extension of existing fossil power plants; and (3) large-scale transmission facilities.

The Java-Madura-Bali system already has two major 500kV corridors in the north and south part of the island respectively, which enables significant power flow across the island. These 500 kV corridors have formed the basic foundations for the integration of renewables, thus no major transmission investments within the Java-Madura-Bali grid will be required to support the JETP scenario. However, in anticipation of the need for renewable energy to meet the strong demand beyond 2030, investment in the transmission will be required to evacuate renewable energy from other islands.

Interisland HVDC connection is not only resolving the future supply and demand mismatch and improving the system's reliability, but also allowing higher renewables penetration to achieve the emission reduction target. However, before connecting the islands, each island must already have suitable transmission lines, for instance, the interregional transmission lines connecting subsystems in Sumatra must be reinforced first. In addition, due to the large potentials of hydropower projects in Papua a detail analysis of the potential utilization of this potential and the evacuation of the energy to the industrial area in Maluku and surrounding area need to be conducted as part of JETP priority project.

5.4.4 Selected Showcase of Grid Expansion and Modernization Projects

The Table 5.4-1 shows some identified investment in large-scale transmission projects as part of the JETP priority list. Summary descriptions of key projects follow the table.

Table 5.4-1 Top priority transmission grid projects

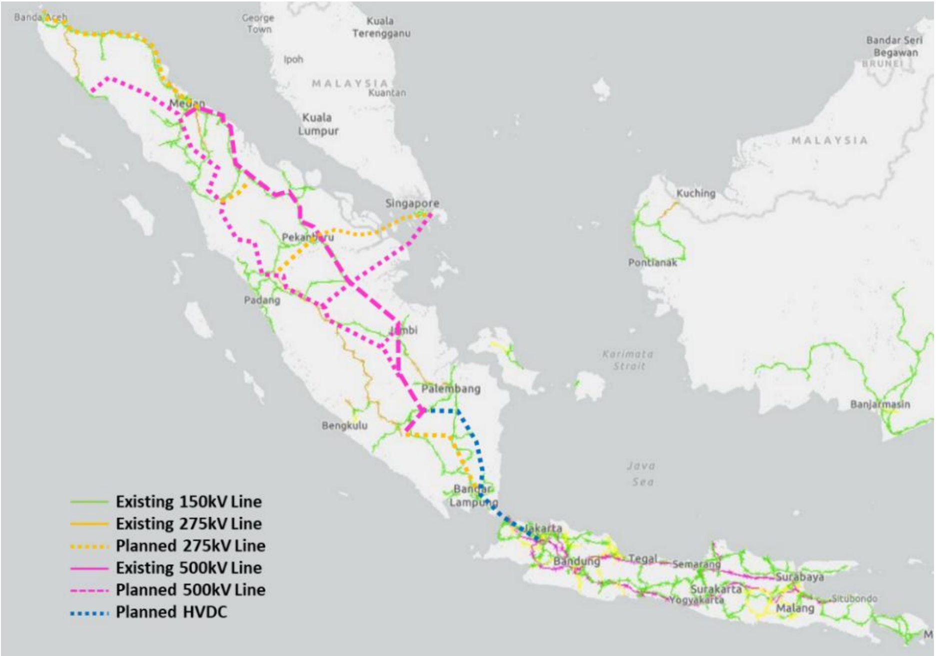
Source: (JETP Secretariat and Working Groups, 2023)

Project	Major Contents	Commercial Operations Date
Sumatra-Batam-Bintan Interconnection		2028
Sumatra-Java Interconnector (ISJ)	1. Muara Enim – Ketapang 2. Ketapang – Salira Indah 3. Salira Indah – BogorX CS	1. 2029 2. 2029 3. 2029
Sumatra Backbone (First Phase)	1. 500kV Galang - Rantau Prapat - Perawang/Riau 2 2. 275kV Sarulla – Rantau Prapat 3. 275kV Pangkalan Susu - Arun- Sigli	1. 2028 2. 2028 3. 2028
Sulawesi Backbone	1. Wotu – Bungku 2. Bungku- Andowia 3. Andowia-Kendari 4. Bakaru II – Palopo 5. Bakaru II – Sidrap 6. Sidrap – Daya Baru 7. Daya Baru – Bantaeng Switching 8. Further upgrades Marisa –-Tolitoli – Leok (TBD) 9. Further upgrades on Gorontalo – Tolinggula (TBD) 10. Further upgrades on Tolitoli - Bangkir – Tambu (TBD)	1. 2024 2. 2024 3. 2025 4. 2025 5. 2025 6. 2025 7. 2025 8. TBD 9. TBD 10. TBD
Deployment of Smart Grid Technologies	1. Advanced Control Center (ACC) 2. Advanced Metering Infrastructure (AMI)	1. 2030 2. 2030

Beyond Table 5.4-1, the full list of prioritized transmission grid projects is shown in Appendix 10.1

1. Sumatra backbone and Sumatra-Batam-Bintan interconnection

   In the Sumatra system, a 500 kV backbone transmission needs to be built in the eastern corridor. After completion of 500kV backbone, the Sumatra transmission system will conform to the network topology of the 275 kV interconnection system in the west corridor and 500 kV in the east corridor. Currently the sections of 500 kV Muara Enim - New Aur Duri - Peranap Perawang substations are already in the construction stage, while the sections of 500 kV Perawang Rantau Prapat - Galang substations will initiate the construction in a few years. There is also a plan to establish a second 500kV backbone beyond 2030 to integrate more renewables in Aceh and North Sumatra region. The interconnector between the Sumatra main island and Bintan-Batam also plays a key role in the decarbonization of the island.The new 500kV corridors will unlock the development of renewables mainly hydro and geothermal with huge potentials in the northern and western side of the Sumatra Island. Combined with Java-Sumatra interconnection, the evacuation of these renewables from Sumatra to Java will play a crucial role for the decarbonization in the Java-Bali system.



Source: (PT Perusahaan Listrik Negara, 2023)

Figure 5.4-2 Outline of the Sumatra 500kV-275kV Backbone

2. Java-Sumatra HVDC interconnector

   From a long-term perspective the Java-Sumatra interconnector will play a crucial part in the transmission of renewable power, especially hydropower, from Sumatra to Java in the JETP scenario. A feasibility study was completed in the past, with further evaluation ongoing by PLN. It should be noted that the interconnector should be developed under the condition that the oversupply of the grids on both ends is resolved, ensuring that the interconnector would not contribute to the extension of the life of coal power plants in both sides.

3. Sulawesi backbone

   For the development of the transmission backbone in the Sulawesi Region, the 275kV transmission corridor is planned on the south side of Sulawesi. The new corridor establishes a 275kV solid backbone across the island, from Central to South Sulawesi as well as Southeast Sulawesi. In Central Sulawesi, there is huge potential for hydro which has not been realized because of a lack of power demand which would use the power generated. Some wind resources also exist on the western part of the island of which the development will be promoted by the backbone. Furthermore, South Sulawesi region has been developed as a center of economic growth of the island, by which strong demand increase is expected to continue. In addition, Southeast Sulawesi expects significant increase in demand within several years mainly for nickel smelters. In addition, Southeast Sulawesi expects a significant increase in demand within several years mainly for nickel smelters.

Construction of new 275kV transmission facilities will form the basis of and stimulate hydropower development in the central part of the Sulawesi Island, and utilization of green energy at the southern part of the island where the large-scale potential load increase is expected. In addition, interconnection with Central Sulawesi and North Sulawesi in future will maximize the usage of efficient RE sourced energy across the island.

Source: (PT Perusahaan Listrik Negara, 2023)

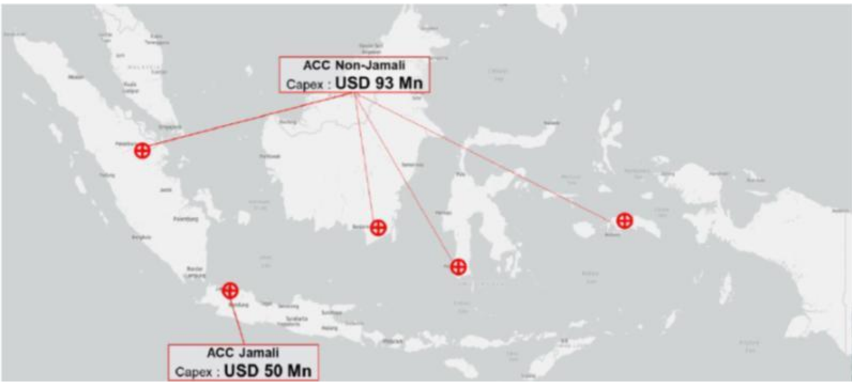
Figure 5.4-3 Outline of the Sulawesi 275kV Green Corridor

4. Grid modernization and digitalization with Smart Grid technologies.

   The widespread deployment of Smart Grid technologies will contribute to digitalizing the business of power supply chain from generations to customers and optimize the operations of the grid. Among others, technologies such as the advanced control center (ACC) can all strongly impact the efficiency of the power grid operation. The impact includes (1) the automation of control and management of supply from variable renewable energy generators, (2) the minimization of power system failures through proactive system malfunction mitigation, and (3) the optimization of power grid operations via analytics and digitization of infrastructure that will lead to an optimal cost of production.

   Improvement of the grid operation taking advantage of the application of smart grid technologies is one of the prerequisites for the deployment of huge amount of VREs. An increasingly complex power system drives high demands for upgrading automation technology. Real-time system monitoring and control is crucial function to meet security, reliability, quality, and economy of the power supply.

The development of advanced control centers (ACC) will enable operators to cope with the challenges in system dispatching and control which arises from the growth of distributed energy resource, unpredictable demand characteristics, and intermittent characteristics of VREs. The ACC should have several key functions including weather forecast, load forecast, economic dispatch modeling, automatic generation system, reserve margin monitoring, generation and marginal cost management, contingency analysis, voltage stability analysis, dynamic simulation analysis, wide area monitoring system, and wide area protection scheme, enterprise information system, and cyber security system. PLN is planning investments in ACC which amounts to around US$150 million in total.



Source: (PT Perusahaan Listrik Negara, 2023)

Figure 5.4-4 Advanced Control Center Development Plan

In addition to ACC, other technologies can be deployed to promote the modernization and digitalization of the grid at not only transmission but also distribution level. These technologies include but are not limited to advanced metering infrastructure (AMI), digitalized substation, and distribution automation system (DAS). To maintain the stable grid operation by ensuring compatibility of the innovative technologies with existing facilities, PLN intends to develop plans for the deployment of such innovative technologies after the implementation and assessment of demonstration projects to evaluate the cost-benefit of the technology and selected area and business regions to be prioritized. After the deployment plan is established, prioritized projects can be supported under the JETP, depending on further assessment.

By using two- way communication technology of AMI, energy flow at each distribution point can be monitored and managed so that the distribution can be carried out efficiently. The developed AMI technology includes technical schemes for data retrieval from customer meters to data processing centers, meter specifications that suit AMI needs, two-way communication media, meter data management systems, and data analytics capabilities.

It will also have effects to increase operational effectiveness, reduce risk, and carry out best practice processes for electricity transaction measurement systems, standard operating procedures, security monitoring, control, and reporting. PLN intends to develop a plan for the deployment of AMI after its implementation of ongoing demonstration projects to assess the cost-benefit of AMI technology and selected area and business regions to be prioritized. After the deployment plan is established, prioritized projects can be supported under the JETP, depending on further assessment of the projects.

5. 500kV backbone in north to east Kalimantan

   In addition to Sulawesi, Kalimantan is also likely to become a hub for industrial demands. The demand increase is also expected from the perspective that the new capital is planned to be in East Kalimantan where the power should be supplied by 100% renewables in accordance with the law. To serve these demands, even though it is not part of the top priority projects, the new 500kV corridor will play a crucial role to enable the development of hydro in north Kalimantan and transmit the power produced by these plants to the demand center in the eastern side of the island. In addition, depending on the need for further decarbonization in Java system and utilization of huge renewable energy resources including solar PV in Kalimantan, in the future there would be opportunity to reinforce the grid across the island and connect Kalimantan system to the Java system. In the JETP scenario, significant interisland HVDC interconnection will be required over 2035–2050 to transmit clean power from Kalimantan to Java.

Figure 5.4-5 Outline of the 500kV backbone in Kalimantan

Source: (PT Perusahaan Listrik Negara, 2023)

5.4.5 Risks and mitigation measures for transmission grid projects

To complete transmission projects in a successful and timely manner, there are several risks that need to be addressed. The table below summarizes the key risks and mitigation measures for transmission investments, especially for those are listed as showcase projects in this document.

Table 5.4-2 Summary of risks for transmission grid projects and mitigation measures

Source: (JETP Secretariat and Working Groups, 2023)

Risk	Mitigations
Delays in development and construction due to prolonged negotiation with stakeholders and land acquisition.	• Proactive engagements with stakeholders from the early stage of the project. • Adequate consultation and compensation based on relevant regulations and standards.
A significant number of projects in a limited timeframe (especially to 2030) may strain funding and working resources for PLN.	• Securing adequate budget and experts in PLN for prioritized projects. • Mobilizing the private sector in financing and providing work resources.
Because HVDC technology is new to PLN, technical implementation shortcomings may hinder project development and operations.	• Utilization of best practices through the engagement of experienced international utilities for design, construction, and operation.

Especially, HVDC technology is quite unique compared to traditional AC technologies, and facilities for HVDC system requires specific expertise different from those for AC. Given that the HVDC facilities to be established within a decade will play a vital role in the grid, extremely high availability is required for operation. Such aspects pose a high technical risk to the project unless PLN takes specific measures against it.

For the successful completion of the project as well as long-term stable operation, it is quite important to maximize the usage of up-to-date international expertise and practice in HVDC technology. Therefore, it will be crucial for PLN to engage well-experienced international firms, especially a utility abroad that has experience in the successful design, construction, and operation of HVDC facilities.

Among potential ways to involve such international utilities, public–private partnerships including build-operate-transfer (BOT) or joint ventures schemes between PLN and private firms would be options to ensure long-term cooperation, rather than assigning consulting firm for a limited period. Such schemes with investment from the private sector also help ease the financial burden of PLN with the sizable upfront capital expenditure required for the projects.

Beyond the analysis above, future in-depth studies have been identified to be potentially conducted to further sharpen the analysis made in this subchapter. The full list of potential studies is shown in Appendix 10.18.

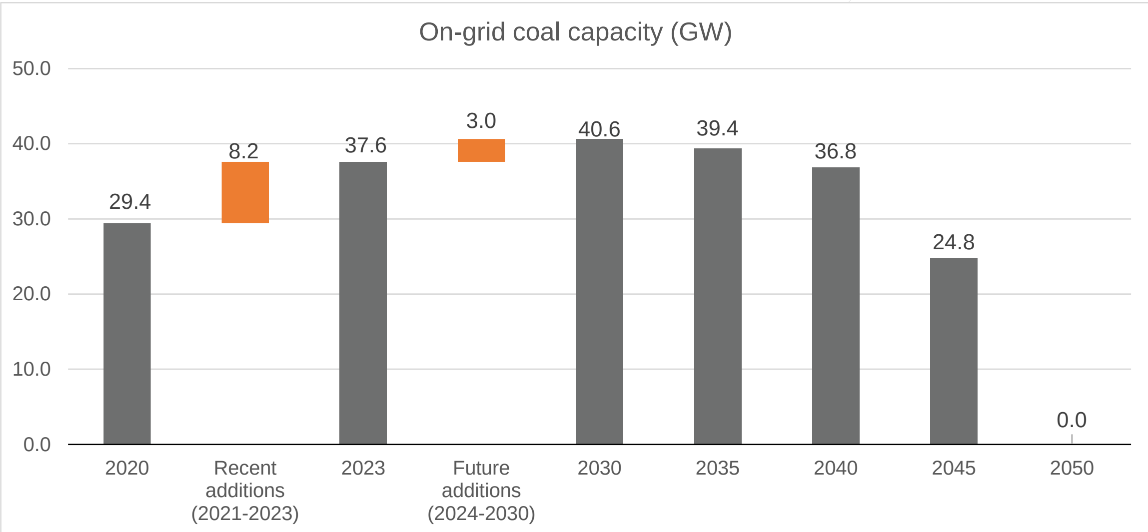
5.5 Investment Focus Area #2: Early coal-fired power plant retirement and managed coal phase-out

5.5.1 Outlook for on-grid coal power generation and capacity

Over the past two decades, coal has provided the bulk of Indonesia's additional energy needs, with its share growing from 8% to 30% in the energy mix. Over 51% of Indonesia's electricity in 2022 was powered by coal with around 33 GW of installed coal capacity.

- However, the role of coal is evolving. Shifting economics, along with the health, climate, and energy security consequences of coal-fired power translates to a significant opportunity for Indonesia to support economic growth, create jobs, lower costs, and lower emissions through a managed coal-to-clean transition. In 2022, Perpres No. 112 was issued which banned the development of new coal power plants, except for plants there were already included in the RUPTL pipeline. The regulation also allows for fiscal support for phase-out and accelerated retirement of coal-fired power plants through blended finance instruments. However, realizing this opportunity requires massive capital mobilization, which makes the case for managed coal phase-out to be an investment focus area of the JETP.

Such dynamics are reflected in the JETP scenario. Growth of on-grid coal power capacity expands over this decade but peaks and declines from 2030 as strategies are employed to reduce emissions from the coal fleet and facilitate renewable power development. Coal generation in the on-grid system grows initially, but begins to level off and decline, as remaining new additions are balanced by lower utilization factors and early retirements.



Source: On-grid coal capacity in 2020 based on (Ministry of Energy and Mineral Resources, 2020) and on-grid coal capacity in 2023 projections from (JETP Secretariat and Working Groups, 2023)

Note: Data corresponds to net power capacity

Figure 5.5-1 Coal power capacity under the JETP scenario

As the share of variable renewables increases in the scenario, the role of the remaining coal power fleet starts to shift from providing base load power to more of a flexibility and load following function. On-grid coal power plants are operated more flexibly, enabled by a climate policy to cap emissions at 250 Mt in 2030 and relaxed technical constraints, including reduced minimum loading requirements and control center, and equipment upgrades at the system and plant level. This has the effect of decreasing their annual capacity factors from over 70% today to 63% in 2030 and toward 50% in the early 2040s.

From 2035, an increasing number of fossil-fuel based power plants are retired or repurposed. In the RUKN, coal plants are retired when they reach their natural retirement age (i.e., when their book value is assessed to be zero). In the JETP scenario, early retirements are carried out for 1.7 GW of IPP and PLN capacity by 2040, enabled by international financial support from the Energy Transition Mechanism.

After 2040, an increasing number of fossil-fuel based power plants (coal and gas) are retired and retrofitted to fully run on bioenergy or ammonia for coal power, and hydrogen for gas power. To reach net-zero emissions by 2050, the retirement and repurposing of coal power plants reaching their natural retirement age during the 2050s in the draft RUKN (over 10GW) is accelerated to the period of 2045–2050.

5.5.2 Key Issues for Managed Phase-out of grid-connected coal-fired power plants

While the economic, environmental, and social benefits of a coal transition are clear, challenges remain in implementing the transition, which can be supported using a managed phase-out approach. This entails a diligently designed, structured and implemented plan that is agreed upon by all impacted stakeholders and leads to five key outcomes: 1) short- and long-term grid reliability continues, if not improves; 2) opportunities for economic growth and diversification, including support for workers and communities affected by climate change and by the economic impacts of the transition are provided; 3) electricity costs are minimized; 4) carbon emissions decline rapidly; and 5) institutions and companies that provide crucial public services remain financially stable.

Furthermore, Indonesia has invested significantly in coal generation over the last decade to keep up with anticipated demand growth, with around 20 GW of additions (Ministry of Energy and Mineral Resources, 2021). This translates to a substantial amount of capital that PLN and independent power producers (IPPs) still need to recover. IPPs have tied their investment into long-term power purchase agreements (PPAs) with PLN under contract conditions–including long contract terms (up to 30 years), inflexible take-or-pay amounts, and fuel cost transfer–that would need to be restructured for their successful transition.

Transitions require conditions to accelerate investment in coal plant closure and operational flexibility retrofits, transition coal PPAs, and develop clean replacements. There is a need to improve the bankability of renewable energy projects, ensure generation and other technologies providing system services compete on equal terms with coal (e.g., against real cost of fuel), incentivize competitive procurement, and ensure that the benefits also reach taxpayers and local communities. Additional investments in flexibility resources (described in subchapter 5.2) are needed to integrate higher shares of variable renewables.

As part of a managed phase-out portfolio, coal plant repurposing can play a key role in providing secure and reliable electricity. Repurposing refers to modifying a CFPP to fit a new use (for example, for energy storage), to support a new mode of operation (for example, cycling the output to follow demand instead of providing baseload power), or both. Repurposing coal plants has the potential to serve as a transitional tool while clean energy technologies scale up to become the dominant electricity generation resources. Basing repurposing choices on the technical requirements of the grid ensures that reliability is maintained while maximizing emissions reduction at the least cost, and that repurposing projects are credible from a financing and execution perspective for coal path dependency and leakage to be avoided.

Repurposing provides an opportunity to leverage existing coal assets to achieve emissions reduction goals even as larger investment and just transition challenges can limit the speed of transitions. Still, near-term benefits of repurposing can be outweighed by long-term consequences (like path dependency) if planning for repurposing does not support a widespread shift to clean energy. A critical eligibility covenant for pursuing repurposing will be to ensure the economic life of the coal power plant is not extended. Moreover, investments in repurposing should not delay but rather assist in strengthening clean alternatives.

Early retirement and repurposing of assets is a comprehensive solution for managed coal phase-out when technically, economically, financially, and legally feasible. After retirement, plant owners can consider site conversion and equipment reuse to promote economic diversification, enable clean replacement, and cushion the impacts of unrecovered capital.

If early retirement is not feasible or economical, strategies to encourage more flexible utilization and operations—where coal plants shift from providing baseload to flexible or ancillary services, enabled by plant retrofits—can support integration of growing shares of variable renewables while maintaining grid reliability. In the JETP scenario such strategies play a key role in reducing coal power output and boosting renewables in 2030 and continue to contribute significantly to fuel cost savings and emissions reductions through 2040.

Table 5.5-1 Key risks and mitigation measures to managed coal phase-out

Source: (JETP Secretariat and Working Groups, 2023)

Risk	Mitigation measures
Transitioning coal plants to more flexible utilization and operations is technically feasible, yet potential roadblocks can arise from contractual constraints or financial-related issues.	• Leveraging PLN-owned plants for flexibility while negotiating adjustment to minimum offtake requirements as elaborated in Chapter 8. • The 2020 Grid Code also acts as a basis to ensure there is an investment in flexible resources. • Introducing policies that allow compensation of non-energy services, like ancillary and flexible services, can further encourage operational flexibility.
As coal power plant flexibility is implemented, there is a risk of extending the plant's lifetime, subsequently locking in its emissions and capacity.	• Well-designed carbon emissions caps and pricing mechanisms can act as guardrails against increasing output and extending the operational lifespan of coal power plants. • In addition, an explicit provision prohibiting extending plant lifetime in legal or permitting documents can mitigate the risk. • Encouragement of early retirement through other policy and financial mechanisms.
Legal and financial risks from early coal power plant retirement, in terms of contract breaches, asset valuation, and from transitioning to renewable energy, which requires additional capital investment	• Complement existing legal framework on asset disposal, transaction, and renewable energy replacement for early retirement and flexible operation that provides legal basis for state losses and affected third party lenders as mentioned in Chapter 8. • Staggered transition with financial buffers and international support, e.g., grants or low-interest loans.

A less comprehensive approach to coal phase-out is lower emissions continuous output (LECO), valuable only if coal-fired power would still be essential in maintaining resource adequacy requirements during most hours of the year, however, with the goal of reducing emissions. For operational flexibility and lower emissions continuous output, further assessment of the potential end-use technologies must be undertaken based on their impact on grid reliability, affordability, and emissions reductions. One such example is co-firing with biomass, which in the JETP scenario comprises around 5%–10% of annual generation from coal power plants over 2030–2050, acting as a complementary strategy to reduce emissions from existing plants.

A major obstacle in integrating renewable energy into the Indonesian grid lies in the inflexible nature of existing coal-fired PPAs between PLN and IPP. The take-or-pay (ToP) obligations in these contracts between PLN and IPPs create disincentives for coal power plants to adapt to a flexible grid operation (see Subchapter 8.5 for more details on PPA structures and limitations). This significantly limits the available space in the generation mix for renewable energy sources to get dispatched, especially in the Java-Bali system where there is currently overcapacity.

The take-or-pay clauses in PPAs pose a financial liability to reducing a coal power output through operational flexibility repurposing. To adapt coal-fired PPAs to the operational flexibility necessary during the managed phase-out, PLN could renegotiate the minimum offtake requirements (by lowering the take-or-pay) or increasing their flexibility (by compensating for availability or capacity services) with IPPs. This would allow the power system to gain the ability to adjust its operation in response to system conditions—like fuel consumption patterns or high renewable energy output—while using fossil-based generation more efficiently. Such effects would require policy and contractual changes, complemented with financing mechanisms, such as refinancing with blended finance and the Energy Transition Mechanism, which are discussed more in Chapter 8.

The combination of managed coal phase-out strategies in the JETP scenario reduces emissions from on-grid coal generation by around one-fifth by 2030 and by around one-third by 2040, from over 260 Mt in 2025. Nevertheless, a holistic approach that integrates legal, financial, policy, and operational solutions is critical to enabling such reductions.

5.5.3 Managed Phase-out Strategy and Planning

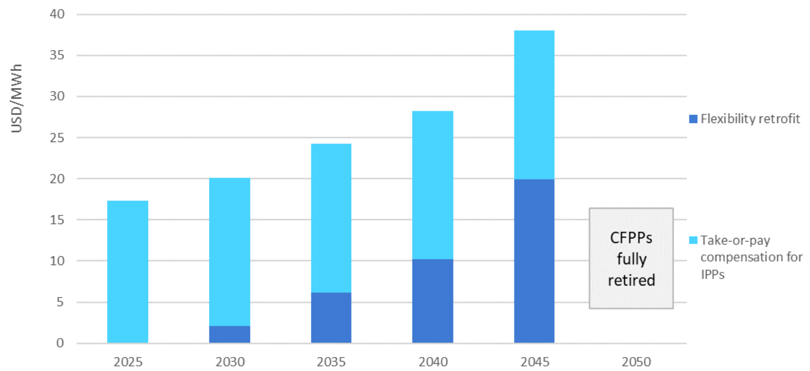
The JETP scenario employs a managed phase-out approach to coal power plants that includes early retirement, flexible utilization and operations of existing assets, and fuel co-firing strategies. While such strategies can reduce system costs, they also involve additional costs and financial compensation. Planning that employs these approaches in an optimal way can help to achieve decarbonization aims in a more cost-effective manner, while mitigating impacts to PLN's finances.

Retrofits for flexible operation require both capital expenditures on the coal plant and additional operating expenses. Capital investments needed to retrofit a coal power plant to improve operational flexibility range between 120,000 and 600,000 US$/MW (Ministry of Energy and Mineral Resouces and Danish Energy Agency, 2021), with PLN and MEMR seeing a typical investment cost at approximately 300,000 US$/MW, depending on the combustion technology, age of the plant, and technical upgrades chosen for flexible operation. Cycling and operating at lower outputs causes thermal fatigue, stress on equipment, corrosion, and increased wear and tear, resulting in higher operating costs. Moreover, the fuel consumption rate may increase at low output levels.

The JETP scenario employs a phased-in approach to flexibility investments based on an annual capacity factor threshold for coal power plants of 65%, below which investments are introduced for a portion of the fleet. Fleetwide retrofits are assumed to take place by the time annual capacity factors reach 50% (in the early 2040s), which is the minimum annual utilization in the JETP scenario. These annual capacity factor assumptions are prescribed by PLN and MEMR.

The lost revenues associated with reduced annual utilization (compared with a contractual minimum of 80%) also represent a potential sum that PLN would need to pay as compensation to IPPs. This sum totals up to US$1.4 billion annually in 2030 and up to US$31 billion cumulatively to 2050, under an assumption of US 3.2 cents/kWh for the value of take-or-pay clauses for IPPs. Such costs are already accounted for in the system cost results of the JETP scenario (subchapter 5.2), so this estimation should be viewed as a component of that. Lower utilization would also have a financial impact for PLN-owned plants. It is also important to note that the take-or-pay compensation for IPPs is a top-down estimation from PLN and MEMR as an informative datapoint, and the actual contract details may differ.

A top-down estimate of the potential total costs for exercising fleetwide flexibility in the JETP scenario (per MWh of coal output avoided) can be derived by comparing the baseline – where the coal fleet operates at an average capacity factor of 80% – to the modeled coal generation in the JETP scenario. Results point to a levelized cost of flexibility retrofits (including take-or-pay penalties for IPP-owned CFPPs) at around US$20/MWh in 2030, rising to US$24/MWh in 2035 and US$28/MWh in 2040.



Source: (JETP Secretariat and Working Groups, 2023)

Note: Excludes financial impact for PLN-owned plants; flexibility retrofit costs represent a theoretical ceiling and further analysis is needed to determine the degree of retrofits required on a plant level and optimal fleet of coal assets to be retrofitted while ensuring system adequacy and stability.

Figure 5.5-2 Capital recovery costs from more flexible utilization and operations of coal power plants in the JETP scenario

Assuming retrofits over time across the entire coal fleet, the cumulative cost of flexibility retrofits on a net present value basis (with 10% discount rate) is assessed at up to US$5 billion–US$6 billion until 2040 (on an overnight basis, such investments total up to US$7 billion). By 2030, the annual financial cost of retrofit investments (on a present value basis) is projected at only around US$0.16 billion. This cost represents a theoretical ceiling for flexibility retrofits, and further analysis is needed to determine the degree of retrofits required on a plant level and the optimal fleet of coal assets that would need to be retrofitted while ensuring system adequacy and stability.

Such costs have an increasing trend over time for two main reasons: 1) the decrease in total coal power output associated with each additional retrofit levels off as capacity factors approach 50%, which also decreases operating cost savings; and 2) flexibility retrofits become financially more expensive over time, as the investments in plant upgrades have less time to be recovered (the JETP scenario does not prolong lifetimes of coal plants, which are all retired by 2050).

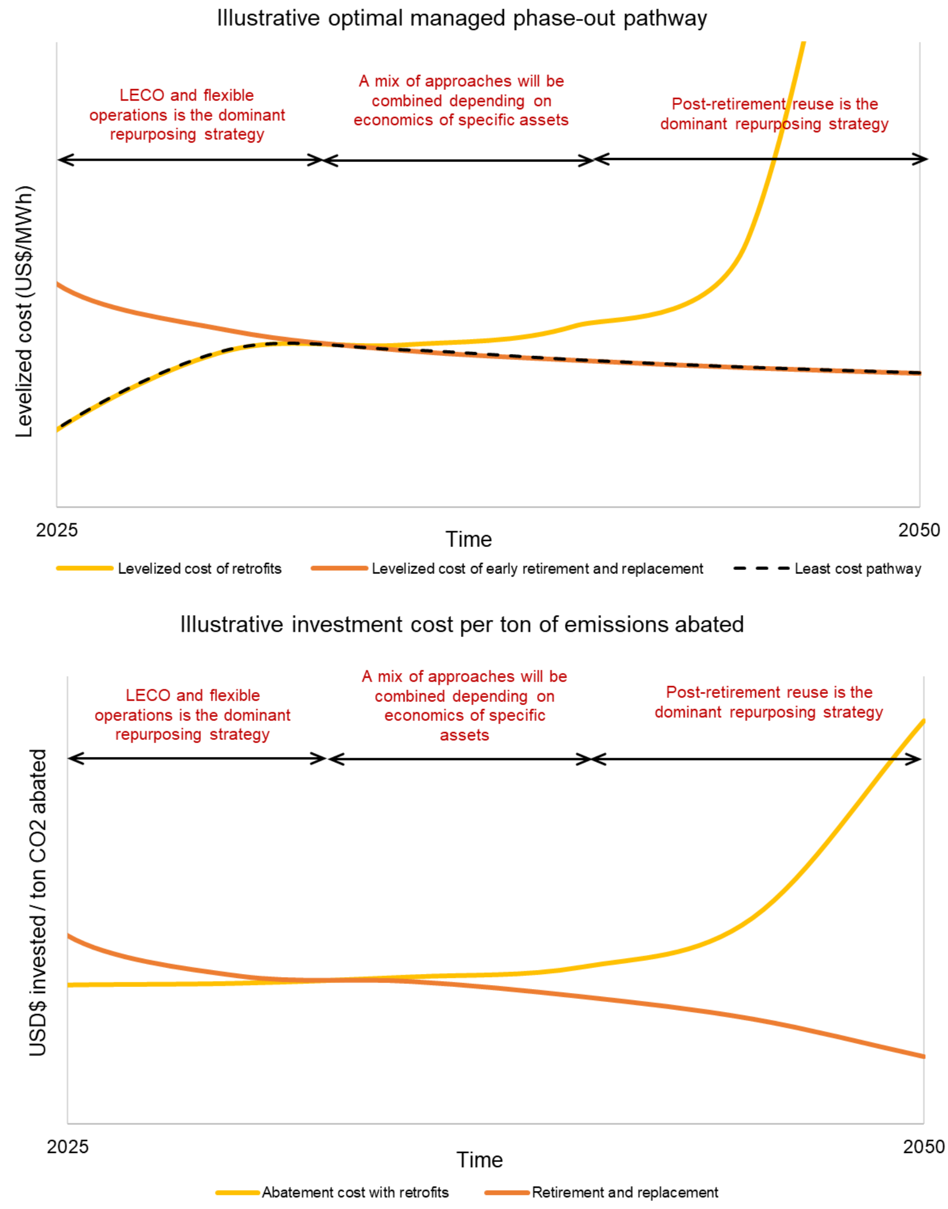
Early retirement and replacement are much more capital intensive, requiring investments in compensating the coal plant owner (whether PLN or IPPs), decommissioning, just transition activities and support, and building new clean energy replacement. Given that renewables generation, however, often has close to zero operating costs (compared to coal-fired generation), total operating savings are higher. Additionally, the economics of early retirement and replacement improve over time as renewable power costs fall, and existing coal power plants have lower value (IPPs forgone cash flows have shorter time frame, and PLN's coal power plant book value depreciates more over time).

Taking these trends into consideration, the economics of early retirement and replacement are expected to improve around the mid-2030s. To determine the optimal cost pathway, the economics of flexibility retrofits would need to be benchmarked against the cost of early retirement—i.e., the levelized cost of recovery of capital and operating expenses until retirement, as well as revenue required for replacing the retired assets with clean resources.

With respect to carbon emissions, flexible operation retrofits have diminishing returns as well (where every coal power retrofit has a lower CO_2 abatement power than the previous one), but the cost per ton abated may be lower than with early retirement and replacement in the near term. That is because flexible operation retrofits allow for earlier integration of renewable power in the grid while decreasing coal power output for a fraction of the investment cost. Similar to power system costs, the cost efficiency of carbon emissions abatement appears less favorable over time for flexibility retrofits, and more favorable for early retirement and replacement.

These dynamics show that there may be an optimal investment strategy for managing coal phase-out, where operational flexibility retrofits (and potentially other repurposing concepts) are chosen initially, and these retrofits are employed less over time as early coal power plant retirement and replacement becomes an increasingly attractive strategy. Figure 5.5-3 shows an indicative illustration of how the optimal investment strategy can be informed by comparing the levelized cost trajectories of repurposing and early retirement.

While the below figures demonstrate an indicative investment strategy for repurposing and early retirement, identifying a preferred pathway for each coal power asset would require a more comprehensive techno-economic and financial analysis at the portfolio level which includes combinations of approaches under different scenarios. Such analysis should be conducted to minimize system costs and abatement costs per ton, subject to maintaining grid reliability, and supporting a declining emissions trajectory.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.5-3 Illustrative cost pathways for managed coal phase-out strategies

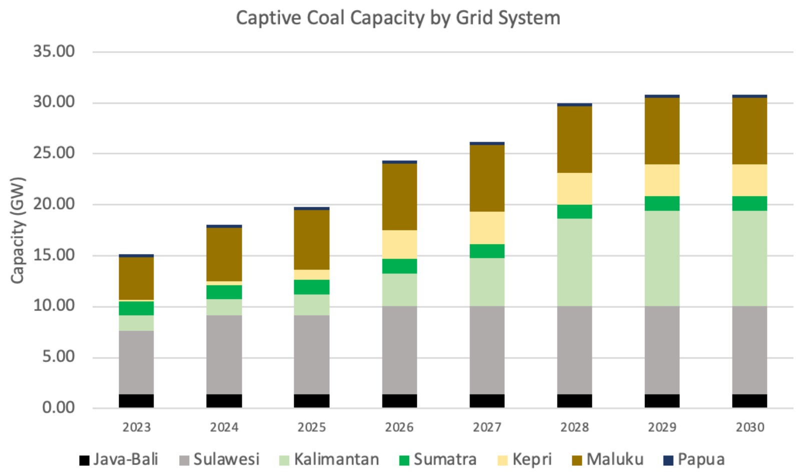
Box 5.1 The role of captive coal power plants

Indonesia has a growing pipeline of off-grid, captive power plants to support the development of industrial facilities, especially heavy industries for processing of critical minerals, which are viewed as important to realizing the governments industrial downstreaming strategy for economic development. Given the location, scale and electricity needs of such plants, connection to the grid is often not feasible or cost prohibitive.

Currently, the total captive power capacity is estimated to be almost 23 GW, around 13 GW of which consists of coal-fired power plants, according to information obtained from MEMR and publicly available project level data. Breaking this coal capacity down by type of industries, around 9 GW of this capacity is utilized for nickel smelting, followed by pulp and paper production at almost 2 GW. Other industries include aluminum smelting, cement production, chemical production, and other mining facilities.

The spread of this coal capacity is mainly concentrated in Sulawesi and Maluku islands, due to the rich nickel reserves in these islands. Sulawesi includes 45% of the total existing captive CFPP capacity, followed by Maluku, Java, and Sumatra at about 25%, 15%, and 10% respectively (Figure 5.5-4). Java mainly includes pulp and paper and chemical production, and similarly Sumatra supports the country's pulp and paper and palm oil production.

Without a significant shift in the business plans, technology choices and regulation of such plants, the realization of all planned captive coal power plants in Indonesia would add over 20 GW by 2030, of which ~8.5 GW are currently in construction. Smelters make up 85% of the pipeline, half of which are planned for nickel production.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.5-4 Planned captive coal power capacity by grid system

This strong potential pattern poses a challenge in terms of emissions and environmental management. Much of the planned development is concentrated in islands where the current grid infrastructure is not sufficient to absorb the potential demand. While technology options exist, current policies and market developments remain inadequate to incentivize the shift of captive industries away from coal to meet their power and process heat needs. Tackling these issues requires enhanced planning and policy frameworks which also enable economic growth aims.

In 2023, the Ministry of Energy and Mineral Resources conducted analysis and proposed 26 captive power plants to be connected to the PLN grid with the objective of reducing approximately 10.5 million tonnes of CO_2 per year. The proposed plants belong to a wide variation of industries, including petrochemicals, cement, and manufacturing, among others. The total cost of materials and services from the customer and the PLN side for this entire proposal is expected to reach Rp1,214 billion or equivalent to US$ 76.4 million (Ministry of Energy and Mineral Resources, 2023). Further details of MEMR's proposal can be found in Appendix 10.18.

As part of an ongoing effort to put support clean energy transitions in this area, JETP will carry out a more detailed study and roadmap on decarbonizing Indonesia's captive industries. Like the CIPP, this roadmap will be a strategy document that the Government of Indonesia will use as a basis for off-grid power sector planning and policymaking as part of the JETP process to implement the JETP Joint Statement agreed in November 2022. It will not constitute a legally binding document.

The study aims to discuss the landscape of off-grid industrial development in Indonesia and its role in economic growth within the existing policy context for development. The energy needs of the captive industries will be analyzed and technology options from both the demand and supply perspectives will be identified for decarbonizing their operations. The roadmap plans to model a low-carbon pathway for energy demand, supply, and CO_2 emissions from captive industries, supported by asset level analysis.

The study also aims to identify the essential enabling factors, including domestic and international policies, investment and financing considerations and technology innovation, as well as assess how energy choices may affect industrial competitiveness, just transition for workers and communities and local environmental welfare.

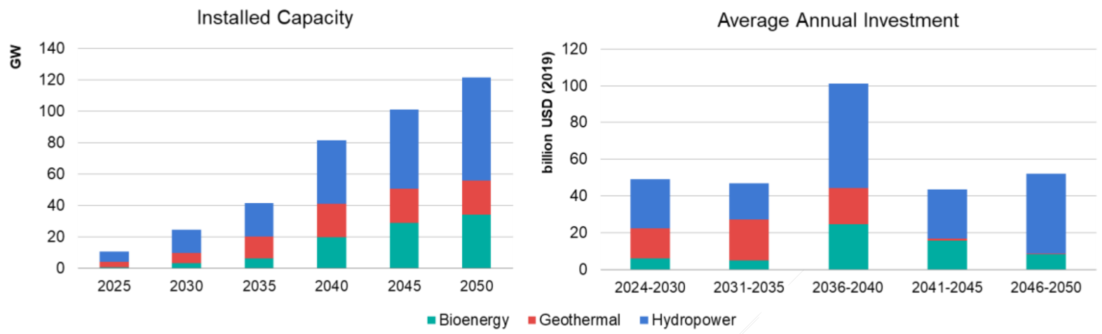
5.6 Investment Focus Area #3: Dispatchable renewable power deployment acceleration

5.6.1 Outlook for Dispatchable Renewable Power Deployment and Investment

In the JETP scenario, dispatchable renewable power (bioenergy, geothermal, hydropower) accounts for the bulk of the clean generation increase between now and 2030 and the largest portion of renewables share, at nearly 30% of total generation in 2030. This share fluctuates between around 35% and 40% in the decades thereafter.

This increased reliance on dispatchable renewable energy, most visibly in the 2020s, is the result of alignment with PLN's list of priority projects, which includes a notable amount of hydropower and geothermal plants. Beyond the priority projects list, the model determines additional investment needs on these technologies based on least-cost capacity expansion, subject to local demand requirements, resource availability and evacuation infrastructure.

This trend also reflects the national stakeholder, notably MEMR, strategies for renewable deployment. However, another route for renewable development strategy, which is incorporating more variable renewable energy in the system, is also rising in importance, which will be discussed further in the following subchapters.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.6-1 Dispatchable renewables installed capacity

Bioenergy represents the smallest dispatchable renewables contribution in 2030, at only nearly 8% of generation. Its expansion over the next decade is driven by 3 GW of new plants, with almost 40% of the new capacity in the Java-Bali system. These bioenergy plants consist of stand-alone biomass plants, biogas plants, and municipal solid waste plants. Bioenergy generation from biomass co-firing in coal plants also increases up until 2030, although the average co-firing rate in these coal plants onward up to 2050 is below the limit of 10%. From 8% of the bioenergy contribution in the generation mix in 2030, almost 3% come from the co-firing of the coal plants. Over time, as coal plants are retired and biomass capacity increases, more bioenergy generation comes from stand-alone plants compared with the co-firing ones, with 20 GW of stand-alone bioenergy plants installed in 2040.

Both hydropower (+9 GW) and geothermal (+4 GW), which have longer lead times, see notable deployment over this decade, based on PLN's priority project development plans, with much larger growth in the 2030–2040 decade. Notably, hydropower development is contingent upon realizing the Java-Sumatra interconnection project (see subchapter 5.4) in a timely manner, which helps both islands to reduce emissions from generation while maintaining appropriate levels of supply adequacy. Accounting for a longer time horizon for project development, from 2030 to 2040, over 26 GW of hydropower are added, along with more than 14 GW of geothermal.

Investment requirements for dispatchable renewable power total of almost US$197 billion cumulatively by 2040, with capital expenditures for hydropower during the 2024-2040 period accounting for over half of this.

5.6.2 Key Issues in Acceleration of Dispatchable Renewable Power Deployment

Acceleration of the deployment of dispatchable renewables requires addressing several key issues, including minimizing project delays and cost overruns, exploration risk mitigation for geothermal projects, and feedstock availability for biomass supply.

According to PLN, hydropower, particularly large-scale projects, and geothermal can take 6 to 10 years to be developed and constructed, respectively, assuming no delay is experienced by these projects (PT Perusahaan Listrik Negara, 2023). Several ongoing projects have experienced delays, as presented in Table 5.6-1, along with their revised commercial operations date (COD).

Some dispatchable renewable energy, e.g., geothermal, and large hydro, require high upfront investment per capacity installed namely between US$4 million – US$5 million/MW for geothermal and around US$2 million/MW for large hydropower plants (Ministry of Energy and Mineral Resouces and Danish Energy Agency, 2021). The high upfront cost presents challenges especially combined with the long development time of the project, which could potentially increase the financing component of the capital expenditure (CAPEX). Improvements to the procurement process of renewable plants are critical to minimize the risk of project delays and cost overruns to realize the JETP scenario. Recommendations for improving the procurement process are detailed in Chapter 8.

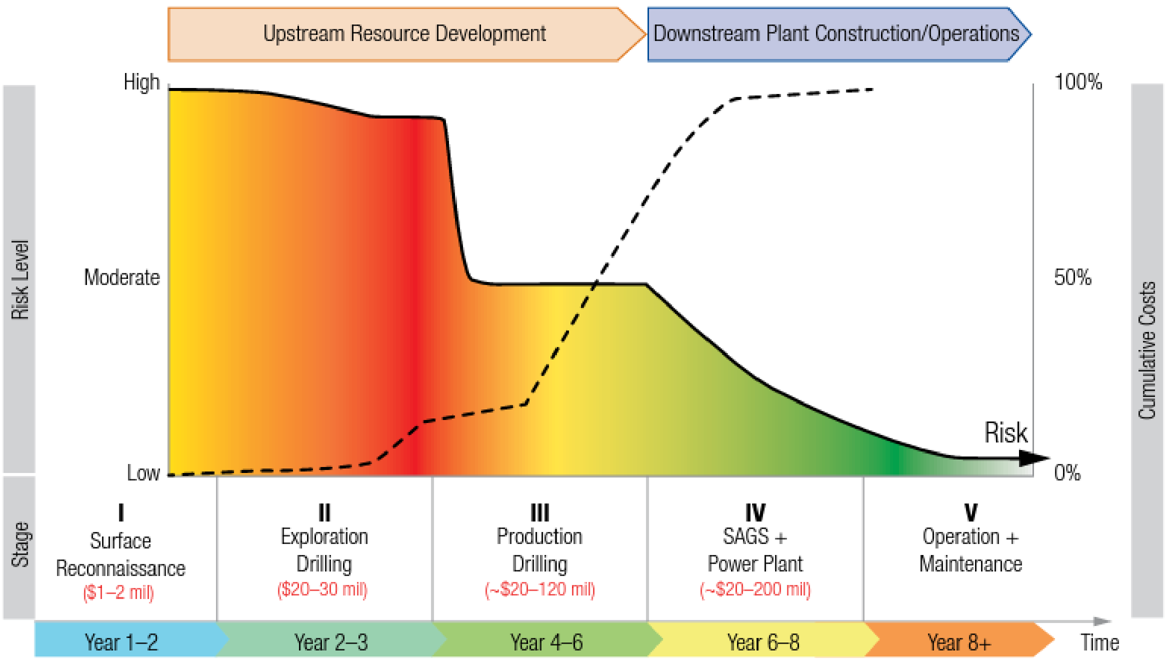
Table 5.6-1 Select hydropower and geothermal projects under development

Source: (JETP Secretariat and Working Groups, 2023)

Project	Source	Capacity (MW)	Year of Inception	COD Year (PLN FR 2020)	COD Year (PLN FR 2021)	COD Year (PLN FR 2022)	Reason for the Delay
Batang Toru	Hydro	510	2015	2021	2026	2026	The project has been facing opposition from local environmental groups and the fact that North Sumatra system is still experiencing overcapacity (Arandito, 2023)
Rajabasa	Geothermal	220	2017	2023	2025	2025	The project is awaiting the amendment made in its PPA with PLN (Anam, 2022)
Baturraden	Geothermal	220	2017	2022	2028	2028	The project faced failure in one of its wells, well F, as the drilling was unable to reach specified depth (Richter, 2021)

Specific for geothermal power plants, the permitting and licensing process is more complex compared to other plants. The pre-development phase requires the developer of geothermal field to acquire the geothermal working areas license, the environment, and the use of forest permit as well as the geothermal permit. Afterward, the exploration phase could be started. A pre-transaction agreement (PTA) is established between PLN and the developer as reference for future PPA. However, note that there is still risk that the expected potential of geothermal field is different from the findings during the exploration phase.

These pre-development and development phases constitute the highest risk and time consuming in geothermal power plants development, as shown in 5.6.2. There are programs established by the Government of Indonesia to mitigate the development risk of geothermal, for example the government-initiated drilling that could reduce the exploration risk of geothermal plants and attract investors into the sector. These government drilling initiatives, however, could also consider larger drilling scale for brownfields reserves to meaningfully mitigate exploration risks charged to the developers, thus driving the cost further down. For example, some developers are suggesting big hole drilling up to 3 holes for the government drilling program, instead of 1 slim hole.



Source: (World Bank, 2016)

Figure 5.6-2 Risks and costs during the different stages of a geothermal development

For geothermal plants, it is also important to address potential social and environmental issues during their development, and operations. These issues range from potential deforestation, contamination of water, H_2S gas leakages, and even seismic disturbances (Meijaard, et al., 2019) (Fadhilah, et al., 2023). These issues could lead to local communities' protest, which could further delay the already long project development phases and adding to the overall risk of project development.

Similar to geothermal, hydropower plants especially the large-scale one that require dams, could be subject to environmental and social risks. The risks involve soil erosion, sedimentation, disruption to aquatic life, displacement of the communities, and disruption for the use of water for other purposes. Nevertheless, in some cases, the dam could benefit the surrounding community, e.g., providing flood control options and supporting (Durin, et al., 2022) (Moran, Lopez, Moore, Muller, & Hyndman, 2018). Such social-environmental risks should be identified, and mitigation strategies developed during the development phase of the project to minimize the potential disruption and negative impacts of the large hydro plants.

For the biomass plants, one of the key issues is related with the availability and price of biomass feedstocks. The issue is also visible from the current implementation of co-firing programs in Indonesia. The price of biomass is set lower than the cap price of coal. PLN, through its own corporate regulations, is willing to buy biomass with a ceiling price benchmarked against the cost per calorific value of their coal supply (MEBI, 2023). However, biomass is an internationally traded commodity, and there is premium buyer of biomass feedstock, which is willing to procure biomass at higher price, therefore enticing the biomass producer to supply the feedstock to the market instead (Institute for Essential Services Reform, 2022) (Institute for Energy Economics and Financial Analysis, 2021). It will be challenging for PLN to procure enough biomass at the expected price levels, thus the suggested revision of the Directors Regulation on a more relaxed price cap could help secure the fuel supply.

In addition, developing bioenergy power plants in Java will have big issue of feedstock supply due to the limited supply in Java, thus project developers need to source the feedstock from outside Java. The increasing need for biomass feedstocks is also potentially intersecting with land use and deforestation issues in Indonesia, which will be a crucial consideration in ensuring a sustainable yet just solution for Indonesia's power system transition. Natural forest cannot be converted into industrial plantation forest for biomass production without significant net emissions. Improving the supply chain for sustainable, locally sourced biomass and harnessing the use of agricultural waste and utilizing critical land for growing energy crops for increased domestic use (rather than export) are critical to support bioenergy development. A detailed study on the impact of the bioenergy feedstock supply among other clean energy sources (e.g., hydropower, solar PV, batteries) on the land use change will need to be conducted.

The Government of Indonesia has identified a total of 57 GW of nationwide bioenergy potentials. However, most of these potentials are in Sumatra and Kalimantan islands. This may limit the utilization of the biomass potential specific for each island where the feedstock is located since it is costly to transport the biomass feedstock for long distances. For example, the freight-on-board (FOB) cost of wood pellets (includes transportation cost up to 60 km) is estimated to be more than US$70/tonne (EA Energy Analyses, 2018). These market and price factors mean that efforts are required to manage potential feedstock supply issues in the future, especially with the additional demand coming from the expansion of biomass generation required in the JETP scenario. Moreover, accelerating the development of transmission interconnection between Sumatra and Java would also help to balance renewable fuel and power imbalances.

Table 5.6-2 Summary of key risks and mitigation measures for accelerating deployment of dispatchable renewables

Source: (JETP Secretariat and Working Groups, 2023)

Risks	Mitigation measures
Delayed projects and cost overruns	• Enhanced procurement process (see Chapter 8) • Thorough assessment of social-environmental risks and safeguards during the pre-development stage
Exploration risks on geothermal projects	• Exploration risk mitigation programs, e.g., government-supported drilling
Lack of biomass availability, affordability, and sustainability	• Locally sourced biomass supply chain improvements, including agricultural waste and energy crop optimization • Interisland connection to maximize local biomass utilization and minimize feedstock transportation costs

Beyond the analysis above, future in-depth studies have been identified to be potentially conducted to further sharpen the analysis made in this subchapter. The full list of potential studies is shown in Appendix 10.18.

5.6.3 Selected showcase of dispatchable renewable energy deployment acceleration

A total capacity of 25 GW of dispatchable renewable energy is required by 2030 in the JETP scenario. The number is around 10 GW higher than in PLN's RUPTL yet aligned with the lower end of the projected capacity for the dispatchable renewable energy indicated in the company's most ambitious renewables scenario.

Given the deployment challenges mentioned above, particularly related to the development lead time and security of feedstock supply, several projects in the pipeline should be prioritized within the next few years to showcase the deployment. In the case of geothermal, to address challenges related to long project lead times and accelerate development as part of the JETP scenario, support from a government geothermal drilling program will be required.

The development of hydropower can be maximized because there are already sufficient hydropower potentials in the pipeline that have submitted feasibility study reports to PLN. However, TA in assessing potential sites could also provide higher-quality feasibility studies, leading to more shovel-ready, bankable projects to fill out the gaps toward the desired ambition in the JETP scenario.

Table 5.6-3, Table 5.6-4, and Table 5.6-5 provide the top 5 power projects and TA projects by dispatchable renewable technology. Table 5.6-3, Table 5.6-4 and Table 5.6-5 provide the top projects and TA projects by dispatchable renewable technology.

Table 5.6-3 Top priority hydropower projects

Source: (JETP Secretariat and Working Groups, 2023)

No	Name	Commercial Operations Date (COD)	System	Capacity (MW)
1	PLTA Sulbagsel Kuota Tersebar 1	2029	Sulawesi	400.0
2	PLTA Sulbagsel Kuota Tersebar 2	2030	Sulawesi	200.0
3	PLTA Kalseltengtimra Tersebar 1, 2	2029	Kalimantan	300.0
4	PLTA Konawe Bendungan Pelosika	2028	Sulawesi	21.0
5	PLTA IPP Bendungan Merangin PUPR	2028	Sumatra	107.0
6	PLTA (PS) Jatiluhur	TBD	Java-Madura-Bali	760.0
7	PLTA (PS) Matenggeng	2032	Java-Madura-Bali	943.2
8	PLTA (PS) Grindulu	2033	Java-Madura-Bali	1,000.0
9	Total PLN-IPP PLTA at Sumatra* (All COD in 2025-2030)	By 2030	Sumatra	> 3,600.0

**Note: Projects COD by 2030.*

The full list of prioritized hydropower projects is shown in Appendix 10.4.

Table 5.6-4 Top priority geothermal projects

Source: (JETP Secretariat and Working Groups, 2023)

No	Name	Commercial Operations Date (COD)*	System	Capacity (MW)
1	PLTP Hululais	2026	Sumatra	110.0
2	PLTP Tulehu	2027	Maluku (MPN)	20.0
3	PLTP Sungai Penuh	2028	Sumatra	55.0
4	PLTP Batu Raden	2028, 2029	Java-Madura-Bali	220.0
5	PLTP Kaldera Danau Banten	2025, 2028	Java-Madura-Bali	110.0
6	PLTP Telaga Ngebel	2027, 2030, 2030	Java-Madura-Bali	165.0
7	PLTP Arjuno Welirang	2030	Java-Madura-Bali	40.0
8	PLTP Candi Umbul Telomoyo	2030	Java-Madura-Bali	60.0
9	Government Drilling Program	TBD	Distributed	TBD

Note: assuming that getting funding in 2023 will speed up the COD target time

Beyond Table 5.6-4, the full list of prioritized geothermal projects is shown in Appendix 10.3.

Table 5.6-5 Top priority bioenergy projects

Source: (JETP Secretariat and Working Groups, 2023)

No	Name	Commercial Operations Date (COD)	System	Capacity (MW)
1	PLTSa Palembang	2025	Sumatra	17.7
2	TA PLTSa Jawa Barat	2026	Java-Madura-Bali	12.0
3	TA PLTSa Tangerang	2026	Java-Madura-Bali	35.0
4	PLTSa Tangsel	2026	Java-Madura-Bali	20.0
5	PLTSa Bekasi	2026	Java-Madura-Bali	12.0
6	PLTSa Sulbagsel	2026	Sulawesi	10.0
7	PLTSa Semarang	2026	Java-Madura-Bali	20.0
8	PLTSa Sulbagut	2026	Sulawesi	10.0
9	Potential Implementation of Co-firing in 52 Identified CFPPs	TBD	Distributed	912.1*
10	TA feasibility study for city waste processing to RDF/SRF	TBD	TBD	TBD

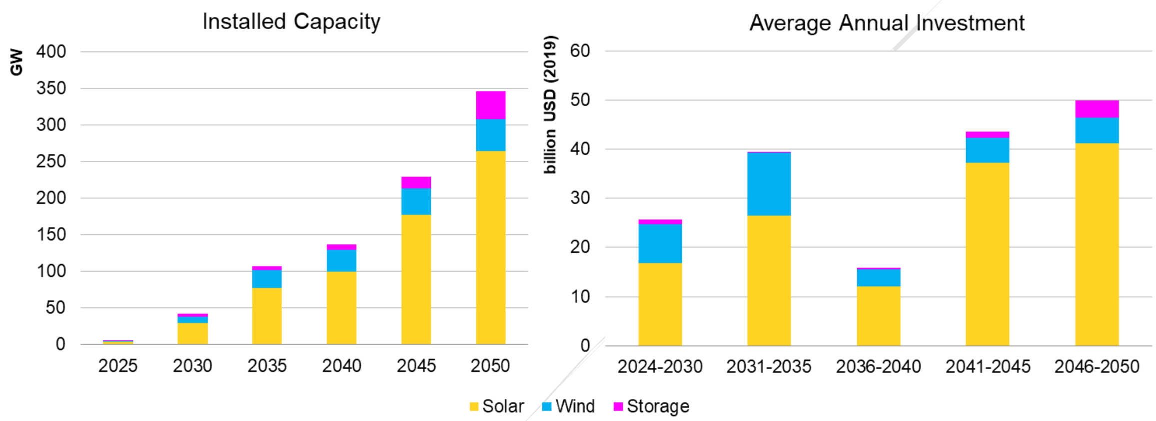
**Note: Assuming 5% co-firing capacity in all 52 shortlisted CFPPs*

Beyond Table 5.6-5, the full list of prioritized bioenergy projects is shown in Appendix 10.5.

5.7 Investment Focus Area #4: Variable renewable power deployment acceleration

5.7.1 Outlook for Variable Renewable Power Deployment and Investment

In the JETP scenario, the share of variable renewable energy generation rises to 14% in 2030 and 25% in 2040, from below 1% today. The expansion is led by the rollout of cost-effective solar PV, whose capacity rises from less than 1 GW to 29 GW by 2030. Wind power complements the growth in solar PV but is more limited due to resource availability and requires the uptake of low-speed turbines in many locations, with over 8 GW installed by 2030. The limited known potential of wind resources, in contrast with solar PV, acts as one of the reasons for a rather small build-out of wind plants compared to other renewables. In the JETP scenario, variable renewable sources increasingly become the lowest-cost source of new generation.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 5.7-1 Variable renewables installed capacity and average annual investment in the JETP scenario

These model outputs also consider PLN's Priority Projects list and expand well beyond the list based on a least-cost capacity expansion. This deployment is conditional upon policy enhancements for renewables procurement and power purchase agreements, without constraints imposed by local content requirements. Still, the modeled results in the JETP scenario are subject to deployment constraints, reflecting national stakeholder (MEMR and PLN) views over realistic annual build-out rates, considering the rate of variable renewables adoption observed in other countries (see subchapter 5.2.1.2).

This ambitious development also strongly depends on integration measures and investments to expand the coverage and enhance grid and system flexibility to integrate variable renewables. In the JETP scenario, these measures include upgrades and investments in transmission and distribution, more flexible operation of thermal power plants, and deployment of dispatchable renewables capacity. The JETP scenario also sees notable deployment of storage technologies, which is one of the integral parts of incorporating a high share of variable sources in the system, such as pumped hydro and battery storage systems which are projected to reach a combined 4GW by 2030 and over 7 GW by 2040.

The JETP scenario puts heavy emphasis on solar PV as the forerunner of Indonesia's renewable development beyond 2030, realizing its enormous potential compared to other renewable solutions. Cumulative solar PV deployment surges to 100 GW in 2040 and close to 265 GW by 2050. Wind also accelerates beyond 2030 to nearly 30 GW in 2040 and almost 45 GW in 2050. Achieving these levels of installed capacity requires nearly US$25 billion cumulative investment in solar PV and wind by 2030 and almost US$80 billion by 2040.

5.7.2 Key Issues in Acceleration of Variable Renewable Power Deployment

Acceleration of the deployment of variable renewables requires addressing several key issues, including integration of variable resources, reducing the cost of solar PV and wind generation, and addressing potential constraints around land availability.

For power system operators, integrating higher shares of variable renewable energy technologies, such as wind and solar PV into the system, will require improvements in operational practices and investments to enhance system flexibility. At low generation shares, solar PV and wind have little to no noticeable impact on the power system (see subchapter 5.2.3.2 for an overview of the phases of system integration for variable renewables). However, as more solar and wind power is being integrated into the system by 2030, a greater impact on the system operation can become apparent.

Infrastructure to accommodate greater flexibility such as primary data collection for better forecasting and economic merit-based dispatching needs to be prepared before 2030. The potential additional cost due to the ancillary service provided by PLN needs to be also considered due to higher penetration on solar PV and wind. Moving further forward in 2030-2040, increased flexible operation for rigid thermal-based plants and improved grid infrastructure such as transmission lines and substations are going to be integral in accommodating more VRE in the system.

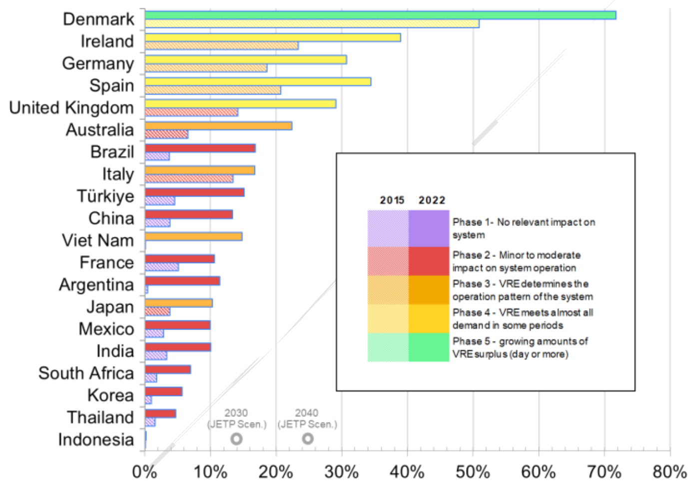
The later stage of the transformation will happen in 2040–2050, where grid operation will be highly influenced by storage and other ancillary services, demand-side response, and large-scale grid digitalization. These stages are often overlapping, requiring system operators to address challenges and employ flexibility options and policy priorities in parallel.

Specifically, energy storage needs to accommodate a larger share of variable renewables are already considered in the model, with identified needs of 4.3 GW storage in the system by 2030 and will almost double in 2040. A few pumped hydro energy storage projects are already listed in PLN's Priority Projects list, namely Upper Cisokan Pumped Storage, emphasizing the awareness of PLN in preparing the infrastructure needed to anticipate more solar and wind in the system. While the initial assessment of Indonesia's pumped storage potential suggests around 7,308.8 GWh of technical capacity (Institute for Essential Services Reform, 2021), alternative technologies such as battery energy storage systems (BESS) also need to be pursued with much higher intention beyond 2030.

In the JETP scenario, Indonesia will experience an ambitious jump in solar PV and wind generation share in the on-grid power sector, with 14% in 2030 compared to well below 1% today (Figure 5.7-2) Such a level would be on par or more than in other leading emerging and developing economy markets for renewables, including the People's Republic of China and India. Looking further forward in 2040, variable renewables account for 25% of annual generation in the JETP scenario, on par with current shares in countries such as Australia and the United Kingdom.

Taking into consideration the level of variable sources penetration in various countries from 2015 to 2022, there are several countries that experienced such a jump in variable renewable share from a very minuscule level, such as Argentina and Vietnam.

Despite challenges in such a jump, such transformation is technically feasible. Rigorous technical adjustments will be needed along the transformation, such as improvement in the protection system and circuit reconfiguration, advancement in grid-interface technologies such as modern inverters, geographical adjustment incorporated in the engineering design to abate cloud cover variability in the case of solar PV, and enhancement of variable sources output forecasting in grid operation.



Source: (JETP analysis for Indonesia and IEA Renewable Energy Market Update for international comparisons, 2023)

Figure 5.7-2 Share of Electricity Generation and VRE Penetration Phase for select countries

Utility-scale solar PV and wind have made encouraging cost reductions in recent years (Figure 5.7-3 and Figure 5.7-4). In Indonesia, these sources remain relatively costly compared with international benchmarks, but recent project tendering is helping to deliver more affordable solar PV and wind over time.

With the latest PPA of the Bali 2x25 MWp solar project signed in March 2022, solar PV PPA prices have decreased by 78% between 2015 and 2022 (from 0.25 US$/kWh to 0.056 US$/kWh). In 2020, the Hijaunesia equity partner solar auctions run by Indonesia Power likewise attracted record-low bids of less than 0.04 US$/kWh (84% less than the PPA price from 2015). Eight projects with a combined capacity of 585 MWp are now in the pipeline and have at least been tendered in some fashion. These projects come from Indonesia Power's

Hijaunesia I equity partner auction, the Cirata 145 MWac FPV project, the Bangka 10 MWp and Bali 2x25 MWp ground-mounted solar projects, and others.

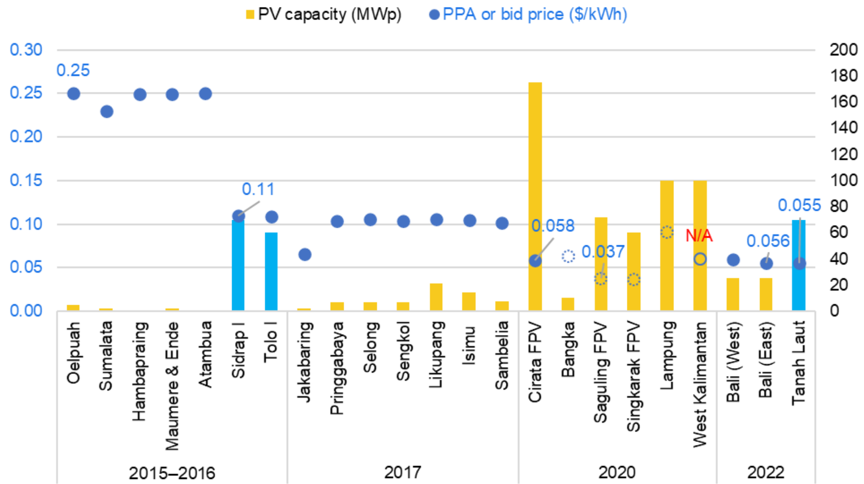
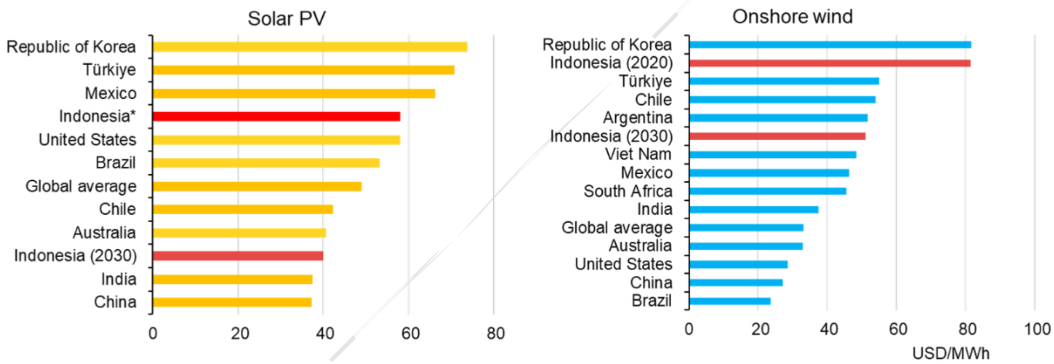


Figure 5.7-3 Indonesia Solar and Wind PPA prices, 2015-2022



Source: (International Renewable Energy Agency, 2022); (Institute for Essential Services Reform, 2021)

Figure 5.7-4 Indonesia solar PV and onshore wind LCOE compared to global values

Wind projects also show some significant stride as well, with the newly signed Tanah Laut project PPA of 0.055 US$/kWh. As a result, PPA for wind power projects has fallen by 50% in the last 6-7 years of development. However, a lot of developers pointed out that because of underbidding, these declines have not exactly created a healthy precedence for the market. For instance, given the incorporation of battery storage for the project, observers have assessed Tanah Laut's 70 MW wind + storage project, which has signed a PPA of 0.055 US$/kWh, as being too low, implying that the consortium is accepting an unhealthy margin or way below market expectation for IRR.

In a market-driven auction for PPA, the price will eventually bounce back to a more achievable level whenever the previous low prices are no longer bankable. However, it is worth noting that this trend would give an unrealistic expectation for future projects, typically from a buyer's perspective, while these low-price levels might not be replicable elsewhere.

With the current estimation of onshore wind LCOE of 0.0836 US$/kWh (Institute for Essential Services Reform, 2023), the margin for improving PPA price in wind power needs to be evaluated to ensure fair project economics for the project developers. This could be enforced through an improved tender system with strong assurance for both seller and buyer interests, discussed in further detail in Chapter 8.

In the JETP scenario, solar PV and wind see notable generation cost reductions over the projection period. Solar PV and wind price of 0.058 US$/kWh and 0.081 US$/kWh respectively, while still well above the global average, is still on par with countries such as the United States and Republic of Korea. This will be further reduced to 0.04 US$/kWh for solar PV and 0.051 US$/kWh for wind in 2030, bringing it down to today's price level of more established renewable markets such as Australia and Vietnam. In comparison, IESR projected the LCOE for utility solar and wind projects in 2050 to be 0.0259 US$/kWh and 0.05 US$/kWh for solar and wind respectively, based on the technology data catalog released by MEMR-DEA (Ministry of Energy and Mineral Resouces and Danish Energy Agency, 2021).

Other country experiences provide lessons for driving down the cost of solar PV and wind. Brazil, India, and the United Arab Emirates have all successfully reduced project risks and transaction costs through measures such as relaxed local content requirements (LCR), fiscal incentives, and financing levers. Such measures, and their application to Indonesia, are elaborated in policy chapter (Subchapter 8.1). Details on LCR and domestic manufacturing as an enabler of cost reduction will also be discussed in subchapter 5.8.

Table 5.7-1 Summary of successful solar PV cases in select countries

Source: (Institute for Essential Services Reform, 2021)

	Brazil	India	UAE
Installation status	7 GWp in 2020, from 84 MWp in 2016.	38.8 GWp in January 2021.	1.9 GWp in 2020
Price trend	0.018 US$/kWh bid received in 2019.	0.027 US$/kWh for utility-scale installation in Gujarat (2020).	0.014 US$/kWh for 1.5 GW Al Dhafra Solar Park, Abu Dhabi (2020)
Enabling policies showcase	• LCR requirement for BNDES loan, boosting local manufacturing • Bid and completion bond requirement to prevent underbidding	• Provide funds through SECI to assist land acquisitions. • Tax incentives such as component's goods, services, and duty payments exemption	• Government-backed pre-determined sites to reduce land acquisition costs. • Project ownership structure with 51-60% owned by government-owned utilities.

With almost 265 GW of solar needs in 2050 according to the JETP scenario, land scarcity would be one of the main issues for the massive build out of solar PV. This could potentially lead to increased land acquisition costs, increased land clearance activities, and other land-related issues. While land acquisition risks can be mitigated with non-fiscal government support, it is worth exploring the possibility of using other areas of usage, such as rooftops and water bodies.

One of the untapped potentials of Indonesia's solar resources is its distributed rooftop solar. The latest update by MEMR in June 2023 shows only around 100 MWp of rooftop solar are installed throughout the archipelago, despite a total technical potential of 354 GWp (Institute for Essential Services Reform, 2021). JETP scenario projected that out of the 265 GW of solar

PV capacity needed by 2050, a potential of around 75 GW could be achieved through distributed rooftop installations.

This, however, would require reform of PLN's revenue model, as the current model does not favor rooftop solar installations which would simply cause a revenue loss for PLN. Recent findings show difficulties caused by a certain level of capacity limitation by PLN distribution units on rooftop solar permits, even though MEMR Regulation 26/2021 allows rooftop solar installation up to 100% of the connected electricity capacity. An enhancement of distribution-level system infrastructure is also needed to accommodate such deployment.

Table 5.7-2 Summary of key risks and mitigation measures for accelerating variable renewables deployment

Source: (JETP Secretariat and Working Groups, 2023)

Risks	Mitigation measures
Impact of variable renewable plants to system operation and reliability	• Improved grid infrastructure and system flexibility (advanced control centers, energy storage, transmission and distribution lines), as described in 5.2 and 5.3
Slower cost reduction for solar PV and wind	• Minimizing project risks through fiscal and non-fiscal incentives (Chapter 8) • Improved tender and procurement processes (Chapter 8) • Enhanced domestic manufacturing (see subchapter 5.8)
Large land requirement for massive solar buildouts	• Non-fiscal government support for land acquisition • Exploration on other area usage such as floating solar PV and distributed rooftop solar PV

Another potential on overcoming the land scarcity issue on solar PV development is the emergence of floating solar PV, which is rising in importance as shown by recent project developments (Aminuddin, Pranoto, Irsyad, Sihombing, & Nurliyanti, 2022).

This technical potential can be further improved by the issuance of Permen No. 7/2023 (Ministry of Public Works and Public Housing, 2023) which revised the water body usage up to 20%, from previously only 5% as stated in previous Permen No. 6/2020 (Ministry of Public Works and Public Housing, 2020). The immediate effect can be seen with the signing of Cirata FPV expansion MoU up to 500 MW between PLN Nusantara Power and Masdar. However, looking on the nascent floating solar development in Indonesia, assistance on project development through TA is crucial to accelerate such projects.

Overall, anticipating these issues and putting in place suitable mitigation measures (such as improvement of the grid, retrofitting, adoption of new technology, and improving interconnections) across the development and operation stage can help support the system's reliability and flexibility. Within the next 6 years, PLN will need to accommodate the additional capacity in the existing system and to include it in the RUPTL planning process. Acceleration of renewables would be enabled by the measures addressing grids and coal power in Investment Focus Areas 1 and 2 of the JETP, as well as policy reforms pertaining to improved procurement processes, power purchase agreements and coal pricing as described further in Chapter 8.

Beyond the analysis above, future in-depth studies have been identified to be potentially conducted to further sharpen the analysis made in this subchapter. The full list of potential studies is shown in Appendix 10.18.

5.7.3 Selected Showcase of Renewable Power Projects

In accordance with the JETP scenario, a total of 37 GW of variable renewables projects would need to be rolled out in the on-grid system by 2030 – which consist of 29 GW of solar and 8 GW of wind. Looking at the status per the last RUPTL and planned projects under the JETP scenario, there are around 30 GW of variable renewable projects that need to be added on top of the existing RUPTL project list.

Table 5.7-3 Top priority solar PV projects

Source: (JETP Secretariat and Working Groups, 2023)

No.	Name	Commercial Operations Date (COD)	System	Capacity (MW)
1	• PLTS Dedieselisasi • BESS Dedieselisasi	2027	Tersebar	• 165.0 • 322.0
2	PLTS Hijaunesia	2027-2030	Java-Madura-Bali	1,000.0
3	PLTS Karang Kates	2025	Java-Madura-Bali	100.0
4	PLTS Terapung Waduk Jatiluhur	2025	Java-Madura-Bali	100.0
5	PLTS Terapung Saguling	2026	Java-Madura-Bali	60.0
6	PLTS Terapung Singkarak	2026	Sumatra	50.1

Beyond Table 5.7-3, the full list of prioritized solar projects is shown in Appendix 10.6.

Table 5.7-4 Top priority wind projects

Source: (JETP Secretariat and Working Groups, 2023)

No.	Name	Commercial Operations Date (COD)	Location	Size (MW)
1	PLTB Timor (Kuota) Tersebar	2026	Nusa Tenggara Timur	22.0
2	PLTB Tanah Laut	2025	Kalimantan	70.0
3	PLTB Sulbagsel	2027	Sulawesi	130.0
4	PLTB Aceh	2027	Sumatra	55.0
5	PLTB Banten	2027	Java-Madura-Bali	200.0

Beyond Table 5.7-4, the full list of prioritized wind projects is shown in Appendix 10.7.

5.8 Investment Focus Area #5: Renewable energy value chain enhancement

5.8.1 Outlook for Renewable Energy Value Chains

In the JETP scenario, solar PV is expected to become the most dynamic source of clean energy in Indonesia as installed capacity rises from less than 1 GW to 29 GW by 2030, and 265 GW in 2050. Annual average capacity additions rise to around 4 GW until 2030, 7 GW over 2031-40 and 17 GW over 2041-2050. However, Indonesia currently has only 2 GW of equipment manufacturing to support this growth, due to persistent uncertainties over the market for solar PV power projects.

Accelerating the deployment of solar PV will require development of manufacturing capable of supplying a significant share of the domestic demand for solar PV supply chain components.

By 2030, the value of this market, in terms of annual solar PV module sales, is projected to reach almost US$1 billion in the JETP scenario.

Indonesia's solar PV manufacturing outlook should be viewed in the context of the global market, which is characterized by a situation of excess capacity. At the end of 2022, global capacity throughout the solar PV supply chain reached around 440 GW for polysilicon, 550 GW for wafers, 570 GW for cells and 640 GW for modules assembly and exceeded demand by at least 60%.

More than 80% of global solar PV manufacturing, across all stages, is today concentrated in the People's Republic of China. For wafers, the People's Republic of China has little competition, while for cells and modules Southeast Asia countries have developed considerable capacity, mostly in Vietnam, Malaysia, and Thailand. The People's Republic of China is also the main manufacturer of module components including glass, EVA (Ethylene Vinyl Acetate) encapsulant, back sheet, and junction boxes.

Equipment trade plays a big role in shaping the outlook for solar PV value chains. In 2021, cross-border trade accounted for almost half of all module production. Including polysilicon, wafers, cells and modules, the total value of PV-related trade reached US$40 billion in 2021. Outside of the People's Republic of China and Southeast Asia, most countries with significant solar PV demand remain net importers. In recent years, Southeast Asian manufacturers comprised one-third of global module exports, mostly to the United States and Europe, where Chinese modules were subject to trade restrictions.

Looking ahead, the inclusion of capacity from all announced projects would bring global solar PV manufacturing capacity to almost 1,000 GW in 2024, already significantly higher than the 2030 annual demand projected under a more ambitious climate pathway, such as the IEA Net-Zero Emissions by 2050 scenario. Considering all the manufacturing plants under construction and planned, China's dominance in global solar PV manufacturing is likely to persist or even expand in the medium term, despite significant, policy-supported investment in the United States and India.

5.8.2 Key Issues in Enhancement of Renewable Energy Value Chains

Indonesia's deployment under the JETP scenario has the potential to support development of a large-scale PV supply chain that attracts significant investment and creates new jobs. However, cultivating a sustainable, long-term domestic market, along with competing in an oversupplied global market, will be challenging. Meeting the JETP scenario will require Indonesia to boost the pipeline for solar PV project development (as described in subchapter 5.7) improve the cost-effectiveness of domestic solar PV manufacturing, tackle regulatory and market barriers (as assessed further in Chapter 8) and address the environmental footprint of the industry.

Globally, economies of scale and innovation throughout the supply chain have enabled steep drops in solar PV manufacturing costs at every step of the production process. As a result, global module prices have fallen more than 80% in the last decade, enabling solar PV to become the most affordable new source of electricity generation in many parts of the world.

Improved material and energy efficiency are expected to drive further cost reductions. Still, a cost gap remains between Indonesia and the rest of the world – in 2020, domestically produced solar PV module prices, at 0.40-47 US$/Watt, were more than double the international average of 0.167 US$/Watt (Ministry of Energy and Mineral Resouces and Danish Energy Agency, 2021).

Table 5.8-1 Key risks and mitigation measures to renewables value chain enhancement

Source: (JETP Secretariat and Working Groups, 2023)

Risks	Mitigation measures
Cost gap for domestically produced solar PV modules persists between Indonesia and rest of the world	• Stimulate domestic market through relaxation of local content requirements; and • Increased support for manufacturers, comprehensive industrial strategy, and coordinated implementation of incentives for suppliers and project developers
High upfront investment requirements or failure to realize economies of scale deter development of domestic solar PV manufacturing capacity	• First focus on latter parts of the production process, i.e., manufacturing of cells and modules assembly, which have lower investment costs compared with polysilicon, ingot, and wafer manufacturing

Indonesia currently has about 2 GW of crystalline-silicon PV module assembly capacity but is in shortage of main upstream components production, i.e., polysilicon, wafers, and cells. Current manufacturing capacity is underutilized due to limited domestic demand for PV modules. Exports have also been challenging due to high costs of production resulting from disparate supply chain, small scale of manufacturing plants and sub-par technology compared with leading international manufacturers. As a result, only about 160 MW of PV modules were manufactured in Indonesia in 2022.

Collaborations with international partners are supporting new project development plans. SEG (United States) in collaboration with ATW is building manufacturing capacity in the Batang Industrial Estate. Trina Solar in collaboration with Sinarmas is also developing new capacity to start operations in 2025. Xinyi is also developing an end-to-end manufacturing facility in Rempang. Vena Energy with module and cell manufacturer Suntech has also announced a 2 GW facility to start construction in 2026.

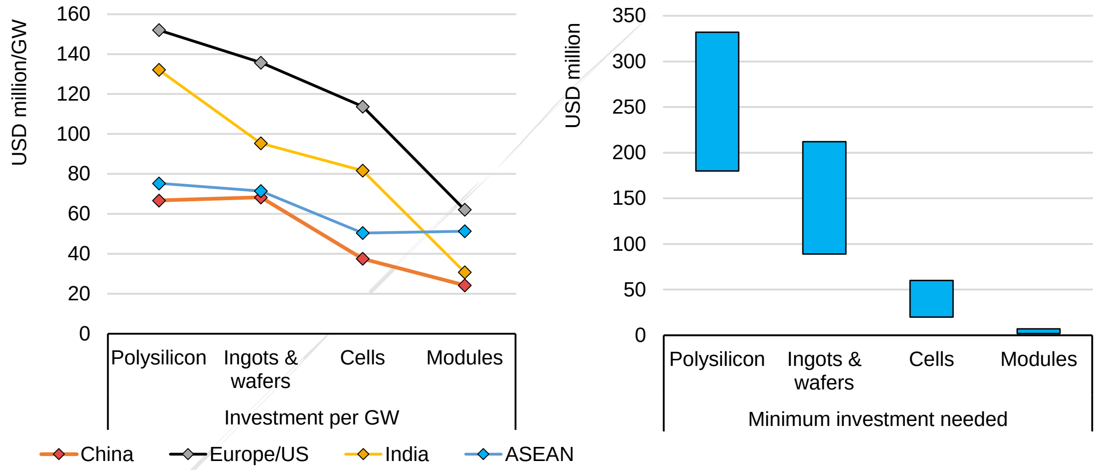
The costs and investments associated with enhancing solar PV manufacturing will depend on the choice of production process and scale of development, among other factors. According to recent international plant and equipment price data, polysilicon plants and ingot and wafer factories require significantly more upfront capital than cell- and module-manufacturing facilities. In addition, because of the considerable infrastructure investments needed (US$200 million –US$400 million), greenfield polysilicon plants are usually not commercially viable for capacities of less than 10,000 Mt (around 3 GW).

For polysilicon, ingot, and wafer manufacturing, benefiting from economies of scale is crucial to realize lower per-megawatt investment costs. Recent greenfield polysilicon plants in the People's Republic of China range in size from 40,000 Mt to 100,000 Mt. For these projects, investment costs are around US$60 million per gigawatt, with similar costs for ingot and wafer plants that have nameplate capacities of 520 GW per year. Costs for energy-intensive polysilicon, ingots, and wafers in Southeast Asian countries, like Vietnam, Thailand, and Malaysia are estimated to be similar to the People's Republic of China's, partly because they are developed mostly by integrated Chinese manufacturers.

By contrast, cell and module-manufacturing plants could be as small as 100 MW and require low upfront investments of a few million US dollars. For cells, the scale of production remains important to achieve lower investment costs per megawatt, with costs estimated to be significantly higher in locations outside of the People's Republic of China due to generally greater equipment, land, and construction costs.

In terms of solar PV module production, assembly makes up 40% to 50% of the costs because it includes multiple key processed materials (e.g., glass, copper, aluminum frames, back sheets, EVA, and junction boxes). Despite requiring less material in terms of weight, cell manufacturing is in general the second-largest cost component because it relies on relatively expensive silver in addition to zinc, lead, and tin. Manufacturing costs vary among key markets due to differences in depreciation, overhead expenses and energy and labor costs.

Taking into consideration the various solar PV supply chain stages, Indonesia could reduce upfront investment requirements and maximize job impacts by first focusing on the latter parts of the production process, i.e., manufacturing of cells and modules assembly. For example, building 3 GW of technologically advanced cells and module production capacity would require an investment of about US$300 million–US$400 million. Such manufacturing capacity would be able to supply most domestic demand in 2030, while leaving space for imports, which would expose domestic manufacturers to a degree of international competition and provide incentives for efficiency improvements.



Source: (International Energy Agency, 2022)

Notes: ASEAN = Association of Southeast Asian Nations. Investment costs are based on investment estimates announced by companies for more than 100 manufacturing projects in various supply chain segments. For countries that do not have any commissioned manufacturing facilities for certain supply chain segments, data from feasibility projects or estimates were used.

Figure 5.8-1 Investment costs (left) and minimum investment requirements (right) by PV manufacturing segment

These cell and module-manufacturing plants could be set up relatively quickly, in about 3–12 months and create around four thousand direct jobs. Depending on the availability of domestically produced auxiliary components, like glass, back sheets, or inventers, around

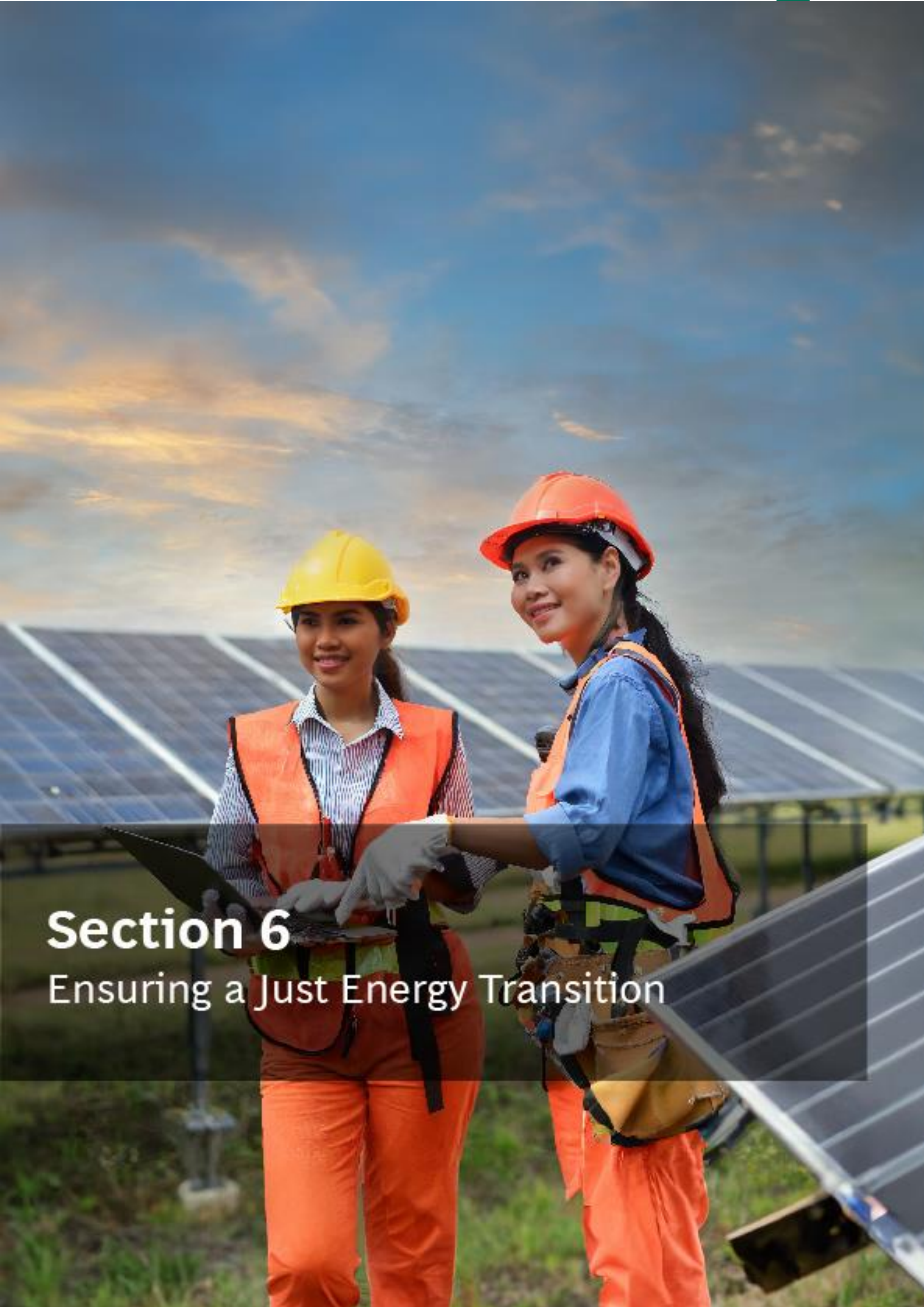
50% to 70% of the module value could be created in Indonesia. Expansion to wafer and polysilicon manufacturing could be considered later to bring further cost efficiencies resulting from supply chain integration.

Indonesia has several additional advantages that can help to develop a cost-effective supply chain, including a large workforce and relatively low costs of labor creating competitive opportunities in labor-intensive cell and module manufacturing. There may also be opportunities for greater cost efficiency through the integration of various production segments, as well as a greater focus on research and development.

Realizing such development requires addressing additional market and regulatory barriers, such as local content requirements (LCR) for power plant development, which have increased production costs amid limited manufacturing capacity, reduced the availability of high-quality modules and hindered access to financing from international institutions. The LCR inhibits solar PV investments and imposes a significant capital cost penalty for projects (around 5% to 10%), relative to global pricing (see Chapter 8). Relaxation of the LCR combined with increased support for manufacturers, the development of comprehensive industrial strategy and coordinated implementation of incentives for suppliers and project developers would greatly help to attract investors, enhance technology and knowledge transfer, and enhance the development of solar PV manufacturing capabilities as well as robust a solar PV supply chain in Indonesia (see Chapter 8 for further details).

In addition to tackling costs, reducing the carbon intensity of solar PV manufacturing will be important to ensure Indonesia's competitiveness in the global market. The introduction of trade restrictions and tariffs related to carbon intensity of products is already under consideration is several countries, especially in the European Union. Globally, the average carbon intensity of solar PV manufacturing is estimated at 270 kg CO_2/kW, which is largely determined by the share of fossil fuels in a country's electricity generation mix. Indonesia should focus on lowering its carbon intensity from current levels, which is above the global average for solar PV manufacturing.

By addressing these key issues, the development of a domestic solar PV value chain can bring multiple economic benefits. Solar PV is one of the most employment-intensive sectors of all renewable and fossil-fuel energy technologies. Of the main processes, module production creates the most PV manufacturing jobs (46%), followed by the making of cells (33%), wafers/ingots (15%) and polysilicon (just 4%). The manufacture of other materials such as glass, EVA and back sheet represents an additional 2% of employment. Producing 1 GW of c-Si solar module capacity per year could create as many as 1,300 full-time manufacturing jobs, covering polysilicon, ingots, wafers, cells, modules, and other materials such as glass, back sheets, and EVA.



Section 6

Ensuring a Just Energy Transition

6. Ensuring a Just Energy Transition

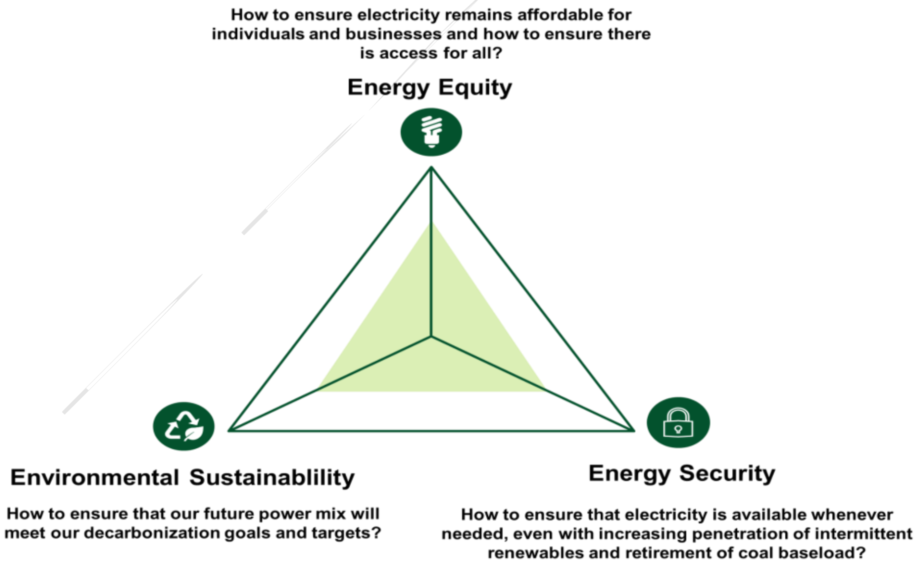
6.1 Guiding Principles and Approach to a Just Transition

6.1.1 Importance of a Just Transition

JETP and Indonesia's broader energy transition brings significant investment for the country and will drive change at a significantly accelerated speed. The country's phasing down of fossil fuel generation before the expected lifespans of its plants, and the growth in renewable energy to become a much larger portion of Indonesia's energy mix, will lead to changes countrywide—especially as generation activity diffuses across the country, significantly lessening the concentration in Java and Sumatra.

The investment into new infrastructure and the provision of ample renewable energy to consumers and businesses yields huge opportunities for Indonesia to diversify and grow its economy, from large industrial plants offering low-carbon products to the world to SMEs transforming their business models with abundant and reliable electricity.

Indonesia's Just Energy Transition needs to consider the energy trilemma that the country currently faces. First established by the World Energy Council in 2010, there are three key dimensions that require management: (1) energy equity, (2) energy security, and (3) environmental sustainability as shown in Figure 6.1-1. The balancing of these three aspects is key to ensure that Indonesia's energy transition pathway will be feasible as well as just.



Source: (World Energy Council, 2022)

Figure 6.1-1 Energy trilemma

The first dimension of the energy trilemma is energy equity. This dimension covers the capability of the national energy system to provide universal access to affordable and sufficient energy for domestic and commercial use. The second dimension of the energy trilemma is energy security. This dimension covers the capability to meet current and future energy demands reliably, as well as withstand and bounce back swiftly from system shocks with minimal disruption to supplies. The third dimension of the energy trilemma is environmental sustainability. This dimension covers the transition of a country's energy system towards mitigating and avoiding potential environmental harm and climate change impacts.

Balancing this trilemma in the energy transition context is central to the just transition and to efforts to ensure all Indonesians can access its benefits and opportunities, whilst adverse impacts to people and the environment are appropriately managed. A just transition would also allow Indonesia to minimize potential risks and maximize benefits from the energy transition that extend far beyond reductions in greenhouse gas emissions, such as improved air quality, increased job opportunities, accelerated technological innovation, a more diversified economy, and reduced inequalities. Conversely, inability to anticipate and manage these social, economic, and environmental impacts has the potential to slow down the pace of energy transition.

6.1.2 Definition and Foundations of a Just Transition for Indonesia

This report uses the following definition of a just transition for Indonesia.

A just transition is an energy transition in which the resulting social, economic, and environmental risks and opportunities are equitably distributed among stakeholders according to their capacity and conditions affirmatively enable vulnerable stakeholders to mitigate the risks and capture benefits from opportunities.

This definition highlights that mitigating risks and enhancing opportunities are critical for the just transition and aligns with other internationally accepted definitions. For example, in 2015, the International Labour Organization (ILO) defined just transition as greening the economy in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities and leaving no one behind (International Labour Organization, 2015).

The concept of a just transition also aligns with ideals expressed in Article 33 of the 1945 Constitution of the Republic of Indonesia, specifically verse 3: "The earth and water and natural resources contained therein shall be controlled by the State and be utilized for the greatest prosperity of the people". The provision of energy is considered a use of natural resources and therefore falls under the purview of Article 33 as well. This also explains why the Indonesian government retains a constitutional right over the power sector through the presence of its State Utility, PLN.

Recognizing this, the President raised just transition as both a concern and priority in advancing Indonesia's energy transition during the S20 High Level Policy Webinar on Just Energy Transition, saying:

"Energy transition will change many things, such as jobs, development scenario, business orientation, and so on. Therefore, viable strategies and mechanisms are needed to identify the existing and upcoming challenges, so that a just and even low carbon energy transition can be realized well (Cabinet Secretariat of the Republic of Indonesia, 2022)."

6.1.3 Developing a Just Transition Framework

Advancing a just energy transition as defined above requires a systematic approach to mitigating risk and enhancing opportunities across all areas impacted by JETP activities. Therefore, this report contains a JT Framework that can help guide stakeholders to identify all areas in which JETP investments may have positive or negative impacts.

This framework was developed through deliberations within the Just Transition Working Group of the JETP Secretariat, and consultations with civil society organizations (CSOs) and Trade Unions facilitated in June 2023. The CSO dialogue on 12 June 2023 included participants from around 40 CSOs and 20 government institutions and included presentations from JETP Secretariat as well as breakout sessions for FGD participants to detail their concerns and recommendations for the JETP process. The CSOs consultation revealed concerns regarding potential socio-economic and environmental risks from the energy transition, particularly to the vulnerable groups; and fully endorsed the importance of wide stakeholder consultations, access to information, readiness of local workforces, and an active role of communities in the provision of clean energy access.

An additional focus group discussion (FGD) on 19-20 June 2023 featured the presentation of the JT Framework and approach to around 15 Government ministries as well as other GoI institutions (e.g., PT SMI and the Indonesian Environment Fund). Lastly, on June 27, 2023, two separate dialogue sessions were held with various groups to receive their input on the just transition approach within the JETP. The first dialogue session was held with CSOs focusing on the natural environment and wellbeing of vulnerable groups, while the second dialogue session was held with leaders of labor unions.

The first level of the framework consists of three foundational concepts that underpin the definition of just transition for Indonesia: (i) human rights, (ii) gender equality and empowerment, and (iii) accountability. These foundations guide the just transition process to be inclusive, nondiscriminatory, equitable, and accountable. They link to several components of Indonesia's legal and regulatory landscape such as (i) Law No. 39 Year 1999 on Human Rights, (ii) Law No. 8 Year 2016 on Persons with Disabilities, (iii) Law No. 7 Year 1984 on Ratification of Convention on the "Elimination of All Forms of Discrimination Against Women, (iv) Law No. 32 Year 2009 on Protection and the Management of the Environment (v) Law No. 14 Year 2008 on Public Information Disclosure and Law No. 25 Year 2009 on Public Service regarding information request and public complaint handling. A list of identified laws and regulations that can serve as the basis for just transition implementation can be found in 0.

These foundations form the basis for two pillars that constitute the second level of the framework. These two pillars are (i) Leave No One Behind (to highlight the importance of prioritizing and providing social protection to marginalized and vulnerable groups), and (2) Sustainability and Resilience (to highlight the importance of creating resilient societies and economies that sustainably manage their natural environment).

The two pillars feed into a set of just transition standards that form the third and final level of the framework. These standards identify the various areas that JETP investment may impact, such as biodiversity and working conditions. The nine standards (nested under their respective pillars) are:

Pillar #1: Leave No One Behind

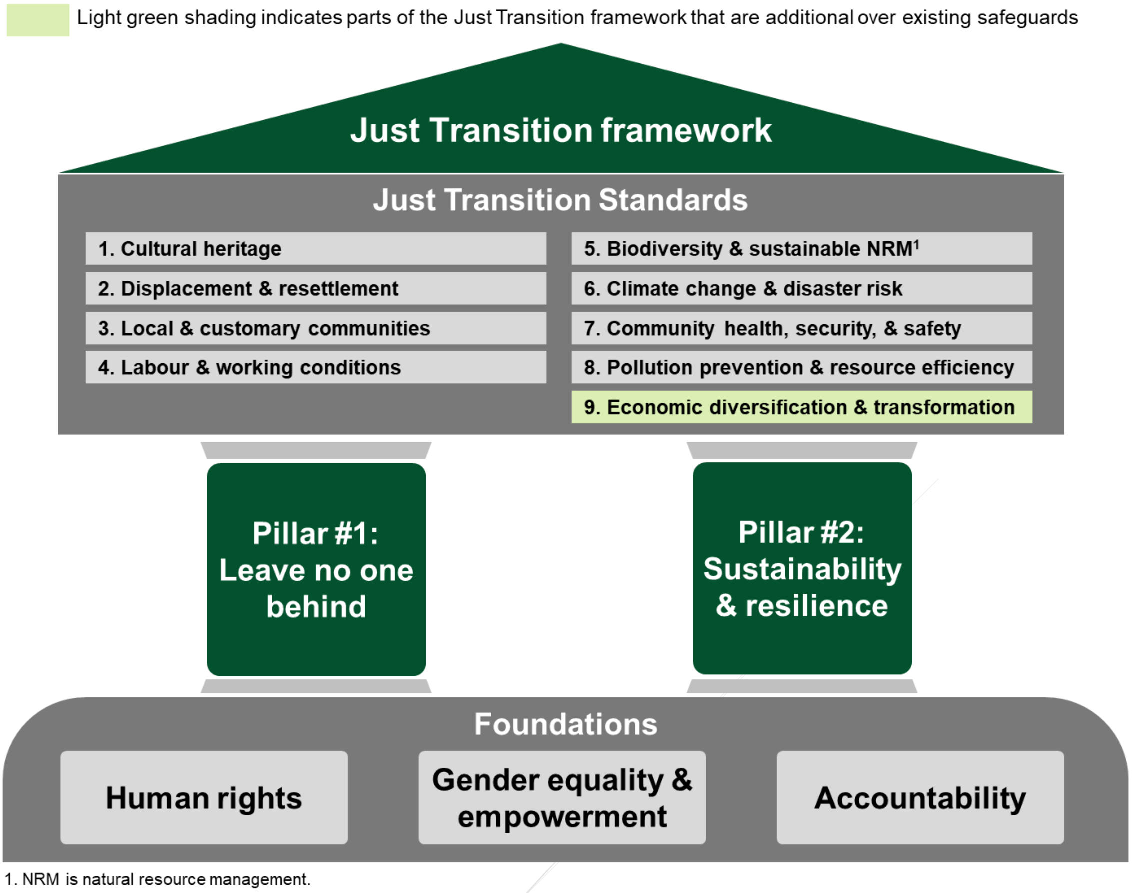
- Standard 1: Cultural heritage;
- Standard 2: Displacement and resettlement;
- Standard 3: Local and customary communities; and
- Standard 4: Labor and working conditions.

Pillar #2: Sustainability and Resilience

- Standard 5: Biodiversity conservation and sustainable natural resource management;
- Standard 6: Climate change and disaster risks;
- Standard 7: Community health, safety and security;
- Standard 8: Pollution prevention and resource efficiency; and
- Standard 9: Economic diversification and transformation.

These nine standards not only provide comprehensive coverage of areas relevant for the just energy transition, but they also align closely with Good International Industry Practice (GIIP) as reflected in various internationally recognized sources, including the International Finance Corporation (International Finance Corporation, 2012), World Bank (World Bank, 2017), Asian Development Bank (Asian Development Bank, 2009), PT Sarana Multi Infrastruktur (PT Sarana Multi Infrastruktur, 2020), United Nations Development Programme (UNDP, 2021), and other financing organizations.

Taken together, these foundations, pillars, standards, and implementation requirements constitute the JT framework. For the implementation of the JT Framework, certain requirements are compulsory to ensure the process and results are reliable, inclusive, and measurable. These requirements are included in the diagram below and shape the enabling environment for the effective implementation of the just transition activities.



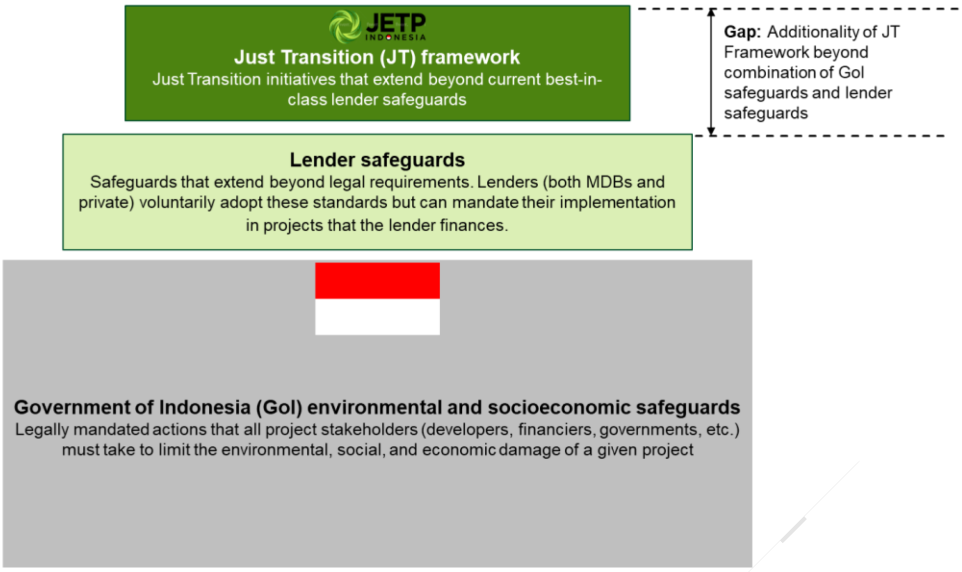
Source: (JETP Secretariat and Working Groups, 2023)

Figure 6.1-2 Indonesia's JT Framework

6.1.4 Additionality of the Just Transition Framework

The JT Framework is designed to incorporate and supplement existing safeguards for energy projects in Indonesia. For example, GoI legally requires that energy projects institute certain safeguards through processes such as the AMDAL (Environmental Impact Analysis) and the Land Acquisition and Resettlement Plan (BPK, 2021). In addition, lenders (both multilateral development banks (MDBs) and the private sector) to energy projects in Indonesia often voluntarily adopt additional safeguards that go beyond legal requirements from GoI, and these lenders can mandate implementation of these safeguards on projects that they finance.

These existing GoI and lender safeguards are adopted as Standards in the JT Framework, thus, there will be no duplication of work and cost. However, the JT Framework introduces one additional standard that addresses economic diversification & transformation (Standard 9). The JT Framework also introduces one additional component to assessments that focuses on identifying and enhancing social, economic, and environmental opportunities. Figure 6.1-3 visualizes how the JT Framework interacts with existing GoI and lender safeguards.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 6.1-3 Relationship between JT Framework and existing safeguards

Both GoI regulations and lender safeguards focus on mitigating risks from energy projects. The JT Framework builds on this by focusing on both mitigating risks and enhancing social, economic, and environmental opportunities associated with energy transition projects, for example the CFPP retirement will have a residual impact (Standard 9) that needs to be mitigated. This additional focus on enhancing opportunities is an essential element for Indonesia to take full advantage of the investment that JETP will bring and will be further detailed in the next subchapter on JT Framework implementation.

The additional standard introduced by the JT Framework centers on how JETP investments impact economic diversification and transformation. This standard encourages the following types of activities to advance economic diversification and transformation.

1. Contribute to giving direction to areas whose economies are highly dependent on public revenues, employment and income generated from a single sector, especially fossil fuel energy and associated energy-intensive products sectors to diversify and transform their economies;
2. Contribute to supporting economic diversification for business and supply chains, both formal and informal, affected by energy transition investment;
3. Contribute to directing public and private funds to diversify and transform the economy through investments with the lowest adverse impacts on the environment, vulnerable groups, disadvantaged subnational, and maximum benefits for the local economy; and
4. Promote conducive and coherent policy measures, incentives and infrastructure that can contribute to subnational and local economies for sustainable development.

See Appendix 10.8 for a description of all just transition standards used in the JT Framework.

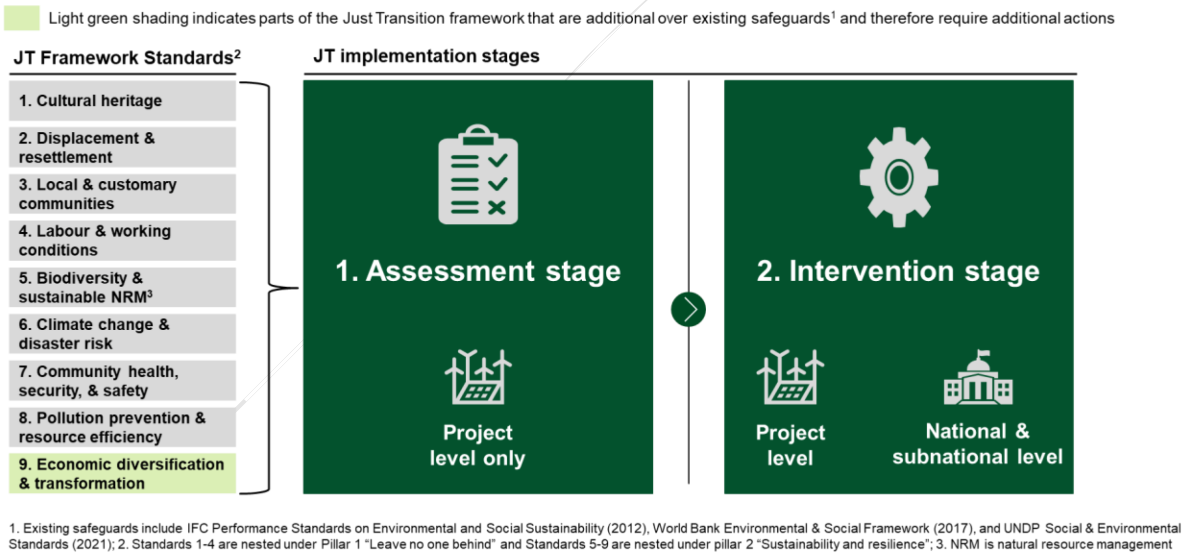
Beyond the analysis above, future in-depth studies have been identified to be potentially conducted to further sharpen the analysis made in this subchapter. The full list of potential studies is shown in Appendix 10.18.

6.2 Implementing the Just Transition Framework

6.2.1 Process To Implement the Just Transition Framework

Deploying the JT Framework enables users to analyze and manage the social, economic, and environmental impacts from energy transition investments. Implementing the JT Framework occurs in two stages: (i) the assessment stage, and (ii) the intervention stage. The assessment stage involves identifying and analyzing the multiple impacts from a given energy transition project, as well as developing actions to manage those impacts. The assessment stage is only conducted at the project level, but multiple project-level assessments can be aggregated to understand the cumulative impacts of energy transition activities at a national and subnational level.

The intervention stage occurs at the project level as well as the national and subnational level. At the project level, the intervention stage requires consolidating the actions identified during the assessment into a plan and carrying out that plan over the project lifetime. At the national and subnational level, the intervention stage can take on various forms ranging from introduction of new policies to the expansion of government programs that relate to the just transition. Figure 6.2-1 displays the two stages of implementing the JT Framework.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 6.2-1 Illustration of JT Framework implementation process

6.2.2 Implementing the Just Transition Framework at the National and Subnational Level

The assessment stage of JT Framework implementation is only performed at the project level and has three components: (i) performing risk identification and analysis, (ii) building risk mitigation actions plan, and (iii) creating plans to enhance opportunities from investments. The resulting plans (ii) and (iii) form the basis of the intervention stage of JT Framework implementation, primarily for the project level interventions. However, the plans may also contain insights and recommendations for the JT Framework Implementation on the subnational and national level and therefore act as input to the process of putting the national and subnational JT Programs together.

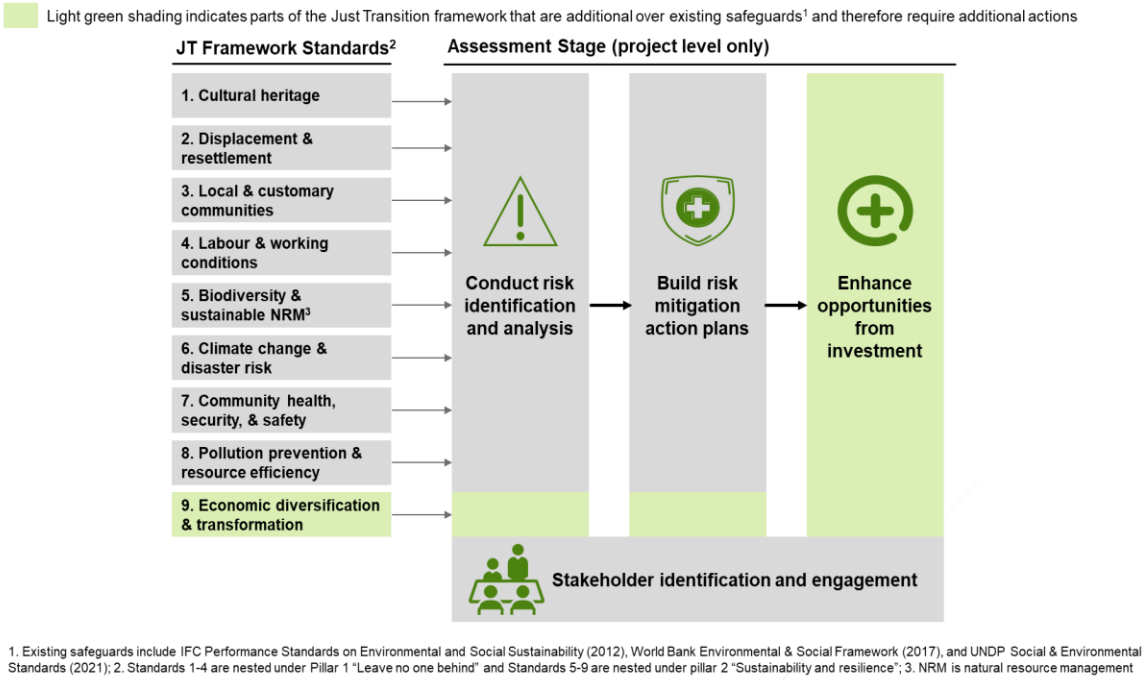
Robust stakeholder engagement is critical throughout each of the Just Transition (JT) Assessment components. Energy transition disproportionately impacts vulnerable stakeholders, and by identifying and understanding their unique needs and challenges, decision-makers can design policies and interventions that address their specific concerns, prevent further inequalities, and ensure their access to opportunities. Furthermore, an inclusive transition planning process based on informed involvement and meaningful participation is crucial to successful implementation and sustainability of JT Framework implementation. Therefore, a robust stakeholder engagement requires identifying vulnerable stakeholders, ensuring their access to accurate project information, providing a system to handle grievances, and a mechanism for participation in project decision-making.

Stakeholders may be vulnerable due to the applicability of a number of criteria. Based on consultations conducted by the Just Transition Working Group of the JETP Secretariat, attributes to identify vulnerable stakeholders include but are not limited to: gender, age, health, social status, type of disabilities, ethnicity, religious/ spiritual background, geographical location, economic capacity, education, and dependency on the immediate environment or natural resources for livelihoods. Including these criteria within foundations and standards when performing the assessment helps to ensure that vulnerable stakeholders are not left behind.

A detailed assessment of all vulnerable stakeholders is necessary for each energy transition project to ensure all such people can be included. Alongside this, an assessment that focuses on complex social systems is essential to understand how inequities, disparity in access to energy, and environmental impacts for vulnerable groups are often exacerbated by intersecting identities.

Finally, it is important that projects take into account Standard 9 when planning their just transition approach, meaning that those responsible for the project address whether there are opportunities for economic diversification and transformation that the project can enhance, and suggest how - alone or with partners - this can be achieved.

Beyond the analysis above, future in-depth studies have been identified to be potentially conducted to further sharpen the analysis made in this subchapter. The full list of potential studies is shown in Appendix 10.18.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 6.2-2 Assessment stage of JT Framework implementation

6.2.2.1 Risk Identification and analysis

The first step in implementing the JT Framework is to assess relevant risks in each of the nine just transition standards. This assessment requires identifying relevant risks and determining the significance of those risks (this significance is based on the likelihood and potential severity of a specific risk). Within a given standard, the overall risk assessment coverage and process in the JT Framework has significant overlaps with those in other prominent guidelines, and in many cases completely matches. The JT Framework standards 1–8 are also found directly or as crosscutting standards in the following guidelines: (i) 2012 IFC Performance Standards on Environmental and Social Sustainability, (ii) the 2017 World Bank Environmental and Social Framework, and (iii) the 2021 UNDP Social Environmental Standards. Therefore, fully following the risk assessment process for these three guidelines also satisfies the risk assessment requirement for standards 1–8 of the JT Framework. Appendix 10.9 provides a description of what kinds of actions are needed both for Standard 1-8 and for the newly added Standard 9.

Examining the types of projects expected to be delivered through JETP suggests that projects under all Investment Focus Areas (IFAs) have potential to present risks across JT standards. Identifying potential risks starts from the earliest screening stages of project development. For project level, JT Assessment is envisaged to be part of the detailed feasibility study phase when developers conduct detailed assessments to build a full view of a project's risks and opportunities and measures to mitigate and enhance them respectively to advance a just transition. The assessment will be conducted through desktop study, site visits, interviews, and public consultations with project developers and related stakeholders to get comprehensive data.

6.2.2.2 Risk mitigation action plan

Risk mitigation action plans are targeted to mitigate the negative impact of risks associated with energy transition investments on vulnerable stakeholders. To avoid duplication of action and cost, the mitigation action plans under the JT Framework look to address only areas that are not already covered by compulsory mitigation measures and any safeguards expected by funders. When building risk mitigation action plans through the JT Framework, it is important to tailor mitigation actions to particular contexts at the subnational and project level to meet the differentiated characteristics and impacts of each location and investment.

6.2.2.3 Enhancement of opportunities

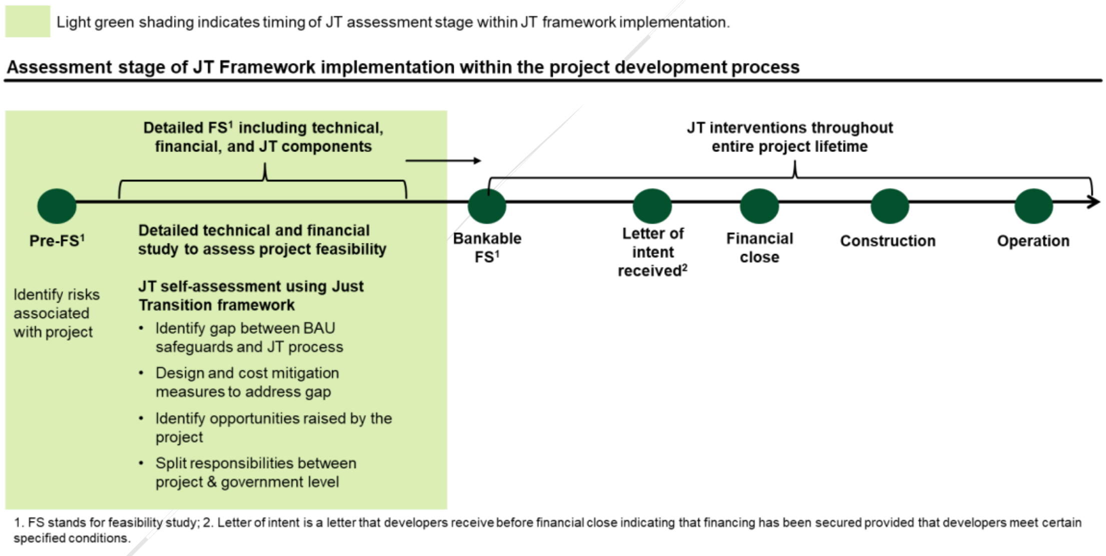
In addition to identifying risks and developing risk mitigation action plans, a just transition approach requires examining the opportunities created by the energy transition investment that can bring positive impacts or benefits. If these opportunities are concentrated in the hands of a few and withheld from the broader community, or not taken advantage of at all, the energy transition risks perpetuating existing inequalities. For example, the accelerated energy transition enabled by the JETP presents an opportunity to improve gender equality in Indonesia by increasing women's employment in the energy sector. Also, JETP presents an opportunity to improve energy access which can be a powerful tool to improve overall living standards. Therefore, a just transition must focus on the creation and distribution of social, economic, and environmental opportunities to ensure that a broad array of stakeholders, particularly those vulnerable groups, enjoy the benefits of the energy transition. As with the risk assessment and risk mitigation action plan processes, this opportunity formulation exercise is meant to demonstrate how energy transition investment can bring opportunities for stakeholders as required for a just transition.

6.2.2.4 Assessments within the project development cycle

Integrating the JT Framework assessment into the project development process occurs according to the following steps:

- A pre-feasibility study typically acts as a data source for determining whether a project is aligned with principles of a just transition. Typically, the pre-feasibility study maps the risks associated with the project, including socioeconomic and environmental risks as defined by GoI compliance or applicable laws. Therefore, the pre-feasibility study can act as a preliminary source of information for the subsequent phase;
- In the next stage, a detailed feasibility study will include the JT Assessment by following JT Framework, which will examine the social, economic, and environmental risks and opportunities presented by a project, and the remaining gap to meet standards in the JT Framework. The social and environmental safeguard assessment commonly required by the lender is part of the JT Framework. Thus, the results of the safeguards assessment can be directly used in the JT Assessment; and

- To complete a full JT Assessment and bring the project to a bankable feasibility study (FS) stage, the developer needs to design project-level JT programs and activities to be implemented over the project's lifetime, starting from when financiers issue a letter of intent to the project developer. These interventions will be particularly important for the safeguarding aspects of JT Standards 1-8. For JT Standard 9 and the focus on opportunity-building, we expect the assessment to look at opportunities to crowd in development activity, to allow infrastructure build as part of the project to serve a wider role if the additional cost is manageable, and to ensure the local community can enjoy benefits of the project - for example, enabling local access to electricity generated by new renewable installations;
- The assessment at the bankable FS stage will be shared with the JETP Secretariat to ensure coverage over the JT Framework, and to serve as a baseline for the meta-monitoring undertaken by the JETP Secretariat;
- The process of JT Assessment throughout the project lifetime should ensure stakeholders engagement and establishment of grievance mechanisms (particularly for vulnerable stakeholders impacted by energy transition investments), open access to project information, availability of financing; and monitoring, reporting and alignment with JT Principles and Standards.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 6.2-3 Just Transition assessment within project development process

6.2.3 Just Transition Framework Implementation: The Intervention Stage

Implementing the framework involves different approaches for the project level, and for the national and subnational level. At the project level, it will be driven primarily by those involved in the projects: developers, financiers and other direct stakeholders. At the national and subnational level, government, national and international NGOs, and other development organizations will be at the fore.

6.2.3.1 JT Interventions at the Project Level

The JT Assessment stage is vital for JETP Projects to get to the bankable FS stage. Once project financing begins to flow, interventions to ensure the JT Framework is followed will be essential. The JT Framework allows developers to align their projects with just transition principles and standards during their implementation.

The phase after bankable FS covers construction and operational interventions. In the assessment phase, these interventions will have been defined and scheduled. Once the JT interventions are developed and tailored with project context, the implementation of JT programs and activities can proceed alongside the project lifetime. It is for the JETP Project financiers, developers and operators to implement the identified interventions and report those activities and their outcomes to the JETP Secretariat as part of its meta-monitoring, reflecting the plans put in place during the assessment phase.

High-level potential risks and related mitigations and opportunities, which can inform project owners' own analysis of the specific risks for their project are detailed in Appendix 10.9. However, the JT Assessments should endeavor to go into greater detail than what is typically done in business-as-usual safeguards assessments following the JT principles and standards as discussed in subchapter 6.1.3. Risks are prioritized based on their potential impact and likelihood, whereas opportunities are prioritized based on their feasibility and reach of impact. See Appendix 10.12 for the risk and opportunity prioritization methodology.

6.2.3.2 JT Interventions at the subnational and national level

The accelerated nature of the energy transition envisioned by the JETP has the potential to result in social, economic, and environmental impacts that extend far beyond the boundaries of an individual project. Implementing the JT Framework at a subnational and national level allows for governments and other relevant actors to manage and develop actions in response to these more systemic impacts from an accelerated energy transition. These actions can be bundled into a set of potential programs needed to ensure a just transition. Therefore, the JT Interventions on the subnational and national level are also referred to as JT Programs.

Following the JT Framework implementation, the programs will be derived from assessments performed on the project level. For example, the JT Assessment for development of a geothermal power plant may conclude that there are risks associated with a shortage of high-skilled workers in the broader jurisdiction. This finding can inform the formulation of a subnational program on increasing technical skills on geothermal skills in the area.

Implementation of these programs is an enabler for the transformative change of the energy transition in ways that increase social equality and inclusivity, offer new employment opportunities, help ensure communities are not left behind, and protect the natural environment. Such programs can give a space for innovative solutions by understanding and taking transformative approaches to address the opportunities and challenges associated with the energy transition, and thus catalyzing a jurisdiction and systems wide transformation towards improved and just livelihoods for all.

Through applying the JT Framework across all JETP IFAs, the JETP Just Transition Working Group identified three broad Just Transition Programmatic Approaches, containing a provisional list of program proposals. These proposals could serve as a starting point for the implementation of just activities at the subnational and national level.

These proposals need to be developed with the guidance, support, and the collaboration of national or regional government entities where responsibility for these matters lies. Non-government actors including international organizations and non-government organizations with capacity, resources and expertise in the matter would also be needed to contribute to areas relevant to the program design and implementation. The JETP Secretariat, as the coordinator of JETP implementation would need to crowd in this support.

The three broad JT Programmatic Approaches relevant across JETP IFAs are:

JT Programmatic Approach 1: Custodianship of the Just Transition

These programs ensure just transition issues that cannot be addressed only at the project level receive proper consideration. In these programs there are issues that will require JETP Secretariat to engage with stakeholders, undertake research, and help marshal resources to drive action. A large proportion of these actions would have to be undertaken by the government, but international partners and development organizations would need to be involved as well.

Programs covered by this approach include:

1. Undertaking robust stakeholders' engagement and grievance mechanism

   Stakeholder consultations must be accessible to everyone, particularly vulnerable stakeholders impacted by energy transition investments. The program will ensure their meaningful participation by looking beyond the directly impacted stakeholders of individual projects. It also aims to establish and uphold an appropriate grievance mechanism to ensure continued stakeholder engagement throughout the implementation of projects to uphold the procedural justice component of a just transition by ensuring that the voices of those impacted are heard.
2. Supporting human capital development

   The energy transition can only be successful with a skilled and competent workforce that can power the growth and development of the economic sectors that the country's energy transition aims to promote. Through this program, JETP will ensure sufficient evaluation of the country's skills and job needs in accordance with its energy transition and economic development goals, supporting the Government of Indonesia to design the appropriate programs to deliver the skills and competencies needed by the country's workforce in an equitable and just manner. The program also aims to promote decent work and compliance with occupational, safety, and health standards.
3. Overcoming impacts of reducing domestic coal use

   While those responsible for the early closure of coal plants will have responsibility for the direct jobs impacted as well as some indirect jobs (particularly where contractual relationships to the power plant exist), the broader impact on the Indonesian economy and the jobs in the coal ecosystem cannot be tracked at the project level. The impact will be the cumulative effect of the projects, as well as shifts in international demand. The program will aim to monitor impacts on the ecosystem and on the formal and informal workforce related to coal and recommend specific measures to support those impacted.

4. Driving economic diversification

   It is essential to ensure that the transformation of Indonesia's economy, which has historically been heavily dependent on fossil fuels, can create new opportunities through the energy transition. Reimagining the new economy in a low carbon society is an urgent task for Indonesia, to ensure that the potential economic opportunities are fully realized. This will involve looking at key existing and new sectors that can be opened or transformed thanks to the energy transition, and identifying where and how Indonesia can be successful domestically and globally in each.

5. Accelerating non-financial support

   Those impacted by the energy transition in negative ways may require support beyond the financial. Within this program, the JETP Secretariat will help to marshal other kinds of resources targeted at those who suffer significant change because of JETP programs. For example, the program can seek to provide psychological counseling to those impacted. Such efforts can ensure that the shocks caused by the energy transition do not introduce severe hardships to those impacted and assist them in recovering quickly and maintaining a good quality of life.

JT Programmatic Approach 2: Policy for the Just Transition.

These programs aim to support the Government of Indonesia in policymaking in areas necessary to support a just transition. Some elements cannot be delivered without the regulatory and legal environment to support such activities. The JETP Secretariat will support the GoI Energy Transition Task Force to guide policymaking in some important areas related to the just transition through projects including:

1. Ensuring fair and adequate compensation

   It is vital to ensure adequate and fair compensation to vulnerable groups impacted by the energy transition through events such as involuntary displacement, resettlement, and unemployment. Where mandatory universal compensation is insufficient, the program should aim to update policies to provide supplementary support in the specific circumstances identified.

2. Enhancing social protection

   Developing the country's social protection program to help minimize the impacts of the energy transition will be vital, considering the potential disruptions that it may introduce. With a robust social protection program, the hardships that vulnerable groups face can be minimized by alleviating the financial burdens of unemployment and climate change-related disasters and accelerating their transition to new decent job opportunities.

3. Strengthening safeguards

   During the energy transition, we expect it to become clear that some social and environmental safeguards do not fully minimize certain social-environmental risks associated with projects related to the energy transition. Drawing on the output of monitoring and evaluation (MONEV), the stakeholder engagement processes, and other input, JETP Secretariat should identify and propose updated legislation for safeguards for legislators to consider. This can also be fed to the international lenders for input into their own safeguarding approaches.

JT Programmatic Approach 3: Thought Leadership for the Just Transition

In some areas the JETP Secretariat will be well positioned to identify challenges and propose solutions, but not to itself drive implementation of those solutions - especially where the issue is cross-cutting and will need to be addressed mostly or entirely by the private sector, without that behavior being compelled by regulation. In these areas, the JETP Secretariat could undertake, or commission appropriate research alongside interested stakeholders, and communicate to impacted parties accordingly. Programs falling into this area include:

1. Driving technology transfer

   Delivering an effective and affordable energy transition requires more than money alone. Innovation is proceeding globally around key technologies for renewable energy, increasing efficiency, and lowering costs. In order to effectively replace cheap fossil fuels in emerging markets, it is essential that the international community, and particularly the rich countries with long histories of technological innovation, find mechanisms to make these advanced technologies available globally. JETP Secretariat will propose mechanisms for this to happen including cooperation between universities and research institutions, joint ventures with protection of IP, and the incorporation of domestic innovation and understanding to help ensure the full value of cutting-edge technology is realized.

2. Advancing gender equality in the energy transition

   A just energy transition must ensure gender equality by creating pathways for women towards decent jobs and increasing their capacities through technical training and entrepreneurship. As well as ensuring gender is mainstreamed into JETP implementation, JETP Secretariat could support the broader community to understand the value of gender equality, and to fully consider the issues of women and girls in their activities. As women have historically not had proportional access to the country's socio-economic benefits, it is crucial to aim for gender equality in just transition - from the makeup of the workforce to the recipients of compensation.

3. Promoting the circular economy

   As is noted in Chapter 4, activities associated with the energy transition can be polluting if not approached properly. JETP Secretariat should promote sustainability through a circular economy, targeting resource efficiency and reduction of waste and pollutants in energy transition projects - including the growth of industries such as metal recycling. It incentivizes project developers to minimize their environmental impact through low-carbon standards and disincentivize unsustainable and polluting activities. Through this program, economic growth can be sustainable, avoid negative externalities that have historically harmed populations, and create long-term benefits for all.

4. Filling data gaps

   During stakeholder discussions, it was frequently noted that data is often siloed, considered unreliable, or simply does not exist. In this context, decision-making can often rely on international proxies, uncertain modeling, or unreliable extrapolation. This is particularly important for just transition topics which often require combining many different types of data from multiple sources. JETP Secretariat will reevaluate the quality of the data underlying plans for the just energy transition both overall and at the project level and propose mechanisms for stakeholders (from the public and private sectors as well as international partners) to bolster the data landscape in Indonesia. This may include finding mechanisms to unlock data held in SOEs or disconnected databases in government, supporting improvements in data coherence or collection methodologies, and issuing reports on the state and coverage of the data used for decision-making.

Other key issues may result in further programs if needed. For example, we expect the MONEV function of JETP Secretariat to oversee the cost and reliability of energy in areas impacted by the energy transition. Should energy access either reduce or fail to increase as expected even as new projects open across the country, more focused interventions may be considered within a new program. This is to ensure that rural communities can benefit from the poverty alleviation and improved life quality that access to energy will drive.

6.3 Enablers for the Just Transition

6.3.1 Just Transition Financing

Appropriate financing is critical to enable implementation of the JT Framework, specifically for those aspects of the framework that are additional to best practice lender safeguards. Given that many just transition initiatives have limited private returns but very high potential social returns, grants are the most appropriate form of funding support for the just transition.

At the project level, the expectation is that lenders will provide the financing for the cost of the JT Assessment for all Standards (1 - 9) by incorporating this cost in their loans to developers. For project-level JT interventions based on assessment results, it is expected that lenders and project developers provide financing for interventions in Standards 1-8 because these areas are already covered by existing safeguards and closely align with current best practice. Public funding support in the form of grants will be needed to fund JT interventions in Standard 9 (on economic diversification and transformation) because these interventions are additional to current best practices and extend beyond the responsibilities of a single project.

Grant funding has an even more prominent role in supporting implementation of the JT framework at the national and subnational level. While Indonesia has several programs that advance just transition principles, the accelerated energy transition envisioned by the JETP presents additional impacts for which Indonesia will need additional financial resources to manage. The JT Programs described in Subchapter 6.2 can provide Indonesia with the tools necessary to manage the systemic impacts from an accelerated energy transition, and grant funding from the international community will be needed to support the JETP Secretariat and other relevant institutions to design and implement these programs.

6.3.2 Capacity Building and Technical Assistance (TA)

Capacity building and TA are also key enablers for the just transition because a sufficiently large pool of professions with appropriate expertise is a key requirement for successful implementation of the JT Framework.

At the project level, capacity building and TA is necessary to enhance and grow the pool of professionals that can conduct JT Assessments as well as advice developers and lenders on design of JT interventions. At the national and subnational level, capacity building and TA is needed to equip the JETP Secretariat and other relevant entities with the expertise needed to design JT programs that account for the more widespread impacts of an accelerated energy transition.

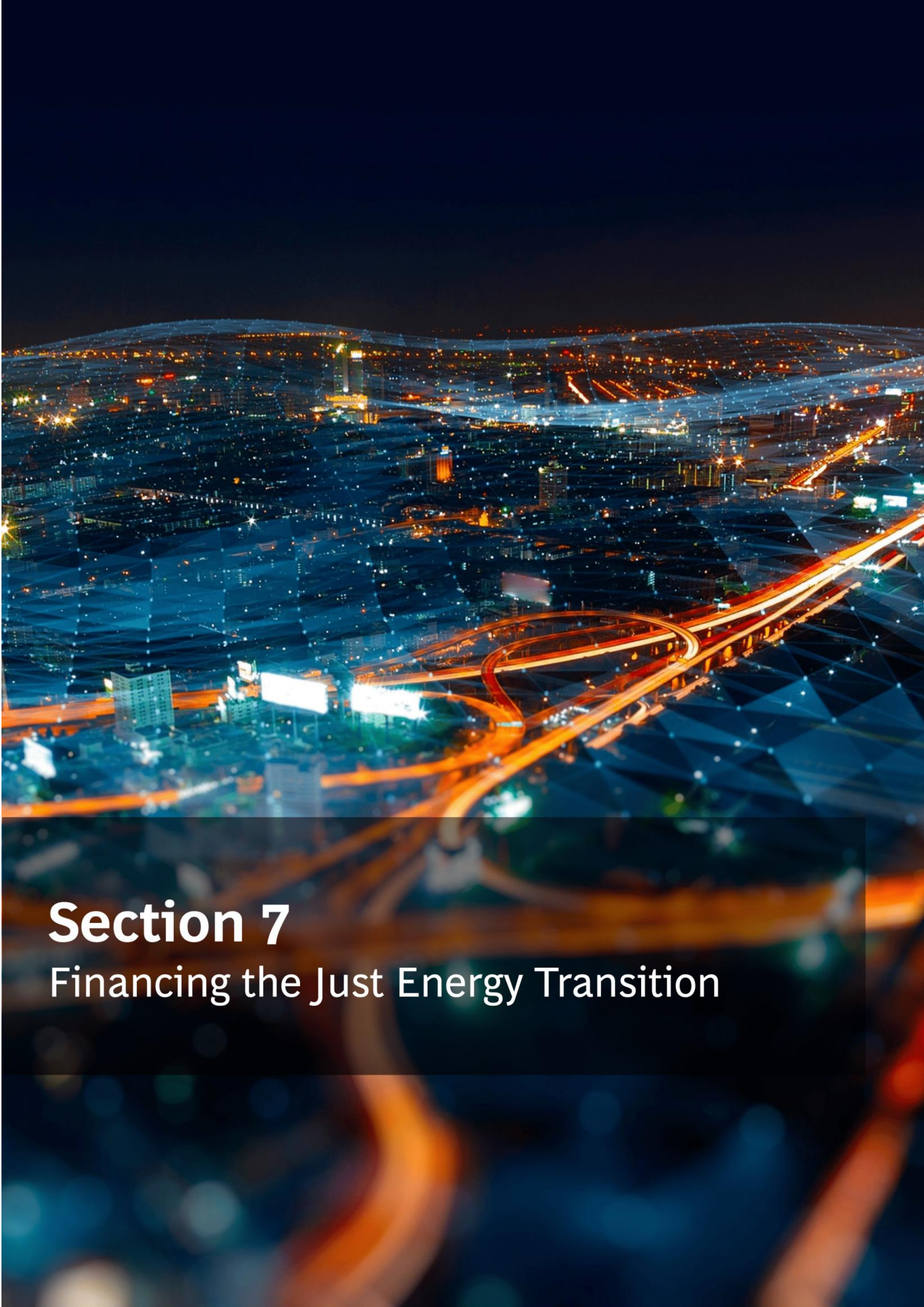
A designated government entity will be responsible for coordinating these capacity building and TA services, while actual service provision will be open to various parties including government bodies, CSOs, and private companies. The JETP Secretariat will conduct meta-monitoring to track delivery of capacity building and TA services. It is important that provision of these capability building, and TA services are prioritized for the most critical and imminent energy transition projects as this can facilitate rapid use of the JT Framework.

6.3.3 Monitoring and Evaluation

Monitoring and evaluation (referred to as MONEV in Indonesia) are critical to ensure effective implementation of the JT Framework. At the project level, developers and lenders will conduct MONEV of their JT interventions, with performance monitored regularly in accordance with relevant legal agreements, the lenders' requirements, or GIIP policies. The approach to MONEV for a specific project will be highly contextual and depend on the location, stakeholders involved, and type of activities.

Reporting, including the choice of indicators, will respond to the risks and issues identified as most important or impactful during the JT Framework Assessment, refined as the project proceeds. It is expected that this monitoring be shared completely with the JETP Secretariat on a regular schedule for the purposes of meta-monitoring. MONEV indicators should include disaggregated data and information based on gender, age, income, membership in customary communities, and jurisdictions.

At the JETP Secretariat level, reporting from the projects will be used for meta-monitoring. This will involve ensuring that data is received, undertaking meta-analysis to present further insights, and making the data available through the meta-monitoring platform. The JETP Secretariat will also incorporate outputs from the grievance mechanism under JT proposal 1 to inform its meta-monitoring. Further information about the overall process of meta-monitoring is given in Subchapter 9.3 which also includes details of how the CIPP will be updated. These updates will include any updates or additions to the JT Framework and the process for implementation, where necessary to support a successful just transition.



Section 7
Financing the Just Energy Transition

7. Financing the Just Energy Transition

7.1 Background and Context

Significant financing support is required to reach the ambitious JETP power sector pathway. To mobilize the US$20 billion available funding from the JETP agreement, the JETP Secretariat together with the Technical Working Group has identified priority projects, of which needs to be matched with the type of modalities and the terms attached to each financing package. The JETP Secretariat has conducted a series of consultations to verify and clarify the financing package provided by each the International Partners Group (IPG) members. From this exercise, a breakdown of each the IPG countries funding pledge by type of modalities and designation is provided below.

With assistance from the Financing Working Group, the JETP Secretariat has decided on financing principles as the overall guidance on allocating available financing. Prioritization for capital deployment and end-to-end financing process flow has also been identified as an approach to mobilize the JETP capital. Acknowledging that financing structure can take many forms and will depend on the nature and specificities of each project, examples of them are presented in the financing library shown in Appendix 10.14.

7.2 JETP Investment Needs

7.2.1 Recap Based On 5 Investment Focus Areas

Based on the five JETP investment focus areas, total amount of investments needed are estimated to be at least US$96.1 billion required over 2023–2030. The breakdown of investments required across transmission/distribution, early coal-fired power plant (CFPP) retirement, renewable energy generations, and just transition is showcased in Table 7.2-1. The investment needed for energy efficiency and electrification projects will be added in the next iteration of CIPP as agreed by the IPG and Government of Indonesia (GoI).

Table 7.2-1 Investment in new renewable energy generation and transmission/distribution required to achieve JETP's power sector pathway

Source: (JETP Secretariat and Working Groups, 2023)

Focus Area	2023-2030	
	Units	Investment needs (2019 US$ Bn)
IFA1 Transmission lines and grid deployment	~8,000-14,000 kmc	19.7
IFA2 CFPP early retirement and managed phase-out*	0 GW	1.3
IFA3 Dispatchable renewable energy deployment acceleration	16 GW	49.2
IFA4 Variable renewable energy deployment acceleration**	40 GW	25.7
IFA5 Renewable energy value chain enhancement	N/A	TBD
Just transition Assessment	N/A	0.2 (minimum)***

Focus Area	2023-2030	
	Units	Investment needs (2019 US$ Bn)
Interventions		TBD
Total		**96.1**

**Before 2030, there will be no CFPP retired, the earliest shut-down will take place in 2035/2036, hence investment needs include overnight investment cost only for coal retrofit, without counting for any CFPP early retirement before 2030.*

***Inclusive of storage capacity additions and investment needs.*

****JT Assessment cost consists of US$18Mn for capacity building, scoping study and project piloting; and US$0.5Mn per priority project assessment, which equals to US$200.5Mn. Both comes down to an estimated total of US$218.5Mn. These are conservative estimates and inconclusive of all just transition needs.*

A Just Transition (JT) Framework has been identified and explained in Chapter 6, and its associated assessment cost is further referenced in the above table. Due to the variable nature of the JT Intervention programs, the costs cannot be determined at this moment and must be calculated on a project basis.

Just transition interventions include social and environmental costs associated with the energy transition, particularly for those directly impacted by the transition, and to ensure that the socio-economic benefits of the energy transition are optimized and equally distributed.

Just transition costs relating to the first 8 standards (the “safeguards”) shall be the shared responsibility of the lenders and project developers, as dictated by common practice. The just transition costs relating to the 9th standard on economic diversification and transformation will either be managed by the GoI, project developers or by the lenders. A detailed explanation on the suggested options can be found in Chapter 6.

7.2.2 JETP Priority Projects

To align with the 3–5 years disbursement period of the JETP agreement, the proposed list of JETP Priority Projects is detailed in Table 7.2-1 with financing requirements over the next 5 years. The projects have been selected based on their criticality to realize the modelled energy pathway, included in the commitment of relevant institutions, and jointly agreed by the relevant government institutions (e.g., MEMR, MoF, MSOE and CMMAI), and have not yet reached financial close. The detailed selection criteria of JETP Priority Projects are explained in subchapter 5.3.3.

7.3 JETP Financing Principles and Approach

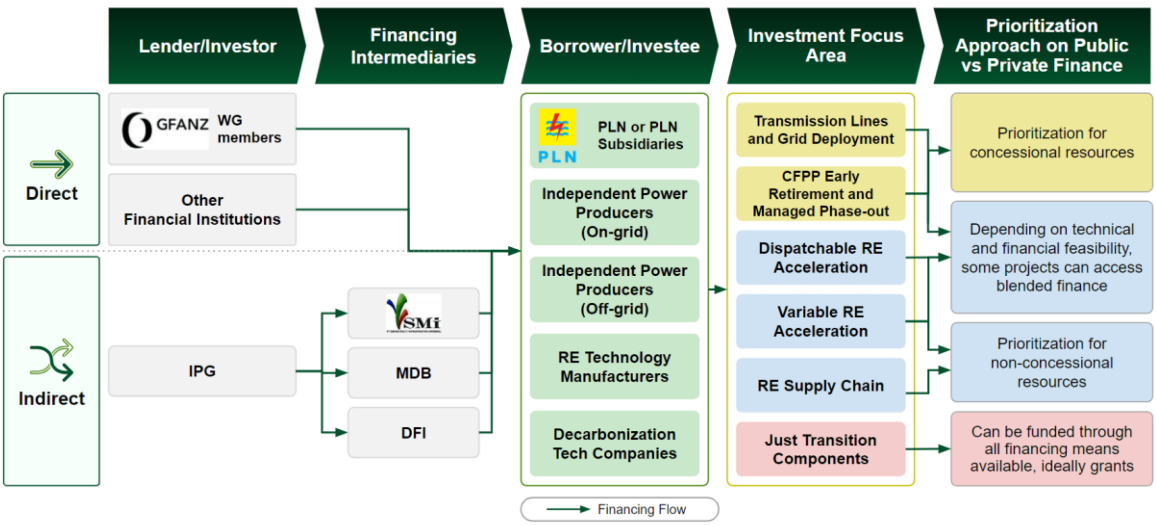
7.3.1 JETP Financing Principles

The basic financing philosophy of the JETP agreement is to minimize the cost of the overall energy transition in Indonesia. This will be accomplished by strategically using public capital, which often comes at a lower cost or with higher risk tolerance, to lower the cost on a system-wide basis (even if it means the expense of an individual project may be slightly higher). Such strategy also hopes to result in the maximization of long-term economic opportunities for Indonesia through the opportunities of clean energy development. Acknowledging public finance, and more particularly, concessional resources are scarce and should be used as a catalyst whenever possible, below are the proposed JETP financing principles and recommended approach for funding the JETP agreement.

1. The Indonesian JETP could help ensure the efficient and effective use of public funding, particularly concessional resources, and avoid market distortion or crowding out commercial finance. This JETP would contribute to catalyzing market development and the mobilization of private sector resources and to focus the use of concessional resources on projects that would not be viable for the private sector alone to finance and implement. Commercially feasible projects may attract potential commercial lenders either from the initial Glasgow Financial Alliance for Net Zero (GFANZ) Working Group members or other financial institutions;
2. Allocation of concessional resources should follow the priorities set by this JETP's five Investment Focus Areas (IFA) in the order stated: IFA#1 for transmission and distribution projects, IFA #2 for early coal retirement transactions, IFA #3 and IFA #4 for dispatchable and variable renewable energy projects, and IFA #5 for renewable energy manufacturing projects;
3. Priority will be given to projects that are ready to finance during this JETP investment period window; and
4. Selection criteria under the project readiness financing principle should be aligned to the recommendations contained in the technical assessment and the JT Framework (See Subchapter 5.3 and Chapter 6 for reference).

7.3.2 Prioritization of Capital Deployment

Strategically leveraging several funding instruments and modalities proposed to be used for supporting the energy transition in Indonesia, the JETP prioritization of capital deployment is illustrated in Figure 7.3-1.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 7.3-1 JETP Prioritization of Capital Deployment

As noted in subchapter 7.3.1, private finance should be used as a priority for financing projects given its relative abundance. In determining the financing option, here are examples of how each type of financial modalities would be leveraged:

1. Within private finance the most easily accessible funding class is non- or limited recourse debt, particularly "Project Finance" loans. This form of debt is usually not recorded as a liability against a project sponsor's balance sheet and as a result, reduces financing costs. Depending on the project, debt can be sized or sculpted accordingly in terms of tenor and grace period to best match the timing of anticipated revenues.

   Internationally, independent power producer (IPP) projects are traditionally financed on a "project finance" basis (non/limited resource finance). In order for any utility-scale IPP financing to be successful, power purchase agreement (PPA) risks will need to be identified, mitigated, and allocated to the participant best suited to manage it. In Indonesia, PLN PPAs have been evolving and PLN has taken good steps to improve the bankability to attract private finance (e.g., Cirata floating solar IPP). PLN should continue to further enhance the risk profile of the PPAs which would lead to lower financing costs and in turn would further lower tariffs.
2. If a project cannot be fully funded with private finance, public finance can be used in a catalytic way to bring in private finance. This can be done either by leveraging public capital instruments to mitigate specific identified risks, or by blending the concessional and non-concessional finance to reduce the cost. A project could benefit from blending concessional and non-concessional capital should it not be financially viable otherwise. For example, in the case of geographically challenging sites, grants/TA may be required to cover a portion of upfront development costs such as feasibility studies or other expensive early-stage development costs to reduce the developer upfront investment risks. If the project utilizes technology that has not been deployed at scale, it might be worth deploying blended finance to achieve higher returns commensurate with the additional project risks. These should be decided on a project-by-project basis to deal with project specific risks.
3. For highly strategic JETP projects where the private sector considers a project high risk (or with a low commercial viability), public finance alone could be an option. This should be limited and only deployed after sufficient analysis and consultation showing that the private finance cannot be mobilized by using a blended modality.

7.3.3 End-to-End Financing Process Flow

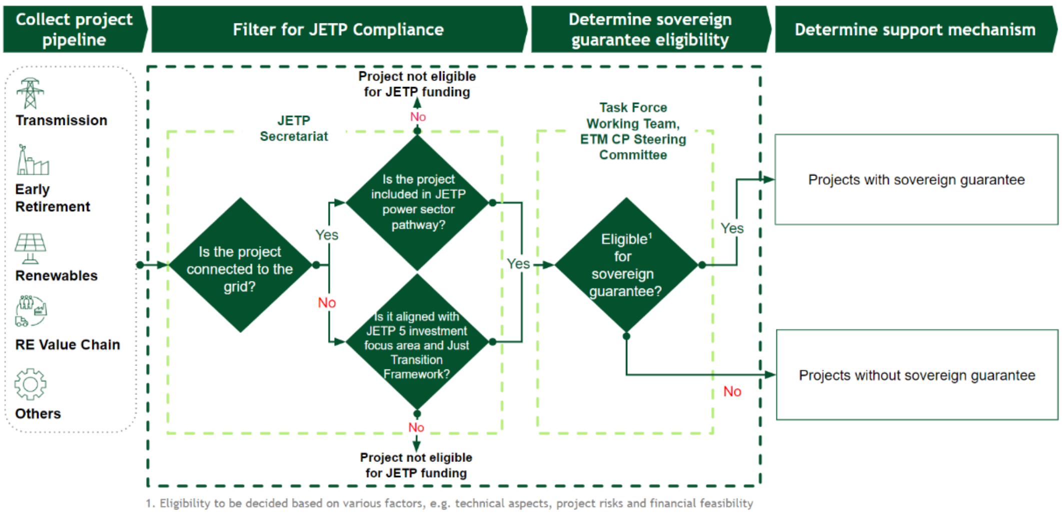
JETP Secretariat is tasked to filter and select projects to be considered for assessment of GoI sovereign guarantee eligibility, provided by Ministry of Finance (MoF) per Article 24 of the Permen No. 103/2023. Government guarantees as defined here is infrastructure financing from international institutions directly to state-owned enterprises (SOEs). Only JETP-compliant projects that pass through the filtering as detailed in Figure 7.3-2 will be considered.

The sovereign-guarantee process is dictated by relevant regulation on infrastructure financing. In the case of Indonesia energy transition, the newly enacted Minister of Finance Regulation

No. 103/2023 concerning Providing Fiscal Support through the Funding and Financing Framework in the Context of Accelerating the Energy Transition in the Electricity Sector, acts as the legal umbrella for the mobilization of sovereign guarantees for energy transition, which will be determined by the Energy Transition Mechanism Country Platform (ETMCP) Steering Committee.

Specifically, for the JETP process, the JETP Secretariat will propose the prioritized projects to the National Energy Transition Task Force Working Team – which is tasked to provide guidance and direction to the JETP Secretariat according to the Coordinating Ministry Regulation no. 144/2023 (Coordinating Ministry of Maritime Investment and Affairs, 2023). The Task Force Working Team will then coordinate with the ETMCP Steering Committee for projects with sovereign guarantee. Once the Taskforce and ETMCP Steering Committee make decision on its eligibility, the project will then follow the typical financing process. For detailed roles and responsibilities of select stakeholders refer to Chapter 9.

The following details end-to-end financing process flow for JETP compliant projects.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 7.3-2 End-to-end Financing Process Flow

7.4 Breakdown of Available JETP Funding

7.4.1 Funding Modalities in the Indonesian JETP

The US$20 billion JETP agreement is the sum of the IPG committing of US$10 billion in public finance, and the GFANZ Working Group members committing to work to mobilize and facilitate at least US$10 billion in private finance.

7.4.1.1 Private Finance

Private finance, also referred to as commercial finance, comprises market rate loans, which can be taken through corporate finance (full-recourse loans), project finance (non- to limited-recourse loans), equity, or quasi-equity types of investment that could come in many different structures, customized to each unique project. Private finance typically does not require a sovereign guarantee, and if structured as an IPP or public private partnership (PPP) project should be subject to a competitive procurement process of project sponsors to achieve the best terms of financing.

Investment decisions made by the private sector are mainly driven by continuously optimizing transition-aligned financing opportunities while generating returns. Private financing instruments include but are not limited to:

1. Commercial debt defined as loans or private non-concessional loans at market interest rates from commercial lenders;
2. Equity investments; and
3. Capital market instruments, including but not limited to bonds (as debt instruments).

The US$10 billion in private finance announced for the Indonesian JETP by the initial GFANZ Working Group members – Bank of America, Citi, Deutsche Bank, HSBC, Macquarie, MUFG, and Standard Chartered – can be leveraged by: (i) the catalytic use of public finance aimed at driving private investment, and (ii) enabling environment, in which policies are addressed that are either wholly prohibitive of private investment or create a need for greater levels of public financing than would otherwise be required. These policies are further discussed in more detail in Chapter 8.

7.4.1.2 Public Finance

Public finance typically refers to sovereign borrowing, ranging from sovereign-guaranteed concessional loans at below-market rates to grants and technical assistance (TA). It is noteworthy that public finance also includes non-sovereign guaranteed, non-concessional loans (at market interest rates) with risk-based pricing from private sector lending arms of public international financial institutions such as Multilateral Development Banks (MDBs) and Development Finance Institutions (DFIs). However, due to the public mandate of MDBs and DFIs, even if commercially priced with full commercial terms and conditions based on the respective risk profile, such transactions include a requirement of achieving certain development objectives and may be able to leverage terms that are more favorable relative to private finance.

Specifically for the Indonesian JETP, the IPG, co-led by the United States and Japan, and of the Governments of Canada, Denmark, the European Union, France, Germany, Italy, Norway, and the United Kingdom, are committing at least US$10 billion in public finance.

Grants / Technical Assistance

Grants are defined as gifted funds that do not require repayment. In the context of the Indonesian JETP, grant funding is provided by the IPG. Most identified grants are already earmarked for specific purposes, as described in the country commitment subchapter below. A total of US$153.8 million has been identified as grant funding.

TA is a mode of MDB or DFI support that facilitates the preparation, financing, and execution of development projects. TA can be non-reimbursable (grants), reimbursable (loans), or contingent recovery (e.g., reimbursable if the project is financed by another lending institution). A total of US$138.5 million has been identified as technical assistance, out of which US$71 million is earmarked for certain development projects.

Concessional Loans

Concessional loans are defined as loans made on more favorable terms than the borrower could obtain in the marketplace. Typical concessional terms found in loan products for countries like Indonesia, include below-market interest rates, longer-than-market loan tenors with longer grace periods, and sometimes can be supplemented with TA. Some of these concessional loans have predefined targets that would need to be achieved before money can be drawn down (this is typically in the form of policy-based lending or results-based lending). A total of US$6.9 billion of concessional loans has been identified and will be disbursed through public, international financial institutions such as MDBs and DFIs.

Concessional loans are standard means of financing from MDBs and DFIs. In the context of the Indonesian JETP, these include but are not limited to the Asian Development Bank (ADB), the European Investment Bank (EIB), the French Development Agency (AFD), KfW Development Bank and Japan International Cooperation Agency (JICA). Loans coming from each of these MDBs and DFIs will follow their internal terms and conditions and will require close coordination with the government as most, though not all concessional loans committed by the IPG for the Indonesian JETP would require a sovereign guarantee.

Up to US$8.6 billion of funding committed by the IPG has been identified that will require a sovereign guarantee to be provided by the Indonesia MoF (combination of sovereign loans and sovereign-guaranteed loans). A sovereign loan is one backed by the state, e.g., the sovereign state is the borrower of record in a loan agreement. In a sovereign-guaranteed loan made directly to a state-owned enterprise, the sovereign state guarantees the loan's repayment via a separate guaranteed agreement. As such, concessional loans identified here can only be given to SOEs such as PLN or Pertamina, as well as Indonesia's Special Mission Vehicles such as PT Sarana Multi Infrastruktur (SMI), PT Geodipa, or PT Indonesia Infrastructure Guarantee Fund (IIGF).

MDB Guarantees

The United Kingdom and the United States have each committed to provide guarantees for US$1 billion in support of lending from the International Bank of Reconstruction and Development (IBRD) for this JETP. These guarantees are made available as additional to IBRD's Single Borrower Limit (SBL) for Indonesia. When the Indonesia's SBL is reached, these guarantees would increase the pool of sovereign-guaranteed concessional funding available for Indonesia from the World Bank. In other words, the additional US$2 billion funding from both the UK and the US will only be accessible when Indonesia has reached its SBL.

Non-Concessional Loans

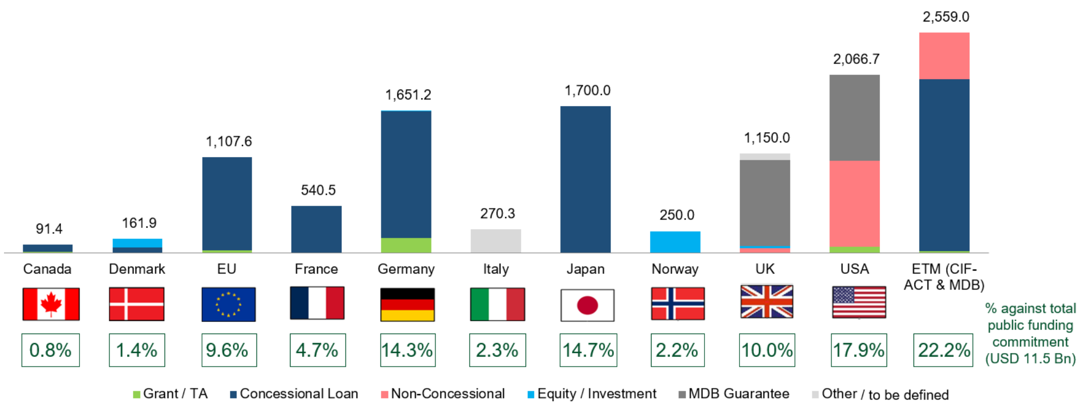
Some of the public funds committed for the Indonesian JETP would be at market interest rates (non-concessional financing), but usually differs from commercial lending in terms of higher political risk absorption and longer maximum tenors than where commercial banks are willing to go on their own. The emphasis is on commercially viable transactions that generate attractive financial returns while also delivering on MDBs' organization-wide mission to promote environmentally sustainable and inclusive economic growth. Those financings to privately held and state-sponsored companies that do not require a sovereign guarantee are recognized by MDBs/DFIs as non-sovereign or, if to a private entity, as private sector operations. However, given the fact that the dollars from private sector lending arms of MDB/DFIs are both (i) more limited than bankable projects, and (ii) can offer more advantageous terms, they are to be considered public finance that should mobilize private financial dollars. Non-concessional loans in JETP funding include are but not limited to: Japan Bank for International Cooperation (JBIC), the United States International Development Finance Corporation (DFC), and Private Infrastructure Development Group (PIDG).

Equity Investment

Equity investments, generally between 5 percent and 20 percent of a company's total equity, may provide developmental support and long-term growth capital for private enterprises. Investments may be directly into companies' and financial institutions' equity and could also be made through private-equity funds. A total of US$384.5 million of equity funding has been pledged by the IPG. Equity investment from JETP public funding include but are not limited to Norwegian Investment Fund (Norfund) and Investment Fund for Developing Countries (IFU).

7.4.2 Breakdown of The IPG Funding by Each Country's Contribution

Details of the IPG funds have been confirmed through a series of consultations with representatives of each the IPG member. Summary of each country's contribution to the JETP deal is illustrated in the following Figure 7.4-1 and Table 7.4-1.



Source: (JETP analysis based on the IPG submissions and consultations, 2023)

Figure 7.4-1 JETP Public Finance breakdown by country/entity and funding mechanism

Table 7.4-1 JETP Public Finance breakdown by country/entity and funding mechanism (in US$million)*

Source: (JETP analysis based on IPG submissions and consultations, 2023)

Countries/Entities	Grant / TA	Concessional Loan	Non-Concessional Loan	Equity	MDB Guarantee	Other / to be defined	Total
Canada	10.0	81.4					**91.4**
Denmark	1.9	60.0		100.0			**161.9**
EU	26.5	1,081.1					**1,107.6**
France		540.5					**540.5**
Germany	167.2	1,474.5		9.5			**1,651.2**
Italy						270.3	**270.3**
Japan		1,700.0					**1,700.0**
Norway				250.0			**250.0**
UK			50.0	25.0	1,000.0	75.0	**1,150.0**
USA	66.7		1,000.0		1,000.0		**2,066.7**
ETM	20.0	1,999.0	540.0				**2,559.0**
Total	**292.3**	**6,936.5**	**1,590.0**	**384.5**	**2,000.0**	**345.3**	**11,548.6**

**The US$ amount is indicative due to the use of exchange rate from original home currency commitment. The currency exchange is done to offer a rough indication for comparability.*

Canada

Canada's total of CAD123.6 million (~US$91.4 million) consists of CAD110.1 million (~US$81.4 million) concessional loan and CAD13.5 million (~US$10.0 million) grant.

Table 7.4-2 Canada Public Finance Commitment

Source: (JETP analysis based on IPG submissions and consultations, 2023)

Funding Entity	Funding Mechanism	Program Name / Description	Investment Focus Area	Amount in US$ (Millions)*	Amount in Home Currency (Millions)
IBRD Trust Funds World Bank (WB)	Concessional Loan	Energy Transition Program	Transmission and Renewable energy (RE)	47.5	64.3
International Finance Corporation (IFC)	Concessional Loan	Blended Climate Finance Program (BCFP)	RE	33.9	45.8
Subtotal Concessional Loan				**81.4**	**110.1**

Funding Entity	Funding Mechanism	Program Name / Description	Investment Focus Area	Amount in US$ (Millions)*	Amount in Home Currency (Millions)
IBRD Trust Funds WB	Grant	Women-Led Coal Transition Mechanism	Just Transition for Women Empowerment	5.5	7.5
ESMAP	Grant	World Bank Energy Sector Management Assistance Program (ESMAP)	All IFA eligible	1.5	2.0
SEA ETP	Grant	Southeast Asia Energy Transition Partnership (SEA ETP)	All IFA eligible	1.5	2.0
CEFIM	Grant	Clean Energy Investment and Financing Mechanisms (CEFIM)	RE	0.7	1.0
International Energy Agency (IEA)	Grant	Clean Energy Transition Program (CETP)	All IFA eligible	0.7	1.0
Subtotal Grant / TA				**10.0**	**13.5**
Total				**91.4**	**123.6**

** The US$ amount is indicative and differences may arise due to the use of exchange rates from original home currency commitment. The currency exchange is done to offer a rough indication for comparability.*

The concessional loan includes the Energy Transition Program, one of four programs under the Canada-World Bank Clean Energy and Forests Climate Facility (CCEFCF). Although funding has been fully disbursed by Canada in 2021, this project is still operational and managed by IBRD (World Bank). With the recent approval in co-financing by CCEFCF, all US$47.5 million has been fully allocated to Indonesia, specifically in the Sustainable Least-cost Electrification Program with World Bank.

The other concessional loan fund is Blended Climate Finance Program (BCFP), which has also been fully disbursed by Canada in 2021 but is still operational and managed by IFC. Indonesia is an eligible country and can receive up to an estimated CAD45.8M (~US$33.9 million) for climate change mitigation and adaptation project (including renewable energy).

The committed grants also include Canada's contribution to ESMAP, SEA ETP, CEFIM and IEA CETP, which Canada plan to use its position in the governance/advisory boards of these programs to advocate for these funds to support the JETP. Yet, since these are pooled funds, Canada cannot predetermine the amount that will be in fact allocated to JETP projects.

Denmark

Denmark is committing a total of ~US$161.9 million, which consist of US$60 million concessional loan, US$100 million equity investment, and US$1.9 million grant.

Table 7.4-3 Denmark Public Finance Commitment

Source: (JETP analysis based on IPG submissions and consultations, 2023)

Funding Entity	Funding Mechanism	Program Name / Description	Investment Focus Area	Amount in US$(Millions)	Amount in Home Currency (Millions)
IFU	Equity	Equity investment for RE	Renewable Energy	100.0	700.0
Subtotal Equity				**100.0**	**700.0**
Danida Sustainable Infrastructure Finance (DSIF)	Concessional Loan	Agricultural biomass waste project on Lombok	Biomass / Waste to Energy	60.0	420.0
Subtotal Concessional Loan				**60.0**	**420.0**
DSIF	Grant	Agricultural biomass waste project on Lombok	Biomass / Waste to Energy	0.9	6.3
DSIF	Grant	Feasibility study on Sulawesi transmission grid connectivity	Transmission	1.0	7.0
Subtotal Grant				**1.9**	**13.3**
Total				**161.9**	**1,133.3**

The US$60 million concessional loan and US$0.9 million grant is designated for an agricultural biomass waste project on Lombok, which is currently in inception phase. According to Denmark, the funding will be based on (attractive) commercial terms that cover capital expenditure (CAPEX) (not operational expenditure (OPEX)), with a grant element that will be able to reduce the interest rate payments – possibly down to zero.

The US$100 million equity investment is through IFU, a DFI established by the Denmark government, investing in the private sector by way of equity, quasi-equity, mezzanine and/or long-term loans. The investment targets include renewable energy and infrastructure projects. All such proposals will be appraised against commercial terms and results and subject to UN's SDG targets and EU Taxonomy. Last, a US$1 million grant for feasibility study on Sulawesi transmission grid connectivity is in the pipeline, with the scope of study subject upon request from GoI and approval from DSIF.

Further, there is a potential EUR50 Mn (~US$54.1 Mn) non-concessional loan through Denmark's Export and Investment Fund (EIFO) to support energy efficiency projects. This potential funding will be included in the table above when the new Working Group for energy efficiency and electrification is set up by the JETP Secretariat.

EU

EU's EUR1.0 billion (~US$1.1 billion) commitment comprises of EUR1 billion (~US$1.1 billion) loan disbursed through EIB, EUR17 million (~US$18.4 million) and EUR5 million (~US$5.4 million) ongoing TA grants, and EUR2.5 million TA grant through EU-IDN Cooperation Facility.

Table 7.4-4 EU Public Finance Commitment

Source: (JETP analysis based on IPG submissions and consultations, 2023)

Funding Entity	Funding Mechanism	Program Name / Description	Investment Focus Area	Amount in US$(Millions)	Amount in Home Currency (Millions)
EIB	Concessional/Non -Concessional Loan	Sovereign and non-sovereign loan (project-dependent)	All IFA eligible except Early Retirement of CFPP	1,081.1	1,000.0
Subtotal Concessional/Non-Concessional Loan				**1,081.1**	**1,000.0**
KfW	Grant / TA	Support for Infrastructure Investments S4I	RE	18.4	17.0
AFD	Grant / TA	SDG Indonesia One -Support to PT SMI	RE	5.4	5.0
EU - IDN cooperation facility	Grant / TA		All IFA eligible	2.7	2.5
Subtotal Grant / TA				**26.5**	**24.5**
Total				**1,107.6**	**1,024.5**

The EUR1 billion loan includes sovereign and non-sovereign loan, which financing terms might vary project by project. This loan can be used for all JETP Investment Focus Area except IFA2 Early Retirement of CFPP. The US$2.5 million grant will be implemented through EU-IDN Cooperation Facility, which can provide TA through some studies and/or focus group discussions/dialogues, without limitation in terms of the JETP Investment Focus Area.

There are ongoing TA grant projects, including EU contribution to the EUR17 million grant to KfW for TA in infrastructure sector (including energy sector), and EUR2 million investment grant and EUR3 million grant to AFD for TA in energy sector.

France

Through AFD, France is committing up to EUR500 million (~US$540.5 million) concessional loans in the type of Policy-Based Lending (PBL), Results-Based Lending (RBL), and concessional loans for renewable energy projects. The PBL and RE projects committed amounts are not final, and the maximum range may make the total contribution to be EUR800 million. However, France total contribution to be recorded in the current CIPP version is EUR500 million.

Table 7.4-5 France Public Finance Commitment

Source: (JETP analysis based on IPG submissions and consultations, 2023)

Funding Entity	Funding Mechanism	Program Name / Description	Investment Focus Area	Amount in US$(Millions)	Amount in Home Currency (Millions)
AFD	Concessional Loan	PBL ASET	RE	108.1 to 216.2	100 to 200
AFD	Concessional Loan	Renewable energy projects	Hydro and Wind	0 to 324.3	0 to 300
AFD	Concessional Loan	RBL AICET	RE	324.32	300
Total				**Up to 540.5**	**Up to 500**

Through the PBL Affordable and Sustainable Energy Transition (ASET), AFD, co-financing with ADB and KfW, envisage to support and finance the policy reform that will enable the necessary regulatory framework in Indonesia for implementing its energy transition agenda.

The program consists of two subprograms, the first period (November 2022 – October 2023) include 11 policy actions in two policy reform areas: (i) policies and regulatory framework for clean energy transition established, and (ii) sector governance and financial sustainability strengthened. The second period subprogram (October 2023–October 2025) has not yet been discussed with the government. The amount committed by France is between EUR100 to 200Mn.

Renewable energy projects committed by France through AFD continues supporting and financing renewable energy projects under PLN, covering the project preparation phase, the preparation of environment and social studies, and project construction for hydropower and wind projects. The 44 MW hydropower project is intended to strengthen baseload renewable energy for Sumatra grid. The 200 MW wind farm project will increase renewable energy share in Java-Bali system. Both projects are currently under preparation, and the estimated timeline for both projects depend on the outcome of the preparatory study, with a committed amount estimated to be between EUR0-300 Mn.

The RBL Accelerating Indonesia Clean Energy Transition is a co-financing agreement between AFD, ADB and KfW to provide financing to PLN in achieving its strategic objective and target to use green low-carbon energy. The RBL will define objective in terms of measurable achievement and results to encourage PLN to focus its activities on delivering financially, environmentally, and socially beneficial impacts. The program will include a list of indicators to be achieved by PLN over the implementation period of 2024–2030. The indicators will focus on (i) investing in various renewable energies and facilitating the coal phasing out, (ii) developing smart grid infrastructure, (iii) involving the private sector, (iv) accessing alternative sources of financing, and (v) strengthening environmental and social safeguards.

Germany

Germany committed up to around EUR1,527.3 million (~US$1,651.2 million), consisting of EUR1,363.9 million (~US$1,474.5 million) concessional loan, EUR8.8 million (~US$9.5 million) equity, and EUR154.6 million (~US$167.2 million) grant and TA grant. The breakdown of this as follows:

Table 7.4-6 Germany Public Finance Commitment

Source: (JETP analysis based on IPG submissions and consultations, 2023)

Funding Entity	Funding Mechanism*	Program Name / Description	Investment Focus Area	Amount in US$(Millions)	Amount in Home Currency (Millions)
BMZ (through KfW)	Concessional Loan	Still to be defined; loans for renewable energies investments	Transmission and RE	540.5	500.0
BMZ (through KfW)	Concessional Loan	Green Energy Corridors Sulawesi (GECS)	Transmission	324.3	300.0
BMZ (through KfW)	Concessional Loan	RBL AICET	Transmission and RE	324.3	300.0
BMZ (through KfW)	Concessional Loan	PBL ASET	Early Retirement of CFPP and RE	216.2	200.0

Funding Entity	Funding Mechanism*	Program Name / Description	Investment Focus Area	Amount in US$(Millions)	Amount in Home Currency (Millions)
BMZ (through KfW)	Concessional Loan	RBL SREAP	Transmission	69.1	63.9
Subtotal Concessional Loan				**1,474.5**	**1,363.9**
BMZ (through KfW)	Equity	Climate Transformation Fund Asia (CTFA)	All IFA Eligible	9.5	8.8
Subtotal Equity				**9.5**	**8.8**
IKI/ ADB ETM	Grant	IKI Funds for JETP Indonesia within the ETMPF for coal early retirement	Early Retirement of CFPP	32.4	30.0
BMZ (through GIZ or other)	Grant / TA	Indicative amount, still to be defined	All IFA Eligible	32.4	30.0
IKI/additional funding	Grant / TA	Additional funding in line with investment plan discussions and/or other TA needs	All IFA Eligible	32.4	30.0
IKI/ SETI (through GIZ)	Grant / TA	Sustainable Energy Transition in Indonesia (SETI)	Renewable Energy	16.2	15.0
BMZ (through KfW)	Grant	Green Bond Development Facility	All IFA Eligible	11.7	10.8
BMZ (through KfW)	Grant	Energy Transition Acceleratioon Programme (ETAP)	Geothermal, Green Hydrogen, and Ammonia	7.0	6.5
IKI/ JET (through GIZ)	Grant / TA	Innovation Regions for a Just Energy Transition (JET)	Just Transition	5.7	5.3
BMZ (through GIZ)	Grant / TA	Support for PT.SMI for ETM / business models for coal phase-out / RE acceleration	Early Retirement of CFPP and RE	5.4	5
IKI/ ALCBT	Grant / TA	The Asia Low-Carbon Buildings Transition (ALCBT)	RE	4.1	3.8
BMZ (through GIZ)	Grant / TA	Green Jobs for Social Inclusion and Sustainable Transformation (GESIT)	RE and Just Transition	3.8	3.5
BMZ (through GIZ)	Grant / TA	Green Energy project (following up on REEP2)	Transmission and RE	3.2	3.0
IKI/ CASE (through GIZ)	Grant / TA	Clean, Affordable and Secure Energy for Southeast Asia (CASE)	All IFA Eligible	2.7	2.5
BMZ (through KfW)	Grant	Exact content still to be defined	All IFA Eligible	2.2	2.0
BMZ (through GIZ)	Grant / TA	1000 Islands/Renewable Energy for Electrification	Transmission and RE	2.2	2.0

Funding Entity	Funding Mechanism*	Program Name / Description	Investment Focus Area	Amount in US$(Millions)	Amount in Home Currency (Millions)
		Programme (REEP2)			
BMZ (through GIZ)	Grant / TA	Renewable Energy Mini-Grids Triangular Cooperation	RE	2.2	2.0
IKI/ ExploRE (through GIZ)	Grant / TA	Strategic exploration of economic mitigation potentials through renewables (ExploRE)	RE	1.6	1.5
BMZ (through KfW)	Grant	Exploration drilling of Geothermal Field Candi Umbul Telomoyo	RE	1.1	1.0
BMZ (through KfW)	Grant	Sustainable Hydropower Programs I&II	RE	0.8	0.7
Subtotal Grant / TA				**167.2**	**154.6**
Total				**1,651.2**	**1,527.3**

The orange-highlighted line items show funding amounts/projects that have not yet officially committed to the GoI via the common processes (government to government negotiations, verbal notes). These do not involve any obligations and are still subject to planning and budgetary procedures on both the German and Indonesian side as well as dependent on progress of the JETP.

Some of the grant and/or TA are newly-committed funds (additional funding committed after JETP Joint Statement signing) for ongoing projects, including Sustainable Energy Transition in Indonesia (SETI), Innovation Regions for a Just Energy Transition (JET), Clean, Affordable and Secure Energy for Southeast Asia (CASE), 1000 Islands/Renewable Energy for Electrification Programme (REEP2) implemented by GIZ and the Asia Low-Carbon Buildings Transition (ALCBT) implemented by GGGI.

Italy

Italy committed up to EUR250.0 million (~US$270.3 million) in 5 years for Indonesia JETP, which should be offered through the Italian Climate Fund – ICF (Italy's Governmental Fund, managed by *Cassa Depositi e Prestiti S.p.A.* CDP). The exact details, including confirmation of the funding entity, indication of mechanisms / split across financial instruments and level of concessionality, are still being defined. Eligible financial instruments may include concessional and non-concessional loans, guarantees to financial institutions, indirect equity (funds), and grants / T, all subject to specific limits applicable to each financial instrument. Projects across all investment focus areas are potentially eligible, should the project pass the eligibility criteria: Rio Marker 2 mitigation and/or adaptation*. Each transaction will be subject to approval by the competent bodies.

Table 7.4-7 Italy Public Finance Commitment

Source: (JETP analysis based on IPG submissions and consultations, 2023)

Funding Entity	Funding Mechanism	Program Name / Description	Investment Focus Area	Amount in US$(Millions)	Amount in Home Currency (Millions)
Italian Climate Fund	Concessional/Non-Concessional	To be defined	Potentially all IFA eligible should the project meet Rio Marker 2 criteria	270.3	250.0
Total				**270.3**	**250.0**

**Based on Scoring System for Climate Markers, Mitigation and/ or Adaptation "Score 2" targets the United Nations Framework Convention on Climate Change (UNFCCC) as a principal objective, that an activity can be marked as principal when the objective (climate change mitigation or adaptation) is explicitly stated as fundamental in the design of, or the motivation for, the activity (OECD, 2016).*

Japan

Japan currently commits an estimate of US$1.7 billion funding, consisting of JICA concessional loan and, JBIC non-concessional loan and investment, as well as small amount of grants. The US$ amount is indicative, due to exchange rate with Yen, and the funding allocation and terms will be determined project by project. All sectors under the JETP Investment Focus Area are eligible, subject to requirement or limitation being met by the project.

Table 7.4-8 Japan Public Finance Commitment

Source: (JETP analysis based on IPG submissions and consultations, 2023)

Funding Entity	Funding Mechanism	Program Name / Description	Investment Focus Area	Amount in US$ (Millions)
JICA/JBIC	Concessional Loan/Non-Concessional Loan	Sovereign and non-sovereign loan (project-dependent)	All IFA eligible	1,700.0
Total				**1,700.0**

Norway

Through Norfund, the Norwegian Investment Fund for developing countries, US$250.0 million (2,500.0 NOK) equity investment can be provided into entities / projects that would deploy the capital for RE asset in Indonesia. While debt is also possible alongside partner (local or international co-lender), Norfund prioritizes equity investment with minority shareholding. The eligible JETP Investment Focus Area is Renewable Energy, including wind, solar, hydro, battery energy storage system (BESS), with geothermal also possible.

Table 7.4-9 Norway Public Finance Commitment

Source: (JETP analysis based on IPG submissions and consultations, 2023)

Funding Entity	Funding Mechanism	Program Name / Description	Investment Focus Area	Amount in US$ (Millions)	Amount in Home Currency (Millions)
Norfund	Equity	Equity investment for RE	Wind, Solar, Hydro, BESS, Geothermal possible	250.0	2,500.0

Funding Entity	Funding Mechanism	Program Name / Description	Investment Focus Area	Amount in US$ (Millions)	Amount in Home Currency (Millions)
Total				**250.0**	**2,500.0**

UK

The UK commitment of US$1.15 billion includes the US$1 billion IBRD PCT (World Bank) Guarantee and US$150m from Private Infrastructure Development Group (PIDG), which is a multi-donor initiative.

Table 7.4-10 UK Public Finance Commitment

Source: (JETP analysis based on IPG submissions and consultations, 2023)

Funding Entity	Funding Mechanism	Program Name / Description	Investment Focus Area	Amount in US (Millions)
IBRD PCT	MDB Guarantee	Guarantee to increase WB lending limit	All IFA eligible except Early Retirement of CFPP	1,000.0
Subtotal MDB Guarantee				**1,000.0**
PIDG	Equity	PIDG portfolio of equity	RE and RE Value Chain	25.0
PIDG	Non-Concessional Loan	PIDG portfolio of debt instruments	RE and RE Value Chain	50.0
PIDG	Guarantee	Guarantee offer through Guarantco	RE and RE Value Chain	75.0
Subtotal PIDG				**150.0**
Total				**1,150.0**

The MDB guarantee will enable an additional US$1 billion in concessional, sovereign-guaranteed lending from the World Bank to Indonesia for JETP programs. These guarantees are to be made available additional to Indonesia's SBL with the World Bank.

The PIDG supports infrastructure investment, operating along the project life cycle and across the capital structure to help projects overcome financial, technical, or environmental challenges, creating investment-ready, bankable infrastructure opportunities. PIDG undertake their own pipeline origination and due diligence and the terms of the project finance depend on the individual project. US$150 million is dependent on private sector-led projects that meet financing, environmental, and social standards. PIDG have portfolio of equity and debt instruments including structured corporate loans, mezzanine and subordinated debt, bridge, and viability gap funding etc., for early project development finance and can deploy these instruments as appropriate, hence the breakdown the table is indicative. The guarantee offer can be done through Guarantco, where the opportunity is sourced and which provides the guarantee to raise debt to finance projects in local currency through capital markets, giving projects a higher credit rating and ability to raise capital from institutional investors.

USA

The USA is committing a total of US$2.1 billion, which includes US$1 billion MDB Guarantee for IBRD PCT (World Bank), US$1 billion non-concessional loan through DFC, and a total of US$67.7 million Grant/TA.

Table 7.4-11 USA Public Finance Commitment

Source: (JETP analysis based on IPG submissions and consultations, 2023)

Funding Entity	Funding Mechanism	Program Name / Description	Investment Focus Area	Amount in US$ (Millions)
IBRD PCT	MDB Guarantee	Guarantee to increase WB lending limit	All IFA eligible except Early Retirement of CFPP	1,000.0
Subtotal MDB Guarantee				**1,000.0**
DFC	Non-Concessional Loan	Private sector funding	All IFA eligible except Early Retirement of CFPP	1,000.0
Subtotal Non-Concessional Loan				**1,000.0**
MCC	Grant	Grants to incentivize wind–down of CFPP	All IFA eligible	50.0
MCC	Grant	TA to support the development of economically viable early coal retirement transactions	All IFA eligible	15.0
USTDA	Grant	FS for onshore wind development in West Sumbawa	Wind	1.0
USTDA	Grant	FS for RE implementation, PT MRT Jakarta	RE	0.7
Subtotal Grant				**66.7**
Total				**2,066.7**

The US$1 billion MDB guarantee works similar to the above referenced UK scheme, with the intention to enable an additional US$1 billion in concessional, sovereign-guaranteed lending from the World Bank to Indonesia for JETP program in addition to Indonesia's SBL,

Up to US$1 billion is committed through DFC, could be in a form of direct loan to eligible private sector-led opportunities. In addition to debt, guarantees and/or political risk insurance per transaction, as well as equity investments—up to 30% of a direct equity or fund transaction—in companies and funds can also be exercised. DFC's ability to provide investments ultimately remains a function of the volume of private sector-led projects that meet DFC's financing, environmental, and social standards, and that seek financing from DFC; project developers can only proceed where host governments have provided the regulatory and enabling environment that supports private sector investment in climate mitigation, adaptation, and other clean energy transition projects.

Millennium Challenge Corporation (MCC) intends to commit US$50 million in grants to incentivize wind–down of coal-fired power plant operations in anticipation of CFPP decommissioning in Indonesia and US$15 million in TA to support the development of economically viable early coal retirement transactions. The MCC grant funding is flexible, and it is available for early coal retirement, but it can also be used to bring down the cost of financing for a range of JETP projects that the CIPP identifies as priorities and in line with MCC's constraints analysis.

The other grants by the USA include the US$1,046,434 for a feasibility study for the development of a 111.3 MW onshore wind farm in West Sumbawa in West Nusa Tenggara and US$709,630 to PT Mass Rapid Transit Jakarta (MRT), Jakarta's public transit operator, for a feasibility study to advance the decarbonization of Jakarta's MRT system through renewable energy.

Indonesia Energy Transition Mechanism (ETM)

An additional pool of funds for this JETP comes from the funds allocated to Indonesia's ETM program through Indonesia's Investment Plan for funds from the Climate Investment Funds Accelerated Coal Transition (CIF-ACT), which "provides a dedicated platform that offers resources at scale at a time when these countries are facing competing pressures on their public finances."

The ETM partnership led by the ADB was launched in 2021. The Japanese grant is the first seed financing to be announced for ETM. CIF-ACT is a global fund, with the identified IPG country contribution being:

- United States ~US$1 billion;
- United Kingdom ~US$500 million;
- Germany ~EUR260 million;
- Canada ~CAD1 billion; and
- Denmark ~the balance.

The exact amount and the share of individual country contribution specifically for the Indonesia ETM are not available as the actual contributions come over time from the various treasuries to the trustee of the fund.

Indonesia's CIF-ACT investment plan was developed by the GoI in collaboration with the ADB and the World Bank Group and will utilize US$500 million in CIF-ACT funding, plus US$2,059 millions of MDB co-financing.

Table 7.4-12 Indonesia ETM Program and Funding

Source: (Indonesia ETM Financing Plan submitted to JETP Secretariat,13 July 2023)

Program Name / Description	Sector	Program / Funding Entity	Mechanism	US$ Value (Millions)
Component 1.1.a. PLN Early Retirement Program (RBL)	Agnostic	CIF-ACT	Concessional Loan	50.0
		ADB	Concessional Loan	530.0
Component 1.1.b. PT SMI Early Retirement Program	Early Retirement of CFPP	CIF-ACT	Concessional Loan	98.0
		CIF-ACT	Grant	1.0
		ADB	Concessional Loan	102.0
Component 1.2 Private CFPP Early Retirement Program	Early Retirement of CFPP	CIF-ACT	Concessional Loan	100.0
		ADB (Private)	Non-Concessional Loan	400.0
Component 2.1.a CFPP Repurposing	Dismantling, Remediation and Repurposing of CFPP	CIF-ACT	Concessional Loan	125.0
		CIF-ACT	Grant	5.0
		World Bank	Concessional Loan	620.0
Component 2.1.b Just Transition in Coal Regions	Just Transition for Coal Mining Area	CIF-ACT	Concessional Loan	57.0
		CIF-ACT	Grant	5.0
		World Bank	Concessional Loan	128.0
Component 2.2 RE repowering program (on + off grid)	Renewable Energy	CIF-ACT	Concessional Loan	50.0
		IFC	Non-Concessional	140.0
Component 2.3 Reskilling for RE (Prime STeP)	Just Transition - Reskilling for RE	CIF-ACT	Grant	9.0
		ADB	Concessional Loan	139.0
Subtotal Grant				**20.0**

Program Name / Description	Sector	Program / Funding Entity	Mechanism	US$ Value (Millions)
Subtotal Concessional Loan				**1,999.0**
Subtotal Non-Concessional Loan				**540.0**
Total				**2,559.0**

As at the time of this CIPP development, Component 1 of the ETM - CIF-ACT program has been allocated to projects/programs as follows:

PLN Results Based Loan (RBL) Program

RBL in ADB's term is defined as a performance-based form of financing, where disbursements are linked to results rather than expenditure. The Accelerating Indonesia Clean Energy Transition RBL program to PLN has 9 Disbursement-Linked Indicators, which define pre-determined targets for PLN to achieve that trigger loan disbursements.

This component consists of US$530 million concessional loan from ADB and US$50 million concessional loan from CIF-ACT. Upon reaching the performance targets, these loans can be freely used by PLN.

PT SMI Early Retirement Program

This component specifically provides concessional funding to retire early PLN's owned CFPP. Currently, negotiations are still undergoing for early retirement of the 1,050 MW Pelabuhan Ratu CFPP with financing structure described in Appendix 10.14. If successful, total amount used from the ETM pooled fund will be as follows:

Table 7.4-13 Allocated Fund of PT SMI Early Retirement Program

Source: (Indonesia ETM Financing Plan submitted to JETP Secretariat, 2023)

Source	Amount in US$ millions	Type
ADB	102.0	Concessional loan
CIF-ACT	98.0	Concessional loan
CIF-ACT	1.0	Grant
TOTAL	**201.0**	

This means there is no funding left to be used for other early retirement of PLN-owned CFPP project from the ETM program's current pool of funds.

Private CFPP Early Retirement Program

This component provides a portion of concessional financing from CIF-ACT and commercial financing by ADB Private / PSOD for an IPP-owned early retirement program. Currently, a due diligence is undertaken to assess possibilities to early retire the 660 MW Cirebon-1 CFPP. The required funding is estimated to reach around US$250 million – US$300 million, which if successful will tap on some of the ETM pooled fund, with breakdown as follows:

Table 7.4-14 Allocated Fund of Private CFPP Early Retirement Program for Cirebon-1

Source: (Indonesia ETM Financing Plan submitted to JETP Secretariat, 2023)

Source	Amount in US$ millions	Type
ADB Private	250.0	Non-Concessional loan
CIF-ACT	50.0	Concessional loan
TOTAL	**300.0**	

Considering that funding allocated for Component 1.2. totaled US$500 million from both ADB (US$400 million commercial) and CIF-ACT (US$100 million concessional), this means there are still US$200 million (US$150 million commercial and US$50 million concessional) funding left to be used for another privately-owned early retirement project.

7.4.3 Breakdown of The IPG Funding by Designation

Based on the description of each of the financial resources provided by the IPG, the JETP Secretariat qualitatively categorizes the proposed funding as designated or non-designated. Designated means that the funds already have specific scope finalized or being designed as of the time of confirmation process with the IPG. For example, all the ongoing TA being extended, ETM funds, PBLs, and RBLs are considered designated. The summary of designated funds based on their modalities and sector is as follows.

Table 7.4-15 Designated The IPG Public Funding (US$ Million)

Source: (JETP analysis based on the IPG submissions and consultations, 2023)

DESIGNATED	Grant / TA	Concessional Loan	Non-Concessional Loan	Total
All IFA Eligible	18.1	580.0		**598.1**
Transmission	1.0	393.4		**394.4**
Transmission and RE	5.4	371.8		**377.2**
Early Retirement of CFPP	6.0	1,045.0	400.0	**1,451.0**
Early Retirement of CFPP and RE	5.4	216.2		**221.6**
RE	60.1	650.5	140.0	**850.7**
Just Transition	25.3	324.0		**349.3**
Just Transition and RE	3.8			**3.8**
Total	**125.1**	**3,581.0**	**540.0**	**4,246.1**

Non-designated funds are those which description has not specifically defined which project or program they will be allocated for, potentially making them more flexible in terms of scoping according to the JETP investment needs compared to designated funds. Examples are the loans committed by the U.S., Japan and the EU. In consultation with the financial institutions providing the multilateral and bilateral, non-designated funding (e.g., DFC, JBIC/JICA and EIB), the investment decision will be made on a project-by-project basis. Non-designated funds based on their modalities and sector are summarized as follows.

Table 7.4-16 Non-designated The IPG Public Funding (US$ Million)

Source: (JETP analysis based on the the IPG submissions and consultations, 2023)

NON-DESIGNATED	Grant / TA	Concess. Loan	Non-Concess. Loan	Equity	MDB Guarantee	Guarantee	Other / to be defined	Grand Total
All IFA eligible	134.7	1,700.0		9.5				1,844.2
All IFA eligible except Early Retirement of CFPP		1,081.1	1,000.0		2,000.0		270.3	4,351.4
Transmission and RE		540.5						540.5
Early Retirement of CFPP	32.4							32.4
RE and RE Value Chain			50.0	25.0		75.0		150.0
RE		33.9		350.0				383.9
Total	**167.2**	**3,355.5**	**1,050.0**	**384.5**	**2,000.0**	**75.0**	**270.3**	**7,302.5**

7.5 Financing Structure Options

7.5.1 Modality Toolkit

Public and private financing provided by the IPG members as well as the GFANZ Working Group members can be used on a stand-alone basis or combined to leverage blended concessional finance. Figure 7.5-1 displays different financing modalities that are available to support JETP-Compliant projects.

Financing modality	Funding Instrument/type
1 Public	• Grants/technical assistance • MDB Guarantees • Concessional loans • Non-concessional loans • Equity investments
2 Private	• Commercial loans (private non-concessional loans) • Equity investments • Capital markets
3 Blended finance	• Credit enhancement mechanisms • Guarantees • Non-fiscal incentives
4 Philanthropy	• Grants/technical assistance/risk capital
5 Carbon finance	• Carbon market: Emission Trading System and carbon offset • Carbon tax • Result-based payment

Source: (JETP Secretariat and Working Groups, 2023)

Figure 7.5-1 Financing modalities to support JETP

In addition to public and private finance as described above, we acknowledge the role of other subspecialities within finance which might help accelerate the country's energy transition.

Capital Markets

The capital market in Indonesia is well equipped to allocate transition-related finance and is one of the keys to raising longer-term private finance for transition-related transactions. Indonesia has experienced an average growth of 10% in market capitalization since 2017 with various capital market products (OJK, 2023). Considering JETP's investment needs, there are opportunities to optimize capital market products to scale up transition finance, such as:

1. By broadening the coverage of environmental, social, and governance (ESG) products, such as Green, Social, and Sustainability (GSS) Bonds, transition bonds, and municipal bonds. GSS Bonds require issuers to use the raised capital for a pre-defined set of projects with environmental and/or social impact and continuously report on the use of proceeds. GSS bond issuers typically want to refrain from the additional costs associated with the issuances of GSS bonds, especially for framework development and impact reporting. Addressing these barriers could be done by favourable tax regime and an incentive scheme, such as GSS bond subsidy, similar to those in Singapore and Malaysia, which offer cost-sharing schemes to GSS bond issuers to kick-start the market and promote standardization throughout the market (ASEAN Capital Markets Forum, 2022).

   Building on the above, regulators could introduce a scheme requiring investors to invest a certain share in green and/or transition related portfolios, especially to attract the investor group from insurance and pension funds. Capacity building on raising awareness on ESG investment and standardize sustainability guidelines should be introduced by having public ESG data and impact platform. More comprehensive regulations and guidelines on different financial instruments with different types of market participants can be explored.

   The utility sector is the only sector showcasing longer term maturities, where 33% of the outstanding corporate bonds have maturities from five to ten years and 43% have maturities longer than 10 years (Credit Guarantee and Investment Facility, 2022). Thus, further efforts should be done to promote the appetite from investors in long-term investments, e.g., by incentivizing pension and insurance programs that require long-term capital allocation from institutional investors (World Bank, 2018).

2. By advancing credit enhancement schemes for bond issuances. According to numbers from the Credit Guarantee & Investment Facility, the share of guaranteed bonds to total domestic corporate bonds amounts to only 2%. For instance, in 2022, PT SMI provided credit enhancement for a hydropower plant project company by making use of a credit guarantee facility, that enabled a final investment grade bond rating of AAA from Pefindo (PT SMI, 2022). This scheme can be replicated to facilitate investment in JETP-compliant projects, particularly for the projects categorized in IFA #3 and IFA #4.
3. By promoting derivative products, for instance, hedging, to enable integration of the domestic and international markets (Climate Bonds Initiative, 2020). The large bulk of infrastructure-related investments in the Indonesian energy sector are denominated in US-Dollars, especially the large volume projects. Due to a low number of available

hedging products in the Indonesian market, project owners will usually tap international markets, to raise the required capital in US-Dollars. An optimal allocation of transition-related financing through capital markets will require further promotion of derivative products, like hedging, to enable the management of currency exchange and convertibility risks among domestic and international investors and markets.

4. By incentivizing pension and insurance programs that require long-term capital allocation from institutional investors (World Bank, 2018). Institutional investors such as pension funds and insurers, due to the longer-term nature of their liabilities, represent a potentially major source of long-term financing for illiquid assets such as infrastructure. Asset allocation trends observed in recent years show a gradual globalization of portfolios with an increased interest in emerging markets and diversification into new asset classes.
5. By strengthening the capital market ecosystem and the regulatory foundation to channel ESG investments (OJK, 2023) (Asian Development Bank, 2021). GoI has published the National Strategy for Financial Market Development, 2018–2024, while Bank Indonesia published the Blueprint for Money Market Development, 2025. In addition to strengthening the overall regulatory framework for the bond and capital markets, OJK has issued the Sustainable Finance Roadmap Phase II (2021–2025), the Indonesia Green Taxonomy, Regulation No. 51/POJK.03/2017 regarding the implementation of sustainable finance and POJK 18/ 2023 on Sustainability Bonds and Sukuk.

   POJK 18/2023 replaces regulation POJK 60/2017 on Green Bonds and has a wider coverage that is not only limited to green bonds and sukuk, but also social bonds/sukuk, sustainability bonds/sukuk, sukuk-linked waqf, and sustainability-linked bond to promote the application of ESG factors across industries and instruments (Asian Development Bank, 2021) (OJK, 2023). Together with key capital market stakeholders, such as the Indonesia Stock Exchange (IDX), Indonesia Clearing and Guarantee Corp (IDClear), and Indonesia Central Securities Depository (KSEI) – OJK, is continuously working on progressing the reform agenda to deepen the market and position it as a trustful marketplace within the ASEAN region (OJK, 2023). In doing so, capacity building on raising awareness on ESG investment and standardizing sustainability guidelines on different financial instruments is recommended.

Blended Finance

Blended finance is the strategic use of development finance for the mobilization of additional finance towards sustainable development in developing countries (OECD, 2020). Blended finance enables the strategic use of both public and private finance to mobilize capital at scale. At its core, blended finance uses relatively small amounts of concessional funds to mitigate specific investment risks and help rebalance risk-reward profiles of pioneering investments that are unable to proceed on strictly commercial terms (International Finance Corporation, 2021). Utilization of blended financing should ensure that concessional financing is used in a catalytic way, that would crowd-in commercial financing to a strategic project that would otherwise be deemed as not bankable.

Blended finance solutions can be structured as debt, equity, risk-sharing, or guarantee products with different rates, tenor, security, or rank. Solutions are tailored to address specific market barriers and failures and the requirements of donor partners (i.e., the IPG, philanthropies). If private sector, commercial banks deem the project to exceed their risk appetite, then a partial risk guarantee could be used. If the technology is immature or there are other technical difficulties, then TA might be deployed. In this way the concerns limiting the entry of commercial financing is reduced and strategic use of blended finance is achieved.

In the context of the Indonesian JETP, blended finance refers to the combination of concessional finance from the IPG, philanthropies with (i) commercial finance from the GFANZ Working Group members, and/or (ii) other commercial lenders, and/or (iii) non-concessional finance from MDBs' and DFIs' private sector lending arms.

An optimal allocation between public and private finance will extend the reach and effectiveness of funding available to enhance development impact. This should be done in a coordinated manner and underpinned by this CIPP. The JETP instruments, which can be applicable include, but are not limited to:

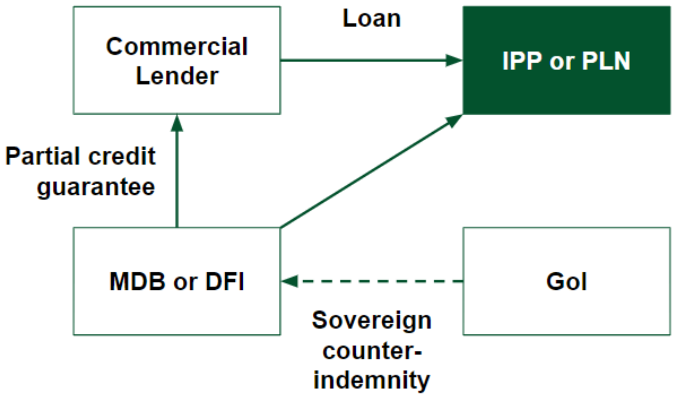
1. Blended finance for de-risking, such as credit enhancement mechanisms. As an example, PT SMI has developed a credit rating enhancement for domestic bond issuers, which improves the credit risk profile of the bonds issued by local corporate and/ or IPPs which has rating lower than PT SMI. PT SMI provides a guarantee to the issued bonds, thus enabling them to obtain better ratings or at par with PT SMI's AAA rating. This type of product can be replicated to accelerate JETP implementation.

   In the case of PT SMI's role in facilitating JETP transactions:

   - JETP would offer an option for financiers to go through the proposed ETM Country Platform to obtain credit enhancement mechanisms from the GoI, which would be determined based on eligibility criteria listed in the JETP Financing Principles and Approach (Subchapter 7.3);
   - Arrangement regarding the blending of the IPG public finance, GoI budget, and other sources of finance would be assessed in reference to JETP Financing Principles and Approach and coordinated by the relevant ETM Country Platform stakeholders (See Chapter 9)

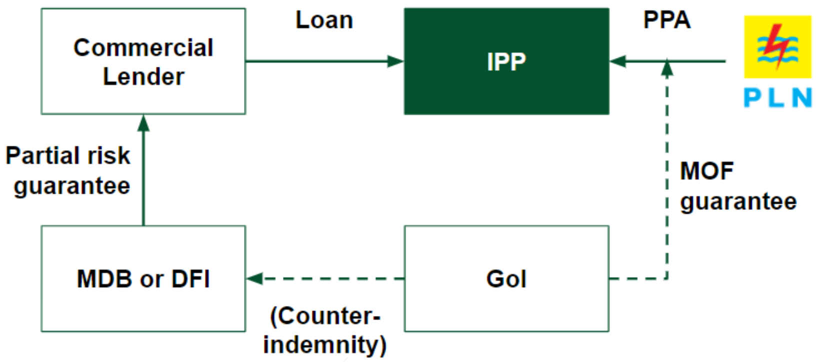
2. Guarantees including, but not limited to:

   Partial credit guarantees (PCG) and partial risk guarantees (PRG). A PCG provides lenders and investors with comprehensive credit cover on the portion of the loan or bond guaranteed; and a PRG covers lenders against nonpayment by the borrower caused by political risk events only (political risk guarantee) as well as breaches of contract under a power purchase agreement (extended political risk guarantee). PRGs are hence well suited where commercial lenders are willing to take on the commercial or credit risks of a project but not political risks. Illustrations of potential PCG and PRG structures are shown below:



Source: (ADB, 2023)

Figure 7.5-2 Partial Credit Guarantee Structure



Source: (ADB, 2023)

Figure 7.5-3 Partial Risk Guarantee Structure

3. Other incentives can be in the forms of, but not limited to, Viability Gap Funding (VGF) and Project Development Facility (PDF) for project developers to lower the cost of capital or lower the risk of a project. Generally, VGF and PDF support could come from various sources, including donor agencies, philanthropies, and government and government agencies.

   In the Indonesian context, as stipulated in the MoF Regulation 08/2020, Project Development Facility (PDF/*Fasilitas Penyiapan Proyek*) is defined as "a facility provided by the MoF to assist the PPP project coordinator to finalize the pre-feasibility study, tender documents, and accompaniment in structuring PPP project transactions until obtaining financing from financing institutions". Viability Gap Fund (VGF/*Dukungan Kelayakan*) is "government support in the form of a fiscal contribution of a financial nature provided to a PPP project by the MoF. Currently, these MoF instruments have been minimally utilized in the renewable energy sector and are not yet open to non-PPP projects. However, certain IPPs could potentially tap on PDF or VGF support not sourced from the State Budget.

Philanthropy

Philanthropies play an increasingly critical and catalytic role in unlocking and supporting public and private financing to scale up climate solutions in the energy transition space. They can bring together science, government, financial institutions, businesses, and civil society to pursue collaborative actions and drive change. Furthermore, philanthropies can assist decision-makers in defining and establishing a set of guidelines and approaches that can help the entire community move forward an ambitious but achievable energy transition and investment mobilization demand.

In the context of JETP, Indonesia welcomes global, regional and country-level philanthropies to allocate their grants and catalytic capital towards just energy transition activities such as stakeholder engagement, institutional capacity building, TA, policy analysis, project development facilities, resource mobilization, risk capital investments and more.

Carbon Finance

Indonesia has introduced carbon pricing instrument through the enactment of Perpres No. 98/2021 regarding the Implementation of Carbon Pricing to Meet NDC and Controlling the GHG Emission in the National Development. Under this regulation Government introduced instruments that will be implemented to meet NDC target, among others, as follows:

1. Carbon market, that consists of Emission Trading System (ETS) and carbon offset;
2. Carbon tax; and
3. Result-based payment.

This regulation provides the basis for the establishment of domestic and international carbon market that can attract financing for the mitigation actions to help meeting NDC target.

Indonesia has been involved in the international carbon mechanism, such as Clean Development Mechanism (CDM), Voluntary Carbon Market (VCM), Result-based Payment, and Joint Crediting Mechanism (JCM). For example, 140 projects have been registered as CDM projects, and around 47 million Certified Emission Reduction (CER) has been issued for Indonesian-based projects. The registered CDM projects have mobilized around US$7 billion, while about 20 CDM projects have been financed directly by the buyers entirely in return for CERs.

The establishment of the carbon pricing in Indonesia is expected to attract financing for the investment in mitigation activities and can be expected to become source of finance to meet JETP target. For example, currently a baseline and monitoring methodology is being prepared for the early retirement of CFPP. Once this methodology is approved, this could be used to develop CFPP early retirement as carbon projects, thus generate carbon credits to be sold to potential buyers.

To maximize the carbon finance potential the carbon pricing instrument must be designed properly. Some of the design issue for the ETS (cap and trade) that need to be considered among others the cap setting, allocation, sector to be covered, etc. In addition, for the domestic crediting mechanism it needs to be in line with the internationally approved standards, which must consider among others environmental integrity, conservative baseline, additionality and social impacts. Meeting the international standard will help in convincing the potential carbon buyers on the integrity of the carbon unit generated and traded.

7.6 Transition Taxonomy and Planning

7.6.1 Transition Taxonomy

Indonesia needs to expand its existing green and sustainable finance framework, to widen its investment coverage in decarbonization activities. Transition finance framework plays a pivotal role in achieving JETP's emission targets particularly in enabling cheaper financing for early coal retirement that would accelerate the process of energy transition.

The five pillars of the Transition Finance Framework (G20 Sustainable Finance Working Group, 2022) to support the-whole-economic transition toward NZE are recommended for further improvement of Indonesia Green Taxonomy (OJK, 2022):

1. Identification of eligible transition activities and investment through principle-based, taxonomy-based, or a combination of both approaches that encompasses both qualitative and quantitative criteria;
2. Reporting and disclosure of transition plan, activities, and investment that can be verified and compared, which can support decisions of financiers;
3. Transitions-related finance instruments, such as debt and equity instruments, de-risking products, and other instruments including blended finance;
4. Policy measures that provide market signals to incentivize and accelerate the capital flow and to improve the bankability of transition activities; and
5. Mitigation of socioeconomic impacts.

Currently, assessment to update the *Taksonomi Hijau Indonesia* or the Indonesia Green Taxonomy (THI) version 1.0 is being conducted by the Indonesian financial regulators. The proposed improvement of THI 1.0 will be aligned at least with the second version of the ASEAN Taxonomy for Sustainable Finance v2 (ASEAN Taxonomy Board, 2023) a common basis to classify sustainable finance in the region.

ASEAN Taxonomy V2 is a world-first taxonomy to include a framework for managed coal phase-out to be categorized as an eligible sustainable activity. Financing an early phase-out of coal-power plant operations is now being considered as an eligible sustainable activity if the plant's commercial operation period is capped at 35 years, with the expectation that the early retirement effort will facilitate the diversity of the energy transition pathways of ASEAN member countries. It demonstrates an opportunity for Indonesia as an emerging nation to adapt to a regional sustainability framework while aligning with its local context.

The next iteration of the Indonesia's taxonomy is meant to streamline guidance on which activities are aligned with decarbonization goals, and therefore increases investors' confidence, including in investing for transition projects such as early retirement of coal plants. New key measures could be introduced for activities under IFA #2 to allow financiers to tag this as "transition" category, as long as there are clear pathway, timeline, and action plans/

remediation strategy. Restrictions could be applied on certain points such as but not limited to, the age of the plants, emission intensity, uphold to environmental safeguards.

With the support of this localized policy approach, potential financing source for JETP #IFA2 can be expected through varieties of transition finance products. This is in line with the implementation of the OJK Sustainable Finance Roadmap on market expansion for the sustainable finance ecosystem (OJK, 2021).

7.6.2 Transition Planning

Local financial institutions and companies can also drive investment towards Indonesia's energy transition objectives, aided by the introduction of wider initiatives and policies. Where local companies and financial institutions set net zero targets, aligned with those of the government, and undertake transition planning to identify strategies and actions to drive finance towards transition-aligned investments, they can better seize climate opportunities and manage climate risks, including the risk of stranded assets, as well as channeling financing to priority projects.

The GFANZ transition planning framework (GFANZ, 2022) is designed to channel finance to transition financing needs across sectors, and well beyond those that are typically identified in existing taxonomies. This framework provides guidance for a credible, comprehensive and consistent transition plan, that consist of:

- Objectives: articulating the organization's overall approach to net zero, including specific objectives and timelines;
- Implementation: developing a strategy to align business activities, products, services, and policies with the net-zero objectives;
- Engagement: developing a strategy to engage with external stakeholders in support of the net-zero objectives;
- Metrics and targets: establishing a suite of metrics and targets to assess and monitor progress towards the net-zero objectives; and
- Governance: developing a set of structures to oversee, incentivize, and support the implementation of the plan.

A specific challenge for transition is that it implies not only financing activities at the greenest end of the spectrum, but also going where the emissions are, across sectors, and helping companies to get on suitable transition pathways, as well as supporting the orderly phaseout of carbon-intensive assets (such as CFPPs). Companies and financial institutions that have started implementing transition planning will have a greater understanding of opportunities and risks, changing risk appetite, and new approaches to financing.

As such, the framework identifies four important transition strategies that can help to drive decarbonization, namely (i) entities and activities that develop and scale climate solutions, including those that directly eliminate, reduce or remove GHG emissions, or that do so indirectly by enabling others; (ii) entities that are already aligned to a 1.5 degrees C pathway; (iii) entities committed to transitioning or aligning in line with 1.5 degrees C-aligned pathways;

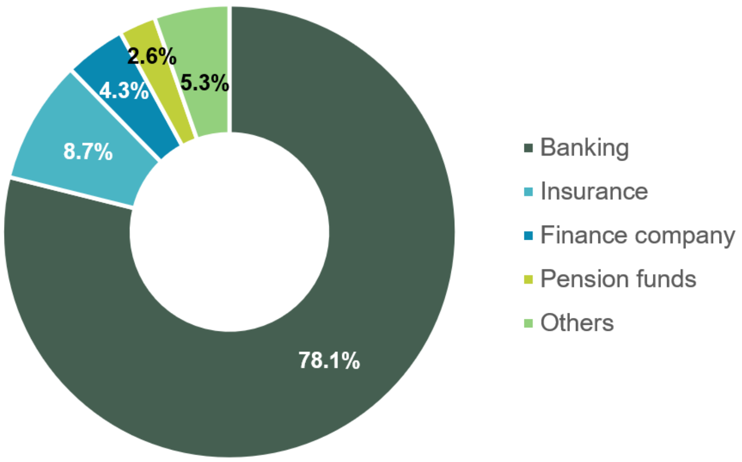
or (iv) the accelerated managed phaseout of high-emitting physical assets. Identifying whether finance provided to activities and companies qualifies as transition finance is not static, but includes consideration of transition pathways and plans, and expected emissions reductions, and progress being made in practice.

7.7 Role of Domestic Financial Institutions to Support JETP Targets

7.7.1 Domestic Banks

The banking sector plays a crucial role in shaping Indonesia's financial landscape, holding a significant 78% share of the sector's total assets (Figure 7.7-1). There are a total of 107 banks in the country as of January 2022, including 8 foreign bank branches, 27 regional development banks, 4 state-owned banks, and 68 national private banks (OJK, 2023). Together, these banks have amassed around Rp.10 quadrillion, which is roughly equal to US$780 billion (ibid.). However, the market is strongly concentrated within four major commercial banks: Bank Rakyat Indonesia (BBRI), Bank Mandiri (BMRI), Bank Negara Indonesia (BBNI), and Bank Central Asia (BBCA) that control 50% of the sector's assets.

Many domestic banks have shown interest to be involved in the overall Indonesia energy transition on top of their BAU portfolios, including to participate in the JETP projects. In fact, these banks obtain local knowledge that could be useful in executing project development, especially in syndication with foreign entities who are not familiar with Indonesia’s landscape.



Source: (Kontan, 2022)

Figure 7.7-1 Indonesia financial sector asset share by type of institution as of October 2020

7.7.2 Non-Bank Financial Institutions

Apart from banks, the roles of other domestic financial services institutions in supporting energy transition projects could be explored, for example:

- Enhancing domestic capital market products, both for equities and debt financing, can be optimized by broadening the coverage of ESG products such as transition activities into the market as previously discussed in subchapter 7.5.1; and
- Introducing transition financing to domestic non-bank financial institutions (NBFIs), such as insurance companies, pension funds, and venture capital, among others. NBFIs provide multiple alternatives to transform an economy's savings into capital investment. Specifically, Indonesian pension funds (Dapen/dana pensiun) are required to implement sustainable finance as of 1 January 2025 (OJK, 2023). Considering the project characteristics and long-term investment targets of NBFIs, they have the potential to become institutional investors in energy transition projects.

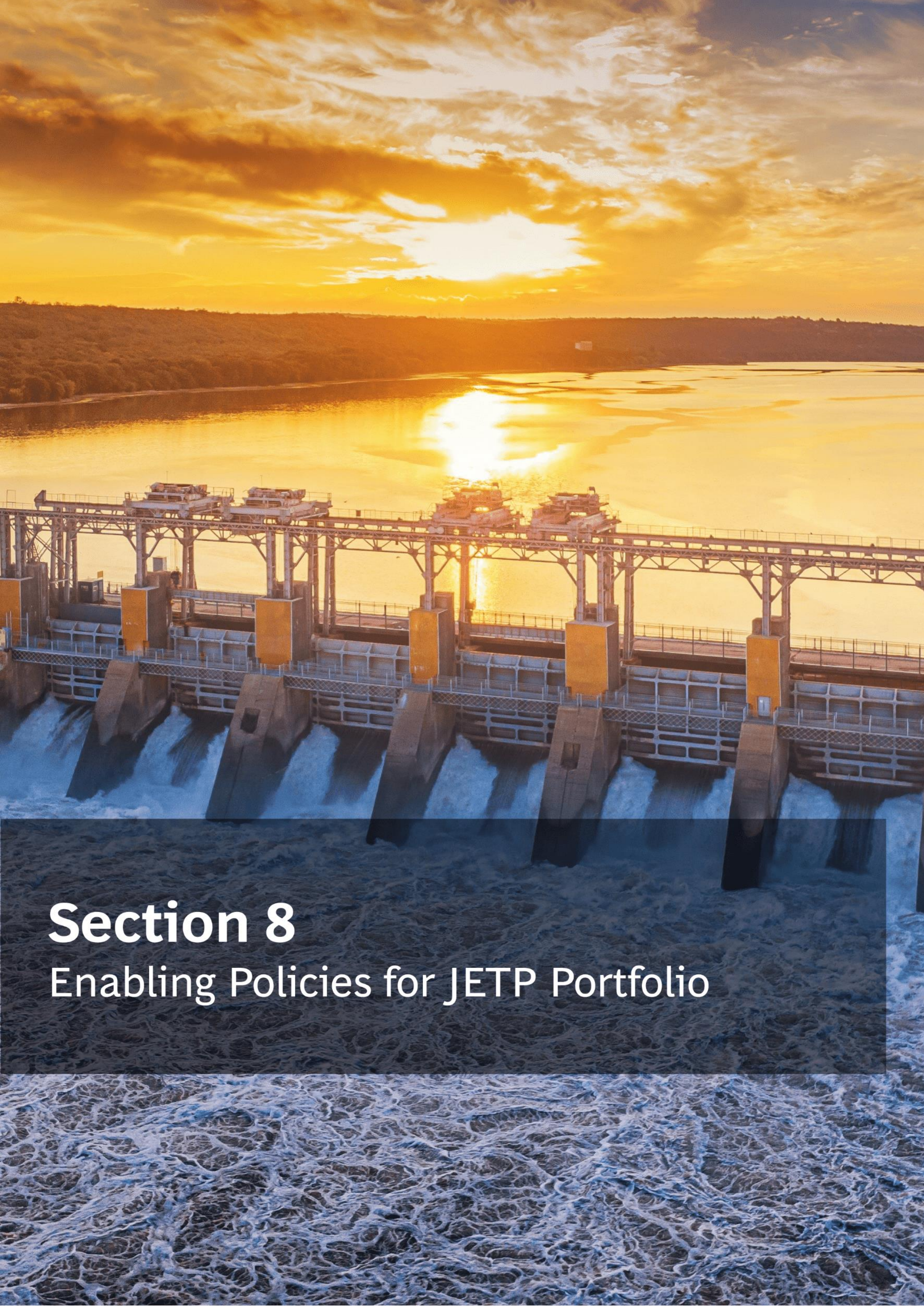
De-risking products to increase the appetite of investors, of which an example of PT SMI past transaction that uses such instruments is detailed in

7.7.3 The Role of Special Mission Vehicles in Energy Transition Financing

In addition to domestic banks, the GoI took steps in 2009, under the Ministry of Finance, to establish two special mission vehicles aimed at catalyzing infrastructure financing, including within the energy transition sector. These entities are SMI and IIGF. Notably, alongside various international development and commercial finance institutions, PT SMI played a pivotal role in the formation of Indonesia Infrastructure Finance (IIF) in 2010.

While SMI and IIF focus on delivering structured and innovative financial solutions for infrastructure projects, which can encompass long-term arrangements under recourse or limited-recourse project financing, the role of IIGF is to act as a government-designated guarantee provider, thereby mitigating governmental risks associated with Public-Private Partnership ventures.PT SMI has also been mandated as the Indonesia ETM Country Platform by the MoF which gives them special authority and treatment to accelerate national energy transition program and to coordinate just energy transition financing and activities and to channel fiscal support, where needed. Through MoF Decision No. 275/KMK.010/2022 and MoF Regulation no. 103 of 2023, PT SMI as ETM Country Platform, among others:

1. Is allowed to assess and integrate fiscal support within the MoF and other sources of de-risking facilities to enhance the involvement of non–state budget financing to accelerate the energy transition in the electricity sector;
2. Acts as Government Investment Operators (OIP), which allows PT SMI to assess government support facility – including fiscal support and equity participation – in managing the funding for the energy transition program in Indonesia; and
3. Is tasked to deploy a range of traditional instruments such as debt (loans), equity, guarantees, bonds, and innovative financing instruments such as blended finance in implementing a just energy transition framework.



Section 8

Enabling Policies for JETP Portfolio

8. Enabling Policies for JETP Portfolio

The policy chapter of the CIPP focuses on enabling policies to achieve the JETP targets while ensuring energy affordability, system stability and sustainability. These policies aim to reduce the cost of scaling up renewable energy and phasing down coal, by removing structure barriers that distort the costs of renewable energy and coal in the market. Eight overarching policy enablers are identified as crucial to bring forward Indonesia's ambition for energy transition. These eight enablers are:

- Strengthening domestic supply chain of renewable energy by reforming Local Content Requirement (LCR);
- Adjusting supply-side incentives;
- Improving renewable energy procurement processes;
- Making power purchase agreements more bankable;
- Enabling early coal retirement and managed coal phase-out;
- Ensuring PLN financial sustainability;
- Strengthening financial policy to support Indonesia's energy transition; and
- Decarbonizing captive power.

Each of these eight enablers address barriers that might hinder Indonesia's ambitious efforts in decarbonization. The policy reforms consist of comprehensive measures that cover the whole spectrum of short, medium, and long-term goals. In the forthcoming study, JETP secretariat will provide a comprehensive study on the last policy enabler, decarbonizing captive power, which will be presented separately from the current version of the CIPP document and conducted over a six-month period.

By addressing these barriers, several intermediate and measurable outcomes can be expected, including lower cost of renewable energy, and showing the apparent true cost of coal, which will together help to demonstrate the affordability of the transition. For example, developing a blanket local content requirement (LCR) relaxation regulation for proposed for select projects in the Priority Programs, and instead applies a "recommended local content" approach will help to build demand for a local manufacturing supply chain as well as reduce costs of renewable energy (RE), resulting in increased procurement of renewable energy capacity. De-risking and facilitating development of renewable energy projects, ensuring fully competitive tenders, and adhering to bankable power purchase agreement templates will similarly reduce costs of renewable energy and achieve economies of scale in renewable energy procurement.

At the same time, existing distortions to the true price of coal generation can be minimized, such as by eliminating the price cap for coal (with commensurate compensation to PLN, sourced from the coal producers). This will help to create incentives for transition through using the real market price of coal to inform dispatch and investment decisions. Provision for clarity on the legal regime for early retirement or more flexible use of existing coal plants would also enable phase-out of such coal plants and give legal protection for both PLN and the IPPs who wish to do early retirement. New IPPs contract might be considered on a more flexible basis, while still complying to the grid code to ensure sufficient flexibility is available in the system. A second look at current performance indicators like minimum capacity factor and specific fuel consumption for PLN generation can be considered to encourage flexibility.

Setting clearer price signals through removal of cap coal prices, combined with targeted policy objectives would also inform future system planning, which, together with technical upgrades such as to control centers and grid upgrades, can allow for more integration of variable renewable energy. With the average generation cost reduced as much as possible, PLN's revenue model for new investments in renewables can potentially be adjusted to enable PLN to generate the returns that they require to meet these new investments while incentivizing PLN to find efficiencies in its investments and operations. This is proposed to be conducted through a five-year forward-looking revenue model which calculates PLN's required revenues from renewable projects through a formula which takes into account full weighted cost of capital along with reforms to power sector governance. To compensate for any cost increment, an automatic tariff adjustment policy to non-subsidized customers similar to the pre-2017 policy could be reapplied, without meddling with subsidy regimes.

This chapter explores a holistic approach to policy enablers recommendations which together is expected to bring change to the paradigm of Indonesia's energy mix, by removing costly barriers to scaling up renewable energy and pricing coal at its true cost. That said, the policy notes take into account the need of further in-depth studies that will be required to prove that such recommendations will bring the best benefit for Indonesia, particularly on sensitive and complex issues such as the need to maintain PLN's financial viability and cost-benefit analysis for certain fiscal incentives which is reflected in a timely manner. A diagram of the key proposed reforms and their outcomes is shown in Figure 8.0.

Policy enabler	Proposed immediate reforms	Proposed short-term reforms (next 2 years)	Intermediate outcomes	Overall objective
Reforming local content requirements and strengthening domestic RE supply chain	Temporary relaxation of LCR (combined with the use of "recommended local content level") for Priority Programs	Provide targeted incentives for domestic manufacturers that could include duty exemptions and relaxing non-tariff barriers for upstream components such as for ingot or wafer manufacturer	Domestic suppliers of RE components increase capacity	Achieve the JETP scenario targets
	Revisit existing regulations for CCR application on government procurements that are financed by multinational development banks concessional roan or grant			
	Revisit LCR for other consultative process stakeholders project through with relevant		Costs of RE are reduced	
Improving RE procurement processes	Use of competitive selection with majority share for private partner, and commensurate equity contributions and risk for minority partners	Developing national RE industrial strategy, as the framework to develop high quality RE industry in Indonesia	Procurement of RE capacity increases	
	De-risk bidding packages. E.g., PLN to assist with land procurement and RE data measurements.	Undertake comprehensive grid studies for projects and system planning: assess generation requirements in each location and related grid constraints		
	Improve procurement processes: 1) market sounding packages and provide sufficient time for bidders to respond; 2) expansion of criteria; and 3) remove reference to BPP for assessing financial proposals			
Making power PPA bankable	Use standardized templates and clauses which have appropriate risk allocation, and which have been market-tested			
Adjusting supply-side incentives	Removal of coal price cap to reflect the true cost of coal, with the difference captured through a levy and channeled back to PLN as compensation for increased fuel costs		True cost of coal is used in dispatch and investment decisions	
Decarbonizing captive power	Increase transparency of captive power pipeline and future emissions in NDC and other planning	Invest in grid-connected RE power	Captive power emissions are reduced	
	Tighten restrictions on captive power licensing including requirement to show consideration of alternatives	Implement carbon pricing instruments		
Enabling early coal retire-ment and managed coal phase-out	Issue a regulation that would protect PLN from potential moral hazard when doing early coal retirement, as well as IPPs when doing coal retirement on their own will		Early retirement and increased flexibility of coal-fired power plants	
	Regulation should also include possibilities for PLN to start using other PLN-owned coal plants for more flexibly			
Ensuring PLN financial sustainability	Explore the option of a forward-looking revenue model for PLN's new investment in renewables which incorporates full costs of capital for renewable projects	Reinstate automatic tariff adjustment regulation similar to pre-2017 tariff freeze to reduce compensation and subsidy needs	PLN achieves higher cost-recovery and is financially sustainable	
	Creation of inter-ministerial committee to reconcile planning, investment and funding of Indonesia's power sector			

Source: (JETP Secretariat and Working Groups, 2023)

Figure 8.0-1 Key proposed policy reforms and outcomes

8.1 Strengthening Domestic Supply Chain of Renewable Energy by reforming Local Content Requirement (LCR)

8.1.1 Background and Context

The GoI adopted local content requirements (LCR) regulations to promote the growth of a domestic renewable energy manufacturing industry. Ministry of Industry (MoI) Regulation (Permen) No. 54/2012 (as recently amended by Ministry of Industry Regulations No. 5/2017 and No. 23/2023) established the general principles that: (i) all electricity infrastructure for public consumption must use domestically produced goods and/or services; and (ii) all goods must be completely fabricated in Indonesia. Exemptions allowing the importation of goods are only allowed if: (i) it is not possible to produce such goods domestically; (ii) the technical specification of domestically produced goods do not meet applicable requirements; and/or (iii) the volume of domestic production of such goods are unable to meet demand. The obligation to use domestically produced goods and/or services must be set out in the tender documents and implementation contracts.

Furthermore, Government Regulation (PP) No. 29 of 2018 on Local Industrial Empowerment could also be applied to contracts under renewable energy projects regarding Industrial Empowerment. Article 61 of this regulation applies to services and goods and stipulates that it is mandatory to use local products, if these are available.

These local content requirements are typically assessed through a point system, which assigns points to various components of a contract based on their level of local content. The higher the local content is, the more points a contract is assigned. The point system is regulated by the Indonesian MoI, which has developed a detailed guideline for calculating local content points in the energy sector. The guideline sets out a specific methodology for determining local content, based on bill of materials, equipment used for the construction, human resources, list of components of the project, and assigns point values to each component based on their local content level.

The new Ministry of Industry Regulation No. 23/2023 delayed the mandatory LCR of 60% for solar modules until 1 January 2025. It also provides for an exemption from mandatory LCR for solar plants over 50 MW capacity servicing the new Indonesia capital city, Nusantara, if there are no similar domestic products available. Only companies that have invested in domestic assembly can import solar modules.

The current LCR of solar modules has reached 40% and is expected to continue rising due to the recent development in additional manufacturing plants. As of 2022, Indonesia has recorded a total of 21 solar module manufacturing industries. Out of these sixteen industries, twelve have become members of the Indonesian Solar Module Manufacturers Association (APAMSI). The combined national production capacity of solar modules is 1,644 MWp per year. The main challenge in increasing the LCR value currently is the lack of interest from tempered glass factories to produce specialized glass for photovoltaics.

Table 8.1-1 shows the minimum LCRs for various sources of renewable energy at project level. Technically, the calculation of LCRs is formulated as a certain percentage of goods, services, and/or a combination of goods and services used. Currently, this applies to coal-fired power plants (CFPPs), hydro power plants, geothermal power plants, gas power plants, solar power plants, and the transmission and distribution network. In power generation projects, the LCRs vary based on the installed capacity of the power plant. It is worth noting that solar modules weight formulas in the LCR calculation are explained more extensively under Ministry of Industry Regulation No. 4/2017.

Table 8.1-1 Project Level LCRs for various sources of renewable energy

Source: (JETP Secretariat and Working Groups, 2023)

Type	Capacity	%LCR		
		Goods	Service	Combination
A. Hydro power plant	up to 15 MW	64.2	86.06	70.76
	15 – 50 MW	49.84	55.54	51.6
	50 – 150 MW	48.11	51.1	49.00
	150 MW	47.82	46.98	47.60
B. Geothermal power plant	up to 5 MW	31.3	89.18	42
	5 - 10 MW	21	82.3	40.45
	10 - 60 MW	15.7	74.1	33.24
	60 - 110 MW	16.3	60.1	29.21
	>110 MW	16	58.4	28.95
C. Solar power plant	Off-grid Decentralized	39.87	100	45.9
	Off-grid Centralized	37.47	100	43.72
	On-grid Centralized	34.09	100	40.68
D. Transmission	High voltage overhead line 70 kV	70.21	100	76.17
	High voltage overhead line 150 kV	70.21	100	76.17
	Extra high voltage overhead line 275 kV	68.23	100	74.59
	Extra high voltage ground line 500 kV	68.23	100	74.59
	High voltage submarine line 150 kV	15	84	26.6
	High voltage underground line 70 kV	45.5	100	56.4
	High voltage underground line 150 kV	45.5	100	56.4
E. Substation	High voltage substation (GI) 70 kV	41.91	99.98	65.14
	High voltage substation (GI) 150 kV	40.66	99.98	64.39
	Extra high voltage substation (GI) 275 kV	22.42	74.57	43.57
	Extra high voltage substation (GI) 500 kV	21.51	74.67	42.77
	High voltage gas insulated substation (GIS) 150 kV	14.27	26.68	19.237

Figure 8.1-1 shows the minimum LCR requirements for solar power plants. Figure 8.1-2 and Figure 8.1-3 show weighting for solar components based on Ministry of Industry Regulation No. 4/2017 for off-grid decentralized, off-grid centralized, and on-grid centralized solar power plants. Presently, weighting of components within is not aligned with the actual cost contribution. For instance, construction services, which often constitute a substantial portion of power plant project expenses, should carry a more substantial weight in the LCR calculation. Adjusting the weighting to reflect the cost significance of different elements, a more accurate and fair representation of the true local content can be achieved. The renewable energy LCR regulations could also be calculated at the project level, which would allow project developers to optimize the use of local and imported resources to achieve the lowest development costs while supporting the development of domestic industries and incentivizing inward transfer of technology and partnerships. This policy could be reviewed periodically to test whether it is contributing to the stated objective or creating an impediment to growth.

Connected Centralized Solar Power Plant (On-grid)

Solar power plant connected to PLN network

Minimum Combined LCR		
No.	**Description**	**Minimum LCR**
1	**LCR (Goods)**	**34,09%**
2	LCR (Services)	100,00%
3	Combined LCR	40,68%

Minimum LCR of Goods		
No.	**Description**	**Minimum LCR**
1	Cable	90,00%
2	**Solar module**	**60,00%***
3	Module buffer	42,40%
4	Distribution panel	40,00%
5	Travo	40,00%
6	DC Combiner box	20,00%
7	Protection system	20,00%

*Implementation delayed until Jan 1st, 2025 as governed by MoI regulation No. 23/2023

Stand-Alone Centralized Solar Power Plant (Off-grid)

Solar power plant that are not connected to the PLN network

Minimum Combined LCR		
No.	**Description**	**Minimum LCR**
1	**LCR (Goods)**	**37,47%**
2	LCR (Services)	100,00%
3	Combined LCR	43,72%

Minimum LCR of Goods		
No.	**Description**	**Minimum LCR**
1	Cable	90,00%
2	**Solar module**	**60,00%***
3	Module buffer	42,40%
4	Battery	40,00%
5	Distribution panel	40,00%
6	Energy limiter	40,00%
7	DC combiner box	20,00%
8	Protection system	20,00%

Source: (JETP Secretariat and Working Groups, 2023)

Figure 8.1-1 Minimum LCR Requirements for Solar Power Plant

LCR Weighting Solar components

No.	Description	Weight
1	**Solar Module**	**40,50%**
2	Inverter	13,50%
3	Module buffer	10,80%
4	Distribution panel	6,30%
5	Travo	5,40%
6	DC combiner box	5,40%
7	Protection system	4,50%
8	Cables (AC and DC)	3,60%
Total Components		**90,00%**
9	Installation services	5,40%
10	Construction services	2,40%
11	Delivery service	2,20%
Total Services		**10,00%**
Total		**100,00%**

LCR Weighting solar module components

No.	Description	Weight
1	**Solar Cells**	**50,00%**
2	Tempered glass	12,00%
3	Frame	9,00%
4	PV Junction box	8,00%
5	Backsheet	4,00%
6	Eva films	4,00%
7	PV ribbon	2,00%
8	Solar silicon	2,00%
Total Material		**91,00%**
9	Workforce	5,00%
10	Production machinery	4,00%
Total		**100,00%**

LCR Weighting solar cell components

No.	Description	Weight
1	Silicon solar grade manufacturing	15,00%
2	Manufacture of metallurgical grade silicon	7,50%
3	Making blue cells	7,50%
4	Printing cell	7,50%
5	Ingot manufacturing	5,00%
6	Procurement of silica sand	2,50%
7	Brick making	2,50%
8	Wafer manufacturing	2,50%
Total		**50,00%**

Source: (JETP Secretariat and Working Groups, 2023)

Figure 8.1-2 Component Level LCRs for On-grid Solar Modules

LCR Weighting Solar components

No.	Description	Weight
1	Battery	25,20%
2	Module buffer	20,70%
3	Inverter and solar charge controller	13,50%
4	**Solar module**	**13,14%**
5	Cables (AC and DC)	7,20%
6	DC combiner box	3,06%
7	Distribution panel	2,70%
8	Energy limiter	2,70%
9	Protection system	1,80%
Total Components		**90,00%**
10	Delivery service	4,67%
11	Installation services	3,33%
12	Construction services	2,00%
Total Services		**10,00%**
Total		**100,00%**

LCR Weighting solar module components

No.	Description	Weight
1	**Solar Cells**	**50,00%**
2	Tempered glass	12,00%
3	Frame	9,00%
4	PV Junction box	8,00%
5	Backsheet	4,00%
6	Eva films	4,00%
7	PV ribbon	2,00%
8	Solar silicon	2,00%
Total Material		**91,00%**
9	Workforce	5,00%
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LCR Weighting solar cell components

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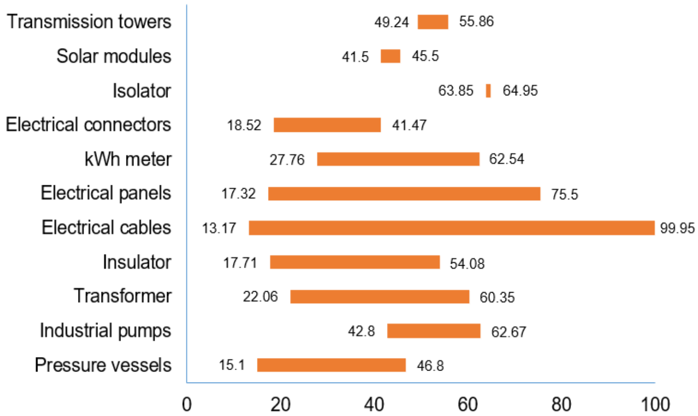
6	Procurement of silica sand	2,50%
7	Brick making	2,50%
8	Wafer manufacturing	2,50%
Total		**50,00%**

Source: (JETP Secretariat and Working Groups, 2023)

Figure 8.1-3 Component Level LCRs for Off-grid Solar Modules

In 2022, LCR for hydro power plants and solar power plants reached the average of 77.1% and 44.1% respectively. Despite the average LCR values of all these projects exceeding the minimum threshold, failure to meet the LCRs entails a penalty (i.e., if the final LCR value doesn't match with the contract value) as governed in Ministry of Industry Regulation No. 54/2012. In many cases, LCRs serve as either a precondition to receive government support or an eligibility requirement for inclusion in the national projects. Imposition of fines for developers failing to meet the minimum LCR may inadvertently deter investment in power plant projects.

Renewable energy industrial development in Indonesia is still at a nascent stage. Domestic manufacturers are not currently able to fulfill projected demand both in terms of volume and quality as renewable energy deployment accelerates. The quality of solar modules has become the key factor of accessing funding from financial institutions. Figure 8.1-4 on current domestic content of power components below sets out the levels of domestic content achieved within the power sector for the specified components for 2021. However, further study is necessary to assess the domestic content currently achievable for other renewable energy technologies such as geothermal and hydro power.



Source: (Ministry of Industry, 2017)

Figure 8.1-4 Current Domestic Content of Power Components

8.1.2 Rationale for Reform

Energy transition creates new economic opportunities around the world. The development of a comprehensive renewable energy industrial strategy for Indonesia will help to achieve energy transition and low carbon objectives. In addition, such a comprehensive strategy will help secure maximum benefits for workers in Indonesia, as illustrated in Table 4.3-1, to take part in skills development and job opportunities, formal and informal businesses and communities, and local supply chains. Realization of these goals will in turn strengthen Indonesia's overall economic resilience.

Currently, investment in local renewables manufacturing capacity is limited, resulting in a high-cost environment arising from the lack of economies of scale and insufficient manufacturing capacity that can support a scaled-up renewable energy deployment program.

This high-cost environment is amplified by requirements under LCR regulations which restrict developers' ability to source supplies from outside Indonesia where the costs of renewable energy components for Solar PV, wind and battery, have fallen rapidly in recent years. As a result, demand for renewable energy is directly impacted, especially considering the broader market context in which PLN is required to prioritize the lowest-cost sources of power generation. In turn, these high prices and capacity constraints contribute to the creation of the existing pattern of relatively small-scale procurements.

However, LCRs are generally inconsistent with the procurement policies of International Financial Institutions (IFIs) the implementation onto a project of which could preclude the availability of concessionary financing. While local preferences are permitted, defining a certain mandatory threshold for the local content in the procurement process, or excluding a bidder on that basis, is not permitted.

For example, for a project to be eligible for ADB financing, ADB generally requires that bidding over goods, works, and services are made open to bidders from all eligible countries. Generally, ADB's International Competitive Bidding (ICB) policies require equal opportunity for and treatment of eligible bidders. Any participation conditions must be limited to those that are essential to ensure the bidder's capability and resources to successfully fulfil the relevant contract.

A recent cautionary case is the cancellation of an IFI commitment to finance a PLN geothermal power plant because of the obligation of PLN to include LCR in the procurement document as was mandated by the LCR regulation. As a result, PLN lost its access to low interest rate financing for this project.

Currently, Indonesia's National Industrial Plan (*Rencana Induk Pembangunan Industri Nasional/*RIPIN) outlines the industrial development plan including the energy sector, classifying only three major activities: (i) certain power generators, (ii) solar PV and battery storage, and (iii) nuclear. This highlights the need to strengthen the RIPIN to enhance its focus on wider domestic supply chain capacity in the power sector as well as set out strategies for implementation.

Box 8.1 LCR in the Solar Industry

In 2021, the Indonesian Solar Module Manufacturers' Association (Asosiasi Pabrikan Modul Surya Indonesia: APAMSI) reported that the annual production capacity for local manufacturing of solar modules is only 681 MW.

Existing manufacturing is only operating at about 5-40 percent of the registered capacity with annual production of 150-200 MWp (Megawatt peak).

Even at full production rates, the existing manufacturing capacity registered with APAMSI is well below that needed to meet the sort of near-term growth required to achieve the plan.

In addition to the limited capacity, this manufacturing industry is only able to provide a maximum of 47.5 percent of the components for solar PV modules in 2021 and this can be achieved only for a very small capacity of solar PV projects annually. Components that can be delivered locally are primarily downstream in the supply chain (see Table 2).

Where local manufacturers do have the capacity to meet LCRs, their costs are high relative to international standards. At the same time, there are concerns about the quality of domestically manufactured panels. The capacity degradation rate of domestically produced panels is about 1 percent per year, compared with 0.5 percent per year expected for the imported panels, * resulting in high levelized costs of solar PV generation.

Source: (Institute for Essential Services Reform, 2022)

Note: *Data is for modules in the 370-390 Wp capacity range.

Lessons from international best practice

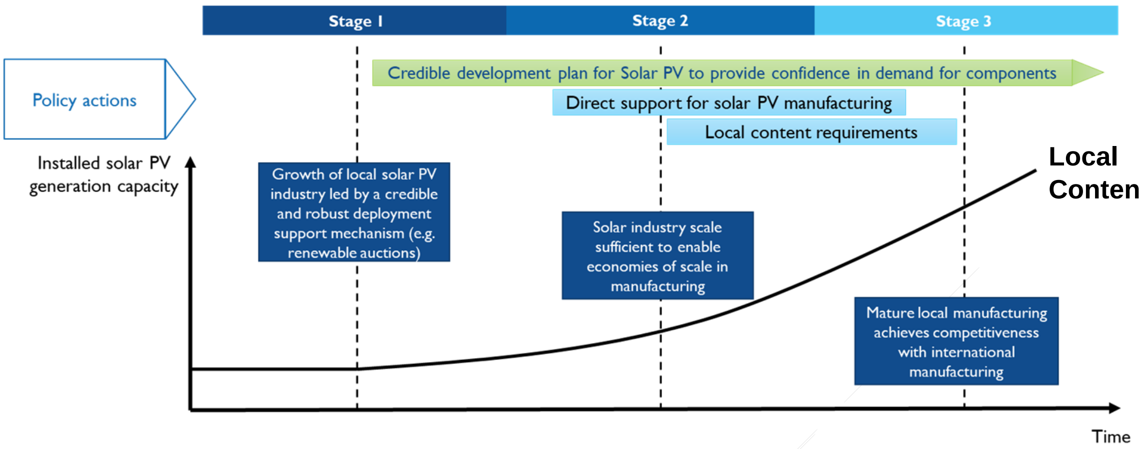
Many countries have applied LCR policies in multiple sectors, with the same objective of incentivizing local manufacturing. However, lessons from international experience suggest LCR policies, if they are to be effective, need to be introduced in a staged manner. This allows time for a sufficient market to be established to support domestic supply chains, to then support the growth of local manufacturing capacity to a point where this is internationally competitive.

These stages are shown in stylized form in Figure 8.1-5 for solar PV industry, and are as follows:

Stage 1: **Creating a domestic market**. At the beginning of Stage 1, uptake of renewable energy generation is negligible. Domestic demand for renewable energy components such as solar PV panels is low and, therefore, there is little incentive for local manufacturers to invest in building production capacity. At the same time, expansion of renewable energy components' capacity is constrained by the insufficiency of local manufacturing capacity to match demand and the lack of economies of scale which raises prices. In these early stages of development of the renewable energy industry, the focus would be on growing a credible renewable energy pipeline.

Stage 2: Support for renewable energy manufacturing. As the scale and pace of renewable energy projects accelerate, local manufacturers will have increased confidence in future demand and will look to make investments in manufacturing capital. These early movers are likely to face several barriers to entry (as with any industry)—such as high learning costs and difficulties in accessing finance. At this stage, targeted support may be justified to help local manufacturers develop. Such targeted support can include local preference policies, which could be part of a larger package that also includes additional measures to address competitiveness issues within the industry such as human resources constraints, though before undertaking any additional measures, a careful cost-benefit analysis must be done to show the marginal impact of any incentives. Indonesia is currently focused on LCRs as the main support policy.

Stage 3: Established manufacturing and international competitiveness. Once the local manufacturing industry achieves large-scale production, international competitiveness should be achieved.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 8.1-5 Stages of Policy Reforms on Strengthening Domestic Supply Chain of Solar Energy Based on International Experience

8.1.3 Proposed Reform Roadmap

The proposed reform program for Indonesia consideration follows the different stages described above, structured as short term and medium term.

8.1.3.1 Short Term:

Scaling up domestic market for renewable energy

It would be prudent to establish a renewable energy industrial strategy that adopts distributive, restorative and procedural justice of JETP principles to ensure that a skilled workforce, industries, and related infrastructures are in place to deliver on Indonesia's energy transition agenda while also driving economic growth and green jobs creation, using domestic products. Deployment of innovative technology should be an integral part of Indonesia's renewable energy development coupled with adequate industrial capacity. This will ensure a cost-competitive, secure, and sufficient renewable energy domestic supply chain by paying attention to environmental and social safeguards at the same time.

This strategy will require coordination with Indonesia's ambitious energy transition pathway to ensure it is aligned with renewable energy development plans and demand for renewable energy products. The national energy transition pathway (including RUKN) should underpin the establishment of renewable energy industrial roadmap including detailed pathways for each renewable energy technology option. Currently, there is no specific industrial pathway for renewable energy other than solar PV.

Support a pipeline of renewable energy and related infrastructure projects

A substantial, clear and viable pipeline of renewable energy projects is crucial to provide investment certainty for supply chains and generate economies of scale. Therefore, at this stage, the focus should be on expanding the renewable energy pipeline in RUKN as well as Indonesia's NZE roadmap and implementing them accordingly. The policy package for developing a domestic renewable energy supply chain can focus initially on establishing a robust pipeline of renewable energy, enabling projects based on sound power sector planning.

The CIPP proposes to establish a priority projects list which would comprise the additional renewable energy capacity needed to achieve the JETP joint targets through 2030. This should ideally be complemented with investments geared towards strengthening PLN's grid capacity to ensure that those renewable energy projects are successful and for the renewable energy pipeline to be credible. In addition, these initiatives require an improvement of PLN's renewable energy procurement practices. This program and plan combined will be the basis for supply chain investors to anticipate the level of production capacity necessary in Indonesia, which will be used as a basis for decision to invest in manufacturing facilities in Indonesia.

Relaxation of LCRs for JETP priority projects

The success of early-stage projects in the pipeline can provide confidence in the future demand for locally sourced renewable energy-enabling goods and services to encourage supply chain investments. To ensure this success, the LCRs could be relaxed temporarily for the priority projects until the local manufacturing facilities are sufficiently developed. Further studies will need to be conducted to ascertain the relaxation timeline for technologies other than solar PV which has been governed by the new regulation No. 23/2023.

IFI-financed projects

IFIs are governed by charters, or treaties, which are signed and then ratified by its member states. Indonesia is a party to a number of such charters, including for multilateral IFIs such as the World Bank and ADB (among others). The charters set out guiding principles for the operations by the IFIs, including fairness and competition in procurement. As Indonesia has signed and ratified these charters, Indonesia has agreed to be bound by the principles. Therefore, the GoI could issue a treatment clarification towards IFI financing subject to LCR under government regulation No. 29 of 2018. The current Ministry of Industry Regulation No. 54/2012 (as amended by Regulation No. 5/2017 on Local Content Requirements and Regulation No. 23/2023 on Use of Domestic Products for Electricity Infrastructure Development) should align with the government regulation.

Streamline the LCR Calculation Methodology

For the purpose of implementing the JETP priority projects at the scale and volume as planned, a streamlined LCR calculation methodology could help. Furthermore, it is essential to establish a more nuanced approach in determining LCR, separating goods and services calculation. Calculating a combined value for both goods and services may lead to complications. There are instances where discrepancies arise between contractors and assessors when focusing solely on LCR for goods where goods' LCR value evaluation should consider the existing manufacturing capabilities within Indonesia. If the GoI considers increasing the LCR, in line with the commitment to industry down streaming policy, it is essential to keep LCRs for renewable energy at the project level - which should be agreed through a consultative process between the key stakeholders including the Ministry of Industry, Ministry of Energy and Mineral Resources, the domestic renewable energy manufacturers and relevant industry associations.

As mentioned in Box 8.1, currently the local renewable energy manufacturers, i.e., solar modules manufacturers, have limited manufacturing capacity with most of the capacity in assembling the module and limited to no capacity in the production of ingot, wafers, and solar cells. Other renewable energy manufacturing industries still require the input material to be supplied through imports. Estimates indicate that the local content provided by solar module producers only reaches 43.5-47.5 percent— below the 60 percent target.

8.1.3.2 Medium Term

Support for re-manufacturing

Before international competitiveness is achieved, locally manufactured components may be more expensive than international counterparts. Even so, early movers in the manufacturing industry may not be able to recoup the full value of their investment because they will generate learning externalities. Providing incentives to reduce the costs for early movers can help to internalize these externalities.

Some measures can be considered by the government, among others support in research and development (R&D) and enhance the quality of human resources in determined strategic priority industries to ensure that Indonesian manufacturing is aligned with global trends and maintains competitiveness. Other support that can be considered is the provision of fiscal incentives such as duty exemptions for raw materials that are accessible to renewable energy equipment manufacturers at all scales, which could help the cost competitiveness of domestic renewable energy technology products.

However, given limited demand (even with full utilization of available resources), GoI policy on LCR may wish to exempt some specialized equipment such as large-sized turbines for hydro and geothermal due to limited future demand, and focus instead on developing domestic manufacturing capabilities for small-scale hydro and geothermal turbines and other components where Indonesia may have a competitive advantage.

Summary of Reforms

The following matrix summarizes the proposed policy package to deliver an internationally competitive renewable energy manufacturing industry in Indonesia.

Table 8.1-2 Policy Package to Deliver an Internationally Competitive Renewable Energy Manufacturing Industry in Indonesia

Source: (JETP Secretariat and Working Groups, 2023)

Expected Timeframe	Reform Area	Implementation Guidance
Short term	RE Industrial Strategy	The strategy shall be adopted in RIPIN as the framework to develop high quality renewable energy industry in Indonesia supporting the energy transition agenda.
	Establish priority programs to create a market of significant size	• Establish priority programs based on the IFA of JETP which prioritize fairness and equity in economic opportunities, job creation and prevent any form of discrimination or exploitation in the industry. • Temporary LCR relaxation for certain renewable energy technologies within the priority programs; • LCR regulation for projects financed by IFIs will follow the Perpres No. 16/2018 on government procurement which allows the use of the development partner's procurement regulations for procurement activities financed by foreign loan or grant (Article 64).
	Revisit the formulation of the minimum percentage of the local content and periodic adjustment by assessing against pre-agreed indicators—including the market size and current domestic supply chain capacity.	To revisit current LCR calculation method for renewable energy by taking into account the domestic manufacturers' capacity. Further study is required to determine the level of LCR for each renewable energy technologies.
	Long-term renewable energy pipeline Establish a credible renewable energy development plan with associated regulatory support as necessary.	• Publishing ambitious and aligned national power development strategies including in the RUPTL, the National Electrification Master Plan (*Rencana Umum Ketenagalistrikan Nasional*), and Net Zero Roadmap. • Procurement to support renewable energy development aligned with power development plans, as described in policy subchapter 8.3
Medium term	Support for R&D	Establish a fund to support R&D to keep Indonesian manufacturing up to date with global trends through relevant research agencies and universities including potential support to private sector R&D
	Targeted support to reduce costs in the manufacturing industry	Consider reducing the costs of upstream components by providing fiscal incentives to support domestic renewable energy equipment manufacturers

8.1.4 Expected Results

Table 8.1-3 Expected Results

Source: (JETP Secretariat and Working Groups, 2023)

Timeframe	Results
Short to medium term	Investment in renewables manufacturing capacity is increased; renewable energy industry continues to grow as barriers to investment are removed and R&D investment improves technology. Renewable energy projects are able to offer more competitive tariff with access to concessional financing from MDBs
Long term	Indonesia develops a domestically and internationally competitive renewable energy industry.

8.1.5 Risk and Mitigation Measures

Table 8.1-4 Risk and mitigation measures

Source: (JETP Secretariat and Working Groups, 2023)

Dimension	Risk	Mitigation
Regulatory	Failure to issue RUKN and RUPTL that would provide project pipeline for investment	Using JETP investment plan under the Comprehensive Investment and Policy Plan as a JETP priority project list would reduce time spent defining the boundaries.
Institutional /Political	Lack of coordination amongst government departments on energy transition targets—that is, LCRs vs renewable energy acceleration plan.	• Adoption of energy transition agenda in the national medium-term development planning process (*Rencana Pembangunan Jangka Menengah Nasional*). • Improved coordination and collaborations among ministries to align multiple energy transition objectives and discuss trade-offs. • Clear political direction to PLN to prioritize a clean energy transition plan.
Market	For solar projects, international financiers and banks only accept Tier-1 level solar products with stringent criteria.	• Apply high standards and guidelines to manufacturers to improve competitiveness and gradually increase production to export level. • R&D fund would help keep Indonesian manufacturing up to date with global trends.
Social	Lack of the labor force to support industry development	Alignment between human resource development, vocational and higher education, and industrial and energy transition priorities in government strategy. Implement just transition policies.
Environmental	Raw material extraction for solar PV panels may have environmental impacts such as water pollution and carbon emission. E-waste management generated from decommissioned or damaged panels. Land use conversion of natural ecosystems or agricultural land. Energy transition and carbon emission PV industry	• Implement strict regulations for responsible mining practices and support the development of recycling initiatives for solar panels. • Establish proper mechanisms for collection, recycling and safe disposal of e-waste including local recycling facilities for PV panels. • Prioritize the use of degraded or non-arable land, establish policies that consider environmental and social factors. • Ensure the entire supply chain for solar PV, including manufacturing and transportation, operates with low-carbon or renewable sources.

8.2 Supply-side Incentives

8.2.1 Background and context

Indonesia ranks number seven in terms of global proven coal reserves and is the second largest coal exporter in the world after Australia (BP, 2022). Over the two decades since 2000, coal production has increased rapidly in response to the fast-growing electricity needs of developing countries in Asia—especially in China and India. Since 2000, Indonesia's coal production has increased eightfold, climbing from 77 megatons to a record high of 616 megatons in 2019–of which about 70 to 80 percent has been for export. Most of the coal consumed domestically is low and medium calorific value (CV) coal. Low and medium CV coal is also exported as there continues to be strong demand for this type of coal in Southeast Asian countries. Coal production costs in Indonesia have been relatively low, driven by factors such as favorable geology and mining conditions, the low costs of labor, transportation, and processing. In recent years, some producers have reported rising cost pressures, mainly driven by higher fuel and maintenance costs, as well as higher stripping ratios associated with older mines.

To ensure the affordability and security of electricity, GoI has implemented two key regulatory ‘backstops’: (i) a domestic market obligation (DMO) which controls the volume of coal to supply domestic power supply; and (ii) controls the domestic price of coal (Domestic Price Obligation or DPO). Partly due to these regulations, coal is currently the lowest cost fuel source for electricity generation. In 2022, the average price of coal purchased by the state-owned electricity company (PLN) was US$50 per ton, resulting in a cost of electricity generation of around 22-33 US$/MWh.

8.2.1.1 Domestic Market Obligation (DMO)

The DMO requirement was first introduced in Law No. 4/2009 (the “Mining Law”) (as amended by Law No. 3/2020). The 2009 Mining Law, and its enabling regulations, supported the rapid expansion of new mining operations against a backdrop of significant increases in both domestic and export demand for coal. Considering this, it is assumed that the government deemed the DMO necessary to ease procurement efforts and ensure a stable and certain supply of coal. Article 3 of the 2009 Mining Law stated, “Within the framework of supporting national development that is continuous, the objectives of mineral and coal management are to guarantee the supply of minerals and coal as a raw material and/or as a source of energy for domestic needs.”

The provisions in the Law were implemented by imposing the DMO via a Government Regulation (PP No. 23/2010) and a Ministerial Regulation issued by the Ministry of Energy and Mineral Resources (MEMR) (Permen No. 34/2009 as amended by Permen No. 17/2020). The Permen requires mineral and coal companies to prioritize domestic needs by supplying a minimum percentage of their annual total production to the domestic market based on their annual work plan and budget (Rencana Kerja dan Anggaran Biaya). It does not state the percentage but does outline the procedures by which the MEMR is to determine it each year, based on forecasts submitted by domestic coal users. Furthermore, once the MEMR determines the DMO percentage, it must be communicated via a Ministerial Decree by June of the previous year. The current DMO is 25 percent of total production.

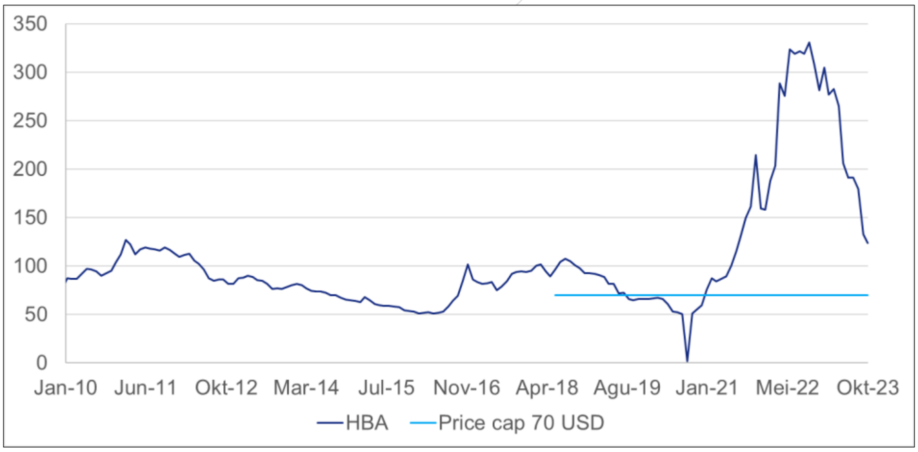
8.2.1.2 Regulation of Domestic Coal Prices

Government Regulations (PP) No. 23/2010 states that the benchmark price for domestic sales will be established under further Ministerial Regulations (Permen). This led to Permen No. 17/2010 (as amended by Permen No. 19/2018 and Permen No. 11/2020), which provided that the price of domestic sales was to be linked to international market prices.

Permen No. 17/2010 set out the procedures and formulas for determining the domestic price, with the key points summarized as follows:

- The price is based on the government's monthly reference export price for high-quality coal—the *Harga Batubara Acuan* (HBA);
- To accommodate for variation in coal quality, the price of coal of lower CV is scaled down from the HBA based on the formulae set out in the regulations, CV being the main driver of the price adjustment; and
- The domestic price is applicable to spot and long-term sales. For long-term sales, the price is based on a weighted average of prices in periods prior to contract signing, and pricing reviews are permitted over the term of the contract.

While initially the pricing regulations ensured that coal companies were no worse off under the DMO requirement, this changed in 2018 in response to a trend of rising coal prices beginning in 2016 and a government decision to freeze automatic end-user electricity tariff adjustments. PP No. 8/2018, Permen No. 19/2018, were first passed authorizing MEMR to determine a special selling price for coal that is supplied specifically for the fulfillment of domestic needs. Kepmen No. 1395/2018 subsequently established the price ceiling. If the HBA is above US$70 per ton, the price ceiling comes into effect and prices are scaled down to a maximum level of US$70 per ton. Since it was introduced, the HBA has been consistently above US$70 per tonne (Figure 8-6). If the HBA is below US$70 per ton, the domestic price continues to be based on the HBA (adjusted for quality).



Source: (Ministry of Energy and Mineral Resources, 2023)

Figure 8.2-1 HBA January 2010 to October 2023 (US$/ton)

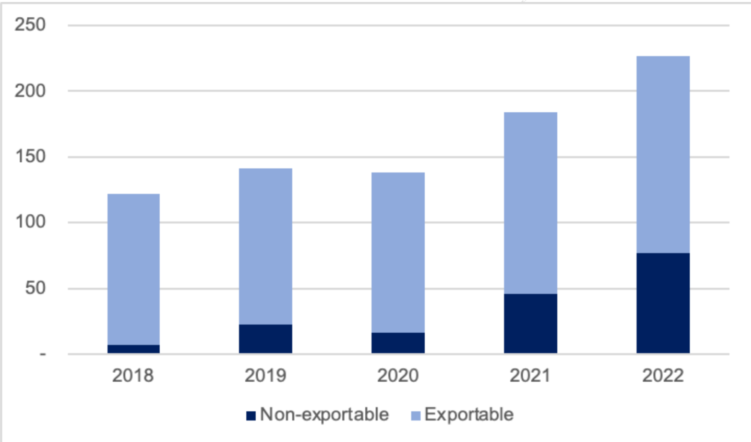
8.2.1.3 Impact of the current regulations

To keep down the cost of electricity for on-grid CFPP, the DMO and price ceiling are aimed ultimately at ensuring the availability of domestic coal supplies at low prices. The price ceiling also helps to minimize the subsidy burden for GoI as any shortfall between PLN's revenues and eligible costs is compensated for by the government through the Ministry of Finance (MoF).

The impact of the interventions on each stakeholder is further outlined as follows:

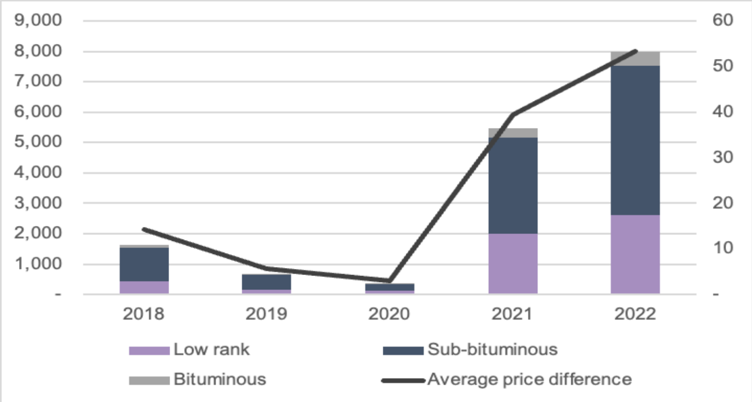
8.2.1.4 Coal mining companies

When the HBA is above US$70 per ton and the price ceiling is triggered, coal mining companies forgo the difference between the formula-driven domestic sales price compared to an unregulated market price. Figure 8.2-2 shows the domestic coal production (mT) and Figure 8.2-3 provide an indication of the "opportunity cost" to coal producers due to the price ceiling. This is based on analysis of coal supplied to the domestic market between 2018 and 2022 that was also export grade-, and a comparison of the domestic price realized for this coal and the potential export value (Figure 8.2-3). Between 2018 and 2021, export prices were about 10 to 90 percent higher than the comparable regulated domestic prices for low rank and sub-bituminous coal which composes most of the domestic coal consumed. As thermal coal prices increased between 2021 and 2022, the gap between potential export prices and received domestic prices increased; the gap in potential earnings in 2022 is estimated to be US$8 billion. Since coal producers have relatively low production costs and export a large share of their production, however, they were able to cross-subsidize foregone revenue on domestic coal.



Source: (Wood Mackenzie, 2023)

Figure 8.2-2 Domestic Production of Coal (mT)



Source: (Wood Mackenzie, 2021))

Figure 8.2-3 (LHS) Potential additional earnings on domestic supply US$ and (RHS) Average price difference on exportable domestic supply US$/ton

In April 2022, the Government issued Regulation No.15 Year 2022 to provide rules in relation to state revenue arrangements for the coal mining sector (i.e., coal royalty rate). When the price of coal is below US$70 per ton, coal mining companies are obligated to pay a royalty rate of 14% of the selling price, deducted by production contribution and tariff for utilizing coal mining concession work agreement (Perjanjian Karya Pengusahaan Pertambangan Batubara/PKP2B) per ton exported. The royalty rate increases progressively with the increment of price of coal (HBA). It is expected that the Government will take a greater role in monitoring the capital expenditure and mining operating costs of companies with the Special Mining Business License (Izin Usaha Pertambangan Khusus/IUPK).

8.2.1.5 Power producers

When the price ceiling is triggered, PLN benefits from cost savings, being the inverse of foregone revenue for producers. On the downside, however, the price cap also introduces distortions in PLN's investment and operational decisions.

For the purpose of PLN's investment planning, the upper bound of fuel assumptions for coal is set at 70 US$/ton, making the cost of electricity produced by coal-fired power plants (CFPPs) lower than that of other technologies (such as variable renewable energy). The underpricing of coal and overly optimistic demand assumptions led to distortions in the power expansion plans that resulted in PLN locking into a large fleet of CFPPs and system overcapacity.

Going forward, the continuation of coal price caps in power planning exercises can have an impact on decisions on the rehabilitation and life extension of CFPPs. Currently, a moratorium is in place on the construction of CFPPs with limited exceptions such as nationally strategic projects.

Coal price caps affect PLN's power dispatch decisions as PLN is incentivized to produce larger amounts of coal-fired electricity than what it would if coal is priced at its economic cost. Based on analysis of 2022 data for CFPPs, the current variable cost of coal (with the price cap) was between 22 to 33 US$/MWh, compared to natural gas at around 56.0 US$/MWh. Thus, if coal were 140.0 US$/ton, preliminary analysis showed that other sources such as natural gas would displace 82 TWh of coal generation or 37 percent of the 220 TWh coal generation from 2022.

8.2.1.6 Government

Government subsidy and compensation have been growing significantly as energy demand rises; in 2022 MoF payments to PLN amounted to approximately US$3.7 billion. The cap on domestic coal prices helps to reduce MoF's subsidy and compensation payments to PLN and eases state fiscal management by helping to smoothen coal price volatility. However, the progressive coal royalty scheme will raise state revenues at a time when the price of this commodity is soaring.

8.2.1.7 Households and businesses

Electricity consumers are shielded from the impact of changes in domestic coal prices as electricity tariffs are set by MEMR across 37 consumer classes. Consumer tariffs are also heavily subsidized — especially for poorer households — and Indonesia has the lowest average electricity prices among ASEAN countries. As of 2021, the basic cost of electricity production (Rp 1,473/kWh) was about 30 percent higher than the average selling price (Rp 1,137/kWh). Although tariffs are fixed, electricity consumers are still indirectly impacted by cost changes; as PLN's losses are covered by MoF through general revenues, the redistributive effect of the current tariff levels is undermined. This issue is covered in policy subchapter 8.6 on PLN's financial sustainability.

8.2.2 Rationale for Reform

Coal price controls create distortions that may lead to higher environmental, economic, and social costs to Indonesia over the longer term. An additional challenge arises from coal being a lucrative resource and to strike a balance between meeting Indonesia's domestic supply needs and pursuing export opportunities to derive maximum economic benefit. It is these competing objectives which have undercut enforcement of the DMO and price cap.

The broader impacts explained below underline the rationale for reforming the price control policy:

8.2.2.1 DPO Hinders Incentives to Decarbonize

In the context of JETP, the primary issue with the existing price control policy is that it incentivizes the use of coal over alternatives such as renewable energy and natural gas. Compared to coal-fired generation, renewable energy has higher upfront capital expenditures but much lower operating costs (and, of course, lower environmental externalities). On the other hand, as a globally traded commodity, coal is volatile and prone to significant price spikes. By capping the price of coal, the policies make coal appear to be a stable, least-cost source of generation from the perspective of PLN, but not from the perspective of the economy. This price signal is a crucial factor in PLN decision making on coal plant retirement vs extension, dispatch, and other key operational and investment decisions as discussed above. By smoothing out the price of coal, PLN is also not exposed to the natural market volatility of the price of coal, which again removes an incentive to find alternatives. Maintaining the current form of intervention, therefore, undermines longer-term improvements in diversification and the sustainability of the power sector.

8.2.2.2 DPO Encourages Inefficiencies

Price controls (DPO) generally are associated with market distortions that lead to other inefficiencies. The interventions dampen incentives for PLN and IPPs to maximize operational efficiencies and minimize risks in how they procure coal, such as seeking more stable long-term contracts through commercial hedging or other means.

8.2.2.3 DMO Enforcement Has Been Ineffective

State-owned enterprises (SoEs) such as PT. Bukit Asam provides approximately 40 percent of its annual production to PLN, while other producers provide significantly less — i.e., approximately 18-22 percent. The original regulations tried to correct for this by allowing a transfer of quota between companies who were above or below their requirement, but the penalties for DMO non-compliance have not sufficiently incentivized its use. The percentage requirement operates more as a target—which is often not met. By and large, required volumes are achieved but are lower on a percentage basis because mining companies end up increasing production beyond the level set in their annual plan (at the approval of MEMR).

More importantly, GoI and PLN currently struggle with non-compliance, especially as the gap between the price ceiling and international prices has widened. In fact, since the DMO was introduced, PLN has experienced several coal supply crises, most dramatically in early 2022 (see Box 1). In August 2022, amid skyrocketing coal prices fueled by the war in Ukraine, PLN warned about the lack of sufficient coal supply for domestic power generation because coal producers would rather export at international prices and pay a penalty, rather than to comply with the DMO and price cap requirements.

In response, GoI has been considering adjusting the DMO and price cap regulations with various schemes proposed. These include a coal blending facility, additional levy on all coal companies, a price floor in addition to the price cap, and business-to-business fixed price long-term supply contracts. These schemes, however, do not resolve the fundamental price distortions and the consequences that arise from such distortions, in particular, the disincentive to rapidly decarbonize the power sector.

Box 8.2: End of 2021/early 2022 Coal Supply Crisis

On the last day of 2021, PLN issued a letter to MEMR noting that there was a coal supply crisis and very low coal availability at PLN and IPP-owned CFPPs. Without government intervention, PLN warned that 10 million customers would experience rolling blackouts. The same day GoI through the Directorate General of Mineral and Coal (DGMC) of MEMR issued a ban on coal exports. The ban was effective from January 1-31, 2022.

The Minister for Energy and Mineral Resources disclosed that only 47 coal-mining companies fulfilled their 2021 requirement, another 32 met 75 percent and 25 supplied 50 percent, while 428 companies completely neglected the DMO. It is not clear what share of production these companies contributed.

8.2.3 Proposed Reform Roadmap

8.2.3.1 Overview of Proposed Reform

Most middle and high-income countries have moved away from price controls in favor of market-based principles. A shift to a more market-based system could be considered by phasing out price controls and introducing greater reflection of the price of coal in PLN's investment process. This would contribute to showing the true cost of energy in Indonesia while enhancing greater domestic supply security. At the same time, any reform must adhere to certain principles to ensure that it does not undermine energy affordability and security. Benefits of any reform should ultimately accrue to the public and reduce complexity where possible. However, any plan to amend these policies should carefully consider and avoid any negative impact on PLN's financial stability as well as the Government's fiscal health.

A potential implementation option for shifting toward a more market-based system sees the DMO maintained but the price ceiling is removed, incentivizing domestic supply. To alleviate the increase in PLN's costs if market prices rise above the original cap of 70 US$/ton, PLN would receive an additional lump sum compensation, utilizing funds collected from coal producers such that the costs of domestic coal are borne by, and shared across, the industry, instead of being drawn from general taxation. When renewable energy has replaced coal as the dominant source of electricity generation, in the long run it would be possible to implement an alternative and likely more efficient option, which would be to phase out the DMO.

To collect sufficient funds to cushion PLN's possible increase in costs all domestic coal sales would be subject to a charge based on the difference between the domestic price under the previous cap and the market price, only when the latter is higher, and up to the required DMO volume.

To ensure that costs are shared evenly across the industry, and it is not just DMO-compliant producers who fund the additional compensation, there must also be a mechanism in place to charge producers based on their DMO shortfall, even those who do not have coal that is suitable for domestic needs. This charge could come from the existing fines and compensation mechanism recently put in place under Kepmen No. 267/2022 on the Fulfillment of Domestic Coal Requirements, or a modified form of it. The amounts paid reflect the additional revenues they were able to earn relative to DMO compliant producers.

The overall effect would be that all producers contribute an amount that is proportionate to the additional revenues they are able to earn as domestic and/or international suppliers under the

DMO. This enables producers to share the costs of the DMO more equally, overcoming the issue of a non-homogeneity in coal production and the ability to meet the needs of domestic consumers. This approach also means that producers are not penalized if market prices fall below the previous domestic price ceiling.

The collection of funds and disbursement would be managed by MoF. A new regulation is needed to create a special purpose entity so that funds can be ring fenced from general taxation revenues and channeled directly to PLN. It is also critical to ensure the compensation to PLN's higher generation costs is administered in a way that does not increase the required compensation and subsidy under PLN's revenue model, while strengthening its incentive to invest in renewables.

It is noted that the proposed reform is an alternative approach to that currently being considered by GoI. Under the GoI's proposal, there is no change to the DMO or price ceiling, and a levy is collected from producers who are not compliant with the DMO, to compensate compliant producers. While this approach helps to improve the incentive to supply the domestic market and distribute the cost of the price cap more evenly across the industry, it also addresses the distortive impacts of the price ceiling on the consumption of coal. These reforms could be complemented by continued implementation of carbon pricing instruments, which will also help to demonstrate the full economic cost of coal.

8.2.3.2 Proposed reforms

Table 8.2-1 Policy Reform Roadmap

Source: (JETP Secretariat and Working Groups, 2023)

Reform approach	Implementation options
Establish institutional set up and transitional policies to prepare for DPO removal	Prepare new regulations and establish institutional mechanisms to utilize industry charges to fund the increase in GoI compensation payments to PLN. Coal producer charges collected. When such mechanisms are in place, the price ceiling can then be removed, allowing PLN and IPPs to buy coal at market price.
	Coal DMO policy should be maintained, but there needs to be a more effective enforcement of the DMO. MEMR should continue to apply volume controls on a yearly basis.

8.2.4 Expected Results

Table 8.2-2 Summary of Expected Results

Source: (JETP Secretariat and Working Groups, 2023)

Timeframe	Results
Short to medium term	PLN uses a coal price that is closer to market prices in its dispatch and investment decisions. PLN transitions to lower carbon energy as the least-cost source of generation in many instances, which also helps with energy security concerns

8.2.5 Risk and Mitigation Measures

Table 8.2-3 Risk Mitigation Measures

Source: (JETP Secretariat and Working Groups, 2023)

Risk	Mitigation
Fiscal and implementation risks Transitioning from the current system to a new scheme that would impose new taxes/fees to coal producers and implement a new compensation mechanism to PLN may result in different fiscal costs to MoF (since the fees from producers may not exactly match the compensation). Administration of such a scheme may also increase administrative complexity	The reform program foresees a careful analysis to assess the best mechanisms to impose new taxes/fees and compensate PLN for its increased generation costs. PLN would also need to implement measures to optimize fuel procurement and better manage potential volatility of coal prices.
Stakeholders buy-in risk	The current DMO and price control regime is already being considered for reform given recent non-compliance and does not currently represent a popular policy amongst producers. The proposals in this subchapter are also designed to have no net financial impact on each stakeholder compared to the current system.
PLN PLN's financials could be negatively impacted by the taking out of the DPO which would cause fuel cost increases. In addition, PLN faces liquidity risks relative to the time needed to receive compensation payments. Furthermore, dispatch decisions may result in the prioritization of other lower-carbon fuels such as natural gas which will have an impact on PLN's costs.	PLN will be compensated for any price differential between coal market prices and capped prices through the institutional set up. Compensation payments for this coal price differential to PLN should be arranged on a monthly basis.
Coal producers Coal producers are exposed to implementation risk if enforcement of new regulations and institutional set up are unclear or ineffective	Government to ensure appropriate enforcement of the new mechanism with consultation from law enforcement agencies
Government Electricity subsidy payments might increase and affect Government fiscal health	Implementing efficient dispatch planning to avoid any significant increase in electricity production costs so as to minimize the level of needed subsidy
Power system operations In the short and medium term, operational impact in the power sector activities. PLN's use of the economic price of coal for both its investment and dispatch decisions will impact the ongoing preparation of the RUPTL.	The reform roadmap proposes gradual changes to current practices. PLN will initially implement changes in its power system planning and in a second stage, changes to its dispatch decisions, reducing the impact on operational activities.

8.3 Procurement processes improvement

8.3.1 Background and Context

Indonesia has procured only limited amounts of RE to date. Despite Indonesia's vast RE resources, PLN currently has only approximately 5.6 GW of hydropower capacity and 2.5 GW of geothermal power capacity on its systems, and less than 0.4 GW of wind, photovoltaic (PV), waste-to-energy, biomass, and biogas capacity combined. Under the JETP scenario, as described in Chapter 5, total renewable power generating capacity will increase to 24.6 GW of dispatchable renewables and 38 GW of variable renewables by 2030. To achieve the JETP targets, PLN will have to procure far more renewable energy (RE) generation than it has in the past, and at a much faster pace to get them in operation by 2030. This subchapter focuses on procurement processes currently utilized by PLN to obtain renewable power.

8.3.1.1 Overview of Regulatory Framework

Procurement of RE from IPPs is currently governed by Presidential Regulation (Perpres) No. 112/2022 on the Acceleration of Renewable Energy Development for Electricity Supply. This is a comprehensive regulation that also covers, among others: (i) retirement of existing and committed coal-fired generation and restrictions on development of new capacity connected to grid; (ii) RE pricing; (iii) inter-agency coordination within the GoI; (iv) government support for RE development; and (v) allowed development of certain captive CFPPs. Under Perpres No. 112/2022, PLN is required to consider the use of RE in its RUPTL and to prioritize purchasing power generated from RE and operating renewable power plants.

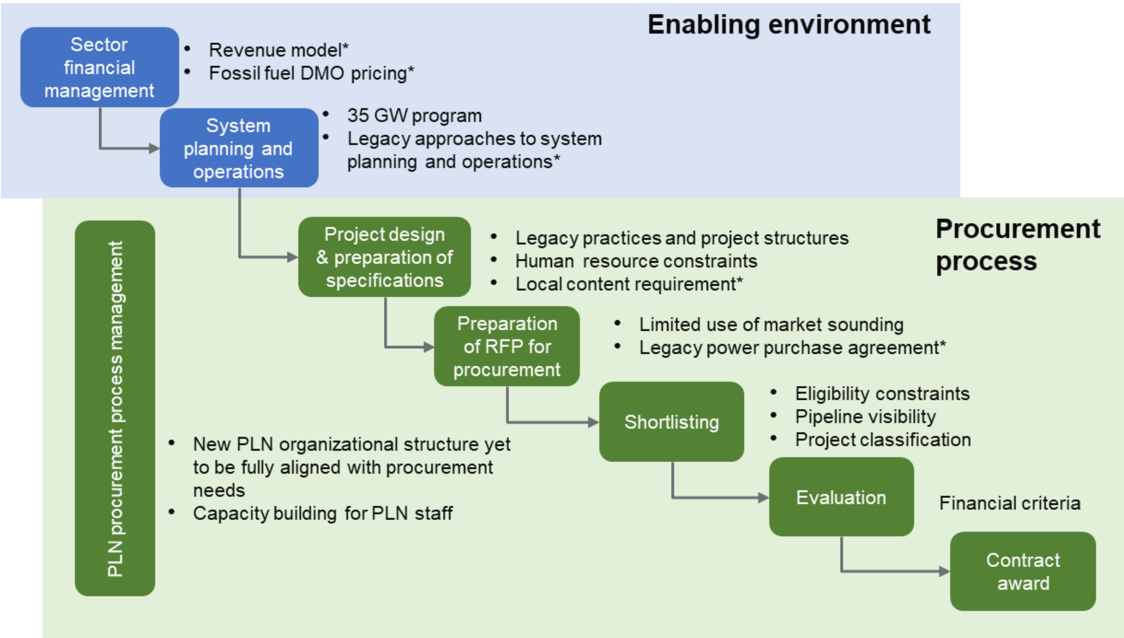
Perpres No. 112/2022 largely preserves the procurement processes originally defined by MEMR Regulation No. 50/2017 on the Utilization of Renewable Energy Resources for the Production of Electricity (as amended by MEMR Regulation No. 4/2020). It includes the qualification, offer submission, evaluation and signing of the Power Purchase Agreement (PPA) which must be completed within 180 calendar days. During this period PLN and the Independent Power Producer (IPP) candidate will also negotiate the PPA.

Under Perpres No. 112/2022, RE procurement should be generally conducted through "direct selection", a competitive method in which at least two offers or bids are compared, and selection is based on the lowest price. Since 2017, it has been done in two stages: Pre-Qualification (PQ) and proposal submission. PLN conducts the PQ process to create a List of Selected Providers (D*aftar Penyedia Terseleksi*: DPT) consisting of pre-approved developers who meet certain administrative and financial requirements. PLN then issues a request for proposal (RfP) that is only available to DPT-registered firms. Developers submit their bids in response to the RfP, and PLN chooses the most competitive one.

The "direct appointment" method, or negotiation with a single bidder, is reserved for specific situations, such as geothermal in which working areas have already been competitively tendered, or hydropower developed as part of a multi-use dam. This also includes the expansion of existing renewable energy generation capacity. Perpres No. 112/2022 also regulates RE pricing—a key parameter of RE procurement. Detailed discussion of this is found in the PPAs note.

8.3.2 Rational for Reform

RE procurement in Indonesia has, to date, fallen short of the target. There is no single cause for the slow uptake of RE. As shown in Figure 8.3-1, there is a confluence of factors in the enabling environment that are holding up PLN's progress in even getting sufficient RE projects to the procurement stage as well as challenges in the procurement process itself. Eight distinct sets of issues have been identified for further discussion. These have been grouped into issues that affect the enabling environment and those that arise within PLN's procurement processes.



*Issues with asterisk are covered in other policy subchapters

Source: (JETP Secretariat and Working Groups, 2023)

Figure 8.3-1 Power Procurement Process

With respect to the enabling environment, sector financial management policies, including PLN's revenue model and the domestic market obligation coal price cap, make large-scale RE procurement more challenging. The reasons are discussed in the PLN Financial Sustainability discussed in subchapter 8.7 and the Supply-side Incentives discussed subchapter 8.2. In addition, frequent regulatory changes have hampered the bankability of PPAs—as detailed in the Power Purchase Agreement discussed in subchapter 8.4.

Legacy system planning and the resultant over-capacity in certain PLN systems have also hindered renewables uptake. This problem originated with economic growth targets under the National Medium Term Development Plan (Rencana Pembangunan Jangka Menengah Nasional/RPJMN, 2015-2019) that averaged 7.4 percent per annum from 2015-2019, resulting in forecast electricity demand growth of 9.1 percent per annum (Bappenas, 2015). Economic growth turned out to be lower than forecast and actual load growth during this period was only 4.3 percent per annum. Until this capacity backlog is cleared, any additional capacity that is procured will weigh as an unproductive financial burden on PLN. With the long lead time for projects to go from preparation to award and finally to commissioning, however, procurement needs to start soon for new RE addition to be available for meeting new demand growth in a few years. Planning processes that move from the system level plan stage to the procurement stage without a full consideration of grid impacts on a locational basis may set up RE for further curtailment risks in the future.

Once at the procurement stage, there are further bottlenecks in current processes that delay project implementation. While it is commendable that PLN largely follows a competitive process with its RE procurement, issues around project design, project structuring, and tendering documents have slowed down procurement. These issues include:

8.3.2.1 Project preparation

Some of the recent RE procurements were delayed due to lack of adequate tender preparation and documentation. For some projects, such as solar PV, the successful bidder is typically required to prepare the feasibility studies and grid connection study after award and, therefore, does not have the benefit of these studies for preparing its offer. For other projects, such as hydro power plants, PLN relies on feasibility studies prepared by developers in advance of tendering, which may not be as thorough or accurate as if PLN prepared these studies itself.

Moreover, the successful bidder does not have access to complete system data held by PLN that is required for grid connection studies. Around the world, the lowest prices for renewable power projects have been achieved when the government or the utility facilitates the tender by conducting feasibility and interconnection studies, procuring the land required for the project, and securing all permits and licenses in advance of the tender. To some extent, the government provides tax incentives to reduce the costs. The government and utility are better placed than the bidder to resolve issues such as identifying the land, coordinating with local government and communities, and compensating the landowner.

8.3.2.2 Land acquisition

Land procurement and permitting has been one of the major barriers to renewable projects' expansion in Indonesia as developers are generally expected to acquire all the land needed for the plant site and the transmission lines needed to connect the plant to the nearest substation. It is common for the transmission corridor to be 20 to 40 kilometers long, in particular for large scale projects. The process of land acquisition can often be one of the longest lead items in the development of an Indonesian power project—especially given that these are often located in remote areas.

8.3.2.3 Assignment of PLN subsidiaries

As noted above, under Perpres No. 112/2022 PLN generally follows competitive procurement practices, using the DPT as a qualifying round. PLN increasingly requires the successful bidder to join with a PLN subsidiary to carry out the project in both majority and minority shares. For example, PLN's diesel replacement procurement now underway stipulates that a PLN subsidiary will take a 15 percent equity interest in the project company established by the successful bidder, but the subsidiary will be responsible for land acquisition and permit/licensing. On another example, PLN directly assigned development of the Karangkates 100 MW floating solar project to PJB (now Nusantara Power)—a wholly owned subsidiary of PLN. Nusantara Power will take 51 percent ownership of the project and is currently tendering for a private partner for the remaining 49 percent.

While this method of procurement may seem easier to administer, in practice it can create delays in implementation. Due to existing regulatory restrictions, taking security over state-owned assets is challenging and sometimes complicates the ability to raise additional off-balance sheet financing. In cases where the subsidiaries cannot provide equivalent equity to their ownership interest in the project, it could create an unbalanced risk-reward profile between the two shareholders. Issues could also arise during implementation; for example, it is also difficult for SoEs to absorb cost overruns and such risks end up being placed on the private partner.

Provided that the level of mandatory participation by PLN subsidiaries in competitively tendered projects is commensurate with the value they bring to the project and that they share project risks equitably with other partners, this is not an impediment to project development.

8.3.3 Proposed Reform Roadmap

Reforms should start at the system planning level with improvements to be made throughout the entire procurement cycle. The following subchapter follows the stages described in Figure 8.3-1.

System planning and operations

Generation planning should be based on more thorough system planning that fully considers generation requirements in each location and related grid constraints. These location-specific considerations coupled with a wider latitude in transmission planning would inform where and when RE resources are needed and determine the flexibility that can be achieved in the long term.

This would, in turn, also inform the short-term activities to establish the necessary upgrades, smaller-scale investments for decongesting the network as well as right-of-way processes. This includes safeguarding the role of RE in the system in the presence of long-term, inflexible thermal power contracts—for example, through fair curtailment rules and compensation and through cost transparency on the avoided cost of replacing thermal with RE. The prevailing grid code accommodates greater RE penetration on PLN’s main grids in part by requiring greater flexibility of thermal generation, but imposing these requirements on legacy thermal projects is likely to put additional financial burden to PLN due to the take-or-pay contract. The planning methodology also needs to be better aligned with the needs for a transition to a low carbon energy system. An overt focus on high thermal capacity reserve by individual zones, lack of sufficient consideration of flexible resources in generation and transmission limit the room for variable RE (VRE) resources.

More generally, to ensure that the existing grid can accommodate the procurement of larger volumes of new capacity and that grid bottlenecks are avoided, RE capacity planning and corresponding procurement volumes should be fully aligned with PLN's multi-year system planning. RE procurement volumes should be aligned with available grid capacities in the short term.

There are simple measures that may ensure that the process of VRE integration remains orderly by:

- Publishing available capacities at substations in regions with proven solar radiation and wind resources—if possible before competitive project tenders are launched and, at the latest, as part of the RfP documentation; and
- Making necessary short-term upgrades to the transmission and distribution systems—such as reconductoring and incorporating essential smart grid devices—that can cost-effectively accommodate a progressively higher volume of RE generation in the system.

In the longer term, there will be more substantial investments needed to enhance grid capacity to accelerate the transition process beyond 2030:

- Streamlining the RUPTL planning process to incorporate a more holistic consideration of renewable resources—including mapping of such resources and defining Renewable Energy Zones (REZs) with high-quality RE resources. The planning methodology needs to be enhanced to give full consideration of flexible resources like storage, higher-voltage AC and DC line options, interconnection among islands, and extensive smartening of the grid that can cost effectively mitigate intermittency of VRE. The RUPTL process should also co-optimize transmission and generation planning in an integrated process, rather than conducting this planning sequentially as done at present; and
- Put in place the necessary regulations to encourage development of scale-efficient transmission projects to facilitate timely approval, financing, and construction of lines and substations to connect to the REZs. It is also important to recognize the need for commensurate upgrades and extensions to the incumbent grid so that all parts of the grid can benefit from RE generation while operating the system in a secure manner. As the thermal capacity is expected to decline over the years, there will also be substantial changes to the existing grid. Such changes are an essential part of greening the power system even though most of these projects will be confined to the existing grid that is dominated by coal generation.

Project design and preparation of specifications

PLN should expand its role in project pre-development and technical studies. PLN can either procure land directly or make land available for project developers on a "lease" basis. Project developers then may compete to construct and operate an RE installation at specific pre-developed sites as part of site-specific procurement rounds or lease the site as an IPP. Alternative approaches include making advance arrangements for acquisition of the land by the IPP upon execution of the PPA, including the prior negotiation of a binding price with the landowner, as has been done for solar park projects in India.

As the system operator, PLN is best placed to ensure that the selected sites are of high RE resource quality, easy to connect to the transmission network, and that sufficient high-quality data is available to bidders. Pre-development of a site could include, among others, providing the land and conducting a grid connection assessment—with possible add-ons including securing permits or reserving capacity in the grid, conducting an early-stage Environmental and Social Impact Assessment that is normally required by lenders, and providing preliminary measurement data on RE sources. Increased facilitation of land and grid connection would help to de-risk projects and reduce the price of the procured electricity.

Geothermal projects have a particular need for pre-tender preparation to mitigate exploration risks. Under current regulations PLN does not enter a PPA until after the geothermal resource is proven. Financing for costly exploration activities is therefore expensive, if available at all. The World Bank has worked with GoI and PT SMI to establish the Geothermal Resource Risk Mitigation (GREM) and Geothermal Energy Upstream Development Project (GEUDP), but application of these facilities has been slow. However, in countries such as Iceland and New Zealand where geothermal provides a substantial portion of electricity production, the government has taken a leading role in exploration. GoI has initiated a more active direct role in exploration to reduce exploration risks, for example through a government drilling program implemented by PT Geodipa, a state-owned company, to be directly financed from the state budget.

Mandatory participation of a PLN subsidiary needs to be assessed properly with care to ensure that the percentage of equity reserved for mandatory participation commensurate with the value of the subsidiary's contribution. This interest should also share the risks that arise in project development and execution on an equitable basis with other shareholders in the project company.

Preparation of RFP for procurement

Procurement process implementation needs to be further aligned with PLN's recent restructuring and organizational responsibilities, authorities. In addition, the high rotation of personnel across different positions further highlights the need for improved knowledge management processes. Furthermore, the linkage between the technical and procurement departments needs to be improved. Lastly, the energy transition requires new approaches to planning and procurement. There is a continuing need for capacity building among PLN staff so they can rise to this challenge.

Moreover, the volume of procurement for new RE projects required to meet JETP targets also demands a huge increase in the number of PLN staff assigned to generation procurement. Depending on the targets that are ultimately adopted, PLN will need to procure new RE capacity at 10 to 20 times the rate of recent years. This is a huge organizational challenge, and a high risk to achieving the JETP joint targets. PLN should consider new approaches to increase procurement throughput such as engagement of one or more procurement agents and project preparation advisors.

Procurement should nonetheless remain with PLN, though regulatory scrutiny of PLN's planning and procurement processes by MEMR can be enhanced. Establishing a new RE procurement agency or transferring the function to another agency will face even greater challenges in establishing the required organizational capacity.

Tender document compilation: PLN prepares the RfPs which includes the proposed PPA, based on the final project design and specifications. The RfPs currently issued by PLN are tailored towards traditional thermal power projects and suited for baseload or dispatchable sources—with payments structured around capacity availability and recovery of capital and operating expenses and financial costs. Complex multi-part tariff formulations developed for thermal projects are applied to variable renewable energy projects, while standard practice throughout the world is to use a one-part energy-only tariff. Such a formulation would be consistent with the ceiling prices defined in Perpres No. 112/2022. This thermal power heritage is also evident in the heavy penalties imposed for over- or under-production relative to declared quantities, and excessive prescription of production profiles and the technical components to be used. The contracts thereby resemble Engineering, Procurement, and Construction type contracts rather than PPAs for an RE IPP. To attract competition and quality bidders, bidders should be given at least 3-6 months for proposal submission.

PPAs should be standardized to the extent possible and allow for differences in technologies and project sizes. The allocation of risks between the utility, the government, and the developer to be thoroughly reassessed as new types of projects are prepared and reflected in the PPA. Issues related to the PPA are addressed in a separate Policy Working Group paper.

Market sounding can provide an opportunity to improve project design, re-balance risks, and achieve better procurement outcomes. PLN has used market sounding from time-to-time on an ad hoc basis or sometimes to investigate the causes of failed tenders, but systematic application in advance of RfP finalization would maximize benefits.

Shortlisting

While all new greenfield RE procurement (except for geothermal and hydro at multi-purpose dams) will utilize the competitive process of direct selection, the DPT process could be modified to provide greater visibility of the procurement pipeline, and then account for the relevant project experience of interested bidders. The current prequalification process is mostly focused on administrative requirements and the financial capability of the potential bidders. While these are important criteria in determining whether bidders can successfully implement projects, the process does not sufficiently assess technical capability such as experience developing similar projects.

Perpres No. 112/2022 now requires PLN to open DPT registration every three months—a big improvement from the previous two years. PLN could consider accompanying the opening of the DPT with the announcement of the procurement pipeline and evaluation of relevant experience. Finally, current PLN practice only allows for the formation of consortiums among DPT-listed firms. PLN could also consider allowing DPT-listed firms to associate with non-DPT firms when forming consortiums—to accommodate the involvement of firms with specialized expertise.

Evaluation

Although Perpres No. 112/2022 sets ceiling prices for most RE technologies, PLN still considers proposed prices relative to the generation production cost (Biaya Pokok Penyediaan: BPP) for that system—which is typically lower than the Perpres No. 112/2022 ceiling price. This is a direct result of the government's continued application of a revenue model based on BPP. This practice could potentially result in PLN rejecting bids based on proposed prices more than BPP yet below the Perpres No. 112/2022 ceiling price.

Table 8.3-1 Policy Reform Roadmap

Source: (JETP Secretariat and Working Groups, 2023)

Timeframe	Reform Approach	Implementation Options
Short Term	Enhanced role and capacity for PLN and government in project preparation.	(1) Develop new simplified tariff structures for RE; (2) Expand grid studies for projects and system planning; (3) Enforce thermal flexibility; (4) Facilitate projects through the provision of land and RE data measurements, including consideration of the government exploration drilling program for geothermal; and (5) facilitate the preparation of feasibility studies prior to the procurement process (tender)
	Enhance procurement processes.	(1) Prepare a standardized RfP document templates that can be used in each procurement; (2) At the RfP stage, conduct more systematic market sounding and prepare detailed guidelines and eligibility criteria for bidders; (3) At shortlisting, undertake deeper assessments of technical qualifications based on the pre-determined criteria; and (4) Use the price ceiling in Perpres 112/2022 in the preparation of PLN's own pricing estimate that will be used as reference for assessing financial proposal
	Enhance PLN procurement implementation.	(1) Strengthen digitalization and uphold the principles of Good Corporate Governance (GCG) to increase transparency and efficiency in the procurement of goods and services for electricity infrastructure development. (2) Invest in procurement capacity building for PLN personnel and adopt measures to increase the volume of procurement processing in accordance with JETP targets.
	Improve PPA terms to lower investor risk.	(1) Improve approach to mandatory participation that include the equity participation and risk sharing of equity holders; and (2) Adopt standardized PPAs with risks allocated according to prudent risk management principles, thereby minimizing costs and supporting bankability.
Medium Term	Enhance system planning and operations.	(1) Prepare framework for renewable expansion in advance of lower reserve margins; (2) Assess and optimize flexibility as input to generation planning; and (3) Fully integrate generation, grid and procurement planning.

8.3.4 Expected Results

Table 8.3-2 Summary of Expected Results

Source: (JETP Secretariat and Working Groups, 2023)

Timeframe	Expected Results
Short term	**Improved investor sentiment**

Timeframe	Expected Results
	Addressing bottlenecks in current procurement processes will improve investor perception that Indonesia is moving towards a regulatory environment that is more supportive of private investment in RE. Enhanced ability of PLN to procure projects to meet JETP targets
Medium Term	**Shorter times from planning to commissioning** Government support with land acquisition and other project preparation activities will reduce project lead times and should improve investor confidence. **A larger and higher-quality renewable power project pipeline** Improving the transparency of the PPA pipeline and enhancing procurement processes will attract a wider pool of investors which should, over time, lead to better levels of competition and quality of bids. This could also help to put downward pressure on investor expected returns which are currently elevated due to the perceived risks involved in the Indonesia power sector.
Long term	**Increase in renewable power capacity** Over the long term the reforms will support the realization of increased renewable power capacity and ensure a close alignment with the JETP.

8.3.5 Risk and Mitigation Measures

The following are risks and barriers to reforms, and/or risks achieving the expected outcomes/results, along with mitigation measures.

Table 8.3-3 Risks and Mitigation Measures

Source: (JETP Secretariat and Working Groups, 2023)

Risk	Mitigation Measure
PLN does not have the capacity to handle the volume of procurement required to achieve the JETP targets	Greatly increase PLN investment in capacity building for renewable energy procurement, including implementation of new approaches such as the appointment of procurement agents to support in procurement process
Waiting for major reform of the sector financial management and system planning and operations would delay the procurement process, but without such reforms even a good procurement process would risk the procurement of the “wrong” types of projects.	Both major reforms and simple improvements to the procurement process should be started as soon as possible, but initial work on immediate procurement could focus on tender document improvements to see immediate results.
Predevelopment of sites by PLN or government could lead to time delays and the lack of data and resources if the government wants to introduce competitive procurement on government-owned land.	Schemes for an increased facilitation should be introduced as soon as possible, but in the meantime incremental improvements to the current procurement process could prevent the stop-and-go cycle of project development.
PLN continues to enforce mandatory participation of PLN subsidiaries in the projects could lead to the delay in project construction and decrease the interest of project developers to invest in renewable energy projects	The scheme for participation of PLN’s subsidiaries in the projects needs to be prepared and implemented. Instead of mandating the winners to participate with the subsidiaries it would be best for subsidiaries to approach project developers for partnership prior to the procurement process
PLN may choose to continue to use assignment to SoEs rather than competitive procurement.	Continued socialization of the risks of direct assignment and the benefits of competitive tenders, along with a review of the outcomes of recent competitive tenders and direct assignment projects.

8.4 Power Purchase Agreement for Renewables

8.4.1 Background and Context

A Power Purchase Agreement (PPA) is a commercial contract between an independent power producer (IPP or seller) and an off-taker (buyer) providing for the sale and purchase of energy thereby securing a long-term revenue stream from the project. In the case of Indonesia, PLN is the single off-taker and purchaser of all electricity generated for public use with certain exceptions of captive power or at licensed industrial zones. In such a single off-taker market, a signed PPA therefore serves as a crucial prerequisite to securing long-term financing and developing an IPP project.

Since the 1990s, Indonesia has relied on IPPs for a significant amount of new capacity. As IPPs are responsible for securing their own financing, purchasing electricity from IPPs is a way for PLN to procure additional capacity with minimal upfront costs. The cost to PLN is spread over the term of the PPA—generally 25-30 years. Until the mid-2010s, PLN was successfully and regularly procuring additional (often coal-based) capacity through IPPs—with a feasibility that assessed the PPAs as bankable. As of December 2022, Indonesia had 69.0 gigawatts (GW) of installed capacity—of which more than one-third, around 23.0 GW, are produced by IPPs. The current Electricity Business Plan (*Rencana Usaha Penyediaan Tenaga Listrik:* RUPTL) 2021-2030 envisions an increase in the number of IPPs. Of an additional 40.6 GW of planned new capacity by 2030, 26.3 GW or 65 percent is expected to come from IPPs under PPAs, all of which will be based on gas or renewable energy.

Before 2017, risk allocation in PPAs was largely negotiated between the buyer and seller, however, since 2017, PPAs have been regulated in Indonesia. Relevant regulations include:

1. Ministry of Energy and Mineral Resources (MEMR) Regulation No. 10/2017 on the Main Provisions of Power Purchase Agreements (as amended by MEMR Regulations No. 49/2017 and No. 10/2018);
2. MEMR Regulation No. 50/2017 on Renewable Energy Use and Tariffs;
3. MEMR Regulation No. 53/2018: the first amendment of MEMR Regulation No. 50/2017;
4. MEMR Regulation No. 4/2020: the second amendment of MEMR Regulation No. 50/2017; and
5. Perpres No. 112/2022 on Accelerating Renewable Energy.

The key terms of a PPA are regulated under Ministerial Regulation No. 10 of 2017 issued by the MEMR. These terms, among others, include contract period, rights and obligations of principal parties, risk allocation, insurance, tariff formula, dispatch, penalties, termination, share transfers, pricing adjustments, fuel supply (for bioenergy and geothermal), dispute resolution, force majeure, and others. The terms and conditions of the PPA define the risk allocation between the seller and buyer and determine the “bankability” from the lender’s and sponsor’s perspective, and “value” from the power system operator’s perspective.

Ministerial Regulation issued by MEMR No. 12/2017, as replaced by Ministerial Regulation No. 50/2017, was adopted to accelerate the development of IPP projects from renewable sources of energy. It defines the various renewable technologies and requires the PPA to be standardized for each type of technology—with procurement through a direct selection process (except for geothermal and waste-to-energy plants). The market generally found these regulations to be wanting due to the various changes made to the procurement and risk allocation structures that thermal IPPs previously enjoyed. In response, MEMR issued Ministerial Regulation No. 4 of 2020, retaining the tariff regime under MEMR No. 50/2017 which relied on benchmarking based on the local BPP (*Biaya Penyediaan Pokok* or PLN's average electricity generation cost).

The tariff regime in MEMR No. 50/2017 linked to BPP made renewables uncompetitive on large power systems that relied primarily on effectively subsidized coal-fired generation. This tariff structure effectively rendered many renewable energy projects in Indonesia unviable. In September 2022, the government issued the long-awaited Perpres No. 112/2022 on Acceleration of Renewable Energy. Perpres No. 112/2022 negated the previous BPP regime and adopted a tariff regime that focuses on the highest benchmark price (Ceiling Price) with limited exceptions where the tariff can be agreed on a business-to-business (B2B) basis with PLN (Agreed Price). The Ceiling Prices are set in US cents per kWh for all renewable energy technologies based on:

- The generation capacity levels of the relevant renewable energy IPPs;
- A staged tariff approach with higher Ceiling Prices for the first 10 years of operation and lower Ceiling Prices from year 11 onwards; and
- The application of a locational factor for the first 10 years.

The initial Ceiling Prices set out in Perpres No. 112/2022 will be evaluated by MEMR (in coordination with the Ministry of Finance: MoF and the Ministry of State-owned Enterprises: MSoE) on a yearly basis with consideration to PLN's latest average contract prices. If this evaluation leads to changes in the Ceiling Prices, these will be set out in a ministerial regulation. If applicable, the main PPA tariff will have an added separate and specific tariff component for the interconnection with the grid and a further tariff for any battery energy storage solutions (BESS).

There is no standard form of PPA, including for renewable PPAs, in Indonesia while it is noted that the ministerial regulation for renewables PPA is under finalization. PPAs for IPP projects in Indonesia are currently negotiated on a case-by-case basis, and with each new request for proposal (RfP), the template PPA has tended to shift more and more risks, including risks which are better handled by the buyer, towards the seller.

Perpres No. 112/2022 provides that MEMR will issue a guideline for PPAs executed with IPPs. An MEMR implementing regulation has been recently drafted and is being socialized. This implementing regulation sets out the terms of a renewable energy PPA, similar to the list above for Ministerial Regulation No. 10 of 2017 issued by the MEMR. It also includes provisions on renewable energy attributes and carbon crediting, intermittency of generation, and generation combined with storage. In parallel, various draft model PPAs have been developed by legal counsel and stakeholders, but none have yet to be issued as the model PPA.

8.4.2 Rationale for Reform

Early intermittent PPAs awarded during 2016 to 2017, all of which were sponsored by international developers, were able to obtain sufficient financing. Large hydro, geothermal, windfarm, and solar projects the PPAs of which were awarded prior to the adoption of MEMR Regulation No. 10/2017 generally were able to obtain financing from export credit agencies, multilateral agencies, and international banks. Although the spate of regulations around 2017-20 detailed above had the effect of dampening the market for IPPs, some of the recent renewables' tenders were nonetheless able to successfully obtain financing.

Meanwhile, downward pressure on power purchase tariffs is causing RE projects in Indonesia to become less attractive, especially given the other risks described in this subchapter.

It is hoped that a new MEMR regulation governing PPAs that is currently under consideration would establish a template with standard terms that will be favorable for each RE technology and for the RE sector as a whole. PPA standard terms should help to ensure that projects will be developed successfully and enter service within the specified timeframe.

However, certain of the risk allocation terms contained in draft template PPAs for projects being tendered are not consistent with market practice. For example, PPA for certain hydropower projects include a clause that prohibits a developer from divesting the project before the fifth year from COD. Given that hydro projects have long lead time, such a delay for a "stalled" project would instead hurt PLN's capacity-planning and debt repayment capability.

In certain cases, a hardship and restructuring clause is inserted that would allow unilateral restructuring of the material terms of a PPA, including tariff adjustments. In addition, a grace period is typically requested before deemed generation payment applies, for example in the case of grid curtailment, change in law, government action/inaction. The length of this grace period is generally longer than that as included within precedent PPAs. These provisions would affect the economic returns of renewable energy projects.

Furthermore, power purchase price or tariff is ultimately one of the most important aspects of the PPA. Although under Perpres 112/2022 the MEMR and PLN began implementing a reference or ceiling price paid to different renewable energy projects based on size and geographic location, PLN is still required to ensure that purchases of renewable energy do not result in higher customer tariffs and should, therefore, be equal to or lower than the cost of supplying electricity generated by subsidized fossil fuel. Embedded price cap to fossil fuels and the failure to capture external environmental impact (including CO_2 emissions) or health costs—especially coal-fired power plants (CFPPs)—distorts the true cost of fossil fuels and benefits for renewable energy purchases. This is discussed further in subchapter 8.2 on supply-side incentives.

Recent PPAs introduce provisions under which any deemed dispatch or deemed commissioning payments by an IPP would be offset against any payment for energy that PLN would otherwise be required to pay in excess of the take-or-pay amount. These concepts would have a negative impact on project returns and will thereby reduce the competitiveness of the bidding tariff. In addition, wind project developers' site annual committed energy for wind

PPAs varies depending on the location, and the predicted capacity metric is only accessible by PLN.

8.4.3 Proposed Reform Roadmap

8.4.3.1 Create Market-accepted PPA Template

Creating a market-accepted standard-form template is a critical component of an effective procurement process, as it would significantly reduce transaction costs. More crucially, the template PPA must strike an equitable balance and allocation of risks amongst PPA contracting parties, which is the foundation of a successful and bankable PPA.

The standard-form template should be market-tested by agglomerating best practices from negotiated PPAs agreed with PLN that have been proven to be bankable, with international best practices, and by taking into account input from all principal market participants (e.g., PLN, developers, lenders, sponsors, and contractors).

Finally, a standard-form template must be uniformly applied to all procurement processes, which ideally would be mandated by MEMR regulation. It is expected that these improvements would greatly improve the investment climate of Indonesia’s renewable energy sector.

8.4.3.2 Conform PPAs with Current Regulations

MEMR may consider evaluating whether a PPA template conforms with applicable regulations before they are ultimately signed by the parties. For example, PPAs that prior to the adoption of MEMR Regulation No. 4/2020 incorporated a BOOT scheme (i.e., build, operate, owned, and transfer) could after such adoption be converted to BOO (i.e., build, operate, and own). However, this conversion has not generally occurred. Similarly, negotiation for new PPAs after MEMR Regulation No. 4/2020 still generally incorporates BOOT scheme rather than BOO even though a BOOT structure causes significant impediment to the bankability of a project.

8.4.3.3 Ensure Equitable Risk Allocation

The core of a bankable PPA is equitable allocation of risks.

Generally, risk is most optimally allocated to the party best able to manage such risk. If a party is required to take on risk that the other party is otherwise more well-placed to mitigate, the former party would expect to receive some benefit for assuming such risk.

From January 2016, PLN began recognizing energy purchases from IPPs pursuant to existing PPAs as power sale and purchase transactions and no longer as capitalized lease. As a result, PLN adjusted downwards Rp72.2 trillion of property, plant, and equipment which concurrently reduced PLN’s lease liabilities of Rp128.0 trillion. This change was in accordance with OJK Regulation 6/2017 which allows for transactions based on a PPA to be treated as sales and purchase transactions, notwithstanding the fact that certain of its substance may be other than that of sales and purchase of electricity.

Consequently, a PPA should not be treated by its contracting parties as a procurement of a “project” or an “asset” that PLN would eventually own but rather as a procurement of electrons.

Similarly, those parties may also consider a comparable modification on the appropriate balance of risk allocation for future PPA negotiations. Finally, consultation on this matter with the Supreme Audit Agency (Badan Pemeriksa Keuangan or BPK) should be made to evaluate the related treatment of IPP assets and returns.

Table 8.4-1 highlights material issues relating to risk allocation arising from PPAs contained in recent RFP documentation, which should be addressed in a template PPA. This list is illustrative in nature and therefore not exhaustive.

Table 8.4-1 Risks Allocation Issues to consider in template PPA

Source: (JETP Secretariat and Working Groups, 2023)

Issue	RFP PPA	Comment
Hardship and restructuring	PLN has the right to unilaterally restructure material terms of a PPA including electricity pricing, terms of the agreement, load curtailment, and availability factor. This right could be triggered by cases of hardship or, in certain cases, at PLN's discretion.	Sponsors and lenders of a lender expect to make equity and debt investments and therefore require certainty that a PPA will constitute a reliable long-term agreement. Inclusion of a unilateral right to alter, or propose alteration to, material and commercial contractual terms will introduce a significant degree of uncertainty, require a reordering of agreed risk allocation, and are not in line with precedent PPAs. Finally, the definition and effects of hardship must be clearly defined and, ideally, should be addressed in the force majeure (FM) provisions of a PPA.
Benefits arising from refinancing	If a project developer is able to obtain refinancing on better terms, any net financial benefits arising from such refinancing must be shared with PLN by way of tariff reduction payable to the seller on a 50:50 basis.	A requirement to share upside from successful debt refinancing would be highly non-market. A project developer takes on significant project and market risks by taking on financing in order to undertake a project.
PLN payment default	In the case where PLN breaches its payment obligation, it has a 45-day cure period; however, an additional grace period has been added in certain cases for a period of up to three months.	This is a material departure from PLN precedents. As discussed, PPAs generally already provide for a 45-day cure period if PLN breaches any payment obligation. However, creating an additional grace period produces a significant degree of uncertainty regarding a project's cash flow visibility. In addition, although application of a late payment interest could potentially be helpful to ameliorate any adverse impact on a project's aggregate economic returns, extending this grace period would nonetheless put significant strain on a developer's cash flow.
Grace period for deemed dispatch payment	Payment for deemed dispatch would be required for certain cases of grid curtailment, change in law, government action/inaction; however, such payment would only be required after a specified grace period. The length of this grace period varies substantially in length and method of calculation across different PPAs.	Generally, grace period for curtailment should be limited because they result in decreased deemed dispatch payment from a project. Furthermore, the period before which an actual curtailment would count towards becoming a deemed dispatch obligation must also be limited; because repeated short disturbances (e.g., less than 48 hours) that do not count towards such a deemed dispatch calculation would, in aggregate, result in significant loss of revenue to the seller.
Deemed dispatch and deemed commissioning clawback	PLN has the right to offset any deemed dispatch or deemed commissioning payments by an IPP against any payment for energy that PLN would otherwise be required to pay in excess of the take-or-pay amount. This effectively limits the project upside that a seller	To consider an upside-sharing mechanism for excess energy payments. For example, allowing early purchase of power, e.g., by accelerating the occurrence of the COD, could be mutually beneficial for both parties. In this case, the seller's

Issue	RFP PPA	Comment
	could otherwise obtain from such excess energy.	project economics would be improved while the duration of the PPA would remain as agreed.
Insufficient time before financial close deadline	PPAs typically provide a deadline by which date a project must have received disbursement of financing which could be in equity or debt. The deadline can be as early as six months from the effective date of the PPA.	Conditions precedent to financing from sponsors or lenders typically include items that a developer could only begin to obtain after having a PPA with PLN signed. These include completion of all feasibility studies, acquiring all licenses and permitting, and land acquisition. It is highly unlikely for each of these processes to be completed within the required financial close deadline of, for example, six months. To optimize this project development process, a mechanism should be devised by which the material project conditions mentioned above should have been completely secured by PLN prior to initiating its procurement process. This approach along with the proposed reforms mentioned in subchapter 8.3.3 would significantly reduce project timelines and enhance overall project efficiency.
Ownership of renewable energy attributes and carbon credits	PLN would own all renewable energy attributes or carbon credits generated by the project.	International best practices provide that ownership of renewable energy attributes or carbon credits should be held by the party who bears project and investment risks related to an emission reduction activity. MEMR may consider preparing a regulatory framework to establish clarity as to renewable energy attribute and carbon credits ownership.
Termination payment	Termination payments are made in Rupiah and include certain broad qualifiers such as “to the extent the costs are reasonable” in the calculation of termination cost.	Termination payments in Rupiah raise concerns related to exchange rate risk. To comply with Bank Indonesia Regulation No.17/3/PBI/2015, the termination cost value could be denominated in either U.S. dollar or Rupiah and, if denominated in U.S. dollar, the payment of which could be settled in the Rupiah-equivalent amount. In addition, in the event of termination, it is important to lenders that agreed fees, especially those that are based on quantitative formulae, would not then be subjected to a subjective qualifier such as reasonableness.
Arbitration	Arbitration in Indonesia under the procedural rules of BANI (*Badan Arbitrase Nasional Indonesia* or Indonesian National Arbitration Board).	International parties generally prefer offshore arbitration using procedural rules of established international arbitral bodies, such as the Singapore International Arbitration Centre (SIAC) or International Chamber of Commerce (ICC). An evaluation of BANI and its procedural rules should be done to determine areas that require alignment with international standards. Finally, any question as to the legitimacy of BANI should be comprehensively resolved to create assurance to all parties.

8.4.3.4 Evaluate Optimal Tariff Structure

Perpres No. 112/2022 prescribes that the applicable tariff ceiling must be reviewed each year based on the average contract price of PLN. As noted above, the true avoided costs on which the tariff is based do not include externalities or subsidies. These costs should be revisited from time to time as other reforms are implemented.

The current schedule of ceiling tariffs quotes a higher tariff in years 1-10, which is stepped down in years 11-30. This requirement therefore prescribes a debt repayment period (of about 7-8 years) and could potentially limit the leverage the project developer can achieve. The GoI may consider extending the initial higher tariff period from 10 years to up to 15 years. This would accommodate the typical debt lending tenors available from most international development agencies.

Furthermore, biomass power plants face risks arising from volatility in feedstock prices over the term of the PPA. Biomass power plant PPA's should include an escalation in Component C (fuel charge). The government can also consider escalation clauses for inflation under the next schedule of tariffs to avoid erosion of the economic value of the PPA over time.

Table 8.4-2 Reform roadmap

Source: (JETP Secretariat and Working Groups, 2023)

Timeframe	Reform approach	Implementation options
Short Term	Standardize PPA template and risk allocation	Develop a standard-form PPA template including risk allocation for each type of RE technology. Market-test PPA template and risk allocation to ensure their terms are acceptable to all relevant parties and thereby limit negotiation and transaction cost.
	Adopt implementing regulation to Perpres No. 112/2022	Adopt MEMR regulation that provides for the standardized PPA template and market-standard risk allocation and implement the guiding principles of Perpres No. 112/2022.
	Aligning understanding on material terms in PPA structure and economics	Consultation with the Supreme Audit Agency (Badan Pemeriksa Keuangan or BPK) should be made to align risk allocation and evaluate the treatment of IPP assets and returns.
Medium term	Review tariff structure under Perpres No. 112/2022	Review to ensure that the tariffs offered under a PPA more closely represent the true avoided costs of alternative technologies.

8.4.4 Expected Results

Table 8.4-3 Summary of expected results

Source: (JETP Secretariat and Working Groups, 2023)

Timeframe	Expected results
Short term	**Improved investor sentiment** The PPA framework and power purchase tariffs are currently viewed by investors as two of the major regulatory barriers to private investment in renewables. Addressing these concerns would improve investor perception that Indonesia is moving towards a regulatory environment that is more supportive of investment.
Medium Term	**A larger and higher quality RE project pipeline** Improving the PPA framework, linked with procurement reforms, should attract a wider pool of investors, which over time would lead to better quality tenders. Furthermore, addressing current issues in the PPA framework, especially risk allocation, could also help put downward

Timeframe	Expected results
	pressure on investor expected returns (and bid prices) which are currently elevated due to the perceived risks involved in the Indonesian power sector.
Long term	**Increase in RE capacity** Over the long term, reforms will help to realize increases in RE capacity at internationally competitive tariff levels.

8.4.5 Risk and Mitigation Measures

The following are risks and barriers to reforms, and/or risks in achieving the expected outcomes/results, along with mitigation measures.

Table 8.4-4 Risks and mitigation strategy

Source: (JETP Secretariat and Working Groups, 2023)

Risk	Mitigation measure
Implementation risk Most of the proposed reforms relate to the rebalancing of risk towards the party best positioned to bear that risk. Achieving these reforms could be challenging, especially given that they form part of a broader suite of recommended reforms aimed at reducing regulatory distortions that shield PLN from normal market risk.	Encouraging the proposed reforms will help to demonstrate policy alignment with international best practices, especially across ASEAN. Analyses will demonstrate that improving the PPA and tariff framework will ultimately improve value for money for PLN. Furthermore, changes to the PPA framework will need to strike an equitable balance between government and bidder risk, distributing risks fairly based on who is most well-placed to mitigate their outcomes.
Reforms that result in higher benchmark tariffs to incentivize investment in RE could be resisted in the absence of a clear compensation mechanism.	The MoF may evaluate an appropriate mechanism to compensate PLN for adopting benchmark tariffs that are aligned with market standards.

8.5 Early CFPP Retirement and Managed Phased-out

8.5.1 Background and Context

To reach the ambitious decarbonization target, Indonesia will need to advance its renewable energy and climate ambitions in a timely manner, one of them by managing a phase-out of the existing coal-fired power plants (CFPPs). Sector-level planning for CFPP phase-out is required to ensure smooth transition. There are largely two ways to reduce emissions from CFPPs: one is to retire certain CFPPs based on predetermined agreement at an arm's length basis; and the other is to reduce generation output by encouraging more flexible operation through lowering capacity factor (CF). The former would need proper compensation, legal and regulatory environment for early retirement. The latter would require compensation mechanisms for non-energy outputs and technical retrofitting.

Indonesia has laid out the regulatory framework to start to phase-out its coal fleets. In September 2022, the President issued Perpres No. 112/2022 on Accelerated Development of Renewable Energy for Electricity Supply which called for the Ministry of Energy and Mineral Resources (MEMR), in coordination with the Ministry of Finance (MoF) and the Ministry of State-owned Enterprises (MSOE), to prepare a roadmap to accelerate the decommissioning of CFPPs. The roadmap should, at a minimum, address the following issues: (i) reduction of greenhouse gas emissions from CFPPs; (ii) strategies for accelerating the decommissioning of CFPPs; and (iii) ensuring policy alignment. Currently, the MEMR has started the drafting process of such a roadmap in close coordination with the MSOE and MoF.

Indonesia's grid-connected coal fleet consists of a mix of plants owned by either PLN or Independent Power Producers (IPP). The early retirement, or change in operating patterns, of these two types of plants has different implications. IPPs have a binding power purchase agreement (PPA) with PLN under which PLN is obliged to offtake electricity at a certain price (usually also with minimum capacity requirements).

There are PPA-related matters that would need further studies when it comes to retiring early IPP plants, such as restrictions in transfer of shares, termination clauses, and employment issues. In terms of shares transfers, considering that most large-scale CFPPs in Indonesia are financed through project finance schemes, this may provide shares transfer restriction under the relevant financing agreements with the lenders. A full legal due diligence would be needed before any asset can be retired early, looking into other documents such as land leases, operations and maintenance (O&M) contracts, and fuel agreement contracts.

There are also clauses which set out formula for compensation in case of early termination or other material changes instigated by PLN, e.g., reducing contracted CF, in the PPA. Compensation on termination, for example, generally covers outstanding debt and expected equity, plus miscellaneous fees. However, compensation as a result of either an act of retiring an asset earlier than its predetermined useful life or for reduction of capacity to allow flexibility generation, will entail a renegotiation of these terms on a case-by-case basis—with the baseline compensation set out by agreement and would need to be reached with an arm's-length basis between each party.

Business models and transactions are being discussed by various stakeholders to enable the early retirement of IPPs. These include the Energy Transition Mechanism proposed by the Asian Development Bank for the Cirebon-1 plant in West Java, which uses concessional financing to reduce the timeline for debt and equity returns, thereby bringing up the timeline to early retirement (refer to 0 for financing structure of these early retirements). For other IPPs without access to concessional financing, short of early retirement (which would trigger compensation on early termination clauses) PLN would have to negotiate to increase the flexibility of the minimum offtake requirements. This would allow the power system to gain the ability to adjust its operation in response to real-time conditions. However, changes to existing PPAs which have a negative financial impact on the private partner are unlikely to be acceptable without compensation.

PLN-owned plants do not have a power purchase contract with a third party and therefore change and termination clauses do not apply. Instead, PLN maintains a book value of its assets in its accounting systems. According to PLN, 1 GW of coal-fired capacity for a 30-year-old plant has a book value of approximately US$400 million (newer plants cost much more). Given the significance of these assets, it is imperative to find the most efficient mechanisms for any possible early retirement of PLN-owned coal plants. In theory, PLN is permitted to dispose of its assets and record an impairment and/or accelerated depreciation in its books based on the recently issued regulations. PLN could also be compensated for such disposal, and indeed several models are currently being discussed, such as the spin-off model. However, the early retirement of PLN-owned CFPPs is challenging due to a lack of a legal framework and other issues which might lead to adverse impacts on PLN.

8.5.2 Rationale for the Reforms

The rationale for reforming the legal framework for early retirement of PLN-owned CFPPs is as follows:

1. To complement the existing legal framework on asset disposal, compensation and renewable energy acceleration with regulations specific to early retirement and changed operating patterns of CFPPs;
2. To alleviate state loss concerns by introducing a legal cover for such early retirement; and
3. To provide a legal basis for negotiations with third party lenders impacted by the early retirement

The rationale for reforming the legal framework for early retirement of IPP-owned CFPPs is similar to retiring PLN-owned CFPPs. In practice, retirement for IPPs-owned CFPP should be simpler as it does not intersect with the complex issues concerning state assets. As long as all parties come to an agreement at arm's length, then contract amendments are workable.

8.5.2.1 Completing the existing legal framework

Currently there are a number of regulations concerning the legal framework for early retirement of PLN-owned CFPPs. These include:

- Minister of Finance Regulation No. 159/PMK.02/2021 as most recently amended by Minister of Finance Regulation No. 159/PMK.02/2022 ("Regulation 159") on Compensation to PLN. Regulation 159 compensates PLN for its revenue deficit from non-subsidized electricity tariffs and higher electricity generation costs based on a cost-plus model. The formula subsidizes PLN for its losses in electricity sales but does not allow full cost recovery of the investment outlays (see subchapter 8.6 on PLN Financial Sustainability). Mandatory early retirement will accelerate the depreciation of the CFPP assets, thus reducing the asset base and therefore significantly impact compensation calculations under Regulation 159 without an alternative method of compensation for early retirement;
- Perpres No. 112 of 2022 on the Acceleration of Renewable Energy Development for Electricity Supply ("Perpres 112/2022") sets out a moratorium on new grid-connected CFPPs, a requirement to develop an early coal retirement roadmap, and fiscal support sourced from the GoI budget and/or other sources for the acceleration of Indonesia's energy transition. The implementing regulations under Perpres 112/2022 are under development, and expected to be an ideal mechanism for early retirement of CFPPs;
- Minister of State-Owned Enterprise Regulation No. PER-2/MBU/03/2023 on the Governance and Significant Corporate Activities of State-Owned Enterprise (MSOE 2/2023). This regulation provides a basis for the disposal of SOEs assets through,

among other methods, the sale, exchange, or write-off of fixed assets, provided that such write-off is in the "public interest". The early retirement of the CFPPs pursuant to Perpres 112/2022 could be deemed to be in the public interest given that it is intended to support and accelerate the energy transition; and

- Minister Regulation No. 2/2023 issued by MSOE provides some guidance on the valuation methodology of the assets being disposed of that can be applied to the early retirement scenario. This regulation provides that, to determine the disposal price, the Board of Directors of the SOE must utilize the services of an appraisal company. This means that, as a general rule, the sale or disposal of the SOE's assets should be based on the valuation of the appointed appraisal company.
- Notwithstanding this general rule, however, MSOE Regulation No. 2/2023 provides for the ability of the Board of Directors to deviate from selling or disposing the assets based on the appraisal price provided that:
  a. The Board of Directors does not receive any offers with the same or higher value than the minimum price set by the appraisal company;
  b. There are no interested buyers after several attempts to sell the assets (i.e., two public offerings, three limited offerings and no direct offer acceptance);
  c. The independent appraiser confirms that the transfer of the assets at the price offered by a bidder will be more profitable for the SOE than retaining the relevant assets; and/or
  d. There is an urgent need for the SOE to complete such sale or disposal.
- Supporting the implementation of the 2020 Grid Code as the basis for flexibility. PLN will need to ensure there is investment in flexible resources that can provide 'spinning' reserves to guard against grid interruptions *and* to ensure that there are mechanisms to exploit the flexibility of these resources once installed. PLN could start co-optimizing generation and transmission investments and grid operation by explicitly considering the flexibility needed to facilitate the uptake of VRE as part of the energy transition. This can be done by ensuring ancillary services allocation in its dispatch processes take into consideration variable outputs from VREs in the dispatch control center. This will ensure the spinning reserve requirement is set in advance and the designated flexibility suppliers (such as generation or storage facilities) are assigned spinning reserve responsibilities. While the 2020 Grid Code already provides for this, it is often not implemented because it can have an adverse financial impact on the generator. PPAs signed before the current Grid Code may challenge the new Grid Code for this reason.

8.5.2.2 To alleviate state loss concerns

The principal concern of state loss is that any disposal of the CFPPs below their book value would be prima facie presumptive of corruption under Law No. 1 of 2004 regarding State Treasury as amended by Government Regulation in Lieu of Law No. 1 of 2020 (Law 1/2004), and the implementing Government Regulation No. 38 of 2016 regarding Procedures for Claiming State/Regional Loss Against Non-Treasurer Public Servants or Other Officials (PP

38/2016). These laws are designed to safeguard from moral hazard that may lead to any perceived or actual losses.

Box 8.4 Legal analysis on "State assets" and "State loss"

The term "State assets" as set out in Law 1/2004 and GR 38/2016 has historically drawn divisive conclusions when it comes to determining whether the assets of a SOE are part of "State assets". Under Law No. 17 of 2003 regarding State Finances ("Law 17/2003"), "State finances" are defined as assets managed by the State or by other parties in the form of money, securities, accounts receivable, goods, and other rights that can be valued in money, including "assets that are separated from state enterprises/regional enterprises". The words "assets that are separated from State enterprises/regional enterprises" were reviewed by the Constitutional Court under Decision 48/PUU-XI/2013 ("Decision 48"), in which the Constitutional Court confirmed that assets of an SOE are also assets of the state as they are part of the state finances. Also, in Decision 62/PUU-XI/2013 ("Decision 62"), the Constitutional Court decided that an asset which is owned by a SOE is owned by the state, contradicting earlier decisions in 2011 which found that Law 17/2003 should be taken to mean that SOEs are business entities that have separate assets from state assets. Given the conflicting rulings, it is not clear whether PLN's CFPP assets fall within the scope of Law 1/2004.

Furthermore, pursuant to Article 1(22) of Law 1/2004, "State loss" is defined as a reduction in money, securities and goods, the amount of which is real and certain as a result of unlawful acts, whether intentional or negligent. Therefore, for "State loss" pursuant to Law 1/2004 to arise, the occurrence of an unlawful act is required. Accordingly, the elements of "unlawful act" under Article 1365 of the Indonesian Civil Code must be fulfilled. The elements that must exist are: (i) a loss, (ii) a wrongful act, and (iii) a causal relationship between (i) and (ii). This analysis has been supported by various decisions of the Indonesian courts which emphasize the existence of the unlawful act being committed as a ground for any claim of State loss. Whatever the true legal position, the ambiguity means that SOE officers are unlikely to want to take a decision to sell because there remains an unresolved personal risk. This has also been the concern raised by PLN's management.

The proposed early retirement of the CFPPs will take place against the backdrop of the GoI's commitments in the Paris Agreement and the JETP, as well as regulations including Perpres 112/2022. Therefore, sub-book value asset sale or disposals (made by PLN exercising its right to decision making autonomy) in respect of the early retirement of the CFPPs should not constitute "unlawful acts" under Law 1/2004 unless there is any fraud, corruption or embezzlement involved in such disposals. However, to fully cover the personal and institutional risks, it is preferable that a specific regulation be passed which allows for early retirement of CFPPs to be considered as a "lawful act."

It is acknowledged that given its status as a SOE, the state finance aspects of PLN's management and operations may require guidance from the Supreme Audit Board (Badan Pemeriksa Keuangan/BPK) and the National Government Internal Auditor (Badan Pengawasan Keuangan dan Pembangunan/BPKP) of Indonesia. Further studies and engagement with these entities are needed to assess the potential disposal of PLN's assets and other risks attached to it.

8.5.2.3 Third party lenders, export credit agencies and bondholders

PLN relies heavily on debt financing from various lenders, including banks and capital markets, for its capital expenditures. These debt financings are underpinned by legal agreements which often include specific covenants which may be triggered by revaluation or write-off of PLN assets. Often, the financing structure also includes an Export Credit Agency (ECA), whose agreement with the lenders include covenants that are mirrored in the loan agreements with PLN.

Some covenants which may be impacted include the restriction on the disposal of PLN's assets, whether voluntary or involuntary, where such disposal would reasonably be expected to result in a Material Adverse Effect; and/or the restriction on taking any action to materially change the nature of PLN's business. More detailed analysis of the existing loan or bond documentation would be required to determine if any of these covenants would be affected by early retirement.

8.5.3 Recommended Reforms

8.5.3.1 Regulation on Early Retirement

As noted above, it would be useful to have a legal basis for early retirement. This regulation could be part of the expected Early Retirement Roadmap to be issued by MEMR as an implementing regulation under Perpres 112/2022, or it could be a separate regulation by MoF.

The proposed regulation would cover the following:

1. A definition of the CFPPs and a clear description of the transactions that are permitted to be undertaken by PLN in connection with the early retirement of the CFPPs. The definition of the CFPPs should list out all of the CFPPs that are being considered for early retirement based on clear criteria (e.g., power plant lifespan, capacity, utilization, GHG emission, investment cost) and PLN should be able to sell or write off such CFPPs;
2. An explicit provision stipulating that the early retirement of the CFPPs is in the public interest (i.e., to reduce carbon emission and accelerate the uptake of renewable energy under Perpres 112/2022);
3. A formula for calculating the compensation payable, if retired early;
4. A step-by-step procedure and timeline for each type of disposal transaction (e.g., sale, write-off);
5. A clear procedure for obtaining the approvals or recommendations that are required by the relevant government institutions; and
6. The legal documents required to affect the sale or disposal transaction.

8.5.3.2 Flexible operation of assets

Barring full retirement, PLN could also consider operating its CFPPs more flexibly and allow for higher integration of RE. To do so, PLN will need to reduce technical minimum loading requirements and develop more advanced control centers at the system level as well as upgrade controls and equipment at the plant level, among other factors (see Chapter 5 for further discussion). A revisit of existing performance indicators on capacity factor and fuel use, which incentivizes continuous and full operation of the plant, would be needed. Further analysis of the legal and accounting impacts of introducing flexibility to PLN-owned plants is also needed.

Finally, additional policies to allow compensation mechanisms for non-energy services that could be provided by existing CFPPs, such as ancillary services and flexibility, can also be considered. Existing IPPs can be brought on board by adjusting their contract terms and, if necessary, pricing. In the longer term, unbundling ancillary services pricing may be necessary to incentivize compliance with the additional flexibility that will be necessary to fully integrate RE reliably.

Going forward, any thermal PPAs and fuel-supply contracts PLN signs with an IPP (for example for gas generation) should include flexibility built into the contracts to avoid locking-in gas. PLN can consider hybrid contract models, which combine fixed-price components to cover for fuel supply purchase obligations with variable components that remunerate generating assets for the provision of energy, capacity or flexibility based on market conditions and renewable energy availability.

Table 8.5-1 Reform Roadmap

Source: (JETP Secretariat and Working Groups, 2023)

Timeframe	Reform approach	Implementation options
Short Term	Issuance of implementing regulation for early retirement of CFPPs	The Coal Retirement Roadmap required by Perpres 112/2022 would need to address issues relevant to early retirement or flexible CFPP operation, amongst others: potential impairment or asset disposal that could trigger state loss concerns, The same or a separate regulation will provide that early retirement is in public interest and provide procedures to do so
	Implement existing grid code on flexible use of certain CFPPs	Start to use PLN-owned plants more flexibly, following necessary technical upgrades. Develop compensation mechanisms for non-energy outputs such as flexibility and ancillary services to shift CFPPs into a more supportive role, including IPPs.
	Implement Early Retirement Roadmap	All of the CFPPs that are being considered for early retirement should be based on clear criteria
Medium term	Negotiate on a case-by-case basis further flexibility or early retirement of IPPs where possible	Depending on interest from the sponsor and lenders, identify a few IPPs which may be amenable to additional flexibility or early decommissioning
	Potentially insert flexibility clause in future thermal (gas) PPAs and the fuel supply contracts	To avoid gas lock-in in the future, new thermal PPAs and fuel supply contracts can potentially have built-in flexibility clauses

8.5.4 Expected Results

Table 8.5-2 Summary of Expected Results

Source: (JETP Secretariat and Working Groups, 2023)

Timeframe	Expected results
Short term	Earlier and more capacity of CFPPs retired, more flexible use of PLN CFPPs, immediate emissions reductions
Medium Term	More flexible system with gradual decrease of capacity and utilization from CFPPs and increase from renewable energy
Long term	Eventual phase-out of most CFPPs

8.5.5 Risk and Mitigation Measures

The following are risks and barriers to reforms, and/or risks achieving the expected outcomes/results, along with mitigation measures.

Table 8.5-3 Risk and Mitigation Measures

Source: (JETP Secretariat and Working Groups, 2023)

Risk	Mitigation measure
Concern about personal liability under state loss results in inaction on early retirement decisions	Regulation explicitly covers risk of personal exposure to state and commercial losses, to be verified by Supreme Audit Board and the National Government Internal Auditor; list of CFPPs for early retirement published
Risk of PLN outstanding debt covenants breached; bondholders and lenders unwilling to issue necessary waivers	To market-sound the early retirement of CFPPs to key lenders and advisors, appeal to ESG sentiment

8.6 Ensuring PLN Financial Sustainability

8.6.1 Background and Context

The JETP Comprehensive Investment and Policy Plan (CIPP) estimates that the capital expenditure needed for the development of grid investments and electricity generation under JETP is projected to total US$330.6 billion by 2040, or an average of US$19.4 billion annually, compared to PLN's 2022 capital expenditure program of US$3.5 billion, requiring an expansion of PLN's capital expenditure program to over 5 times its current level or ~2.5 times (~US$ 7 billion) its historical high over the last 10 years (PT Perusahaan Listrik Negara, 2022).

PLN has a highly leveraged balance sheet, low profitability, constrained self-financing capacity, and it cannot access the equity capital markets without a privatization mandate from the government. These factors constrain its capacity to externally and internally finance the required JETP capital investment without a significant amount of fiscal support, combined with increasing amounts of concessional financing to maintain a sustainable long term capital structure.

The financial model applies the inputs from the technical working group for its demand and supply forecasts; IPP and PLN split for newly built power plants; power purchase tariffs as per the technologically specific mid-tariff stated in the Perpres No. 112/2022 on Accelerating Development of Renewable Power Supply (detailed in Appendix 10.15); and other macroeconomic variables and fuel price curves. The model is built to ensure that PLN remains compliant with its current debt covenants. Further, the model does not distinguish between GoI subsidies and compensations.

The preliminary estimate of the external financing required is US$230.1 billion up to 2040, which is the required capital expenditure to be financed after the proportion financed by PLN's internal operating cashflow, under the assumption that the current regulatory environment is maintained (Table 8.6-1). To target a sustainable capital structure PLN would need more than US$100 billion up to 2040 of the external financing requirements to be sourced from equity (or an equity like financial instrument).

Table 8.6-1 Preliminary PLN JETP Financial Projections (US$ Billion)

Source: (JETP Secretariat and Working Groups, 2023)

Financing Requirements	2024-2030	2030 - 2040	Total
Total capital expenditure	96.1	234.5	330.6
Internal cashflow generation	16.1	84.4	100.5
Required external financing Debt Equity*	80.1 30.9 46.5	150.1 77.8 71.5	230.1 108.7 118.0
GoI subsidy & compensation	91.0	267.2	358.2

Note: Forecast values are preliminary and based on certain underlying assumptions that remain uncertain due to the nature of the assumptions; equity does not include forecasted capital injections from the GoI

The projected capital investment figures represent a significant challenge for a utility whose revenue model is heavily reliant on government support. Government support for PLN is provided in five ways:

1. The Public Service Obligation (PSO) for which the Ministry of Finance (MoF) covers the difference between the allowed subsidized residential tariff and PLN's costs;
2. Compensation for below-cost tariffs for non-subsidized consumers (compensation);
3. Government guarantees for PLN loans, mostly with international financial institutions, which enable PLN to borrow at lower costs compared to market rates;
4. Equity injections; and
5. Policy support to shield PLN from volatile fuel costs, such as coal price cap.

The current end-user tariff structure comprises two broad groups of consumers: (i) consumers that pay subsidized tariffs; and (ii) consumers that pay full cost under PLN's current cost-plus-margin tariff model. The mechanism to compensate PLN for subsidized consumers is the PSO. It is paid by MoF as a monthly payment and is based on the difference between the estimated costs of service to subsidized customers and forecast tariff revenue. At the end of each year, the final subsidy payment is adjusted for differences between actual and forecast costs and tariff revenues. The final determination of PLN's PSO is set out in the Supreme Audit Office's report.

Compensation payments are regulated by Minister of Finance Regulation No. 159/PMK.02/2021 as most recently amended by Minister of Finance Regulation No. 159/PMK.02/2022 (Regulation 159). Regulation 159 covers PLN's revenue deficit from the regulatory decision to keep tariffs below cost-recovery levels. The formula sets compensation based on a cost-plus model which allows PLN to recover operating expenses, depreciation and interest expenses, plus a regulated margin of 7 percent minus revenues received from electricity sales. If the required investment needs exceed the depreciation expense, however, the compensation formula underfunds the required capital expenditure on a forward-looking basis.

In FY2022, the PSO and Compensation subsidies cost the GoI Rp.58 trillion (US$3.9 billion) and Rp.61 trillion (US$4.1 billion), respectively. This represented about 26.9% of PLN's total revenues. For comparison, the PSO and compensation was Rp.48 trillion (US$3.2 billion) and Rp.23 trillion (US$1.5 Billion) in FY2018. There has been an increasing trend of compensation payment over the last 5 years due to PLN's increased cost of service while tariffs remain fixed.

Assuming tariffs remain fixed for the foreseeable future, there will be an increasing gap between PLN's net revenues and its investment needs. To fill the gap, subsidy payments are projected to increase significantly. If non-subsidized consumer tariffs are slightly adjusted (for inflation, for example) each year, however, this can significantly decrease the compensation that would be required. Our preliminary calculations estimate that should select non-subsidized consumer tariffs be adjusted for core inflation at 2% each year, GoI subsidy & compensation could decrease by US$104.0 Mn totaling to 2040 or averaging US$6.1 Mn annually. Another GoI policy benefitting PLN is the domestic coal price cap. Referring to subchapter 8.2 on supply-side incentives, this policy support has created an artificial low and stable fuel cost which incentivizes the use of coal over alternatives such as renewable energy and gas. The policy benefited PLN by shielding them from market price volatility and helps them to maintain low operational expenditure. However, it also undermines price signal which is crucial for PLN's decision-making process for future investments and dispatch order.

The increasing revenue gap results from policies that limit revenue generation while at the same time assign PLN further responsibilities and performance expectations. PLN is governed by many stakeholder ministries across the GoI, where each ministry considers PLN in accordance with the specific individual responsibilities under its jurisdiction. MEMR is responsible for developing the RUKN and RUPTL, a sector-wide system plan, and provide policy support such as fuel price cap and tariffs setting. MoF determines PLN's subsidy and compensation levels, and other interventions such as MoF guarantees or periodic equity injections. The Ministry of State-Owned Enterprises (MSOE) separately sets corporate performance targets for PLN as a state-owned enterprise (SOE), amongst other to ensure their financial health and profitability. This split of responsibilities has led to PLN facing challenging decisions when considering new investments without certainty that it will be able to recover the costs.

PLN currently also has multiple roles as the system planner, the single buyer, a generator, the system operator, the transmission and distribution owner, and distributor/retailer. This creates potential internal conflicts of interest, where PLN's decisions on planning, procurement, and operations may be influenced by concerns over the financial impacts on its own generation, transmission, and distribution businesses. It also means PLN would need to balance its planning and procurement decisions, the health of its finances and the national energy transition targets.

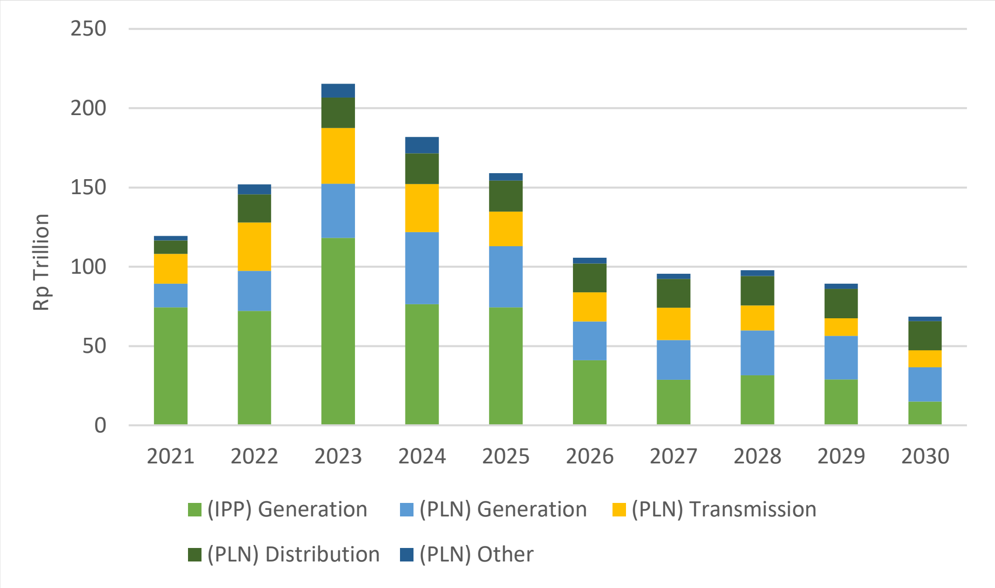
8.6.2 Rationale for Reform

To achieve the ambitious JETP scenario, PLN needs to procure a higher share of renewables at a much faster speed going forward. However, PLN's current revenue model could pose challenges for the anticipated increase in investment needs under the energy transition. The compensation formula, which is to compensate PLN for not having tariff adjustment, allows for total allowable expenses booked by PLN for the previous year, plus a 7% margin, minus revenues from electricity sales. This approach is based on the previous year's audited costs, rather than being forward-looking and reflective of future investment needs.

The cost-plus 7% margin is not linked to full cost recovery for all capital expenditures plus operating costs, which creates a challenge for future renewables investment needs. Interest payments and depreciation on new investments are typically reimbursed using the weighted average cost of capital (debt and equity) associated with the projected mix of assets. As a result, the 7% margin on operating expenses—which is fixed—is not reflective of the required annualized return on the new investment. PLN's actual return on equity has averaged just 2% over the last five years impacting on their ability to reinvest internally generated capital to support growth.

As a result, PLN's investment levels are falling, both in terms of actual investments and planned investments under the RUPTL (see Source:

Figure 8.6-1). Without reform, PLN will continue to invest based on the revenues they are permitted to receive.



Source: (PT Perusahaan Listrik Negara, 2021)

Figure 8.6-1 Planned investments under the RUPTL 2021-2030

Recent regulations issued by MEMR (Permen ESDM 9/2020) and MoF (PMK 178/2021) attempt to move PLN to a more performance-based model by adjusting subsidy payments to PLN based on performance against network loss and specific fuel consumption (SFC) targets. This is a good start, and the targets could be further adjusted in the context of the energy transition.

8.6.3 Proposed Reform Roadmap

8.6.3.1 Short Term

Governance and planning reforms

A new approach to technical planning might be considered to incentivize and prioritize investments in energy transition on a long-term basis.

- At the national level, GoI and PLN have started incorporating specific and actionable energy transition targets in the draft RUKN and RUPTL documents. PLN's modelling approach could also further take into account potential savings from the avoided cost of thermal generation, the potential early retirement and flexibility pathways for thermal capacity, as well as the need to strengthen the grid and to ensure firming capacity in the evolving power system; and
- At PLN level, PLN has started incorporating energy transition as one of the corporate objectives and performance indicators as outlined, among others, in RUPTL. PLN has recently implemented an Energy Transition Team, which is a good start. This could be further progressed to justify investment decisions and plans to accelerate the energy transition. Particular attention would be given for better project risk planning and

management, planning for the necessary improvements in grid control, and implementation of other smart grid features needed to increase operational efficiency, system security and to accommodate higher penetration of renewables.

To ensure that the energy transition plan is fully funded, governance reforms are also needed. In the short term, the government can create a new inter-ministerial commission, as envisioned under Perpres 112/2022 for the RUPTL, but in an expanded scope. This commission would bring together Coordinating Ministry for Maritime Affairs and Investment (CMMAI), MEMR, MSOE, and MoF, that jointly defines planning objectives including:

- Ensuring that the RUPTL is consistent with the availability of finance from tariffs and subsidies; and
- Supports for PLN's investment plans designed to achieve these objectives and oversees PLN's delivery of these plans.

The new inter-ministerial commission, under CMMAI, would be responsible for policies, planning, and funding needs within the existing legal competencies of the ministers on the commission, without authority to determine PLN's revenue model (which would remain with relevant ministries). Strengthening capacity at the ministry level might be needed to appraise plans and to consult with sector-related experts.

A secretariat can be established to support the commission and help to analyze data and present options for decision makers. It may potentially expand into a fully-fledged regulatory agency over time as its capabilities grow (see medium and long-term reforms below).

Revenue model

A reform on domestic coal price cap will send a clear price signal to PLN. To manage the associated increase in fuel cost, should the price cap policy be revoked, PLN will be compensated for the difference between the market price and the current 70 US$/ton price cap. In the long run, it is expected that the true cost of coal will be reflected in PLN's investment decisions and dispatch order.

On the revenue model, there are policy options to allow PLN to fulfill its revenue requirement under the energy transition. A forward-looking methodology for determining and periodically adjusting PLN's allowed revenue for new investments in renewables could be explored. The proposed method of calculation is called as PLN's annual revenue requirements (ARR) over a forward five-year period, where the goal is to provide clear signals to PLN to promote operational and investment efficiency in select segment of the electricity supply chain. ARR method can be computed at the beginning of the first year of each five-year price control period, and then periodically and automatically adjusted within the period as per pre-defined formulas.

To avoid sudden increases in revenue needs, ARR principles would be applied only to future renewable energy investments. For existing assets and other new investments, the revenue model will remain as cost plus margin. This hybrid model is to ensure that the tariff or subsidy increases implied by the rise in cost are manageable. The required return on capital in this formula is set at the weighted average cost of capital (WACC) of the new renewable's projects, which is an estimate of the return that, theoretically, needs to be paid to private investors (both debt and, hypothetically, equity) to attract investment into the company. Another option is to apply the ARR method selectively, only for certain renewables projects that receive lower cost of debt.

Acknowledging that PLN is an SOE with specific mandates that include both commercial and social targets, it would be important to set the return on equity not at commercial rates but at a rate appropriate to SOEs. It is suggested to use PLN's market cost of debt to calculate the return on equity during each ARR cycle. In addition, a minimum weight of concessional loans can also be required as a pre-condition before PLN applies the revenue model on select projects. For example, a required 50% of the debt portion should come from concessional financing before PLN could implement the ARR revenue model. Considering the scarcity of concessional capital, this highlights the importance for the international community to increase their climate finance contribution. Further details on the calculation of ARR can be found in Appendix 10.16.

This hybrid model—the minimum required for financial sustainability— coupled with a removal of coal price cap would ensure that the revenue allowance is sufficient to make PLN become financially sustainable. At the same time, the hybrid model will also keep the government's fiscal health as tariffs and/or subsidies do not increase excessively in a short period.

The current BPP plus margin formula has its origins in Law 19/2003 on State Enterprises, which obliges the government to compensate SOEs for their costs incurred plus a margin when undertaking a government assignment that is not financially viable. Taking this into account, the hybrid ARR approach can be used to determine this "margin" on a forward-looking basis, to comply with Law 19/2003.

This policy recommendation will need a greater in-depth assessment to ensure PLN's financial health and the government's fiscal health are maintained at the same time.

8.6.3.2 Medium term reforms

Governance and planning reforms

In September 2022, PLN restructured by moving its generation assets into subsidiaries (see Box 8.3) which is a positive start. PLN can progress with its restructuring plan where system planning, generation procurement and contracting, and system operations are to be separated and established as new subsidiaries within PLN. All entities, including the GenCos, could deal with each other on an arm's length commercial basis, which would allow for financial independencies between each subsidiary, including in raising future financing needs.

Box 8.3: PLN 2022 Restructuring

PLN's corporate restructuring, announced in September 2022, involves the establishment of PLN holding and sub-holding entities. Key features of this new structure include: (I) separation of all generation from the holding company into two generating companies (Gencos) and further subsidiaries for new RE; (ii) consolidating activities of supplying primary energy into a single sub-holding; (iii) consolidation of system planning, transmission, and system operations under the Directorate for Transmission and System Planning; and (iv) consolidation of generation procurement and single buyer functions under the Directorate for Generation Management.

The restructuring consolidates several previous PLN subsidiaries into fewer sub-holdings, which is expected to improve efficiencies and sets PLN up for the reforms discussed in this policy note. As a next step, PLN can consider arms' length commercial practices such as PPAs between Gencos and PLN. The proposed reforms to the revenue model will also be important for the full benefits of the restructuring to be realized.

With regards to financing, PLN could continue to develop diversified financing sources. Historically, PLN has successfully developed a diversified and appropriate financing plan consistent with its overall corporate strategy. With the new ambitious decarbonization targets, PLN could further explore new sources of financing for its needed investments, which might include but not limited to: (i) further developing the use of asset-based securities; (ii) expanding the use of sustainable finance debt instruments—including green and sustainability-linked bonds/loans based on robust sustainable financing frameworks; and (iii) assessing coal phase-out financing schemes and laying out a robust financing mechanism for supporting coal phase-out.

Revenue model

To improve PLN's financial sustainability, the government could consider gradually restoring the automatic tariff adjustment mechanism, to reflect the true cost of service and reduce government spending on compensation payment. Some key principles for the design of the tariff structure can be as follows:

- Automatic adjustment of non-subsidized tariffs including changes in cost driver and reviewed every 3 months; and
- Explore potential tariff structures to provide appropriate pricing signals to customers—including shifting demand from peak periods, greater energy efficiency, and a premium for excessive consumption. This will help reduce current customer bills and reduce the costs of the energy transition.

As an interim measure to full automatic tariff adjustments, the government could adjust the non-subsidized tariff categories by inflation so that real tariffs remain flat.

8.6.3.3 Long term reforms

Governance and planning reforms

The GoI can consider evolving the technical secretariat of the inter-ministerial commission into a regulator for the sector separate from MEMR and its policy role, and which can eventually take the role of system planning, procurement, and tariff setting.

Revenue model

Incorporate ancillary service, to be provided by PLN or IPPs, could be encouraged as a new type of services in the power sector to maintain grid stability and reliability. This type of services is particularly important to be compensated separately especially when a higher portion of renewable energy penetrate the grid.

Table 8.6-2 Policy Reform Roadmap

Source: (JETP Secretariat and Working Groups, 2023)

Timeline	Reform Approach	Implementation Options
Immediate – short term	Creation of inter-ministerial committee to reconcile planning, investment and funding of Indonesia's power sector	• A new inter-ministerial commission is created as envisioned by Perpres 112/2022 amongst CMMAI, MEMR, MoF and MSOE, that jointly defines planning objectives consistent with the availability of finance from tariffs and subsidies. This inter-ministerial commission will oversee coordination across ministries on achieving energy transition objectives including PLN's investment plans and delivery of these plans.
	Strengthen power system governance	• Strengthen capacity at the ministry level to appraise and improve on financial plans
	Explore PLN revenue policy and formulation.	• Explore PLN's hybrid revenue formula so that it encompasses a forward-looking view of PLN's operating and financing needs and allows for a full reimbursement for some of PLN's capital expenditures for new renewables investments.
Short – medium term	Restore automatic tariff adjustment to non-subsidized customers	• Gradually re-instate automatic tariff adjustments to non-subsidized customers as pre-2017 to reduce government spending on compensation payment to PLN • Explore potential tariff structures refinement (e.g., peak and off-peak tariffs) to provide appropriate pricing signals to customers
	Diversify PLN financing sources	• Develop a diversified and appropriate PLN financing plan consistent with its overall corporate strategy.
	Improve efficiencies and internal contestability through separation of PLN business units	• PLN restructuring progresses to a model where system planning, generation procurement and contracting, and system operations are to be separated and established as a new subsidiary within PLN. System planning may eventually move with regulator
Long term	Maintaining grid stability by acknowledging and compensating ancillary service	• Incorporate ancillary services as a new type of service in the power sector, that is billable to maintain grid stability and reliability
	Establish a power sector regulator	• The inter-ministerial committee evolves into a regulator to align and oversee planning criteria, performance targets, and associated investment and revenue requirements

Beyond the analysis above, future in-depth studies have been identified to be potentially conducted to further sharpen the analysis made in this subchapter. The full list of potential studies is shown in Appendix 10.18.

8.6.4 Expected Results

Table 8.6-3 Summary of Expected Results

Source: (JETP Secretariat and Working Groups, 2023)

Timeframe	Expected Results
Short term	Revised hybrid revenue model determined and implemented.
	Inter-ministerial commission established.
Medium term	Improvements in key financial performance indicators.
	Reduction in government budget support.
Long term	Investment plans are reconciled with funding and financing availability.
	PLN restructuring is completed
	Significant improvement in indicators of financial performance and operating efficiency.

8.6.5 Risk and mitigation measures

Table 8.6-4 Summary of Risks and Mitigation Measures

Source: (JETP Secretariat and Working Groups, 2023)

Risk	Mitigation
Tariff adjustments are not implemented due to political sensitivities.	• Gradually reinstate tariff adjustments on the non-subsidized consumers; • Ensure a strong public communications campaign to socialize the need for tariff adjustments to improve services
Restructuring PLN is seen as not politically feasible.	• It will be important to communicate that the changes have been carefully tailored to be within the existing requirements of the Constitution and Electricity Law. Furthermore, a partial restructuring has already taken place, and this is a natural progression.

8.7 Strengthening Financial Policy to Support Indonesia's Energy Transition

8.7.1 Enhancing Capacity of Financial Institutions Sustainable and Transition Finance

8.7.1.1 Background and Context

Given the scale of JETP investment's needs, a more effective sustainable finance policy is critical to unleash the full potential of Indonesia's financial market. Domestic knowledge in sustainable and transition finance issues is currently scarce, resulting in small financial transaction volume despite its potential. One of the potential avenues is improving financial institutions (FI)' capacity in sustainable and transition-related finance through strategic collaboration with international partners and organizations such as, GFANZ, MDBs, DFIs, donors that offer valuable expertise, resources, and networks. For instance, the IFC's Green Banking Academy serves as an exemplary model for effective capacity-building in sustainable finance, including but not limited to knowledge exchange platforms in global best practices and TA programs, thus enhancing the impact of domestic initiatives and positive environmental and social outcomes (International Finance Corporation, 2022).

8.7.1.2 Rationale for Reform

Enhancing the capacity of financial institutions is already mandated by Law 4/2023 on Development and Strengthening of the Financial Sector (UU P2SK). Implementing regulations is needed to translate the law into actionable activities that can be performed by financial institutions as the key players to bridge the climate finance gap. Well-equipped institutions, including human resources, internal policies, and risk management, should be optimized to support the achievement of national decarbonization target.

8.7.1.3 Proposed Reform Roadmap

Table 8.7-1 outlines the roadmap strategies for enhancing the capacity of Indonesian financial institutions, leveraging international partnerships, and aligning with existing national initiatives through a cross-stakeholder collaboration.

Table 8.7-1 Proposed Activities for Strengthening of Financial Institution's Capacity in Sustainable and Transition Finance

Source: (JETP Secretariat and Working Groups, 2023)

Expected Timeframe	Reform Areas/ Activities	Implementation Guidance/ Sub-Activities
Short term (< 2 years)	Design a comprehensive knowledge-exchange platform ("the Hub") that will be hosted by Indonesia's Sustainable Finance Committee/ *Komite Keuangan Berkelanjutan (KKB)* consisting of MoF (as coordinator), BI (leads on macroprudential policies), and OJK (leads on microprudential policies), following the mandate of UU P2SK for synergies in capacity-building programs.	• Design a knowledge-exchange platform and peer-to-peer learning, providing TA and resources while ensuring alignment with global best practices and standards. • Align the capacity of the Hub with the need of FIs
Short term (< 2 years)	Develop comprehensive curriculum and training programs on sustainable and transition finance	• Collaborate with domestic partners (e.g., associations of banks and capital market, the Indonesia Chamber of Commerce and Industry, etc.), and international partners (e.g., GFANZ, MDBs, and DFIs), and sustainable finance certification institutions to develop a comprehensive curriculum • Design tailored training programs for FIs that include case studies and real-scenarios to enhance practical understanding. • Integrate e-learning platforms for accessible and continuous learning.
Medium term (2 – 3 years)	Research and development	Support research initiatives through collaboration with academic institutions, practitioners, etc. to encourage sustainable finance innovation

8.7.1.4 Expected Results

Table 8.7-2 Expected Results

Source: (JETP Secretariat and Working Groups, 2023)

Timeframe	Results
Short to medium term	• Investment in energy transition and sustainable projects is increased. • Improved capacity of FIs through training programs, TA, and R&D in transition finance.
Long term	• More competitive rates and a wide variety of financial instruments (e.g., de-risking, capital market, etc.) are offered by FIs for the energy transition program. • Indonesia develops a domestically and internationally competitive financial sector capacity and ecosystem in sustainable and transition-related finance

8.7.1.5 Risk and Mitigation Measures

Table 8.7-3 Risk and Mitigation Measures

Source: (JETP Secretariat and Working Groups, 2023)

Dimensions	Risk	Mitigation
Regulatory	In the absence of implementing regulations and well-structured institutions, this initiative may not attract sufficient knowledge pool from markets.	Provide TA to policymakers in developing relevant regulations to increase FIs interests in sustainable and transition finance.
Institutional	There is a potential overlap of activities among existing government institutions, i.e., MoF, BI, OJK, and other organizations.	Integrate platforms and institutions through the coordination of MoF, as mandated by UU P2SK, together with OJK and BI as the supervisory and regulatory body overseeing the Indonesian financial sector.

8.7.2 Improvement of Sustainability Disclosure Policy for Financial Institutions

8.7.2.1 Background and Context

OJK Regulation POJK 51/ 2017 was initiated to steer the Indonesian financial sector toward environmentally responsible practices. It sets a requirement for sustainability reporting (SR) with key disclosures that encompass governance, strategy, targets and commitments, and the implementation of sustainable finance. With the recent launching of International Sustainability Disclosure Standards (ISSB) (i.e., IFRS S1 "General Requirements for Disclosure of Sustainability-related Financial Information" and IFRS S2 "Climate-Related Disclosures" (International Finance Reporting Standards, 2023), it is envisioned that there will be a common language for disclosing the impact of climate-related financial risks, exposure, and opportunities. This is expected to improve the credibility of the SR. The recent updates in accounting regulation highlights the necessity for Indonesia financial sector policy to start internalizing climate risks and opportunities in their investment decisions.

8.7.2.2 Rationale for Reform

Aligning domestic financial sector's policy with dynamic global standards, such as the newly launched Sustainability Standards by ISSB is imperative to enhance market competitiveness. Globally, integrating climate-related risks and opportunities into financial decision-making process is already common practice, and deemed to be beneficial not only for the financiers but also for the investors. This alignment is expected to foster more inclusive investments as disclosure and planning becomes more transparent and comprehensive - which is also aligned with the objective of Indonesia Green Taxonomy as previously discussed in subchapter 7.6.1.

8.7.2.3 Proposed Reform Roadmap

Table 8.7-4 Proposed Activities for Sustainability Disclosure Policy Enhancement

Source: (JETP Secretariat and Working Groups, 2023)

Expected Timeframe	Reform Areas/ Activities	Implementation Guidance/ Sub-Activities
Short term (<2 years)	Baseline Assessment of Sustainability Reporting	• Identify gaps, challenges, and areas for improvement in the current policies and practices. • Capacity building through training programs/ workshops on sustainability disclosure practices, e.g., knowledge-sharing platform for across FIs and industry practitioners
Medium term (2-3 years)	Regulation Alignment	• Realign the prevailing regulations on sustainability reporting, e.g., IFRS S1 and IFRS S2 adoption into the Indonesia accounting framework/ standards by Institute of Indonesia Chartered Accountants (Ikatan Akuntan Indonesia/ IAI) • Phased voluntary adoption: Develop guidance for the adoption of voluntary sustainability disclosure standards/ practices for FIs
	Explore potential incentive mechanism for financial sector	• Continue the existing incentive i.e., recognition and industry leadership awards for early adopters • Conduct a thorough study to design appropriate fiscal incentive to support implementation of sustainable and transition finance. MoF - Fiscal Policy Agency, Center of Financial Sector Policy is in the preparatory stage of designing direct incentive for financial sector
Long term (> 3 years)	Larger Market Adoption	• Expand the adoption of sustainability disclosure standards and practices across industries, with the intention of shifting the adoption into a mandatory SR

8.7.2.4 Expected Results

Table 8.7-5 Expected Results

Source: (JETP Secretariat and Working Groups, 2023)

Timeframe	Results
Short to medium-term	• Improved disclosure and risk management by FIs due to better integration of climate and sustainability risks into the decision-making processes • Increased investors' confidence due to transparent reporting on sustainability metrics and climate-related risks. • Alignment of national and international standards, providing common language across government institutions, businesses, and organizations
Long term	• Development of a sustainable financial ecosystem in Indonesia through continued adherence to enhanced sustainability disclosure policies. • Mandatory SR adoption

8.7.2.5 Risk and Mitigation Measures

Table 8.7-6 Risk and Mitigation Measures

Source: (JETP Secretariat and Working Groups, 2023)

Dimensions	Risk	Mitigation
Regulatory	Inconsistent or rapidly changing disclosure regulations	Conduct regular compliance assessments to stay updated on regulatory changes.
Institutional	Insufficient FIs' internal capacity for enhanced disclosures	• Invest in training programs for enhanced sustainability reporting • Integrate sustainability into the company's strategic vision. • Develop key performance indicators (KPIs) tied to sustainability goals.

Dimensions	Risk	Mitigation
Environmental	Inaccurate or incomplete science-based climate environmental data and target.	• Regularly update data collection methods and validation process based on evolving standards. • Engage with third-party environmental experts for data verification.
Market Awareness	Limited market awareness of the recent development of the International Sustainability Disclosure Standard	• Improve market awareness through seminars and FGD highlighting the business advantages and risk management benefits associated with the materiality of sustainability disclosures for long-term risk mitigation and value creation.

8.7.3 Development of a Specific Regulation on Credit Guarantee Mechanisms to Facilitate Financing towards Energy Transition

8.7.3.1 Background and Context

Indonesia's financial sector is not a stranger to credit guarantee mechanisms for infrastructure projects. The existing policies on guaranteed mechanisms govern PPP infrastructure project, including power projects, that GoI may provide fiscal and non-fiscal supports as governed by Perpres No. 13/2010 on the Partnership of Government with Business Entities for the Provision of Infrastructure or guarantee, as well as guarantee through IIGF as governed by MoF Regulation No. 260/2010 on Guidelines for the Implementation of Infrastructure Guarantees in PPP Projects. Yet there is currently limited credit guarantee for renewable energy projects and so far, is only for state-owned companies.

Credit guarantee could provide significant risk coverage that would help to de-risk certain projects, through leveraging on proposed blended finance and a collaborative approach among MDBs, IPG funding, and donors or philanthropies. By having a regulated credit guarantee mechanism, it is expected that project-specific risks can be addressed, including risks on regulatory uncertainties, technological challenges, and market-related fluctuations.

8.7.3.2 Rationale for Reform

Credit guarantees incentivize FIs by de-risking investment in energy transition projects and potentially accelerating the deployment of enabling technologies. A specific terms and conditions can be designed to tailor to the context of JETP and Indonesia's sustainable finance as a whole, by expanding its existing guarantee coverage from infrastructure projects to include renewable energy (IFA# 3 and IFA #4) and to facilitate retirement of CFPPs and managed phase-out (IFA #2).

8.7.3.3 Proposed Reform Roadmap

Table 8.7-7 Proposed Key Activities for Development of Risk Mitigation Instruments for Energy Transition

Source: (JETP Secretariat and Working Groups, 2023)

Expected Timeframe	Reform Areas/ Activities	Implementation Guidance/ Sub-Activities
Short term (< 2 years)	Market Survey and Stakeholder Consultation	• Conduct a market survey on risk mitigation in energy transition to check on the applicability of guarantee structure, coverage, fee, triggering events, etc. • Identify industry/ country best practices • Stakeholder consultation: Facilitate workshops and FGD on development of credit guarantee
Medium term (2 – 3 years)	Regulatory Landscape Analysis and Development	• Analyze the regulatory framework related to risk mitigation and credit guarantees (e.g., through Ministerial regulation, etc.) as a basis for formulating the relevant regulations. • Explore other sources of credit guarantee providers.
Long term (> 3 years)	Institutional Set-Up	• Expand the role of IIGF to provide guarantee to private sector. • Design and implement a robust credit guarantee structure, incorporating industry best practices and adaptive mechanisms to address the evolving needs of energy transition projects. • Pilot and commission of the guarantee instrument.

8.7.3.4 Expected Results

Table 8.7-8 Expected Results

Source: (JETP Secretariat and Working Groups, 2023)

Timeframe	Results
Short to medium term	• Increased investors' confidence and financing appetite on energy transition projects due to the presence of risk mitigation instruments, such as credit guarantees
Long term	• A vibrant sustainable financing ecosystem integrated with risk mitigation instruments, contributing to the long-term growth of the energy transition sector. • Diversification of investments in energy transition projects as the financial sector becomes more confident in the risk mitigation mechanisms, attracting a broader range of investors.

8.7.3.5 Risk and Mitigation Measures

Table 8.7-9 Risk and Mitigation Measures

Source: (JETP Secretariat and Working Groups, 2023)

Dimensions	Risk	Mitigation
Financial	Budget constraints could limit the guaranteed institution set-up.	• Secure diversified funding sources and explore potential leveraging of JETP and philanthropies funds for sustained funding.
Regulatory	Regulatory limitations on providing guarantees for the private sector	• Review the regulatory frameworks of guarantee in Indonesia as an enabling environment for private sector participation in energy transition.
Technical	Technical risks associated with projects to be guaranteed	• Collaborate with technical experts, MDBs, and donor/ philanthropies and institutions to provide TA and support.
Market	Acceptance of participating banks to the credit guarantee instruments	• Socialization of the applicability of guaranteed structure, coverage, fee, triggering events, etc.

8.7.4 Design Incentives to Scale-Up Sustainability and ESG Investment Products

8.7.4.1 Background and Context

The financial sector plays a key role in energy transition transactions as they offer both highly standardized products and flexible customized products in high-volume ticket size for private investors. Investment products with an adequate risk-return profile related to sustainable and transition-related products, are important to be developed in a transparent manner to increase the overall market confidence. The latter particularly refers to the promotion of ESG investments, such as (i) GSS Bonds, which require issuers to use the raised capital for pre-defined set of projects having environmental and/or social impact, and to continuously report on the use-of-proceeds, (ii) Sustainability-linked investment products, such as sustainability-linked loans (SLL) and sustainability-linked bond (SLB), designed to incentivize the borrower's achievement of their ESG targets through pricing incentives. As of March 2022, SLBs are still nascent in Indonesia, which represent only 6 percent of total issuance in 2021.

8.7.4.2 Rationale for Reform

While the market is expected to further grow, there remain major barriers to channel transition-related finance via capital markets. One these includes product mismatch in transition-related infrastructure, such as IFA #1 and IFA #3 and #4 which will require long-term capital, while the domestic bond market in Indonesia is dominated by short-term investments.

GoI is committed to support Indonesia's sustainable investment product by issuing of POJK 60/2016 on Green Bond and Green Bond and Green Sukuk Framework in 2018 which laid the ground framework to raise capital for eligible green projects, including RE and energy efficiency among others. The most recent regulation POJK 18/2023 on Sustainability bonds and sukuk launched in October 2023 replaces POJK 60/ 2017, expanded the coverage of the categories of sustainable activities and products. This provides a legal basis for GSS and other long-term maturity ESG investment products, as well as their associated enablers such as fiscal incentives, tailored to sustainable and ESG investments, including JETP-compliant projects, to improve their attractiveness (OJK, 2023). A more detailed implementing regulation could be designed to address other issues such as fiscal incentives for financial communities that are willing to invest in the transition finance activities.

8.7.4.3 Proposed Reform Roadmap

Table 8.7-10 Proposed Policy Recommendation for Designing Incentives for Sustainability and ESG Investment Products

Source: (JETP Secretariat and Working Groups, 2023)

Expected Timeframe	Reform Areas/ Activities	Implementation Guidance/ Sub-Activities
Short term (<2 years)	Design incentives to attract investment in specific financial products, such as transition bonds	Proposed study on fiscal incentive for financial sector, such as ● Tax credit: bond investors receive tax credits instead of interest payments, so issuers do not have to pay interest on their bond issuances

Expected Timeframe	Reform Areas/ Activities	Implementation Guidance/ Sub-Activities
		• Direct subsidy: bond issuers receive cash rebates from the government to subsidize their net interest payments. • Tax-exemption: bond investors do not have to pay income tax on interest from the bonds they hold (so the issuer can get a lower interest rate).
Long term (>5 years)	Consideration for Green trade window	• Consider reducing tariffs for sustainability products and services, through a "green trade window" to stimulate the flow of green capital and incentivize energy transition program and greening of industry. Further assessment of fiscal impact may be required. • A green window could also help to compensate for any carbon border tax-induced trade impacts, such as Carbon Boarder Adjustment Mechanism (CBAM)

8.7.4.4 Expected Results

Table 8.7-11 Expected Results

Source: (JETP Secretariat and Working Groups, 2023)

Timeframe	Results
Short to medium term	• Evolving positive trends in pricings, metrics, instruments, as the market for sustainability and ESG investment product matures • Increasing demand for a variety of sustainable investment products as institutions seek to leverage these instruments to address various sustainability priorities
Long term	• Indonesia is well-placed for continued strong and inclusive growth, supported by broad-based ESG investment products with the integration of alternative social and environmental indicators • International recognition for Indonesia's commitment to accelerate the transition effort and sustainability

8.7.4.5 Risk and Mitigation Measures

Table 8.7-12 Risk and Mitigation Measures

Source: (JETP Secretariat and Working Groups, 2023)

Dimensions	Risk	Mitigation
Regulatory	Existing sustainability-related regulatory frameworks have not been facilitating the incentive designs	Harmonization and alignment of key regulations in the financial sector (e.g., discount of listing fees which was previously enacted by OJK and IDX in 2020 (OJK, 2020) and other supply-side incentives – See Sub Chapter 8.2
Finance	Potential adverse impact on fiscal balance and loss of revenue if the incentive requires allocation from the state budget	• Further fiscal assessment impact may be required to estimate the cost of incentive design • Consider allocating revenue generated from carbon credit and carbon tax to be utilized for incentives
Market awareness	Lack of awareness on incentive mechanisms that can be accessed in	Socialization of sustainability and ESG investment products to the wider intermediaries and market players e.g., domestic, international, banks, capital market

Dimensions	Risk	Mitigation
	sustainable and ESG-related investment products	

Section 9

JETP Implementation and Governance

9. JETP Implementation and Governance

The implementation and governance of JETP is designed to ensure (i) leadership and ownership that provides clear strategic direction, transparency, and integrity; (ii) accountability by the implementing institutions to all partners in a transparent manner; and (iii) capacity to plan for and attract ongoing funding and scale-up funding from diverse sources that target appropriate financing instruments and JETP investment focus areas (IFA).

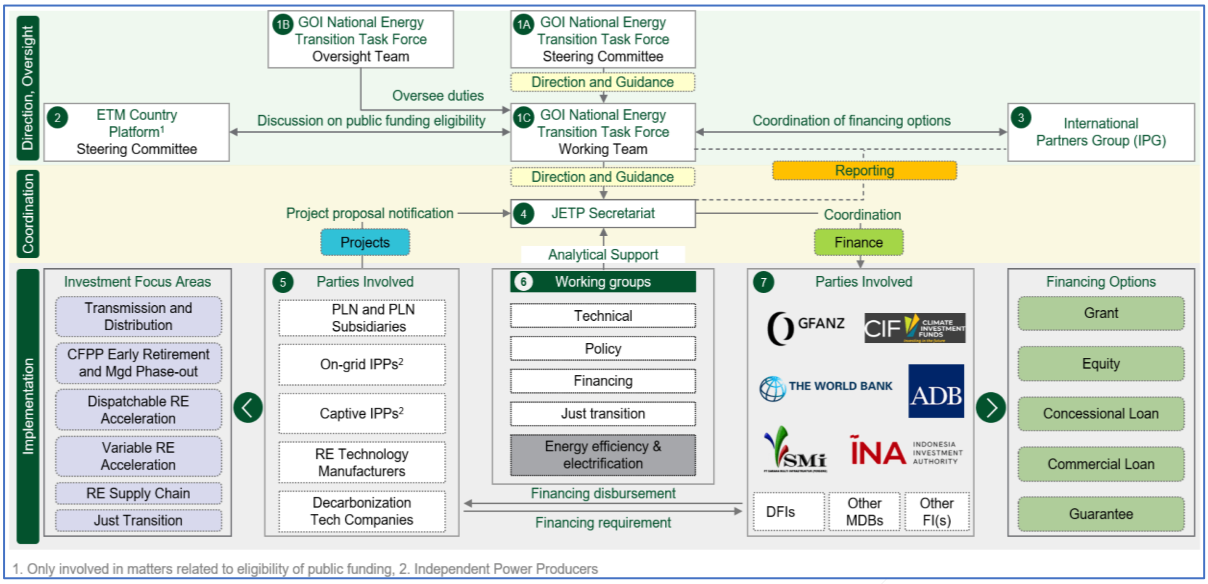
The JETP implementation mechanism must facilitate sustained and visible collaboration across key stakeholders. The stakeholders include, among others, the Government of Indonesia (GoI) and other institutions relevant to JETP, such as the International Partners Group (IPG), Glasgow Financial Alliance for Net Zero (GFANZ), the private sector, and civil society organizations. The basic principles behind the CIPP development and implementation plan are:

1. Clear governance for ensuring leadership, coordination, and accountability for the delivery of the CIPP;
2. Rigorous implementation arrangements for the JETP CIPP, such as selection of JETP-compliant projects, fund allocation and disbursement performance, reporting, and verification;
3. A mechanism that effectively manages disclosure and communication across JETP stakeholders including but not limited to the GoI and its relevant institutions, the IPG, GFANZ, the private sector, and civil society organizations; and
4. A monitoring and evaluation framework against the CIPP formulated objectives and goals, based on principles stated in the joint statement, to provide oversight, ensure transparency, and promote learning for continuous improvement; and risk management framework to identify potential risks and proposed mitigation measures to manage material risks to CIPP.

9.1 JETP Governance Structure

As described previously in Chapter 2, the CIPP document is endorsed by both the GoI and the IPG. In relevance to the GoI, the CIPP will act as a strategy document that the Government of Indonesia will use as a basis for power sector planning and policymaking as part of the JETP process. JETP and its outputs, notably the CIPP, must reflect the country-led and country-owned structure and therefore recognize that the central government represents international partnerships, as well as the country's constitutional mandates at the national, subnational, and provincial levels.

JETP is envisioned to be an evolving process of driving economic, social, and environmental change. In doing so, the process will require multiyear implementation across sectors and jurisdictional initiatives. Considering the complexity of the task, a robust governance structure is required to ensure JETP can achieve the goals that have been set out in the joint statement. The proposed JETP governance structure is shown in Figure 9.1-1.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 9.1-1 JETP Governance Structure

The governance structure is divided into three layers, which consist of (i) direction and oversight; (ii) coordination; and (iii) implementation.

Direction and oversight refer to the process where select entities endorse the deliverables created and proposed by the JETP Secretariat. The entities consist of three main parties – the GoI, the IPG, and the Energy Transition Mechanism (ETM) Country Platform. The GoI is represented by the National Energy Transition Taskforce. Through the National Energy Transition Task Force working team, the inputs are consolidated and given to the JETP Secretariat in the form of direction and guidance.

Coordination refers to the process by which the JETP Secretariat ensures alignment between the direction and guidance received with the implementation that will be conducted. Among other responsibilities, the JETP Secretariat matches the projects received from the parties involved with implementation with the financial institution that will help provide the financing required. Aside from coordinating the projects and financing, the JETP Secretariat also provides convening and analytical support to the policymakers to facilitate the process of necessary policy reforms. Moreover, the JETP Secretariat will also be responsible for the annual updating of the CIPP – a process which will require analytical support from the JETP working groups.

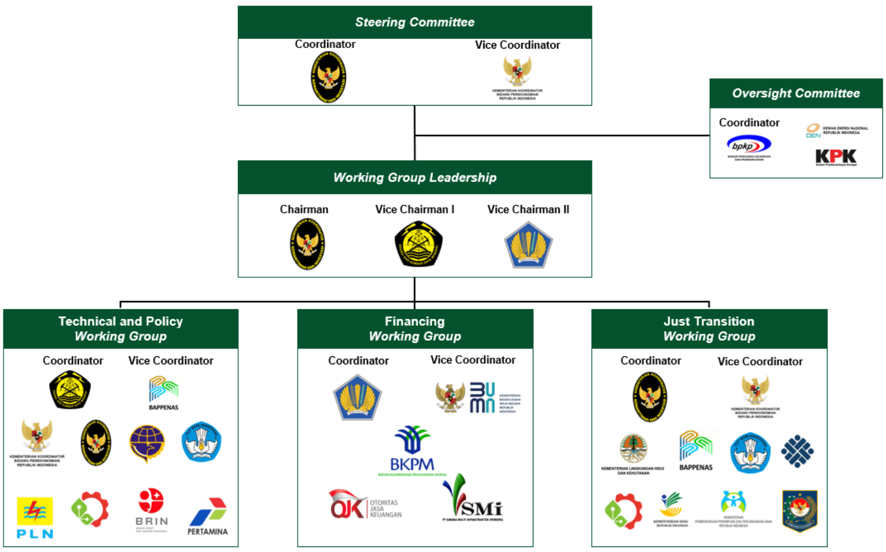
Lastly, implementation refers to the process of which select entities work in collaboration to realize the plans that have been coordinated by the JETP Secretariat and endorsed by the entities responsible for direction and oversight. Various entities will need to be involved in the implementation to ensure the JETP CIPP can be realized. Two main entities include the project developers and financiers relevant to the implementation of priority JETP-compliant projects, as discussed in Subchapter 7.3.2.

The following subchapters explain the key institutions and the respective description and roles based on the order of which they are shown in Figure 9.1-2.

9.1.1 The National Energy Transition Task Force of the Government of Indonesia

The National Energy Transition Task Force (Entity 1A, 1B, and 1C in Figure 9.1-2) spearheads the country's direction on the governance and implementation to accelerate the achievement of Indonesia's existing energy transition commitments, such as: (i) to meet its Enhanced NDC target to reduce emissions to 31.9% unconditionally and to 43.2% conditionally as compared to business-as-usual; (ii) to reach its target of NZE by 2060 or sooner as expressed in Indonesia's Long-Term Strategy for Low Carbon and Climate Resilience (LTS-LCCR) submitted to the United Nations Framework Convention on Climate Change (UNFCCC); (iii) to scale up investment and to identify the necessary policy measures to meet renewable energy mix target in accordance with the national energy policy and strategy toward national energy independence; and (iv) to optimize the use of blended finance mechanisms to accelerate the energy transition.

The third point of Coordinating Ministerial Decree No. 144 of 2023 signed by the Coordinating Ministry of Maritime Affairs and Investments, stipulates that the National Energy Transition Task Force is mandated to provide direction, guidance, and oversight to the national energy transition acceleration programs in Indonesia, which includes but is not limited to the JETP Secretariat. Furthermore, the Task Force acts as the counterpart to the IPG governments on key decisions such as JETP investment, financing, and policy decisions. As shown in Figure 9.1-2, the National Energy Transition Task Force aims to fulfill these mandates through three main working units, including (i) The steering committee, (ii) the working team, and (iii) the oversight committee.



Source: (Coordinating Ministry of Maritime Investment and Affairs, 2023)

Figure 9.1-2 The National Energy Transition Task Force of the Government of Indonesia

9.1.1.1 Task Force Steering Committee

The Task Force steering committee exercises the following mandates based on the Coordinating Ministerial Decree No. 144 of 2023:

1. Provide guidance and considerations to the Working Team in determining activities, strategies, programs, timelines, and performance indicators for the implementation of the national energy transition acceleration program; and
2. Monitor and evaluate the implementation of programs and activities to accelerate the national energy transition based on established performance indicators.

To perform its mandates, the Task Force steering committee is composed of the following members:

Table 9.1-1 Members of the Task Force Steering Committee

Source: (Coordinating Ministry of Maritime Investment and Affairs, 2023)

Steering Committee	
Chair	Coordinating Minister for Maritime and Investment Affairs
Vice Chair	Coordinating Minister for Economic Affairs
Members	1. Minister of Home Affairs 2. Minister of Foreign Affairs 3. Minister of Finance 4. Minister of Education, Culture, Research, and Technology 5. Minister of Social Affairs 6. Minister of Manpower 7. Minister of Industry 8. Minister of Energy and Mineral Resources 9. Minister of Transportation 10. Minister of Environment and Forestry 11. Minister of State Apparatus Utilization and Bureaucratic Reform 12. Minister of State-Owned Enterprises 13. Minister of Women's Empowerment and Child Protection 14. Minister of Investment
Secretary	Coordinating Minister Secretary for Maritime and Investment Affairs

9.1.1.2 Task Force Oversight Committee

The Oversight Committee oversees the activities carried out by the Working Team based on the Coordinating Ministerial Decree No. 144 of 2023. To perform its mandates, the Oversight Committee is composed of the following entities:

Table 9.1-2 Members of the Task Force Oversight Committee

Source: (JETP Secretariat and Working Groups, 2023)

Oversight Committee	
Coordinator	Head of the Financial and Development Oversight Agency
Members	1. Deputy for Oversight of Government Agencies in the Economic and Maritime Sectors, Financial and Development Oversight Agency 2. Deputy for Corruption Prevention and Monitoring, Corruption Eradication Commission (Komisi Pemberantasan Korupsi) 3. Secretary General of the National Energy Council

9.1.1.3 Task Force Working Team

The Working Team exercises the following mandates based on the Coordinating Ministerial Decree No. 144 of 2023.

1. Develop proposals for activities, strategies, programs, timelines, and performance indicators for the development of national energy transition policy;
2. Provide recommendations for accelerating the implementation steps of the national energy transition;
3. Coordinate the implementation of the national energy transition acceleration as referred from the Steering Committee; and
4. Provide guidance and considerations to other entities to support the duties, such as the Secretariat of JETP), Energy Transition Mechanism (ETM) Country Platform, and other relevant institutions implementing the national energy transition acceleration program.

The working groups consist of three groups and exercise the following mandates.

- **Technical and Policy Working Team**. The main duties include: (i) drawing up a plan to accelerate the implementation of the energy transition and consolidate it with the NDC targets, National Energy Policy (KEN), National Energy General Plan (RUEN), National Electricity Master Plan (RUKN), Electricity Supply Business Plan (RUPTL) targets; (ii) drafting a strategy for strengthening and developing the domestic industry and supply chain for renewable energy technologies; (iii) proposing adjustments to policies and regulations needed to accelerate the implementation of the energy transition; and (iv) developing proposals for activities, strategies, programs, timelines, and performance indicators for accelerating the implementation of the national energy transition, including but not limited to the list of priority projects, early retirement of coal-fired power plants, development of renewable energy, electrification of industry and transportation, and energy efficiency;
- **Financing Working Team**. The main duties include: (i) identifying funding sources, funding mobilization strategies and policies on domestic and/or foreign financing mechanisms; preparing adjustments to fiscal incentive policies to accelerate the

implementation of the energy transition; (ii) adjusting the financial sector policies needed to accelerate the implementation of the energy transition, including but not limited to sustainable financing policies; and (iii) developing a platform for financing the accelerated implementation of the energy transition; and

- **Socioeconomic and Environment Working Team**. The main duties include: (i) identifying and documenting socioeconomic and environmental barriers in the process of accelerating the energy transition; (ii) calculating the reduction of greenhouse gas emissions and the socioeconomic and environmental impacts of activities to accelerate the implementation of the national energy transition; and (iii) formulating strategic steps for the distribution of benefits and mitigate socioeconomic and environmental risks in accelerating the implementation of the national energy transition.

In addition, several points are highlighted:

- The implementation of activities by the Working Team is reported periodically, at least once a month or as needed, to the Coordinating Minister for Maritime Affairs and Investment, who serves as the Chair of the Steering Committee;
- In carrying out its duties, the National Energy Transition Task Force may involve experts, academics, and/or other parties deemed necessary and able to contribute to the achievement of performance indicators; and
- All costs required for the activities of the Working Team are charged to the Budget Implementation List (DIPA) of the Coordinating Ministry for Maritime Affairs and Investment, as well as the Budget of each Ministry/Institution and/or other legitimate sources in accordance with the provisions of laws and regulations.

To perform its mandates, the Working Team is composed of the following entities:

Table 9.1-3 Members of the Task Force Working Team

Source: (JETP Secretariat and Working Groups, 2023)

Working Team	
Chair	Deputy for Infrastructure and Transportation Coordination, Coordinating Ministry for Maritime Affairs and Investment
Vice Chair I	Director General of New and Renewable Energy and Energy Conservation, Ministry of Energy and Mineral Resources
Vice Chair II	Head of Fiscal Policy Agency, Ministry of Finance
Technical and Policy Working Team	
Coordinator	Director General of Electricity, Ministry of Energy and Mineral Resources
Vice Coordinator	Deputy for Maritime Affairs and Natural Resources, National Development Planning Agency (Kementerian PPN/Bappenas)
Member	1. Deputy for Maritime Sovereignty and Energy Coordination, Coordinating Ministry for Maritime Affairs and Investment 2. Director General of Land Transportation, Ministry of Transportation

	3. Expert Staff in Connectivity, Service Development, and Natural Resources, Coordinating Ministry for Economic Affairs 4. Expert Staff in Strengthening the Capacity of Domestic Industry, Ministry of Industry 5. Director General of Higher Education, Research, and Technology, Ministry of Education, Culture, Research, and Technology 6. Head of the National Research and Innovation Agency 7. CEO of PT PLN (Persero) 8. CEO of PT Pertamina (Persero)
Finance Working Team	
Coordinator	Director General of Risk Management and Financing, Ministry of Finance
Vice Coordinator	Deputy for Finance and Risk Management, Ministry of State-Owned Enterprises
Member	1. Director General of State Wealth, Ministry of Finance 2. Deputy for Investment Promotion, Investment Coordinating Board (Kementerian Investasi/BKPM) 3. Expert Staff in Macroeconomics and International Finance, Ministry of Finance 4. Special Staff to the Minister for Fiscal and Macroeconomic Policy, Ministry of Finance 5. Deputy Commissioner for Financial System Stability, Financial Services Authority 6. CEO of PT Sarana Multi Infrastruktur (Persero)
Socioeconomic and Environment Working Team	
Coordinator	Deputy for Coordination of Environmental Management and Forestry, Coordinating Ministry for Maritime Affairs and Investment
Vice Coordinator	Deputy for Coordination of Commerce and Industry, Coordinating Ministry for Economic Affairs
Member	1. Deputy for Population and Employment, National Development Planning Agency (Bappenas) 2. Director General of Metal, Machinery, Transportation Equipment and Electronics Industry (ILMATE), Ministry of Industry 3. Director General of Climate Change Control, Ministry of Environment and Forestry 4. Director General of Industrial Relations Development and Social Security, Ministry of Manpower 5. Director General of Vocational Training and Productivity Development, Ministry of Manpower 6. Director General of Vocational Education, Ministry of Education, Culture, Research, and Technology 7. Director General of Regional Development, Ministry of Home Affairs

	8. Director General of Social Empowerment, Ministry of Social Affairs 9. Deputy for Gender Equality, Ministry of Women's Empowerment and Child Protection

9.1.2 Energy Transition Mechanism Country Platform Steering Committee

The Energy Transition Mechanism (ETM) Country Platform (Entity 2 in Figure 9.1-2) is a framework developed to provide necessary financial support to accelerate the national energy transition, by mobilizing commercial and non-commercial funding sources in a sustainable manner – directly contributing to the achievement of JETP targets. According to Kepmen no. 275 of 2022, the Ministry of Finance (MoF) has appointed PT SMI, a special mission vehicle, as the ETM Country Platform manager to develop the financing and investment framework for the ETM program in Indonesia (Ministry of Finance, 2022) (Ministry of Finance, 2023).

To achieve the mandates given, the ETM Country Platform is spearheaded by a steering committee comprising of:

1. Chair;
2. Vice Chair concurrently a member; and
3. Member.

The steering committee is assisted by the following team:

1. Technical Team; and
2. Oversight Committee Secretariat.

The steering committee is led by the MoF. Further, based on the Permen No. 103 of 2023, five mandates have been assigned to the ETM Country Platform steering committee, as follows (Ministry of Finance, 2023):

1. Determine projects that would be proposed to obtain the ETM country platform facility, including the determination of the priority of projects,
2. Provide recommendations on the ETM Country Platform facility scheme,
3. Evaluate policies and governance of the ETM Country Platform, while providing directions based on the evaluation,
4. Coordinate solving of issues associated with the governance of the ETM Country Platform, and
5. Develop cooperation across ministries centered around the energy transition.

In line with the mandates provided to the ETM Country Platform steering committee, the committee is also actively involved in the JETP governance structure. Alongside the National Energy Transition Task Force working team and the IPG, the ETM Country Platform plays a crucial role in determining the eligibility of public funding for JETP projects. Considering the limited amount of public funding, the steering committee provides input and ultimately endorses the priority of projects to ensure the most optimal use of public funding.

9.1.3 The International Partners Group (IPG)

The IPG (Entity 3 in Figure 9.1-2) comprises the governments of Japan and the United States, who are co-leaders of the partnership, as well as Canada, Denmark, the European Union, the Federal Republic of Germany, the French Republic, Norway, the Republic of Italy, and the United Kingdom of Great Britain and Northern Ireland. Working closely with the GoI and GFANZ Working Group members, the IPG will aim to mobilize US$10 billion out of the US$20 billion over the next 3-5 years.

Alongside other institutions within the entities that provide direction and oversight, the IPG will contribute in overseeing in three main roles: (i) endorsing the proposals provided by the JETP Secretariat regarding funding allocation, and coordinating of financing options decisions together with the National Energy Task Force working team in compliance with JETP Financing Approach (Refer to subchapter 7.3.3); and (ii) receiving periodic reporting and providing input to the key activities conducted by the JETP Secretariat (e.g., monitoring and evaluation reports prepared by the JETP Secretariat).

9.1.4 The JETP Secretariat

The JETP Secretariat (Entity 4 in Figure 9.1-2) functions in an independent manner while reflecting the GoI ownership of the process. The Secretariat was established in February 2023, fulfilling the 3-month target mentioned in the JETP Joint Statement and is hosted at the Ministry of Energy and Mineral Resources of Indonesia, with institutional support and implementation capacity provided by the ADB. It bridges the coordination at the policy and implementation levels. Up to the publication of the first official version of the CIPP launched on 21 November 2023, the main mandate for the JETP Secretariat has been to coordinate the creation of the CIPP.

Beyond the responsibilities of developing the JETP Comprehensive Investment and Policy Plan, the JETP Secretariat will further evolve to take the lead on the following responsibilities:

- Develop the CIPP based on the analytical work and recommendations of the WGs. The CIPP itself is expected to be a living document that is annually updated, requiring updates to reflect shifts in power supply and demand dynamics, prevailing costs, available technologies as well as the policy and legal environment;
- Facilitate and coordinate the technical work as overseen and guided by the GoI and the IPG in supporting Indonesia’s just energy transition by coordinating the mobilization and deployment of an initial US$20 billion over 3 to 5 years on a planned 50:50 basis between public and private financing. The CIPP will support the achievement of JETP joint conditional targets and ensure positive contributions to Indonesia’s economy, strengthen energy security and affordability, and enhance grid stability;
- Facilitate support from the key stakeholders and coordinate the JETP financing package and options with the relevant parties including GoI institutions such as PT Sarana Multi Infrastruktur (PT SMI) as the ETM Country Platform manager, multilateral

and bilateral development institutions, the private sector, philanthropies, and other financiers, among others;

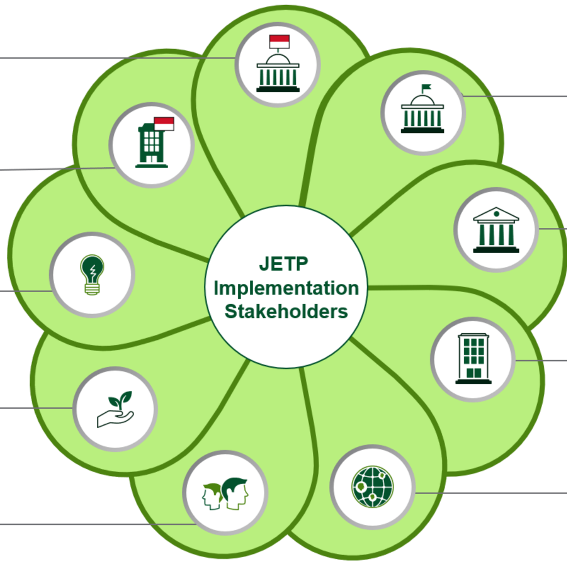
- Create and collate the deliverables from working groups (WGs) to ensure inclusivity and robustness of JETP CIPP. WGs consist of ad hoc experts convened to provide input to CIPP, consisting of technical, financing, policy, and just transition. An additional Energy Efficiency and Electrification Working Group is planned to be formed correspondingly;
- Provide notification of the project proposal and coordinate financing sources, terms, and options to the parties involved, such as PLN, IPP, among others for projects and GFANZ, MDBs, DFIs, and other FIs for financing, to be screened and filtered by the JETP Secretariat and endorsed by the National Energy Transition Task Force working team;
- For financing allocation, disbursement, and requirements, "JETP Financing Principles and Approach" should be followed (Subchapter 7.3); and
- Monitor the implementation of the CIPP and produce quarterly progress reports including the approval and disbursement of the funds pledged for JETP-compliant projects and programs, execution of strategies to access new sources of private capital that can support the energy transition, and adherence to the national JT Framework.

Source: (JETP Secretariat and Working Groups, 2023)

Figure 9.1-3 The Key Mandates of the JETP Secretariat

9.1.5 Other Entities Involved in Implementation

Active engagements with stakeholders beyond project developers, whether state-owned enterprises or private businesses, and financers, whether international financial institutions (IFIs) or commercial banks is key to creating a strong basis for JETP implementation that seeks to uphold the principles of transparency, participation, and inclusion. A summary of the key stakeholders for JETP is shown in Figure 9.1-4.



Source: (JETP Secretariat and Working Groups, 2023)

Figure 9.1-4 JETP Implementation Stakeholders

Each key stakeholder undertakes the roles and functions to support the JETP implementation.

- The GoI leads the implementation of JETP CIPP. It provides direction and guidance through the National Energy Transition Task Force in driving project preparation and facilitation, as well as enacting necessary reforms to enable investments. The GoI is also driving efforts to ensure an inclusive and just transition as it carries out constitutional duties to protect the rights and safeguards the socioeconomic needs of its citizens. Finally, the GoI also acts as a focal point for the engagement of state apparatus crucial to the policymaking process (e.g., ministries, provincial governments, parliament, state-owned enterprises such as PLN). In the implementation process, the GoI represented by the National Energy Transition Task Force is consulted and accountable for various key JETP activities. The JETP Secretariat also conducts reporting to the GoI on a quarterly basis;
- The International Partners Group leads in securing the necessary financial resources in the form of public finance instruments such as grants, TA, concessional financing and guarantees to help unlock and provide leverage for private financing at a scale needed to support the implementation of JETP CIPP. In particular, the IPG helps secure funding for the priority projects that could significantly contribute to the CIPP formulated objectives. In the implementation process, the IPG is consulted on various key JETP activities. The JETP Secretariat also submits reports to the IPG every quarter;
- International Financing Institutions, Commercial Banks and other Financiers participate in mobilizing and scaling up investment to meet CIPP formulated objectives. They are directly engaged in the project matchmaking and financing facilitation processes of JETP implementation. As intermediaries with global reach and influence,

these international and intergovernmental agencies play a crucial role in supporting technology and knowledge transfer, building capacity and political goodwill to promote and sustain JETP implementation on the project level and the programmatic level to ensure a just energy transition. These agencies are engaged directly in many of the key JETP processes as part of the working group to the JETP Secretariat, as both a resource and knowledge partner;

- Think tanks, research organizations and academia conduct research and modelling, provide inputs to the JETP Secretariat or GoI entities (i.e., the National Energy Transition Task Force) and monitor and advocate the proposed policy reforms to enable energy transition in a just and equitable manner. This stakeholder group is engaged through targeted and public consultation processes and may be reached out directly;
- Civil society organizations and grassroots communities act as the stakeholder group covering impacted communities including indigenous communities, vulnerable groups including women and children, that monitors and ensures that the JETP implementation abides by the principles of just transition. This includes alignment with applicable laws and regulations for environmental and social safeguards, including, but not limited to GoI environmental law governing pollution and emission thresholds, biodiversity, and conservation as well as safeguards measures such as Environmental Impact Analysis (AMDAL/Analisis Dampak Lingkungan). This stakeholder is engaged on the macro level through targeted and public consultation processes and, on the project level, through the AMDAL and JT Assessment process as described in Chapter 6; and
- Workers and trade unions act as stakeholder group that covers impacted communities within the project and, similarly as the above, monitors and ensures that the JETP implementation abides by the principles of just transition. This includes alignment with applicable laws and regulations for environmental and social safeguards, including, but not limited to the Job Creation Law (UU Cipta Kerja/Ciptaker).

Periodic dialogue and consultation with JETP implementation stakeholders and the wider groups, when necessary, are held regularly to ensure effective inclusiveness in the process.

9.2 Roles and Responsibilities within the JETP Governance

Based on the JETP governance structure which has been extensively discussed in subchapter 9.1, the division of roles and responsibilities of key activities necessary to reach JETP objectives can be conducted. Table 9.2-1 shows the proposed division mapped toward the key activities done in the JETP Secretariat.

Table 9.2-1 Roles and responsibilities division within JETP Governance

Source: (JETP Secretariat and Working Groups, 2023)

No	Key Activity	Responsible (entity proposing)	Accountable (entity approving)	Consulted (entity providing key input)
1	Development and annual updating of the JETP CIPP	JETP Secretariat	Task Force Working Team	Task Force Working Team, Other GoI Ministries and Institutions, the IPG, and GFANZ
2	Project selection and prioritization	JETP Secretariat	Task Force Working Team	Task Force Working Team
3	Project-financing matchmaking	JETP Secretariat	N/A	Project developers and financiers
4	Decision on eligibility of public funding	JETP Secretariat	ETM Country Platform Steering Committee	Task Force Working Team, the IPG, and GFANZ
5	Meta Monitoring and Evaluation (MONEV)	JETP Secretariat	Task Force Working Team	Project developers and financiers, Other GoI Ministries and Institutions, Task Force Oversight Committee

9.3 JETP Monitoring and Evaluation (MONEV) Framework

Given the importance of the technical, policy, financing, and just aspects being part of the JETP Program, the establishment of a participatory monitoring and evaluation system will be considered. The CIPP signifies an opportunity for the GoI and nongovernment institutions, JETP implementation stakeholders (Figure 9.1-4), and the wider groups of local and international communities to learn through the design, delivery, and review of the CIPP process and IFAs in the context of the national energy transition.

The JETP Monitoring and Evaluation Framework will be designed for these purposes, among others:

- To demonstrate transparency, accountability, impact, and enhanced decision-making;
- To accommodate all programs and projects, funded through the JETP that comprise the indicators of monitoring, means of verification, and key areas of evaluation, including just transition-related dimensions. This will build on, contribute to, and draw data from the current government's project-level MONEV system, drawing data from these and other sources to measure high-level outcome indicators for the country-level JETP Monitoring Platform; and
- To draw and refer to the existing climate policy-relevant data sets that have already been defined and collected by for instance, the Ministry of Finance through the Climate Budget Tagging (CBT) mechanism and other government and nongovernment entities and/or platforms that monitor and evaluate the national climate policy implementation and fulfill Indonesia's international reporting obligations as a Party to the UNFCCC and the Paris Agreement.

Table 9.3-1 displays the JETP Monitoring and Evaluation Framework, which monitors the impacts generated per JETP aspect, including technical, policy, financing, and just transition.

Table 9.3-1 Proposed JETP Monitoring and Evaluation Framework

Source: (JETP Secretariat and Working Groups, 2023)

Monitoring Approach				
Expected Results	**Indicators**	**Baseline (Date)**	**Target (Date)**	**Means of Verification**
1. Technical Target Monitoring				
Indonesia's progress in achieving peaking on-grid power sector emissions and consequent absolute value by 2030	CO_2 emissions emitted	2021	No more than 250 MT CO_2 in the on-grid system (2030); including with the accelerated retirement of coal plants, conditional on international support	Inventory of Greenhouse Gases Report of the Energy Sector, reported by MEMR
Immediately declining trajectory of emissions and achieving net zero emissions in the power sector by 2050,	CO_2 emissions trajectory post peak power sector emissions	Peaking year of power sector emission	Peak year by 2030; declining trajectory up to net zero (2050); including with the accelerated retirement of coal plants, conditional on international support	Inventory of Greenhouse Gases Report of the Energy Sector, reported by MEMR
Acceleration of the deployment of renewable energy in the on-grid power sector system	Share of renewable energy in on-grid power generation	12% (2021)	44% (2030)	National Statistics (Handbook of Energy and Economic Statistics by MEMR)
Limitation of the development of captive CFPPs in accordance with Perpres 112 / 2022	Development of captive CFPPs	2023	Full compliance, i.e. no new captive CFPPs, with exceptions made for CFPPs that provide additional value or are national strategic projects (2023 onwards)	JETP monitoring platform
Emission reduction and scheduled cease of operations for captive CFPPs allowed to be developed (exceptions) in accordance with Perpres 112 / 2022	GHG emissions of captive CFPPs	2023	Full compliance, i.e. 35% reduction of emissions in 10 years since start of operations and full cease of operations in 2050	JETP monitoring platform
Implementation of JETP programs/ projects	JETP progress to the planned schedule	2023	3 – 5 years, at least monitor annually	JETP monitoring platform
2. Financial Target Monitoring				
Disbursement of JETP funding commitment	Value of JETP funding disbursement, by type	2023	3 – 5 years	JETP monitoring platform
3. Policy Target Monitoring				
Reforming Local Content Requirements	LCR relaxation and other policy changes are put in place Domestic suppliers of RE components increases in capacity	2023	TBD	JETP monitoring platform, Ministry of Industry data, Ministry of Energy and Mineral Resources data, project appraisal data
Improving RE Procurement processes	Improvements in procurement process Procurement of RE capacity increases in volume and frequency that matches the agreed	2023	TBD	JETP Monitoring Platform

Monitoring Approach				
Expected Results	**Indicators**	**Baseline (Date)**	**Target (Date)**	**Means of Verification**
	capacity expansion plans			
Making PPA bankable	Development and use of market tested standardized PPA templates Market-tested standardized templates and clauses are used	2023	TBD	JETP Monitoring Platform, project information
Adjusting supply side incentives	Adjustments and eventual removal in coal price cap True cost of coal is used in dispatch and investment decisions	2023	TBD	PLN
Enabling early coal retirement and coal phase-out	Regulations are issued that would enable early coal retirement Early retirement and increased flexibility of coal plants	2023	TBD	JETP Monitoring Platform, MEMR power sector report
Ensuring PLN financial sustainability	Enabling regulations are put in place Level of cost recovery, indicators of financial sustainability	2023	TBD	PLN
4. Just Transition Target Monitoring (for indicators for JT Framework standards 1-8 please see 0)				
Economic diversification & transformation	TBD (to be developed in study on just transition)	2023	TBD	Project level monitoring and evaluation data, regional and national government economic statistics
Accountability	Grievance mechanism is set up and accessible to the wider public Responded grievances as a portion of total grievances received Participation of women, customary groups, and other vulnerable groups in stakeholders consultations	2023	TBD	JETP Secretariat

In addition, the results monitoring will conduct research studies and surveys to analyze the impacts of CIPP implementation on economic diversification, policy reforms, stakeholders' participation in JETP forums, and impact on fiscal measures and public finance expenditure. Monitoring data will inform and improve decision-making, accountability, key learning and innovation, and the management of change; as such, a variety of evaluation methodologies will be deployed and adapted during the CIPP implementation phase.

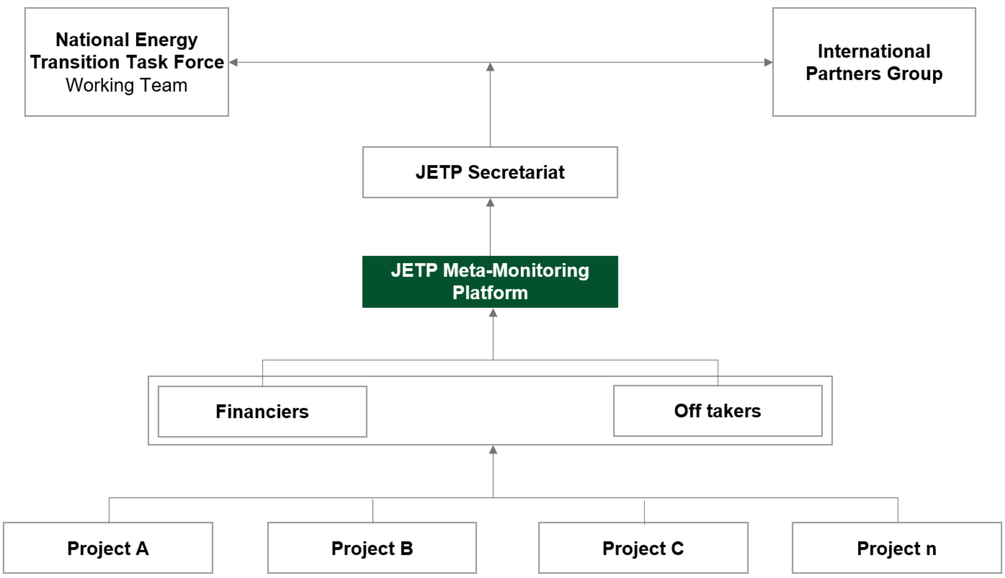
JETP Meta-Monitoring Platform

The JETP Meta-Monitoring Platform serves as a monitoring and evaluation tool that will include the assessment of whether the project is on track to achieving its objectives and a reporting mechanism that helps to identify potential issues, track progress, and measure outcomes of:

- Financing flow, including the disbursement of the JETP funding package and project progress (Subchapter 7.3.3); and
- Just transition aspects, which also covers the monitoring and evaluation of environmental and social safeguards as described in the previous subchapter on Just transition (Subchapter 6.3.3)

The platform is envisioned to be hosted on the JETP website, enabling project and deal tracking for accredited users. JETP implementation stakeholder may apply for accreditation to access data gateway, with eligibility criteria, accreditation process and communications to be developed in accordance with public information management laws and regulations that apply broadly to energy sector project management and policy making.

The process flow of the JETP Meta-Monitoring Platform is illustrated in Figure 9.3-1.



Source: (JETP Secretariat and Working Groups, 2023)

Disclaimer: The Comprehensive Investment and Policy Plan is a document for the implementation of the Joint Statement agreed in November 2022. The CIPP is a strategy document that the Government of Indonesia will use as a basis for power sector planning and policymaking as part of the JETP process. It does not constitute a legally binding document. This public consultation draft is dated November 1, 2023.

Figure 9.3-1 Illustration of JETP Monitoring and Evaluation Process Flow

9.4 JETP Risk Management Framework

The Risk Management Framework is the guideline that will be used to identify, eliminate, and minimize risks that might occur during the process and implementation of JETP programs. It shows Indonesia's commitment to co-lead the JETP implementation management, enabling a transparent and inclusive process throughout.

9.4.1 Potential Risks to JETP Implementation

Potential risks to JETP implementation are summarized in Table 9.4-1 below.

Table 9.4-1 Potential Barriers to JETP Implementation

Source: (JETP Secretariat and Working Groups, 2023)

Potential risks to JETP Implementation	Description	Risk level
Limited experience, knowledge, and skills in implementing entities	Projects are selected based on the capacity, knowledge, and sector-specific experience, as well as an understanding of regulations of the implementing entities	High
Commercial financiers/private sectors banks are constrained in providing long-term financing	~70% of bonds were issued with a tenor of 3 to 5 years, with less than 8% of the bonds issued had a tenor of 10 years or more Banks are constrained to provide long-term debt financing due to reliance on short-term deposits	Medium
Inconsistent regulation provisions - i.e., PPA, licensing, procurement, tariff, across key regulators	Regulatory silos, particularly among energy regulator and financial sector regulators may create uncertainty for investors and financiers	High
Unclear policy signals that may result in delay in design and implementation of key reforms needed to offer certainty to the market and key players	Long-term participation in JETP implementation is mainly influenced by the policy signals from the government and relevant institutions to create foreseeable regulatory environment	High
Uncertainty caused by national/provincial/local political processes and changes	Risk of political instability during JETP implementation and its associated policies reform as well as the long-term country transition pathway planning	Medium
Financial: Risk of debt and credit worthiness, FX risk, and insufficient funding, leading to adverse impact on the country's credit rating	Risk of insufficient funding to meet JETP investment needs Risk of undermining the country's fiscal capacity and potential to raise funds in the market on favorable terms	High
Capital deployment: The risk that the access to capital can be delayed or not accessible	The funding offers may be dependent on the third-party intermediaries subject to their own deployment processes and/or project-by-project approval	Medium
Private sector projects are delayed by financing, pricing, technology factors, or challenges at local construction site	Nature of JETP projects is multi-sectoral, multi-stakeholder, and inter-dependent that will require streamlined coordination at the implementation level	High
Lack of access to new technology, procurement delays to implementation, challenges with integrating technology to local conditions, knowledge, skills, capacity gaps	Technology risk will need to be mitigated/minimized by enabling environment, including policy reform and the strategic use of public and development finance to allow technology transfer	Medium
Social and transition risks, particularly at the local level	Transition efforts will, directly and indirectly, affect the communities in the coal regions in the short and long terms	High
Environmental and safeguard risks on vulnerable communities, excluded groups	The risk of lack of appropriate environment management and social development measures in project design of projects and programs	Medium

9.4.2 Proposed Risk Mitigation to JETP Implementation

An initial risk register is developed as Indonesia's commitment to implementation management, enabling the national leadership to track, monitor, and validate on the risk mitigation strategy to reduce the levels of risk identified in key categories (Table 9.4-2). A comprehensive Risk Management Framework will be then developed as a guideline, used as a national risk monitoring tool, as the programs and projects commence, and mainstreamed to the JETP Secretariat and the implementing institutions as appropriate.

Table 9.4-2 Indonesia JETP Risk Register

Source: (JETP Secretariat and Working Groups, 2023)

Key Risks	Risk level	Mitigation measure	Residual risk
Capacity risk • Limited experience, knowledge, and skills of implementing entities • Constrained of providing long-term financing by commercial financiers/ private sectors	High	TA should be appropriately designed and provided as necessary to build capacity and support implementation.	Low
Regulatory, policy, and political risks • Regulatory silos between demand side (i.e., energy sector) and supply side (i.e., financial sector) • Unclear policy signals that may delay the needed reform • Risk of political instability during the process and implementation of JETP	High	The implementation of JETP will need to be strengthened via a regulatory framework that acknowledges and supports the Governance, including the JETP Secretariat. Furthermore, the regulatory regime is expected to support and streamlined energy sector policy reforms to create long-term certainty for energy infrastructure investment	Medium
Implementation risks • Private sector projects are delayed either by financing, pricing, technology factors, or challenges at the localities • Lack of access to new technology, procurement delays to implementation, challenges with integrating the technology • Corruption risk: involvement of multi-implementing entities and key stakeholders, potential of misappropriation of funds furthering funding away from its intended use	High	Mechanisms to regularly monitor such developments and escalate intervention measures should be established to target necessary resources (e.g., finances) / actions (e.g., enabling regulations) to support the implementation, with periodic reporting and evaluation of JETP project implementation progress Tight oversight and governance structure i.e., oversight committees	Medium
Financial risks • Risk of debt and credit worthiness, FX risk, and insufficient funding, leading to adverse impact on the country's credit rating • Capital deployment risks	High	Principles and guidelines for Technical, Financial, and Just Transition will be strictly followed. Risk-appropriate instruments will be deployed in a targeted manner to address specific barriers. Design considerations will be built-in to mobilize additional funding, where necessary.	Medium

Key Risks	Risk level	Mitigation measure	Residual risk
Just transition risks • Failure to promote adequate economic diversification and transformation • Adverse social and environmental impact that are unaddressed • Social rejection and political opposition	High	A JT framework that builds on GoI socio environmental compliance as well as lenders safeguards will be developed and mainstreamed. The JETP Secretariat to drive coordination of risk mitigation action and opportunities enhancement on various levels, including central government, regional government and project implementors as well as coordinate with lenders for TA, monitoring and evaluation.	Medium

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10. Appendix

Appendix 10.1: Detailed List of Investment Focus Area #1 Priority Projects: Transmission and Grid Development

NO	Name of IFA #1 Priority Projects	System	Est. Starting date[1]	Capacity (KMs)	Est. Investment Needs (US$Mn)	RUPTL
1	SUTET 500 kV Upper Cisokan PLTA PS - Inc. (Cibinong - Saguling)	Java-Madura-Bali	2024	60.0	22.4	NO
2	SUTET 500 kV Matenggeng PLTA PS - Inc. (Tasikmalaya - Kesugihan / Rawalo)	Java-Madura-Bali	2024	120.0	39.3	YES
3	SUTET 500 kV Grindulu PLTA PS - Inc. (Pedan - Kediri)	Java-Madura-Bali	2024	40.0	14.9	YES
4	SUTET 500 kV DC LP E. Java - Ngimbang Converter Station	Java-Madura-Bali	2030	120.0	65.0	NO
5	SUTET 500 kV PLTA Kelai - Inc 2 phi (M.Wahau-Tj.Redeb)	Kalimantan	2024	1.0	0.1	YES
6	SUTET 500 kV GITET TJ. Selor - GITET Embalut	Kalimantan	2024	760.0	377.7	NO
7	SUTET 500 kV GITET Embalut - GITET IKN	Kalimantan	2024	150.0	74.5	NO
8	SUTET 500 kV PLTA Tabang - Kembang Janggut	Kalimantan	2024	140.0	16.2	YES
9	SUTET 500 kV PLTA Kaltara 1 - Tj. Selor	Kalimantan	2024	80.0	9.2	YES
10	SUTET 500 kV DC HEPP N. Kalimantan - LP S. Kalimantan	Kalimantan	2030	1,800.0	975.0	NO
11	SUTET 500 kV DC LP S. Kalimantan - LP E. Java	Kalimantan	2030	920.0	7,840.7	NO
12	**Sulawesi Backbone** SUTET 275 kV GITET Wotu - GITET Bungku	Sulawesi	2024	260.0	105.3	YES
13	**Sulawesi Backbone** UTET 275 kV GITET Bungku - GITET Andowia	Sulawesi	2024	260.0	105.3	NO
14	**Sulawesi Backbone** SUTET 275 kV GITET Andowia - GITET Kendari	Sulawesi	2024	135.0	54.7	YES
15	**Sulawesi Backbone** SUTET 275 kV GITET Sidrap - GITET Daya Baru	Sulawesi	2024	350.0	141.8	NO
16	**Sulawesi Backbone** SUTET 275 kV GITET Palopo - GITET Bakaru 2	Sulawesi	2024	210.0	85.1	NO
17	**Sulawesi Backbone** SUTET 275 kV GITET Daya Baru - GITET Punagaya	Sulawesi	2024	140.0	56.7	NO
18	**Sulawesi Backbone** SUTET 275 kV GITET Bakaru 2 - GITET Sidrap	Sulawesi	2024	130.0	52.7	NO

NO	Name of IFA #1 Priority Projects	System	Est. Starting date[1]	Capacity (KMs)	Est. Investment Needs (US$Mn)	RUPTL
19	**Sulawesi Backbone** SUTET 275 kV GITET Malili-GITET Pomalaa Switching	Sulawesi	2024	467.0	189.1	NO
20	**Sulawesi Backbone** SUTET 275 kV GITET Pomalaa-GITET Kendari	Sulawesi	2024	252.0	102.1	NO
21	**Sulawesi Backbone** SUTET 275 kV GITET Wotu - GITET Malili	Sulawesi	2024	95.0	38.5	YES
22	SUTET 500 kV Cascade Tripa HPP (Upper Tripa 300 MW + Lower Tripa 140 MW) - GITET Takengon-2	Sumatra	>2024	90.0	46.2	NO
23	SUTET 500 kV PLTA WOYLA - Meurebo	Sumatra	>2024	26.0	10.9	YES
24	SUTET 500 kV PLTA Woyla Hulu & Hilir - PLTA Woyla	Sumatra	>2024	4.2	1.8	YES
25	SUTET 275 kV Sibual Buali - GITET Sarulla	Sumatra	>2024	2.0	0.5	NO
26	SUTET 500 kV GITTET Takengon-2 - Inc. 2 Phi (Naganraya - Takengon-2)	Sumatra	>2024	0.5	0.3	YES
27	**Sumatra Backbone** SUTET 275 kV GITET 275 kV Siborpa - Inc. 2 Phi Sarula Rantau Perapat	Sumatra	>2024	0.2	0.1	NO
28	**Sumatra Backbone** SUTET 500 kV Galang-PLTA Pump Storage-1	Sumatra	2024	100.0	49.7	YES
29	**Sumatra-Java Interconnector** SUTET 500 kV DC Muara Enim - LP Ketapang - Salira Indah - Bogor + Subsea 40 KM	Sumatra	2024	570.0	1,900.0	NO
30	Transmisi Papua-Maluku-Pulau Obi	Maluku-Papua-Nusa Tenggara	TBD	TBD	TBD	NO
31	**Deployment of Smart Grid Technologies** Advanced Metering	Tersebar	2024	N/A	860.0	NO
32	**Deployment of Smart Grid Technologies** Advanced Control Center	Tersebar	2024	N/A	93.0	NO
Total				**7,282.9**	**13,328.8**	

Appendix 10.2: Detailed List of Investment Focus Area #2 Priority Projects: Early CFPP Retirement and Managed Phase-out

NO	Name	System	Natural Retirement	Est. Early Retirement	Capacity (MW)	Est. Investment Needs (US$Mn)
1	PLTU Pelabuhan Ratu	Java-Madura-Bali	2042	2037	969	870
2	PLTU Cirebon-1	Java-Madura-Bali	2045	2037	660	300
Total					**1,629**	**1,170**

Appendix 10.3: Detailed List of Investment Focus Area #3 Priority Projects: Geothermal Energy

NO	Name of IFA #3 Priority Projects	System	Est. Starting date[1]	Capacity (MW)	RUPTL
1	PLTP Arjuno Welirang	Java-Madura-Bali	N/A	55,00	NO
2	PLTP Baturaden (FTP2)	Java-Madura-Bali	2024	110,00	YES
3	PLTP Baturaden (FTP2)	Java-Madura-Bali	2024	75,00	YES
4	PLTP Baturaden (FTP2)	Java-Madura-Bali	2026	35,00	YES
5	PLTP Bedugul	Java-Madura-Bali	2024	60,00	YES
6	PLTP Candi Umbul Telomoyo	Java-Madura-Bali	N/A	55,00	NO
7	PLTP Cibuni (FTP2)	Java-Madura-Bali	2024	10,00	YES
8	PLTP Dieng (FTP2)	Java-Madura-Bali	2024	55,00	NO
9	PLTP Dieng (FTP2)	Java-Madura-Bali	2024	55,00	NO
10	PLTP Dieng (FTP2)	Java-Madura-Bali	2024	55,00	NO
11	PLTP Dieng (FTP2)	Java-Madura-Bali	2024	55,00	NO
12	PLTP Dieng (FTP2)	Java-Madura-Bali	2024	35,00	NO
13	PLTP Dieng (FTP2)	Java-Madura-Bali	2024	35,00	NO
14	PLTP Gunung Salak 7	Java-Madura-Bali	2024	55,00	YES
15	PLTP Gunung Salak 8	Java-Madura-Bali	2024	80,00	YES
16	PLTP Halmahera (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2025	20,00	YES
17	PLTP Hululais	Sumatra	2024	110,00	YES
18	PLTP Ijen (FTP2)	Java-Madura-Bali	2024	50,00	YES
19	PLTP Ijen (FTP2)	Java-Madura-Bali	2024	30,00	YES
20	PLTP Ijen (FTP2)	Java-Madura-Bali	2024	30,00	YES
21	PLTP Jaboi (FTP2)	Sumatra	2023	5,00	YES

NO	Name of IFA #3 Priority Projects	System	Est. Starting date[1]	Capacity (MW)	RUPTL
22	PLTP Jaboi (FTP2)	Sumatra	2028	2,50	YES
23	PLTP Jaboi (FTP2)	Sumatra	2028	2,50	YES
24	PLTP Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2026	60,00	YES
25	PLTP Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2026	60,00	YES
26	PLTP Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2026	55,00	YES
27	PLTP Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2026	55,00	YES
28	PLTP Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2026	55,00	YES
29	PLTP Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2026	55,00	YES
30	PLTP Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2026	55,00	YES
31	PLTP Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2026	55,00	YES
32	PLTP Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2026	55,00	YES
33	PLTP Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2026	55,00	YES
34	PLTP Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2026	55,00	YES
35	PLTP Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2026	55,00	YES
36	PLTP Kotamobagu 1	Sulawesi	2024	20,00	NO
37	PLTP Kotamobagu 2	Sulawesi	2024	20,00	NO
38	PLTP Kotamobagu 3	Sulawesi	2024	20,00	NO
39	PLTP Kotamobagu 4	Sulawesi	2024	20,00	NO
40	PLTP Mataloko	Maluku-Papua-Nusa Tenggara	2024	20,00	NO
41	PLTP Muara Laboh (FTP2)	Sumatra	2024	80,00	NO
42	PLTP Muara Laboh (FTP2)	Sumatra	2024	60,00	NO
43	PLTP Patuha (FTP2)	Java-Madura-Bali	2024	55,00	YES
44	PLTP Patuha (FTP2)	Java-Madura-Bali	2024	55,00	NO
45	PLTP Patuha (FTP2)	Java-Madura-Bali	2024	55,00	NO
46	PLTP Patuha (FTP2)	Java-Madura-Bali	2024	55,00	NO
47	PLTP Patuha (FTP2)	Java-Madura-Bali	2024	55,00	NO
48	PLTP Patuha (FTP2)	Java-Madura-Bali	2024	55,00	NO
49	PLTP Patuha (FTP2)	Java-Madura-Bali	2024	55,00	NO
50	PLTP Rajabasa (FTP2)	Sumatra	2024	110,00	YES
51	PLTP Rajabasa (FTP2)	Sumatra	2026	110,00	YES
52	PLTP Sokoria (FTP2)	Maluku-Papua-Nusa Tenggara	2024	80,00	NO
53	PLTP Sokoria (FTP2)	Maluku-Papua-Nusa Tenggara	2024	30,00	NO

NO	Name of IFA #3 Priority Projects	System	Est. Starting date[1]	Capacity (MW)	RUPTL
54	PLTP Sokoria (FTP2)	Maluku-Papua-Nusa Tenggara	2024	11,00	NO
55	PLTP Sungai Penuh (FTP2)	Sumatra	2024	11,00	YES
56	PLTP Ulumbu	Maluku-Papua-Nusa Tenggara	2024	3,00	NO
57	PLTP Ungaran	Java-Madura-Bali	2023	55,00	YES
58	PLTP Wayang Windu 3 (FTP2)	Java-Madura-Bali	2024	40,00	NO
59	PLTP Wayang Windu 4 (FTP2)	Java-Madura-Bali	2024	55,00	NO
60	PLTP Atadei	Maluku-Papua-Nusa Tenggara	2024	30,00	NO
61	PLTP Danau Ranau	Sumatra	2024	30,00	YES
62	PLTP Gunung Sirung	Maluku-Papua-Nusa Tenggara	2024	10,00	NO
63	PLTP Gunung Talang Bukit Kili	Sumatra	N/A	40,00	NO
64	PLTP Gunung Ungaran	Java-Madura-Bali	N/A	5,00	NO
65	PLTP Jaboi	Sumatra	N/A	20,00	NO
66	PLTP Kaldera Danau Banten	Java-Madura-Bali	N/A	55,00	NO
67	PLTP Kepahiang	Sumatra	2024	70,00	YES
68	PLTP Oka Ile Ange	Maluku-Papua-Nusa Tenggara	2024	110,00	NO
69	PLTP Songa Wayaua	Maluku-Papua-Nusa Tenggara	2024	110,00	NO
70	PLTP Tangkuban Perahu	Java-Madura-Bali	2023	10,00	YES
71	PLTP Telaga Ngebel (FTP2)	Java-Madura-Bali	2024	10,00	YES
72	PLTP Telaga Ngebel (FTP2)	Java-Madura-Bali	2024	40,00	YES
73	PLTP Telaga Ngebel (FTP2)	Java-Madura-Bali	2024	55,00	YES
74	PLTP Tulehu	Maluku-Papua-Nusa Tenggara	2024	55,00	YES
75	PLTP Sokoria (FTP2)	Maluku-Papua-Nusa Tenggara	2024	55,00	NO
76	PLTP Sokoria (FTP2)	Maluku-Papua-Nusa Tenggara	2024	20,00	NO
77	PLTP Cubadak	Sumatra	Post 2030	66,00	NO
78	PLTP Gn. Ciremai	Java-Madura-Bali	Post 2030	27,00	NO
79	PLTP Marana	Sulawesi	Post 2030	28,00	NO
80	PLTP Lainea	Sulawesi	Post 2030	66,00	NO
81	PLTP Songgoriti	Java-Madura-Bali	Post 2030	35,00	NO
82	PLTP Sipaholon Ria-ria	Sulawesi	Post 2030	35,00	NO
83	PLTP Bora-pulu	Sulawesi	Post 2030	123,00	NO

NO	Name of IFA #3 Priority Projects	System	Est. Starting date[1]	Capacity (MW)	RUPTL
84	PLTP Pentadio	Sulawesi	Post 2030	25,00	NO
85	PLTP Suwawa	Sulawesi	Post 2030	20,00	NO
86	PLTP Sembalun	Maluku-Papua-Nusa Tenggara	Post 2030	20,00	NO
87	PLTP Gn. Pandan	Java-Madura-Bali	Post 2030	40,00	NO
88	PLTP Gn.Willis	Java-Madura-Bali	Post 2030	50,00	NO
89	PLTP Simbolon Samosir	Sumatra	Post 2030	150,00	NO
90	Government Drilling Program (Cost TBD)	Nation-wide	TBD	2,148.00	NO
Total Capacity, incl. Gov. Drilling (MW)		**6,433.0**			
Total Est. Investment Needs (US$Mn)		**22,521.4**			

Appendix 10.4: Detailed List of Investment Focus Area #3 Priority Projects: Hydro Energy

NO	Name of IFA #3 Priority Projects	System	Est. Starting date1	Capacity (MW)	RUPTL
1	PLTA NEW 9_PLTA Sumatra 1300 MW	Sumatra	2024	1,300.0	NO
2	PS Grindulu	Java-Madura-Bali	2025	1,000.0	YES
3	PLTA Java Bali (Kuota) Tersebar PSPP	Java-Madura-Bali	2025	760.0	YES
4	PLTA NEW 9_PLTA Sumatra 500 MW	Sumatra	2024	500.0	NO
5	PLTA Sumatra	Sumatra	2025	500.0	NO
6	PLTA Hidro Sumatra (kuota) tersebar*	Sumatra	2026	400.0	YES
7	PLTA Hidro Sumatra (kuota) tersebar*	Sumatra	2027	400.0	YES
8	PLTA Sulbagsel (Kuota) Tersebar	Sulawesi	2024	400.0	NO
9	PLTA Sumatra (Kuota) Tersebar	Sumatra	2025	400.0	NO
10	PLTA Sulbagsel (Kuota) Tersebar	Sulawesi	2025	350.0	NO
11	PS Upper Cisokan Pump Storage (FTP2)	Java-Madura-Bali	2024	260.0	YES
12	PS Upper Cisokan Pump Storage (FTP2)	Java-Madura-Bali	2024	260.0	YES
13	PS Upper Cisokan Pump Storage (FTP2)	Java-Madura-Bali	2024	260.0	YES
14	PS Upper Cisokan Pump Storage (FTP2)	Java-Madura-Bali	2024	260.0	YES
15	PLTA Sulawesi (Kuota) Tersebar	Sulawesi	2029	250.0	NO
16	PLTA Sulawesi (Kuota) Tersebar	Sulawesi	2030	250.0	NO

NO	Name of IFA #3 Priority Projects	System	Est. Starting date1	Capacity (MW)	RUPTL
17	PLTA Sumatra (Kuota) Tersebar	Sumatra	2024	250.0	NO
18	PS Sumatra Pump Storage-1	Sumatra	2025	250.0	YES
19	PS Sumatra Pump Storage-2	Sumatra	2026	250.0	YES
20	PLTA Hidro Sumatra (kuota) tersebar*	Sumatra	2025	200.0	YES
21	PLTA Hidro Sumatra (kuota) tersebar*	Sumatra	2026	200.0	YES
22	PLTA Kalseltengtimra (Kuota) Tersebar	Kalimantan	2024	200.0	YES
23	PLTA Kalseltengtimra (Kuota) Tersebar	Kalimantan	2026	200.0	YES
24	PLTA Kalseltengtimra (Kuota) Tersebar	Kalimantan	2026	200.0	YES
25	PLTA Kaltimra	Kalimantan	2025	200.0	YES
26	PLTA Sulbagsel (Kuota) Tersebar	Sulawesi	2026	200.0	YES
27	PLTA Sulbagsel (Kuota) Tersebar	Sulawesi	2025	200.0	YES
28	PLTA Muara Juloi	Kalimantan	2026	170.0	NO
29	PLTA Muara Juloi	Kalimantan	2027	170.0	NO
30	PLTA Pokko	Sulawesi	2026	125.0	NO
31	PLTA Tanjung Sakti	Sumatra	2028	114.0	YES
32	PLTA Bendungan Merangin	Sumatra	2026	107.0	YES
33	PLTA Sesayap	Kalimantan	2028	103.0	YES
34	PLTA Tabang	Kalimantan	2028	101.0	YES
35	PLTA Buttu Batu	Sulawesi	2024	100.0	YES
36	PLTA Buttu Batu	Sulawesi	2024	100.0	YES
37	PLTA Kalseltengtimra (Kuota) Tersebar	Kalimantan	2025	100.0	YES
38	PLTA Kalseltengtimra (Kuota) Tersebar	Kalimantan	2027	100.0	YES
39	PLTA Kaltimra	Kalimantan	2026	100.0	YES
40	PLTA Nanga Pinoh	Kalimantan	2026	100.0	YES
41	PLTA Simonggo	Sumatra	2028	90.0	NO
42	PLTA Simonggo	Sumatra	2025	90.0	YES
43	PLTA Sulbagsel (Kuota) Tersebar	Sulawesi	2027	80.0	YES

NO	Name of IFA #3 Priority Projects	System	Est. Starting date1	Capacity (MW)	RUPTL
44	PLTA Bakaru 2	Sulawesi	2024	70.0	YES
45	PLTA Bakaru 2	Sulawesi	2024	70.0	YES
46	PLTA Sulbagut (Kuota) Tersebar	Sulawesi	2027	70.0	YES
47	PLTA Sulbagut (Kuota) Tersebar	Sulawesi	2025	60.0	YES
48	PLTA Kelai	Kalimantan	2024	55.0	YES
49	PLTA Wai Tala	Maluku-Papua-Nusa Tenggara	2028	54.0	NO
50	PLTA Kelai	Sumatra	2028	45.0	NO
51	PLTA Kumbih-3	Sumatra	2024	45.0	YES
52	PLTA Masang-2 (FTP2)	Sumatra	2024	44.0	NO
53	PLTA Sulbagut	Sulawesi	2024	30.0	YES
54	PLTM NTB (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2029	30.0	NO
55	PLTA Wai Tala	Maluku-Papua-Nusa Tenggara	2025	27.0	YES
56	PLTA Wai Tala	Maluku-Papua-Nusa Tenggara	2025	27.0	YES
57	PLTA Watunohu	Sulawesi	2024	22.0	NO
58	PLTA Konawe (Bendung PUPR)	Sulawesi	2028	21.0	NO
59	PLTM Papua (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2030	20.0	NO
60	PLTM Sulbagsel (Kuota) Tersebar	Sulawesi	2024	20.0	YES
61	PLTM Minihidro (Kuota) Tersebar*	Sumatra	2024	19.1	YES
62	PLTA Lambakan	Kalimantan	2028	18.0	YES
63	PLTM Khatulistiwa (Kuota) Tersebar	Kalimantan	2024	17.0	YES
64	PLTA Orya 2. Papua	Maluku-Papua-Nusa Tenggara	2022	14.0	YES
65	PLTM Minihidro (Kuota) Tersebar*	Sumatra	2024	12.4	YES
66	PLTA Buru (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2025	12.0	NO
67	PLTA Baliem (Bendung PUPR)	Maluku-Papua-Nusa Tenggara	2028	10.0	YES
68	PLTA Hidro Sumatra (kuota) tersebar*	Sumatra	2024	10.0	YES
69	PLTM Batang Toru 4	Sumatra	2024	10.0	YES
70	PLTM Ketaun 3	Sumatra	2024	10.0	NO
71	PLTM Koro Yaentu	Sulawesi	2024	10.0	YES

NO	Name of IFA #3 Priority Projects	System	Est. Starting date1	Capacity (MW)	RUPTL
72	PLTM NTB (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2030	10.0	NO
73	PLTM Ordi Hulu	Sumatra	2024	10.0	YES
74	PLTM Sulbagut (Kuota) Tersebar	Sulawesi	2024	10.0	YES
75	PLTM Sulbagut (Kuota) Tersebar	Sulawesi	2024	10.0	YES
76	PLTM Sisira	Sumatra	2024	9.8	YES
77	PLTM Khatulistiwa (Kuota) Tersebar	Kalimantan	2024	9.0	YES
78	PLTM Minihidro (Kuota) Tersebar*	Sumatra	2024	8.8	YES
79	PLTM Sidikalang-1	Sumatra	2024	8.6	YES
80	PLTA Sawangan	Sulawesi	2024	8.3	YES
81	PLTA Sawangan	Sulawesi	2024	8.3	YES
82	PLTM Sulbagut (Kuota) Tersebar	Sulawesi	2024	8.3	YES
83	PLTM Aek Tomuan-1	Sumatra	2024	8.0	YES
84	PLTM Simonggo	Sumatra	2024	8.0	NO
85	PLTM Seram (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2025	7.8	YES
86	PLTM Sumpur	Sumatra	2024	7.6	NO
87	PLTM Aek Situmandi	Sumatra	2024	7.5	NO
88	PLTM Batang Toru 1	Sumatra	2024	7.5	YES
89	PLTM Batang Toru 5	Sumatra	2024	7.5	YES
90	PLTM Sulbagsel (Kuota) Tersebar	Sulawesi	2024	7.4	YES
91	PLTM Alur Cincin	Sumatra	2024	7.2	NO
92	PLTM Raisan Hutadolok	Sumatra	2024	7.0	YES
93	PLTM Raisan Nagatimbul	Sumatra	2024	7.0	YES
94	PLTM Sukarame	Sumatra	2024	7.0	NO
95	PLTM Sumbawa-Bima (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	7.0	YES
96	PLTM Kalibumi I	Maluku-Papua-Nusa Tenggara	2024	6.4	YES
97	PLTM Tuik	Sumatra	2024	6.3	NO
98	PLTM Bayang Nyalo	Sumatra	2024	6.0	NO

NO	Name of IFA #3 Priority Projects	System	Est. Starting date1	Capacity (MW)	RUPTL
99	PLTM Cascade Walesi	Maluku-Papua-Nusa Tenggara	2024	6.0	YES
100	PLTM Sumber Jaya	Sumatra	2024	6.0	NO
101	PLTM Tongar	Sumatra	2024	6.0	NO
102	PLTM Alani	Sulawesi	2026	5.6	YES
103	PLTM Kukusan 2	Sumatra	2024	5.4	NO
104	PLTM Bendungan PU Batanghari	Sumatra	2024	5.0	NO
105	PLTM Flores	Maluku-Papua-Nusa Tenggara	2024	5.0	NO
106	PLTM Kanzy 3	Sumatra	2024	5.0	YES
107	PLTM Sumba	Maluku-Papua-Nusa Tenggara	2024	5.0	NO
108	PLTM Warnasi Warkapi	Maluku-Papua-Nusa Tenggara	2024	4.6	YES
109	PLTM Pantan Cuaca	Sumatra	2024	4.5	NO
110	PLTM Rabi Jonggor	Sumatra	2024	4.5	NO
111	PLTM Nua (Masohi)	Maluku-Papua-Nusa Tenggara	2024	4.4	YES
112	PLTM Nua (Masohi)	Maluku-Papua-Nusa Tenggara	2024	4.4	YES
113	PLTM Mamberamo Raya	Maluku-Papua-Nusa Tenggara	2025	4.0	YES
114	PLTM Sumbawa-Bima (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	3.8	YES
115	PLTM Walesi Blok II	Maluku-Papua-Nusa Tenggara	2024	3.8	YES
116	PLTM Dominanga	Sulawesi	2024	3.5	NO
117	PLTM Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2024	3.2	YES
118	PLTM Tarusan	Sumatra	2024	3.2	NO
119	PLTA Wai Tina	Maluku-Papua-Nusa Tenggara	2026	3.0	YES
120	PLTA Wai Tina	Maluku-Papua-Nusa Tenggara	2026	3.0	YES
121	PLTA Wai Tina	Maluku-Papua-Nusa Tenggara	2026	3.0	YES
122	PLTA Wai Tina	Maluku-Papua-Nusa Tenggara	2026	3.0	YES
123	PLTM Digoel	Maluku-Papua-Nusa Tenggara	2025	3.0	YES
124	PLTM Muara Sako	Sumatra	2024	3.0	NO
125	PLTM Wabudori	Maluku-Papua-Nusa Tenggara	2025	3.0	YES
126	PLTM Lapai 1	Sulawesi	2024	2.7	NO

NO	Name of IFA #3 Priority Projects	System	Est. Starting date1	Capacity (MW)	RUPTL
127	PLTM Lapai 1	Sulawesi	2024	2.7	NO
128	PLTM Lombok (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	2.6	YES
129	PLTM Sumbawa-Bima (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	2.5	YES
130	PLTM Koko Babak	Maluku-Papua-Nusa Tenggara	2024	2.3	NO
131	PLTM Way Meleson 2	Sumatra	2024	2.3	NO
132	PLTM Aek Pungga	Sumatra	2024	2.0	YES
133	PLTM Biak I	Sulawesi	2024	2.0	YES
134	PLTM Iya	Sulawesi	2025	2.0	YES
135	PLTM Lapai 2	Sulawesi	2024	2.0	NO
136	PLTM Lapai 2	Sulawesi	2024	2.0	NO
137	PLTM Sumba (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	2.0	NO
138	PLTM Tepuai	Kalimantan	2024	2.0	YES
139	PLTM Wae Lega - Ruteng	Maluku-Papua-Nusa Tenggara	2024	1.8	NO
140	PLTM Sumba (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	1.6	NO
141	PLTM Tras	Sumatra	2024	1.6	NO
142	PLTM Uwe	Maluku-Papua-Nusa Tenggara	2024	1.5	YES
143	PLTM Lombok (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	1.4	YES
144	PLTM Riorita	Sulawesi	2024	1.3	NO
145	PLTM Riorita	Sulawesi	2024	1.3	NO
146	PLTM Waigo	Maluku-Papua-Nusa Tenggara	2026	1.3	YES
147	PLTM Halulai	Sulawesi	2024	1.2	YES
148	PLTM Amai	Maluku-Papua-Nusa Tenggara	2024	1.1	YES
149	PLTM Wae Mala	Maluku-Papua-Nusa Tenggara	2025	1.1	YES
150	PLTM Biak II	Sulawesi	2024	1.0	YES
151	PLTM Biak III	Sulawesi	2024	1.0	YES
152	PLTM Lombok (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	0.6	YES
153	PLTM Pandanduri	Maluku-Papua-Nusa Tenggara	2024	0.6	NO

NO	Name of IFA #3 Priority Projects	System	Est. Starting date1	Capacity (MW)	RUPTL
154	PLTM Lombok (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	0.5	YES
155	PLTM Lombok (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	0.5	YES
156	PLTM Lombok (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	0.3	YES
Total Capacity (MW)				12,881.5	

Est. Investment Needs (US$Mn)		
	Hydro	10,480.0
	Minihydro	9,591.9
	Pump storage	2,232.9
Total Est. Investment Needs		22,304.8

Appendix 10.5: Detailed List of Investment Focus Area #3 Priority Projects: Bioenergy

NO	Name of IFA #3 Priority Projects	System	Est. Starting date[1]	Capacity (MW)	RUPTL
1	PLTBg Air Upas	Kalimantan	2024	2.0	YES
2	PLTSa Bandung	Java-Madura-Bali	2024	29.0	YES
3	PLTBg Kendawangan	Kalimantan	2024	2.5	YES
4	PLTBg Nanga Tayap	Kalimantan	2024	2.5	YES
5	PLTBg Sei Melayu	Kalimantan	2024	2.5	YES
6	PLTBio Bacan	Maluku-Papua-Nusa Tenggara	2024	4.0	YES
7	PLTBio Bangka	Sumatra	2024	12.0	YES
8	PLTBio Belitung	Sumatra	2024	12.0	YES
9	PLTBio Buru	Maluku-Papua-Nusa Tenggara	2024	10.0	NO
10	PLTBio Dodo	Maluku-Papua-Nusa Tenggara	2024	10.0	NO
11	PLTBio Halmahera	Maluku-Papua-Nusa Tenggara	2024	5.0	YES
12	PLTBio Kepri	Sumatra	2024	2.4	YES
13	PLTBio Khatulistiwa	Kalimantan	2024	44.0	YES
14	PLTBio Mahakam	Kalimantan	2024	10.0	YES
15	PLTBio Mahakam	Kalimantan	2024	10.0	YES
16	PLTBio Nias	Sumatra	2024	3.0	YES

NO	Name of IFA #3 Priority Projects	System	Est. Starting date[1]	Capacity (MW)	RUPTL
17	PLTBio Sanana	Maluku-Papua-Nusa Tenggara	2024	10.0	YES
18	PLTBio Saumlaki	Maluku-Papua-Nusa Tenggara	2024	10.0	YES
19	PLTBio Sulbagsel	Sulawesi	2024	10.0	NO
20	PLTBio Sulbagsel	Sulawesi	2024	10.0	YES
21	PLTBio Sulbagut	Sulawesi	2024	10.0	YES
22	PLTBio Tual	Maluku-Papua-Nusa Tenggara	2024	10.0	NO
23	PLTBm Kaimana	Maluku-Papua-Nusa Tenggara	2024	10.0	YES
24	PLTBm Langsa	Sumatra	2024	10.0	YES
25	PLTBm Merauke	Maluku-Papua-Nusa Tenggara	2024	10.0	YES
26	PLTBm Sumbawa	Maluku-Papua-Nusa Tenggara	2024	10.0	YES
27	PLTSa Bekasi	Java-Madura-Bali	2024	12.0	YES
28	PLTSa Makassar	Sulawesi	2024	10.0	YES
29	PLTSa Palembang	Sumatra	2024	20.0	NO
30	PLTSa Tangerang	Java-Madura-Bali	2024	20.0	YES
31	PLTSa Tangerang Selatan	Java-Madura-Bali	2024	20.0	YES
Total Capacity (MW)				**342.9**	

Est. Investment Needs (US$Mn)	
Biogas	17.1
Bioenergy	273.6
Biomass	60.0
Waste to energy	388.5
Total Est. Investment Needs	**739.2**

Appendix 10.6: Detailed List of Investment Focus Area #4 Priority Projects: Solar Energy

NO	Name of IFA #4 Priority Projects	System	Est. Starting date[1]	Capacity (MW)	RUPTL
1	PLTS+BESS Dediesel	Indonesia	2024	550.0	YES
2	PLTS Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2024	140.0	YES
3	PLTS Sutami / Karangkates	Java-Madura-Bali	2024	100.0	NO
4	PLTS Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2024	100.0	YES
5	PLTS Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2024	100.0	YES
6	PLTS Indramayu	Java-Madura-Bali	2024	100.0	NO
7	PLTS Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2024	80.0	YES
8	PLTS Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2024	80.0	YES
9	PLTS Saguling	Java-Madura-Bali	2024	60.0	YES
10	PLTS Singkarak	Sumatra	2024	50.0	NO
11	PLTS Kedung Ombo (Hijaunesia)	Java-Madura-Bali	2024	50.0	NO
12	PLTS Banten	Java-Madura-Bali	2024	50.0	YES
13	PLTS Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2024	50.0	YES
14	PLTS Dedieselisasi	Kalimantan	2024	44.2	YES
15	PLTS Dedieselisasi	Maluku-Papua-Nusa Tenggara	2024	40.1	YES
16	PLTS Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2024	40.0	YES
17	PLTS Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2024	40.0	YES
18	PLTS Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2024	40.0	YES
19	PLTS Dedieselisasi	Maluku-Papua-Nusa Tenggara	2024	34.0	NO
20	PLTS Dedieselisasi	Sulawesi	2024	33.3	YES
21	PLTS Dedieselisasi	Sulawesi	2024	25.9	YES
22	PLTS Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2024	25.0	YES
23	PLTS Bali	Java-Madura-Bali	2024	25.0	YES
24	PLTS Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2024	25.0	YES
25	PLTS Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2025	25.0	YES
26	PLTS Dedieselisasi	Sumatra	2024	24.0	YES
27	PLTS Dedieselisasi	Java-Madura-Bali	2024	23.0	YES
28	PLTS Java-Bali (Kuota) Tersebar	Java-Madura-Bali	2024	20.0	YES
29	PLTS Dedieselisasi	Java-Madura-Bali	2024	16.1	YES

NO	Name of IFA #4 Priority Projects	System	Est. Starting date[1]	Capacity (MW)	RUPTL
30	PLTS Dedieselisasi	Sumatra	2024	15.2	NO
31	PLTS Dedieselisasi	Maluku-Papua-Nusa Tenggara	2024	13.9	YES
32	PLTS Dedieselisasi	Sulawesi	2024	10.6	NO
33	PLTS Dedieselisasi	Maluku-Papua-Nusa Tenggara	2024	8.8	NO
34	PLTS Dedieselisasi	Sumatra	2024	7.4	YES
35	PLTS Dedieselisasi	Java-Madura-Bali	2024	7.3	YES
36	PLTS Dedieselisasi	Kalimantan	2024	6.0	YES
37	PLTS Dedieselisasi	Java-Madura-Bali	2024	4.0	YES
38	PLTS Dedieselisasi	Sumatra	2024	3.6	NO
39	PLTS Dedieselisasi	Java-Madura-Bali	2024	3.4	YES
40	PLTS Dedieselisasi	Sumatra	2024	3.3	NO
41	PLTS Dedieselisasi	Java-Madura-Bali	2024	3.2	YES
42	PLTS Dedieselisasi	Sumatra	2024	3.1	YES
43	PLTS Dedieselisasi	Sumatra	2024	3.1	YES
44	PLTS Dedieselisasi	Java-Madura-Bali	2024	2.6	YES
45	PLTS Dedieselisasi	Java-Madura-Bali	2024	2.0	YES
46	PLTS Dedieselisasi	Java-Madura-Bali	2024	1.6	YES
47	PLTS Dedieselisasi	Sumatra	2024	1.4	YES
48	PLTS Dedieselisasi	Kalimantan	2024	1.0	YES
49	PLTS Dedieselisasi	Java-Madura-Bali	2024	1.0	YES
50	PLTS Dedieselisasi	Sumatra	2024	0.6	YES
51	PLTS Dedieselisasi	Sulawesi	2024	0.6	YES
52	PLTS Dedieselisasi	Maluku-Papua-Nusa Tenggara	2024	0.4	YES
Total Capacity (MW)				**2,094.7**	
Est. Investment Needs (US$Mn)		**2,380.4**			

Appendix 10.7: Detailed List of Investment Focus Area #4 Priority Projects: Wind Energy

NO	Name of IFA #4 Priority Projects	System	Est. Starting date[1]	Capacity (MW)	RUPTL
1	PLTB Java Barat	Java-Madura-Bali	2024	60.0	YES
2	PLTB Sulbagsel (Kuota) Tersebar	Sulawesi	2024	60.0	NO
3	PLTB Tanah Laut	Kalimantan	2024	40.0	YES
4	PLTB Tanah Laut	Kalimantan	2024	30.0	NO
5	PLTB Timor (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	11.0	NO
6	PLTB Timor (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	11.0	NO
7	PLTB KarimunJava	Java-Madura-Bali	2024	2.2	NO
8	PLTB Lombok (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	30.0	NO
9	PLTB Timor	Maluku-Papua-Nusa Tenggara	2024	22.0	NO
10	PLTB Sumba (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	3.0	NO
11	PLTB Maubesi	Maluku-Papua-Nusa Tenggara	2024	2.0	NO
12	PLTB Banten	Java-Madura-Bali	2024	100.0	YES
13	PLTB Banten	Java-Madura-Bali	2024	100.0	YES
14	PLTB Sulbagsel (Kuota) Tersebar	Sulawesi	2024	70.0	YES
15	PLTB Sulbagsel	Sulawesi	2024	60.0	YES
16	PLTB Sulbagsel	Sulawesi	2024	70.0	NO
17	PLTB Aceh	Sumatra	2024	55.0	YES
18	PLTB Lombok (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2024	30.0	NO
19	PLTB NEW 1_PLTB JETP	Java-Madura-Bali	2025	375.0	NO
20	PLTB NEW 2_PLTB JETP	Java-Madura-Bali	2025	375.0	NO
21	PLTB NEW 2_PLTB JETP	Java-Madura-Bali	2025	375.0	NO
22	PLTB NEW 3_PLTB JETP	Java-Madura-Bali	2025	375.0	NO
23	PLTB NEW 3_PLTB JETP	Java-Madura-Bali	2025	375.0	NO
24	PLTB NEW 4_PLTB JETP	Java-Madura-Bali	2025	375.0	NO
25	PLTB NEW 4_PLTB JETP	Java-Madura-Bali	2025	375.0	NO
26	PLTB NEW 1_PLTB	Java-Madura-Bali	2026	100.0	NO
27	PLTB NEW 1_PLTB	Java-Madura-Bali	2026	100.0	NO
28	PLTB Timor (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2026	22.0	NO
29	PLTB Timor (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2026	22.0	NO

NO	Name of IFA #4 Priority Projects	System	Est. Starting date[1]	Capacity (MW)	RUPTL
30	PLTB NEW 1_PLTB	Java-Madura-Bali	2027	100.0	NO
31	PLTB NEW 1_PLTB	Java-Madura-Bali	2027	100.0	NO
32	PLTB NEW 1_PLTB	Java-Madura-Bali	2028	100.0	NO
33	PLTB NEW 1_PLTB	Java-Madura-Bali	2028	100.0	NO
34	PLTB Sulbagsel (Kuota) Tersebar	Sulawesi	2028	60.0	NO
35	PLTB Sulbagsel (Kuota) Tersebar	Sulawesi	2028	60.0	NO
36	PLTB Sumatra Tersebar	Sumatra	2028	60.0	YES
37	PLTB NTB (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2028	10.0	NO
38	PLTB NTB (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2028	10.0	NO
39	PLTB NEW 1_PLTB	Java-Madura-Bali	2029	100.0	NO
40	PLTB NEW 1_PLTB	Java-Madura-Bali	2029	100.0	NO
41	PLTB Sulbagsel (Kuota) Tersebar	Sulawesi	2029	60.0	NO
42	PLTB Sulbagsel (Kuota) Tersebar	Sulawesi	2029	60.0	NO
43	PLTB Sumatra Tersebar	Sumatra	2029	60.0	YES
44	PLTB Maluku (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2029	10.0	NO
45	PLTB Maluku (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2029	10.0	NO
46	PLTB NEW 1_PLTB	Java-Madura-Bali	2030	100.0	NO
47	PLTB NEW 1_PLTB	Java-Madura-Bali	2030	100.0	NO
48	PLTB NEW 3_PLTB	Java-Madura-Bali	2030	100.0	NO
49	PLTB NEW 3_PLTB	Java-Madura-Bali	2030	100.0	NO
50	PLTB Sulbagsel (Kuota) Tersebar	Sulawesi	2030	60.0	NO
51	PLTB Sulbagsel (Kuota) Tersebar	Sulawesi	2030	60.0	NO
52	PLTB NTB (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2030	10.0	NO
53	PLTB NTB (Kuota) Tersebar	Maluku-Papua-Nusa Tenggara	2030	10.0	NO
Total Capacity (MW)				**5,165.2**	
Est. Investment Needs (US$ Mn)		**4,477.1**			

Appendix 10.8: Principles and Standards that underpin the JT Framework

<table>
<tr><th>JT Principles & Standard</th><th>Function of the Principle & Standard</th><th>Application of the Standard</th><th>Other relevant safeguards (non-exhaustive)</th></tr>
<tr><td colspan="4"></td></tr>
<tr><td>Human rights</td><td colspan="2">● Upholds participation, inclusion, accessibility, equality, and non-discrimination (race, ethnicity, gender, religion, political, property, health, and other status including as a member of a minority group)
● Refrains from providing support for activities that may contribute to violations of a State’s human rights obligations and the core international human rights treaties.
● Ensure meaningful, effective and informed participation of stakeholders in the formulation, implementation, and monitoring.</td><td>IFC-PS, WB-ESF, SMI-ESS, UNDP–SES, etc.</td></tr>
<tr><td>Gender equality and empowerment</td><td colspan="2">● Everyone regardless of gender is able to participate meaningfully and equitably, have equal access to programme and project resources, and receive comparable social and economic benefits.
● Promote gender equality and empowerment of vulnerable stakeholders including women.
● Address any risk of potential exposure of affected people to gender-based violence (GBV) and other abuse in connection with activities.</td><td>All lenders</td></tr>
<tr><td>Accountability</td><td colspan="2">Promotes accountability to stakeholders through engagement and public consultation, transparency of process, data and information, a working redress mechanism, and active participation in monitoring and evaluation.
Ensures stakeholders have access to appropriate grievance resolution.</td><td>All lenders</td></tr>
<tr><td colspan="4">Main Principle 1: Leaving no one behind
All impacted stakeholders will be taken into account and interventions will prioritize addressing the situation of those most marginalized, discriminated, excluded, and vulnerable, and to empower them as active agents of the process.</td></tr>
</table>

JT Principles & Standard	Function of the Principle & Standard	Application of the Standard	Other relevant safeguards (non-exhaustive)
Standard 1: Cultural Heritages	• Protect tangible and intangible cultural heritage from damage, inappropriate alteration, disruption, removal or misuse, • Preserve, safeguard, and ensure access to cultural heritage, • Promote the equitable sharing of benefits from the use of Cultural Heritage, • Promote meaningful consultation with stakeholders regarding preservation, protection, utilization and management of Cultural Heritage.	This standard is particularly applicable where significant excavations, demolitions, movement of earth, flooding, or other topographical and environmental changes may take place close to Cultural Heritage.	IFC-PS, ADB- SPS, WB-ESF, SMI-ESS, UNDP–SES, etc.
Standard 2: Displacement and Resettlement	• Prohibit forced evictions and promote voluntary resettlement. • Ensure appropriate law to be followed for the resettlement process • Avoid (and when avoidance is not possible, minimize) social and economic impacts from land or resource acquisition or restrictions on land or resource use, • Enhance and restore the livelihoods of all displaced persons, to pre-displacement levels or better • Improve the standards of living and overall socioeconomic status of displaced poor and other displaced groups, • Support efforts to progressively realize the rights to adequate housing and adequate standards of living for displaced populations, • Ensure that resettlement activities are planned and implemented collaboratively with the meaningful and informed participation of those affected.	Applicable where physical displacement (i.e., relocation, loss of shelter or plants), whether full or partial and permanent or temporary, or economic and occupational displacement (i.e., loss of assets / access to assets leading to income loss or loss of livelihood) may occur.	IFC-PS, ADB- SPS, WB-ESF, SMI-ESS, UNDP–SES, etc

JT Principles & Standard	Function of the Principle & Standard	Application of the Standard	Other relevant safeguards (non-exhaustive)
Standard 3: Local and Customary Communities	• Recognize and foster respect for customary communities' human rights as recognized under Applicable Law, including but not limited to their rights to self-determination, their lands, resources and territories, traditional livelihoods and cultures, • Support the promotion and protection of customary rights, through implementation of domestic laws, policies, and project activities consistent with the State's human rights obligations, • Involve customary communities participation and supervision over developments affecting them, • Avoid (and if not possible, mitigate) adverse impacts on their rights, lands, territories, resources. • Provide just and equitable benefits and opportunities for local and customary communities in a culturally appropriate manner.	Where the human rights, lands, natural resources, territories, Cultural Heritage and/or traditional livelihoods of local and customary communities may be affected.	IFC-PS, ADB- SPS, WB-ESF, SMI-ESS, UNDP–SES, etc
Standard 4: Labour and Working Conditions	• To promote the fair treatment, nondiscrimination, and equal opportunity of workers. • To establish, maintain, and improve the worker-management relationship. • To promote compliance with national employment and labor laws. • To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain. • To promote safe and healthy working conditions, and the health of workers. • To avoid the use of forced labor. • Leave no one behind by protecting and supporting workers in disadvantaged and vulnerable situations (including a special focus, as appropriate, on women workers, young workers, migrant workers and person (s) with disability).	To all types of workers (including informal, contract workers, migrant workers) and across all activities in an appropriately-scaled manner, based on the nature and scale of the project, its specific activities, and the type of contractual relationships with workers.	IFC-PS, ADB- SPS, WB-ESF, SMI-ESS, UNDP–SES, etc

JT Principles & Standard	Function of the Principle & Standard	Application of the Standard	Other relevant safeguards (non-exhaustive)
• Principle 2: Sustainability and resilience • *Strengthening the resilience of societies to the impact of shocks, disasters, conflict and transitioning situations including emergencies, and the sustainable management, conservation and rehabilitation of natural habitats and their associated biodiversity and ecosystem functions that would sustain the operation of the project.*			
Standard 5: Biodiversity Conservation and Sustainable Natural Resource Management	• Protect and conserve biodiversity and ecosystem services, including required remediation and rehabilitation. • Maintain and enhance the benefits of ecosystem services • Promote sustainable management and use of living natural resources • Ensure the fair and equitable sharing of the benefits from the utilization of genetic resources • Respect, preserve, maintain and encourage knowledge, innovations and practices of local/customary communities relevant for the conservation and sustainable use of biodiversity and their customary use of biological resources.	In modified, natural, and critical habitats or where there is dependence on their ecosystem services, or where there is production or utilization of living natural resources.	IFC-PS, ADB- SPS, WB-ESF, SMI-ESS, UNDP–SES, etc
Standard 6: Climate Change and Disaster Risks	• Ensure sensitivity and implement adaptive measures to reduce the severity of climate change and disaster risks, • Strengthen resilience to achieve sustainable development outcomes, • Reduce project-related greenhouse gas (GHG) emissions and intensity.	This standard is broadly applicable but especially where development outcomes may be threatened by climate change or disaster risks; may contribute to increased exposure and/or vulnerability to climate change or disaster risks; or may produce or incentivize significant GHG emissions.	IFC-PS, ADB- SPS, WB-ESF, SMI-ESS, UNDP–SES, etc
Standard 7: Community Health, Safety and Security	• Anticipate adverse impacts on the health and safety of affected communities from both routine and non-routine circumstances, • Ensure quality and safety in the design and construction of infrastructure, preventing and minimizing potential safety risks and accidents,	Applicable where there may be significant risks to human health and safety, including due to pollution elaborated in Standard 8.	IFC-PS, ADB- SPS, WB-ESF, SMI-ESS, UNDP–SES, etc

JT Principles & Standard	Function of the Principle & Standard	Application of the Standard	Other relevant safeguards (non-exhaustive)
	• Avoid or minimize community exposure to hazards, diseases and hazardous materials associated with their activities, • Ensure that the safeguarding of personnel and property minimizes risks to communities and is carried out in accordance with international human rights standards and principles, • Have in place effective measures to address emergency events, whether human-made or natural hazards.		
Standard 8: Pollution Prevention and Resource Efficiency	• Avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution to land, water, and air (including noise, vibration) from project activities, • Promote circular economy approach for more sustainable use of resources, including energy, land and water, • Avoid or minimize emissions of short and long-lived climate pollutants and ozone-depleting substances, • Avoid or minimize generation of hazardous and non-hazardous substances and wastes, and promote a human rights-based approach to the management and disposal of hazardous substances and wastes, • Promote safe, effective, environmentally sound waste management.	Broadly applicable but particularly where there is a focus on improving existing waste management practices, where the storage or disposal of hazardous materials and chemicals; may be needed, or where there will be significant consumption of water, energy, or other resources.	IFC-PS, ADB- SPS, WB-ESF, SMI-ESS, UNDP–SES, etc
Standard 9: Economic diversification and transformation.	• Support economic diversification and transformation in production and consumption, employment and income creation, fiscal and financing, and trade and investment especially in sector or subsector of national economy related to the energy transition investment, and in particular where input materials or products may otherwise be imported, • Support sub-national areas (provinces and districts) whose economies are highly dependent	Broadly applicable but will apply specifically to activities directly aiming to promote economic diversification.	None cover all

JT Principles & Standard	Function of the Principle & Standard	Application of the Standard	Other relevant safeguards (non-exhaustive)
	on public revenues, employment and income generated from the production, processing, and/or on consumption of fossil fuel energy and associated energy-intensive products to diversify and transform their economies. ● Support economic diversification for business and supply chain, both formal and informal, affected by energy transition investment. ● Direct public and private funds, and promote sustainable funding mechanisms, to diversify and transform the economy through investments with the lowest adverse impacts on the environment, vulnerable groups, disadvantaged sub-nationals, and maximum benefits for local economy, and through social protection, active labor policies (especially for those disproportionately affected by the energy transition), and sustainable and inclusive procurement, ● Promote conducive and coherent policy measures, incentives and infrastructure that diversify and transform sub-national and local economy for sustainable development.		

Appendix 10.9: Analysis Results of Common Risks, Vulnerable Stakeholders, Mitigation actions, and Opportunities across JETP Investment Focus Areas

Just Transition Principles/ Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Areas	Vulnerable stakeholders	Mitigation Action	Opportunities
Cultural heritage	1	Energy transition investments risks altering or damaging culturally significant sites	1) Communities with cultural ties to sites along path/location of investment area.	1) Robust stakeholders engagement and develop socially accessible and acceptable grievance mechanism: communities participation in the planning, decision-making, implementation, and evaluation of activities, grievance mechanism to report and respond concerns, and conduct FPIC process 2) Avoid, minimize alteration, damage, or restriction to culturally significant sites. 3) Adjust activities plan in the case previously unknown cultural heritage is encountered during the activity (e.g. follow Chance Finds Procedure)	1) Economic diversification: development of cultural heritage as part of sustainable tourism.
	2	Energy transition investments risk restricting access to culturally significant sites that hold social values tied to cultural practices/customs, religions, or history.			
Displacement & Resettlement	3	Energy transition investments risk economic and/or physical displacement, whether temporary/permanent and full/partial, due to land acquisition, land use change, or reduction of assets value required for infrastructure, which may result in loss of	1) Vulnerable groups in communities live in proximity to investment area, particularly those who do not formally own land. 2) Former workers from legacy energy infrastructures (e.g. CFPP or coal-mine	1) Compliance with existing regulations on displacement and resettlement. Minimize displacement and avoid involuntary resettlement. 2) Robust stakeholders engagement and develop socially accessible and acceptable grievance and	1) Social Protection program for Just Energy Transition: provide adequate compensation to the affected individual and households, assistance throughout the resettlement, livelihood restoration activities.

Just Transition Principles/ Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Areas	Vulnerable stakeholders	Mitigation Action	Opportunities
		local livelihoods because of environmental, ecosystem services and biodiversity degradation.	workers) and their dependents forced to resettle due to the unemployment.	dispute resolution mechanism: Facilitate an open and inclusive community dialogue to foster understanding and identify sustainable solutions agreed by the members of affected communities, put in place grievance and dispute resolution mechanism. 3) Provide fair and adequate compensation including alternative social infrastructure, tailored assistance throughout the resettlement process to limit involuntary displacement and to restore livelihoods. 4) Conduct evaluation of communities that have been previously displaced by land acquisition for CFPP's identified for early retirement and defining ongoing obligations to ensure that these programmes can be completed and livelihoods fully restored to pre-displacement levels.	
	4	Energy transition investments risk activities risk social disruptions, conflicts amongst communities, or loss of community identity associated with land use change, displacement, and loss of livelihood.			
	5	Energy transition investments risk reducing access to social infrastructure (e.g road, education facilities, healthcare, community/sport facilities, etc)			

Just Transition Principles/ Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Areas	Vulnerable stakeholders	Mitigation Action	Opportunities
Local & customary communities	6	Energy transition investments may not consider local hiring or incorporate local insights, wisdom, and advice of traditional leaders in the planning, development, and ongoing operation which can result in social tensions.	Local and customary communities/workforce, particularly vulnerable groups with low education/skill, women, person(s) with disability.	1) Robust stakeholder engagement and socially accessible and acceptable grievance mechanism, particularly conducting the FPIC process. 2) Ensure the recognition and protection of customary rights, and consider local knowledge and traditional wisdom in the planning, decision-making, and investment implementation. 3) On Job Training, capacity-building and educational programs for workers and potential local hires	1) Social Forestry Program (Regulation of the Minister of Environment and Forestry Number 83 of 2016 concerning Social Forestry program for sustainable forest management implemented by local or customary law communities.to improve their welfare. 2) Cultural diffusion between migrating workers and local communities by enable peer-to-peer exchanges between local workers and incoming skilled workers on local wisdom and RE expertise to create a more inclusive renewable energy community.
Labour & working conditions	7	Energy transition investments risk job opportunities for the local workforce due to lack of appropriate local skills to service these investments.	1) Unskilled workforce in the investment area, particularly youth, women, person(s) with disability. 2) Workers and their dependents from former legacy industry (e.g. CFPP) and its value chain, particularly informal and contractual workers, and micro-enterprises.	1) Enforce compliance with occupational, health, and safety (OHS) standards, monitor labour policies implementation. 2) Enforce decent work practice, including fair and transparent employment and procurement policy and processes that prioritize local hire. 3) Tailored upskilling and reskilling program with energy transition	1) Employment (decent work) opportunities for local workforce in the clean energy sector. 2) Workforce Development Program for just energy transition: Work competency development (Pre-employment Card/Kartu Pra-Kerja), Community Learning Activity Center (PKBM) for non-formal community education.
	8	Energy transition investments may lead to job losses in certain legacy industries and across their respective value chains, including direct, indirect, induced, and informal jobs losses.			

Just Transition Principles/ Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Areas	Vulnerable stakeholders	Mitigation Action	Opportunities
	9	Energy transition investments may result in an influx of skilled migrant workers, which can reduce job opportunities for local workforce and may cause social tension, gentrification, or limit community cohesiveness.		investment plan in the area: including on Job Training, scholarship, vocational training, and educational programs for workers and potential local hires. 4) Robust stakeholders engagement through social dialogue, establishment tripartite committee to ensure industrial relation practice.	3) Social Protection for Just Energy Transition: (a) expand the coverage of unemployment benefits (JKP) scheme to include unemployed workers due to closing business in the industry (e.g. CFPP), JKP to include micro-enterprise or construction project, and JKP to provide allowance to support new job-seeking; prioritize public employment service (PASKER ID as online job market place) in the targeted area for energy transition investment; apply life-cycle approach in the social protection schemes; and expand social insurance to cover climate change-related risks.
	10	Energy transition investments risk increasing workers' risks from improper labor practices, inadequate OHS (occupational, health, safety) implementation, and dangerous working conditions if adequate protection measures, enforcement, and monitoring system are not in place. This includes new Projects developed and also ensuring the workforce for CFPP's identified for early retirement remain appropriate protected.			
Biodiversity & natural resource management	11	Energy transition investments may lead to habitat, biodiversity, and ecosystem services deterioration or loss, and cause local communities that are dependent on immediate access to natural resources for their livelihoods may experience a decline in their livelihoods and well-being.	1) Local households and farmers cultivating downstream rivers used for power plants. 2) Communities live in proximity to investment areas whose livelihoods depend on natural resources.	1) Avoid building large-scale plants and project areas located within a forest or productive agriculture to minimize the impact of land clearing. 2) Compliance with existing safeguards standards, international best practices, and best available science to	1) Development of incentive schemes for sustainable land, natural resources, and biodiversity management by communities.

Just Transition Principles/ Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Areas	Vulnerable stakeholders	Mitigation Action	Opportunities
	12	Energy transition investments may lead to deforestation, encroachment of protected areas, alteration of the landscape, land use changes, and reduction of functionality of the cleared area, leading to changes in local climate.		develop rehabilitation/remediation plan, and anticipate contamination. 3) Robust stakeholder engagement and socially accessible and acceptable grievance mechanism, , particularly conducting the FPIC process. 4) Development of biodiversity-friendly technologies.	
	13	Energy transition investments may alter hydrological system, and reduce availability of water because of the need for large quantities of water by the investment.			
Climate change & disaster risk	14	Energy transition investments risk maintaining the same or increasing emissions due to delay in the implementation (of CFPP retirement), reduced attention to emissions from CFPP's identified for early retirement, land clearing, land and marine environment use change, and (for manufacturing investments) deriving energy from fossil fuels	1) Vulnerable groups in communities live in proximity to investment areas, downstream of rivers, material dredging locations. 2) Central and sub-national governments facing budget constraints due to an increase in disaster management costs.	1) Sustainable procurement and resource efficiency of goods and materials – prioritization of suppliers closest to the site, use low emission machinery. 2) Establishing protocols to prevent and manage disasters, including master plan, safety signs, and early warning system. 3) Establishing protocols and requirements for CFPPs identified for early retirement to continue to operate in accordance with original design and approved emission limits.	1) Increase access to clean energy particularly for isolated/remote communities around the investment area to reduce emissions.
	15	Energy transition investments that involve land clearing, land use change, and use of heavy machinery, renders communities more vulnerable to climate change impacts and natural disasters			

Just Transition Principles/ Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Areas	Vulnerable stakeholders	Mitigation Action	Opportunities
		such as flooding and landslides			
Community health, safety, & security	16	Communities near energy transition investments are at health and safety risk from exposure to various disturbances such as excessive noise, vibration, as well as physical risks from equipment failure, heavy equipment use, and safety shortfalls	1) Communities live in the proximity of investment area	1) Enforce monitoring of environmental and social management plan (ESMP), including placement of equipment to reduce pollution, landscape barrier to minimize dispersion and Community Health and Safety Management Plan. 2) Implementation of Minimum Service Standard by local government.	1) Utilization of ongoing sub-national and national government progam to support the quality of public service, like Regional Socioeconomic Infrastructure Development Program (PISEW) by Ministry of Public Works or Regional Development Plan.
	17	Decrease in provision and/or quality of public services that were funded by taxes from sectors of the economy that shrink as a result of energy transition investments, or by CSR programs from companies that close due to the energy transition (e.g. CFPPs)			
Pollution prevention & resource savings	18	Energy transition investments risks deteriorating air quality due to dust, debris, and other air pollutants released during project development	1) Local communities and farmers live in proximity to investment area, particularly near water bodies, material dredging locations.	1) Compliance with land, water, air, and noise pollution management regulations, including comprehensive mitigation and monitoring plan on	1) Application "Polluters Pay" principle and "Extended Producer Responsibility" to disincentivize unmanaged waste and

Just Transition Principles/ Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Areas	Vulnerable stakeholders	Mitigation Action	Opportunities
	19	Energy transition investments risk polluting land and water from waste, spilling, leaking, or improperly disposing of hazardous materials.		pollutants, rehabilitation and remediation plans for contaminated zones, waste treatment and disposal systems. 2) Robust stakeholder engagement, conduct FPIC process, and socially accessible and acceptable grievance mechanism.	pollutions resulted from energy transition investment. 2) Application of circular economy approach to increase resources efficiency and reduce waste.
Economic diversification & transformation	20	Closing or decreased operation of certain legacy energy infrastructure due to energy transition investments may negatively impact regional's and Indonesia's macroeconomic environment, especially in regions heavily reliant on the fossil fuel industry as a source of government revenue (through local level royalty payments), employment and supporting businesses	1) Workers from direct, indirect and induced jobs linked to fossil fuel industry with limited transferrable skills 2) Vulnerable sub-national governments such as governments in coal regions, low fiscal capacity, high poverty level. 3) Local communities whose income depend on servicing the energy infrastructure, particularly those with low income. 4) CFPP project owner and its supply chain.	1) Strategic studies based on CFPP retirement prioritization and key sources of coal and transport corridors to define Provinces and Districts most exposed to upstream economic risks. 2) Identification of potential Economic diversification program for priority provinces and districts based on macro socio-economic impact analysis, consultation with all levels of stakeholders, perception survey and baseline characterization to create green jobs, alternative revenues streams, (especially those streams most closely linked to the green economy) and linkages to long-term strategic planning objectives.	1) Design and implementation of the identified Economic diversification (based on findings of studies): MSMEs and entrepreneurship training program, AKSES program on MSME business acceleration program through the Securities Crowdfunding Mechanism (SCF); People's Business Credit (KUR) provide access to finance for MSMEs; Joint Business Group (KUBE) is a group of poor families implementing Productive Economic Enterprises (UEP); Regional Socioeconomic Infrastructure Development Program (PISEW) by Ministry of Public Works supporting
	21	Low interest of private sector to invest in energy transition because of lack of readiness in the required ecosystem and compliance standards, like social and environmental disruption, increased price of RE key input minerals, and insufficient size of RE market.			

Just Transition Principles/ Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Areas	Vulnerable stakeholders	Mitigation Action	Opportunities
				3) Defining revenue shortfalls, measures to offset any of these reductions, and financial mechanisms to address these.	economic growth in rural settlement areas.
Accountability	22	Lack of public acceptance of the energy transition investment because of no proper public consultations and involvement in the decision making which cause risk that impacted stakeholders will raise grievances	1) Vulnerable workers (informal, contractual, low-skill) that rely on legacy industries and its supply chain. 2) Vulnerable groups in communities living in the proximity of the investment area.	1) Robust stakeholders engagement and establishing socially accessible and acceptable grievance, dispute resolution mechanism: involve vulnerable groups in the planning, decision-making, and implementation of investment by applying appropriate participatory approaches for a meaningful participation. 2) Build sustainable partnerships with local leaders/ CSOs to facilitate a continuous inclusive and meaningful engagement. 3) Cultural and community-based development program to tap into local socio-cultural landscape and to gain public acceptance and heighten local ownership of the project.	1) Build an inclusive local development by allowing community's ownership of share in the energy transition investment (e.g. village enterprises); and participation in the clean energy generation (community-based renewable energy).

Just Transition Principles/ Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Areas	Vulnerable stakeholders	Mitigation Action	Opportunities
Gender Equality and Empowerment	23	Increased incidence of gender-based violence as a result of social changes linked to energy transition investments (e.g. displacement, influx of largely male foreign workers, hostile environment for women, etc.)	1) Vulnerable groups in the workforce and communities live in the proximity of investment area, particularly women-headed household, low-education, low-income, depend on natural resources and people with disabilities. 2) Female STEM graduates, female professional with skill/knowledge on energy.	1) Equip project proponents with training on gender equality, gender-based violence, and gender-sensitive recruitment policies to mitigate the reproduction of non-inclusive engagements. 2) Establish a gender equality program in the investment plan: awareness raising on gender-based violence, grievance mechanism, counseling support, promote female employment, gender-sensitive facilities. 3) Capacity building program dedicated to female graduates to increase female in STEM (Science, Technology, Engineering and Mathematics) 4) Robust stakeholders engagement and establishing socially accessible and acceptable grievance, and dispute resolution mechanism to ensure access of communities to natural resources and ecosystem services for livelihoods (e.g. water, land)	1) Promote gender equality through energy transition: a dedicated program for women and girls in technical skills and STEM, Indonesia Smart Card, Bidikmisi education financial assistance for low-income families, · training and mentoring program for women 2) Economic diversification: training for women MSMEs, home industries, servicing sector. 3) Decentralized rural electrification system to promote women's productive activities and reduce gender-based violence when women and girls conducting activities during night time.
	24	Gender-based discrimination in forms of inequal wages, compensation (e.g. CFPP), and access to work for women and girls in energy transition investments			
	25	Energy transition investments may alter ecosystem services and negatively impact livelihoods, especially for women and girls who commonly are responsible for domestic matters and depend on environmental services for their livelihoods			
	26	Limited representation of women in decision making process for energy transition investments leading to discriminatory impacts towards women and girls			

Just Transition Principles/ Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Areas	Vulnerable stakeholders	Mitigation Action	Opportunities
Human rights	27	Energy transition investments can reduce energy security if they are not paired with the appropriate technologies.	1) Energy consumers, MSMEs particularly with low economic capacity, isolated communities in remote area with limited access to sources of electricity. 2) Vulnerable groups in communities live near the investment area.	1) Integrated roadmap for power supply and its infrastructure readiness. 2) Increase social welfare by ensuring accessibility, affordability, and reliability of energy in rural areas by the deployment of hybrid RE power plants, electricity installation for low-income households, and economic, technical, management capacity development related to the availability of electricity. 2) Robust stakeholders engagement and establishing socially accessible and acceptable grievance, and dispute resolution mechanism to ensure access of communities to natural resources and ecosystem services for livelihoods (e.g. water, land)	1) Expansion of access to affordable clean energy in the area of energy transition investment: targeting households in the proximity of investment area; decentralized hybrid system; community-based power generation. 2) Improvement of Social Welfare Integrated Data (DTKS) platform managed by the Ministry of Social Affairs to include data of the vulnerable households impacted by the energy transition investment
	28	Retirement of legacy energy infrastructure before new energy generation is ready may lead to increases in energy prices and negatively impact energy availability and reliability			
	29	Energy transition investments risk access of communities to get rights to livelihoods and basic services, rights to a clean environment, and rights to a condition that is free of any drives of conflict.			

Appendix 10.10: Rating for Socio-economic and Environmental Risk Assessment

Score	Rating	Impacts	Benefits
5	Extreme	Significant adverse impacts on vulnerable groups, disadvantage sub-national jurisdictions, and/or the environment. Adverse impacts of large-scale magnitudse and spatial extents (area cover, number of impacted parties, trans-jurisdictional and cumulative impacts) as well as duration (long-term, permanent, and irreversible). Area adversely impacted include areas of high conservation value and sensitivity (e.g., ecosystem, habitats), critical to GHG emissions and stocks, and indigenous people territories with associated rights and resources; impacts of projects involve significant levels of displacement or resettlement, may give rise to significant social conflict.	Substantial benefits to the vulnerable groups, disadvantage sub-national jurisdictions, and/or the environment in terms of magnitude, affected area extent (trans jurisdiction, large number of beneficiaries), and duration (long term), potentially creating new benefits that require major efforts to tap.
4	Extensive	Adverse impacts on vulnerable groups, disadvantage sub-national jurisdictions, and/or the environment of considerable magnitude, spatial extent and duration, but more limited than Extreme (e.g. more predictable, mostly temporary, reversible). Impacts of projects are to be considered at a minimum potentially Extensive.	Considerable benefits to the vulnerable groups, disadvantage sub-national jurisdictions, and/or the environment in terms of magnitude, affected area extent, and duration, but more limited than Significant (more predictable, mostly temporary, still likely dissipate/disappear), require medium but less significant efforts to tap.
3	Intermediate	Impacts on vulnerable groups, disadvantage sub-national jurisdictions, and/or the environment of medium magnitude, limited in scale (site-specific) and duration (temporary), can be avoided, managed and/or mitigated with relatively uncomplicated accepted measures.	Medium benefits to the vulnerable groups, disadvantage sub-national jurisdictions, and/or the environment in terms of magnitude, limited affected area, temporary duration, require relatively medium efforts to tap.
2	Minor	Very minor impacts on vulnerable groups, disadvantage sub-national jurisdictions, and/or the environment in terms of severity and magnitude (e.g., small affected area, very low number of people affected) and duration (short), may be easily avoided, managed, mitigated.	Very minor benefits to the vulnerable groups, disadvantage sub-national jurisdictions, and/or the environment in terms of magnitude (e.g. benefits to vulnerable groups like women, elderly, children, low income groups, isolated communities, natural resources-dependent communities, etc.), small affected area, short duration, require minor effort to tap.

Score	Rating	Impacts	Benefits
1	Negligible	Negligible or no adverse impacts on vulnerable groups, disadvantage sub-national jurisdictions, and/or the environment.	Negligible or no economic, social, environmental benefits to the vulnerable groups, disadvantage sub-national jurisdictions, and/or the environment.

Appendix 10.11 Rating the likelihood of a risk and an opportunity

Score	Risk rating	Opportunities rating
5	Expected risk / existing issue	Expected opportunity
4	Very likely risk	Very likely opportunity
3	Moderate risk	Moderate opportunity
2	Low likelihood risk	Low likelihood opportunity
1	Not likely	Not likely

Appendix 10.12: Rating the significance of a risk and an opportunity

Impact/Benefit	5	Moderate	Substantial	Substantial	High	High
	4	Low	Moderate	Substantial	Substantial	High
	3	Low	Moderate	Moderate	Moderate	Substantial
	2	Low	Low	Low	Moderate	Moderate
	1	Low	Low	Low	Low	Low
		1	2	3	4	5
	Likelihood					

Appendix 10.13: Lists of Existing Regulations to Mitigate the Socioeconomic and Environmental Risks

Just Transition Principles/Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Area	Existing Regulations Relevant to Mitigate Risks
Cultural heritage	1	Energy transition investments risks altering or damaging culturally significant sites	1) Law No. 11 of 2010 concerning Cultural Heritage. The heritage zoning system is aimed at protecting cultural heritage by setting the boundaries of the area and its utilization. 2) Law 11/2005 on The Ratification of International Covenant on Economic, Social and Cultural Rights.
	2	Energy transition investments risk restricting access to culturally significant sites that hold social values tied to cultural practices/customs, religions, or history.	
Displacement & Resettlement	3	Energy transition investments risk economic and/or physical displacement, whether temporary/permanent and full/partial, due to land acquisition, land use change, or reduction of assets value required for infrastructure, which may result in loss of local livelihoods because of environmental, ecosystem services and biodiversity degradation.	1) Right of Way Regulation, Ministry of Energy and Mineral Resources. 2) Law Number 7 of 2012 concerning Social Conflict Handling 3) Home Affairs Ministerial Regulations No 42/2015 on The Implementation of Social Conflict Resolution Coordination
	4	Energy transition investments risk activities risk social disruptions, conflicts amongst communities, or loss of community identity associated with land use change, displacement, and loss of livelihood.	
	5	Energy transition investments risk reducing access to social infrastructure (e.g., road, education facilities, healthcare, community/sport facilities, etc.)	
Local & customary communities	6	Energy transition investments may not consider local hiring or incorporate local insights, wisdom, and advice of traditional leaders in the planning, development, and ongoing operation which can result in social tensions.	1) Law 11/2005 on The Ratification of International Covenant on Economic, Social and Cultural Rights
Labour & working conditions	7	Energy transition investments risk job opportunities for the local workforce due to lack of appropriate local skills to service these investments.	1)Government Regulation Number 50 of 2012 on the Implementation of Occupational Health and Safety Management System 2) Law no 1 of 1970: Obligations of Employers and Workers in Occupational Safety 3) Minister of Manpower Regulation No. 5 of 2018: Occupational Health, Safety and Environment 4) Law 2/2022 on Job Creation 5) Perpres Number 113 of 2022 concerning the Second Amendment to Perpres Number 36 of 2020 concerning Work Competency Development Through the Pre-Employment Card Program 6) Regulation of the Minister Of Manpower Number 16 Of 2022 on
	8	Energy transition investments may lead to job losses in certain legacy industries and across their respective value chains, including direct, indirect, induced, and informal jobs losses.	
	9	Energy transition investments may result in an influx of skilled migrant workers, which can reduce job opportunities for local workforce and may cause social tension, gentrification, or limit community cohesiveness.	

Just Transition Principles/Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Area	Existing Regulations Relevant to Mitigate Risks
	10	Energy transition investments risk increasing workers' risks from improper labor practices, inadequate OHS (occupational, health, safety) implementation, and dangerous working conditions if adequate protection measures, enforcement, and monitoring system are not in place.	Guidelines For Distribution Of Government Assistance At The Ministry Of Manpower For Fiscal Year 2023 7) Minister of Education and Culture Regulation Number 81 of 2013 concerning the Establishment of Non-Formal Education Units, community learning activity center programs (PKBM). 8) Law No.13/2003 on Labor (amended by Law No.6/2023) requires employers to pay severance to workers whose employment are involuntarily terminated.
Biodiversity & natural resource management	11	Energy transition investments may lead to habitat, biodiversity, and ecosystem services deterioration or loss, and cause local communities that are dependent on immediate access to natural resources for their livelihoods may experience a decline in their livelihoods and well-being.	1) Law Number 32 Year 2009 Regarding Environmental Management and Protection in Lieu of Law Number 11 Year 2020 Regarding Job Creation, mandating that the power plant owner shall develop Environmental Impact Assessment (EIA/AMDAL) to assess any impact/risk and shall involve public consultation with impacted community. 2) Governmental Regulation No. 22 year 2021 regarding Environmental Protection and Management. 3) Ministry of Environment and Forestry (MoEF) Regulation No. 4 year 2021 on the List of Business and/or Activities that are mandatory to have Amdal, UKL/UPL, or SPPLH. 4) Law No. 5 year 1990 on Conservation of the living natural resources and its ecosystem. 5) Law Number 26 Year 2007 on Spatial Planning in Lieu of Law Number 11 Year 2020 Regarding Job Creation. 6) Government Regulation Number 23 Year 2021 on Forestry Management 7) Law Number 41 Year 1999 regarding Forest in Lieu of Law Number 11 Year 2020 Regarding Job Creation.
	12	Energy transition investments may lead to deforestation, encroachment of protected areas, alteration of the landscape, land use changes, and reduction of functionality of the cleared area, leading to changes in local climate.	
	13	Energy transition investments may alter hydrological system and reduce availability of water because of the need for large quantities of water by the investment.	
Climate change & disaster risk	14	Energy transition investments risk maintaining the same or increasing emissions due to delay in the implementation (of CFPP retirement), land clearing, land and marine environment use change, and (for manufacturing investments) deriving energy from fossil fuels	1) Perpres No. 98 Year 2021 stated that every permit holder/project owner shall annually conduct monitoring, reporting, and verification of greenhouse gas emissions produced by the activity. 2) Ministry of Environment and Forestry's decree No. 716/2023 stated that climate change shall be integrated into environmental approvals, permits and partnership. Every permit holder/project owner shall develop emission mitigation plan document. 3) Law Number 24 year 2007 on Disaster Management. 4) Head of Disaster Management Agency Regulation No. 12 Year 2014 on Business' Participation in Disaster Management.
	15	Energy transition investments that involve land clearing, land use change, and use of heavy machinery, renders communities more vulnerable to climate change impacts and natural disasters such as flooding and landslides	

Just Transition Principles/Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Area	Existing Regulations Relevant to Mitigate Risks
Community health, safety, & security	16	Communities near energy transition investments are at health and safety risk from exposure to various disturbances such as excessive noise, vibration, as well as physical risks from equipment failure, heavy equipment use, and safety shortfalls	1) Law 32/2009 on Environmental Impact Assessment (EIA)/ Environmental and Social Impact Assessment (ESIA) and Law 11/2020 Omnibus law on Job Creation (Cipta Kerja) 2) Minister of Environment and Forestry Regulation No. 4 of 2021 on List of Business/Activities required to have EIA 3) Disturbance permit/HO (Hinder Ordonantie) issued by local government. 4) Government regulation No.2/2028 on Minimum Service Standard 5) Government Regulation No. 66 Year 2014 on Environmental Health 6) Minister of Manpower Regulation No. 5 Year 2018 on Occupational Health and Safety.
	17	Decrease in provision and/or quality of public services that were funded by taxes from sectors of the economy that shrink as a result of energy transition investments, or by CSR programs from companies that close due to the energy transition (e.g. CFPPs)	
Pollution prevention & resource savings	18	Energy transition investments risks deteriorating air quality due to dust, debris, and other air pollutants released during project development	1) Government Regulation No. 22 year 2021 on Environmental Protection and Management. 2) Ministry of Environment Regulation Number 8 Year 2009, regulates the wastewater effluent standard for business and activity of thermal power plants. 4) Minister of Environment and Forestry Regulation Number 15 Year 2019 on Power Plant Air Quality Standards. 5) Ministry of Environment Decree No. 48 year 1996 on Noise Standard. 6) Ministry of Environment and Forestry No. 101 year 2018 on Guideline on the Restoration of Land Contaminated by Hazardous and Toxic Waste. 7) Law No.18 year 2008 on Waste Management
	19	Energy transition investments risk polluting land and water from waste, spilling, leaking, or improperly disposing of hazardous materials.	
Economic diversification & transformation	20	Closing or decreased operation of certain legacy energy infrastructure due to energy transition investments may negatively impact regional's and Indonesia's macroeconomic environment, especially in regions heavily reliant on the fossil fuel industry	1) Regulation of the Minister of Cooperatives and Small and Medium Enterprises Number 2 of 2021 concerning General Guidelines for Distribution of Government Assistance for Micro Enterprises to Support National Economic Recovery. 2) Financial Service Authority POJK 57/2020 concerning Crowdfunding Services or Securities Crowdfunding. 3) Presidential Instruction (Inpres) Number 6 of 2007 expands access to credit for MSMEs. 4). Regulation of the Minister of Social Affairs Number 2 of 2019 concerning Productive Economic Social Business Assistance to Joint Business Groups for Handling the Poor. 5) Law Number 1 of 2011 concerning Housing and Residential Areas supporting sustainable livelihoods in urban and rural area. 6) Perpres No. 10 of 2021 on Investment Business Sector
	21	Low interest of private sector to invest in energy transition because of lack of readiness in the required ecosystem and compliance standards, like social and environmental disruption, increased price of RE key input minerals, and insufficient size of RE market.	
Accountability	22	Lack of public acceptance of the energy transition investment because of no proper public consultations and involvement in the decision making which cause risk that impacted stakeholders will raise grievances	1) Ministry of Energy and Mineral Resources Regulation No. 40 year 2015 regarding complaint management in energy and mineral resources sector. 2) Ministry of Energy and Mineral Resources Decree No. 129 year 2021 regarding information request and public complaint handling in energy and

Just Transition Principles/Standards	Risk #	Identified Socioeconomic and Environmental Risks Across JETP Investment Area	Existing Regulations Relevant to Mitigate Risks
			mineral resources sector 3) Ministry of Environment and Forestry Regulation No. 22 year 2017 regarding environmental complaint handling. 4) Ministry of State Apparatus Utilization and Bureaucratic Reform Regulation No. 3 year 2015 regarding the Development of Public Complaint System Handling Roadmap
Gender Equality and Empowerment	23	Increased incidence of gender-based violence as a result of social changes linked to energy transition investments (e.g., displacement, influx of largely male foreign workers, hostile environment for women, etc.)	1) Presidential instruction No 9/2010 on Gender mainstreaming in the national development plan and budget. 2) Law No. 7 of 1984, ratification of Convention on the 'Elimination of All Forms of Discrimination Against Women' (CEDAW) 3) Law No 13/2003 on Manpower regulates that every worker has the right to receive equal treatment without discrimination. 4) Ministry of Home Affairs Regulation No.15/2008 on Guidelines for implementing mainstreaming gender in the regions. 5) Regulation of the Minister of Women's Empowerment and Child Protection of the Republic of Indonesia No.2/2016 concerning Development of Home Industries through Women's Empowerment, 6) Regulation of the Minister of Education and Culture No 10/2020 on Smart Indonesia Program 7) Regulation of the Minister of Education and Culture No. 44/ 2020 concerning Government Assistance for Entrepreneurial Skills Education Program.
	24	Gender-based discrimination in forms of inequal wages, compensation (e.g., CFPP), and access to work for women and girls in energy transition investments	
	25	Energy transition investments may alter ecosystem services and negatively impact livelihoods, especially for women and girls who commonly are responsible for domestic matters and depend on environmental services for their livelihoods	
	26	Limited representation of women in decision making process for energy transition investments leading to discriminatory impacts towards women and girls	
Human rights	27	Energy transition investments can reduce energy security if they are not paired with the appropriate technologies.	1) Law No. 39 year 1999 on Human Rights 2) Regulation of the Minister of Energy and Mineral Resources No. 17/2019 on Mechanism of Providing Electricity Tariff Subsidies for Low-Income Households 3) Ministry of Villages, Disadvantaged Regions and Transmigration Regulation No. 11/2019 on Priority Use of Village Funds 4) Regulation of the Minister of Energy and Mineral Resources No.3/ 2022 on New Electrical Installation for Low Income Households 5) Perpres No. 112 Year 2022 on the Acceleration of Renewable Energy Development for Electricity Generation.
	28	Retirement of legacy energy infrastructure before new energy generation is ready may lead to increases in energy prices and negatively impact energy availability and reliability	
	29	Energy transition investments risk access of communities to get rights to livelihoods and basic services, rights to a clean environment, and rights to a condition that is free of any drives of conflict.	

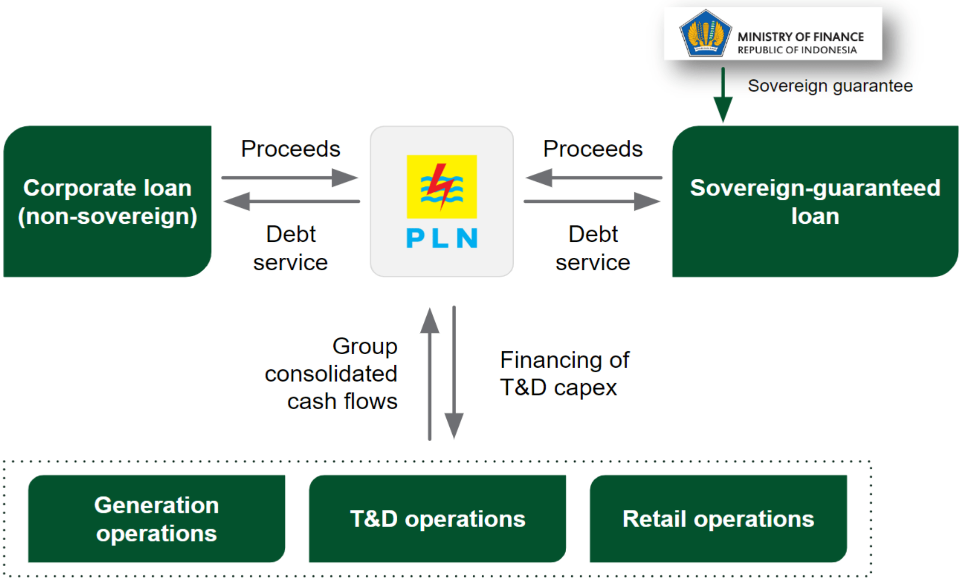
Appendix 10.14: Financing Structure Examples for JETP Investment Focus Area

Below are examples of financing structures across the identified key investment focus areas. While the structures here is not an exhaustive list of possibilities, as all JETP projects will likely present unique attributes that lend themselves to new and novel approaches, each structure is both potentially scalable and applied directly to the Indonesian energy sector. The purpose of this "library" is intended to support ongoing JETP governance and set forth an example of the opportunity at hand to leverage both concessional and non-concessional dollars to finance energy transition projects.

Appendix 10.14.1: IFA 1: Transmission Development

Currently, the primary mechanism for financing transmission and distribution (T&D) projects is to take a direct approach, wherein PLN as the state utility mandated to control the national transmission & distribution is extended a corporate loan, where group consolidated cash flows will be used to service debt. Currently, PLN has 100% equity ownership over the transmission and distribution asset while debt is fully consolidated onto its balance sheet.

While there is international precedent for making T&D investments by operating the transaction through a joint venture off the SOE's balance sheet, this approach currently faces regulatory constraint in the Indonesian context. As a result, all major T&D transactions being considered are with the structure below.

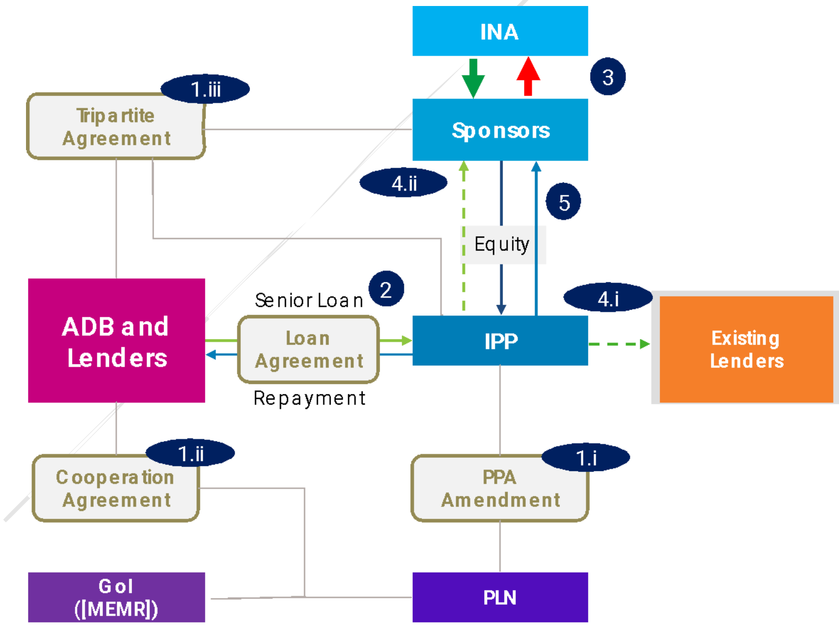


Appendix 10.14.2: IFA 2: Early CFPP Retirement and Managed Coal Phase-Out

This structure is currently being applied to a coal-fired IPP pilot transaction. ADB has been canvassing the market by engaging with IPPs that are interested in early retirement of CFPPs. ADB proceeded to sign nondisclosure agreements with IPPs and is pursuing discussions accordingly.

The first proposed project in the program, which is the Cirebon-1 coal-fired IPP, would involve a US$300m refinancing which would consist of concessional and non-concessional loans both using public and private finance under a commitment to retire the CFPP several years before the end of the PPA (i.e., accelerated retirement), as illustrated in the figure below. Just transition requirements are integrated into the proposed project, recognizing that the IPP will need to coordinate with government on the issue. Through the proposed refinancing, the first project aims to open the pathway for further coal-fired IPP early retirements by demonstrating the tangible willingness of PLN and the broader GoI to operationalize the CFPP early retirement roadmap.

Coal-fired IPP Pilot Transaction



Note: "ADB and Lenders" include commercial lenders along with ADB, in the IPP CFPP pilot transaction.

(1). Early retirement of the plant to be contractually agreed through:

- (i). PPA Amendment (IPP, PLN) to reduce PPA tenor.
- (ii). Cooperation Agreement (PLN, GoI, ADB and Lenders) to ensure that, in all PPA termination scenarios, the plant will permanently cease operations as a CFPP by the shortened PPA term.

(iii). Tripartite Agreement (IPP, Sponsors/INA, ADB and Lenders) to ensure early retirement of the plant after new loan has been repaid.

On this basis:

(2). ADB and Lenders provide senior debt to the project company and receive repayment based on sculpted cash flow over the investment tenure.

(3). INA to conduct share purchase transaction with existing sponsors.

(4). ADB and Lenders loan proceeds to be used for.

(i). Prepayment of existing lenders.

(ii). Payment of a special dividend to shareholders to compensate for the present value of lost cash flows.

(5). IPP continues to operate the plant and shareholders receive residual cash flows until the end of the shortened PPA tenure.

PT SMI early retirement program

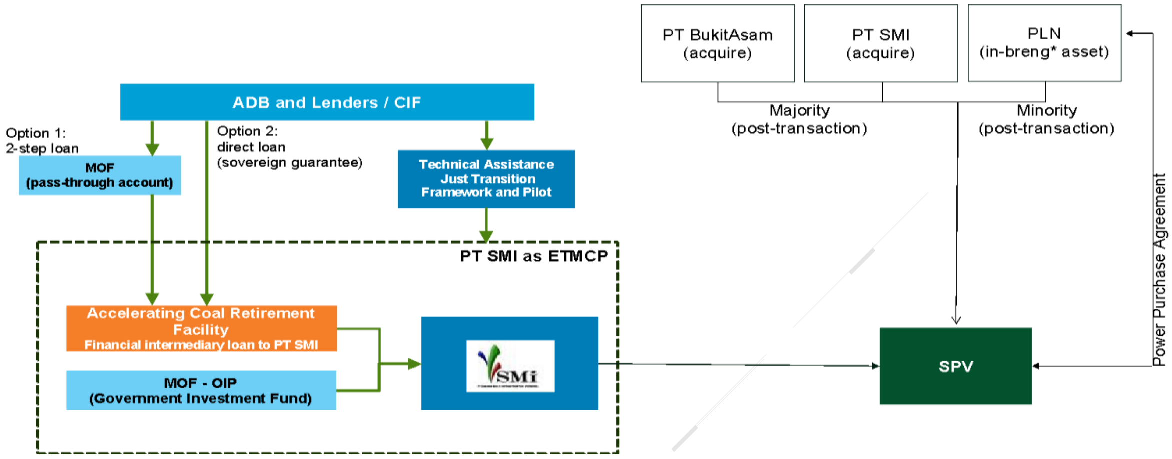
In the current applied case, the GoI and ADB propose to enter into a financial intermediation loan (FIL) (US$98m CIF-ACT, US$1m CIF-ACT grant, US$102m ADB, commercial financing US$150m, US$500m GoI) to PT SMI with two components.

- The first component, the Accelerating Coal Retirement Facility (ACRF), will provide debt financing to support the accelerated retirement of PLN-owned CFPPs. ADB's FIL, a CIF-ACT loan and financing from commercial lenders will be blended with the Government Investment Fund (Operator Investasi Pemerintah, OIP) contributing to ACRF, which may be established as a trust fund within PT SMI. It will be used to invest in PT SMI Energy Transition Mechanism Country Platform (ETMCP) initiatives such as an "asset spin-off scheme" whereby PT SMI provides (i) an investment loan (debt) to a sponsor or SPV of a CFPP (a previous PLN asset, now IPP to be spun off and/or repurposed) whose PPA term will be decreased (i.e., early retirement); and/or (ii) equity through acquisition of majority shares of the CFPP's SPV, thereby shortening the operational and economic life of the CFPP and contributing to the reduction of carbon dioxide emissions. It is important to note that while the project entails both a debt and equity investment, the ACRF will only go toward the investment loan (i.e., debt). PT SMI will be sourcing equity funding from other budgets internally;
- The second component will be a US$1 million CIF-ACT grant for an ADB TA to be designed and deployed ahead of the ACRF to support the "Implementation Guidelines of JT Framework for Energy Transition." This involves translating the requirements of the JT Framework developed by the Indonesian JETP Just Transition Working Group for the context of PT SMI as the ETMCP and lead financier of energy transition activities for the GoI and to build the capacity of PT SMI to implement and monitor the framework. Funds deployed in 2023-2024 will be used to provide requisite staffing and the development of ETMCP-specific implementation guidelines. The PT SMI ETMCP Just Transition Implementation Guidelines will take the national framework one step further by stipulating requisite audit, mitigation, monitoring and evaluation requirements, as well as financial and legal obligations at the asset-level. It will also develop a feedback mechanism to allow for challenges and gaps in implementation to

promote adjustments at the national level. Overall, the grant will build on early support ADB has provided to MoF and PT SMI on just transition and may include further analytical work to support the further design and adjustment of the framework as required.

Notes: "ADB and Lenders" include commercial, along with ADB, in the PT SMI pilot transaction.

Option 1: in a two-step loan process, the borrower is MoF; the loan is then on-lent to the beneficiary, PT SMI. The sovereign state is the borrower of record in the loan agreement.



Option 2: direct loan to PT SMI with a sovereign guarantee, which is one backed by the state, the sovereign state guarantees the loan's repayment.

"in-breng asset" (Indonesian legal term) is capital injection in the form of asset transfer instead of cash injection.

Appendix 10.14.3: IFA 3: Dispatchable Renewables and IFA 4: Variable Renewables

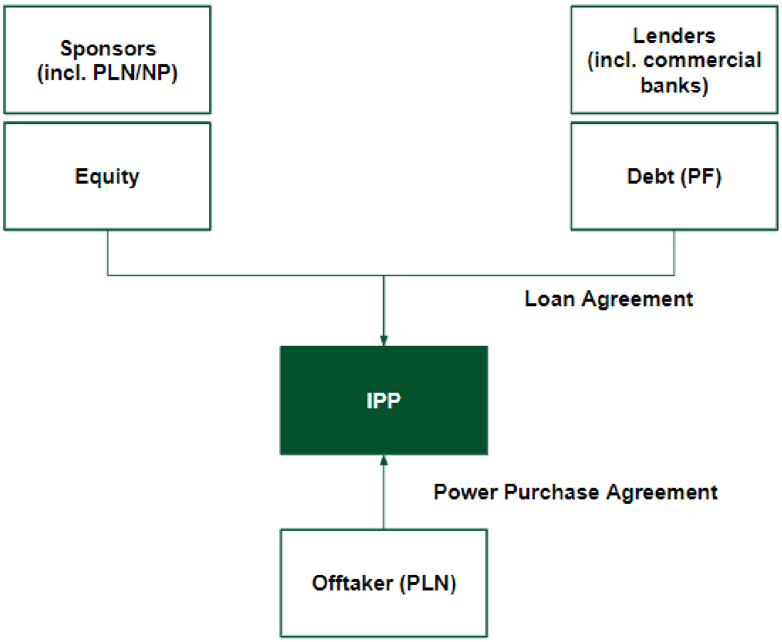
As previously indicated, most of the renewable energy IPP projects can be largely financed using project finance.

Common Project Finance Approach

Project finance, a method of raising long-term debt financing for major projects (including IPPs) based on lending against the cash flow generated by the project rather than the balance sheets of the project sponsors. It depends on a detailed evaluation of a project's construction, operating and revenue risks, and their allocation between investors, lenders, and other parties through contractual and other arrangements.

Project finance structures differ from project to project: there is no such thing as "standard" project finance, since each project has its own unique characteristics. But there are common principles underlying the project finance approach.

This figure is intended to provide a simplified Project Finance structure for those who are new to the subject.



The project finance itself has two elements:

- Equity, provided by investors in the project (or the project's sponsors);
- Project finance-based debt, provided by one or more groups of lenders.

The project finance debt has first call on the project's net operating cash flow; the equity investors' return is thus more dependent on the success of the project.

The off-take contract (i.e., the PPA) entered into by the project company (the IPP) provides support for the project finance, particularly by transferring risks from the IPP to the other parties (e.g., PLN as the off-taker), and form part of the lenders' security package.

Features of project finance

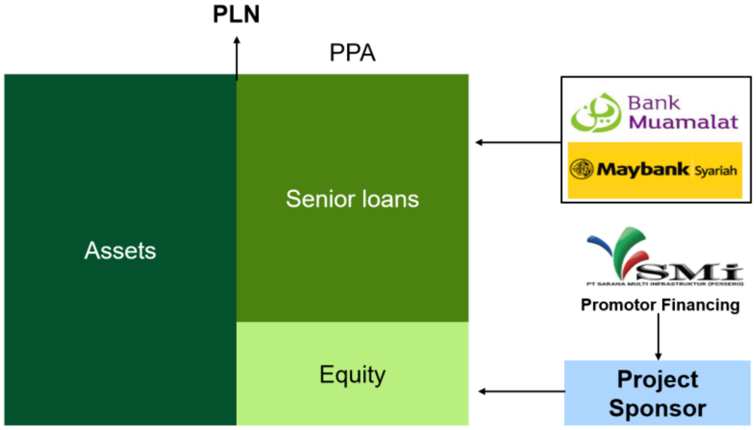
Some typical characteristics of project finance are:

- It is provided for a "ring-fenced" project (i.e., one which is legally and economically self-contained) through a special purpose legal entity whose only business is the project (the IPP project company);
- It is usually raised for a new project rather than an established business (although project finance loans may be refinanced, see IPP CFPP early retirement program);
- Project finance debt may cover 70-80% of the cost of a project;
- There are no guarantees from the investors in the IPP ("non-recourse" finance), or only tailored sponsor support ("limited-recourse" finance), for the project finance debt;
- Lenders rely on future cash flow for interest and debt repayment (debt service), rather than the value of the value of the sponsors balance sheet or analysis of historical financial results;

- The main security for lenders is the IPP's contracts (including the PPA) that is why the PPA and other contractual documents need to be bankable and financeable to support the non-recourse financing as highlighted in subchapter 8.4 Power Purchase Agreements for Renewables; the IPP's physical assets are likely to be worth much less than the debt if they are sold off after a default of the financing;
- The IPP project has a finite life, based on such factors as the length of the PPA, and therefore the project finance must be fully repaid by the end of this life
- Examples of Existing Blended Finance Facilities

Box 10-1 Blended Finance for De-Risking and Guarantee – Application for Commercial Financial Institutions

PT SMI offers several de-risking products such as cost-overrun mechanism, first-loss mechanism, interest subsidized loan, and innovative equity mechanism. The purpose of these facilities is mainly to de-risk investment in infrastructure and renewable projects, thus increasing the appetite of investors including financial institutions. In 2021, PT SMI acted as promotor financing for hydro power plant, PLTA Lau Gunung, with the capacity of 2x7.5 MW in North Sumatra, allowing two commercial banks to adjust the project risk lower due to de-risking aspect provided by PT SMI. **Error! Reference source not found.** below depicts the project structure of PLTA Lau Gunung.



Notes:
- PT SMI as creditor for project financing i.e., promoter financing facility
- Promoter financing in the context of capital contributions and/or loans to subsidiaries for the construction and operation of a hydro, PLTA Lau Gunung, with capacity 2x7.5 MW

Source: (PT SMI, 2021)

Appendix 10.15: Technologically Specific Mid-tariffs

The financial model of subchapter 8.6 inputs power purchase tariffs as per the technologically specific mid-tariff stated in the Perpres No. 112/2022 on Accelerating Development of Renewable Power Supply, with applicable capacities and tariffs detailed below:

Technology	Capacity (MW)	Mid-tariff for the first 10 years (US$/kWh)	Mid-tariff for beyond 10 years (US$/kWh)
Geothermal	10 - 50	9.41	8.00
Bioenergy	3 - 5	10.20	8.16
Hydro	20 - 50	8.86	5.54
Solar	3 - 5	8.77	5.26
Wind	5 - 20	10.26	6.15

Appendix 10.16: Indicative formula for determination of ARR

1. The Annual Revenue Required (ARR) will be determined through the following general formula:

   $AAR^t_i = RC^t_i + DEP^t_i + OPEX^t_i$ *(which includes* WCA^t_i*)*

   ✓ AAR^t_i: Annual Revenue Required in segment “i”, in year “t”.

   ✓ RC^t_i: Return on Capital invested in RAB in segment “i”, in year “t”.

   DEP^t_i: Regulatory Depreciation in segment “i”, in year “t”.

   ✓ $OPEX^t_i$: Operating Expenditure in segment “i”, in year “t”.

   ✓ WCA^t_i: Financing Cost of Working Capital in segment “i”, in year “t”.

2. The Return on Capital (RC) in each year of the five-year period will be calculated by multiplying the net value of PLN’s Regulatory Asset Base (RAB) in the year by a rate of return, which is equal to the weighted average between the cost of equity provided by PLN and financial debt for investments (WACC principle). This rate of return will be determined by the inter-ministerial committee (or equivalent regulatory body) before each five-year period.
3. The ARR can be exercised when certain conditions are met:
   a. The cost of equity allowed is capped at 6%,
   b. At least 50% of the debt portion is at concessional rate
4. The Net Value of RAB at the end of each year will be calculated by: (i) adding to net value of RAB at the beginning of the year the new commissioned additional infrastructure (capital expenditure); and (ii) deducting from net value of RAB at the beginning of the year depreciation and written-off assets (assets no longer used for operations).
5. Given its forward-looking nature, ARR for each period should include a “claw-back” adjustment for any investments assumed in the previous period which were not actually implemented.

6. The value of RAB to be considered in each five-year period includes the investments of infrastructure completed and commissioned during the forthcoming five-year period as per the approved investment plan.
7. Assets to be incorporated to RAB must meet the following conditions:
   a. Assets will be incorporated to RAB from commissioning date.
   b. Assets will strictly correspond to investment plan approved by the Regulatory Body for the five-year period.
8. The Operating Expenditure component of ARR of each regulated activity for each five-year period will be determined through approaches that reflect efficiency in operations in all business areas. The Financing Cost of Working Capital will be determined using standard practices, considering revenue stream of the regulated activity and average financing costs in the Indonesia market.

Appendix 10.17: List of Future In-depth Studies

No	Study	Description
Technical: Future In-depth Studies		
1	In-depth studies for IFA #1	Planning for installation of Smart Grid; and Study on system planning for incorporation of VRE into the system
2	In-depth studies for IFA #3 – Hydro	Feasibility study for hydro power plants; Standardization of power purchase agreements for independent power producers hydro plants; and Capacity building for financial modeling for hydro power plants
3	In-depth studies for IFA #3 – Geothermal	Exploration drilling programs; Exploration, exploitation, and utilization approach for high enthalpy; Exploration approach for medium-high enthalpy; Exploration and utilization approach for medium-high enthalpy; Exploration approach for acidic geothermal field; and Specific topic for high enthalpy geothermal field (i.e., mineral extraction, manage reservoir, sustainability,

		bottoming, binary cycle, geological modeling development)
4	In-depth studies for IFA #3 – Bioenergy	Capacity building for financial modeling of bioenergy power plants
5	In-depth studies for IFA #4 – Wind	Capacity building for financial modeling of wind power plants Study on system planning for incorporation of VRE into the system Feasibility study for de-dieselization locations used for wind power plants
6	In-depth studies for IFA #4 – Solar	Capacity building for financial modeling of solar power plants Study on system planning for incorporation of VRE into the system Feasibility study for de-dieselization locations used for solar power plants
Policy: Future In-depth Studies		
7	Decarbonization of captive coal power	To create an integrated strategy that aligns Indonesia's off-grid industrial facilities with low-carbon alternatives, including by taking into account key policy, economic and environmental enabling conditions
8	Land-use implications and mitigation strategies for clean energy technology options	To analyze the lifecycle impact on land-use of clean energy technologies the operations of which involves environmental and social risks, including bioenergy, solar, wind and battery storage, and then to devise appropriate mitigation strategies.
9	Conceptualizing and operationalizing Just Transition Standard No. 9	To establish a robust and implementable framework for JETP Standard No. 9 in respect of both the assessment and intervention phases. This study should include assessing impact at the project, subnational and national levels.

10	Comprehensive evaluation and assessment of PLN's revenue model	JETP's ambitious targets involve significant investments requirements by PLN which could increase PLN's cost of purchased power. PLN's revenue model is therefore critical in the context of PLN's financial health. Meanwhile, adjustments to consumer electricity tariffs may be necessary to minimize state subsidies and compensation. The study should also assess appropriate policy-driven initiatives including the level and sequence of incentives and disincentives. Finally, this study would evaluate potential institutional reforms in relation to an independent regulator for the power sector.
11	Power wheeling cost	A comprehensive power wheeling study will help PLN determine the associated costs to provide power wheeling services. This would be especially appropriate to help ensure that market demand for renewable energy can be met even in areas where PLN is unable to supply them.
12	Incentives for renewable energy technology and R&D	To promote the development of new and renewable energy sources, a deeper understanding on the technical and economic feasibility of new marine- or ocean-based energy technologies is necessary. In addition, new incentive models should be explored to encourage technological advancements and investments in such cleaner energy alternatives, including "contract for difference" observed in the United Kingdom.
13	Cost-benefit analysis of tax incentives for small- and medium-scale renewable energy developers and manufacturers	Tax incentives for large-scale renewable energy investments have been provided by the MoF for several years. However, the small- and medium-scale renewable energy developers and manufacturers have yet to benefit from such incentives. A deeper study needs to be conducted to determine the cost-benefit assessment of tax incentives for smaller-scale renewable energy developers and manufacturers. This analysis will help the MoF to calculate the overall economic impact for providing such incentives.

Appendix 10.18: Preliminary List of Potential Captive Connections

Source: (Ministry of Energy and Mineral Resources, 2023)

No	Province	Sector	Capacity (MW)	Generation (GJoule)	Yearly Emission (Tons CO_2)	Total Investment (Rp Billion)
1	West Java	Petrochemicals	49	569,838	149,414	112
		Manufacturing	21	383,312	63,187	54
2	Banten	Petrochemicals	263	5,380,353	1,613,654	158
		Cement	60	1,068,649	285,489	39
3	DKI Jakarta	F&B	5	86,553	12,586	17
4	Jambi	Pulp and Paper	337	4,017,548	787,325	276
5	East Java	F&B	30	677,187	110,812	72
		Manufacturing	2,4	23,947	3,779	17
		Pulp and Paper	200	4,017,502	2,089,445	130
		Petrochemicals	17	325,944	25,984	21
6	South Kalimantan	Cement	55	1,034,996	331,512	6
7	Lampung	F&B	11	216,169	89,544	39
8	Aceh	Cement	33	357,052	178,445	144
		Petrochemicals	35	262,492	105,704	51
9	South Sulawesi	Cement	120	1,222,862	591,416	59
10	Riau	Pulp and Paper	18	16,700,356	3,827,565	8
11	North Sulawesi	Petrochemicals	18	635,682	240,001	10
Total			**1,233**	**36,980,443**	**10,505,860**	**1,214**