



Powering Prosperity and Enabling Sustainability in South East Asia

PHASE 1 REPORT

STUDY ON THE FINANCIAL IMPLICATIONS OF THE EARLY RETIREMENT OF COAL-FIRED POWER PLANTS IN INDONESIA

RFP/2022/41426

NOVEMBER 2022



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INDONESIA'S RETIREMENT PATHWAYS FOR COAL-FIRED POWER PLANTS WITH RESPECT TO THEIR FINANCIAL IMPLICATIONS

Indonesia & Coal

- In 2020, coal made up 28% of the country's total primary energy supply
- 62% of the country's electricity is generated in coal-fired power plants
- Coal has also played a major role in Indonesia's economy, being the world's top coal exporter by weight
- The mineral and coal sector alone contributed 5% of Indonesia's GDP in 2019

The study

- **The study aims analyse, evaluate, and provide suggestions on the retirement pathways for coal-fired power plants with respect to their financial implications**
- The report's primary purpose is to respond to the expectations of Phase 1 of the TORs, providing a first analysis of the pathways, policy and regulatory frameworks and its implications on PLN and in Indonesia
- Phase 1 of the project provides an overview of the policy and regulatory framework, and it shows the implications of the roadmaps, policy and financial framework of Indonesia's coal-phaseout strategy
- Phase 2 will include a deep dive on the policy, regulatory and financial framework, and through the enhanced retirement decision tool and it will select a CFPP as case study through the enhanced retirement decision tool to showcase the financing mechanisms available

Source:

Climate Transparency. (2021) Indonesia.
The Maritime Executive. (2022) Indonesia's New Partial Ban on Coal Exports Will Impact EU and Bulklers. 12 August.
EITI. (2021) New report shows Indonesia's extractive revenues in decline. 12 May

INDONESIA'S POLICY AND REGULATORY FRAMEWORK IS DEFINED BY KEY INITIATIVES

Document/Initiatives

1. Government Regulation 79/2014 on National Energy Policy (KEN)
2. Presidential Regulation 22/2017 on National General Energy Plan (RUEN)
3. Presidential Regulation 98/2021 on the Carbon Pricing
4. Presidential Regulation 112/2022 on Acceleration of RE Development for Electricity Supply
5. Nationally Determined Contribution (NDC)*
6. Long-Term Strategy for Low Carbon and Climate Resilience (LTS-LCCR) 2050
7. Electricity Business Plan (RUPTL) 2021-2030
8. An Energy Sector Roadmap to Net Zero Emissions in Indonesia
9. Coal Phase-Out Plan 2060, MEMR
10. Energy Transition Mechanism (ETM), Asian Development Bank (ADB)
11. Energy Transition Mechanism (ETM), Indonesia Investment Authority (INA)

* NDC in the report refers to "Updated NDC". Indonesia has updated it with "Enhanced NDC" which brings new emissions reduction targets

INDONESIA'S POLICY AND REGULATORY FRAMEWORK STILL HAS SOME AREAS OF OPPORTUNITY

Gaps and Limitations

1. With the ambitious goals in achieving the NZE target, **the government is yet to put the energy transition roadmap, including the coal phase-out plan, into regulations.***
2. Many studies regarding the NZE roadmap, specifically in the electricity sector, have been performed. With many pathways presented, the government needs to assess and eventually determine the **pathway to be taken for transitioning the country's energy landscape**—this will include alternatives for replacing the early retired CFPPs.
3. Looking into the power system landscape, renewable energy resources and centers of electricity demand are not conveniently co-located in Indonesia.¹ With growing calls for energy transition toward NZE, this becomes a significant challenge and improvements in the power system landscape are undoubtedly required. In this case, **assessment concerning security in electricity sector** (e.g. grid stability, flexibility, supply & demand, interconnectivity) should be performed by the government.
4. While Presidential Reg. 98/2021 on Carbon Pricing has been set out, **derivative regulations on carbon pricing mechanisms have not yet been in place**. Accordingly, there is currently no guide to implement carbon pricing mechanisms to support the energy transition in Indonesia.
5. The government has appointed PT SMI as the fund manager of the ETM Country Platform. Considering the financing framework for accelerating energy transition are relatively new, the government needs to set up **regulations concerning instruments that can be applied to support the CFPPs' early retirement**.

* CFPP retirement issue has been stipulated in Presidential Regulation 112/2022

THE PROJECT FOLLOWS THE EARLY RETIREMENT ROADMAP DEFINED BY THE INDONESIAN GOVERNMENT

By Presidential Regulation the only new CFPPs to be installed after 2021 will be the ones defined in the RUPTL, the pipeline includes the installation of 11 GW from 2021 to 2025 and 3 GW from 2026 to 2030 [2]

The project follows the **early retirement roadmap defined by the MEMR** during the COP26 [1], where three milestones were established:

1. The share of RE will reach 23% of utilization in the energy mix by 2025, mainly supported by the deployment of solar PV;
2. CFPPs' retirement from 2031 to 2035 will be backed an upscale of RE until reaching a participation of 57% in the energy mix. This would result in the reduction of coal-fired generation to 39% in the energy mix;
3. CFPPs' retirement from 2036 to 2040 will be backed by an upscale of RE reaching a participation of 66% in the energy mix. Coal-fired generation would reduce to 30% in power generation.

Each milestone of the early retirement roadmap would represent the displacement of coal-fired generation and the retirement of installed capacity

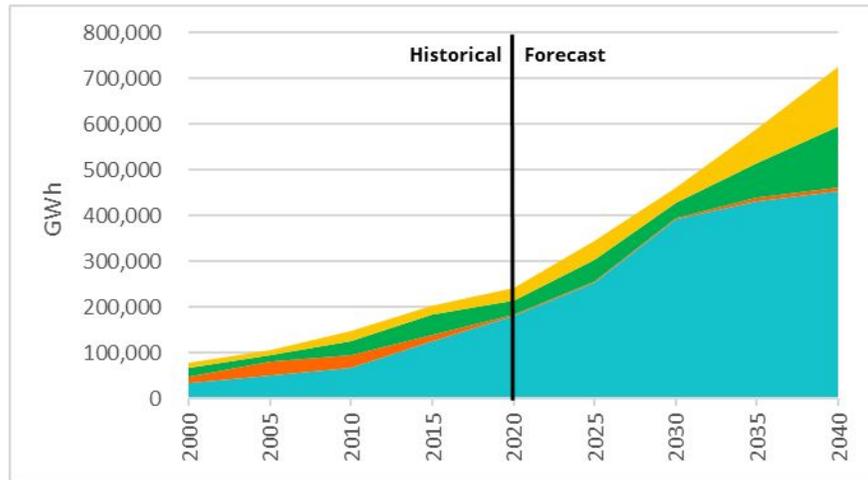
Milestone	Start Year	End Year	CFPP Generation to be displaced (GWh)	Estimated Capacity (GW)
1	2030	2035	89,332	15-25
2	2035	2040	12,185	1-5

Source: [1] Ministry of Energy and Mineral Resources (2021, Nov 2) Speaking at COP26, Energy Minister Gives Indonesia's Commitment to Net Zero Emission. Head of Bureau of Communication, Public Information Services, and Cooperation. From: <https://www.esdm.go.id/en/media-center/news-archives/speaking-at-cop26-energy-minister-gives-indonesias-commitment-to-net-zero-emission>.

[2] PT Perusahaan Listrik Negara (PLN) (Persero) (2021) RUPTL 2021-2030.

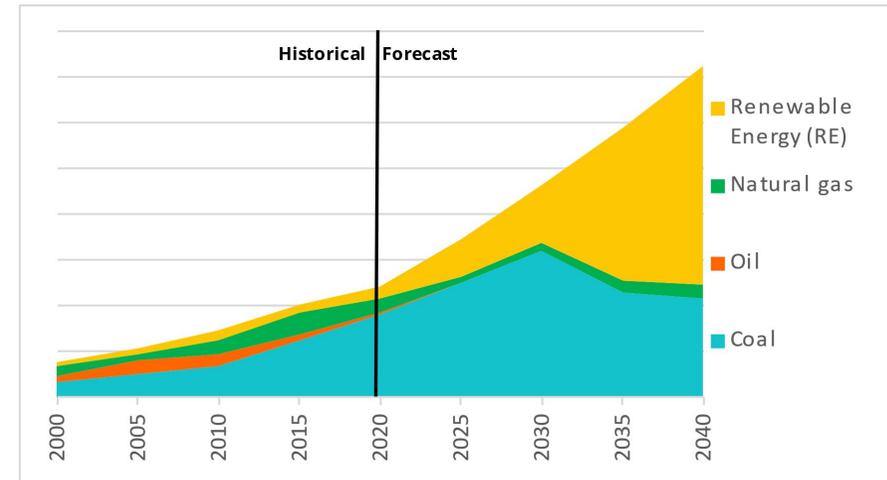
INDONESIA'S POWER GENERATION HAS BEEN FORECASTED TO COMPARE THE IMPACT OF FOLLOWING THE ROADMAP

Business-as-Usual (BAU) Scenario



- Coal-fired generation peaks in 2030 and then declines to reach 62% by 2040;
- Oil reaches 1% by 2025 and then remains constant until 2040;
- Natural gas-fired generation increases to 19% by 2040;
- RE power generation share reaches 18% by 2040;
- Natural gas and RE share in power generation will dip in 2030 due to the new CFPPs coming online.

Coal Retirement Roadmap (CRR) Scenario



- CFPPs retired early, and replaced by RE, primarily dominated by solar, hydro, geothermal and bioenergy
- Oil based generation will decrease until full retirement in 2025
- Natural gas generation share in the electricity generation will remain the same until 2040

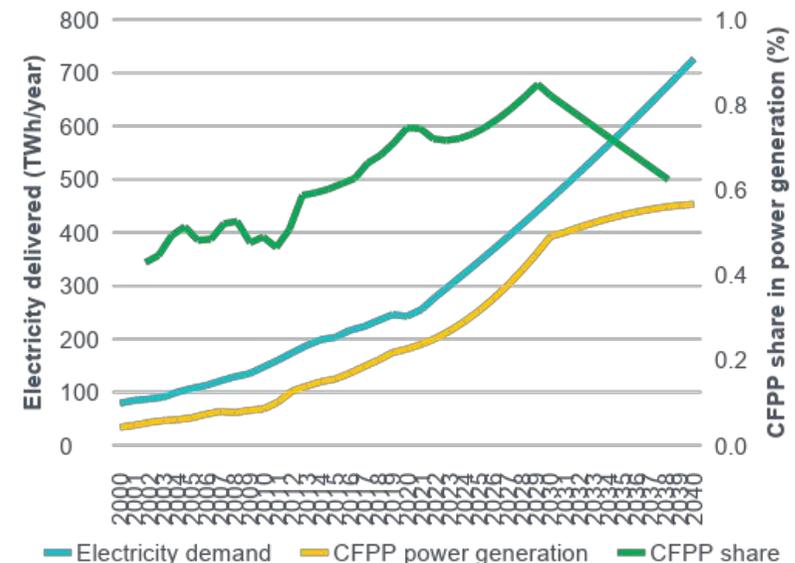
INDONESIA'S POWER GENERATION BASELINE HAS BEEN PROFILED BASED ON HISTORICAL DATA AND EMISSION'S TARGETS

Methodology

- Established historical period for selected variables
- Base year: 2021. Time horizon: 2040.
- Electricity demand projected yearly according NZE's BaU.
- Power sector emissions established yearly (2019-2030)
- CFPP share in power generation peaking in 2030 at 84.8% with total emissions from the power sector equivalent to 349 MtCO₂e .
- CFPP power generation following emissions trend until 2030 and declining linearly from there.
- CFPP coal demand established according power generation.
- Sectoral demand established by function of the total demand.
- Electricity tariff established as the difference between BPP and electricity subsidies.

Electricity demand business-as-usual (BAU) projection

- BAU assumes that demand will continue to grow following historical trends, and CFPP share in power mix will peak in 2030 when all CFPPs in PLN's are in operation.
- GHG emissions from the power sector will go from 224 MtCO₂e in 2019 up to 349 MtCO₂e in 2030, as it has been estimated.
- National electricity demand of about 720 TWh in 2040;



INDONESIA'S STATE AND FISCAL CONDITION

Electricity subsidies

- Electricity subsidies in the range of 2.7 - 3.7 billion USD/year up to 2040;
- Subsidy rate remaining stable around 5.2 USD/MWh up to 2040;
- BPP rate relatively stable between 2030 and 2040 around 62 USD/MWh.

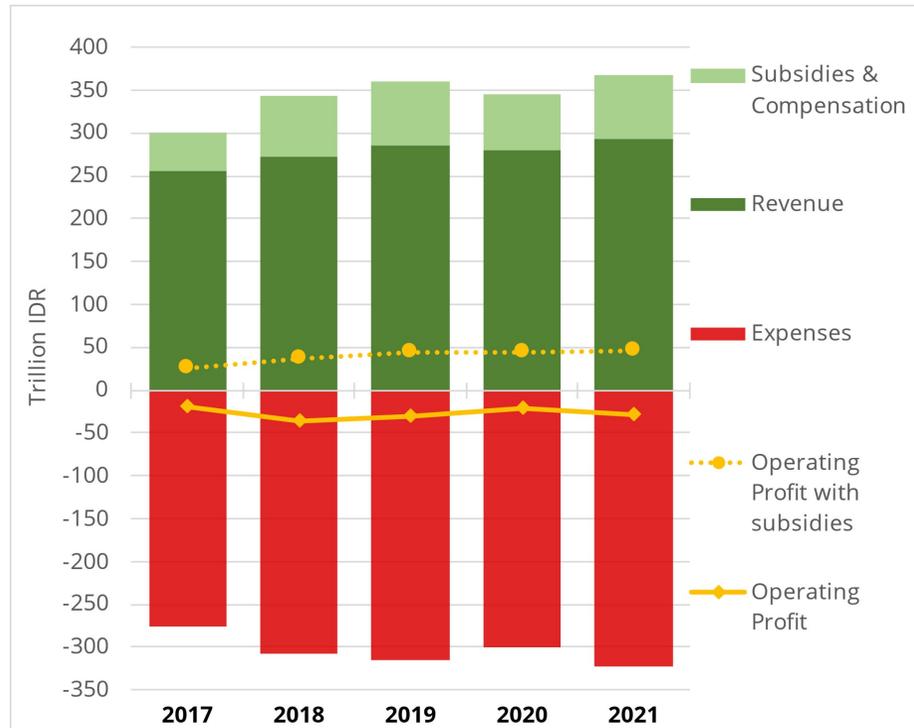


Fiscal risks of implementing CRR

- Decrease in government revenue due to:
 - Decrease in corporate and income taxes: collected from the retired CFPPs
 - Non-tax revenue
 - Decrease of individual income tax from former CFPP employees
- Increase in government spending due to:
 - Increase of financial compensation or societal subsidies due to the increased unemployment
 - Increase of electricity subsidies to be paid to compensate an increase in energy costs coming from renewable sources

PLN HAS BEEN EFFICIENT WHEN PROVIDING A PUBLIC SERVICE BUT INEFFICIENT TO RECOVER ITS COSTS

PLN's historical operating revenues, operating expenses, and profit



Revenue

- PLN's 2021 total income considering operating revenue has increased 7% from 2020
- In 2021, electricity sales composed 98% of PLN's annual revenue and increased 5% from 2020
- Electricity sales could increase around 118% by 2040, if tariffs change following historical trends
- If tariffs remained constant since 2021, electricity sales could increase 185% by 2040, from to 2021

Expenses

- In 2021, PLN's total expenses represented Rp 323,119 billion, which was an increase of 7% compared to 2020.
- PLN's expenses are mainly composed of fuel and lubricants (37%) and purchased electricity (32%)
- Both fuel and lubricants and purchased electricity increased from 2020, 12% and 8% respectively

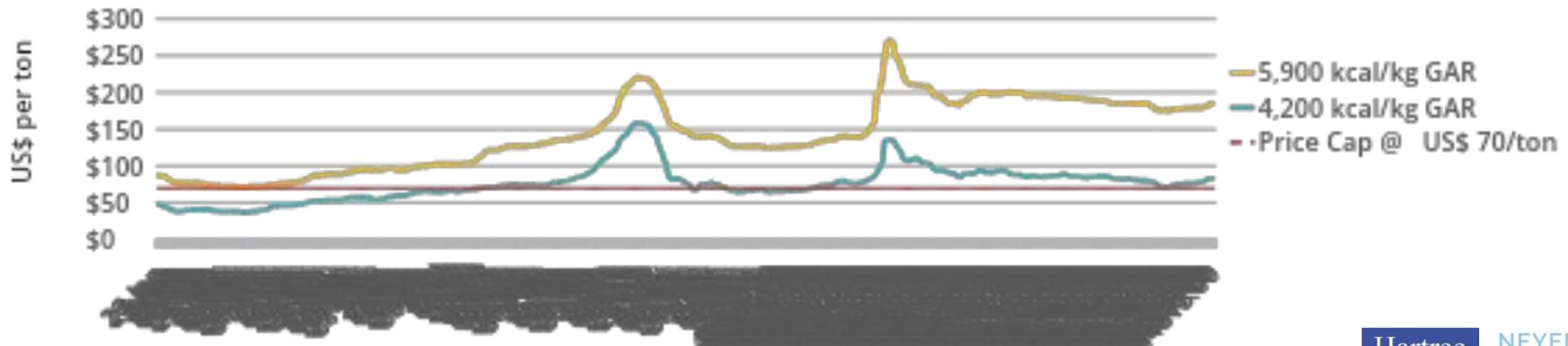
PLN BENEFITS FROM DIRECT AND INDIRECT SUBSIDIES THAT ALLOWS IT TO HAVE A STABLE STREAM

Direct subsidies

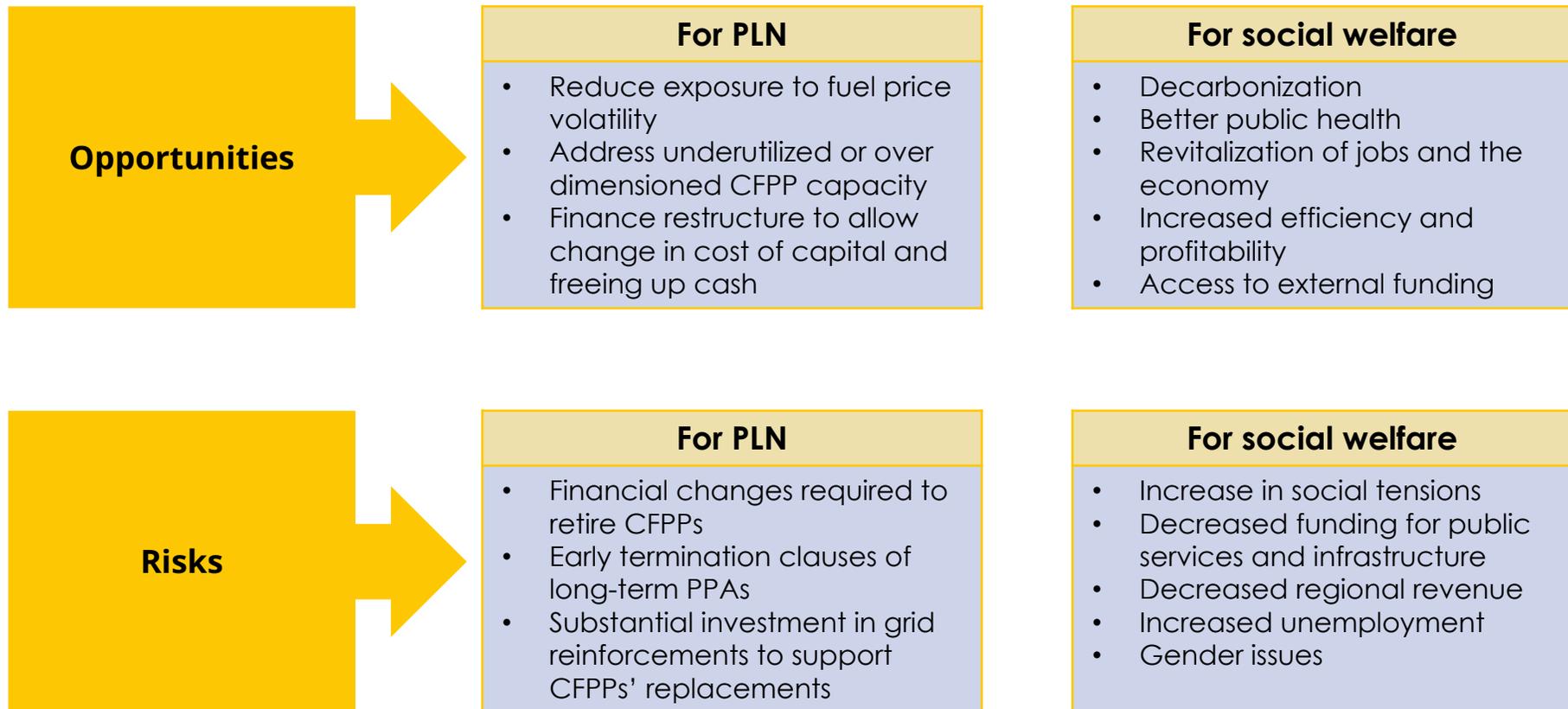
- Governmental subsidies on tariffs and compensations from the government make up 21% of the company's total income
- Based on historical tendencies, government subsidies and compensation could increase 135% by 2040, from 2021, and represent between 25-33% of total income by 2040
- In 2021, direct subsidies and government compensations accounted for US\$ 4.7 bn

Indirect subsidies

- Coal price for power plants is capped at US \$70 per ton of coal 4,200-4,500 kcal/kg
- The price cap protects PLN's financial solvency by reducing price volatility, which in turn benefits the Indonesian electricity consumers.
- In 2021, for example, for example, we estimate the cap represented around US\$ 1.2 bn, which would represent a 5% additional cost for PLN.
- The domestic market obligation (DMO) required miners to sell 25% of the production nationally and at the price cap., but as market prices rise some miners prefer to pay the fines for not complying and export the coal.



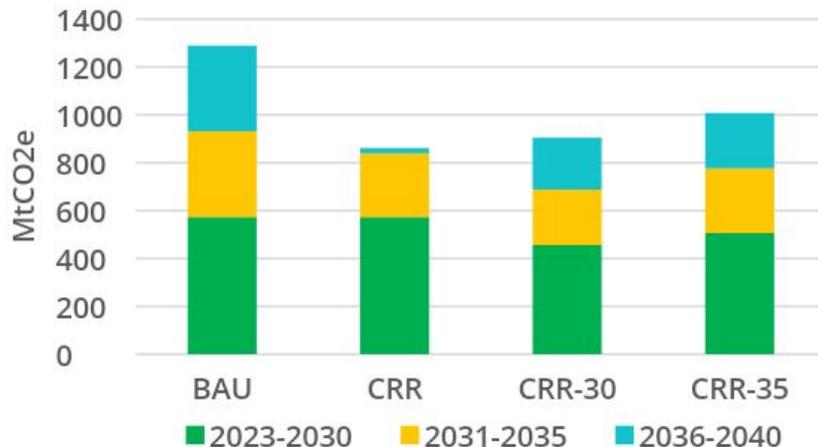
THE EARLY RETIREMENT ROADMAP CAN OFFER BOTH OPPORTUNITIES AND RISKS FOR PLN AND SOCIETY



EARLY RETIREMENT FOR CFPP HAS A SIGNIFICANT POTENTIAL TO REDUCE CO₂ EMISSIONS

Potential GHG emission reductions

- CRR roadmap annual emissions could be reduced 33% (427 MtCO₂e), compared to BAU
- To compare the impact of the CRR scenario in the GHG emissions' reduction, four retirement scenarios were defined:
 - Business-as-usual (BAU)
 - Coal Retirement Roadmap (CRR)
 - CRR 30-year lifespan (CRR-30)
 - CRR 35-year lifespan (CRR-35)



Monetization of potential emissions reduced

Carbon Tax (CT)

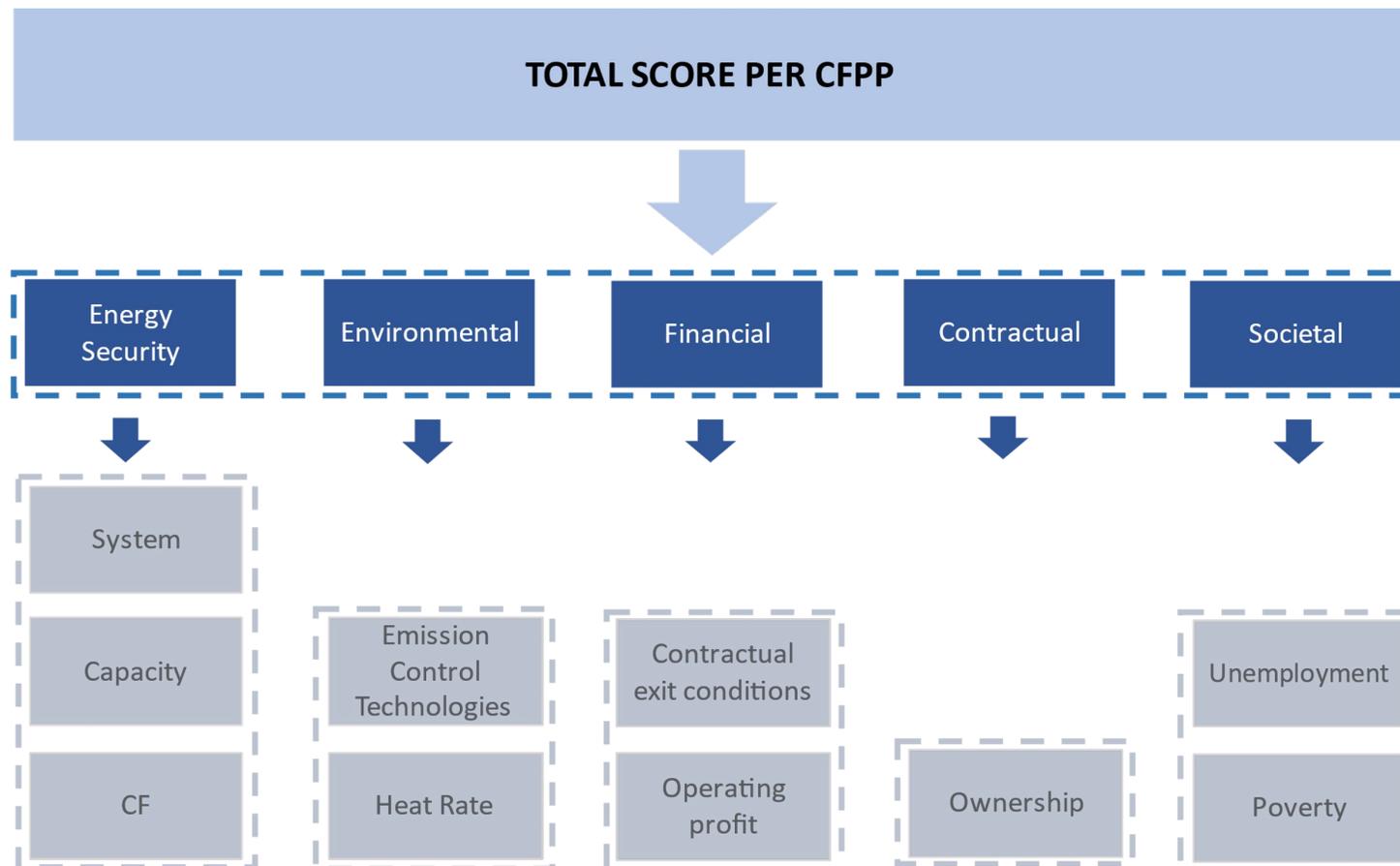
- The CT will be implemented only for CFPPs with over 100MW of installed capacity. It is estimated that the levy will start at 30 IDR/kgCO₂e^[1]
- Implementing the roadmap could represent a 26% reduction in CT collection if CT were to be indexed to inflation, and a 22% reduction in tax collection if CT stayed flat.

Offsetting Revenue

- For a project to be credited by any of the international standards, it must demonstrate permanent GHG emission reductions
- The government could also prioritize the development carbon offset projects generation based on permanent carbon removal e.g., biochar

A CFPP EARLY RETIREMENT DECISION FRAMEWORK IS PROPOSED TO SUPPORT THE RETIREMENT DECISION MAKING PROCESS

A CFPP retirement decision framework is tentatively proposed to balance energy security, environmental, financial, and societal considerations.



EACH CRITERIA WITHIN THE EARLY RETIREMENT DECISION FRAMEWORK HAS ITS CONSIDERATIONS TO PRIORITIZE THE RETIREMENT

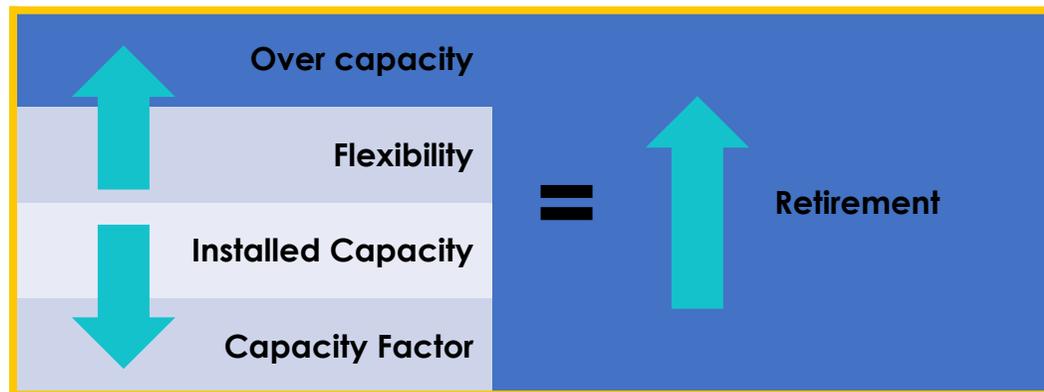
Energy Security

The energy security aspect was assessed to look at how the CFPP's early retirement could affect the grid's security of energy supply.

A high score suggests that the CFPP will have a lesser impact on the grid's security relatively.

The energy security score was assessed based on parameters as follows:

- System
 - Overcapacity
 - System's flexibility
- Capacity of CFPP
- Capacity Factor (CF)



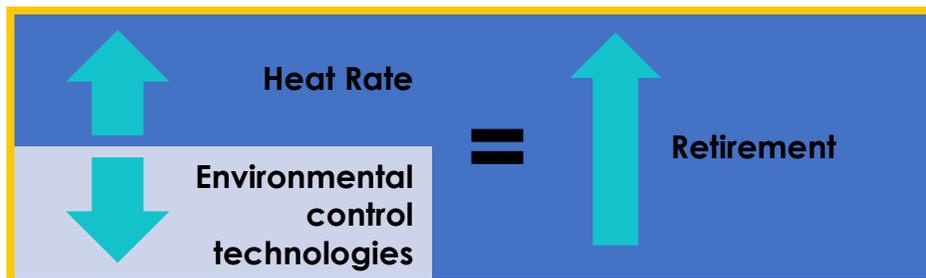
EACH CRITERIA WITHIN THE EARLY RETIREMENT DECISION FRAMEWORK HAS ITS OWN SCORING SYSTEM

Environmental

Shall be examined through the emission of PM and harmful gases, measured through energy efficiency and the utilization of environmental control technologies.

- Heat Rate
 - Energy used by a power plant to generate one kWh of electricity

- Environmental control technologies
 - Amount of environmental control technologies the CFPP has from a portfolio of technologies that will be defined as this study develops.



Financial

Examines the financial cost of closing a CFPP before its natural closure.

- Operating Profit
 - Operating profit only considers operating expenses i.e., fuel and labour and revenue from electricity
 - This criteria evaluates how financially efficient is the power plant

- Contractual exit conditions
 - Termination conditions are usually dependent on the years of contract remaining
 - Exit conditions are pricey since capacity payments are paid in advance, so it must be considered when analysing the retirement
 - The cost of early termination conditions will be added to the COGS score



EACH CRITERIA WITHIN THE EARLY RETIREMENT DECISION FRAMEWORK HAS ITS OWN SCORING SYSTEM

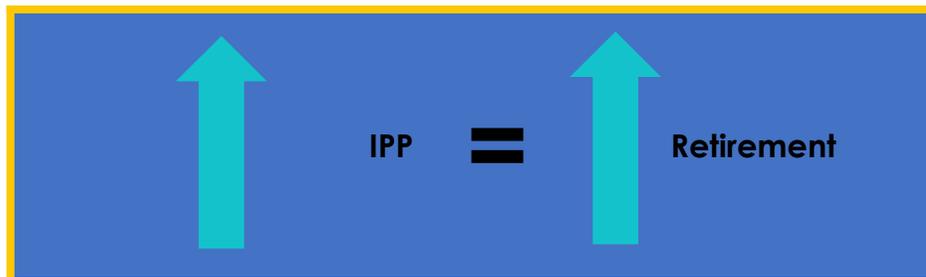
Contractual

Contractual aspect was assessed by assuming that a clear contractual framework will ease the early retirement program evaluating the asset and penalties.

PLN would benefit from ending long term PPAs as most of them have high-capacity factor obligations which forces the curtailment of other types of generation.

PLN would benefit from paying capacity in advance when assessing early termination of PPAs as they can access discounts during the negotiation.

The aspect was assessed by looking at the CFPP ownership—IPP or PLN/its subsidiaries.



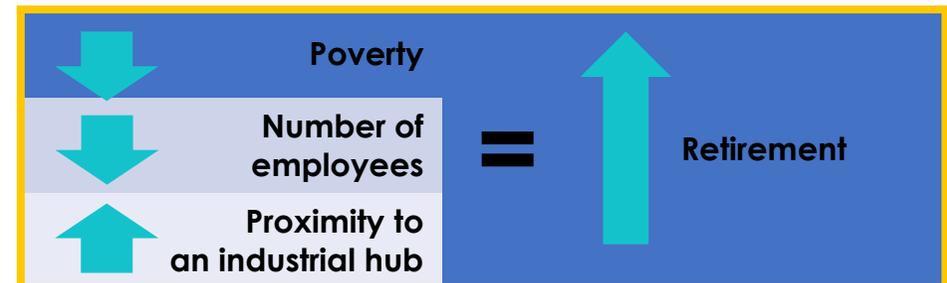
Societal

Evaluates the social vulnerability around the retirement of a CFPP

- Poverty rate
 - Assesses how much the closure of the CFPP can accentuate local poverty rates

- Number of employees
 - Unemployed workers resultant from the power plant closure.

- Proximity to an industrial hub
 - Presents opportunities to workers whose jobs are lost in the early retirement. Thus, the negative impacts on employment can be offset.



A VARIETY OF COAL TRANSITION INSTRUMENTS AND MECHANISMS ARE EMERGING BY PUBLIC AND PRIVATE SECTOR ENTITIES

Existing financial instruments

- Just Transition Transaction (JTT)
- The Energy Transition Mechanism (ETM)
- Germany's Act to Reduce and End Coal-Fired Power Generation (Coal Phase-Out Act)
- The EU Just Transition Mechanism (JTM)
- The CIF's Accelerating Coal Transition (ACT) Investment Program
- Coal Asset Transition Accelerator (CATA) of the European Climate Foundation
- Engie Energía Chile

Finance mechanisms

The financial mechanisms to be used must consider a risk mitigating approach and ensure alignment with the economic, social, and environmental plans and national priorities

- Refinancing to address long-term contractual obligations
- Investment vehicles
- Compensation
- Indirect financial support

THE EXPERIENCE OF OTHER COUNTRIES THAT HAVE STARTED THE RETIREMENT HAS BEEN STUDIED TO LEARN FROM THEIR EXPERIENCE

South Africa and China were chosen for international case studies due to similarities in their dependence on coal and clear commitment to phase out CFPPs

	Indonesia	South Africa	China
Share of coal in total energy supply (%) (2019)	28.5%	72.2%	61.1%
Share of coal in electricity generation (%) (2020)	62.8%	87.7%	64.1%

South Africa (SA)

- Difference in energy security, Indonesia has overcapacity whilst SA experiences an energy crisis
- Increased coal exports to Europe have increased with coal-phase out
- Just Energy Transition Partnership operating in SA
- Increased social tensions

China

- Contrary to Indonesia, China’s retirement plan still allows the construction of new CFPPs
- A methodology for determining which CFPPs to retire has been developed, yet its implementation
- Government control creating an attractive environment for continued coal-fired power generation

THANK YOU!

INDONESIA POLICY AND REGULATORY FRAMEWORK

Document/Initiatives	Summary
Government Regulation 79/2014 on National Energy Policy (KEN)	Set out the ambition to transform the primary energy supply mix by 2025 and 2050.
Presidential Regulation 22/2017 on National General Energy Plan (RUEN)	Set out the energy management plan which constitutes the application and implementation of energy policy across sectors to achieve KEN's targets.
Presidential Regulation 98/2021 on the Carbon Pricing	One of the critical legal bases for the implementation of carbon pricing instruments in Indonesia. The regulation introduces certain mechanisms to implement carbon pricing.
Presidential Regulation 112/2022 on Acceleration of RE Development for Electricity Supply	This regulation was issued with the aim of increasing investment and accelerating the achievement of renewable energy mix targets in the national energy mix in accordance with the National Energy Policy (KEN) and reducing greenhouse gas emissions.
Nationally Determined Contribution (NDC)*	Indonesia has committed to reducing unconditionally 29% of its GHG emissions against the business-as-usual (BAU) scenario by the year 2030 (base year 2010). Indonesia could increase its contribution up to a 41% reduction of emissions by 2030, subject to the availability of international support for finance, technology transfer and development and capacity building.

* NDC in the report refers to "Updated NDC". Indonesia has updated it with "Enhanced NDC" which brings new emissions reduction targets

INDONESIA POLICY AND REGULATORY FRAMEWORK

Document/Initiatives	Summary
Long-Term Strategy for Low Carbon and Climate Resilience (LTS-LCCR) 2050	<p>The LTS-LCCR 2050 provides long-term national policy direction on climate change, with the pathway scenario based on the best available science as follows:</p> <ul style="list-style-type: none"> • CPOS (extended unconditional commitment of NDC/current policy scenario): coal will make up almost half of the total primary energy supply • TRNS (transition scenario): coal will make up about 40% of the total primary energy supply • LCCP (low carbon scenario compatible with the Paris Agreement target): coal will make up about a third of the total primary energy supply
Electricity Business Plan (RUPTL) 2021-2030	<p>RUPTL is a guideline document for the development of an optimal electric power system in PLN's business areas for the ten years. The latest RUPTL (2021-2030) set a planned coal capacity target of 44.8 GW for 2030, down by 20% from the target set by RUPTL 2019-2028 for 2028 (56 GW).</p>
An Energy Sector Roadmap to Net Zero Emissions in Indonesia	<p>A pathway devised by MEMR and the IEA to reach net-zero emissions by 2060. Several mitigations have been identified: development of renewable energy with a focus on solar, hydro, and geothermal energy; gradual phase down of coal-fired power plants; use of low-emission technologies such as super grid to improve connectivity and CCS/CCUS; etc.</p>

INDONESIA POLICY AND REGULATORY FRAMEWORK

Document/Initiatives	Summary
Coal Phase-Out Plan 2060, MEMR	Coal phase-out plan for 2060, with coal entirely phased out by 2057. Although the natural and accelerated retirements of coal are both expected to be completed by 2057, the accelerated retirement sees earlier drops in CFPP capacities.
Energy Transition Mechanism (ETM), Asian Development Bank (ADB)	Public and private investments will finance country-specific ETM funds to retire coal power assets on an earlier schedule than if they remained with their current owners. A separate fund will also be utilized to invest in the development of clean energy facilities to potentially replace retired CFPPs.
Energy Transition Mechanism (ETM), Indonesia Investment Authority (INA)	INA will participate in ETM by establishing a 51%:49% Joint Venture company (JVCO) with New Equity Partners. INA has identified 3 CFPPs to participate in Phase 1 of ETM. The CFPPs were shortlisted based on size, age of CFPP, technology, and tariff structures.

INDONESIA'S BASELINE PROFILING

Assumptions

- Historical period of electricity demand: 2000-2021
- Electricity demand scenario in line with the BaU of NZE proposal 2025-2060
- CFPP average coal demand: 558.29 ton/GWh
- Average CFPP's plant factor: 56.07% (2011-2021)
- CFPP share in power generation peaking in 2030 at 84.8% with total emissions from the power sector equivalent to 349 MtCO_{2e}
- Electricity tariff assumed constant (2022-2040): Household (64.53 USD/TWh), Industry (70.83 USD/TWh), Commercial (85.83 USD/TWh)
- BPP (total cost of electricity delivered) correlated with projected CFPP coal demand

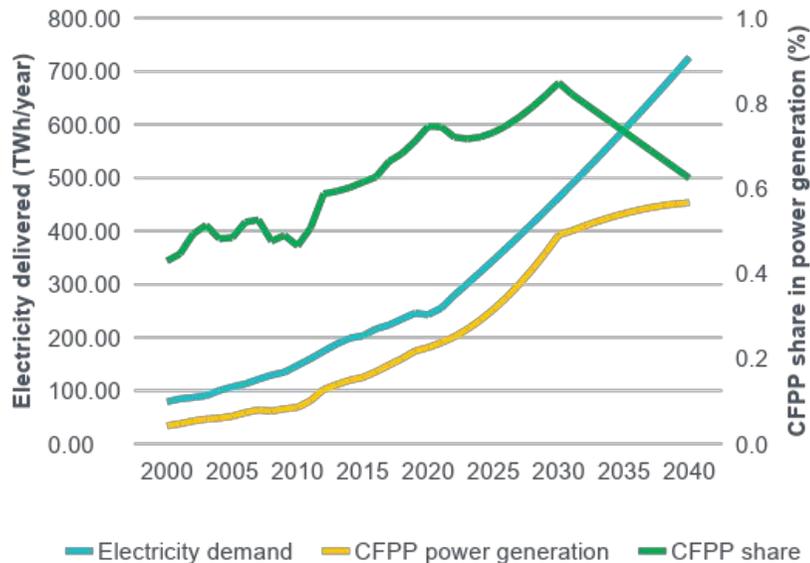
Methodology

- Established historical (2001-2021) period for selected variables
- Base year: 202, Time horizon: 2040.
- Electricity demand projected yearly according NZE's BaU.
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- CFPP power generation following emissions trend until 2030 and declining linearly from there
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INDONESIA'S BASELINE PROFILING

Electricity demand projection

- Electricity demand of about 720 TWh in 2040;
- CFPP share in power generation peaking in 2030;
- GHG emissions from the power sector ranging from 224 MtCO₂e in 2019 up to 349 MtCO₂e in 2030.



Electricity subsidies

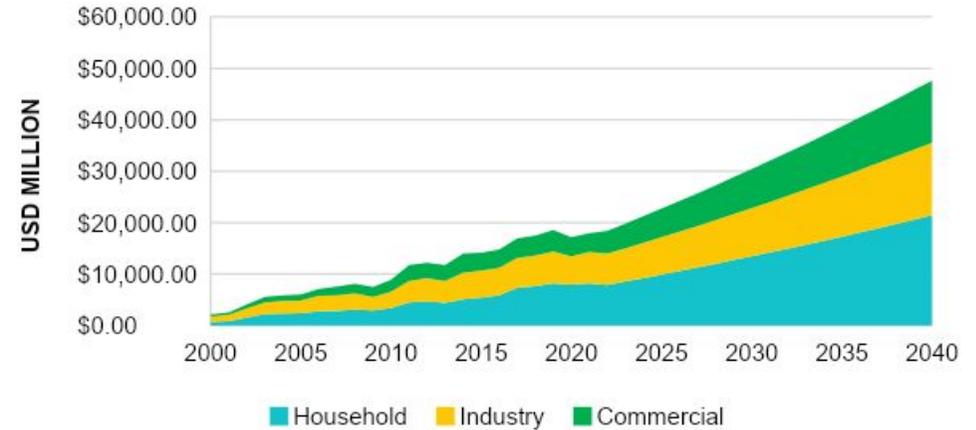
- Electricity subsidies in the range of 2.7 - 3.7 billion USD/year up to 2040;
- Subsidy rate remaining stable around 5.2 USD/MWh up to 2040;
- BPP rate relatively stable between 2030 and 2040 around 62 USD/MWh.



INDONESIA'S FISCAL CONDITIONS

Electricity revenues in the baseline scenario

- Government revenues fed by electricity tariffs of three major sectors in the demand side



Share of CFPPs associated revenues and expenditures in the national budget

- Regular increasing tendency maintained for both, government revenues and expenditures
- Government revenues and expenditures in the power sector being less than 1% of the total government and revenues

