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Original research article

# To reform or not reform? Competing energy transition perspectives on Indonesia's monopoly electricity supplier Perusahaan Listrik Negara (PLN)

Indri Dwi Apriliyanti<sup>a,\*</sup>, Diwangkara Bagus Nugraha<sup>b,c</sup>, Stein Kristiansen<sup>b,c,d</sup>, Indra Overland<sup>d</sup>

<sup>a</sup> Faculty of Social and Political Sciences, Universitas Gadjah Mada, Indonesia

<sup>b</sup> Department of Economics and Finance, School of Business and Law, University of Agder, Norway

<sup>c</sup> Faculty of Economic and Business, Universitas Gadjah Mada, Indonesia

<sup>d</sup> Centre for Energy Research, Norwegian Institute of International Affairs (NUPI), Norway

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## ABSTRACT

This paper maps the opposing rationales for reforming or not reforming the giant monopoly electricity provider in the world's fourth most populous country. Indonesia's state-owned power company, Perusahaan Listrik Negara (PLN), distributes electricity to 98 % of the country's households. Only 13 % of the company's power generation is from renewable sources, while 60 % is from coal-fired power plants. PLN is sometimes cast as the main obstacle to the energy transition in Indonesia, which has a more carbon-intensive electricity sector than both China and India. How PLN evolves is therefore important for global climate mitigation. Based on document analysis and rare interviews with the high-level policymakers who govern PLN, we find that keeping consumer prices low and maintaining security of supply are the utility's dominant concerns. Indirect costs, negative environmental externalities and alternative business opportunities in renewable energy are rarely taken into consideration. This is due to entrenched elite interests and what is referred to in the theoretical literature as 'collective conservatism'. Three measures that could change PLN's approach to decarbonisation are: redirecting government financial support, introducing more stringent carbon pricing regulations and leveraging growing private business interest in renewable energy to change the framework within which PLN operates.

## 1. Introduction

Learning curves have rendered renewable energy competitive with coal in many parts of the world, even without taking the externalities of coal into consideration. With high fossil-fuel prices in international markets, new solar and wind projects can even undercut the operating costs of *existing* plants powered by non-renewables in some locations [1]. However, in some countries, renewables are still not the preferred option. Indonesia is one such country.

Indonesia is one of the world's fastest growing economies, resulting in annual electricity demand growth of around 5 % [2]. The country is also the world's third largest coal producer and largest coal exporter [3]. This has impacts on employment, export earnings and central and local government revenues. Dependence on coal revenues provides motives to delay coal phase-out [4]. Coal's share of the national electricity mix is currently around 60 % and growing. By contrast, solar and wind contribute <1 % of total electricity generation [5]. As a result, the Indonesian electricity sector is currently among the world's most carbon

intensive [6]. Moreover, the country plans to build additional coal-fired power plants with a combined capacity of 13 gigawatts (GW) by 2030, bringing total coal-fired installed capacity to 44 GW [2,7].

Indonesia is known for elite collusion and enrichment [8], as well as for a weak regulatory and energy-transition environment [9,10]. For example, it has not introduced any substantial charges for energy-related pollution. Taking into account available technologies and the country's natural resources, Indonesia has the opportunity to significantly transform its electricity system [11]. While green financing is increasingly available internationally, it is held back in Indonesia by barriers to investment [11]. The monopoly electricity market and its complex and changing pricing regulations render investment in renewables risky and unattractive [12]. Sekarintias et al. [13] conclude that the main energy transition barriers in Indonesia are conflicting interests and inconsistent regulations, while Resosudarmo et al. [14] emphasise the lack of capital and knowledge, along with poor institutional quality.

Indonesia's power system is structured as a vertically integrated

\* Corresponding author.

E-mail address: [indri\\_mkp@ugm.ac.id](mailto:indri_mkp@ugm.ac.id) (I.D. Apriliyanti).

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market, similar to many systems in East Asia, the Pacific and Sub-Saharan Africa [15]. The state-owned monopoly, Perusahaan Listrik Negara (PLN), plays a central role, owning and operating the transmission and distribution networks and serving as the sole distributor of electricity to Indonesia's population of 275 million. PLN is 100 % state-owned, in contrast to neighbouring Malaysia, where private entities are allowed to hold portions of Tenaga Nasional Berhad, the country's sole utility company [16]. Malaysia also separates the system-operator and market-regulator roles into independent institutions, Tenaga Nasional Berhad and Suruhanjaya Tenaga [16]. By contrast, PLN fulfils both roles in the Indonesian context.

Unlike fully deregulated electricity markets, where multiple players can enter the generation, transmission and distribution sectors, private companies in Indonesia are only allowed to participate in generation. While this reduces PLN's dominance in power generation, PLN remains the sole off-taker. In addition, renewable electricity in Indonesia must compete with coal-fired power plants, which are mostly owned by PLN and have low costs due to over-expansion and indirect subsidies.

Given its monopoly status and exclusive role as off-taker, PLN's ability to change is crucial for the greening of Indonesia's carbon-intensive power system, as well as an important part of the puzzle of global electricity decarbonisation. The state-owned company has been accused – rightly or wrongly – of inefficiency [17], non-transparency [18], dependence on the government budget [12], vested interests [19] and arrogance and insensitivity about its monopoly position [20]. However, there is not much use focusing eventual blame on PLN, as the company does not exist in a vacuum but is steered by several political bodies.

Previous research on the energy transition in Indonesia has focused on the need for privatisation and more market-based energy policies [12,21], as well as on the dominant role of pro-coal business and politics [7,20]. Existing studies on the energy transition have not thoroughly examined the power, authority and dynamics among the various actors that influence a monopoly electricity company's business environment and ability to transition [22,23]. This examination is particularly needed in the Global South, where the current understanding is often dominated by Western perspectives [24,25]. Power relations in the Global South typically involve unique dynamics and more intricate relationships among influential stakeholders compared to the situation in Western countries [26]. To fill this gap, our study combines document analysis and in-depth interviews to delve deeply into the underlying goals governing PLN's development and assess the influence of key government institutions on the company.

An important premise for our study is that, while PLN is often considered a reform bottleneck in its own right, its decisions are shaped by government bodies such as the Ministry of Energy and Mineral Resources (MEMR), Ministry of Finance (MOF) and Ministry of State-owned Enterprise (MSOE) [13]. Political statements by the president and other members of the political elite also exert significant influence on the behaviour of PLN [27]. It is therefore politically complex to change the monopoly status of PLN, at least in the short run. A change in the regulations and guiding principles of PLN's work is more likely, which could potentially be brought about by enhanced public awareness and growing elite interest in the energy transition.

We centre our discussion on the institutional context, policy framework and stakeholder dynamics within which PLN operates, as well as the interplay among the multiple rationales that dominate Indonesia's energy-policy debates and decision-making at the national level. Our first research question is therefore: *What rationales do Indonesian decision-makers have for the development of PLN?*

Our research also seeks to identify which institutional changes and organisational initiatives could speed up the energy transition. Our second research question is therefore: *What would it take for PLN to become a more active promoter of low-carbon electricity generation?*

The context in which PLN operates is briefly described in section 2 and, based on this, the methodological approach is presented in section

3. The findings and discussion follow in sections 4 and 5. We present our conclusions and policy recommendations in section 6.

## 2. PLN and its institutional environment

Perusahaan Listrik Negara (PLN) is embedded in a complex structure of government bodies and stakeholders, each of which exerts varying degrees of influence over the planning, regulation, development and operation of the country's energy infrastructure but often has policy goals that conflict with those of the others [13,18,28]. This situation gives rise to regulatory challenges and restrictions on private sector involvement [12,29]. Indonesia's energy policy is often criticised for operating within a short time horizon, centralised planning, ignoring the depletion of fossil-fuel resources and being vulnerable to politicisation by political elites [7,12,27,30].

Domestically, PLN is widely regarded as a strong and moderately successful utility, since it offers a mostly stable electricity supply at low prices over the vast and complex geography of Indonesia – which includes >17,000 islands and spans 5,000 km from one end to the other. PLN owns and operates three quarters of the country's 75 GW of installed generation capacity. Independent power producers own the remaining share and sell their electricity to PLN. PLN is the sole operator of both transmission (high-voltage, long-distance) and distribution (low-voltage, local) networks.

According to Article 33 of the Indonesian Constitution, all vital utilities must be 'controlled' by the state. The 2009 Electricity Law instructs the government to keep a tight grip on the sector, and this strongly impacts PLN's margin for manoeuvre. The government, represented by both its executive and legislative branches, has power over PLN through regulations, supervision and allocation of funds. Commission 7 of the Parliament has the authority to enact electricity-related laws and approve state budget allocations to the electricity sector, including infrastructure development and electricity price subsidies.

PLN operates at a loss and relies on state subsidies. The retail price of electricity in Indonesia is subject to frequent political debate and is set by the Ministry of Energy and Mineral Resources (MEMR), not PLN. For example, the average tariff paid by consumers in December 2023 was around USD 0.07/kW-hour (kWh), which was below the average cost of generation, as shown in Fig. 1. This average cost of generation is normally referred to as *biaya pokok produksi* (BPP).

The government also tasks PLN with developing the national electricity infrastructure, which includes costly investment in >1 million kilometres of distribution networks. Historically, the company suffered from insufficient investment in infrastructure. Notably, in the decade from the 1998 financial crisis until 2007, PLN did not commission a single power plant.

The Indonesian government defines two types of financial support: 'subsidies' and 'compensation'. Subsidies in the context of the Indonesian power sector are state budget allocations that address the gap between PLN's production costs and the lower electricity tariffs paid by subsidised consumer groups, mainly poor households. Compensation is a state budget allocation covering the gap between PLN's production costs and tariffs paid by non-subsidised consumer groups. In practice, of course, both forms of support are subsidies.

The Ministry of State-Owned Enterprises (MSOE) controls PLN's capital expenditure and supervises its financial performance. Due to a stable national electricity tariff and skyrocketing global fossil fuel prices, government expenditure in the sector increased by 34 % from 2021 to 2022. Electricity subsidies and compensations, allocated and approved by the Ministry of Finance (MoF) and the Parliament, make up around 20 % of total national energy subsidies and 3 % of the state budget [32]. Subsidies and compensations for PLN totalled 128 trillion Indonesian Rupiah (IDR) or USD 7.86 billion in 2022, accounting for 27 % of the company's revenue that year [33].

Indonesia has the world's largest geothermal potential, as well as rich resources of hydro, bioenergy, solar and wind. The renewable energy

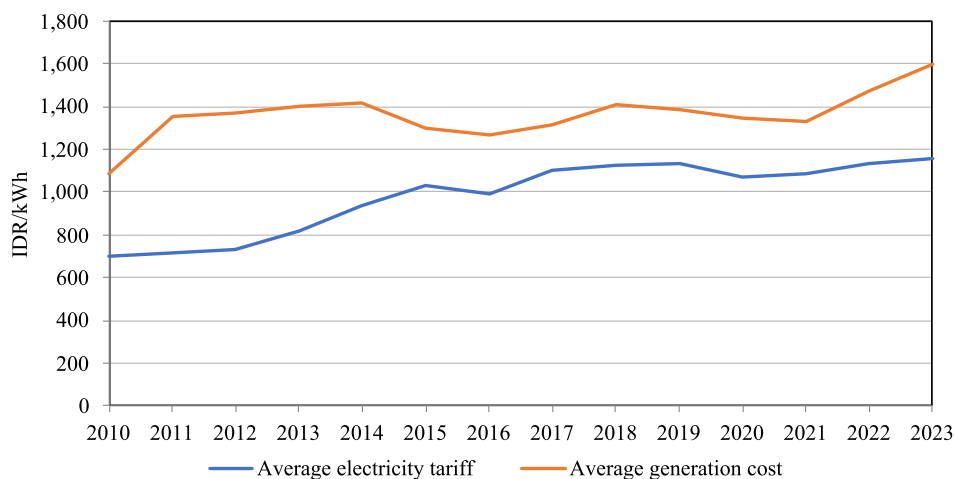


Fig. 1. Comparison between PLN's average electricity tariff and average generation cost (BPP). Source of data: PLN [31].

potential is estimated to be three hundred times greater than total installed capacity [34]. In 2017, the company established a renewable energy target of 23 % by 2025; however, there has subsequently been little progress towards this goal.

Bridle et al. [35] find that the independent power producers are the strongest supporters of policies promoting renewable energy. Independent power producers own and operate around a fourth of the country's generating capacity. Feed-in-tariffs (FITs) for independent power producers must be negotiated with PLN on an individual basis, typically in contracts with a duration of 20–30 years. Between 2021 and 2030, PLN plans to allocate 56 % of new renewable power plant construction to independent power producers [2].

According to Guild [21], there are reasons to doubt PLN's commitment to stimulating the expansion of renewable energy through FITs for independent power producers, notably because this may compete directly with PLN's own business interests. Burke et al. [11] similarly state that PLN has been hesitant to support renewables because they would compete with existing generation assets. Since renewable power plants often must be located some distance from existing transmission lines, PLN's resistance could also be explained by its responsibility for investment in transmission infrastructure.

Indonesia's energy transition is also hampered by the current gap between the levelised cost of electricity (LCOE)<sup>1</sup> from existing (mostly coal-fired) power plants and new renewables as illustrated in Fig. 2. Prices for coal used in domestic power plants are capped by the government at USD 70 per tonne (far below world market prices), creating an uneven playing field for renewable energy [11].

### 3. Methods

Transitioning from fossil fuels to renewable energy is a complex process. Since the transition is influenced by technical, economic, political, administrative and cultural factors and their co-evolution, it should be studied from an interdisciplinary and contextual perspective [25]. We adopted a two-pronged qualitative approach that combined analysis of policy documents and interviews with the hard-to-access, high-level policymakers who influence PLN's operations [37].

The aim of the document analysis was to identify the decision-making logic of key institutions as reflected in their reports, plans, programmes and regulations. We thoroughly examined the documents listed in Table 1. The analysis of regulations covered both renewable-

energy and fossil-fuel regulations, since a regulatory shift in one area can influence the other.

The analysis of annual ministerial reports mainly focused on two sections that such reports typically contain: (1) performance planning (*perencanaan kinerja*), which contains strategic plans, targets and budget allocations; and (2) performance accountability (*akuntabilitas kinerja*), which reports on the implementation of the plans. The analysis of these sections aimed to identify the ministries' priorities and possible competing interests among ministries. The analysed documents are all written in Bahasa Indonesian and are from the period between 2016 and 2023, i.e. after Indonesia ratified the Paris Agreement. The document analysis was used first to prepare the interviews and later to triangulate data collected from the interviews, which are discussed in the following paragraphs.

To obtain a deeper understanding of the thinking of key stakeholders, we conducted semi-structured interviews with high-ranking officials in PLN and relevant government bodies, including ministerial expert staff, deputies, deputy assistants and members of Parliament. Securing interviews with such actors is challenging, due to their full schedules, high social status and general inaccessibility because of security measures and non-public telephone numbers and email addresses, not to mention a reluctance by such officials to talk about political matters [38]. Consequently, little existing research is based on interviews with such actors [39]. Securing the interviews was made possible by the authors' strong networks within the Indonesian energy sector and intensive efforts to mobilise them.

Since interviewing government elites carries the risk of limited openness on their part, we assured the interviewees of confidentiality and omit references to their institutions or positions when discussing politically sensitive issues. This encouraged more candid responses.

To select the interviewees, we employed a purposive sampling technique [40]. Our first step in this process involved a thorough analysis of regulations to determine the best-placed people to interview. We prioritised stakeholders vested with regulatory authority and responsibility for formulating, overseeing and enforcing regulations in the electricity sector related to both fossil fuels and renewable energy.

Since our approach prioritised individuals who hold real decision-making authority, our sample size was necessarily small [37]. We conducted in-depth, semi-structured interviews with 27 high-ranking officials and key decision-makers from PLN and relevant government bodies, as listed in Table 1. Our selection ensured the representation of the four main groups in the energy sector: (1) PLN as the state-owned enterprise that executes government electricity policy; (2) the ministries that formulate and oversee energy-related regulations; (3) non-ministerial government agencies that develop and oversee national energy planning; and (4) Parliament, which is responsible for approving

<sup>1</sup> The average net present cost of electricity generation for a generator over its lifetime, i.e. the price at which electricity should be sold for the generator to break even at the end of its lifetime.

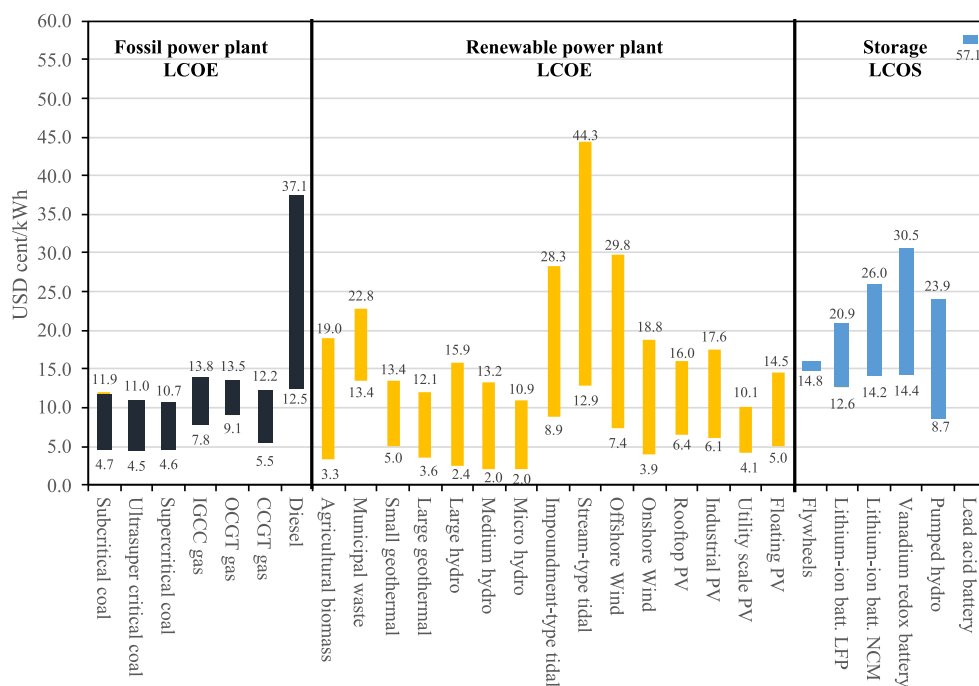


Fig. 2. Comparison between the levelised cost of electricity (LCOE) for power plants and the levelised cost of storage (LCOS) for storage facilities in Indonesia. Source: Author, modified from Bintang [36].

budgets and formulating and passing energy-related laws and policies.

In the interviews, we delved into and clarified stakeholders' viewpoints on the current state of PLN and the energy transition in Indonesia. We inquired about their vision for ideal energy-transition pathways and sought to understand which underlying rationales drive the thinking of these high-ranking officials. Since primary data collected through open-ended interview questions may be susceptible to recall bias, potentially resulting in incomplete recollections by interviewees, we engaged with diverse government stakeholders to obtain a variety of perspectives. To ensure triangulation, mitigate bias and enhance our capacity to incorporate multiple perspectives, we conducted interviews with more than one representative from each institution. We also cross-checked responses among interviewees.

The interviews typically lasted between 60 and 90 min and were recorded for subsequent transcription. Prior to the interviews, we obtained verbal consent, while assuring confidentiality and anonymity. When analysing the data, we adhered to the Gioia technique, which is derived from grounded theory [41].

## 4. Results

### 4.1. Energy-policy document analysis

Our document analysis illuminates the dynamics of government actions and priorities from 2016 to 2022. An overview of relevant regulatory changes made by the central government since 2016, is provided in Table 2.

Concern in Indonesia about the energy transition grew after the ratification of the Paris Agreement in 2016. The Indonesian government made a new long-term National Energy General Plan (Rencana Umum Energi Nasional – RUEN) to align with its Paris commitments. The plan set a target of 23 % for renewables in the electricity mix by 2025. PLN accordingly adjusted its 10-year Business Plan (Rencana Usaha Penyediaan Tenaga Listrik – RUPTL) to the new renewables target. Since 2018, the Ministry of Finance (MoF) and the Investment Coordinating Board (Badan Koordinasi Penanaman Modal – BKPM) have provided incentives in the form of tax reductions for renewable-energy projects and

a geothermal fund was established. The Ministry of Industry (MoI) established a local-content requirement for renewable-energy projects to link domestic industries with global technological progress.

Despite the growing attention to renewables, the government's priorities remain affordable and reliable electricity. In 2016, the Ministry of Energy and Mineral Resources (MEMR) created a tariff adjustment mechanism based on the currency exchange rate, the inflation rate and crude oil and coal prices. However, since 2017, the government has kept electricity tariffs below IDR 500 (USD 0.03) for 450 V-ampere (VA) connections and 1500 IDR for 2200 VA customers, despite significant changes in the above-mentioned variables that normally would have led to higher tariffs. Hence, MoF must provide USD 7.86 billion of subsidies and compensation to cover the gap between the real cost of production and the set tariffs.

In 2018, MEMR introduced a Domestic Market Obligation to secure domestic coal and gas supplies for the country's power plants at a fixed coal price of 70 USD/t and fixed gas price of 6 USD/million British Thermal Units (MMBtu). MEMR also set a new upper purchasing price for renewables from independent power producers, benchmarking it to the regional 'average cost of generation' (BPP). That regulation was revised in 2022, so that the price ceiling is now based on energy type, capacity and location, although the final price is determined through negotiations with PLN.

At the Conference of the Parties (COP) 26 in 2021, Indonesia pledged to reach net-zero emissions by 2060. In 2021, PLN also initiated the co-firing of coal-fired power plants with biomass waste, as well as a gradual replacement of diesel-fired plants with gas and renewables. In 2022, the Government issued a presidential regulation for early retirement of coal-fired power plants and the acceleration of renewable-energy projects. A moratorium was declared on new coal-fired plants owned by or supplying PLN, except for those already included in PLN's 2021–2030 electricity business plan (*Rencana Umum Penyediaan Tenaga Listrik*). Also exempted were captive power plants, which provide electricity for natural-resource value-adding industries, such as the processing of nickel ore, or those that are listed as 'National Strategic Projects' by the Coordinating Ministry of Economic Affairs. Coal's share of the electricity mix is currently planned to peak in 2030, and the last coal-fired power

**Table 1**  
List of institutions and interviewees.

Type of institution	Name of institution	Role of institution	Number of interviewees
State-owned enterprise	Perusahaan Listrik Negara (PLN)	Responsible for electricity generation, transmission and distribution.	2
Regulating ministry	Ministry of Energy and Mineral Resources (Kementerian Energi dan Sumber Daya Mineral – MEMR)	Determines electricity tariff and draft roadmap for RE and early retirement of coal power plants.	4
	Ministry of State-owned Enterprises (Kementerian Badan Usaha Milik Negara-MSOE)	Stipulates the target for PLN's performance indicator, including renewable energy utilisation and financial performance	2
	Ministry of Finance (Kementerian Keuangan – MoF)	Provides electricity subsidies and compensation to PLN, including incentives for renewable energy.	3
	Coordinating Ministry for Maritime & Investment Affairs (Kementerian Koordinator Bidang Kemaritiman dan Investasi – CMMIA)	Develops partnerships with investors to support energy transition strategies.	3
	Ministry of National Development Planning (Badan Perencanaan Pembangunan Nasional – MNDP)	Formulates national development plans, including for the energy sector.	5
Non-ministerial gov. agency	Ministry of Environment and Forestry (Kementerian Lingkungan Hidup dan Kehutanan – MoEF)	Coordinates governmental policies across ministries on climate change and the environment.	2
	National Energy Council (Dewan Energi Nasional – NEC)	Formulates and oversees the implementation of National Energy Planning	3
Parliament	Commission 7	Approves national energy laws, regulations and policies.	3
Total number of interviewees			27

plant is to be shut down by 2055 [42]. There are plans to build nuclear power plants by 2040 or 2050, and more than half (421 GW) of power generation capacity is expected to be solar by 2060 [42].

The government also adopted carbon-pricing regulations in 2021 to support the net-zero emissions roadmap, although the details of the scheme and carbon price level remain to be determined. MEMR introduced a cap-and-trade mechanism for coal-fired power plants in 2022 and implemented a limited version of the scheme for 146 coal power plants in 2024 [43].

The 'Energy Transition Mechanism' was established under the authority of MoF with a blended finance platform for renewable energy development, a coal retirement scheme and technical assistance to relevant stakeholders. An agreement on an additional source of financing for the energy transition, the Just Energy Transition Partnership (JETP), was signed with the International Partners Group (G7 plus Denmark and Norway) intending to mobilise 20 billion USD for decarbonising Indonesia's energy sector [30]. JETP aims for Indonesia to reach a carbon emissions peak by 2030 and net-zero emissions by 2050.

**Table 2**  
Energy and climate regulations 2016–2022.

Stakeholders	2016–2018	2019–2021	2022
<b>National laws and government regulations</b>	<b>Law 16/2016 Ratification of the Paris Agreement</b> The commitment of Indonesia to the Paris Agreement	<b>Government Reg. 8/2019 (amended)</b> <b>Non-tax state revenue</b> Coal royalty of 3–7 %	<b>Government Reg. 26/2022 Non-tax state revenues</b> Normal coal royalty 13.5 %
	<b>President (regulations)</b>	<b>President Reg. 4/2016 Acceleration of electricity infrastructure development</b> Accelerating 35 GW power plant development (Mixed, 50–60 % coal)	<b>President Reg. 98/2021 Carbon Pricing</b> Coordinating Ministry of Investment Affairs (CMMIA) and Ministry of Environment and Forestry (MoEF) be coordinators; the Ministry of Energy and Mineral Resource (MEMR) formulates mechanisms; the Ministry of Finance (MoF) sets carbon price
<b>Ministry of Energy and Mineral Resources (MEMR) (regulations, decrees, plans)</b>	<b>MEMR Reg. 28/2016 Electricity Tariff Adjustment Mechanism (amended)</b>	<b>MEMR Reg. 12/2019 Solar Rooftop (amended)</b> License for solar rooftop >500 kVA	<b>Net zero emissions roadmap</b> Power plant and storage in 2060:  • Renewable energy: Solar 421 GW, Wind 94 GW, Hydro 72 GW, Bioenergy 60 GW, Nuclear 31 GW, Geothermal 22 GW, Ocean Energy 8 GW.
	• Electricity tariffs are adjusted based on prices, inflation and currency • MEMR sets PLN's tariffs	<b>MEMR Reg. 50/2017 RE Power Plant (amended)</b> Renewable pricing, based on regional cost of generation	<b>MEMR Reg. 4/2020 RE Power Plant Allowance of build, own, operate (BOO) scheme for renewables</b>
	<b>MEMR Reg. 19/2018 Coal and Mineral Pricing</b> MEMR sets coal price	<b>MEMR Reg. 20/2020 Grid Code</b> New grid code to accommodate intermittent renewable	<b>MEMR Reg. 16/2022 Carbon pricing for Power Plant</b> Cap and trade mechanism
	<b>MEMR Decree 1395/2018 Coal Domestic Market Obligation</b> Coal price USD 70/t	<b>MEMR Reg. 11/2021 Electricity Business</b> Electricity business mechanism, incl. power wheeling concept	
	<b>MEMR Reg. 49/2018 Solar Rooftop (amended)</b> 100 % installed capacity, net metering, export with 65 % tariff	<b>MEMR Reg. 26/2021 Solar Rooftop</b> 100 % installed capacity, net metering, export with 100 % tariff	
		<b>MEMR Decree. 118/2021</b>	

(continued on next page)

Table 2 (continued)

Stakeholders	2016–2018	2019–2021	2022
Ministry of Finance (MoF) (regulations, programmes, annual reports)	MoF Reg. 62/2017 Geothermal Fund (amended) Revolving funds from the state budget and ADB to mitigate geothermal exploration risks  MoF Reg. 35/2018 Tax allowance/holiday for renewable business	Gas price Gas price at 6 USD/MMBtu	MoF Reg. 80/2022 Geothermal Fund Expansion of funds for private drilling
		MoF Reg. 159/2021 Electricity Tariff Compensation State budget to cover a gap between costs and tariffs	Energy Transition Mechanism (ETM) Country Platform Blended finance platform
			Just Energy Transition Partnership (JETP) Energy transition financing PLN restructuring Introduction of subsidiaries focusing on different business aspects
Ministry of State-owned Enterprises (MSOE) (annual reports)			
Coordinating Ministry of Investment Affairs (CMIIA)	Interministerial Coordination Coordinating interministerial programmes, including MEMR's, MOEF's and ICB	President Reg. 98/2021 Carbon Pricing CMIIA and MoEF be coordinators of the national climate plan	
Perusahaan Listrik Negara (PLN) (business plans, RUPTL, annual reports)	RUPTL 2016–2025 19.6 % RE target by 2025  RUPTL 2017–2026 22.5 % RE target by 2025  RUPTL 2018–2027 23 % RE target by 2025	RUPTL 2019–2028 23.2 % RE target by 2025 Using biodiesel for diesel power plant (PP)  RUPTL 2021–2030 Additional NRE PP capacity: 20.92 GW (51.6 %)  Biomass cofiring (2021) Mixing coal power plant (PP) fuel with biomass  Diesel PP reduction (2021) Replacement of diesel PP to RE PP or Gas PP	
National Energy Council (NEC) (regulations)	President Reg. 22/2017 National Energy Planning (RUEN) Setting a target of 23 % RE by 2025, 31 % by 2050		
Ministry of Environment and Forestry	Nationally Determined Contribution	President Reg. 98/2021 Carbon Pricing	MoEF Reg. 21/2022 Carbon Pricing

Table 2 (continued)

Stakeholders	2016–2018	2019–2021	2022
(MoEF) (regulations, programmes)	(NDC) Submission 29 % of carbon reduction by 2030	CMIIA and MoEF are coordinators; MEMR sets mechanisms  Enhanced NDC submission	<ul style="list-style-type: none"> <li>• Domestic carbon trading</li> <li>• International trade is only allowed if the NDC target is met</li> <li>• Carbon roadmap decided by relevant ministries</li> <li>• MoEF issues Emission Reduction Certificates</li> <li>• MoF formulates carbon tax regulation</li> </ul>
Ministry of National Development Planning (MNDP) (regulations and programmes)		National Mid-term Development Planning 2019–2025 Incorporate low carbon into national midterm development planning	
Ministry of Industry (MoI) (regulations)	MOI Reg 4/2017 Local content requirement for solar power plant	MOI Reg. 5/2017 Local content requirement for the electricity business	
Investment Coordinating Board (ICB) (regulations)		ICB Reg. 1/2019 Reduction of income tax for RE business	

4.2. Interview data

Our 27 interviewees mostly argued in favour of the status quo regarding Indonesian electricity production. This notably includes the continued use – and continuing expansion – of the country's coal-fired generating capacity. As shown in Table 3, reasons include concerns about the price of electricity for consumers, security of supply and national budgetary priorities. The official goals for national emissions reduction and decarbonisation are often dismissed by key policymakers. As stated by one interviewee: 'Such pledges [are] declarations to participate; it's like a vision, not a plan.' Other excerpts from typical statements from the interviews are presented in Table 3.

4.2.1. Status quo arguments

Electricity price arguments emphasise the advantages of coal-fired power plants. 'It's about the coal business interests and the government's fiscal ability', according to a high-ranking ministry representative. Our interviewees unanimously stated that a larger share of renewables in the electricity mix would force electricity tariffs to rise, both for households and industrial customers, unless government subsidies were increased. The interviewees from the Ministry of Finance indicated that there is no current political will to spend more on energy subsidies or to shift subsidies from coal to non-fossil energy.

Despite the existence of a scheme for adjusting electricity tariffs, ministry representatives highlighted the political sensitivity and

**Table 3**  
Arguments from the interviews for maintaining the status quo.

Rank*	Argument	Interview excerpts
1	Affordable electricity	<ul style="list-style-type: none"> <li>● ‘We need to provide electricity at an affordable level.’</li> <li>● ‘... affordability for the people’</li> <li>● ‘the energy price also determines industrial competitiveness.’</li> <li>● ‘... coal is cheapest.’</li> <li>● ‘PLN’s key performance indicator is a low cost of generation, ... so why should PLN integrate more renewable energy?’</li> <li>● ‘renewables are still expensive, ... the greener our energy mix, the more expensive.’</li> </ul>
2	Security of supply	<ul style="list-style-type: none"> <li>● ‘Emissions are for the world, but security and affordability are for our nation.’</li> <li>● ‘If our goal is energy transition, it can have negative implications on our electricity provision.’</li> <li>● ‘We do not want to compromise our energy security.’</li> <li>● ‘Energy independence and security are Indonesia’s major issues.’</li> </ul>
3	National priorities	<ul style="list-style-type: none"> <li>● ‘We still need more brown projects, rather than green, ... brown energy is more affordable.’</li> <li>● ‘Once we have sufficient funding and feel that energy transition becomes more urgent, more funds will be available for green energy development.’</li> <li>● ‘We need to prioritise energy self-sufficiency. We shouldn’t become dependent on imports when imports are expensive and unreliable. We have fossil fuels, so let’s maximise their use.’</li> <li>● ‘As far as the energy transition is concerned, it will be of secondary importance, ... we need to eat first.’</li> </ul>

\* The ranking is based on the frequency of arguments across all interviews.

practical challenges associated with eliminating existing subsidies and raising tariffs. Ministries, legislative bodies and PLN all underlined the importance of ensuring that electricity remains affordable for consumers, given the population’s limited purchasing power, the desire for industrial competitiveness and worries about inflation. This challenge becomes particularly apparent when trying to accurately identify ‘low-income’ households that would be eligible for individual, need-based subsidies, given the variations in household data across ministries and agencies.

Many interviewees mentioned the surplus capacity of coal-fired power plants, particularly those built on Java since the 2016 Presidential Regulation, ‘Acceleration of electricity infrastructure development’. One interviewee stated: ‘Under the current condition of oversupply, adding renewable-energy power plants...becomes burdensome.’ A Ministry of National Development Planning officer even stated that ‘some renewable-energy plants owned by PLN should be shut down to allow coal power plants to supply electricity instead’. Some interviewees also noted that ‘affordable’ is mentioned before ‘clean’ in Sustainable Development Goal (SDG) 7, taking this to mean that affordability should have a higher priority (‘Ensure access to affordable, reliable, sustainable and modern energy for all’).

**Arguments related to supply security** emphasise the importance of national economic growth and stability, particularly for businesses. Many interviewees raised the question of which power source could replace the coal-fired baseload when the sun is not shining or the wind is not blowing. Related to this, interviewees worried about the need for large and costly energy storage to mitigate the intermittency of renewable energy. The supply-security argument also included points about avoiding dependence on foreign supply of technology and competence. A member of Parliament stated that ‘we cannot be dependent on imports, we need to maximise what we have, including fossil fuels’. Many interviewees underlined the fact that coal-fired power plants are familiar and well-managed in Indonesia, while technical competence regarding solar cells, wind turbines and energy storage facilities is still lacking.

**Arguments based on national priorities** prioritise infrastructure

investment and evenly distributed economic growth over costly efforts towards sustainability. A representative from the Coordinating Ministry for Maritime and Investment Affairs said: ‘In Indonesia, economic growth should be allowed to rise first until we catch up with the United States and other developed countries. Then we can reduce our emissions.’ Another said that ‘shifting from fossil to renewable energy is almost like hell for Indonesia. What we are trying to do is, instead of going to hell, we are going to heaven.’

Many interviewees underscored the government’s overwhelming investment needs, particularly in physical infrastructure such as roads, bridges, harbours and the new capital city. One commented that ‘a broader fiscal space for renewable energy development means that we will have less money for national strategic projects’. Potential private investments in renewable power are typically ignored by government representatives, since they all agree that PLN should remain a monopoly electricity supplier and that a greater private share of the market may threaten PLN’s position and interests. Foreign funding is regarded with scepticism, since the support that is offered (for example via JETP) is deemed to be too small and coming with strings attached. One Ministry of Finance representative said that ‘some countries want to dictate to us by giving loans’, and another interviewee talked about ‘a form of conspiracy among developed countries’.

4.2.2. Decarbonisation arguments

Arguments for accelerating decarbonisation were rare among the interviewed decisionmakers. Table 4 presents those we found to be strongest:

**Long-term economic benefits** were most strongly claimed by representatives of the Ministry of National Development Planning and the Ministry of Environment and Forestry. Especially emphasised were the prospects of further developing geothermal and solar-energy competence and capacity, along with the ability to handle energy storage through domestic battery production. Some interviewees also mentioned the potential economic benefits of participating in global carbon offset and trading schemes through the early retirement of coal-fired power plants.

**Improved access to capital** for investment in renewable energy was highlighted by some interviewees. It is increasingly difficult to raise foreign funding for coal-fired power plants, while both private and government sources offer investment or support for the energy transition in various forms. There seemed to be a growing awareness of green financing options and potential, although most interviewees underlined the gap between needs and offers, the advantages of grants over loans and the strict regulations and requirements associated with foreign green funds, particularly exemplified by the European Union (EU) taxonomy. Other interviewees stressed the need for fiscal and non-fiscal

**Table 4**  
Arguments for decarbonisation from the interviews.

Rank	Arguments	Interview excerpts
1	Long-term economic benefits	<ul style="list-style-type: none"> <li>● ‘The solar panel price will be very low in 10 years’ time.’</li> <li>● ‘In the long term, the energy transition can bring benefits, both fiscal and environmental.’</li> <li>● ‘The energy transition creates three times more employment than fossil projects.’</li> <li>● ‘If natural disasters and diseases decline, that, of course, will also reduce costs.’</li> </ul>
2	Improving capital access	<ul style="list-style-type: none"> <li>● ‘Once we have sufficient funds and we feel that the energy transition becomes more urgent, more funds for green energy development will become available.’</li> <li>● ‘We have a lot of tax incentives for renewable energy’.</li> </ul>
3	Environmental concerns	<ul style="list-style-type: none"> <li>● ‘In the past, our main job was to provide electricity, but now our main job is to ensure environmental sustainability.’</li> <li>● ‘The sense of urgency regarding the climate crisis is still minimal in Indonesia.’</li> </ul>

incentives by the government to facilitate increased flows of green funds from international banks and financial institutions.

**Environmental concerns** regarding the intensive use of coal and the slow pace of the energy transition were mainly expressed by representatives of the Ministry of Environment and Forestry. *‘The burden is heavy [on us] because we directly deal with international affairs’*, said one, emphasising the gap between national policies and pledges on carbon dioxide emissions. Some interviewees also emphasised the possibility of making coal-fired power plants environmentally friendly by co-firing with biomass and the use of carbon capture and storage technology.

4.2.3. Inter-agency power distribution

Our interviews revealed clear differences in perceptions of political influence among the various government institutions, and many interviewees did not conceal disagreements and lack of coordination among actors involved in relevant decision making. There was a general agreement among interviewees that the Ministry of Energy and Mineral Resources (MEMR), Ministry of Finance (MoF) and Ministry of State-owned Enterprise (MSOE) have the most power over PLN. *‘We position MoF above MEMR’*, said one interviewee from the Ministry of National Development Planning (MNDP). While several interviewees, including those from MoF, MEMR and MSOE, indicated that *‘the ministerial agenda and PLN decisions are determined by the president’s requests’*, they also highlighted the Parliament’s influence on ministerial policy, programmes and state budget allocations. Fig. 3 illustrates the authority and level of influence of state institutions based on the input from our interviewees.

Some interviewees suggested that debates on the energy transition *‘become unbalanced’* because of the greater power held by certain bodies. For example, representatives from the MNDP and the Ministry of Environment and Forestry (MOEF) clearly articulated that they are marginalised in energy-policy discussions. The National Energy Council (NEC) and the Coordinating Ministry of Maritime and Investment Affairs (CMMIA) hold moderate levels of power. The NEC is responsible for designing Indonesia’s long-term energy planning but has limited

coercive power to enforce target achievement. CMMIA focuses on inter-ministerial coordination and investment attraction, including both fossil-fuel and renewable-energy projects. It also has occasional input on carbon pricing, though lacks regulatory authority.

PLN is generally regarded as an implementing agency, not a policymaker. A PLN representative stated that *‘if government can bear the fiscal burden, we can do the job’*. While PLN can advocate policy changes, decisions on tariffs and electricity subsidy reform fall under the remit of MoF and MEMR.

One interviewee indicated that PLN may be among the state-owned enterprises that *‘become tools to support political interests’*, and it seemed to be no secret that *‘PLN is close to PDIP’*, the ruling party that nominated Joko Widodo when he was elected president. *‘PLN is under pressure’*, said one interviewee, while another indicated that actors other than PLN should be blamed for the slow speed of the energy transition: *‘One finger points at PLN, but the remaining four point at government agents.’*

Some interviewees also emphasised that what matters may not be the institutions, but rather the persons leading the institutions. According to one interviewee: *‘when the minister changes, the situation can change.’* It depends on *‘which political party is in power, which minister is close to the President.’*

5. Discussion

PLN does not operate independently. Its plans, priorities and prices are politically determined, and there are multiple rationales behind them. In this paper our aim is to identify factors and actors that could influence PLN to become a more active promoter of low-carbon electricity generation. In this section, we analyse the pro-status-quo rationales. Next, we discuss potential ways to accelerate decarbonisation through policies to internalise externalities, modify government support measures and capitalise on emerging business opportunities. We supplement our findings with theory and apply a multi-level perspective on the energy transition.

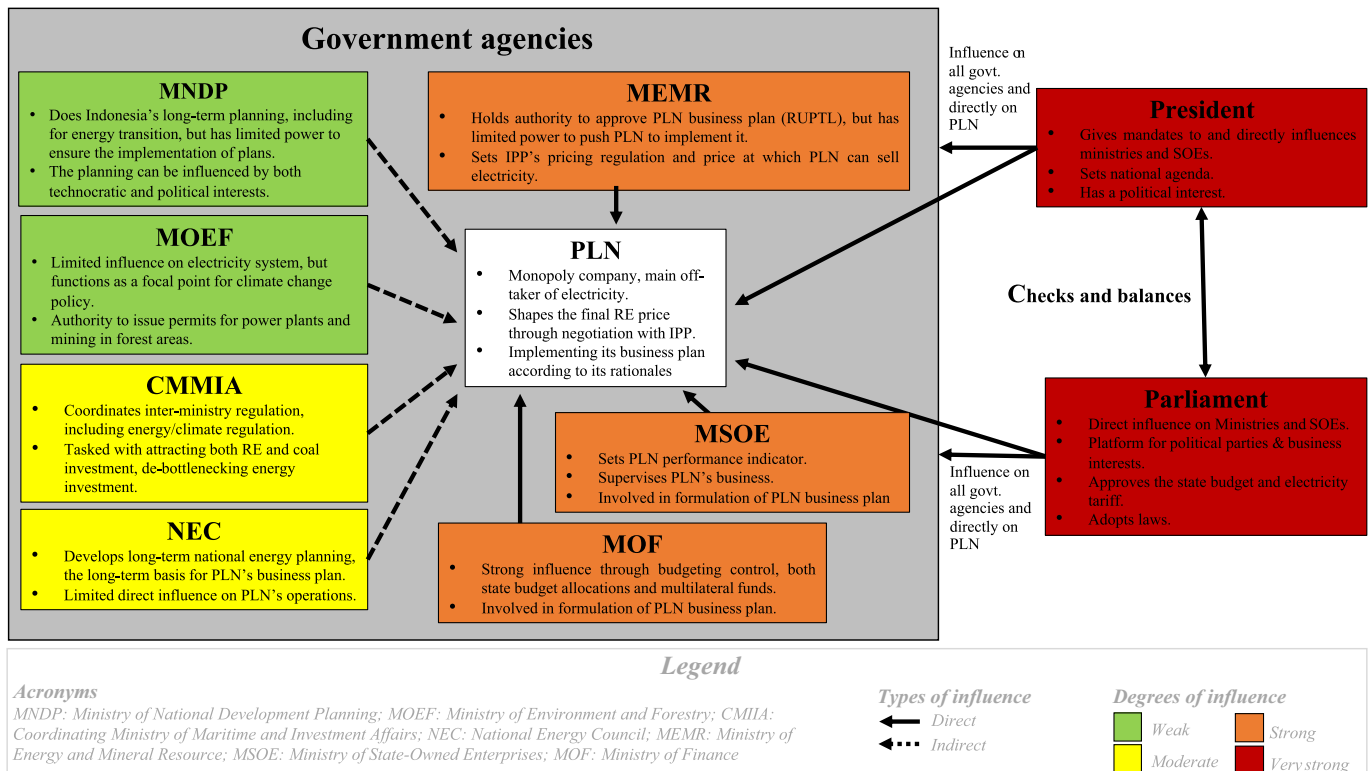


Fig. 3. Current authority and influence of government institutions over PLN according to our interviewees.



### 5.1. Status-quo logics

The Indonesian government generally favours energy independence and lowest-cost electricity supply without taking externalities into account [44]. PLN has been relatively successful within two of the three dimensions of the 'energy trilemma', defined by the World Energy Council as the three goals that governments need to balance: securing energy supplies (security), providing universal energy access (equity) and ensuring environmental protection (sustainability). The security aspect assesses the energy system's supply security, resilience and reliability [45]. <1 % of Indonesia's total electricity demand is fulfilled by electricity imports [5]. Power outages are relatively rare, with an average annual system interruption frequency of 6.7 h in 2021, impacting customers with a total of 9 h of blackouts [46]. The equity goal deals with fair and affordable access to electricity. The political challenges of removing energy subsidies lead the government to favour maintaining the status quo [47]. The current retail tariff to consumers in Indonesia is low by international standards [48]. However, efforts to keep the tariff low incentivise investment in coal power plants [49]. Meanwhile, the national electrification rate is high at 99.63 % in 2022 [50]. This is an excellent performance in a developing-country context.

Another argument commonly used to support the status quo is the income generated by current practices, especially the production and use of coal. This applies to both government and businesses, both centrally and locally. With coal-related government royalties at 13.5 % of the sale price, coal prices high and annual production close to 700 million tonnes, coal is obviously important to the Indonesian economy. Some 80 % of total government coal revenue remains at the local or regional level, while 20 % goes to the central government. As a result, the interests of regional governments weigh heavily on central policy making. So do those of the private sector. Ordóñez et al. [7] offer an overview of vested interests in the Indonesian coal business and state that a 'politically well-connected and highly concentrated Indonesian coal industry lobby for the construction of coal-fired power plants'.

Our interview data reveal strong support for the status quo among key policymakers. The main arguments for the continued use and expansion of coal-fired power and for limiting investment in renewables include the need to keep prices low for customers, to limit government subsidies, to ensure security of electricity supply and to channel capital investment to sectors and projects that boost exports.

Our findings indicate that the existing Indonesian energy system is supported by the country's political culture and established pricing mechanisms. The President and political parties in control of Parliament's Commission 7 hold the most power in shaping the national energy agenda and priorities. With direct authority over ministers, the President can effectively decide policies at the ministerial level. At the same time, many people in these political circles are personally involved in the coal business [7,51].

Building upon well-established theories on 'collective conservatism' by Kuran [52] and 'dysfunctional institutions' by Bardhan [53], our empirical findings contribute to the research on the political and economic factors influencing the continued reliance on coal in the electricity sector. These theories connect closely with the multi-level perspective (MLP) applied recently in studies of transitional dynamics in socio-technical systems. This train of research focuses on how technical development relates to changes in user practices, policies, markets, industrial structures and supporting institutions [54].

Despite differences in electricity market structures, the Indonesian government's arguments for maintaining the status quo resemble those found in Australia and India, where coal abundance historically has been integral to trade and economic development. In both countries, pro-coal narratives depict coal as a source of trade revenue, economic prosperity and cheap energy, creating logics for coal lock-in [55,56]. Meanwhile, in the Philippines, a country that relies on coal power and fuelled by imported coal, arguments for affordability and reliability are intertwined with industrial and economic development imperatives [57].

Given the disruptive nature of clean-energy technologies, which sometimes spark conflicts with established business interests, it is important to examine the strategies employed by powerful actors within prevailing regimes who view these changes as threats [58]. According to Geels [59], a barrier to sustainability transitions may be that unsustainable industries have large economic resources and good political contacts, 'which may hinder, delay or water down strict environmental regulations'. In struggles against actors with vested interests, incumbents or a 'techno-political alliance' [60,61] will defend existing institutions, which are at the heart of regime stability. But once a transition seems inevitable, a 'tipping point' may be reached when incumbents start to actively support the new technology and start developing the necessary competence and infrastructure for transition [58].

This leads us to the following question: *What institutional changes could the Indonesian government pursue to potentially trigger radical shifts in the energy transition?* We propose that there are three key dimensions that require enhancement to accelerate the energy transition in Indonesia: internalising negative externalities, revising government support mechanisms and bolstering emerging business opportunities in renewable energy. We discuss these dimensions in the next three subsections.

### 5.2. Internalising externalities

In 2021, almost half of the 600 million tonnes of carbon dioxide (Mt CO<sub>2</sub>) emissions from Indonesia's energy sector came from coal, most of it burned for electricity generation [6]. The growth in coal-fired power generation has been responsible for more than half of the doubling of CO<sub>2</sub> emissions from Indonesia's energy sector since 2000. With some further development, the new Indonesian regulations on carbon pricing, taxing and trading could possibly help limit emissions.

A system of carbon cap and trade for coal-fired power plants is currently being tested, with a price of USD 2 per tonne of carbon dioxide equivalent (CO<sub>2</sub>e), and an emission cap set close to the maximum level of emissions from such plants. The quantity of carbon traded or taxed is therefore low, and so is the impact on the levelised cost of electricity (LCOE). With a higher CO<sub>2</sub> price, such as USD 54 as proposed by the G20 countries [36,62], and an emission cap set at zero, the coal LCOE could double and thus make renewables clearly competitive [36]. However, we are currently more likely to see a carbon price between USD 2 and 18 per tonne CO<sub>2</sub>e in Indonesia [63], and a cap that is likely to be set high for coal-fired power plants.

Our document analysis suggests that carbon pricing mechanisms will gradually be adopted. However, our interview data reveal that there is little focus on, or support for, the implementation of such energy-transition measures in Indonesia's electricity sector.

### 5.3. Modifying support measures

Suharsono et al. [64] quantify 'support measures' for the energy sector in Indonesia. These measures include direct subsidies and government programmes that create financial contributions or forego government revenues. For the period 2016–2020, they find that 94 % of the support for the sector was spent on helping the production and consumption of fossil fuels, while <1 % was used to incentivise renewable energy. The value of support to the coal industry tripled from 2016 to 2020, largely due to the Domestic Market Obligation. Moreover, if it were not for the present Domestic Market Obligation (at current global market prices), the LCOE of coal-fired power plants would increase by a factor of 2.5 [36].

Indonesia's current system 'serves to lock in fossil fuel production and consumption' [64]. Moreover, the support regime for coal contradicts Indonesia's 2009 Electricity Law, which states that the government should provide incentives for the development of renewable energy. Switching support to renewables would level the playing field for coal

and renewables and provide fiscal space for infrastructure development [65]. According to the Asian Development Bank, renewable energy in Indonesia needs substantial government support if costs are not to be covered by customers [66]. No clear support mechanism or guidelines for renewables are yet on the table [67].

Our document analysis shows that the Ministry of Finance and the Investment Coordinating Board have recently established a geothermal development fund and intend to provide incentives in the form of tax reductions for renewable-energy projects. Likewise, the Energy Transition Mechanism and Just Energy Transition Partnership (JETP) represent positive recent developments towards enhanced international financial support. However, our interviews reveal little enthusiasm among Indonesian policymakers for increased or amended government subsidies or for the planned JETP. The lack of government support and leadership creates challenges to the flow of financing for renewable-energy development [68].

#### 5.4. Utilising emerging business opportunities

Indonesia's renewable energy resources harbour great potential for reducing greenhouse gas emissions [69], ensuring a stable domestic supply of energy [70] and offering business opportunities. The country's solar, wind, hydro, biomass and geothermal resources are estimated to have a combined electricity generation potential of >400 GW [36]. A turning point could be reached, where business interests and institutions that currently support coal production and consumption shift their focus to utilising these resources [71].

In 2021, less than USD 1.4 billion was invested in renewable energy projects in Indonesia, only a slight increase from 2020. The government target for 2022 was USD 3 billion [72]. Reaching the net-zero emissions goal for the electricity sector by 2060 would require annual investment above USD 8 billion, according to the IEA [6]. The 2023 Indonesia Energy Transition Outlook from the Jakarta-based Institute for Essential Service Reform stipulates a need for annual investments of USD 20–29 billion in renewable energy generation, energy efficiency, energy storage and network infrastructure by 2030 for the country to reach net-zero emissions by 2050 [73].

There are signs of a shift among some of Indonesia's dominant business conglomerates away from a narrow concentration on coal to a nascent interest in renewables. For instance, the Bakrie Group,<sup>2</sup> an Indonesian conglomerate, has declared that 'sustainable energy becomes its future business focus' [74], while Indika Energy<sup>3</sup> – Indonesia's leading diversified energy company – plans to invest USD 500 million in renewables as part of its new energy strategy [75]. The Bakrie Group also plans to join with multinational mining and commodities company Glencore in a USD 9 billion investment in Indonesia's nickel resources for battery production. On the other hand, some energy-transition businesses can pose environmental challenges. For example, nickel mining and refining has been supported by the building of captive coal-fired power plants with a combined capacity of >13 GW, representing 70 % of the 18.8 GW of new coal-fired power plants in the pipeline [76], despite the moratorium on building such plants.

As shown in the Findings section, some interviewees saw future business and employment potential and environmental advantages in renewable energy, particularly geothermal and large-scale solar power, despite high capital costs, long lead times and unclear investment returns. De-risking measures are therefore indispensable for lowering

<sup>2</sup> The Bakrie family wields substantial influence in Indonesian business and politics. Aburizal Bakrie, a former minister, previously led the Bakrie Group. The group is involved in a range of sectors, including mining, agriculture, infrastructure and mass media.

<sup>3</sup> Indika Energy, founded by Arsjad Rasjid, a prominent businessman and political figure, is active in coal mining, power generation and oil and gas exploration.

investment risks and costs [77].

## 6. Conclusion and policy recommendations

PLN is sometimes blamed for Indonesia's lack of progress on the energy transition. We have tried to identify the rationales of the dominant actors behind the policies and decisions that influence PLN's operations. Understanding the thinking of policy makers can help identify possible strategies for accelerated decarbonisation.

The two datasets that this study builds on point in different directions. The document analysis offers many indications of political will to accelerate the energy transition, while the interviews are dominated by arguments for the status quo, constraining renewable energy development. Although regulations have been progressively updated to support renewables, the status-quo arguments restrain the government from moving away from coal. Forcefully formulated arguments in favour of continued coal-dominated electricity production in Indonesia are based on a desire for low prices for consumers, fiscal conservatism, security of supply and the continuation of established central and local business and government income-generation practices. Can these arguments be reasonably opposed, and can other opinions counterbalance the status-quo logics and collective conservatism?

Powerful policymakers who are deeply vested in the current system play a pivotal role in resisting change. To contribute effectively to the energy transition, PLN needs substantial support and a significant shift in the dominant domestic political thinking. Despite the lack of serious concern about the negative national impacts of climate change even among well-educated and high-ranking policymakers in Indonesia, the country's commitments in international forums, such as the Conferences of the Parties (COPs), may gradually build a momentum for change.

PLN operates within a complex framework of government regulations and policies, as well as a highly regulated power market. The most important driving force for government to change the 'rules of the game' may come from private business interests, evolving through the continuous interplay between business conglomerates and influential national political actors. Since the long-term outlook is better for renewables than for fossil fuels, a turning point may be reached when overlapping business and political interests change the socio-technical landscape and allow current niche technologies to overtake the existing energy-system regime. Indonesia's recent focus on attracting foreign investment could reflect such a change in interests, as foreign investors increasingly favour renewable-energy projects.

Many large companies, including those from abroad, are also increasingly concerned about scope-2 emissions reporting. Members of the international business association Renewable Energy 100 (RE100) operating in Indonesia have sent a 'corporate demand signal' to policymakers, advocating for a low-carbon, grid-delivered electricity supply [78]. Such pressures could potentially push the Ministry of Energy and Mineral Resources (MEMR) to introduce a premium electricity tariff, which would give PLN greater scope for producing, purchasing and supplying electricity with a low-carbon certificate. (Many interviewees emphasised the need to include storage costs in LCOE calculations – whether in the form of batteries, pumped hydro, thermal, mechanical, or hydrogen – given the need for security of supply over a vast and divided geographical area.) The consequent premium might cover the difference between the average generation cost (BPP) and the LCOE of renewables, including energy storage costs, to meet industry requirements for security of supply.

Electricity tariffs in Indonesia have not been adjusted to the rising cost of power generation and remain low. This has resulted in growing government spending on electricity subsidies. In a lower-middle-income country like Indonesia, there are political reasons to keep electricity prices low, especially for poor customers. While there may be neither sufficient political will nor national economic capacity to raise electricity prices, it may be possible to argue for shifting government financial support from coal to renewables.

One obvious step would be for MEMR to remove the Domestic Market Obligation and amend the domestic coal pricing policy. The reduction of subsidy misallocation, which currently benefits rich households [79], also should be a priority for MEMR and the Ministry of Finance (MoF), as this would free up fiscal resources for the development of renewable energy. Another argument, emphasised by many interviewees and several policy documents analysed in our study, is the need to cover a larger share of energy transition costs with external funding. One example of such funding is JETP, although it was deemed financially far too modest by most interviewees.

Carbon-pricing, if implemented at a significant level, would provide a price signal for carbon reduction in PLN's decision-making processes. Although a general regulation framework is in place, MEMR and MoF should set an appropriate carbon price and apply it to the power system as a matter of urgency. Interviewees from the Ministry of National Development Planning (MNDP) and Ministry of Environment and Forestry (MoEF) in particular advocated for more strict regulations and guidance on carbon pricing, taxation and trading. Moreover, the MoF increasingly appears to recognise the need for internalising externalities when it comes to carbon emissions and pollution, especially from coal-fired power plants.

Climate interests should be infused and prioritised in energy-policy decision making. This could be achieved either by strengthening the authority and competence of the MoEF as the current climate policy coordinator, or by establishing a new ministry dedicated to both energy and climate issues [10].

Finally, in a highly regulated electricity market with top-down governance, political leadership plays an important role. Although PLN is the main actor in the electricity sector, the rules of the game are set by the ministries, which align with the President's will and priorities. The parliament also plays a significant role in approving the budget for subsidies, enacting laws and putting political pressure on the president, ministries and PLN.

The history of institutional reform in Indonesia's energy sector demonstrates the possibility of separating operational and regulatory roles [80]. Pertamina, Indonesia's national oil company, fulfilled both roles until the establishment of SKK Migas and BPH Migas, which took over responsibility for regulating the upstream and downstream sectors, respectively. However, it is unlikely, at least in the short run, that the monopoly status of PLN will be changed. More probable is a change in the regulations and guiding principles of PLN's work, brought about by enhanced public awareness, political debate and a growing elite interest in the transition.

Given the evolving nature of the energy transition and its susceptibility to changes in leadership and national priorities, the findings of this study are inherently limited in terms of time and context, which present limitations of our analysis. Future research may examine the political factors that influence energy policy decisions or conduct a cost-benefit analysis of the proposed policy recommendations.

#### CRediT authorship contribution statement

**Indri Dwi Apriliyanti:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Diwangkara Bagus Nugraha:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation. **Stein Kristiansen:** Writing – review & editing, Writing – original draft, Validation, Supervision, Formal analysis, Conceptualization. **Indra Overland:** Writing – review & editing, Visualization, Supervision, Project administration, Funding acquisition.

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

the work reported in this paper.

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#### Data availability

The data that has been used is confidential.

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