



Reframing Renewable Energy Reliability as a National Security Threat: Strategic Foresight and Institutional Challenges in Indonesia's Energy Transition

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Abstract

This study critically examines the threats to Indonesia's energy security arising from the unreliable integration of renewable energy sources (EBT) within the national grid. Drawing from Barry Buzan's sectoral threat typology, Michael T. Klare's energy geopolitics framework, and Sugirman's early warning intelligence theory, the research reframes energy reliability as a national security concern rather than a purely technical issue. Through qualitative analysis of policy documents and in-depth interviews with key informants from government, academia, and intelligence institutions, the study identifies systemic vulnerabilities linked to intermittency, underdeveloped infrastructure, and institutional fragmentation. It reveals that the absence of anticipatory intelligence and risk scenario planning limits Indonesia's capacity to ensure a stable and resilient energy transition. The findings further highlight the underutilized role of local stakeholders in decentralized energy resilience and the lack of integration between climate risk modelling and national energy planning. Drawing comparisons with the United Kingdom and Germany, the paper argues for embedding strategic foresight within Indonesia's energy governance framework. The study concludes by proposing institutional reforms that enhance cross-sectoral coordination, intelligence engagement, and localized adaptive capacity to secure the future reliability of EBT. Ultimately, it positions renewable energy reliability as not only a cornerstone of environmental and economic policy, but also of state sovereignty and long-term climate diplomacy.

Keywords: energy security; renewable energy; reliability; strategic foresight; national security; Indonesia

INTRODUCTION

In recent years, energy security has emerged as a core issue in global politics, economic development, and national resilience. Fossil fuels such as coal, oil, and natural gas remain the dominant sources driving industrial growth and international trade. However, their limited availability and growing demand have triggered fierce competition and strategic rivalry among countries, creating risks of geopolitical tensions and conflict (Chow, Kopp, and Portney 2003; Iskandar, Pratama, and Muhdar 2022; Rachmat 2018). Historically, major energy-producing countries have become targets of global power struggles, as illustrated by conflicts in Libya and Iraq. More recently, the Russia-Ukraine conflict demonstrates how disruptions in global energy supply can destabilize dependent regions like the European Union (Rakhmayanti 2022; Sidik 2023).

Indonesia, despite its rich endowment of natural and Renewable Energy Sources (RES), continues to face structural energy security challenges. While the government has committed to increasing the share of renewable energy to 23% by 2025 and 31% by 2050 through Presidential Regulation No. 112 of 2022 on Acceleration of Renewable Energy Development for Electricity Provision, the current figure stands at only 13.09% (Adi 2024). This underperformance is not merely a policy gap - it represents a critical vulnerability in Indonesia's long-term energy resilience. It also exposes persistent institutional challenges in policy execution, regulatory alignment, and inter-ministerial coordination that must be addressed at the national governance level.

A key concern that remains underexamined in both policy and academic discourse is the reliability of renewable energy as a cornerstone of national energy security. Unlike fossil fuels, many forms of RES - particularly solar and wind - are intermittent and subject to environmental variability. Fluctuating output, grid integration challenges, and the absence of adequate storage technologies all contribute to system unreliability. These issues can jeopardize the consistency of energy supply, especially as Indonesia decommissions coal-fired power plants without ensuring that RES can meet the same level of demand. This raises fundamental questions about how the state anticipates and manages reliability risks through policy, planning, and national-level institutional design.

From a theoretical standpoint, this study adopts Barry Buzan's theory of sectoral threats, specifically the economic threat typology, which includes disruptions to critical economic systems and infrastructures, such as energy (Buzan 1983). Energy reliability, in this context, is not just a technical matter but an economic-security issue. The failure of renewable energy infrastructure to deliver consistent output can lead to power shortages, increased dependence on imported energy, and social unrest - all of which fall within the domain of non-traditional but significant national threats. According to Buzan, national security is shaped by vulnerabilities across five key sectors: military, political, economic, societal, and environmental. The military sector concerns threats to the state's physical sovereignty and defense capabilities. The political sector involves the stability of state institutions and legitimacy of governance. The economic sector, which is the primary focus of this study, includes threats to the state's economic stability, resource availability, and infrastructure resilience. The societal sector addresses challenges to identity, cohesion, and cultural continuity, while the environmental sector captures the risks posed by ecological degradation and climate change. These sectors often overlap and interact - for instance, an environmental shock can trigger economic and societal instability. By locating energy reliability within Buzan's economic threat category, this study underscores how technical vulnerabilities - such as intermittency, inadequate grid infrastructure, and climate fragility - can scale into broader economic disruptions that challenge the resilience and sovereignty of the state (1983). This theoretical framing enables the analysis to connect energy planning with national strategic foresight, policy design, and the functioning of state institutions.

Aligned with this view, Lee (2012) and Klare (2012) conceptualize energy security as the ability of a state to ensure stable, affordable, and sustainable access to energy resources. When reliability is compromised, even abundant energy potential becomes meaningless. Therefore, Indonesia's energy transition must address not only the availability of renewable energy but also its capacity to reliably support the country's economic and societal systems. Reliability, in this sense, includes availability, system stability, redundancy, and the ability to handle load fluctuations without service disruptions. It also depends on how national institutions—such as energy ministries, regulatory bodies, and intelligence agencies—collaborate to foresee and mitigate disruptions.

Recent studies on Indonesia's energy transition have largely emphasized the technical, economic, and policy dimensions of renewable energy integration. Zahira and Fadillah (2022) examine the feasibility of achieving Net Zero Emissions through Variable Renewable Energy (VRE), while Arsita, Saputro, and Susanto (2021) analyze the evolution of national energy policy toward sustainability. Safitri, Rizki, and Zulkarnain (2021) discuss regional cooperation within ASEAN to improve energy access and stability. Similarly, Nikolaus Loy (2020) offers a theoretical discussion on balancing state-market dynamics in energy security, but does not assess renewable energy infrastructure vulnerabilities. In a comparative context, Rosinawati and Munabari (2021) analyse how China securitized its energy policy in Africa through diplomacy and strategic alliances, reinforcing the relevance of energy foresight. However, their focus remains on external energy diplomacy, not internal governance. Collectively, these studies enrich the policy discourse, yet none engage deeply with the idea that renewable energy unreliability - manifested through grid instability, intermittency, and poor foresight - could constitute a national-level security vulnerability.

This study builds on the above insights but seeks to fill the conceptual and empirical gap by reframing reliability issues as emerging national threats that require anticipatory governance tools. In doing so, it contributes to national security and public policy literature by proposing a framework for integrating energy planning with institutional foresight and strategic risk management at the national level.

The threat to energy security from unreliable RES can be categorized as a hybrid economic threat - technical in form but strategic in impact. These threats stem from interconnected factors such as inconsistent stakeholder support, low feed-in tariffs, long project lead times, and unfavourable risk profiles (CNBC Indonesia 2023; Suganal and Hudaya 2019; Syahni 2018). This complexity demands a multidimensional security approach, one that can assess and anticipate the cascading risks of systemic failure across governance, economics, infrastructure, and society.

To address these risks, the study also incorporates the concept of strategic intelligence, particularly the role of state intelligence agencies in early detection and early warning systems. As suggested by Sugirman (2009), intelligence analysis should guide proactive policy formulation through foresight, judgment, and net assessment. In the energy sector, such intelligence foresight is essential to anticipate mismatches between projected demand and actual system capacity, enabling better crisis response and long-term planning. The role of intelligence is not to react after failure, but to anticipate where failures may occur and offer options to mitigate them. This study applies these concepts to understand how national-level institutional mechanisms either support or hinder strategic planning in energy reliability.

The reliability of RES, therefore, is more than an operational concern—it is a strategic vulnerability that, if unaddressed, can undermine the very goals of the energy transition. The government's ambition to reduce greenhouse gas emissions and achieve Net Zero Emissions (NZE) by 2060 risks failure if system reliability is not integrated into energy planning and national security assessments. The consequences of failure are real: economic slowdowns, energy rationing, increased reliance on imported fuels, and public dissatisfaction with transition policies.

This article offers a security-oriented analysis of Indonesia's renewable energy agenda. It analyses the emerging security threats caused by reliability issues in RES and assesses how strategic intelligence can be utilized to prevent or mitigate such threats. Unlike existing studies that focus on the techno-economic aspects of RES, this study adopts a threat-based approach, examining how intermittent and unreliable energy supplies can disrupt public services, reduce national competitiveness, and erode public trust.

By framing energy reliability as a strategic concern, the study contributes to a more holistic understanding of national energy policy. It argues that traditional planning models, which emphasize availability and cost, must evolve to include reliability as a third pillar of energy security. The failure to do so may compromise Indonesia's ability to maintain economic stability, fulfil its climate commitments, and assert its energy sovereignty in the face of global and regional uncertainty. At the same time, this study highlights the need to reorient national energy governance toward resilience planning and scenario-based policy development, particularly at the central government level.

Ultimately, this study explores how unreliable renewable energy infrastructure can become a source of strategic vulnerability, and how the state intelligence apparatus can contribute to identifying and mitigating such risks. It provides insights for energy policymakers, intelligence practitioners, and scholars interested in the intersection of climate governance, national security, and foresight-based planning.

RESEARCH METHODS

This research employs a qualitative approach to examine how energy security threats manifest in the reliability of renewable energy (EBT) in Indonesia. The study adopts a descriptive-analytical research design with a case-oriented strategy. Qualitative methods are deemed most appropriate because they allow for in-depth exploration of complex, context-dependent phenomena, such as institutional dynamics, governance challenges, and the strategic framing of reliability within Indonesia's energy transition. The design is also grounded in the principle that energy reliability is not only a technical matter but one embedded in socio-political and institutional structures, requiring contextualized insight that quantitative models may not fully capture. The study's qualitative orientation is particularly useful for unpacking the interactions between national-level actors, state capacity, and anticipatory planning mechanisms in public policy.

The primary data were collected through a series of semi-structured, in-depth interviews with five key informants selected using purposive sampling. These include: a senior government official from the National Research and Innovation Agency (Participant A); a former intelligence agency executive (Participant B); an academic expert in computational energy systems (Participant C); a former diplomat with ambassadorial experience in Asia-Pacific (Participant D); and an executive from the national oil company specializing in exploration (Participant E). These individuals were chosen based on their strategic positions, multidisciplinary expertise, and institutional affiliations relevant to the intersection of energy policy, intelligence, and national security. The selection criteria emphasized national-level leadership experience, direct involvement in energy planning or security strategy, and the ability to provide cross-sectoral perspectives on reliability. Interviews were conducted between November and December 2023 in Jakarta, Tangerang, Bogor, and Bandung.

All interviews were recorded with consent and transcribed verbatim. To ensure ethical standards, participants were briefed about the purpose of the study, their voluntary participation, and confidentiality protections. Written and verbal consent were obtained in accordance with standard qualitative research ethics and all participants requested to remain anonymous. The research received informal ethical clearance through internal faculty supervision at the graduate level.

Data analysis followed Creswell and Creswell's (2018) five-step model for qualitative research: (1) organizing and preparing the data, (2) reading through the data, (3) coding the data, (4) generating themes and descriptions, and (5) interpreting the meaning of the themes. This model was selected for its clarity and flexibility in handling inductive analysis while still offering a structured process suitable for both exploratory and confirmatory qualitative studies. Compared to other models, the approach enables iterative back-and-forth engagement between data and emerging insights, a method well-suited for a topic such as energy security that evolves in response to shifting policy and environmental conditions (Creswell and Creswell 2018). In this study, the model was operationalized through a manual coding process using descriptive and axial coding techniques, which enabled the identification of recurring institutional and strategic patterns across the interviews. The coding process was aligned with the research questions and guided by the thematic categories emerging from both interview data and policy documents.

Triangulation was conducted in two principal ways: methodological and theoretical. First, primary interview data were corroborated with secondary sources, including national policy documents such as the Rencana Umum Energi Nasional (RUEN; National Energy General Plan), Rencana Umum Ketenagalistrikan Nasional (RUKN; National Electricity General Plan), Rencana Usaha Penyediaan Tenaga Listrik (RUPTL; Electricity Supply Business Plan), and Presidential Regulation No. 112/2022 on the Acceleration of Renewable Energy Development for Electricity Provision, as well as relevant government reports and peer-reviewed journal articles. These documents were selected due to their authoritative function in defining Indonesia's energy governance structures and institutional responsibilities. Second, theoretical triangulation was applied by interpreting the findings through multiple conceptual frameworks, including Buzan's theory of sectoral threats, Klare's model of energy conflict, and Sugirman's framework on strategic intelligence. This multi-perspective approach enhanced the validity and depth of the analytical findings.

Researcher reflexivity was also maintained throughout the process. The researcher holds a background in energy policy and intelligence studies, which provided both insight and potential bias in interpreting the data. To mitigate bias, field notes and reflective memos were used to distinguish between researcher assumptions and participant perspectives. Where interpretive ambiguity arose, the analysis leaned on direct quotes and descriptive coding to preserve the integrity of participant narratives.

The unit of analysis in this study is conceptual rather than institutional. That is, the focus is not on assessing specific agencies or technologies, but on understanding how the concept of energy reliability is constructed, challenged, and securitized in Indonesia's energy transition discourse. This approach enables a deeper interrogation of how reliability is framed within national policy, institutional agendas, and expert assessments, offering insights relevant to both academic scholarship and policymaking.

This study acknowledges several limitations related to data access. First, interviews were limited to five elite respondents due to their institutional rank and availability, which constrained the breadth of perspectives captured—particularly from subnational actors or civil society groups. Second, given the strategic sensitivity of national energy and intelligence planning, certain topics were off-limits or discussed cautiously by respondents. This may have influenced the depth of insights on institutional risk mapping and internal policy coordination. Nevertheless, the methodological design prioritizes depth over breadth, and the interviews yielded high-value insights at the strategic level - particularly concerning institutional foresight, policy gaps, and governance inertia within Indonesia's central energy apparatus. Future research may expand the range of informants to include implementing agencies, regional governments, and private sector developers to enrich triangulation and generalizability.

RESULTS AND DISCUSSION

Reliability Challenges in Indonesia's Renewable Energy Transition

Indonesia's commitment to increasing the share of renewable energy (EBT) in its national energy mix has encountered significant reliability challenges. Despite a projected target of 23% by 2025, as outlined in Presidential Regulation No. 112 of 2022, renewable energy contributed only 13.09% of the mix as of 2023 (Adi 2024). While the country possesses abundant renewable energy potential, the ability to deliver stable and continuous power supply from these sources remains underdeveloped. The gap between target and implementation points to deeper institutional and planning challenges within national policy instruments such as RUEN and RUPTL, which do not fully account for system resilience or energy intermittency.

Participant C, a specialist in computational energy systems, emphasized that one of the core challenges is the intermittency of renewable sources such as solar and wind. "Solar panels produce during the day, and wind energy depends on local climate dynamics. Without energy storage infrastructure, these systems cannot be considered reliable baseload power," he explained (personal communication, December 2023). According to him, Indonesia's lack of national energy storage planning creates a fundamental risk in large-scale renewable integration.

Participant E, an executive from the national oil company specializing in exploration, supported this view from the industry side. "From our operational perspective, reliability is critical. If we are to substitute fossil inputs with EBT, then system response, load balance, and grid stability must be addressed - currently they are not," he said (personal communication, December 2023). He noted that there is no overarching roadmap for integrating battery storage or flexible grid management within the national energy system - leaving technical risks unmitigated at the planning stage. He further explained that the grid infrastructure is designed for centralized, fossil-based generation and not optimized for distributed or fluctuating inputs typical of RES.

Beyond technical reliability, the geographic disconnect between where renewable resources are abundant (e.g., solar in eastern Indonesia) and where demand is highest (e.g., Java-Sumatra) complicates effective utilization. Inter-island transmission networks remain underdeveloped, limiting the role of RES in the base grid system. According to Ahmad, "This imbalance leads to generation potential that's not usable, simply because we can't get it where it's needed" (personal communication, December 2023).

Institutional Fragmentation and Policy Incoherence

Another key theme from the interviews is the institutional fragmentation in energy governance. Although national documents like RUEN and RUKN articulate the vision for EBT integration, execution remains uneven and poorly coordinated across ministries and levels of government. While these frameworks are ambitious, their implementation is undermined by conflicting mandates, lack of enforcement mechanisms, and siloed ministerial functions.

Participant A, a senior government official from the National Research and Innovation Agency, remarked that “Indonesia has strong targets but weak instruments. The institutions are operating in silos - policy, science, and regulation don’t communicate well” (personal communication, November 2023). He emphasized the absence of a cross-sectoral mechanism to translate long-term national energy goals into synchronized, evidence-based policy at the technical level. According to him, the gap is not merely in implementation, but in strategic alignment between actors. He also noted that scientific modelling capabilities are available but underutilized due to a lack of institutional integration with energy regulators.

The interviews further revealed that regional governments often operate without adequate authority or capacity to innovate in renewable energy deployment. While local governments are expected to implement the Rencana Umum Energi Daerah (RUED; Regional Energy General Plan), they are not empowered with fiscal instruments to do so. This leads to disjointed implementation and limited local ownership of energy transition initiatives. Informants noted that despite formal decentralization, “energy is still centrally controlled, with regions waiting for signals from Jakarta” (Participant A, personal communication, 2023).

Compounding these issues, overlapping regulatory frameworks and lack of clarity in licensing processes also emerged as key concerns. “Investors and developers face confusion over which ministry regulates what. This undermines momentum for long-term energy transition,” said Participant A. In practice, energy planning suffers from bureaucratic gridlock, where the absence of a dedicated central coordinating body for renewable energy results in fragmented policy leadership.

Strategic Intelligence and the Need for Anticipatory Energy Security Planning

One of the novel findings from this study is the absence of strategic intelligence integration into national energy security planning. Interviewees widely agreed that the transition to renewable energy entails risks that go beyond technical matters and extend into the domains of geopolitics, social stability, and strategic vulnerability.

According to Participant B, a former intelligence agency executive, the energy sector has traditionally been treated as a technical and economic area, with limited intelligence oversight. “But in the current era, energy has become a strategic asset. Disruptions in renewable supply - due to climate, technology failure, or cyber-attacks - should be treated as national threats,” he explained (personal communication, December 2023).

He emphasized the need for energy to be part of a national early warning system, capable of anticipating crisis scenarios that could arise from internal or external disruptions. "We are late to foresee risks. There is no scenario development at the strategic level in the energy sector," Participant B added. He also expressed concern that Indonesia lacks institutional culture for inter-agency coordination in energy intelligence, despite growing complexity in global energy dynamics. BIN and BSSN remain peripheral in energy planning discussions, even though vulnerabilities in EBT infrastructure could have cascading impacts across national systems.

Participant D, a former diplomat with ambassadorial experience in Asia-Pacific, further reinforced this view. "Energy is no longer just an economic concern. It is a geopolitical instrument and a matter of sovereignty," he stated (personal communication, November 2023). He pointed out how countries like China embed energy within their national security strategy, while Indonesia still compartmentalizes the issue.

This absence of intelligence foresight appears to stem not from a lack of awareness, but from structural gaps in policymaking processes. While institutions such as National Research and Innovation Agency (BRIN) and National Development Planning Agency (Bappenas) have long-term modelling capabilities, they are not structurally connected to security institutions. Informants noted that without formal linkages, anticipatory intelligence cannot inform early-stage energy planning, leaving Indonesia vulnerable to unforeseen disruptions.

In addition, there is a lack of cross-border scenario modelling or geopolitical threat assessments related to energy system dependencies - particularly in technology imports, mineral value chains, and regional grid integration. Participant B noted, "We know we're dependent on external actors, but we have no shared intelligence mechanism to assess the risks of that dependency."

Climate Disruption, Technological Lag, and the Limits of Forecasting

The final theme emerging from the interviews is the role of climate change in shaping the reliability of renewable energy systems. While much of the policy discussion around EBT has focused on reducing emissions, informants pointed to the irony that renewable infrastructure is itself increasingly vulnerable to climate variability. Participant C explained that solar energy systems have shown significant efficiency drops during prolonged haze events, and hydropower has suffered in regions experiencing erratic rainfall due to climate anomalies. “We are building clean energy infrastructure, but if we don’t integrate adaptive design, it will fail to deliver reliability under changing climate conditions,” he warned (personal communication, December 2023).

Participant E similarly noted that Pertamina’s upstream operations have had to adjust energy modelling due to seasonal unpredictability. “The data we used five years ago no longer matches field realities. We need real-time monitoring and predictive capabilities,” he explained (personal communication, December 2023). He added that climate adaptation is often not considered in early-stage feasibility planning, leading to performance risks post-construction.

What emerged from multiple interviews was a growing concern that EBT deployment strategies are built on static assumptions of climate and environmental stability. However, the accelerating impacts of climate change—such as intensified haze, shifts in cloud cover, and longer dry seasons - are disrupting these assumptions in real time.

This reveals a broader issue: the absence of climate-informed risk modelling in energy system planning. The RUPTL and national resilience frameworks do not systematically integrate climate resilience indicators. This makes the EBT agenda vulnerable not only to climate shocks but also to misplaced infrastructure investments and stranded assets.

Participant D argued that the implications go beyond supply disruptions: “Climate shocks can destabilize national energy narratives, affect investor confidence, and escalate into political dissatisfaction—especially if public expectations are high and service delivery fails,” he said (personal communication, November 2023). Without proper adaptation measures and strategic foresight, climate change may shift from being a justification for renewables to a barrier to their viability.

Indonesia's energy transition is not merely a technical endeavour to decarbonize its energy mix; it is a complex and deeply political process embedded in broader questions of state capacity, institutional coherence, climate adaptation, and national security. This study demonstrates that while EBT has gained prominence in official discourse and regulatory frameworks, the unresolved issue of reliability poses risks that extend beyond energy governance. Using Barry Buzan's typology of sectoral threats (1983), Klare's (2012) framework on energy conflict, and Sugirman's (2009) approach to intelligence foresight, this research frames EBT reliability as a hybrid economic-security threat, shaped by systemic vulnerability and institutional inertia. This perspective also positions reliability as a critical factor in public policy effectiveness, requiring a national-level institutional response that goes beyond technical reform.

The technical challenge of intermittent supply - particularly from solar and wind - is well-documented, but often under-theorized as a security issue. The findings confirm that Indonesia's national grid, transmission infrastructure, and energy storage systems are ill-equipped to manage fluctuating supply from renewable sources. Prof. Ade Gafar's observation on the inadequacy of real-time balancing and the lack of national storage policy indicates a systemic misalignment between energy planning and operational resilience. Buzan's security framework is useful here in expanding our understanding of these risks - not only as engineering problems but as latent threats to the state's ability to ensure consistent public services, economic productivity, and political stability. A failure in reliability, if systemic, could lead to service interruptions that erode public confidence, generate economic losses, and potentially escalate into unrest - dimensions typically analysed within national security and governance studies.

Furthermore, geographic imbalances between resource availability (concentrated in eastern Indonesia) and energy demand (cantered in Java and Sumatra) remain unresolved due to underinvestment in inter-island transmission and regional grid development. This produces an ongoing tension between the potential of renewables and their practical utility in meeting national energy needs. The inability to resolve this spatial disconnection exacerbates reliance on fossil-based legacy systems, particularly coal, whose long-term contracts crowd out grid space for new EBT.

The findings also show how this lock-in is reinforced by institutional and contractual rigidity, a hallmark of what Klare (2012) calls energy path dependence. The Take or Pay (ToP) contracts with Independent Power Producers (IPPs) for coal-fired generation have created a structure in which utilities are disincentivized from absorbing variable renewable output, regardless of cost or environmental impact. This is not simply a policy misstep - it is a structural vulnerability, in which outdated contractual frameworks inhibit systemic reform. It also reflects broader political economy dynamics, including the continued influence of fossil fuel interests and the electoral logic of energy subsidies, both of which sustain Indonesia's dependence on coal.

Interviews with Participant A and other informants point to an additional layer of institutional fragmentation. National, ministerial, and subnational planning instruments operate with insufficient coordination. RUEN, RUED, and RUPTL are developed in parallel but rarely integrated in a way that reflects local realities or anticipates macro-level risks. This leads to a form of what Buzan (1983) would characterize as internal, institutional threats - where disjointed governance structures reduce the state's adaptive capacity. These findings also resonate with studies in energy governance that highlight the role of "policy incoherence" and "siloed mandates" as major barriers to effective transition (Sovacool and Cooper 2013). This fragmentation weakens not only the technical implementation of energy policy but also the state's capacity to act cohesively in response to systemic threats - a central concern in public administration and policy reform literature.

Of particular concern is the absence of strategic intelligence integration in Indonesia's energy transition. The findings reveal that institutions such as BIN are not formally engaged in energy security planning, despite increasing evidence of risk convergence - such as cyber threats to energy systems, climate-related shocks, or geopolitical shifts in technology supply chains. As emphasized by Heru Istiono and Imron Cotan, energy disruption should be viewed as a strategic concern with the potential to affect social cohesion, diplomatic credibility, and national resilience. Yet, current planning remains reactive, focused on supply-demand projections rather than anticipatory scenario modelling. This highlights a critical shortfall in Indonesia's national strategic planning architecture - where foresight mechanisms and institutional linkages remain weak or absent.

Sugirman's (2009) framework on early warning and net assessment is relevant here. It calls for intelligence institutions to not only monitor threats but also provide forward-looking assessments that can guide political decision-making. In the energy sector, this might include risk mapping of critical infrastructure, geopolitical analysis of mineral dependencies (e.g., lithium, rare earths), or long-range modelling of climate volatility. Several countries have adopted institutional models that integrate intelligence and energy planning. For instance, the United Kingdom's National Risk Register (Cabinet Office 2023) includes energy system disruption as a tier-one risk, informed by coordination between security and energy agencies. Germany's Federal Ministry for Economic Affairs and Climate Action has likewise embedded foresight and scenario planning into its *Energiewende* strategy, particularly after the energy shocks following the Russian invasion of Ukraine (Federal Government 2022). These examples demonstrate that strategic energy governance benefits from inter-ministerial collaboration and adaptive planning - elements still missing in the Indonesian context. Indonesia could benefit from institutionalizing a national energy security council or task force that formally connects energy planners with intelligence, environmental, and financial agencies.

Another critical issue is the failure to integrate climate resilience into EBT planning. While renewables are often promoted as climate-friendly, they are not climate-proof. Solar systems in Kalimantan and Sumatra have experienced reduced performance due to haze and seasonal cloud cover, while hydropower has been impacted by irregular rainfall patterns linked to El Niño and climate change. However, energy planning documents like RUPTL rarely incorporate real-time climate models or develop contingency strategies for climate-induced disruption. This leaves infrastructure vulnerable to failure, particularly in frontier regions where grid stability is weakest.

These environmental vulnerabilities also have social and political consequences. Prof. Imron Cotan noted that energy reliability is increasingly linked to public expectation and state legitimacy. If EBT systems fail to deliver promised improvements - or worse, trigger brownouts or price shocks - then the social and political costs could be significant. This aligns with Buzan's societal threat category, in which public unrest and loss of institutional credibility are understood as indirect threats to state security. Reliability failures may also generate regional disparities in energy access, eroding the public's trust in the state's commitment to equity and inclusive development—issues that intersect with political legitimacy.

The study also underscores the need to reframe the energy transition through a security-justice lens. Energy access, affordability, and reliability are not only technical goals but fundamental to development equity and social stability. As argued in the growing literature on energy justice (Heffron and McCauley 2017), transitions must consider who benefits, who is left behind, and how risks and costs are distributed across populations. Without justice-informed design, energy transitions risk reinforcing existing inequalities, especially in remote and economically marginalized regions of Indonesia. In this regard, local stakeholders - particularly provincial governments, energy cooperatives, and community-based renewable initiatives - play a vital role in shaping decentralized energy resilience. However, their influence remains limited by centralized decision-making and a lack of financial and regulatory autonomy. Stronger involvement of these actors in national energy forums, supported by fiscal decentralization and technical assistance, could help align top-down policy with local adaptive needs and improve the reliability outcomes of distributed generation systems.

Moreover, energy sovereignty must be redefined beyond the control of domestic reserves. In a post-fossil future, sovereignty will also depend on technology independence, regulatory foresight, and adaptive governance. Indonesia's reliance on imported solar panels, foreign investment for grid modernization, and externally developed energy models may compromise its ability to set and sustain autonomous energy policy. This echoes Klare's argument that dependence on external actors for energy systems can evolve into strategic subordination. To prevent such subordination, Indonesia must invest in local R&D, strengthen domestic supply chains for EBT technologies, and develop regulatory capabilities that support innovation without undermining security.

While this research is grounded in the Indonesian context, the issue of renewable energy reliability and intelligence foresight is increasingly relevant across other developing economies undergoing similar transitions. Although regional dynamics were not a focus of this study, future research could explore how strategic risk planning and anticipatory governance are being addressed—or neglected—within regional cooperation frameworks such as ASEAN. As member states explore mechanisms for cross-border energy trade and shared infrastructure, the incorporation of reliability indicators and intelligence-based early warning systems may become increasingly necessary.

In sum, this study contributes to the growing literature that views energy transition not merely as a technical substitution process, but as a reconfiguration of state-society relations, institutional structures, and geopolitical positioning. It provides empirical evidence that EBT reliability is not a peripheral issue - it is central to the credibility and sustainability of the transition. It also offers a novel framework by linking energy governance with strategic intelligence, institutional design, and security analysis. This framing enhances academic understanding of how states in the Global South navigate complex transitions under conditions of uncertainty and asymmetric interdependence.

From a policy perspective, the findings call for urgent institutional reform. Energy planning must be reorganized around resilience, not only availability. Intelligence foresight should be embedded in scenario planning. Climate risks must be translated into operational adjustments. And local governments must be given the authority and tools to innovate in their own contexts. Without such changes, Indonesia risks not only missing its energy targets but also deepening systemic vulnerabilities that could erode national security, public trust, and development equity.

CONCLUSION

This research critically examines the threats to energy security posed by the unreliable integration of renewable energy (EBT) within Indonesia's transition framework, arguing that such reliability challenges constitute not merely technical obstacles but multifaceted strategic vulnerabilities. Drawing on Buzan's sectoral threat typology, Klare's theory of energy conflict and dependency, and Sugirman's early warning framework, the study reveals that intermittency, underdeveloped storage infrastructure, and governance fragmentation have turned EBT reliability into a latent security concern. These challenges are further intensified by a legacy of path-dependent fossil fuel investment, institutional inertia, and a lack of anticipatory intelligence planning. Indonesia's national grid remains ill-equipped to absorb fluctuating renewable input, particularly in the absence of a clear national strategy for hybrid energy systems or smart grid integration. Despite the ambitious goals articulated in national policies such as RUEN and RUKN, the research finds significant gaps in institutional coordination, fiscal decentralization, and regulatory clarity, which hinder the practical implementation of EBT at both the national and subnational levels. These findings reaffirm that energy reliability is not a peripheral technical

matter—it is a central governance challenge with direct implications for public service delivery, national resilience, and policy legitimacy. A core insight of this study is the absence of strategic foresight mechanisms within Indonesia's energy planning apparatus. Interviews with national intelligence and policy experts affirm that energy reliability has not yet been securitized in a way that triggers institutional readiness or risk modelling. In light of rising global climate volatility, technological uncertainty, and geopolitical competition over renewable technologies, the findings argue for the urgent incorporation of intelligence institutions and scenario-based planning into the energy transition process.

Climate-induced disruptions, such as hydrological instability and haze events, further complicate EBT performance, especially in remote areas. These emerging risks underscore the importance of not only decarbonizing Indonesia's energy mix but doing so in a manner that preserves national resilience, technological autonomy, and institutional adaptability. By identifying this foresight gap, the research calls attention to the need for anticipatory governance mechanisms that link energy, security, and institutional planning at the national level. To strengthen the scientific and policy foundation for a reliable energy transition, this study recommends several academic and practical steps. Academically, further research is needed on the integration of EBT with fossil fuel-based energy within national grid systems through the application of Hybrid Renewable Energy Systems (HRES). Collaborative research between universities, think tanks, and industry actors should be intensified to design context-specific integration models and to incorporate EBT into the higher education curriculum to build a technically capable workforce. Partnerships with international research institutions are also crucial for knowledge exchange and technology transfer. Future scholarship could also examine how risk perception and strategic foresight are shaped within Indonesia's central government institutions, and how they interact with decentralized policy implementation. Practically, the Government of Indonesia must reinforce regulatory and institutional support for EBT development. The DPR is encouraged to elevate Presidential Regulation No. 112/2022 to a legislative framework that ensures long-term legal certainty and resource allocation.

Kementerian Koordinator Bidang Kemaritiman dan Investasi (Kemendo Marves; Coordinating Ministry for Maritime and Investment Affairs) should assume a leadership role in streamlining foreign investment procedures, strengthening technology transfer agreements, and embedding energy transition within national development planning. Kementerian Energi dan Sumber Daya Mineral (Kementerian ESDM; Ministry of Energy and Mineral Resources) and Kementerian Badan Usaha Milik Negara (KemenBUMN; Ministry of State-Owned Enterprises) must prioritize infrastructure development for energy storage, grid integration, and the mapping of national EBT potential. In parallel, Kementerian Komunikasi dan Informatika (Kemendikominfo; Ministry of Communication and Information Technology) should advance public awareness campaigns that promote the long-term benefits of EBT for energy security, environmental sustainability, and economic growth. Kementerian Luar Negeri is advised to deepen bilateral and

multilateral cooperation with countries producing advanced EBT technologies, and to advocate for international financing mechanisms that support developing countries in achieving their transition targets. BIN should institutionalize energy-related foresight mechanisms, while BRIN and Badan Koordinasi Penanaman Modal (BKPM; Investment Coordinating Board) must lead R&D and investment facilitation in emerging EBT technologies, including nuclear and thorium-based alternatives. These policy actions must be grounded in a whole-of-government approach, ensuring horizontal coordination across ministries and vertical alignment from national to local levels. By reconceptualizing renewable energy reliability through the lens of national security, this study makes an original contribution to both the energy policy and security studies literatures. It calls for a paradigm shift that positions reliability and strategic planning as pillars of sustainable energy governance.

The research also highlights the need for integrating justice considerations, ensuring that the benefits and risks of energy transition are equitably distributed, especially among marginalized regions. In doing so, this study lays the groundwork for future investigations into the governance of energy transitions in other developing countries, particularly in Southeast Asia. Future research may also focus on how intelligence agencies and energy planners in ASEAN member states collaborate—or fail to collaborate—on cross-border energy resilience, scenario planning, and early warning systems. In a broader sense, the Indonesian case offers a valuable lens for understanding how developing states can navigate the pressures of global energy transitions while safeguarding institutional integrity and social stability. Ultimately, safeguarding energy reliability is not only essential for realizing Indonesia's environmental and economic goals, but also for defending its political legitimacy, development equity, and national sovereignty. As energy systems become increasingly entangled with technological innovation, foreign dependency, and climate shocks, energy reliability must be redefined as a strategic benchmark of governance competence. As Indonesia continues to position itself as a regional leader and global climate advocate, the credibility of its energy transition will shape its diplomatic weight in international climate negotiations, influence its ability to attract green investment, and determine its role in co-creating the norms of a sustainable global energy order.

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