Formosa Journal of Multidisciplinary Research (FJMR)
Vol. 5 No. 6, 2026: 1745-1758

Legal and Policy Analysis of Indonesia's Energy Sector: Energy Resilience and Gas Dependence in the Electricity System

Muh. Jamil[1]*, M. Adnan Madjid[2], Anang Puji Utama[3]
Fakultas Keamanan Nasional, Universitas Pertahanan Republik Indonesia
Corresponding Author: Muh. Jamil muh.jamil@kn.idu.ac.id

A R T I C L E I N F O
Keywords: Energy Resilience, Energy Security, Gas Power Plants, RUPTL 2025–2034, Energy Transition

Received : 28, April
Revised : 25, May,
Accepted: 25, June

A B S T R A C T
The 2025–2034 RUPTL plans 10.3 GW of gas-fired power plants, increasing gas demand by 60% by 2034. At the same time, Indonesia's domestic gas reserves are falling by 65.1% to 35.30 TCF, with an estimated lifespan of only 14 years. Using a juridical-empirical approach, this study identifies structural contradictions in gas expansion. In terms of availability, aging power plants (up to 40 years) and limited reserves raise stranded asset risks. Regarding accessibility, infrastructure disparities across regions remain significant. For affordability, LNG import volatility could impose costs of up to IDR 155.8 trillion by 2034. From a sustainability perspective, CO_2 and methane emissions are expected to rise. Legally, this systemic vulnerability may trigger an energy emergency under Presidential Regulation No. 41/2016. Under Law No. 30/2007, energy policy should prioritize diversification toward renewables rather than expanding fossil-based infrastructure that increases long-term energy security risks.

DOI: https://doi.org/10.55927/fjmr.v5i6.108
ISSN-E: 2829-8896
https://journalfjmr.my.id/index.php/fjmr

INTRODUCTION

In May 2025, the government issued the Electricity Supply Business Plan (RUPTL) 2025–2039, targeting an additional 69.5 GW of power generation capacity to support national economic growth and strengthen the electricity system. Of this total capacity, renewable energy is planned to contribute 42.6 GW, energy storage systems 10.3 GW, and fossil-based power plants 16.6 GW, consisting of 6.3 GW of coal-fired power plants and 10.3 GW of gas-fired power plants (Ministry of Energy and Mineral Resources, 2025). This composition indicates that although the energy transition is being directed toward renewables, coal and gas are still positioned as key pillars of the national electricity system in the coming decades.

Natural gas, in various policy documents, is often promoted as a transition fuel due to its lower emission intensity compared to coal. However, several studies indicate that this claim does not fully reflect the overall environmental impact of the gas industry. Brauers et al. (2021) emphasize that natural gas still produces carbon dioxide emissions during combustion as well as methane emissions throughout its production, distribution, and utilization chain. Methane has a significantly higher global warming potential than carbon dioxide in the short term, while leakage rates in natural gas systems can range from 2.3% to 17%, depending on infrastructure characteristics and measurement methods. In addition, large-scale gas infrastructure development may create infrastructure lock-in effects and hinder the acceleration of low-carbon energy deployment.

Beyond environmental issues, the expansion of gas-fired power capacity raises strategic concerns regarding national energy resilience and security. Increasing dependence on gas will require sustained long-term supply, both from domestic production and LNG imports. At the same time, several domestic gas fields are experiencing natural decline. Data shows that Indonesia's proven natural gas reserves decreased from 101.22 TCF in 2016 to 35.30 TCF in 2023, a decline of around 65.1% within seven years (Ministry of Energy and Mineral Resources, 2024). This condition potentially increases Indonesia's reliance on the international LNG market, which is vulnerable to price volatility, supply chain disruptions, and global geopolitical dynamics.

The post Russia–Ukraine conflict energy crisis in 2022 demonstrated that gas supply is influenced not only by technical and economic factors but is also highly sensitive to international geopolitical developments. The surge in global LNG prices and competition for LNG supplies between Asian and European countries highlights how gas dependence can become a source of strategic vulnerability for states (International Energy Agency [IEA], 2023). For Indonesia, this risk becomes increasingly relevant when the expansion of gas-fired capacity is not accompanied by long-term domestic supply security.

From a legal perspective, this issue is not merely a technical energy sector concern but is also linked to the state's obligation to ensure energy availability for the public as mandated by Article 33 of the 1945 Constitution of the Republic of Indonesia, as well as energy and electricity regulations. However, most existing studies on gas power development in Indonesia focus on economic, investment, and emission reduction aspects, while analyses that connect gas

expansion with energy security risks and potential energy emergency conditions remain relatively limited.

Based on this background, this study aims to analyze how increasing dependence on gas in Indonesia's electricity sector may create long-term vulnerabilities in energy security and risks of energy emergency conditions. It also examines the extent to which Indonesia's legal energy framework is capable of anticipating these risks amid growing global competition over gas resources and international geopolitical uncertainty

LITERATURE REVIEW

Energy Security Theory

The concept of energy security has evolved from a traditional approach focused on the availability of energy supply toward a multidimensional framework encompassing economic, environmental, governance, and geopolitical aspects. According to Cherp and Jewell (2011), energy security is the ability of an energy system to ensure a continuous and protected energy supply against various risks that may disrupt a country's social, economic, and political functions. In a modern context, energy security is not only understood as security of supply, but also includes a state's capacity to manage vulnerabilities related to price volatility, geopolitical conflicts, climate change, and disruptions in global energy supply chains.

This theory is relevant to explain how increasing Indonesia's dependence on natural gas may heighten exposure to global LNG geopolitical risks, energy supply disruptions, and vulnerabilities within the national electricity system.

Energy Resilience Theory

The development of energy literature shows that energy security cannot be separated from the concept of energy resilience. Chester (2010) defines energy resilience as the ability of an energy system to anticipate, absorb, adapt to, and recover from various internal and external disruptions.

Cherp and Jewell (2011) explain that a resilient energy system must be able to maintain its core functions despite pressures such as supply crises, natural disasters, geopolitical conflicts, and changes in global energy markets. In the context of this study, the concept of energy resilience is used to assess whether the expansion of gas-fired power generation capacity strengthens or instead weakens the long-term resilience of Indonesia's energy system..

Sustainable Development Theory

The concept of sustainable development was introduced by the World Commission on Environment and Development (1987) in the report Our Common Future. This theory emphasizes that development should meet the needs of the present without compromising the ability of future generations to meet their own needs.

In the energy sector, sustainable development requires a balance between economic growth, equitable access to energy, and environmental protection. Therefore, energy transition strategies that rely too heavily on natural gas must be evaluated not only from the perspectives of economic efficiency and supply

security, but also in terms of their impacts on decarbonization targets and environmental sustainability.

Legal Theory of State Obligation

From a public law perspective, the state has a constitutional obligation to ensure the availability of energy for the public. This obligation is derived from Article 33 of the 1945 Constitution of the Republic of Indonesia, which mandates state control over sectors of production that are important to the state and that affect the livelihood of the people.

According to state obligation theory, the state is not only required to enact regulations but also to ensure the provision of a reliable, sustainable, and accessible energy system for all citizens. Therefore, the risk of energy crises arising from dependence on natural gas should be understood as an issue of law and state governance, rather than merely a technical problem within the energy sector.

Previous Research

A study by Brauers et al. (2021) found that natural gas has the potential to create infrastructure lock-in effects and hinder the transition to low-carbon energy. Meanwhile, a report by CERAH (Shalati, 2025) indicates that the addition of gas-fired power plants in the 2025–2034 RUPTL may increase carbon emissions and place a fiscal burden on the state.

Table 1. Previous Research

No	Researcher and Year	Research Title	Method	Research Result	Similarities with this Research	Differences with this Research
1	Brauers et al. (2021)	*Natural Gas as a Bridge Fuel? A Systematic Review of Sustainability Transition Literature*	Systematic literature review	Natural gas creates methane emissions, infrastructure lock-in, and may hinder long-term decarbonization.	Critically evaluates natural gas as a transition fuel.	Does not discuss energy security or legal consequences of gas dependency.
2	International Energy Agency (2022, 2023)	*World Energy Outlook* and *Gas Market Report*	Global energy market analysis	LNG markets are increasingly affected by geopolitical conflicts, supply disruptions, and price volatility.	Highlights the geopolitical risks of gas dependence.	Does not specifically examine Indonesia's legal preparedness for energy crises.
3	Shalati (2025) – CERAH	*Gas in RUPTL 2025–2034 Hinders Net Zero 2060 Target*	Policy analysis and emissions assessment	Expansion of 10.3 GW gas-fired power plants may generate 10–11 million tons CO_2 annually, create fiscal burdens, and slow	Examines the same RUPTL and gas expansion policy.	Focuses primarily on climate and fiscal impacts, not on energy security, emergency

				Indonesia's decarbonization pathway.		energy risks, or legal frameworks.

However, most of the existing studies above still focus on economic, technical, and environmental aspects. Research that links the increasing dependence on gas in the electricity sector with energy security, energy emergency risks, and its legal implications within the Indonesian energy law framework remains very limited.

This study seeks to address this gap through a juridical-empirical approach that integrates legal, energy security, and geopolitical perspectives. Thus, the novelty of this research lies in its analysis that connects four aspects that have rarely been examined in an integrated manner, namely:

i. The expansion of gas-fired power plants in the RUPTL 2025–2039,
ii. Global LNG geopolitical vulnerability,
iii. Risks of energy crisis and energy emergency, and
iv. The legal construction of Indonesia's energy resilience based on the Energy Law and Government Regulation No. 40 of 2025.

This approach positions natural gas not merely as an energy transition issue, but as a matter of national security and a constitutional obligation of the state to guarantee the right to energy.

Conceptual Framework

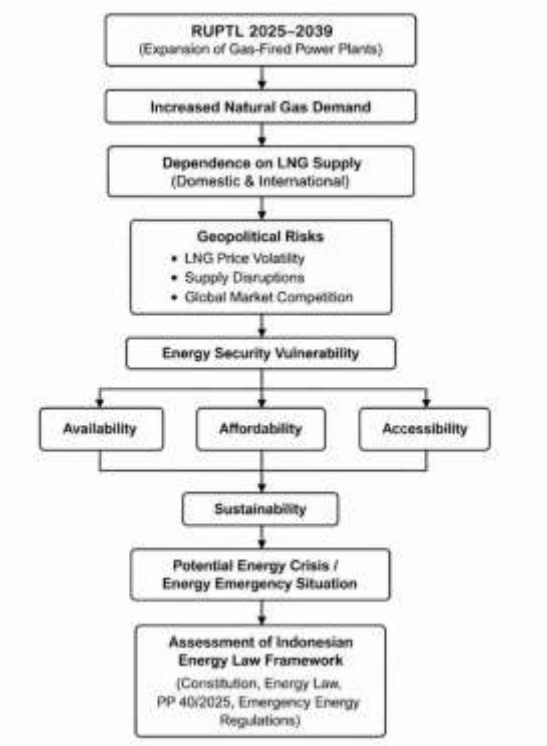


Figure 1. Conceptual Framework

METHODOLOGY

The juridical approach in this study is conducted through an analysis of laws and regulations in the energy and electricity sectors, including Law No. 30

of 2007 on Energy, Law No. 30 of 2009 on Electricity, and Government Regulation No. 40 of 2025 on National Energy Policy (Indonesia, 2007; Indonesia, 2009; Indonesia, 2025). The analysis also covers the concepts of energy crisis, energy emergency, and the state's obligation to ensure energy supply security as part of public service and national interest.

The empirical approach is carried out through document analysis of the National Electricity General Plan (RUKN), the Electricity Supply Business Plan (RUPTL), data on gas production and consumption, LNG demand projections, as well as global gas price dynamics and geopolitical factors affecting energy supply chains (PLN, 2025; International Energy Agency, 2024).

Primary data are derived from regulations and policy documents, while secondary data are obtained from reports of international organizations, academic publications, and previous studies. All data are analyzed qualitatively using an energy security framework and risk analysis to assess the vulnerability of the electricity system due to increasing dependence on gas (Cherp & Jewell, 2014; Winzer, 2012).

RESEARCH RESULT AND DISCUSSION

Energy Security and Energy Resilience Concepts

The concepts of energy security and energy resilience have evolved from a traditional understanding that primarily focused on the availability and affordability of fossil energy into a multidimensional framework encompassing sustainability, system resilience, and the ability to adapt to disruptions. This shift has been driven by increasing geopolitical risks, energy price volatility, and the global energy transition agenda, which demands more reliable and sustainable energy systems (Cherp & Jewell, 2011; Chester, 2010). In this perspective, energy security is no longer merely a supply issue, but also includes governance, economic development, and environmental protection within the framework of sustainable development (World Commission on Environment and Development, 1987).

Historically, the discourse on energy security intensified following the 1973–1974 oil crisis caused by the OPEC embargo, which disrupted supply and triggered a sharp increase in global oil prices from around US$2.90 to more than US$11.60 per barrel, leading to inflation and recessions in many developed countries. Since then, geopolitical factors have become a key determinant of global energy security, as again demonstrated by the Russia–Ukraine conflict in 2022, which prompted the European Union to launch the REPowerEU strategy to reduce energy dependence (IEA, 2022). This event reaffirmed that reliance on specific energy suppliers significantly increases economic and political risks.

In the Indonesian context, this issue has become increasingly relevant with the growing role of gas in the national energy mix. Although Indonesia remains a net LNG exporter, rising domestic demand has created an energy security paradox, where part of export supply must be redirected to domestic needs. The government even faces a potential LNG supply shortage in 2025 due to surging domestic demand, leading to export adjustment policies (IEA, 2022). This condition illustrates the emergence of a new energy dependency, namely reliance on the global LNG market despite Indonesia's status as an exporter.

From a theoretical perspective, energy security focuses on ensuring supply continuity through instruments such as strategic reserves and crisis management, while energy resilience emphasizes the system's ability to anticipate, adapt, and recover from disruptions (Cherp & Jewell, 2011; Chester, 2010). Within this framework, energy resilience encompasses four main dimensions: availability, accessibility, affordability, and sustainability.

Thus, increasing dependence on gas in Indonesia's energy system may shift energy vulnerability from oil dependence toward exposure to global LNG market volatility and international geopolitical risks.

The Use of the Term Energy Resilience in Indonesian Energy Law

In the discourse of Indonesian energy law and policy, the terms energy resilience and energy security are often used interchangeably, although they differ conceptually in scope. Normatively, Indonesian positive law places energy resilience as the primary objective of energy management, while energy security is more appropriately understood as an operational dimension related to supply assurance (security of supply) and energy crisis response mechanisms.

This distinction is important because it determines the direction of energy policy within the context of energy transition and national security (Cherp & Jewell, 2011). Law No. 30 of 2007 on Energy affirms that energy management is not only oriented toward availability, but also efficiency, welfare, and environmental sustainability (Government of the Republic of Indonesia, 2007).

Energy resilience in Indonesian law cannot be reduced merely to supply security; rather, it encompasses the capacity of the national energy system to ensure sustainable, equitable, and affordable energy availability. The Energy Law and its implementing regulations show that energy resilience is positioned at the level of a policy objective, while energy security functions as an operational instrument through mechanisms such as energy reserves, crisis management, and emergency response. This is reflected in Presidential Regulation No. 41 of 2016, ESDM Ministerial Regulation No. 12 of 2022, and Government Regulation No. 40 of 2025, which govern energy crisis and supply resilience governance (Government of the Republic of Indonesia, 2016; 2022; 2025). Thus, energy security is part of energy resilience, not a standalone concept.

In the context of climate change and energy transition, this distinction becomes increasingly important because an approach focused solely on supply security may overlook sustainability and social justice considerations. Conversely, an energy resilience approach requires a balance between energy availability, environmental protection, and equity in the distribution of energy benefits. From a national security perspective, environmental instability and resource conflicts may even evolve into non-military threats to state stability (Buzan et al., 1998; Homer-Dixon, 1999). Therefore, energy resilience must be understood as a multidimensional concept that goes beyond short-term supply logic.

Operationally, Indonesia's energy resilience can be broken down into four main dimensions: availability, accessibility, affordability, and sustainability, as reflected in the Energy Law and reinforced by Government Regulation No. 40 of

2025 (Government of the Republic of Indonesia, 2007; 2025). These dimensions include ensuring energy supply and reserves, equitable access to remote regions, price affordability based on efficiency, and sustainability through energy transition and decarbonization.

The Main Requirements of Indonesia's Energy Resilience

The main requirements of Indonesia's energy resilience can be seen in the following table:

Table 2. The Main Requirements of Indonesia's Energy Resilience

Dimension	**Normative Construction under Government Regulation No. 40 of 2025**
Availability	Ensuring adequate energy supply, national energy reserves, and reducing import dependence (Articles 6, 28)
Accessibility	Equitable access to energy, including remote areas and small islands (Article 6 letter h; Article 7 letter c)
Affordability	Efficiency, productivity, and affordability of energy prices (Articles 2, 6, 65)
Sustainability	Energy transition, conservation, and decarbonization (Articles 2, 31, 33–34)

Source: Author's elaboration (2026)

Thus, energy resilience is an umbrella concept that integrates these four dimensions simultaneously. The success of an energy system is therefore not measured solely by supply availability, but also by equity of distribution, affordability, and environmental sustainability (Government of the Republic of Indonesia, 2025). This approach is consistent with the principles of sustainable development, which require the integration of economic, social, and environmental dimensions in national energy policy.

Energy Resilience Analysis for Gas Power Plants in Indonesia

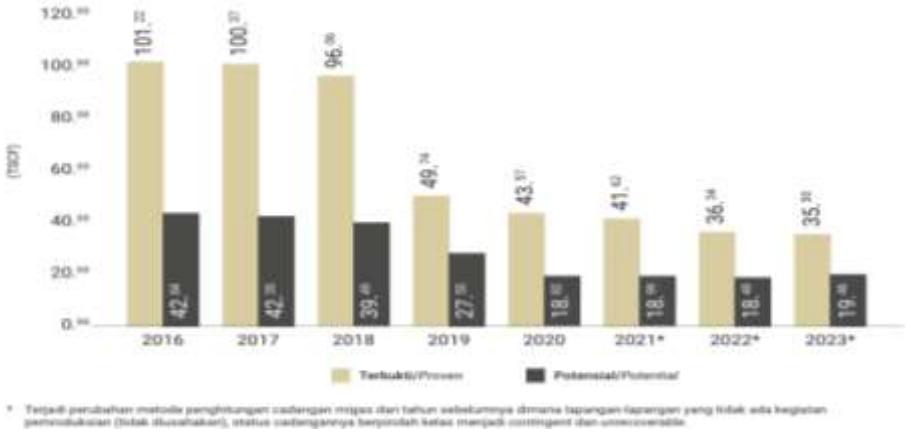
The planned expansion of 10.3 GW of gas-fired power plants under the 2025–2034 RUPTL faces serious challenges to national energy resilience, particularly in terms of availability, affordability, and sustainability. This capacity increase is not matched by long-term certainty of domestic gas supply, while Indonesia's gas reserves show a significant declining trend. This condition creates a risk of supply shocks and increases dependence on imported LNG, which is increasingly vulnerable to price volatility and global geopolitical dynamics (International Energy Agency, 2022; Cherp & Jewell, 2011).

Historically, Indonesia's gas reserves declined from 101.22 TCF (2016) to 35.30 TCF (2023), representing a reduction of approximately 65.1%, with a sharp decline in 2019 due to the implementation of the PRMS 2018 standard. Gas production also decreased from 7,472 MMSCFD (2013) to 6,802 MMSCFD (2024), reinforcing indications of domestic supply constraints. At current production ratios, reserves are projected to last only until around 2037, far shorter than the 40-year economic lifespan of gas power plants, thereby creating stranded asset risks within the national electricity system.

Dependence on imported LNG further increases Indonesia's geopolitical exposure, particularly because the gas trade structure is concentrated among a limited number of supplier countries such as the United States, Qatar, the United Arab Emirates, and Algeria. This dependence is reinforced by energy purchase commitments within international trade policy frameworks, including a US$15 billion oil and gas import agreement with the United States. This condition demonstrates that domestic energy resilience is increasingly linked to geopolitical dynamics and global trade negotiations.

a. Availability

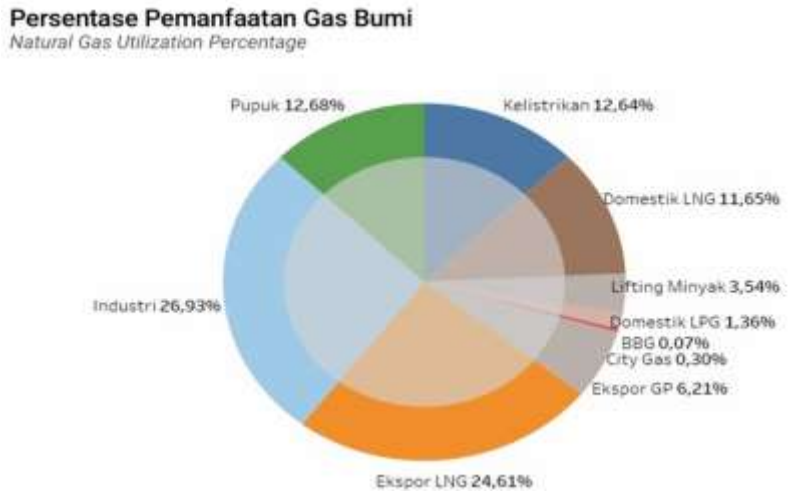
From the availability perspective, declining gas reserves indicate weakening domestic supply capacity. Proven reserves fell from 101.22 TCF (2016) to 35.30 TCF (2023), or around 65.1% (Ministry of Energy and Mineral Resources, 2024). This decline is exacerbated by stagnant production and rising cross-sector consumption, meaning Indonesia may become a net gas importer earlier than previously projected



Source: Statistik Minyak dan Gas Bumi Semester I 2024, Kementerian ESDM

The gap between reserve life and plant lifespan creates a structural dilemma: whether to continue relying on limited domestic gas or shift toward more expensive and volatile imported LNG. In addition, competition across sectors (electricity, industry, fertilizers, and households) intensifies pressure on supply allocation, thereby accelerating the risk of a national gas deficit.

Natural gas utilization is not limited to power generation but also extends to industry, fertilizers, households, and the electricity sector, all of which compete for supply. This rising cross-sector demand strengthens internal competition and increases the likelihood that Indonesia will become a net gas importer sooner, potentially even before 2037, when domestic production is no longer sufficient to meet continuously growing national demand (Ministry of Energy and Mineral Resources, 2024)



Source: Statistik Minyak dan Gas Bumi Semester I 2024, Kementerian ESDM

This contradiction indicates that the narrative of natural gas as an abundant and reliable transition fuel is increasingly inconsistent with empirical realities. The simultaneous decline in reserves, stagnant production, and rising consumption suggests that dependence on gas may in fact create short-term supply vulnerabilities rather than provide a sustainable transition solution..

b. Accessibility

From the accessibility perspective, the distribution of gas reserves, which is concentrated in Kalimantan and Papua, is not aligned with national electricity consumption patterns, where 73.5% is centered in the Java–Bali system. Although the national electrification ratio has reached 99.83%, disparities in quality and reliability of electricity supply remain significant across regions, particularly in Papua, Central Papua, and NTT, which are still below the national average (Ministry of Energy and Mineral Resources, 2024).

paradox emerges in Papua, which hosts the Tangguh LNG production site yet still experiences limited electricity access, reflecting a form of domestic resource curse. The centralized allocation of energy resources indicates that gas is still primarily positioned as an export commodity rather than an instrument for energy equity, thereby reinforcing structural interregional inequality.

Efforts such as small-scale LNG projects are intended to reduce these gaps; however, high distribution costs (30–40% of gas prices) and limited supply capacity mean that equal access to energy continues to face structural constraints

c. Affordability

From an affordability perspective, dependence on imported LNG increases exposure to price volatility. Asian spot LNG prices once surged from below US$5/MMBtu in 2020 to more than US$56/MMBtu in 2021, demonstrating high sensitivity to geopolitical shocks (International Energy Agency, 2022).

The planned addition of 10.3 GW of gas-fired power plants is projected to increase annual costs by up to IDR 155.8 trillion by 2034, including subsidies to cover the price gap between domestic and international gas prices (CERAH, 2025). In the context of an increasingly tight global market driven by competition

between Europe and East Asia, Indonesia faces the risk of escalating energy costs that directly impact fiscal stability and industrial competitiveness.

d. Sustainability

From a sustainability perspective, the expansion of gas-fired power plants risks creating both carbon lock-in and import lock-in. Natural gas remains a fossil fuel that produces CO_2 and methane emissions, with an additional estimated 10–11 million tons of CO_2 per year resulting from the expansion of 10.3 GW of gas-fired capacity.

Moreover, methane emissions have a global warming potential 28–80 time stronger than CO_2 over a 100-year horizon, thereby challenging the claim that gas is a clean transition fuel (Buzan et al., 1998). Consequently, gas risks prolonging fossil fuel dependence while increasing long-term emission burdens, which is inconsistent with Indonesia's Net Zero Emission 2060 target.

Legal and Policy Analysis of Energy Resilience

a. State Obligation and the Architecture of Energy Resilience

In Indonesian energy law, the state does not merely act as a regulator but holds a constitutional mandate over the control of energy production sectors for the greatest prosperity of the people (Republic of Indonesia, 2007). Law No. 30 of 2007 on Energy establishes four pillars of energy resilience—availability, accessibility, affordability, and sustainability—which are further strengthened by Government Regulation No. 40 of 2025 as instruments for diversification, conservation, and energy reserves (Republic of Indonesia, 2025).

Thus, energy resilience constitutes a preventive and long-term legal obligation of the state, rather than merely a technical policy issue (Yergin, 2006).

b. Legal Escalation from Energy Resilience to Crisis and Emergency

Indonesian energy law establishes a graduated legal escalation framework. An energy crisis occurs when supply shortages arise, while an energy emergency occurs when systemic disruptions cause supply failure (Republic of Indonesia, 2007). The four pillars of energy resilience function as legal risk indicators; when they simultaneously weaken, the system enters an escalation pathway toward crisis even before an official emergency status is declared (Winzer, 2012; Sovacool, 2011).

c. Gas Expansion as Structural Risk Production

The 2025–2034 RUPTL reveals a contradiction between the energy transition agenda and energy resilience, as the expansion of 10.3 GW of gas-fired power plants strengthens dependence on volatile and geopolitically vulnerable LNG imports. This condition weakens all pillars of energy resilience, namely: availability (declining reserves), affordability (price volatility), accessibility (distribution inequality), and sustainability (carbon lock-in) (CERAH, 2025; Sovacool, 2011).

Thus, gas becomes a structural risk variable within the national energy system.

d. Escalation Pathway Toward Energy Emergency

Dependence on gas and imported LNG creates a pre-crisis structural condition that moves toward systemic escalation. Normatively, emergency status only applies when conditions meet Article 6 of the Energy Law, yet materially the system shows increasing exposure to external risks (Republic of Indonesia, 2007; Yergin, 2006).

Energy system escalation stages:

i. Normal – stable system based on four resilience pillars (IEA, 2023)
ii. Structural weakness – declining reserves & rising prices (World Bank, 2022)
iii. Pre-crisis – increasing import dependence (BP, 2023)
iv. Crisis – supply shortages (IEA, 2022)
v. Infrastructure disruption – distribution breakdowns
vi. Emergency – systemic failure (Republic of Indonesia, 2007)
vii. Systemic state dysfunction – economic crisis & public service collapse (Sovacool, 2016)

This escalation demonstrates that energy resilience is dynamic and vulnerable to both structural and geopolitical pressures, meaning that energy system failure can evolve into a systemic national threat.

CONCLUSIONS

This study produces the following conclusions and recommendations:

1) The expansion of gas-fired power plants does not strengthen energy resilience, but instead creates a new dependence on volatile and geopolitically vulnerable LNG imports.
2) Normatively, the system has not yet reached crisis or emergency status; however, materially it has entered a structural pre-crisis phase (Winzer, 2012).

Thus, gas policy has the potential to become an escalation pathway toward an energy crisis that undermines the legal objective of energy law as a guarantee of public safety.

RECOMMENDATIONS

This study recommends two key measures:

1) Risk-Based Energy Governance
   Energy resilience must be established as a risk-based legal framework, where every energy expansion is required to be tested against systemic risks such as import dependence, price volatility, and geopolitical exposure.

2) Diversification as a Preventive Legal Instrument
   Gas should not be positioned as a permanent transition solution, but rather as a structural risk. Any expansion of fossil-based power plants must be accompanied by stranded asset analysis, acceleration of

renewable energy development, and limitation of LNG import dependence toward the Net Zero 2060 target.

ADVANCED RESEARCH

The author would like to express sincere gratitude to the previous researchers whose scholarly works served as the main references and intellectual foundation for this study. Their contributions to the fields of energy security, energy resilience, and energy policy have been highly valuable in shaping the analytical framework and theoretical development of this research.

ACKNOWLEDGMENT

The author also expresses the highest appreciation to Formosa Publisher for its support and willingness to facilitate the publication of this scholarly work. Special thanks are also extended to the Supervisor, who has consistently provided guidance, direction, and constructive feedback with great patience throughout the research process.

Finally, the author conveys the deepest gratitude to his parents, as well as his wife and child, for their continuous moral, emotional, and material support throughout this academic journey, without whom the completion of this work would not have been possible.

REFERENCES

BP. (2023). Statistical review of world energy 2023. https://www.bp.com

BP. (2024). Statistical review of world energy 2024. https://www.bp.com

Brauers, H., et al. (2021). Natural gas as a bridge fuel? A systematic review of sustainability transition literature. Energy Research & Social Science, 76, 102083. https://doi.org/10.1016/j.erss.2021.102083

Buzan, B., Wæver, O., & de Wilde, J. (1998). Security: A new framework for analysis. Lynne Rienner Publishers.

CERAH. (2025). Analisis dampak ekspansi pembangkit gas dalam RUPTL 2025–2034. CERAH.

Cherp, A., & Jewell, J. (2011). The three perspectives on energy security: Intellectual history, disciplinary roots and the potential for integration. Current Opinion in Environmental Sustainability, 3(4), 202–212. https://doi.org/10.1016/j.cosust.2011.07.001

Cherp, A., & Jewell, J. (2014). The concept of energy security: Beyond the four As. Energy Policy, 75, 415–421. https://doi.org/10.1016/j.enpol.2014.09.005

Chester, L. (2010). Conceptualising energy security and making explicit its polysemic nature. Energy Policy, 38(2), 887–895. https://doi.org/10.1016/j.enpol.2009.10.039

Homer-Dixon, T. (1999). Environment, scarcity, and violence. Princeton University Press.

Indonesia. (2007). Undang-Undang Nomor 30 Tahun 2007 tentang Energi.

Indonesia. (2009). Undang-Undang Nomor 30 Tahun 2009 tentang Ketenagalistrikan.

Indonesia. (2016). Peraturan Presiden Nomor 41 Tahun 2016 tentang Penetapan dan Penanganan Krisis dan Darurat Energi.

Indonesia. (2022). Peraturan Menteri Energi dan Sumber Daya Mineral Nomor 12 Tahun 2022.

Indonesia. (2025). Peraturan Pemerintah Nomor 40 Tahun 2025 tentang Kebijakan Energi Nasional.

International Energy Agency. (2022). World energy outlook 2022. https://www.iea.org

International Energy Agency. (2023). Gas market report 2023. https://www.iea.org

International Energy Agency. (2024). World energy outlook 2024. https://www.iea.org

Kementerian Energi dan Sumber Daya Mineral Republik Indonesia. (2024). Statistik minyak dan gas bumi Indonesia: Semester I 2024. Kementerian ESDM.

Kementerian Energi dan Sumber Daya Mineral Republik Indonesia. (2025). Rencana Usaha Penyediaan Tenaga Listrik (RUPTL) 2025–2039. Kementerian ESDM.

PT PLN (Persero). (2025). RUPTL 2025–2034. https://www.pln.co.id

Sovacool, B. K. (2011). The governance of energy megaprojects. Energy Policy.

Sovacool, B. K. (2016). Energy and system failure. Energy Research & Social Science.

Winzer, C. (2012). Conceptualizing energy security. Energy Policy, 46, 36–48. https://doi.org/10.1016/j.enpol.2012.02.067

World Bank. (2022). Energy sector outlook report. https://www.worldbank.org

World Commission on Environment and Development. (1987). Our common future. Oxford University Press.

Yergin, D. (2006). Ensuring energy security. Foreign Affairs, 85(2), 69–82.