



Decision-Making on Additional Power Supply for the Timor System: A Systematic Literature Review of Analytic Network Process Applications

I Dewa Gde Budhita Mahaprasetya¹, I Ketut Gunarta^{2*}

^{1,2}Departemen Teknik Sistem dan Industri, Institut Teknologi Sepuluh Nopember, Indonesia

E-Mail: ¹budhita13@gmail.com, ²ik.gunarta@gmail.com

Received Apr 24th 2026; Revised Jun 16th 2026; Accepted Jul 07th 2026; Available Online Jul 19th 2026

Corresponding Author: I Ketut Gunarta

Copyright © 2026 by Authors, Published by Institut Riset dan Publikasi Indonesia (IRPI)

Abstract

This study employs a Systematic Literature Review (SLR) to synthesize empirical findings on the application of the Analytic Network Process (ANP) in energy planning and power-supply decision-making. The review identifies commonly used evaluation criteria, assessed alternatives, and strategic implications for electricity-system planning, particularly in constrained or semi-isolated systems such as the Timor System. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 framework, including identification, screening, eligibility assessment, and inclusion. Relevant literature was retrieved from Scopus and Google Scholar using keywords related to ANP, power-system planning, energy storage, generation expansion, and electricity decision-making. Of 52 records identified, eight studies satisfied the inclusion, eligibility, and quality-assessment criteria and were synthesized. The findings show that ANP effectively evaluates alternatives involving interdependent technical, operational, economic, environmental, and policy criteria. Battery Energy Storage Systems (BESS) and other flexible low-carbon technologies are generally preferred when reliability, flexibility, and policy alignment are prioritized, whereas conventional thermal generation remains competitive under cost-oriented scenarios. This review transforms dispersed ANP evidence into a structured decision-making framework for the Timor System and recommends evaluating future power-supply alternatives using reliability-oriented, scenario-based, and policy-aligned weighting instead of relying solely on economic comparisons.

Keywords: Analytic Network Process, Energy Planning, Power Supply, Systematic Literature Review, Timor System

1. INTRODUCTION

The availability of reliable and sustainable electricity is one of the main pillars supporting economic growth, social stability, and improvements in quality of life. In an electrical power system, supply reliability is determined not only by the adequacy of generation capacity but also by the system's ability to maintain operations under contingency conditions. This requirement is reflected in the single-contingency reliability standard, commonly expressed as the N-1 criterion [1]. In small-scale or quasi-isolated power systems, such as the Timor System in East Nusa Tenggara, this challenge becomes more complex because of limited reserve margins, dependence on fossil fuel-based power plants, limited interconnection with other systems, the geographical separation of load centers, and the need to maintain supply continuity when local generating units become unavailable because of outages, contract expirations, or changes in generation agreements.

Based on the projections presented in the 2025–2034 Rencana Usaha Penyediaan Tenaga Listrik (RUPTL), Indonesia's Electricity Supply Business Plan, the Timor System is expected to experience a power deficit beginning in 2026 because of the expiration of independent power producer (IPP) generation contracts and rising peak demand. These conditions may reduce system reliability and increase the risk of blackouts [2]. These characteristics distinguish the Timor System from large interconnected systems because reserve adequacy, start-up capability, fuel logistics, technological readiness, and policy alignment must be considered simultaneously. Therefore, the addition of power-supply capacity constitutes a strategic decision that must be supported by a comprehensive analysis.

In practice, decision-making related to the addition of generation capacity is complex because it involves various interdependent criteria. These criteria include technical aspects, such as reliability, reserve capacity, and operational flexibility; operational aspects, such as ramp rate and start-up time; economic aspects, such as investment costs, operating costs, and energy efficiency; and policy aspects, such as alignment with

the RUPTL and energy transition objectives. Therefore, conventional single-criterion approaches or deterministic analyses based solely on cost comparisons are often unable to produce system-wide optimal decisions [3]. In this context, multi-criteria decision-making (MCDM) is a relevant approach because it can integrate multiple criteria into a systematic decision-making framework [4], [5].

One of the increasingly applied MCDM methods is the Analytic Network Process (ANP), which was developed as an extension of the Analytic Hierarchy Process (AHP). Unlike AHP, which assumes that relationships among criteria are independent and hierarchical, ANP accommodates interdependence and feedback among elements within a decision system [4]. This characteristic makes ANP particularly suitable for complex problems, such as electrical power-system planning, which involves interactions among technical, operational, economic, and policy-related aspects. According to Taherdoost and Madanchian, ANP offers advantages in modeling nonlinear and interdependent relationships among criteria and improving the accuracy of decision prioritization [6]. In addition, Büyüközkan et al. demonstrated that an ANP-based approach could provide more robust results for energy-source selection than other MCDM methods because it accounts for causal relationships among decision factors [7].

Previous studies applying ANP in the energy sector can be classified into several types of decisions. First, in generation-expansion decisions, Kaytez applied fuzzy ANP to evaluate wind-power expansion strategies and found that economic and technical factors had a dominant influence on decision-making [8]. Second, in energy-storage and system-flexibility decisions, Yang et al. developed a fuzzy ANP-based model to evaluate the benefits of energy-storage projects by simultaneously integrating economic, social, and technical aspects [9]. Third, in renewable-energy site-selection decisions, Shafiee integrated ANP with the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to determine optimal locations for wind farms [10].

2. MATERIALS AND METHOD

This study employed a Systematic Literature Review (SLR) design to synthesize empirical findings on the application of the Analytic Network Process (ANP) in power-supply planning and related electrical power-system decision-making. The review procedure followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 framework, which comprises the stages of identification, screening, eligibility assessment, and final inclusion of relevant studies [15]. The review focused on studies addressing additional power-supply capacity, electrical power-system expansion, Battery Energy Storage Systems (BESS), coal-fired and diesel power-generation alternatives, ANP applications, and closely related multi-criteria decision-making approaches in the energy sector in illustrated in Figure 1.

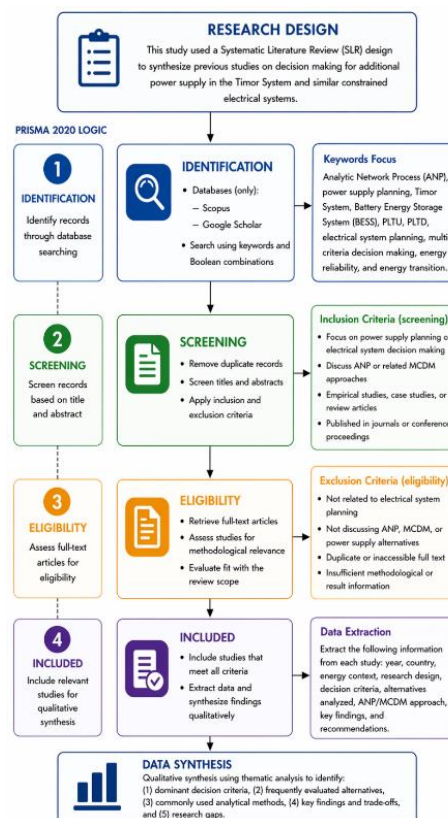


Figure 1. Research Methodology

2.1. Data Sources and Search Strategy

A literature search was conducted using the Scopus and Google Scholar databases. The search strategy employed Boolean combinations of the following keywords: (“Analytic Network Process” OR “ANP”), (“multi-criteria decision-making” OR “MCDM”), (“power-supply planning” OR “electrical power-system expansion” OR “generation expansion”), and (“Battery Energy Storage System” OR “BESS” OR “energy storage”). Additional technology- and system-related search terms included “coal-fired steam power plant,” “*Pembangkit Listrik Tenaga Uap*” (PLTU), “diesel power plant,” “*Pembangkit Listrik Tenaga Diesel*” (PLTD), “reliability,” “energy planning,” and “electricity decision-making.” These keywords were combined using the Boolean operators AND and OR to identify studies that explicitly applied the Analytic Network Process (ANP), including ANP-based hybrid models, in the contexts of power-supply planning, energy storage, renewable energy, and electrical power-system planning. The search was limited to journal articles and conference papers published between 2015 and 2025 and written in either English or Indonesian. This publication period was selected because it captures recent developments in ANP-based energy planning, the increasing integration of renewable-energy and energy-storage technologies, and the growing need for decision-making models that incorporate power-system reliability and energy-transition considerations in illustrated in Table 1.

Table 1. Search strategy and initial literature records

Database/source	Main search terms	Initial records
Scopus	("analytic network process" OR ANP) AND ("power supply planning" OR "electricity system expansion" OR "generation expansion")	16
Scopus	("analytic network process" OR ANP) AND ("battery energy storage system" OR BESS OR storage) AND ("energy planning" OR reliability)	12
Google Scholar	"analytic network process" "power supply planning" BESS PLTU PLTD "electricity system" "multi-criteria decision making"	24
Total	-	52

2.2. Inclusion and Exclusion Criteria

The inclusion criteria were as follows. (1) Studies explicitly discussed the Analytic Network Process (ANP) or ANP-based hybrid approaches in energy planning, power supply evaluation, electricity system expansion, energy storage assessment, or closely related decision-making contexts, ensuring that the selected articles remained directly relevant to the focus of this review. (2) Studies reported decision criteria, alternative technologies, analytical procedures, or strategic planning recommendations, allowing the review to identify recurring patterns in ANP applications. (3) Full-text articles were available for review, ensuring that each study could be examined in sufficient depth during the data extraction and synthesis stages. (4) Publications were within the predefined year range, ensuring that the review reflected relatively recent developments in ANP-based energy planning. The exclusion criteria were as follows. (1) Studies were unrelated to electricity systems or power supply decision-making. (2) Studies were conceptual essays without clear methodological or operational findings. (3) Records were identified as duplicates during the screening process. (4) Papers provided insufficient methodological explanations or inadequate descriptions of the results for reliable synthesis. The inclusion and exclusion criteria are presented in Table 2.

Table 2. Inclusion and exclusion criteria

Criterion	Inclusion	Exclusion
Topic scope	ANP, energy planning, power supply, BESS, electricity expansion, storage evaluation	Studies unrelated to electricity or supply planning
Evidence type	Empirical study, review study, conference paper with clear findings	Opinion paper or conceptual note only
Accessibility	Full text available	Abstract only or inaccessible full text
Publication period	2015-2025	Outside the time range

2.3. Study Selection Procedure

The initial search identified 52 records from the selected databases. After duplicate removal and title–abstract screening, 22 studies remained for further evaluation. Of these, 15 reports were sought; however, 3 could not be retrieved in full text, leaving 12 studies for eligibility assessment through full-text review. At this stage, studies were excluded if they did not sufficiently discuss power supply decision criteria, did not clearly apply the Analytic Network Process (ANP) or a related multi-criteria decision-making (MCDM) method, or lacked adequate descriptions of the methodology and results required to support a comparative analysis. A quality assessment was subsequently conducted on the 12 full-text studies using five criteria: relevance to electricity or energy planning, explicit application of an ANP or hybrid MCDM procedure, clarity of the criteria

and alternatives, transparency of the results, and transferability of the findings to constrained or semi-isolated systems. Each criterion was qualitatively assessed as either adequate or inadequate. Studies with inadequate methodological explanations, unclear results, or limited relevance to the focus of the review were excluded. Upon completion of the selection and quality assessment processes, 8 studies were included in the final synthesis. This final selection demonstrates that the review prioritized relevance to strategic power supply planning and the transferability of ANP-based evidence rather than technological similarity alone. Therefore, studies addressing energy storage, renewable energy expansion, site selection, and planning under reliability constraints were retained when they provided meaningful insights relevant to the focus of the review in illustrated in Figure 2.

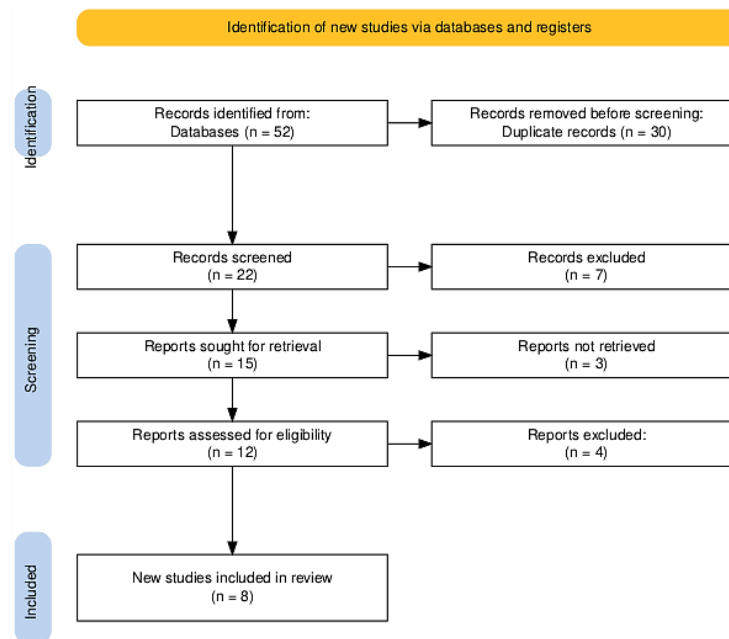


Figure 2. PRISMA Review Procedure

2.4. Data Extraction and Synthesis

Data extraction in this study was conducted systematically to capture the most relevant information from each selected article in a consistent format. The extraction process focused on several key elements: the author and year of publication, the decision-making or planning context analyzed, the energy sector or application setting, the main Analytic Network Process (ANP) or hybrid analytical methods employed, the dominant decision criteria identified, the main alternatives evaluated, the quality assessment results, and the strategic recommendations reported in each study. These elements were selected because they provided a clear basis for comparing how ANP had been applied across different energy-planning environments and how the reviewed studies structured complex power supply decisions. Following the data extraction stage, the findings were synthesized using thematic analysis to identify recurring patterns and relationships across the reviewed studies [15], [16]. The synthesis was structured around four main dimensions: dominant decision criteria, thematic decision contexts, analytical approaches applied, and strategic recommendations reported in the literature. This approach was selected because the included studies varied in terms of context, technological focus, and methodological design, making direct statistical aggregation less appropriate. Therefore, narrative and thematic synthesis was considered more suitable for preserving contextual richness while identifying broader patterns relevant to the Timor System..

3. RESULTS AND DISCUSSION

3.1. Results

The final dataset consisted of eight studies that met all inclusion and quality assessment criteria. The selected papers cover power generation expansion, renewable energy selection, energy storage evaluation, wind site selection, and broader reviews of ANP applications in energy-related decision-making. Although their application settings differ, the studies consistently examine complex power supply or technology-related decisions and, therefore, provide a relevant evidence base for understanding additional power supply planning in the Timor System. In terms of publication trends, the reviewed studies were concentrated in the 2021–2024 period, comprising one study published in 2021, three in 2022, two in 2023, and two in 2024. The thematic distribution comprised three review studies on ANP or MCDM applications, two studies on power generation or renewable energy expansion and energy source selection, two studies on energy storage or reliability

planning, and one study on site selection. This distribution indicates that recent ANP research in the energy sector has increasingly focused on hybrid, comparative, and energy transition-oriented decision contexts, whereas direct applications to semi-isolated power systems, such as the Timor System, remain limited in illustrated in Table 3.

Table 3. Characteristics of the Selected Studies

Author(s)	Energy planning / decision context	Main tools	Key findings
Gonzalez-Urango et al. [3]	ANP applications in economics, finance, and management	Review of ANP applications	ANP is suitable for complex decisions with interdependent criteria
Taherdoost and Madanchian [6]	Comprehensive review of ANP method	ANP review framework	ANP offers advantages in feedback-based and non-linear decision structures
Büyüközkan et al. [7]	Renewable energy selection	Integrated DEMATEL-ANP-VIKOR	Energy technology choice is sensitive to multiple technical and sustainability criteria
Kaytez [8]	Wind power expansion strategy	Fuzzy-ANP	Economic and technical factors strongly shape expansion priorities
Yang et al. [9]	Grid-side commercial storage project evaluation	Fuzzy-ANP	Storage evaluation requires simultaneous consideration of technical, economic, and social benefits
Shafiee [10]	Wind energy development site selection	Fuzzy ANP-TOPSIS	Hybrid approaches improve ranking robustness under complex criteria
Sahoo and Goswami [11]	MCDM trends in energy and related sectors	Comprehensive MCDM review	Hybrid and comparative approaches are increasingly common in energy decision making
Singh and Pachori [14]	Grid expansion and reliability with electricity storage	Planning and reliability analysis	Storage is important for maintaining balance and reliability in constrained systems

3.1.1. Dominant Decision Criteria

Across the selected studies, technical reliability and economic feasibility emerged as the most recurrent decision-making dimensions. Technical criteria were represented by system reliability, reserve adequacy, operational security, and flexibility, whereas economic criteria commonly included investment costs, operating costs, and broader feasibility considerations. Operational flexibility was also frequently reported, particularly in studies addressing energy storage or renewable energy integration. Policy and environmental alignment remained relevant across many studies, especially when energy transition objectives and regulatory consistency were taken into account. Implementation and technology readiness criteria were less dominant but remained important for translating analytical results into feasible investment decisions. These patterns are illustrated in Table 4. These patterns indicate that power supply planning is determined not by a single factor but by the interaction of technical, economic, operational, implementation, and policy-related criteria [3], [6], [8], [9].

Table 4. Synthesis of Dominant Decision Criteria in the Reviewed Literature

Decision criterion	Frequency in reviewed studies	Typical role
Technical reliability	High	System adequacy, reserve margin, N-1 security, supply continuity
Economic feasibility	High	Investment cost, operating cost, cost efficiency, and affordability
Operational flexibility	Moderate-High	Fast response, ramping, start-up performance, and balancing capability
Policy/ environmental alignment	Moderate-High	Energy transition goals, regulatory consistency, and sustainability direction
Implementation/ technology readiness	Moderate	Maturity, deployment practicality, and infrastructure fit

3.1.2. Analytical Approaches Used in ANP Studies

The review also reveals a strong methodological pattern. Classical ANP remains central because it enables the explicit modeling of interdependent criteria and feedback relationships. However, many studies complement ANP with methodological extensions and supporting techniques, such as Fuzzy ANP, hybrid ANP-TOPSIS, DEMATEL-ANP-VIKOR, scenario analysis, and sensitivity analysis, to enhance decision-

making robustness under uncertainty. This finding confirms that ANP-based energy planning studies generally combine structured criteria weighting with comparative scenario evaluation and post-ranking validation rather than relying solely on a single ranking result [6], [7], [10], [11]. Such methodological integration is particularly relevant to the Timor System because expert judgments regarding reliability, cost, and policy preferences may vary across different planning scenarios.

3.1.3. Strategic Recommendations Reported in the Literature

The most consistent recommendation across the reviewed studies is the use of integrated multi-criteria frameworks that simultaneously balance reliability, flexibility, cost, implementation readiness, and policy objectives. Another recurring recommendation is the inclusion of energy storage technologies, such as BESS, in comparative evaluations, particularly when reliability, rapid response capability, and energy transition goals are emphasized. Many studies also recommend conducting sensitivity analyses to determine whether the ranking results remain stable under changes in criterion weights. In addition, several authors emphasize the need to align energy technology decisions with policy frameworks, planning horizons, and implementation constraints to ensure that the final decision is not only technically sound but also strategically feasible [7], [8], [9], [14]. For the Timor System, these recommendations suggest that PLTU, PLTD, BESS, and hybrid alternatives should be compared under distinct reliability-oriented, cost-oriented, and policy-oriented scenarios before the preferred power supply option is selected, as illustrated in Table 5.

Table 5. Recurring Strategic Recommendations in the Reviewed Studies

Strategic recommendation	Primary issue addressed	Expected effect
Integrated multi-criteria evaluation	Single-factor bias in technology choice	More balanced ranking across reliability, cost, and policy goals
Include BESS and flexible resources in comparison	Limited flexibility and reserve support	Better assessment of fast-response and transition-oriented options
Conduct sensitivity and scenario analysis	Ranking instability under changing weights	Improve robustness of final decision
Align decision criteria with policy objectives	Mismatch between technical choice and strategic direction	Ensure long-term consistency with transition and planning goals
Combine technical and economic evidence in investment planning	Trade-off between reliability and cost	Support more transparent and defensible supply decisions

3.2. Discussion

The synthesis indicates that ANP-based studies consistently identify the interdependence of decision criteria, rather than any single performance metric, as the central challenge in power supply planning. In electricity planning, alternatives cannot be adequately evaluated on the basis of cost alone because the final decision is shaped by interactions among reliability, reserve adequacy, operational flexibility, operating profiles, implementation readiness, and policy alignment. This explains why technical reliability repeatedly emerges as one of the most dominant dimensions in studies addressing constrained or energy transition-oriented systems [3], [6], [8], [9]. In a semi-isolated power system such as the Timor System, these interdependencies are even more pronounced because low reserve margins, outage risks, contract expirations, and limited interconnection capacity can amplify the operational consequences of power supply decisions.

The recurring prominence of economic feasibility as a co-dominant criterion further suggests that power supply decisions inherently involve trade-offs. Even when energy storage or cleaner technologies provide advantages in terms of reliability and flexibility, conventional thermal alternatives may remain competitive when greater emphasis is placed on investment and operating costs. This pattern implies that ANP studies in the energy sector do not simply identify a universally superior technology; rather, they demonstrate how ranking outcomes depend on the strategic priorities assigned to reliability, cost, policy objectives, and implementation feasibility [7], [8], [9], [14]. Therefore, the practical value of ANP for the Timor System lies in its ability to make these trade-offs transparent and defensible for planners and decision-makers.

Another important finding is the consistency of the analytical tools employed across the reviewed studies. ANP remains central because it can capture feedback relationships and interdependencies among criteria. However, many authors strengthen the method by integrating fuzzy logic, DEMATEL, TOPSIS, VIKOR, and sensitivity analysis. This finding suggests that robust energy planning should not end with the calculation of a priority vector; it should also assess the stability of the results when uncertainty, subjective judgments, or changes in policy emphasis are introduced [6], [10], [11]. The reviewed literature also highlights several limitations of ANP. The method relies heavily on expert judgments, requires consistent pairwise comparisons, and can become increasingly complex when numerous criteria and interdependencies are incorporated. These limitations can be mitigated by integrating ANP with fuzzy logic to address uncertainty, DEMATEL to map causal relationships, TOPSIS or VIKOR to strengthen the final ranking process, and sensitivity analysis to evaluate ranking robustness.

For the Timor System, the review provides a practical conceptual framework for power supply planning. First, the decision problem should be defined in terms of supply adequacy and reliability risks, including potential power deficits, reserve margin limitations, and N-1 security requirements. Second, the alternatives should include not only conventional thermal options, such as PLTU and PLTD, but also BESS and hybrid supply configurations capable of providing rapid response and operational flexibility. Third, the ANP network should integrate technical, operational, economic, policy-related, and implementation-readiness criteria because these dimensions are mutually influential. Fourth, the resulting rankings should be evaluated under reliability-oriented, cost-oriented, and energy transition-oriented scenarios. Under this framework, the preferred alternative for the Timor System should be the option that remains robust across different scenarios, particularly when reliability and operational flexibility are treated as primary requirements rather than secondary considerations.

This review also has several limitations. The selected studies were conducted in diverse energy contexts and did not all directly examine the Timor System; therefore, the synthesis does not imply complete contextual equivalence. The number of included studies was also limited because the review prioritized articles that explicitly reported ANP or ANP-based hybrid procedures, decision criteria, alternatives, and sufficiently detailed results. Nevertheless, the included studies share common planning characteristics, such as multi-criteria evaluation, technology comparison, and trade-offs between reliability and cost, thereby enabling the conceptual transfer of their findings to power supply planning in the Timor System. Future studies could extend this review by incorporating broader database coverage, bibliometric mapping, and empirical ANP validation using local power system data, expert judgments from power system planners, and context-specific scenario analyses. Further research could also integrate ANP with optimization techniques, reliability simulations, or techno-economic modeling to establish a more direct connection between qualitative priority weights and operational power system performance.

4. CONCLUSION

This systematic literature review demonstrates that the Analytic Network Process (ANP) has been consistently applied to support complex power supply planning decisions involving technical, operational, economic, implementation-related, and policy criteria. Of the 52 records initially identified, eight studies were included in the final synthesis following the screening, eligibility assessment, and quality appraisal processes. The reviewed literature indicates that technical reliability, economic feasibility, operational flexibility, policy and environmental alignment, and technology readiness are the most frequently emphasized decision dimensions. Across the selected studies, ANP, Fuzzy ANP, hybrid ANP-TOPSIS, DEMATEL-ANP-VIKOR, and sensitivity analysis were commonly employed to evaluate alternatives such as BESS, PLTU, PLTD, renewable energy expansion, and other power supply options. The practical implication for the Timor System is that additional power supply options should not be selected solely on the basis of the lowest cost. Instead, they should be evaluated using an integrated ANP-based framework that prioritizes supply reliability, reserve adequacy, operational flexibility, implementation readiness, and alignment with energy transition policies. In this context, BESS and hybrid flexible resources should be carefully evaluated when reliability and rapid response capabilities are prioritized, whereas PLTU and PLTD alternatives should be transparently assessed under cost-oriented scenarios. Future research should validate the findings of this review through empirical applications using local power system data, expert judgments, and scenario-based sensitivity analyses to enable a more robust identification of the most suitable alternative for the Timor System.

REFERENCES

- [1] Kementerian ESDM, *PM ESDM No.20/2020 Aturan Jaringan Tenaga Listrik*. 2020.
- [2] PT PLN, “RUPTL PLN 2025 2034,” 2025.
- [3] H. Gonzalez-Urango, E. Mu, A. Ujwary-Gil, and A. Florek-Paszkowska, “Analytic Network Process in Economics, Finance and Management: Contingency Factors, Current Trends and Further Research,” *Expert Syst. Appl.*, vol. 237, pp. 1–13, Mar. 2024, doi: 10.1016/j.eswa.2023.121415.
- [4] T. L. Saaty, *Theory and Applications of the Analytic Network Process: Decision Making With Benefits, Opportunities, Costs, and Risks*. Pittsburgh: University of Pittsburgh, 2013.
- [5] A. Ishizaka and P. Nemery, *Multi-Criteria Decision Analysis*. Chichester: Wiley, 2013. doi: 10.1002/9781118644898.
- [6] H. Taherdoost and M. Madanchian, “Analytic Network Process (ANP) Method: A Comprehensive Review of Applications, Advantages, and Limitations,” *J. Data Sci. Intell. Syst.*, vol. 1, no. 1, pp. 12–18, May 2023, doi: 10.47852/bonviewJDSIS3202885.
- [7] G. Büyükoçkan, Y. Karabulut, and F. Göçer, “Spherical Fuzzy sets Based Integrated DEMATEL, ANP, VIKOR Approach and its Application for Renewable Energy Selection in Turkey,” *Appl. Soft Comput.*, vol. 158, pp. 1–21, Jun. 2024, doi: 10.1016/j.asoc.2024.111465.
- [8] F. Kaytez, “Evaluation of Priority Strategies for the Expansion of Installed Wind Power Capacity in Turkey using a Fuzzy Analytic Network Process Analysis,” *Renew. Energy*, vol. 196, pp. 1281–1293,

-
- Aug. 2022, doi: 10.1016/j.renene.2022.07.043.
- [9] H. Yang, W. Fan, G. Qin, and Z. Zhao, "A Fuzzy-ANP Approach for Comprehensive Benefit Evaluation of Grid-Side Commercial Storage Project," *Energies*, vol. 14, no. 4, pp. 1–17, Feb. 2021, doi: 10.3390/en14041129.
 - [10] M. Shafiee, "Wind Energy Development Site Selection Using an Integrated Fuzzy ANP-TOPSIS Decision Model," *Energies*, vol. 15, no. 12, pp. 1–20, Jun. 2022, doi: 10.3390/en15124289.
 - [11] S. K. Sahoo and S. S. Goswami, "A Comprehensive Review of Multiple Criteria Decision-Making (MCDM) Methods: Advancements, Applications, and Future Directions," *Decis. Mak. Adv.*, vol. 1, no. 1, pp. 25–48, Jun. 2023, doi: 10.31181/dma1120237.
 - [12] IAM, "Asset Management—An Anatomy V3," 2015. [Online]. Available: https://theiam.org/media/1781/iam_anatomy_ver3_web.pdf
 - [13] M. Resch, J. Buhler, B. Schachler, and A. Sumper, "Techno-Economic Assessment of Flexibility Options Versus Grid Expansion in Distribution Grids," *IEEE Trans. Power Syst.*, vol. 36, no. 5, pp. 3830–3839, Sep. 2021, doi: 10.1109/TPWRS.2021.3055457.
 - [14] D. Singh and S. Pachori, "Planning for Grid Expansion and Maintaining Reliability in the Context of Electricity Storage," in *2022 International Conference on Futuristic Technologies (INCOFT)*, IEEE, Nov. 2022, pp. 1–6. doi: 10.1109/INCOFT55651.2022.10094374.
 - [15] M. J. Page *et al.*, "The PRISMA 2020 Statement: an Updated Guideline for Reporting Systematic Reviews," *BMJ*, pp. 1–13, Mar. 2021, doi: 10.1136/bmj.n71.
 - [16] J. Thomas and A. Harden, "Methods for the Thematic Synthesis of Qualitative Research in Systematic Reviews," *BMC Med. Res. Methodol.*, vol. 8, no. 1, pp. 1–10, Dec. 2008, doi: 10.1186/1471-2288-8-45.