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Conference Paper

ENERGY SECURITY AND THE ENERGY TRANSITION

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Abstract.

Geopolitical instability and worldwide conflicts impact the gas and oil market, triggering fluctuations in prices of natural gas, coal, and oil. These disturbances highlight the fragile nature of traditional energy systems and demonstrate the strategic relevance of renewable energy as the sturdy alternative. This paper draws on a qualitative content analysis of policy documents, institutional agendas, and expert narratives in Australia and Indonesia to shows the consequences of renewable integration on energy security. The results indicate that Australia's accelerated transition to renewables, with the aid of large-scale battery deployment, enhances economic resilience and tackles grid stability problems. New case studies from South Australia demonstrate that batteries are keeping the power on and integrating renewables more effectively. Comparison with Indonesia reveals common challenges of coal reliance and decentralised grids, as well as opportunities for cooperation through the Australia-Indonesia Climate Infrastructure Partnership. Findings underscore the importance of supply chain diversification, renewable adoption, and international collaboration for achieving sustainable, affordable, and secure energy systems in a world of geopolitical and climate insecurity.

Keywords: energy security; renewable energy; geopolitical conflict; supply chain diversification; energy transition

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Introduction

Volatility of geopolitical instability continue to affect the security of global energy (1,2). Conflict between Israel and Gaza, along with the Russian invasion of Ukraine, shows the impact of geopolitical events to supply chains and energy prices. Fossil energies like oil, natural gas, and coal have all experienced price shocks that reverberate across industries worldwide. In response, renewable energy emerges as a robust alternative (3,4). After the instalment, renewables operate with zero marginal cost and remain insulated from external geopolitical shocks. This transition shows commitment to decarbonisation and energy transition in many countries, particularly Australia and Indonesia (5,6).

Literature Review

Theoretical Studies

Importance of energy trilemma, sustainability, affordability, and reliability, defines the main challenge of modern energy systems (7). Conventional energy systems such as coal and gas remain vulnerable to global price fluctuations and climate-induced disruptions. In contrast, renewable energy offers resilience by decentralising supply, reducing reliance on fossil fuel imports, and lowering exposure to geopolitical conflict (8). Batteries and distributed energy resources further enhance resilience by stabilising electricity systems against sudden shocks, ensuring grid reliability, and enabling black start capabilities. Theoretical frameworks in energy security highlight diversification of supply chains as critical not only for fossil fuels but also for renewable technologies like solar photovoltaics, wind turbines, and battery storage (5,6,9).

Empirical Studies

Australia offers a unique case study of rapid renewable integration (5,6,10–12). In 2024, 46% of the country's electricity was being generated by renewables, and installed capacity stood at 61%. The target of 82% renewable electricity by 2030 requires effort for doubling renewable penetration within five years. South Australia leads the transition with 74% renewable generation in 2024 and a target of 100% by 2027. One of the first large scale batteries, the Hornsdale Power Reserve, proved its worth by stabilising grids during extreme weather. When a storm in 2018 took out significant transmission lines, the battery rapidly kicked in, and helped save South Australia from blackouts, while neighbouring states that still rely on coal experienced power outages. Battery projects continue to multiply, with nearly 20 gigawatts worth now planned, under construction or approved.

Methods

The study use a qualitative content analysis approach for deriving valid and replicable inferences from textual data (13,14). The analysis examines narratives on renewable energy transition, policy frameworks, and institutional strategies within Australia and Indonesia, with attention to their implications for energy security. Primary sources consist of government reports, international agreements, energy industry publications, and peer-reviewed academic studies produced over the past two decades. Selection criteria emphasize relevance to sustainability, affordability, reliability, and geopolitical resilience in energy systems, particularly in coal dependency, renewable integration, and battery storage deployment. The unit of analysis centres on state-led initiatives, cross-national collaborations, and institutional responses to managing the energy trilemma. Data credibility is ensured through triangulation of official publications, expert commentary, and corroboration with academic literature.

Results and Discussion

The Australia experience highlights both opportunities and challenges of renewable energy transition (10,12,15,16). Renewable integration strengthens economic resilience. Industrial sectors like data centres, green metals, and hydrogen exports are relocating to regions with high renewable penetration, creating future-oriented jobs. However, reliability risks persist. The blackout accident that occurred in South Australia in 2016 revealed vulnerabilities in grid infrastructure under extreme weather events. However, lessons learned from that event informed new strategies, that are scaling up battery storage, improving grid resiliency, and integrating distributed energy resources (5,6).

Indonesia presents similar comparisons of challenges. Coal has been the basis for cheap electricity in both countries historically, and both have great extensive grids (10,17). The $200 million Australia-Indonesia Climate Infrastructure Partnership (Kinetic) reflect the Australia’s effort to support Indonesia’s transition through investment in renewable energy and increased energy security. Additionally, diversification of the supply chains of renewable energy continues to be important. Australia has launched schemes to try and get joint ventures with its Indo-Pacific partners, one being Indonesia, to build solar panels, batteries and hydrogen electrolysers. These partnerships decrease dependence on concentrated suppliers and strengthen the resilience of regional supply chains (5,6).

Conclusion

Geopolitical issues, climate crisis and volatility of international energy price challenge the relevance need for resilient and sustainable energy systems. Renewables energy mitigate upheaval and ensure economic stablity in addition to fostering new industries. Batteries and distributed resources are important to assist in balancing grids and offer protection against catastrophic regional blackouts. There are lessons that can be drawn from Australia's shift for Indonesia, both in terms of moving toward renewables, building grid resilience and diversifying the supply chain. Both countries provide a way forward on secure, sustainable, affordable energy futures in a world which is becoming more uncertain.

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