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Battery Energy Storage: A Key Enabler for Low-Carbon, Reliable Grid

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Abstract

The global shift toward decarbonization and growing renewable energy adoption makes energy storage system crucial for balancing supply, managing peak demand, and enhancing grid flexibility. As Malaysia accelerates its energy transition to achieve net-zero emissions by 2050, the integration of variable renewable energy sources is rapidly increasing. Unlike some regional peers, Malaysia is not blessed with sufficient wind resources to develop large-scale wind farms, resulting in a heavy reliance on solar.

Over the next five years, several large coal-fired and gas power plants are scheduled to retire, leading to a significant reduction in baseload and mid-merit capacity. These poses growing concerns over system adequacy, especially as the rapid growth of data centers accelerates electricity demand. The development timeline for these high-demand facilities is much shorter than the long lead times typically required to commission new thermal generation, further widening the reliability gap.

In this context, battery energy storage systems (BESS) have emerged as a critical enabler of grid resilience and reliability. BESS can provide multiple grid services, including peak demand management, firming of solar output and contingency reserves. Strategically deployed, BESS can help smooth solar generation variability, defer costly grid reinforcements, and enhance overall system flexibility. This paper examines the potential of BESS in Malaysia's power system, focusing on their role in improving reliability and resilience as the energy mix shifts. The presentation includes planning, regulatory, and investment perspectives to support large-scale deployment of BESS.