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Battery energy storage becomes more economically viable

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Talk about solar energy adoption is beginning to shift from meeting sustainability goals to making the most economically viable choice, says Solarvest Holdings Bhd (KL:SLVEST) group vice-president Jack Tan Qi Jie. He attributes this to improved battery energy storage systems (BESS) and advanced technologies like artificial intelligence (AI).

"Sustainability is going from a luxury to an economic decision that makes sense. We used to always talk about energy transformation and the energy revolution as good-to-haves, but now it is a necessity for some businesses to go green to keep energy costs down," says Tan, who adds that costs for solar and BESS have fallen by as much as 70% to 80% in the past decade.

BESS allows businesses to store excess solar energy generated in the day and deploy it strategically. Usually, this would occur during peak demand periods, when electricity tariffs spike.

This capability has become especially desirable for businesses under Malaysia's evolving tariffs. Last year, Tenaga Nasional Bhd (TNB) introduced the Regulatory Period Four (R4) framework, which changed how it charges for electricity, shifting from a category-based system to one based on voltage used.

This has driven up electricity costs, as the base rate approved under RP4 is roughly 5 sen/kWh higher than the previous system, and consumption during peak hours now incurs higher charges. Tan notes that electricity costs have risen by about 22% for medium-voltage users and up to 200% for high-voltage users, depending on sector and use case.

With BESS, businesses can rely on energy stored in batteries during these peak hours, reducing reliance on the grid and avoiding higher charges. Tan says this results in a far more predictable energy bill.

Beyond potential savings, he notes that general technological maturity has made these solutions more affordable.

"About three years ago, [a BESS battery] was around US\$300/kWh. Now, they cost around US\$110 to US\$130/kWh, with forecasts of US\$80 to US\$90/kWh by 2030," says Tan.

"This pricing can drop further by 50% due to two criteria when it comes to BESS production: raw materials to make these batteries are getting cheaper, and the technology to build them is improving."

He notes that these improvements are not limited to solar infrastructure, as BESS uses lithium-ion batteries. The maturity of technologies like electric vehicles also spills over, leading to reduced costs for the technology as a whole.

This translates into tangible returns. Tan estimates that BESS projects can deliver savings ranging from 20% to 65%, depending on load profiles, with typical payback periods ranging from three to six years.

Additionally, Tan notes that some businesses are seeing BESS as a hedge against energy price volatility. With geopolitical tensions such as the war in Iran leading to fuel price fluctuations, renewable energy (RE) and BESS provide long-term stability.

USING TECHNOLOGY TO MAXIMISE EFFICIENCY

While BESS provides the hardware, Tan argues that the true cost-saving potential lies in the software. Energy usage is rarely static. Production schedules shift, demand peaks change according to the season, and some machines may be offline for maintenance.

AI-enabled management systems are increasingly becoming a part of the larger BESS system to resolve this gap. For Solarvest Holdings, it is



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its AIES, the AI-powered Energy Simulator. These energy monitoring solutions act as platforms that monitor real-time energy consumption and usage patterns. They then

create a forecast of demand, determining the optimal moments to charge and discharge the battery. This ensures that the battery in BESS is used in ways to maximise financial benefit.

"BESS is just a component; to make it work effectively, you need a smart system to manage it," says Tan.

He adds that these management systems play a critical role in system design, especially as factories dive deeper into automation and Industry 4.0. By analysing real-time data, AI can help determine the appropriate size for solar and battery installations, avoiding overinvestments.

"When talking of automation, which is more [taxing] on the electricity supply, you need a strong battery energy system to manage production. Some may think coal would be the cheapest, but now coal is three to four times more expensive than it used to be, but BESS provides an avenue for more stable growth," says Tan.

NOT A SOLUTION FOR EVERYONE

Despite its growing appeal, BESS is not a universal solution. Its value depends heavily on a business's energy profile: how much it uses and how frequently.

Tan notes that industries with high and fluctuating energy usage stand to benefit the most. Heavy manufacturers such as cement, steel and aluminium producers are prime candidates. Businesses involved in agriculture, like rice farmers, will also be key beneficiaries.

These sectors typically experience significant demand spikes due to batch processing, heavy machinery or seasonal operations. Tan notes that, for them, BESS can deliver substantial savings, often in the range of 30% to 50%.

On the flipside, businesses with stable, flat energy loads may see limited benefits. Facilities such as cold storage warehouses that operate with consistent power usage 24 hours a day, seven days a week, do not generate the demand peaks that BESS is designed to mitigate.

Similarly, commercial users on lower tariffs, like small and medium enterprises in shoplots, may also not consume enough energy to justify the investment. Even among large corporations, highly optimised operations with dedicated energy management teams may only see modest financial gains.

In such cases, Tan says energy efficiency measures like upgrading equipment or improving processes may see better results.

This is why he emphasises that BESS must be seen as part of a larger ecosystem. Its effectiveness depends on integration with broader energy strategies, including solar generation, intelligent management systems and operational adjustments.

"Energy security is important, and you can't just be looking at BESS. The world is changing and unpredictable, businesses need to find the right solutions [for them] to take control of it for the long term," says Tan. ■