

South Korea's BESS energy storage system is resistant to low temperatures



Overview

Why South Korea Is Betting on Grid-Scale Battery Energy Storage
South Korea's BESS industry experienced a critical turning point following a series of batte.

Key Takeaways

South Korea's BESS are designed with advanced thermal management systems, which help maintain performance in low temperatures, though extreme cold can still reduce efficiency and capacity.
Overview of South Korea's BESS Deployment

South Korea is rapidly expanding its battery energy storage systems (BESS) to support renewable energy integration and grid stability, with a nationwide tender for 540 MW of BESS totaling 3,240 MWh planned for completion by 2026 . These systems are intended to store excess solar and wind energy and dispatch it during peak demand or low-generation periods, making them critical for seasonal and daily grid balancing . Major domestic manufacturers like LG Energy Solution, SK On, and Samsung SDI are leading the development of these utility-scale lithium-ion BESS .

Low-Temperature Considerations

Lithium-ion batteries, which dominate South Korea's BESS, are sensitive to low temperatures. At temperatures below 0°C, the following effects can occur:

- Reduced capacity and energy output due to slower electrochemical reactions.
- Lower charge acceptance, meaning batteries take longer to charge.

- Potential for lithium plating, which can reduce battery lifespan if charging occurs at very low temperatures. To mitigate these issues, South Korean BESS typically incorporate thermal management systems (TMS), which include:
 - Active heating using internal resistive heaters or liquid-based heat exchangers to maintain optimal battery temperature.
 - Insulation and enclosure design to reduce heat loss in cold climates.
 - Battery management systems (BMS) that adjust charging and discharging rates based on temperature readings to prevent damage. These measures allow BESS to operate reliably in moderate cold conditions, such as winter temperatures in South Korea, while maintaining grid support functions. However, extremely low temperatures (e.g., below -20°C) may still require additional precautions or temporary derating of capacity.

Practical Implications

- South Korea's BESS are engineered for seasonal variations, including cold winters, ensuring renewable energy can be stored and dispatched efficiently.
- The combination of advanced lithium-ion chemistries, TMS, and BMS enhances resilience against low-temperature performance degradation.
- Operators planning BESS deployment in colder regions should consider site-specific thermal management strategies to maintain efficiency and battery longevity. In summary, while South Korea's BESS are not immune to the effects of extreme cold, their design and thermal management systems provide significant resistance to low temperatures, enabling reliable operation for grid stabilization and renewable energy integration.

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Lithium-ion batteries, popular candidates for BESS due to their high energy density and long cycle life, are susceptible

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