BATTERY ENERGY STORAGE - ECONOMY

NEWS: According to a report by the Central Electricity Authority (CEA), around **34 gigawatts (GW)** or 136 gigawatts per hour (GWh) of battery energy storage systems is expected to be installed in India by 2030.

WHAT'S IN THE NEWS?

Background

- India is targeting to have **half of its electric power** capacity come **from renewables by 2030** and energy storage is key in maintaining grid flexibility during surplus and deficit power generation.
- Traditional energy sources offer consistent output, but renewable energy's variability can cause a **3-5% error** in dispatches.
- For India's planned 500 GW capacity by 2030, a 3% error could cut 15 GW, destabilizing the grid.

Ancillary Services

- In absence of infrastructure that can store electricity in large amounts, it must be produced and used simultaneously.
- **Ancillary services provide quick, real-time adjustments** to balance supply and demand of power. There are three kinds of ancillary services;
    - **Primary services** respond to fluctuations in real-time (less than a second), making them most relevant in addressing imbalances in renewables-heavy grids. They can only be provided via hydroelectricity, and battery storage (more on that later).
    - **Secondary services** respond to fluctuations within 10-15 minutes. These comprise gas-based capacities.
    - **Tertiary services** take about 20-30 minutes to respond, and comprise thermal power plants, including the coal-fired plants that remain in use in India.

Need for Battery Storage

- Renewables make up roughly **10%** of India's energy portfolio at the moment. As India's grid becomes more renewables-heavy, deployment of **Battery Energy Storage Systems (BESS)** is necessary.
- BESS is the fastest in responding to grid contingencies, and can transition from standby to full power in under a second.
- It can provide essential services such as frequency control, voltage regulation, congestion relief, peak shaving, power smoothing, and peak capacity support, making it an invaluable asset in the modern grid.

Challenges

- **Raw Material Scarcity:** India lacks sufficient reserves of critical materials like lithium, cobalt, and nickel, essential for battery manufacturing.
- **Energy Density and Lifespan:** Current battery technologies may not meet the energy density requirements for long-term storage or withstand prolonged cycling without significant degradation, impacting overall efficiency.
- **Regulatory Hurdles**: Lack of clear regulatory frameworks and incentives for BESS deployment slows down its adoption, making it harder to integrate into the existing grid.

Way Ahead

- The government announced a **Viability Gap Funding scheme,** allocating INR 3,760 crore to develop 4,000 MWh of battery storage systems.
- **Partnering with industry leaders and start-ups** to co-develop and commercialize advanced energy storage technologies will be key to driving innovation and scaling solutions.
- Also developing efficient and scalable **battery recycling facilities** will help recover valuable materials and reduce the environmental impact of battery waste, supporting a circular economy.

Source: https://indianexpress.com/article/explained/expert-explains-battery-storage-renewables-heavy-electricity-grid-9611568/