FAQs

What are Solid-State Batteries?

Q What is the context ?

A After Twitter CEO Parag Agrawal, now another Indian origin is in the headline is Jagdeep Singh, CEO and founder of a US battery startup. The reason for his recent buzz for his breakthrough battery technology.

Q What is QuantumScape ?

A

- QuantumScape Corp is a battery startup backed by Volkswagen AG.
- Its solid-state battery lithium metal with a solid electrolyte separating the two electrodes is seen as an exceptionally bright prospect in E-Vehicle industry.

Q What are Solid-state batteries?

A

- A solid-state battery is a battery technology that uses solid electrodes and a solid electrolyte, instead of the liquid or polymer gel electrolytes found in lithium-ion or lithium polymer batteries.
- Such batteries can provide potential solutions for many problems of liquid Li-ion battery, such as flammability, limited voltage, unstable solid-electrolyte interphase formation, poor cycling performance and strength.

Q What are Li-ion Batteries?

A

- Lithium-ion batteries use aqueous electrolyte solutions, where ions transfer to and fro between the anode (negative electrode generally made of graphite) and cathode (positive electrode made of lithium), triggering the recharge and discharge of electrons.
- The energy density of lithium-ion cells used in today's mobile phones and electric vehicles is nearly four times higher than that of older-generation nickel-cadmium batteries.

Q What are limitations of Li-ion Batteries ?

A

- **Low energy density:** Despite improvements in technology over the last decade, issues such as long charging times and weak energy density persist.
- **Small appliances:** While lithium-ion batteries are seen as sufficiently efficient for phones and laptops, they still lack the range that would make EVs a viable alternative.
- **Extreme reactivity:** One major problem is that lithium metal is extremely reactive.
- **Corrosion of cells:** The main form of lithium corrosion is dendrites (branched lithium structures) that grow out from the electrode and can potentially pierce the separator short-circuiting the cell.
- **Fire hazard:** In current lithium-ion batteries, in which the electrolyte is a flammable liquid, dendrite formation can trigger a fire.

FAQs

Q What is the breakthrough?

A

- QuantumScape claims to prevent dendrites formation.
- It uses a solid-state separator technology that eliminates the side reaction between the liquid electrolyte and the carbon/graphite in the anode of conventional lithium-ion cells.
- The replacement of the separator enables the use of a lithium-metal anode in place of the traditional
- The lithium metal anode is more energy-dense than conventional anodes, which allows the battery to store more energy in the same volume, according to the company.

Q What are the advantages of QuantumScape Battery ?

A

- The advantages of the solid-state battery technology include higher cell energy density (by eliminating the carbon anode), lower charge time (by eliminating the need to have lithium diffuse into the carbon particles in conventional lithium-ion cells).
- It has the ability to undertake more charging cycles and thereby a longer life, and improved safety.
- Lower cost could be a game-changer, given that at 30 per cent of the total cost, battery expenses are a key driver of the vehicle costs.

Q How is India's battery push ?

A

- The centre is working on a blueprint for a project of around 4,000 MWh of grid-scale battery storage system at the regional load dispatch centres that control the country's power grid, primarily to balance the vagaries of renewable generation.
- Reliance Industries Ltd has announced plans to set up an Energy Storage Giga factory; state-owned NTPC Ltd has floated a global tender for a grid-scale battery storage project.
- The Ministry of Heavy Industries issued a request for proposal for setting up manufacturing facilities for Advanced Chemistry Cell (ACC) battery storage in India.