

Solid-state batteries

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In news- Shareholders of California-based **QuantumScape Corp, a solid-state battery startup** backed by Volkswagen AG, have approved a multibillion-dollar pay package for **Chief Executive Officer Jagdeep Singh** recently.

About solid-state batteries-

- A solid-state battery **uses solid electrolyte** instead of the liquid or polymer gel electrolytes found in lithium-ion or lithium polymer batteries.
- They 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.
- QuantumScape's solid-state battery lithium metal with a solid electrolyte separating the two electrodes – is seen as an exceptionally bright prospect in an increasingly crowded space.
- The company's **use of a solid state separator technology eliminates the side reaction between the liquid electrolyte and the carbon/graphite in the anode of conventional lithium-ion cells.**
- 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.
- 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.
- 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 to internal combustion engines as lithium metal is extremely reactive.

- **The QuantumScape design is supposed to be 'anode-free'** in that the battery is manufactured in a discharged state, and the negative electrode forms in situ on the first charge.
- **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), 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 percent of the total cost, battery expenses are a key driver of the vehicle costs.