Electric Vehicle Fires

What is the issue?

The recent incidents of fire involving electric two-wheelers (ETWs) have raised concerns over quality and safety of these vehicles.

What are EVs?

- EVs are vehicles that are either partially or fully powered on electric power.
- While some EVs used lead acid or nickel metal hydride batteries, the standard for modern battery electric vehicles is now considered to be lithium ion batteries.

What are lithium ion batteries, and how do they work?

- A Li-ion battery consists of an anode, cathode, separator, electrolyte, and two current collectors.
- The anode and cathode is where the lithium is stored, while the electrolyte carries positively charged lithium ions from the anode to the cathode and vice versa through the separator.
- The movement of the lithium ions creates free electrons in the anode, which creates a charge at the positive current collector.
- **Features**
    - Light weight
    - High energy density
    - Ability to recharge
    - Longer lifespan compared to a lead acid battery
    - More efficiency
    - Greater driving range
- Because of the high energy density, a battery management system (BMS) is applied to a Li-ion battery to make sure they operate safely.
- A BMS constantly measure the voltage, current flowing, charging and discharging rate, battery life cycle, and efficiency.

What are the pros and cons of EVs?

Pros of EV

- **Low running costs**- Electric vehicles have low running costs as they have less moving parts for maintaining.
- **Energy efficient-** EVs convert over 77% of the electrical energy from the grid to power at the wheels.
- **Environmentally friendly**- They also very environmentally friendly as they use little or no fossil fuels.
- **Reduced energy dependence**- Electricity is a domestic energy source.
- **Performance benefits**- Electric motors provide quiet, smooth operation and stronger

acceleration and require less maintenance than internal combustion engines.

Cons of EV

- **Driving range-** EVs have a shorter driving range than most conventional vehicles.
- **Recharge time-** Fully recharging the battery pack can take 3 to 12 hours. Even a "fast charge" to 80% capacity can take 30 min.
- **Thermal runaway-** Even if few batteries malfunction and cause a short circuit, it can kickstart a chain reaction resulting in a fire, given that a battery pack is tightly packed with a number of Li-ion cells.

Why did the EVs' batteries catch fire?

- The actual reasons behind the Ola and Okinawa EVs catching fire are currently unknown as the companies have said they are investigating the matter.
- Okinawa said that from its preliminary observations, the fire in its scooter was a result of short circuiting due to negligence in charging the vehicle.
- A number of reasons could result in these batteries becoming a fire risk, such as
    - Manufacturing defects (use of cheap knocked down kits and batteries)
    - External damage
    - Faults in the deployment in the BMS
    - Extremely high temperatures
    - Thermal runway
    - Prior accidents of a vehicle which may have damaged the battery pack
    - Overcharging

What is the need of the hour?

- **Addressing the lacunae**- The government too has been lax and has allowed ETWs with speeds of less than 25 km/hour to be sold without any serious certification.
- **Proper investigation**- The Ministry of Road Transport and Highways has ordered a probe into the vehicles catching fire abruptly.
- It has reached out to the Centre for Fire Explosive and Environment Safety (CFEES) to carry out investigations.
- **Alternative options**- Debates are mounting on whether battery swapping would be a better solution for electric scooter in India.
- When the user's vehicle battery is discharged fully or about to be discharged, manufacturers or a third-party provider just swaps it out with a fully-charged battery at a battery-swapping station.
- One of the key elements of EV, charging is in complete control of the swapping company and the customer never has to charge the battery.
- The other advantage of swapping is that there is always an extra pool of batteries giving ample time to charge the batteries.
- The government needs to act swiftly to frame stringent regulations and standards.

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