

## 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 runaway
  - 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.

## References

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