Electric Vehicles: The Advantages and Challenges

This editorial is based on **EVs are crucial for decongesting our cities** which was published in The Hindu Business line on 21/05/2023. It talks about importance of Electric Vehicles and their potential benefits.

For Prelims: Lithium, Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme, Vehicle Scrappage Policy, Production Linked Incentive (PLI) scheme

For Mains: EVs: Advantages, Challenges, Way Forward and Government policies

There can be no denying that the era of **electric vehicles (EVs)** is well and truly upon us. With zero tailpipe emissions, EVs are a direct cure for air pollution and will also help reduce **oil imports**.

There has been a significant rise in the production and sales of electric vehicles in recent years. Many major automobile manufacturers have invested heavily in EV technology, launching a wide range of electric models to cater to the growing demand. This increased availability and diversity of electric vehicles contribute to the notion that the era of EVs is indeed underway.

Advancements in battery technology and infrastructure have played a crucial role in accelerating the adoption of EVs. The development of more efficient and affordable batteries has extended the driving range of electric vehicles, reducing range anxiety for consumers. Additionally, the expansion of charging infrastructure, including public charging stations and home charging solutions, has improved the convenience and accessibility of EVs for drivers.

Furthermore, governments and policymakers around the world have shown a strong commitment to promoting electric vehicles as a means to address climate change and reduce emissions.

Why are EVs crucial?

- **Environmental Benefits:** EVs have the potential to significantly reduce greenhouse gas emissions and combat **climate change.**
    - Unlike **fossil fuel** engine vehicles, EVs produce zero tailpipe emissions.
    - EVs help reduce carbon dioxide (CO_2) and other pollutants that contribute to air pollution, smog, and global warming.
    - Electric vehicles help reduce harmful pollutants such as nitrogen oxides (NOx), particulate matter (PM), **and** volatile organic compounds (VOCs).
        - This has a direct positive impact on public health, as cleaner air reduces the risk of respiratory and cardiovascular diseases.
- **Energy Diversity and Security:** EVs contribute to energy diversity by reducing dependence on oil imports.

        - As the electricity grid can be powered by a mix of energy sources, including renewables like solar and wind, EVs offer the opportunity to shift transportation towards cleaner and more sustainable energy options.
            - This reduces vulnerability to fluctuations in oil prices and enhances energy security by reducing reliance on fossil fuel imports.
- **Technological Advancements and Job Creation:** The development and adoption of EVs have spurred technological advancements in battery technology, electric drivetrains, and charging infrastructure.
    - These advancements not only benefit the automotive sector but also have broader applications, such as energy storage for **renewable energy** sources and grid stability.
    - Electric mobility creates jobs and innovation in battery manufacturing, **renewable energy** , and charging infrastructure.
- **Long-Term Cost Savings:** Electric vehicles have lower operating costs, as electricity is generally cheaper than gasoline or diesel.
    - Moreover, EVs have fewer moving parts and require less maintenance, resulting in reduced servicing and repair expenses over time.
- **Decongesting Cities:** Electric vehicles can help decongesting cities by promoting **shared mobility** and **compact design.**
    - Shared mobility refers to the use of vehicles as a service rather than as a personal asset. This can reduce the number of vehicles on the road and the need for parking space.
    - Compact design refers to the use of smaller and lighter vehicles that can fit more easily in urban spaces. This can also reduce congestion and emissions.
    - Innovative and futuristic smart EVs for shorter intra-city distances, day- trips, and the like would not need a bigger battery. That means less time to recharge and lower cost.

What are the challenges for EVs?

- **High Initial Cost:** The upfront cost of purchasing an electric vehicle is relatively higher compared to conventional vehicles. The high initial cost makes it less affordable for many potential buyers, limiting the demand for EVs.
    - This cost difference is primarily due to the expensive battery technology used in EVs.
- **Limited Charging Infrastructure:** In India, the charging infrastructure is still in the early stages of development and is concentrated in major cities.
    - The lack of a robust and widespread charging network makes it inconvenient for EV owners, especially for those living in apartments or without dedicated parking spaces.
- **Range Anxiety:** Range anxiety refers to the fear or concern of running out of battery charge while driving. Limited driving range is a significant challenge for EV adoption.
    - Although EV ranges have been improving, there is still a perception that EVs may not offer sufficient range for long-distance travel, particularly in a country with vast distances like India.
    - The batteries in EVs degrade over time, which can lead to a decrease in range.
- **Battery Technology and Supply Chain**: The production of lithium-ion batteries, which are a key component of EVs, requires specific minerals and rare earth elements.
    - India currently relies heavily on imports for battery manufacturing, leading to supply chain challenges.
    - The charging time of EVs is longer than the refuelling time of conventional vehicles, which affects their convenience and usability.
- **Limited Model Options:** Currently, the availability of electric vehicle models in India is relatively limited compared to conventional vehicles. The market needs more options in various segments, including affordable EVs, to cater to diverse consumer preferences and requirements.

What are some government initiatives to promote EV adoption?

- The **Faster Adoption and Manufacturing of Electric Vehicles (FAME)scheme II,** which provides incentives for EV manufacturers and buyers. These incentives include subsidies, tax rebates, preferential financing, and exemptions from road tax and registration fees.
- The **National Electric Mobility Mission Plan (NEMMP),** which sets out the target to achieve 6-7 million sales of hybrid and electric vehicles year on year from 2020 onwards by providing fiscal incentives.

- The **National Mission on Transformative Mobility and Battery Storage,** which seeks to create a comprehensive ecosystem for the adoption of EVs and support the establishment of giga-scale battery manufacturing plants in India.
- The **Production Linked Incentive (PLI) scheme**, which provides incentives for the manufacturing of electric vehicles and components.
- The **Vehicle Scrappage Policy**, which provides incentives for the scrapping of old vehicles and the purchase of new electric vehicles.
- The **Go Electric campaign** aims to create awareness on the benefits of EVs and EV charging infrastructure.
- India is among a handful of countries that support the global **EV30@30 campaign**, which aims for at least 30% new vehicle sales to be electric by 2030.
- The Ministry of Power, in its revised guidelines on charging infrastructure (MoP Guidelines), has prescribed that at least one charging station should be present in a grid of 3 km and at every 25 kms on both sides of the highways.
- The **Ministry of Housing and Urban Affairs** has also amended the **Model Building Bye-laws, 2016 (MBBL)** to mandate setting aside 20% of the parking space for EV charging facilities in residential and commercial buildings.

What should be the Way Forward for India to adopt EVs?

- Reduce the initial cost of owning an EV by providing subsidies, tax incentives, and financing schemes for both consumers and manufacturers.
- Increase the choice of EVs by encouraging innovation, competition, and collaboration among Original Equipment Manufacturers **(OEMs)**, start-ups, and other stakeholders.
- Encourage domestic manufacturing of EVs and related components through incentives and supportive policies.
- Raise the awareness among the public by launching campaigns, portals, and platforms to educate them about the benefits and incentives of EVs.
- Improve the electricity distribution and supply by investing in renewable energy sources, smart grids, and energy storage systems.
- Reduce the charging time of EVs by developing fast-charging and battery-swapping technologies and standards.
- Expand the EV charging infrastructure by creating a network of public and private charging stations across the country with adequate quality and accessibility.
- Enhance the service centre and repair options for EVs by training and certifying technicians, mechanics, and dealers for EV maintenance and servicing.
- Encourage government institutions, including public transport authorities, to adopt EVs in their fleets. This would create a significant demand for EVs, stimulate the market, and demonstrate the viability of electric mobility.
- Developing a domestic battery manufacturing ecosystem and reducing reliance on imports is crucial to address this challenge.
    - Recent, lithium discovery in Rajasthan could be crucial for this.

Conclusion

India has set a very ambitious target to achieve net zero by 2070 at UNFCC COP26. To achieve this goal, EVs have a crucial role to play. While EVs themselves produce zero tailpipe emissions, the overall environmental impact of electric vehicles depends on the source of the electricity used to charge them. If the electricity is generated from renewable sources like solar or wind, the environmental benefits are maximized.

Drishti Mains Question

Discuss the potential impact of electric vehicles on the transportation sector and the environment. Evaluate the challenges and opportunities associated with their widespread adoption.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q. In the cities of our country, which among the following atmospheric gases are normally considered in calculating the value of Air Quality Index? (2016)

1. Carbon dioxide
2. Carbon monoxide
3. Nitrogen dioxide
4. Sulfur dioxide
5. Methane

Select the correct answer using the code given below:

(a) 1, 2 and 3 only
(b) 2, 3 and 4 only
(c) 1, 4 and 5 only
(d) 1, 2, 3, 4 and 5

Ans: (b)

Exp:

- National Air Quality Index (AQI) is a tool for effective communication of air quality status to people in terms which are easy to understand. It transforms complex air quality data of various pollutants into a single number (index value), nomenclature and colour.
- There are six AQI categories, namely Good, Satisfactory, Moderately Polluted, Poor, Very Poor, and Severe.
- It considers eight pollutants namely:
    - Carbon Monoxide (CO), hence, 2 is correct.
    - Nitrogen Dioxide (NO_2), hence, 3 is correct.
    - Sulphur Dioxide (SO_2), hence, 4 is correct.
    - Ozone (O_3),
    - PM 2.5,
    - PM 10,
    - Ammonia (NH_3),
    - Lead (Pb).
- **Therefore, option b is the correct answer.**

Q. With reference to the Agreement at the UNFCCC Meeting in Paris in 2015, which of the following statements is/are correct? (2016)

1. The Agreement was signed by all the member countries of the UN and it will go into effect in 2017.
2. The Agreement aims to limit the greenhouse gas emissions so that the rise in average global temperature by the end of this century does not exceed 2ºC or even 1.5ºC above pre-industrial levels.
3. Developed countries acknowledged their historical responsibility in global warming and committed to donate $ 1000 billion a year from 2020 to help developing countries to cope with climate change.

Select the correct answer using the code given below:

(a) 1 and 3 only
(b) 2 only
(c) 2 and 3 only

(d) 1, 2 and 3

Ans: (b)

Mains:

Q. Describe the major outcomes of the 26th session of the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC). What are the commitments made by India in this conference? **(2021)**