New Energy Mobility Paradigm for India

Over the last decade, the world has seen many governments across the world coming up with various initiatives to promote new energy mobility, especially battery electric mobility. China has emerged as the clear leader in this segment due to their first mover advantage and sheer will power to vertically integrate the supply chain. Recognizing the opportunity, the Indian Union Cabinet chaired by Prime Minister Narendra Modi has approved “National Mission on Transformative Mobility and Battery Storage” with an Inter-Ministerial Steering Committee chaired by CEO NITI Aayog in March 2019.

The motivations for new energy mobility comes from two angles. The one is sustainability and clean aspect of mobility. The second is the energy security and self-sufficiency of India, which is not well endowed with traditional mobility fuels like some of the other G20 countries. While currently the CNG and battery powered vehicles are helping the Indian transport sector become cleaner, the future might encompass e-VTOLS (the battery powered flying vehicles), Hyperloops and Maglev trains, enabling Indians move sustainably and at significantly higher speeds.

The Department of Heavy Industry launched the FAME-India Scheme Phase-1 [Faster Adoption and Manufacturing of Electric Vehicles in India] in 2015. The FAME II India Scheme proposes to give a push to electric vehicles (EVs) in public transport (especially buses) and seeks to encourage adoption of EVs by way of market creation and demand aggregation. The Total outlay of for FAME 1, was around 795 Crore to Rs. 895 Crore and the total fund requirement for FAME 2 is Rs 10,000 Crore over three years from 2019-20 to 2021-22. It is prudent to note that the incentive capital outlay jumped ten times of the FAME I quantum, representing the positive market evolution bolstering the government confidence.

Sustainable and Clean
Globally, the environmental impact of transport is significant because transport is a major user of energy, and burns most of the world’s petroleum. This creates air pollution, including nitrous oxides and particulates, and is a significant contributor to global warming through emission of carbon dioxide. Within the transport sector, road transport is the largest contributor to global warming. Environmental regulations in developed countries have reduced the individual vehicle’s emission. However, this has been offset by an increase in the number of vehicles, and increased use of each vehicle (an effect known as the Jevons paradox). The GHG emissions fueled global warming and subsequent climate change will affect India’s multitude of islands and financially important cities dotting the 15000 Km Indian coastline.

With significant amount of world’s top 20 polluted cities in the world located in India, air-pollution emerges as the most important subset of this conversation. Air pollution is the fifth leading risk factor for mortality worldwide. It is responsible for more deaths than many better-known risk factors such as malnutrition, alcohol use, and physical inactivity. Each year, more
people die from air pollution–related disease than from road traffic injuries or malaria. Globally around 4.2 million people die every air due to exposure to poor quality air. So, it is important to gradually attain a paradigm shift in the way we move.

Energy Security and Self Sufficiency

In India, transport is the second largest consumer of energy after Industry at 28%. Almost all of that mobility energy come from high polluting oils. The import dependence of oils in 2019 stands at 86.89%. India with a growing economy depends a lot on mobility to transport goods and people. As highlighted by recent global events, a small disruption in the global value chain can affect the sensitive oil prices. This reality cannot continue and a need for transformative but measured transition to localized energy sources powering mobility is imminent.

Rational for Electrification

India has significantly improved its electricity access in the last 20 years with special acceleration in last 7 years. Electrification of mobility (in effect any energy intensive sector) achieves two objectives for India. It reduces the air pollution in urban conglomerations (transport is the No.1 source of PM 2.5) leading to better quality of living and strongly supports the reduction in oil imports. India already has emerged as a global leader in e-3 wheeler space and it’s not going to take long before Indian e-2 wheelers are absorbed by the market. The reduction in battery prices and increasing offerings is attracting value-conscious consumer and soon electrification of India’s most common mode of mobility will complement the vastly improved ICE vehicles.

There is an argument that given the major share of electricity generation comes from thermal sources, electrification won’t achieve the desired effects. But, India is already among the top 5 renewable electricity producing countries in the world with 85 GW installed capacity. We are expected to grow to 450 GW by 2030. But, we can’t reach the desired results if we start electrifying after reaching majority renewable share in electricity. We have to build green supply and green demand simultaneously. Intra-city buses, LCVs, 2/3 wheelers and cars are going to be gradually electrified supported by market demand and consumer awareness. The charging and swapping infrastructure will grow hand in hand with the sales and the maturity of business models supported by the state incentives.

Way forward for Heavy Duty Vehicles

HDV – Heavy Duty Vehicles form the majority of vehicular emissions in countries like India. The majority of emission from HDVs might be outside of urban agglomerations, as heavy-duty trucks with long-haul travel account for three-quarters of HDV fuel consumption. Rising emissions and energy use in this segment are driven primarily by strong economic activity and increased demand for goods, which translates into more delivery and more trucking activity.

Electrifying Long haul Heavy Duty Vehicles has many engineering challenges and requires transformative improvement in both gravimetric and volumetric energy density of batteries. So, in medium term, varieties of natural gas and second generation bio-fuels are the best bet for HDVs, to cut their emissions significantly. In the long term, hydrogen produced from surplus renewable capacity (on-site or bulk) might be the way to go for trucks.

Future modes of transportation

It is important to note that gradual and significant improvements to existing mobility modes like national and transnational train networks, airplanes, HDVs and personal vehicles will continue to play a significant role in improving the sustainability of the sector. At the same time, world has intermittently seen transformative mobility systems, which took the market by storm. Examples are the airplane by Right brothers or Model T of Henry Ford. Following are some of the exciting developments in the 21st century which might shape our lifestyle in the centuries to come.

The Hyperloop : Engineers around the world are testing a radically different type of mass transit: one that aims to move people and cargo in small wheel-less pods in a vacuum tube at speeds that could exceed 600 miles per hour. Today’s fastest rail travel, at top speeds less than half as fast, would become a quaint if this takes off. The challenges are mainly in land acquisition in straightlines.

The Bullet Trains : Though a staple in Japan and recently growing in China, Maglev trains are still not mainstream in majority of the world. Maglev (derived from magnetic levitation) is a system of train transportation that uses two sets of magnets, one set to repel and push the train up off the track, and another set to move the elevated train head, taking advantage of the lack of friction. Along certain "medium-range" routes (usually 320 to 640), maglev can compete favorably with high-speed rail and airplanes.

c-VTOLs : electric – Vertical Takeoff & Landing Vehicle: Drastic reduction in battery prices and other e-drivetrain components coupled with engineering expertise gained from mainstreaming of recreational drones, made the flying cars not only a technical possibility but also financially viable. e-VTOLs has the potential to significantly reduce the congestion in urban roads where cars despite transporting fewer people are occupying the majority of physical space. e-VTOLs solve the problem by taking advantage of the 3D space around the cities. The challenges are in creation of standards and safety protocols which no government in the world are equipped with yet. Uber estimates a journey from Gurgaon to Connaught Place in Delhi, which usually takes 1.40 Hrs by car will take only 6 mins in an e-VTOL with almost the same cost in long-term.

Indian government agencies like NITI Aayog are keeping abreast of the technology and market developments in future new energy mobility space through wide consultations and literature research. As the Indian government’s premier think tank, NITI Aayog will always strive to think ahead and support the federal and state government’s ability to develop, adopt and stay ahead of the curve in green mobility.

*** This article is intended to inform decision-makers in the public, private and third sectors. The views of writers are personal and it does not represent the views of either the Govt. of India or NITI Aayog. They are intended to stimulate healthy debate and deliberation in Urban Transport sector. The data are taken from published source, such as Economic Survey 2019, Union Budget 2019 and NITI Aayog reports.