User Preference for Electric Vehicle Adoption by Small Commercial Vehicles for Freight Delivery in Delhi, India

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Abstract

According to a World Economic Forum report, demand for urban freight would increase by 78% in 2030, resulting in the deployment of 36% more delivery vehicles in the world's top 100 cities. This rapid increase in urban delivery vehicles is bound to have a negative impact on the environment. To meet the goals of rapid decarbonization, especially from freight sector, there is an impending need to rely on recent technological advancements, with rapid advances in automation where electrification is the key. These may include three-wheeler tempos. E-cargo bikes, and E Vans. Preliminary studies reveal that E-vehicles have a tremendous potential to reduce CO2 emissions in last mile delivery. For instance in Amsterdam, using light E-commercial vehicles generated positive NPV results in four years and decreased CO2 emissions by 60% (J.H.R. van Duin et al, 2013);use of E-vans leads to a reduction by approximately 4.0 million tons of CO2 depending on payload (Christophe Rizet et al , 2016) for e-bikes 3.1-3.6% reduction in CO2 emissions is reported (Sandra Melo et al, 2014).

The cities in an emerging economy like India in recent years are witnessing a boom in small Commercial Vehicles (SCVs) comprising both three-wheelers and four-wheelers catering to most of the mid-mile and last mile delivery services in urban centres and around the peripheral areas. Presently, the freight vehicles in India primarily rely on diesel which not only has a severe impact on energy security of the country but also is a cause of several negative externalities such as greenhouse gas (GHG) emissions, air pollution. It is in this context the electric vehicles in light commercial vehicle segment is gaining importance in past recent years with the country vigorously embarking upon the path of EV adoption in passenger and freight vehicles. The Indian Government over last ten years has developed a lot of incentives for EV such as fiscal incentives for electric vehicle buyers, incentives for manufacturing of EV and charging equipment, financial support for public EV charging infrastructure development etc. through its several policy initiatives . India's recent FRAME-II policy has developed subsides on purchase of EV and related infrastructure including that for commercial vehicles. As per TERI India estimates, EVs are increasingly being introduced in the urban freight/last-mile delivery services in India cities and it is estimated that upto 14 per cent reduction in CO2 emissions is attainable in the small commercial vehicle segment with higher EV penetration in total sales by 2030 (TERI, 2020).

Delhi being the epicentre of economic activities in the National Capital Region (NCR), experiences high volume of intra-city and inter-city freight trips daily. An estimated 1.69 lakh freight vehicles presently enter in and out daily at 20 outer cordons of Delhi . As the economic activities in Delhi expand and population grows in future, it is envisaged that the city's reliance on freight traffic would continue to grow. In terms of horizon year traffic forecast it is estimated that in all 4,10,979 vehicles are likely to move in and out of Delhi by the year 2041 . In terms of daily tonnage movement it is estimated that 15,74,404 tonnes of freight shall move in and out of Delhi daily of which about 23% is estimated to be through in nature. This intense movement of traffic, comprising of both passenger and freight vehicles, is bound to severely impact the environmental quality within the city and EV adoption is being seriously pursued by the Delhi government as a mitigation option with its recent EV policy announcement.

It is in this background that the present paper through its empirical investigation attempts to highlight the preferences and issues confronting the key stakeholder , namely small commercial vehicle operators, regarding the adoption of EV in their freight operations. A sample of 100 small commercial vehicle operators were enumerated in South Delhi near wholesale markets and warehouses to assess their operational characteristics, identify various barriers & challenges and possible remedial strategies to scale up the EV adoption in the light commercial vehicle segment. Analytical Hierarchy Process (AHP) has been used for the assessment of weights to various parameters of barriers & challenges for EV adoption. It was observed that "Inadequate charging infrastructure" ranked as the most important barrier having a weightage of 33.8% followed "Less Payload Capacity" with weightage of 27.8 % and "Less electrical range per charge" with weightage of 19.3%. respectively. The parameter "High cost of Vehicles" was ranked lower in terms of importance since the cost of both CNG and electric vehicle are similar to each other.

The response of stakeholders on potential strategies for scaling up EV adoption revealed that "Extensive EV charging infrastructure" was the most important strategy with weightage of 45.8%. followed by "Technological advancement w.r.t increase in range/ payload" with weightage 32.3% and "Incentive to use out of hours" with weightage of 17.2% respectively. .The survey also revealed that most of the operators (86%), were aware about the use of EV for urban goods movement. Further 71% of operators had the knowledge of subsidies given under Delhi Electric Vehicle and FAME II Policy. Most the operators (53%) preferred charging infrastructure to be located near major Origin and Destination points, 35% wanted the infrastructure to be near loading and unloading areas while 13% preferred to have charging infrastructure at public parking places.

This study, one of the first of its kind in Delhi, concludes that barriers such as high capital investment, inadequate charging infrastructure, short ranges and limited loading capacities do not allow wide acceptance of these new EV technologies. It is recommended that extensive charging infrastructure development holds the key to the adaptation of electric vehicle in the small commercial vehicle segment. Further the use of strategies such as low emission zones, congestion prising and other economic benefits that restrict the movement of conventional ICE vehicles and encourage the movement of e-cargo vehicles throughout the city at any given time might could also promote EV adoption and its wider use for freight deliveries. The technological advancements to increase the electric range per charge, power and payload capacity will further increase the acceptance of E-cargo vehicles in the city