Analyzing the Different EV Policy and Strategy Components Essential in Deploying the Electric Mobility in India

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Abstract In India, electric vehicles (EVs) policy framework certifies that India's electric mobility mission keeps tempo with the worldwide scale. India's development projections create capability for emerging scopes for EV in certain segments. In India, a particular set of circumstances such as presence of useable renewable energy resources, readiness of expert work force and knowledge, an infrastructure and consumer conversion for applying technology, and cultural that promotes sharing, are encouraging to an ecological mobility concept have created a prospect for accelerated adoption of EVs over internal combustion engine vehicles.

Keywords Electric vehicles · Policy framework · Electric mobility · Renewable energy

1 Introduction

Electric vehicles (EV) as compare to internal combustion engine vehicles (ICEV) or ICE now considered as environment friendly mobility choice. It means, EV as compare to ICEV has more potential to reduce the greenhouse emissions (GHEs). As EVs are driven completely or partly by batteries, they help in reducing dependency on fossil fuels (FFs) as well. As per a report in 2019, India's GHG discharges have risen by 150% (1990–2016) and the government's environment aims to reduce its discharge amount by 33–35% by 2030 are not yet in line with a 1.5 °C path [1]. Considering these facts and keeping EVs as an alternative to bring down GHEs percentage, promotes clean, connected, shared, sustainable, and holistic mobility, an effective and robust EVs policy framework is very much required, keeping in view the complete electric mobility ecosystem and its various aspects.

There are studies that have been carried out about electric mobility segment in many countries like Austria [2], Brazil [3, 4], China [5], Denmark [6], Ireland [7],

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Germany [8], Latvia [9], Lithuania [10], Norway [11, 12], Portugal [13], Spain [14–16], Sweden [17], the USA [18], Nordic countries [19], etc.

In India, there are investigation findings that have been done on electric vehicle regulations, procedures, decent methods, drivers and hurdles, tasks, and prospects. Luthra performed study on need assessment of the growth of the electric vehicles in India resulted by challenges in the EV development and on the power concerns and power need [20]. Khurana et al. examined the different factors that effects a consumer's adoption of EVs [21]. Kumar et al. investigated the challenges before India to adopt EV by 2030 and the actions taken by Government of India to boost exploration and advancement in EV sector [22]. Vidhi et al. reviewed different stages in the lifespan of an EV, their influence on ecological discharges, and endorses strategies appropriate for diverse socio-economic assembly that are applicable to the Indian bazaar, rise trade of EVs, intensification fraction of renewable energy, and stop air contamination triggered from battery-operated manufacturing [23]. Sriram et al. explored the overall scenario of the EV and areas for further growth [24]. Mokariya et al. presented various aspects in terms of challenges and issues related to impact of EVs on Indian power grid, potential services, and applications [25].

However, no study has yet been presented linked to various characteristics of plans and approaches for the amalgamation of electric movement, RE, and ICT in India.

1.1 Electric Mobility Ecology

Electric mobility holds jointly two separate sectors—transport and power. The integration of these two sectors decides the successful implementation of electric mobility. The electric mobility ecology includes following stakeholders [26] as shown in Fig. 1.

Government, which makes the policy, suppliers, which design and makes the electric vehicle, electricity suppliers, charging infrastructure, and end consumer are

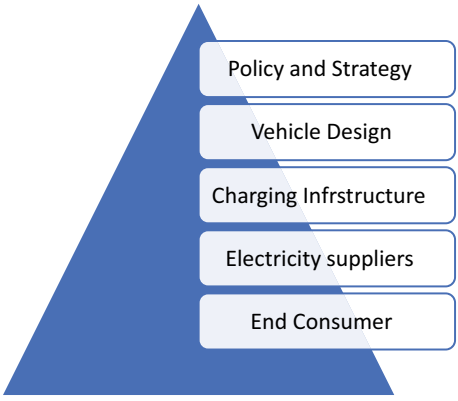

Fig. 1 Different EVs ecology stakeholders

the distinct stakeholders of the electric mobility. The end user could be a truck or bus driver, personal vehicle owner, who would ought to charge batteries in a small time or would like the charging to occur fast for numerous EVs at the same time.

1.2 Drivers of Electric Mobility

For the proper functioning of the electric mobility, following are factors could be the key drivers [27]

- Battery cost
- Government support
- Action by cities.

Battery cost is one the main obstacles for the application of the EVs. With encouraging administration procedures and decline in battery rates, a substantial progress in the EV sell is anticipated.

Governments around the world have been enthusiastic on embracing environment friendly modes of transport.

The growth of EVs apart from national and state policy framework also requires aggressive act headed by cities. Air quality advantages that EVs deal are turn out to be a significant driver of such act around cities, worldwide.

EV acceptance in different international geographics, as illustrated in Fig. 2, comprises nearly 40% of the globe's entire EV trades [29].

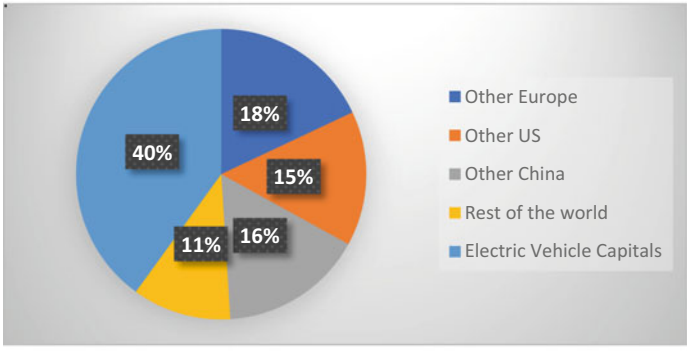

Fig. 2 Estimated cumulative EV stock in market, in different geographies [29]

2 Electric Mobility in India

Though several nations have adopted EVs as a part of conveyance strategy, their reactions have diverged corresponding to their phase of financial growth, energy reserve abilities, industrial resources, and diplomatic ordering of replies to environment shift. In India, a specific set of conditions such as presence of useable renewable energy resources, readiness of trained work force and knowledge, an infrastructure and consumer conversion for applying technology, and cultural that promotes sharing, are encouraging to an ecological mobility concept have created a prospect for accelerated adoption of EVs over ICE [26].

India has initiated its EV promotional program in 2013 through implementing the NEMMP 2020. The plan aims at state power safety measures, alleviation of harmful effects of road transportation development on environment and development of domestic industrial resources. The project aims on providing direct and sustained assistance for supporting electric vehicle knowledge in the country by 2020 [27].

Progressing the NEMMP 2020, the administration has proclaimed that it will offer fiscal support as aid to smart cities for the buying of electric vehicles for majority civic transport for executing model projects in the Faster Adoption and Manufacturing of Electric vehicle (FAME-I & II) plan. Cities with inhabitants more than 10 lakhs can avail this grant [27].

With an objective at speed up advancement of charging base in the country, the government in recent times delicensed setting up of charging bases for EVs [27]

Other initiatives are taken up by the Government of India and State governments to promote EVs are reduced GST on the purchase of EVs, the National E-Mobility Programme (MoP), and the Zero-emission corridor, Agra [27].

There are private initiatives offered like deployment of e-cars, Mahindra Electric is offering rapid charging assistance to electric cars, and the launch of a pilot EV fleet [27].

Several bus pilots' schemes have also been started in many Indian cities [27].

There are well-known disputes cum challenges for EV sector in India like absence of robust EV policies at national and state levels, such uncertainty discourages the EV manufacture, and investing in the EV production. India is also technologically dependent especially in the fabrication of batteries—import of lithium-ion batteries, semiconductor, etc. Lack of clarity over charging infrastructure related to charging stations, grid stability are other issues that hamper the development of EV business [28].

3 Context of the Study

The back-and-forth of technology and mobility is expected to transform India's electric mobility models. The dynamic shift to electric mobility underpins the critical role of policy. In India, EV policy framework certifies that India's electric mobility

mission holds tempo with the worldwide scale. India's development options create possibility for emerging scopes for EV in certain segments. In that sense, national and state levels conducive EV policy support will promote a direction which begins with Indian particular attributes and programs for its auto-segment, constructing for worldwide significance, and applications [26].

4 Various Identified Components for Drafting EV Policies and Strategies

Facilitate awareness to consumer regarding EVs benefits The promotion of electric vehicle markets is essentially depending on the consumers' consciousness and awareness regarding the possible advantages of electric vehicles. Governments both at national and state levels, and city level, private auto-sectors dealing with EV manufacturing, regulatory authorities and private NGOs are involved in many endeavors to help surmount hurdles to consumer consciousness about electric vehicles. These exchange attempts include reports, workshops, technology demonstration projects, conducting campaigns using public platforms, etc. These actions are essential because many prospective consumers are not aware about the green technology behind EVs, benefits EV is offering and also about the other associated incentives [27].

Necessary steps to address the challenges for EV industries Government initiated technical skill enhancement schemes should be modernized to match the obligations of the sectors. Providing tax and other non-monetary incentives can address the prevailing uncertainty of demand and supply cycle. EVs are speedily flourishing dawn sector which can provide momentum to 'Aatma Nirbhar Bharat Abhiyaan' and 'Make in India'. Doing memorandum of understanding (MoU) with countries for filling the technological gaps. Development of coordination among national and state level EV related policies and strategies, this will assist in logical adoption of this sustainable mode of transport.

Policy framework where renewable energy and electric mobility work together Electrification of street transportation has become a primary inclination for maintainable electric mobility, and two of the greatest, noteworthy movements which are achieving drive in cities are power-driven automobiles and renewable energies. Therefore, it is vital to co-build on a framework of systems and approaches where energy and electric movement will work mutually and not perform as distinct units.

Facilitate employment growth in sector Electrification of vehicles can lead to job losses especially in oil industry but can at the same time drive job creation in a host industry. Electrified efficient vehicles require more automation and such design and production require more manpower. Moreover, EVs are much cheaper to operate as

compare to the traditional vehicle, and this would help get more disposable income to spend in other sector of economy.

Promotion of EV related technological advancements Funding from administration and changing mindsets toward EVs has caused in an intensified need for these automobiles at slashed costs. Also, matters such as enhanced vehicle variety and charging structure have fueled the requirement beyond. Here are some of the most encouraging scientific inventions and developments such as charging machinery, battery technology, and autonomous driving.

Clarity over charging infrastructure The energy infrastructure will be the front for the effective expansion of a viable electric mobility environment in India. However, the growth in electricity need from EVs presents a chance for the services with increased revenue, the additional investments required for strengthening or augmenting the present charging base to provide to the alternating demand refers to a financial challenge.

Other identified considerations while promoting electric mobility in policy Government at national and state levels should try to make efforts to utilize renewable resources to get clean electricity. Availability of public charging infrastructure requires availability of approachable and affordable locations. Government is taking several measures in linking the broad gap in EV investment costs.

5 Conclusion

India would considerably reduce its fossil fuel import bill by adopting electric vehicles at the earliest to get improved air quality index especially, in the cities with dense road transportation. On considering the efforts put by the government both at national and state levels in promoting the EV vehicles sales, it seems that in next few years, if the things go in the same pace, we can have clean and green air. This would, however, require more cohesive policies, and strategies which includes amicable solutions to all alarming and favorable circumstances, includes climate shift, innovations in renewable energy, rapid expansion, data recording and assessment, battery technology and infrastructure.

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