Introduction

Urban transport sector – The transport sector accounts for 13% of the total energy-related GHG emissions in India, of which urban transport accounts for a quarter – contributes significantly towards climate change. Hence, it is important to mitigate emissions from the sector.

Literature emphasizes on aligning global climate stabilization target and national sustainable development and sectoral plans to gain various co-benefits and move towards sustainable low-carbon pathway in the long run.

In recent years, electric vehicles (EVs) have emerged as one of the options to mitigate the CO2 emissions from the urban transport sector. Missions within the India’s NAPCC; specific policies such as the NEMMP, NUTP, and JNNSRM have focused on adoption of less carbon intensive modes such as EVs, public transport, and NMT.

Objectives and Methodology: To assess the potential of EVs in India’s medium to long-term urban mobility mix. Our analysis uses the ANSWER-MARKAL to explore India’s urban transport scenarios till 2050. Scenarios for Ahmedabad city as a case study are also analyzed using the AIM/Enduse model. Three scenarios are analyzed: (i) Business-as-usual (BAU), (ii) Sustainable Electric Vehicle (SEV), and (iii) Green Energy and Electric Vehicle (GEEV).

Scenario Architecture

The model results for the three scenarios are presented in the form of GEEV, BAU, and SEV for the years 2020, 2030, 2040, and 2050. The scenarios are divided into business-as-usual (BAU), SEV, and GEEV.

Scenario Description:

BAU scenario: The BAU scenario assumes an average GDP growth rate of 8% between 2010-2035 benchmarking with Planning Commission Integrated Energy Policy report. Existing policies (such as fuel policy, JNNSRM) and projects under construction or planned in future are taken into account.

SEV scenario: Increased focus on the use of EVs as a result of national and local policies is envisaged. These policies would complement other mitigation strategies such as public transport, provision of dedicated lanes for NMT and 2Ws, switch towards cleaner fuels (e.g., biofuels, CNG), travel demand reduction strategies (e.g., land-use integration and increased penetration of ICT) and technological interventions.

GEEV scenario: Here, environmental concerns gain higher importance on global, national and local policy agenda. A carbon tax pegged with 2 degree stabilization target is used along with the decarbonisation of electricity sector which may further promote use of EVs.

Low Carbon Electricity Transition

The graph shows the CO2 intensity of grid (CO2 / MWh) from 2010 to 2050. The CO2 intensity decreases significantly over the years, with a steep drop in the BAU scenario compared to the SEV and GEEV scenarios.

Model Results (National)

The graphs illustrate the share of EVs in Personalised Transport and Public Transport for the years 2020, 2030, and 2050. The BAU scenario shows a gradual increase in the share of EVs, whereas the SEV and GEEV scenarios show a more significant increase.

Model Results (Ahmedabad city)

The graphs for Ahmedabad city illustrate the share of E4W in Personalised Transport and EVs in Public Transport for the years 2020, 2030, and 2050. The BAU scenario shows a gradual increase in the share of E4W, whereas the SEV and GEEV scenarios show a more significant increase.

Conclusion

- The low carbon transition of urban transport sector is accompanied by a sizable shift in fuels and technologies.
- Under GEEV (global 2°C stabilization policy) in India, EVs contribute to nearly 38% to the BAU transport emissions in 2050. The decarbonization of electricity sector is then important as EVs by themselves do not contribute to CO2 mitigation.
- E2Ws will penetrate early in India and Ahmedabad compared to E4Ws. In both cases, E2Ws and E4Ws achieve cost competitiveness in the BAU by 2035. However, tax incentives in SEV and GEEV scenarios help in advancing this to 2020 for E2W and 2025 for E4W.
- Low carbon transition towards EVs and decarbonization of electricity would also deliver local Air Quality co-benefits and would contribute to Energy Security which is more important from a national perspective.