

Achieving Net-Zero Targets through Regional Electric Bus Penetration and Energy Transition

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ABSTRACT

The electrification of public transit stands as a crucial step in advancing sustainable transportation. This study presents an innovative framework aimed at assessing the efficacy and potential emission reductions associated with electrifying transit policies. By analyzing the future energy consumption, greenhouse gas (GHG) emissions, and pollutant emissions of bus fleets in representative Canadian cities, the study provides valuable insights. Incorporating high oil price scenarios, the research accounts for upfront infrastructure costs, the social costs of pollution, and the dynamics of carbon prices and fuel prices, enabling a comprehensive analysis of carbon reduction costs during the transition period. Comparative analyses against business-as-usual (BAU) scenarios reveal significant reductions in cumulative GHG emissions from 2019 to 2030 for bus fleets in the ESD (Electricity System Decarbonization) scenarios. Specifically, reductions of 18.7%, 30.1%, 21.3%, and 34.6% were observed in Toronto, Montreal, Edmonton, and Halifax, respectively. These findings hold implications for managing trade-offs in climate policies at the provincial level and contribute to understanding polycentric governance from diverse resource perspectives. By shedding light on the potential emission reduction benefits of electrifying transit policies, this research offers insights that can inform decision-making and facilitate the adoption of sustainable transportation solutions.