Facilitating, Enabling, and Triggering Sectoral Transitions: India

Case Study 18. Public Transport Systems in India

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Context

India's updated NDC targets a 45 percent reduction in GHG emissions intensity by 2030, compared with 2005 levels (Government of India 2022). The transport sector contributes approximately 10 percent of India's GHG emissions and has the world's fastest energy usage growth rate, averaging 6.8 percent per year since 2000 (LBNL 2022). Oil products, mostly diesel and gasoline, supplied 95 percent of total energy in the sector, and road transport energy demand accounted for 90 percent of the total oil demand in 2017 (IEA 2020b). Heavy-duty vehicles, such as buses and trucks, consumed 55 percent of total energy within India's road transport sector in 2010; this share is expected to reach 67 percent by 2030 (Sharma et al. 2017). As a result, the government of India has identified the electrification of heavy-duty vehicles—particularly buses—as a priority policy intervention.

Policy

The government of India is taking up several fiscal and regulatory measures to accelerate EV manufacturing and adoption across vehicle segments (World Bank 2022d). A total of $7.1 billion has been earmarked across incentives, including $5.8 billion for production-linked incentives for EV manufacturers, component manufacturers, and advanced chemistry cells, and $1.3 billion for end-user incentives under the Faster Adoption and Manufacturing of Electric (and Hybrid) Vehicles in India (FAME-II) scheme. Electrification of public transportation is a key priority under FAME-II, with about 35 percent of the total subsidy outlay earmarked for buses. Electrifying buses provides the twin benefits of mitigating emissions and improving mobility access for the masses, as buses are the mainstay of mobility in India.

The first phase of FAME-II for buses witnessed procurement of close to 3,500 buses across 36 tenders floated between April 2019 and March 2021 (World Bank 2022i). Prices under Phase 1 of FAME II varied widely between cities, despite procuring similar types of bus. This was driven by variations in contractual parameters, the volume of buses procured (from 25 buses in some cities to 300 in others), different procurement specifications with cities requiring different technical and financial commitments from the bidders, and cities' creditworthiness, which posed varying levels of credit risk to the bidders.

Building on the learnings from Phase 1, the government of India adopted an aggregated procurement approach, with concentrated large-scale deployment and standardized procurement specifications to achieve economies of scale. Convergence Energy Services Limited (CESL), a government enterprise, was entrusted with the job of aggregating demand across nine Indian metropolitan cities with a population of more than 4 million. CESL invited cities to subscribe to the numbers and types of electric bus they needed against harmonized procurement specifications to be adopted across all cities. The available subsidy was allocated to cities in proportion to their subscribed demand. Five out of the nine eligible cities participated in the process, subscribing for a total of 5,450 buses, of which 3,472 buses were eligible for subsidy. The rest were tendered without subsidy. This initiative adopted a gross-cost, contract-based business model wherein private service providers invest in the purchase of bus and charging infrastructure and undertake operations and maintenance throughout the contract tenure. The government bus authority defines service levels, monitors implementation, pays the operator, and collects revenue.

CESL floated a request for proposals (RfP) from cities to discover the prices in Indian rupees (Rs) per kilometer for the 5,450 buses split across different lots, according to technical specifications such as length, floor height, and air-conditioning. The eligible bidders with the least-cost quote would be the selected service provider for each lot. The RfP covers a wide range of technical and financial specifications, covering items such as eligibility criteria, vehicle and charger requirements, operational requirements such as depots and routes, contract tenure, grounds for early termination, payment terms such as assured kilometers of payment, periodicity of payment, payment guarantee mechanisms, penalties for underperformance against service-level agreements, and arbitration mechanisms. CESL adopted a collaborative and technically sound approach toward harmonizing procurement specifications across cities and ensuring their robustness. This reduced the number of lots and maximized lot sizes wherever technically, commercially, and practically feasible, enabling economies of scale. The World Bank provided technical support to NITI Aayog and CESL in harmonizing the specifications, and enhancing and calibrating contract terms to balance risks to all parties, thereby reducing costs.

Results and Impacts

The RfP attracted four eligible bidders, post-technical evaluation. Financial evaluation of eligible bidders found that the lower quote for a 12-meter air-conditioned, low-floor bus was Rs 47.99 (~$0.64) per kilometer, and for a 9-meter air-conditioned bus, Rs 44.99 (~$0.60) per kilometer. Prices were about 37 percent lower than procurement under Phase 1 of FAME II with the same subsidy, equivalent to saving more than Rs 10,800 crore (CR) ($1.45 billion) over the 12 years of the corresponding contracts. This was made possible due to the economies of scale offered by the large contract volume, improved procurement specifications that made the contract more bankable, and the five selected cities being among the more mature bus systems in India, with depot infrastructure in place.

As well as being lower than previous electric bus procurements, the prices were also better than the cost of operating on-road diesel and CNG buses in these cities. The quoted costs for electric buses, excluding subsidy, was 27 and 23 percent lower than the cost of the diesel and CNG buses operating in these cities, respectively. Including the available subsidy, they were 35 and 31 percent lower, respectively. However, factors such as the recent rise in fuel prices and lower bus kilometers per day due to passenger demand not yet reaching pre-COVID levels are leading to higher-than-usual costs per kilometer for diesel and CNG buses, so it is likely that the cost difference may narrow as fuel prices and operations stabilize. That said, services run with electric buses are expected to remain cheaper. Together, these 5,450 buses are anticipated to deliver GHG emissions savings of over 1 $MtCO_2e$ across their 12-year life cycle, indicating significant mitigation potential without accounting for the mode shift they enable.

Key Takeaways

The results of the aggregated procurement policy mark a clear inflection point in India's electric bus adoption story. For the first time, the prices quoted for electric buses are cheaper than their diesel and CNG counterparts. Such low prices have encouraged more cities to adopt electric buses as their primary choice in the future. Following this national-level aggregated procurement, the city of Mumbai has procured another 2,100 buses at similar costs. The national government is now looking to scale up the aggregated procurement model across India to secure about 50,000 electric buses over the next two to three years. Such large-scale procurement will ensure the adoption of electric buses even in rural and intercity bus markets, which represent 90 percent of the country's fleet and bus kilometers. The GHG emission mitigation estimates also point to significant decarbonization of India's bus services through large-scale electrification. Bus agencies are now likely to consider electric buses as their primary choice, only opting for diesel and CNG buses if electric ones are not feasible.