



ELECTRIC VEHICLES 101

A series of transport notes on electric vehicle trends and opportunities from IFC

Bumps in the Road: Challenges to E-bus Implementation

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With a broad view of the benefits of electric vehicles and sense for Total Cost of Ownership, or TCO, we turn to some of the challenges of implementation. The good news is that dozens of municipalities are

experimenting with e-buses, while some last-mile delivery companies are using pilot fleets to test performance. At the same time, a smaller group of operators are pushing ahead with more drastic, “big bang” efforts to put dozens or even hundreds of electric vehicles into service. We saw how some locations have already reached TCO parity, while other places will require further reductions in costs and perhaps some forward-thinking tax and tariff policies.

The bad news is that the track record for electric buses to date has been mixed, and e-bus adoption has not scaled up as fast as many had hoped due to institutional, technical, and financial challenges. For those seeking to stay the course with internal combustion engines, there are plenty of valid arguments. To clear the air, today’s piece will bring some of these problems out in the open.

BUMPS IN THE ROAD

Below is a snapshot of some of the bumps in the road:

Institutional Challenges

- **City Transit Frameworks:** At the city level, where finding institutional capacity is often challenging, there is remarkably little information on the commercial and technical aspects of implementing an e-bus program. Cities that do not already have reasonable transit frameworks and well-run bus networks will have a difficult time leapfrogging to electric buses, where technical, financial planning, and governance factors are critical. Also, city transit is not an ideal environment for risk-taking, as botched implementation of a new bus program could likely be political suicide for responsible officials.
- **Old-School Procurement:** Procurement frameworks based on the lowest upfront cost are still the norm, which puts e-buses at a huge disadvantage with city procurement officials. E-buses can cost up to twice more than fossil-burning models. It is hard to convince risk-averse city bureaucrats to take the

risk without political “arm twisting” at the national or local level (or perhaps an air quality crisis—an increasingly common issue).

- **The Diesel Incumbency:** In most large cities, bus transit is a mix of formal and informal operations, the vast majority of which runs on diesel. While diesel buses are fully depreciated after eight to ten years in most cases, buses in emerging markets often stay on the streets for up to 20 years, which can create a huge lag for fleet conversion. Also, if cities can’t figure out a way to make the transition to electric interesting and profitable to operators from a return perspective, they might be spinning their wheels.

Technological and Infrastructure-related Challenges

- **High Upfront Cost:** Electric buses are still an order of magnitude more expensive than old school diesel—in some cases twice as much. In Colombia, where Chinese equipment is widely available, a

smaller 8.5-meter electric bus currently costs around \$200,000—compared with approximately \$100,000 for a conventional diesel bus (note: all dollar figures are in U.S. dollars). This differential expands for larger models that require more expensive batteries and heavier frames to manage the additional weight. If you think about introducing hundreds of these vehicles into the transit mix, the cost differential is substantial and difficult to absorb.

- **Performance Issues Related to Batteries:** Batteries are still at a relatively early stage of development with low energy density per kilogram. This creates range limitations as buses can only handle a limited number of battery packs on their frames. When you factor in heating and air conditioning, hills, stopping and starting, traffic speeds, frequency of stops, and passenger loads (not to mention battery degradation over time), it is difficult to forecast performance. To make matters worse, there have been high-profile cases in developed markets where [buses were returned](#) to the manufacturer for performance shortfalls (fairly or unfairly). Without careful upfront design specifications for the particular application and proper training and supporting infrastructure, it is not hard to imagine how performance could fall short.
- **Infrastructure Development:** Aside from the buses themselves, cities need well-located real estate (for centralized depots) and power infrastructure to support the charging stations reliably and cheaply. Bloomberg New Energy Finance estimates that, in addition to the high costs of electric buses, cities should plan on another \$20,000–25,000 in infrastructure costs per bus at this initial stage. While this is less of an issue for cities with existing bus rapid transit networks and depot space, acquiring scarce and expensive land in strategic locations for servicing a new electric fleet could be complicated enough to discourage city officials from making the switch.

Financial Challenges

- **Fuzzy Math:** Related to the points above (as well as yesterday's discussion) e-buses are still relatively expensive. The savings generated over time through operational cost savings are subject to several factors that are difficult to predict. If you apply adequate discount rates to the risks you take commercially, the numbers often don't quite work yet—from a pure IRR perspective—without risk enhancement and/or some patient long-term (perhaps concessional) financing that matches the longer payback period of the cleaner vehicles.
- **Creditworthiness Issues:** Not far behind the fuzzy math are creditworthiness issues with the underlying business models. Traditional bus concessions are fraught with risk allocation issues for the private sector, including acquisition, demand, and performance risks while revenues are typically in local currencies. Operators are generally not in a financial or technical position to add bus technology risk to the cocktail. New business models are coming online in many cities globally with separation of asset ownership and operator roles—and sometimes even segregation of the charging infrastructure. However, as you add layers of complexity to a municipal concession business, you may be asking for trouble regarding institutional capacity to manage all of these moving parts.
- **Expensive Financing:** It is not surprising to hear that existing sources of finance for operators, in the short term, are very expensive. Local operators are undercapitalized and opaque, while financing is generally from local banks on some sort of asset-backed basis. There is a wall of well-intentioned international donor and financial capital (including blended finance) waiting to invest in e-buses in particular. But there seems to be an equally high wall of misunderstanding about the credit risks and structuring necessary to reach financial close.

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Before losing hope, most of these challenges could play to IFC's strengths with a little creativity and daring. This could be a sector where we invest in early-stage innovation that could include a range of electric types, as well as support to both public and private sector clients. On the public sector side, IFC already works with a network of global municipalities that are experimenting with electrified transport. It would not be a stretch to put together an advisory program (perhaps fortified with some donor funding) that prioritizes a few choice opportunities and helps these municipalities get down the learning curve. IFC is already working on a host of operations that bring advisory and investment support to electrified urban transport.

On the private side, IFC should continue financing well-structured private electric vehicle initiatives and concessions with reasonable municipal counterparties and bankable risk allocation. The operations will not be perfect vis-à-vis what we are used to in customary infrastructure concessions, but we should roll up our

sleeves to try to figure this out. It would not be hard to imagine financing a acquisition special purpose vehicle or funding to one of the global utilities (such as France's Enel/Engie) that are investing in e-buses. Leasing models may also be the way forward for electric fleets ranging from small electric scooters and three-wheelers to delivery trucks and even massive urban buses.

IFC is already on the hunt for the right business models and partners—and we are already investing in a few choice operations globally. It is just a matter of time before this becomes a more prominent part of our business.

ADDITIONAL TRANSPORT NOTES IN THE ELECTRIC VEHICLES 101 SERIES

[An EV Playbook for Electric Buses](#)

[E-Bus Economics: Fuzzy Math?](#)

[Electric Buses: Why Now?](#)

[Twists and Turns: New Business Models](#)

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