



ELECTRIC VEHICLES 101

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

Electric Buses: Why Now?

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There is a quiet revolution underway in a previously sleepy segment of the transport sector: the electrification of municipal buses and other intra-city vehicles. As [McKinsey reported last October](#), the compound annual growth rate of battery-electric buses has exceeded 100 percent since 2013—surpassing that of every other electric vehicle segment. Investing in battery-electric buses—as well as other high-use vehicles, such as e-delivery trucks—is an effective way for IFC to move the needle on air quality and greenhouse emissions from urban transportation. The opportunity is massive, and IFC has the capacity to fast-track implementation. It's time to hit the accelerator.

CONVERGING FACTORS

Driving EV development is a convergence of factors related to a) demographics, b) technology, c) industry economics, and d) concerns over climate and health impacts:

- **Demographics:** According to the United Nations, over half of the global population already lives in urban areas. By 2050, this number is expected to increase to 68 percent—in short, another 2.5 billion people will live in cities in the next 30 years, with the most growth in Asia and Africa. With urban mobility already in crisis in many mega-cities, this urban population explosion will present an additional challenge to city governments.
- **Technology:** Changes in electric drivetrains and battery storage technology lie at the heart of the e-vehicle revolution. According to Bloomberg New Energy Finance, the average price of a lithium-ion battery pack at the end of 2018 was \$176/kWh, representing an 18 percent annual decrease due to technology improvements and economies of scale—an astonishing reduction from the 2010 price of \$1160/kWh. Bloomberg predicts lithium-ion battery production to [more than triple](#) by 2025, and double again by 2030. As the technology improves and massive economies of scale take effect, internal combustion engines will become far less attractive.
- **Economics:** This is where it gets a bit tricky. City buses, the most advanced electric vehicle segment,

have already reached lifecycle cost parity with conventional buses—but only under the right conditions. E-buses can still cost as much as 50–100 percent more than conventional diesel models, which can discourage transit officials from making the switch. However, the growing emphasis on the Total Cost of Ownership procurement gives e-buses a fighting chance. As we will discuss tomorrow, this approach incorporates more than acquisition cost—it also considers fuel, operations and maintenance, and inescapable financing and insurance costs. E-buses have already reached parity in some locations. If you factor in the reductions in greenhouse gas emissions and the cost of urban air pollution, the conversation gets more interesting.

- **Climate and Health Impacts:** While climate change arguments are fraught with politics, urban air pollution presents a less controversial argument for getting diesel engines off the streets. Air pollution has become a serious health issue in many large municipalities. Mayors are declaring dramatic air quality emergencies and vehicle restrictions to confront the problem. Making urban fleets green is indeed expensive and complicated, but highly publicized air quality and health impacts may provide the necessary political cover to make the switch. For mayors pushing for sustainability, a green transportation system fueled by wind and solar is a compelling argument.

NOT SO FAST...

For those who say that "this is too good to be true," you're right—for now. Behind the PowerPoints and glossy presentations about utopian carbon-free urban transit, there are still many practical challenges. Some of the most critical barriers are the following:

- **Institutional:** Altering the composition of urban fleets will ultimately rely on the willingness of city officials to embrace new technology. Transit officials and operators who have spent their entire careers working with relatively uncomplicated diesel systems will not be easy converts, especially while the upfront cost differential is high. Successful implementation of electric bus systems, for example, requires a systemic effort built on political support, inter-agency cooperation, technical capacity, and smart public outreach—not easy for the risk-averse public official.
- **Technology:** Electric vehicles are still expensive compared to diesel. To make matters more challenging, some early efforts to implement battery-electric bus programs have met with range and performance issues driven by factors that sap battery range, including frequent stops, hills, heating, and air conditioning. It is a matter of time before e-buses become the preferred option on all routes, but we are not there yet. If electrics are going to take-off, transit agencies and operators will need to get down the learning curve on things like battery management, charging infrastructure, and electricity supply.
- **Financial:** China has a massive head start in putting electric buses on the road, but the Chinese model has been driven by lavish state support. OECD governments also make substantial funding

available for urban fleets that is often unavailable in IFC's target markets. For cash-strapped municipalities in emerging markets, electric vehicles have to stand on their own from an economic perspective. With this in mind, many municipalities are experimenting with business models and the allocation of risk between operators, asset owners, and even utilities in a way that attracts debt and equity. IFC teams have been poring through e-bus concession documentation (primarily in Latin America) for solutions, but for now, we are just looking for a few models that might work.

WHY NOW?

A cocktail of technology, investment, and scale in electric buses (and other high-use intra-city electric vehicles) will soon reach a point where reliability and cost advantages create the death spiral for internal combustion engines. Superior technology and declining costs will eventually overwhelm the old, static, diesel-driven transportation paradigm.

IFC has the advisory and investment capacity to move this along. It's time to hit the accelerator.

ADDITIONAL TRANSPORT NOTES IN THE ELECTRIC VEHICLES 101 SERIES

[An EV Playbook for Electric Buses](#)

[Bumps in the Road: Challenges to E-bus Implementation](#)

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

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

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