

Electric Vehicle Pilot: Final Report
September 13, 2016

Electric vehicles have been identified as an innovative way to reduce our city's carbon footprint. In 2013, as part of the Electric Vehicle Pilot program, the TLC put the first of five Nissan LEAF electric vehicles on the road. The purpose was to test whether electric taxicabs could replace traditional ones without adversely affecting customer service. The pilot lasted two years, from April 2013 to March 2015. While a small drop in service among pilot vehicles was observed (15.5ⁱ trips per shift versus the industry-wide average of 20), we remain optimistic that electric vehicles can be a viable option for taxis in our city as long as the infrastructure exists to support it.

There were four participants throughout the duration of the pilot:

- **Participant 1:** This owner-driver participated throughout the duration of the pilot. He provided us with the most consistent data and was very satisfied with the pilot vehicle.
- **Participant 2:** This owner-driver was also very satisfied with the pilot vehicle and actively tried to recruit others to join. Unfortunately, a collision involving his LEAF halted his participation.
- **Participant 3:** This was our only fleet participant. Because Nissan did not want the vehicles double-shifted, the participant received two vehicles that "shared" the medallion. The fleet owner found it difficult to integrate the electric vehicles into his operation because, unlike the owner-drivers, the fleet drivers were not personally invested in learning how to optimize the vehicles' ranges. This issue can be addressed through driver education.
- **Participant 4:** A third owner-driver later joined the pilot, and drove his LEAF for a full year. He was also very satisfied with the pilot vehicle.

The main difference between a traditional vehicle and an electric one is the range; that is, how far it can travel before needing to recharge. The Nissan LEAF can provide 75 miles for a 100% charge. In other words, a driver can generally drive 71 miles before reaching 15% battery power and needing to recharge. In the Electric Vehicle Pilot, this usually occurred after four hours of service.

Many factors positively and negatively affect a vehicle's range. Relative to the taxi industry, the following factors were observed by the TLC:

- 1) **Lack of Charging Infrastructureⁱⁱ:** A Level III charger is essential for a taxicab to operate in the city when the vehicle range is not sufficient to get a driver through a shift. However, it requires extensive and complicated land, technical, and user requirements not typically found in Manhattan. After a lengthy recruitment process, the TLC, Nissan and Con Edison were able to establish two charging stations, one located in Midtown, and the other on the Lower East Side. If electric vehicles were to comprise a large number of taxi fleets, many more stations would be needed.
- 2) **Range Anxiety:** Because of limited battery potential, drivers displayed range anxiety and were unwilling to travel long distances when the battery was at a lower charge. Drivers in the pilot were permitted to refuse some passengers traveling longer distances if the battery life was insufficient to complete the trip. They periodically did so, and like most other taxi drivers, they preferred shorter rides within Manhattan. If a trip to another borough was accepted, the driver preferred to return directly to Manhattan rather than search for another passenger in the outer boroughs. However, as drivers became more confident with their vehicles, they were more willing to let the battery drain to a lower level before recharging. This demonstrated that a vehicle with greater range or gas backup may prove useful for taxis to maintain high service standards. Because vehicles with longer ranges and faster charges are both available, there is reason for optimism.
- 3) **Weather Sensitivity:** Drivers found that using their HVAC system decreased vehicle range. This was anticipated by the TLC, and is consistent with normal operation of the vehicle. It was found that HVAC usage increased considerably when the ambient temperature was between 50°F and 80°F, which reduced the vehicle's range significantly. Also, the most miles were driven when the

ambient temperature was between 61°F and 80°F. Sharp decreases were seen outside of this range. As with range anxiety, we believe a greater vehicle range or gas backup system would eliminate this concern.

- 4) **Lack of Customer Service Support:** Several incidents of malfunctioning chargers occurred during the pilot. This not only highlighted the lack of customer service alerts about chargers, but also reaffirmed the need for a more robust charging infrastructure, as seen in Point 1. One charger remained out of service for several weeks, effectively reducing the pilot down to one Level III charger. For a shift to electric vehicles to succeed, updated information on the operating status of chargers is critical.

To mitigate the issues above, drivers adapted their behavior in the following ways: They 1) opted for local roads to increase the amount of energy generated from engine braking; 2) avoided steep roads and bridges; 3) waited for passengers at street corners rather than cruise the block; and 4) lessened HVAC usage by beginning their shifts later in the day on extremely hot or cold days. In addition, fleet drivers commonly conducted a mid-shift vehicle swap at Level III charging stations rather than wait for their vehicle to charge. The drivers' main complaint was the vehicle could not hold a charge for a full 12-hour shift. They nonetheless appreciated the smoothness of the ride, along with the positive comments from passengers, which sometimes led to higher tips.

The TLC is open to conducting other pilots involving electric vehicles. We would be especially interested in testing wheelchair-accessible electric vehicles when they become available, as the City continues to its goal to have a 50% accessible yellow taxi fleet by 2020.

¹ "New York City Electric Taxi Demonstration Results." <https://avt.inl.gov/sites/default/files/pdf/fsev/NYCElectricTaxiFactSheetJan2016.pdf>, United States Department of Energy, January 2016.

² Three charger levels: Level I: Requires a regular outlet and fully recharges vehicle in ~20 hours. Level II: Can be installed in most homes and garages, and fully charges a vehicle in ~8 hours. Level III: Also called DC Fast Chargers, and can charge a vehicle to 80% in 30 minutes.