



U.S. Department of Transportation

# Connected Vehicle Pilot Deployment Program: New York City

## ITS Benefits, Costs, and Lessons Learned: 2018 Update Report

### Connected Vehicle Pilot – New York City

#### Highlights

- For the New York City Pilot, approximately 5,800 taxi cabs, 1,250 MTA buses, 400 commercial fleet delivery trucks, and 500 City vehicles that frequent Midtown Manhattan and Flatbush Avenue in Brooklyn will be fit with connected vehicle (CV) technology.
- The cost to design, build, test, operate, and maintain the New York City Pilot is estimated to total \$23,500,887.
- To ensure stakeholders that driver privacy will be maintained against performance measurement efforts, detailed location data is being removed, while still preserving all relative details about vehicle movements and driver actions taken in response to the Connected Vehicle application warnings.



#### Introduction

*This factsheet is based on past evaluation data contained in the ITS Knowledge Resources database at: [www.itskrs.its.dot.gov](http://www.itskrs.its.dot.gov). The database is maintained by the U.S. DOT's ITS JPO Evaluation Program to support informed decision making regarding ITS investments by tracking the effectiveness of deployed ITS. The factsheet presents benefits, costs and lessons learned from past evaluations of ITS projects.*

Connected vehicles are poised to transform our streets, communities, and personal lives. But first, we must tackle deployment challenges head on and provide interested regions with examples of success stories and champions. The U.S. Department of Transportation (USDOT) is taking on this challenge by investing in a regional pilot deployment program that is not only accelerating deployment but also uncovering what barriers remain and how to address them. This program will help ensure that this revolutionary technology can meet its fullest potential in the near future.

In September of 2015, USDOT selected New York City Department of Transportation (NYCDOT), Wyoming Department of Transportation (WYDOT) and Tampa Hillsborough Expressway Authority (THEA) as the recipients of a combined \$42 million in federal funding to implement a suite of connected vehicle applications and technologies tailored to meet their region's unique transportation needs. These pilot sites will help connected vehicles make the final leap into real-world deployment so that they can deliver on their promises of increasing safety and improving mobility. Moreover, these sites will lay the groundwork for even more dramatic transformations as other areas follow in their footsteps.

The sites are conducting the pilots in three Phases. Under Phase 1, the sites spent 12 months preparing a comprehensive deployment concept that was suitable for further design, building, testing, and operation. This comprehensive concept included identifying specific performance measures, targets and capabilities associated with performance monitoring and performance management. In Phase 2, the sites embarked on a 20-month phase of activity to design, build and test the nation's most complex and extensive deployment of integrated wireless in-vehicle, mobile device, and roadside technologies. In Phase 3, the tested pilot deployment applications and technologies will be placed into operational practice, where the impact of the deployment on a set of key performance measures will be monitored and reported.

#### New York City Pilot Overview<sup>1</sup>

The NYCDOT leads the New York City Pilot, which aims to improve the safety of travelers and pedestrians in the city through the deployment of V2V and V2I connected vehicle technologies.

This objective directly aligns with the city's *Vision Zero* initiative, which seeks to reduce crashes and pedestrian fatalities and increase the safety of travelers in all modes of transportation. NYCDOT's planned deployment provides an ideal opportunity to evaluate connected vehicle technology and applications in tightly-spaced intersections typical in a dense urban transportation system and is anticipated to be the largest connected vehicle technology deployment to date. The NYCDOT CV Pilot Deployment project area encompasses three distinct areas in the boroughs of Manhattan and Brooklyn. The first area includes a 4-mile segment of Franklin D. Roosevelt (FDR) Drive in the Upper East Side and East Harlem neighborhoods of Manhattan. The second area includes four

**The New York City Connected Vehicle Pilot is anticipated to be the largest connected vehicle technology deployment to date.**

one-way corridors in Midtown and the Upper East Side of Manhattan. The third area covers a 1.6-mile segment of Flatbush Avenue in Brooklyn. Approximately 5,800 taxi cabs, 1,250 MTA buses, 400 commercial fleet delivery trucks, and 500 City vehicles that frequent these areas will be fit with the CV technology. Using Dedicated Short Range Communication (DSRC), the deployment will include approximately 310 signalized intersections for vehicle-to-infrastructure (V2I) technology. In addition, NYCDOT will deploy approximately 8 RSUs along the higher-speed FDR Drive to address challenges such as short-radius curves, a weight limit and a minimum bridge clearance and 36 RSUs at other strategic locations throughout the City to support system management functions. As a city bustling with pedestrians, the pilot will also focus on reducing vehicle-pedestrian conflicts through in-

vehicle pedestrian warnings and an additional V2I/I2V project component that will equip approximately 100 pedestrians with personal devices that assist them in safely crossing the street.

## Costs

The CV Pilots were each required to submit a Comprehensive Deployment Plan under Phase 2. This plan describes the approach to complete the Phase 2 Design/Build/Test, and Phase 3 Operate and Maintain activities of the program. In the plan are details about the design approach, procurement, development, integration, testing, and final readiness demonstration. Additional details address the preparation of project plans to secure, operate, and maintain the system and protect privacy. A Cost Summary was also included in the plan to provide insight into the types of costs anticipated for this project (Cost ID: [2017-00385](#)).

These costs are broken into broad categories in the table below. The top four categories based on anticipated cost volume are:

1. Labor costs associated with the design, planning, management, procurement, and general oversight for the project. This includes the labor expense for the three key resources, labor expense related to Project Management and labor associated with the project deliverables (excluding time specifically spent on performance measurements, outreach, and training deliverables).
2. Cost for procuring the in-vehicle and roadside devices.
3. Labor and direct costs related to the installation, integration and maintenance of the in vehicle devices, roadside devices and supporting infrastructure.
4. Equipment and labor focused on meeting the Performance Measurement reporting requirements and deliverables.

**Table 1: High Level Phase 2 and Phase 3 Costs for the New York City Connected Vehicle Pilot Deployment by Expense Category**

Expense Category	Cost
Design/Planning/Project Management/Procurement/Oversight	\$5,826,216
Install/integrate/Maintain	\$5,649,982
In Vehicle and Roadside Devices	\$6,276,000

Expense Category	Cost
Performance Measurement Labor and Hardware	\$2,690,003
Software Development and Support	\$1,510,065
Travel and ODC	\$389,900
Outreach	\$327,458
Training	\$139,002
Infrastructure Adaptions	\$692,262
<b>TOTAL</b>	<b>\$23,500,887</b>

## Lessons Learned

**Include technical, operations, and legal personnel in stakeholder meetings to address the requirements of the CV deployment and ensure that participants' privacy is being maintained** (Lesson ID: [2017-00794](#))

NYCDOT first approached the Taxi and Limousine Commission (TLC), Metropolitan Transportation Authority (MTA), United Parcel Service (UPS), and others to propose a large-scale deployment of connected vehicles. The meetings included technical, operations, and legal personnel to address a wide range of issues, including device installation, maintenance requirements, operating hours, operator selection, geographic coverage areas, stakeholder responsibilities, system operation, driver interface, and data collection activities. A major concern that stakeholders voiced was that any data collected from the onboard units for the performance measurement of the system could be subpoenaed for criminal and/or civil suits or the subject of a freedom of information act (FOIA) request. Once obtained, the data could then be merged with other records (e.g. police accident reports) and used in legal proceedings, disciplinary proceedings, or insurance negotiations.

**The data being collected from the Pilot alone would not be considered Personally Identifiable Information (PII); however, stakeholders feared that, when merged with additional data (e.g. police accident records), PII could be created.**

To ensure stakeholders that driver privacy would be maintained, the team eventually came up with a solution that involved scrubbing the detailed latitude and longitude data recorded by the on board unit and converting it to an undefined Cartesian coordinate system for storage and later evaluation. Using this method, each event data set would still be recorded with full precision for all trajectory points relative to each other in the same event data set, but they would not be tied to an exact real-world coordinate. This removed the detailed location data that could be tied to accident records but still preserved all relative details about vehicle movements and driver actions taken in response to the Connected Vehicle application warnings to ensure proper evaluation of the system.

## References

[1] Connected Vehicle Pilot Deployment Program. New York City Pilot. [https://www.its.dot.gov/pilots/pilots\\_nycdot.htm](https://www.its.dot.gov/pilots/pilots_nycdot.htm). Last Accessed: January 24, 2018.