REV Demonstration Project:
Electric School Bus V2G
2019 1Q Quarterly Progress Report

Dated: January 31, 2019

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1.0 EXECUTIVE SUMMARY

Consolidated Edison Company of New York, Inc. ("Con Edison" or the "Company") submits this quarterly report on the progress of the Electric School Bus V2G REV demonstration project (the "Project") it is implementing as part of the Reforming the Energy Vision ("REV") proceeding, as required by the *Order Adopting Regulatory Policy Framework and Implementation Plan*, issued by the New York State Public Service Commission ("Commission") on February 26, 2015.

1.1 PROGRAM ACHIEVEMENTS

On June 8, 2018, Con Edison submitted the Project for approval by Department of Public Service Staff ("DPS Staff"); on June 20, 2018 DPS Staff approved the Project. Con Edison filed an implementation plan for the Project with the Commission on November 13, 2018. In Q4 2018, the Company focused on the implementation of the Project, specifically contract execution, site construction, and bus operation.

1.2 CYBERSECURITY AND PERSONALLY-IDENTIFIABLE INFORMATION PROTECTION

Consistent with corporate instructions and Commission policy related to cybersecurity and the protection of personally-identifiable information ("PII"), each partner agreement executed for the implementation of the Project includes, where applicable, specific protections related to cybersecurity and PII. Assurance of this protection is critical in encouraging customers to sign up with new and innovative services offered by utilities.

1.3 ACCOUNTING PROCEDURE ESTABLISHED

On February 16, 2016, in Case 15-E-0229, Con Edison filed an accounting procedure for the accounting and recovery of all REV demonstration project costs. This accounting procedure establishes a standardized framework that will govern how the Company categorizes and allocates the costs of the REV demonstration projects and will facilitate analyzing each project to determine the overall financial benefits of the program to customers.

1.4 COSTS, BENEFITS, AND OPERATIONAL SAVINGS

Budget information for all of the Company's REV demonstration projects is being filed confidentially with the Commission, concurrently with the filing of this document. All costs filed are incremental costs needed to implement the projects. To reduce overall

project costs Con Edison worked closely with NYSERDA to take advantage of an expiring grant program.[1] Due to the early stage of implementation for the Project, there are no operational savings to report at this time.

1.5 ELECTRIC SCHOOL BUS V2G

The Project is designed to examine the technical and operational viability of using school buses as both a grid resource and transportation asset. Key tests include proving that electric school buses function well for transportation purposes, are reliable as grid assets, and that using them as grid assets does not cause excessive wear and tear on the equipment. Con Edison is executing the Project in partnership with First Priority Green Fleet ("First Priority"), who is responsible for project management, design and construction of vehicle and site hardware, and V2G operations and analysis.

In Q4 2018, (1) Con Edison and First Priority reached contract terms, (2) the buses were ordered, delivered and have operated reliably since September 2018, and (3) First Priority has installed 100% of the permanent vehicle charging infrastructure.

[1] The federally funded NYT-VIP program.

2.0 ELECTRIC SCHOOL BUS V2G – QUARTERLY PROGRESS

2.1 DEMONSTRATION HIGHLIGHTS

2.1.1 Since Filing of Demonstration Proposal - Major Task Completion

- Project Planning:
  - Con Edison signed project contracts with National Express and First Priority
- Phase 1: Electric Bus Operations & Analysis:
  - First Priority delivered e-buses and provided training to operators
  - First Priority installed Viriciti data logging devices on buses to measure vehicle performance
- Phase 2: Design and Construction of Charging & V2G Infrastructure
  - First Priority has installed 100% of the electrical charging infrastructure, including: conduit and wiring to the charging stations, five charging stations, switch gear. It has partially completed the V2G infrastructure, such as necessary disconnect switches
  - FPGF and its subcontractor ChargePoint (formerly Kissensum) passed Con Edison's cybersecurity vendor risk assessment
  - First Priority has submitted the required distributed generation application to Con Edison

2.1.2 Activities Overview

Project Planning: The Project team entered into partner agreements with First Priority, the project implementor, and National Express, the bus owner and operator.

Phase 1: Electric Bus Operations and Analysis

First Priority delivered the buses to National Express in June 2018. These are the first new, all-electric full-sized school buses in New York State. Several news outlets covered the vehicles favorable reception by the community.[2]

The team is readying the buses and infrastructure for V2G deployment. First Priority submitted a standardized interconnect requirements application (SIR) through Con

[2] https://www.nytimes.com/2018/11/12/climate/electric-school-buses.html

Edison's Power Clerk portal. Because of the project size and use of standard inverters, the team does not anticipate approval challenges.

The electric school buses have performed their primary student transportation function well. This was the key phase one goal. National Express reported 96% uptime during the first two months of operation while completing software adjustments and minor mechanical repairs. Subsequent mechanical issues associated with the installation of after-market bus heaters in preparation for the cold winter months temporarily reduced the uptime to about 80%. The original drivers continue to operate the vehicles and report high vehicle satisfaction, according to a survey performed by National Express and First Priority. Operators expressed one concern regarding the amount of force necessary to engage the secondary hand brake. National Express provided that feedback to Lion.

In December, First Priority successfully installed cellular data loggers that capture miles travelled, energy consumed, state of charge (SoC), and energy per mile. This data helps detail the cost of operating an EV and the range in real world driving and weather conditions.

Phase 2: Design and Construction of Charging and V2G Infrastructure

Electrical subcontractors completed the majority of the site electrical work. The chargers are on site and installed.

The preparation for V2G is also underway. First Priority submitted its distributed generation interconnection request and Con Edison is doing a Coordinated Electric System Interconnection Review (CESIR).

Figure 1: Laying of Charger Electrical Conduit, November 2018

2.1.3 Key Metrics

In Q4, the Project team focused on successful bus operations and necessary site construction. The following data supports the Phase 1 goals of reliability and bus performance.

- E-school bus days of operation: 80
- Vehicle failures due to out of specification range: 0
- Misleading range data provided to driver: 0

2.1.4 Next Quarter Forecast

In Q1 2019, the Project team will begin numerous Phase 2 V2G aspects, including installing the bi-directional charging stations, completing the charger-side software, and modifying the buses' battery management systems. This is in preparation for Phase 3 V2G commissioning in Q3.

2.1.5 Checkpoints/Milestone Progress

Checkpoint/Milestone	Timing*	Status
Buses Perform as Expected as Transportation	Phase 1 Midpoint / End	
Network integration and System testing	Phase 2 Midpoint / End	
Battery and vehicle impacts evaluated and documented	Phase 3 Midpoint / End	

Legend

On Schedule	Delayed w/out Major Impact	Delayed or Stopped – Project Goals Impacted

2.1.6 Planned Activities

2.1.6.1 Customer Acquisition

Status: Green

Expected Target by Phase 1 Midpoint: No vehicle failures due to below specification range or misleading data provided to driver.[3]

Actual by Phase 1 Midpoint: No vehicle failures due to below specification range or misleading data provided to driver.

Solutions/strategies in case of results below expectations: Use diagnostic data to determine cause of failures. Work with customer (National Express) to pursue any out of specification vehicle failures with manufacturer.

[3] Maximum range for these vehicles is 80 miles per charge. Use of heating, air-conditioning and regenerative braking are all factors that can affect range. An example of misleading data provided to the driver would be the bus reporting 40 miles of driving range when in fact only 20 is available. This would make the vehicle unreliable from the driver's perspective.

2.1.6.2 Construction/Commissioning and Integration

Status: Green

Expected Target by Phase 2 Midpoint: Inverter hardware works 100% of the time after pre-summer v2g period diagnostic testing. Software responds to all communication signals and control V2G discharge

Actual by Phase 2 Midpoint: N/A

Solutions/strategies in case of results below expectations: Software troubleshooting methodology from past V2G projects, onsite testing, and potential hardware replacement.

2.1.6.3 Battery and vehicle impacts evaluated and documented

Status: Green

Expected Target by Phase 3 Midpoint: V2G use should have little quantitative or perceived impact on the vehicle's primary transportation asset value. Performance targets are .3%-2% per season.

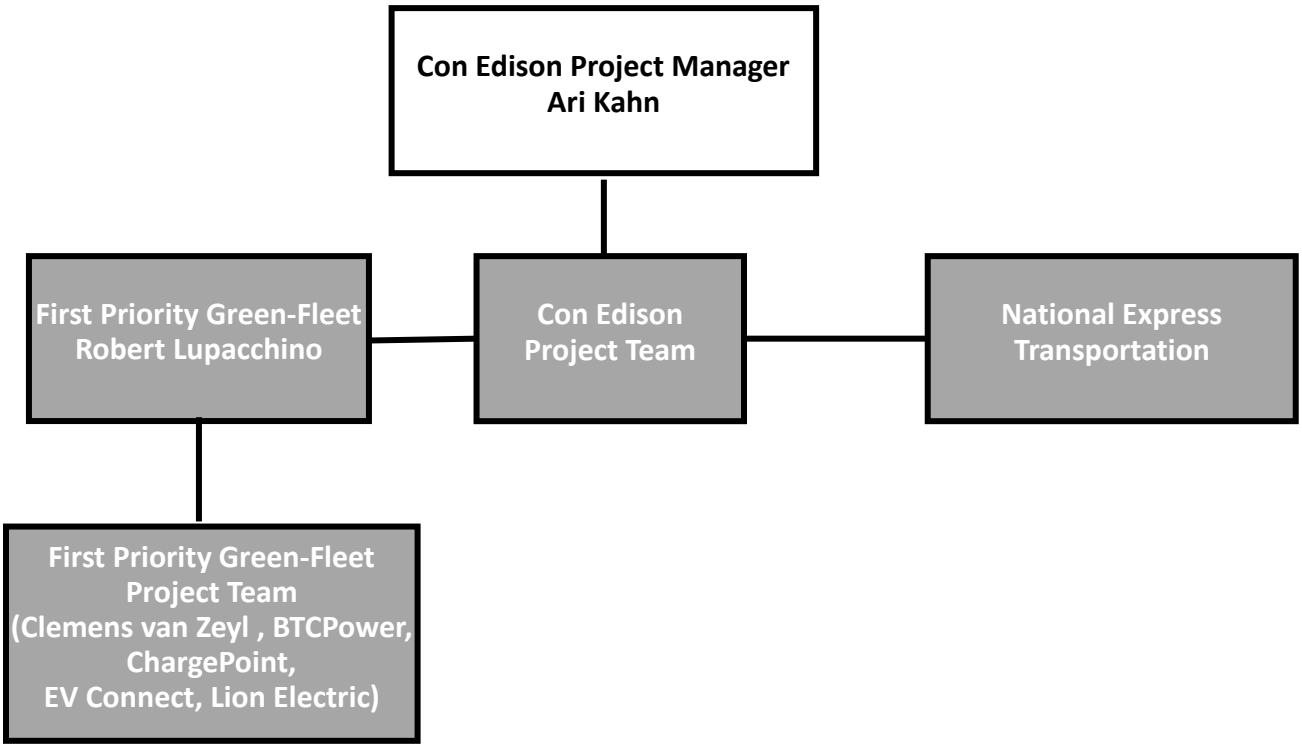
Actual by Phase 3 Midpoint: N/A

Solutions/strategies in case of results below expectations: Reduce depth of discharge and peak state of charge to see if battery wear impacts can be brought to within expected parameters. Explore cell temperature controls.

2.2 CHANGES TO THE PROJECT DESIGN

While the project design has not changed, there have been changes related to the implementation partners. Robert Lupacchino and Clemens van Zeyl have assumed project leadership responsibilities for First Priority. ChargePoint has also acquired Kissensum, the project's V2G provider. The revised project organization chart is as follows:

Figure 2: Team Leadership/Organization



2.3 WORK PLAN & BUDGET REVIEW

2.3.1 Phase Review

The Project team has completed its Project Planning and made progress on Phase 1 (Bus Operations and Analysis) and Phase 2 (Design and Construction of Hardware and V2G Infrastructure). The Project team anticipates development of V2G components this quarter in anticipation of Q3 V2G operations.

2.3.1.1 Phase Progress

2.3.2 Work Plan

Action Nbr.	Phases, Activities/SubTasks	Milestones	Lead	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Demonstration Planning														
0.1	Obtain Commission Approval	PSC approval received	Con Ed											
0.2	Finalize contract with NELLC	Contracted executed	Con Ed											
0.3	Finalize contract with FPGF	Contract executed	Con Ed											
Phase I: Electric Bus Operations and Analysis														
1.1	Buses shipped to NJ from Montreal	Buses arrive in NJ	FPGF											
1.2	Buses pre-inspected, customized, detailed, prepped	Buses prepped for delivery	FPGF											
1.3	Buses delivered and inspected	Buses pass DMV inspection	FPGF											
1.4	FPGF provides operational/technical training	Nat'l personnel certified to operate ebuses	FPGF											
1.5	Buses operational	Buses commence on routes	FPGF											
1.6	Buses generate performance analytics	Data collected from CAN bus and telematics	FPGF											
1.7	Quarterly Data analysis, measurement and evaluation	Analyses/findings produced and reported quarterly	FPGF											
Phase II: Design and Construction of Charging and V2G Infrastructure														
2.1	Site assessments and engineering drawings	Plan and drawings submitted	FPGF											
2.1	Electrical service request	Con Ed receives service request	FPGF											
2.3	Utility assessment and service plan	Con Ed issues service plan	Con Ed											
2.4	EVSE assessment and site plan	Healy Electric completes EVSE site plan	FPGF											
2.5	Ordering of equipment/hardware	EV Connect orders hardware/equipment	FPGF											
2.6	Installation of networked charging stations (without V2G)	5 charging stations installed	FPGF											
2.7	Testing of interface with buses	Testing concludes with full functionality	FPGF											
2.8	Chargers operational	Charging stations fully operational	FPGF											
2.9	EV Connect provides operational training	WPBC personnel knowledgeable of charger operations	FPGF											
2.10	Electricity consumption patterns analysis	Duty and charge cycles established	FPGF											
2.11	Design and software coding	V2G software coding completed	FPGF											
2.12	Charging stations upgrade with inverters and software	Charging stations upfitted with inverters, one at a time	FPGF											
2.13	Buses modified (BMS modifications and SAE Combo plugs)	BMS sytems reengineered; SAE Combo plugs/inverters added one at a time	FPGF											
2.14	Network integration and system testing	charging stations and buses tied to grid through EMP	FPGF											
Phase III: V2G Operations and Analysis														
3.1	V2G launch (summer 1)	V2G fully operational	FPGF											
3.2	V2G battery baselining (summer 1)	V2G baseline established	FPGF											
3.3	V2G analysis (fall 1)	Battery and vehicle impacts evaluated and documented	FPGF											
3.4	V2G commissioning & battery baselining (summer 2)	V2G deployed	FPGF											
3.5	V2G analysis (fall 2)	V2G performance evaluated and documented	FPGF											
3.6	Data collection from Energy Management Platform	Data collected and logged from EMP	FPGF											
3.7	Quarterly Data analysis, measurement and evaluation	Analysis completed with findings/recommendations; reports filed	FPGF											

2.3.3 Updated Budget

Budget information is being filed confidentially with the Commission.

2.4 CONCLUSION

2.4.1 Lessons Learned

Phase 1's biggest question was whether the buses would operate well as transportation. The buses are meeting expectations. This is likely a result of the quality of the vehicles, the mindset of the operator, and the preparedness of all parties in matching the vehicles to the usage.

- Numerous fit and finish issues can put a school bus out of service. Components like turn signals, lights, and door mechanisms must work reliably. The bus and its components have functioned well and without major failure.

- National Express understood that, as new technology, e-buses would behave differently than conventional ones. National spent time training its drivers and maintenance employees so that they understand the vehicles.

- The most fundamental performance difference between electric and internal combustion vehicles is range. First Priority, National and Lion matched the buses to routes that are within the buses' capabilities.

2.4.2 Recommendations

The Company recommends further industry outreach so other bus operators can learn from this demonstration. The Company also recommends ensuring that the V2G operations are successful and well documented.