Medium and Heavy-Duty Electric Vehicle Deployment's Data Collection

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Organization: CALSTART

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Annual Merit Review Presentation
Project ID: ti121
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Overview Slide

Timeline

Project start date:	October 1, 2019
Project end date:	March 31, 2023
Percent complete:	~35%

Barriers

- Transportation electrification is growing rapidly yet data on medium and heavy-duty (MD-HD) electric vehicles (EVs) is lacking
- MD and HD EVs will have larger grid impacts that need to be better understood

Budget

Total project funding

- DOE share: $2.16M
- Contractor share: $0 (no cost share required)

Budget Period 1: $514,073

Budget Period 2: $779,079

Budget Period 3: $873,719

Partners

- **Project lead:** CALSTART
- **Subrecipient:** UC Riverside
- **Implementation:** Tetra Tech; ViriCiti, Geotab
- **Clean Cities Coalitions:** Empire Clean Cities, Live Green Connecticut, Denver Metro Clean Cities, Kansas City Regional Clean Cities, Yellowstone-Teton Clean Cities

Overview Slide

Examples of the vehicle types data is being collected on

Transit Bus
(HD)

Off-Road

Class 6 Truck
(MD)

School Bus
(HD)

Class 8 Truck
(HD)

Project Objectives

Project Objectives

- Collect, validate, analyze and provide summary results on operational data collected from more than 200 MD and HD EVs.
- Disseminate results via public webinars and workshops
- Robust national dataset from a variety of fleet applications, vehicle types, geographies, terrains and climate conditions

VTO TI Goals Addressed

- National security – fuel diversity and alternative fuels
- Economic growth- support growth of alternative clean vehicle technology
- Affordability for business and consumers – understand usage of alt fuels & support cost savings for businesses
- Reliability/resiliency – diverse fueling and transportation options

Barrier Impact

- Expanded national EV dataset to better inform future policy and deployment decisions
- Identification of regional and national trends in MD and HD EV deployment and operating performance
- Improved understanding of grid impacts

Any proposed future work is subject to change based on funding levels

Approach – Three Phases

Phase 1: Establish Framework for Data Collection

- **Task 1.1** – Develop requirements for data characteristics, processing, and storage
- **Task 1.2** – Confirm list of project data sets
- **Task 1.3** – Setup the hardware and software for data collection

Phase 2: Implement Data Collection

- **Task 2.1** – Perform filtering and quality control for data from MD and HD EV deployments
- **Task 2.2** – Conduct data collection on the upcoming projects
- **Task 2.3** – Conduct data collection on the new projects

Phase 3: Data Analysis, Reporting and Sharing

- **Task 3.1** – Develop procedures for summary analysis
- **Task 3.2** – Perform data analyses
- **Task 3.3** – Produce Final Report and conduct information sharing

Budget Period 1 Milestones

Milestone		Type	Description	Status
M1.1	Data sets from **completed projects (A)** are confirmed and approved	Activity	Data sets from completed projects have been approved for sharing.	**Completed**
M1.2	Data Collection Plan completed	Technical	Complete a standardized Data Collection Plan which includes DOE data requirements	**Completed**
M1.3	**Upcoming projects (B)** for data collection confirmed	Technical	Upcoming data sets have been secured and align with the Data Collection Plan.	**Completed/ continuing to BP2**
M1.4	**New projects (C)** for data collection identified	Technical	Outreach completed and new projects have been identified, approved, and align with the Data Collection Plan.	**Complete, continuing to BP2**
M1.5	Number of vehicles / projects for data collection confirmed	Technical	Agreements in place to determine the number of vehicles/projects moving forward for data collection.	**Completed**
M1.6	Transfer data	**Go/No-Go**	First data set transferred to DOE-designated national laboratory.	**Completed**

Any proposed future work is subject to change based on funding levels

Budget Period 2 Milestones

Milestone		Type	Description	Status
M2.1	Data collection for the **upcoming projects (B)** commenced	Technical	Initial data sets from the upcoming project category are received by Recipient.	**In Progress**
M2.2	Data collection for the **new projects (C)** commenced	Technical	Initial data sets from the new project category are received by Recipient.	**In Progress**
M2.3	Transfer data	**Go / No-Go**	Complete quarterly raw data transfers to DOE-designated national lab(s).	**In Progress**

Project Accomplishments and Progress

List of data collection parameters

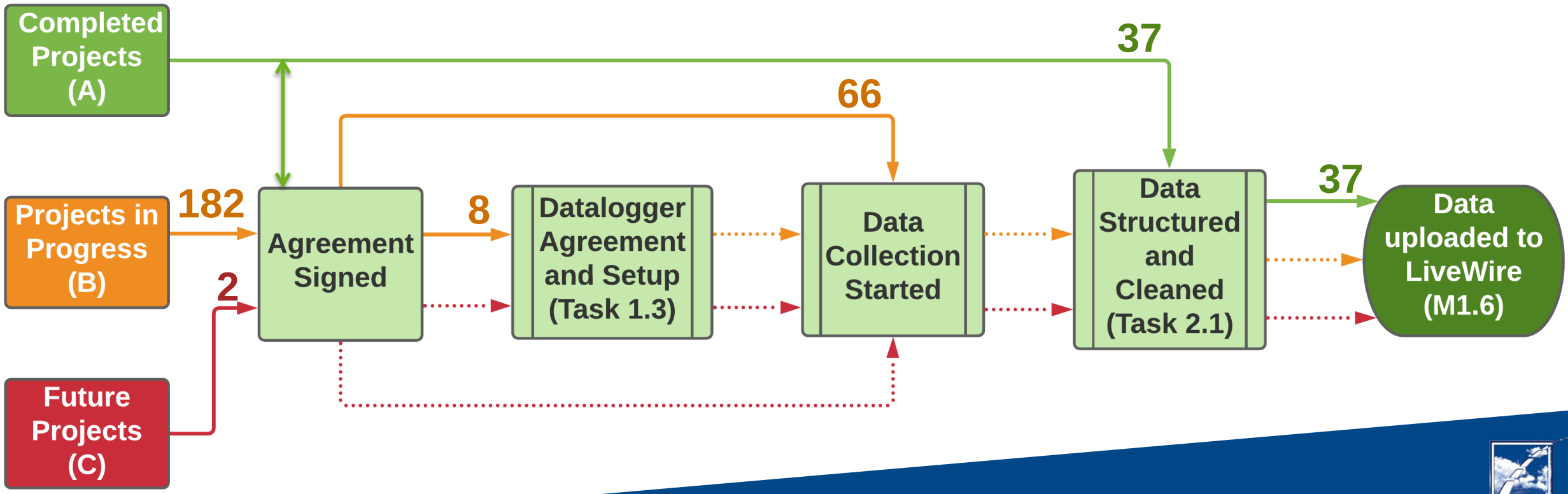
Vehicle Attributes	
Model Year	Battery Chemistry
Initial Service Year	Rated Energy
Data Collection Start	Max Charge Rate
Data Collection End	Charge Connector
Model Name	Total Fleet Size
Manufacturer	% Electrified
Weight Class	State
Curb Weight	Region
Capital Cost	Body Style
Nominal Range	Sector
Nominal Efficiency	Vocation
Peak Power	Vehicle Platform
Peak Torque	Fleet Type
Towing Capacity	Data Collection Method

Vehicle Data	Charging Data	Maintenance Data
Date	Local Connect Time	Timestamp, in
Number of Trips	Local Disconnect Time	Timestamp, out
Total Distance	Local Charge Start Time	Mileage, in
Total Drive Duration	Local Charge End Time	Mileage, out
Total Idle Time	Average Power	Summary of Problem
Initial SOC	Max Power	Type of Maintenance
Final SOC	Total Energy Delivered	Parts Cost
Total SOC Used	Starting SOC	Labor Cost
Total Energy Consumed	Ending SOC	Warranty Covered?
Average Ambient Temperature	Etc.	Etc.
Initial Odometer		
Final Odometer		
Etc.		

Project Accomplishments and Progress

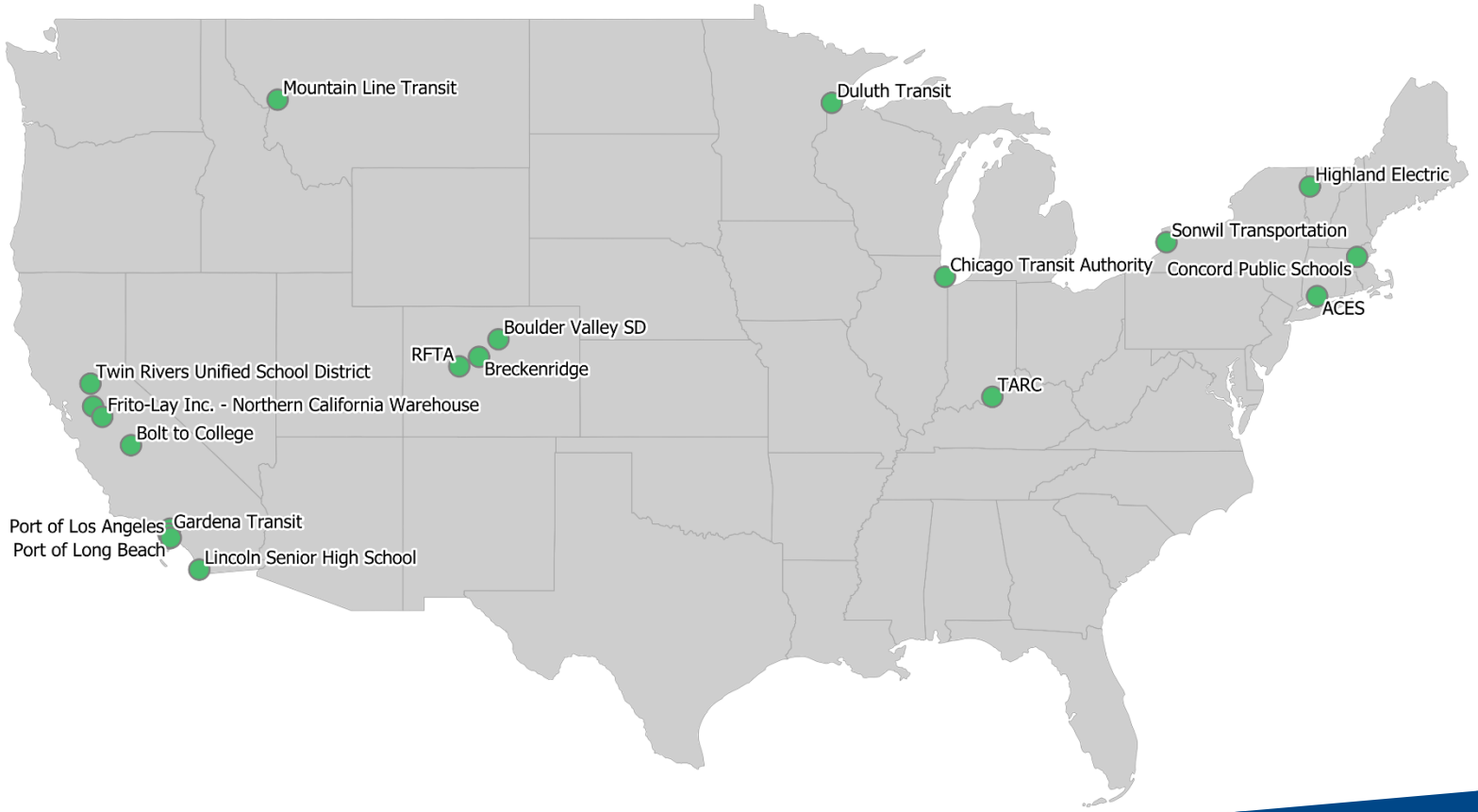
Category A data uploaded to Livewire
37 vehicles / 7 fleets (19% of goal)

Numbers reflect vehicles entering each stage



Project Accomplishments and Progress

221 vehicles across 26 distinct fleets have signed data sharing agreements

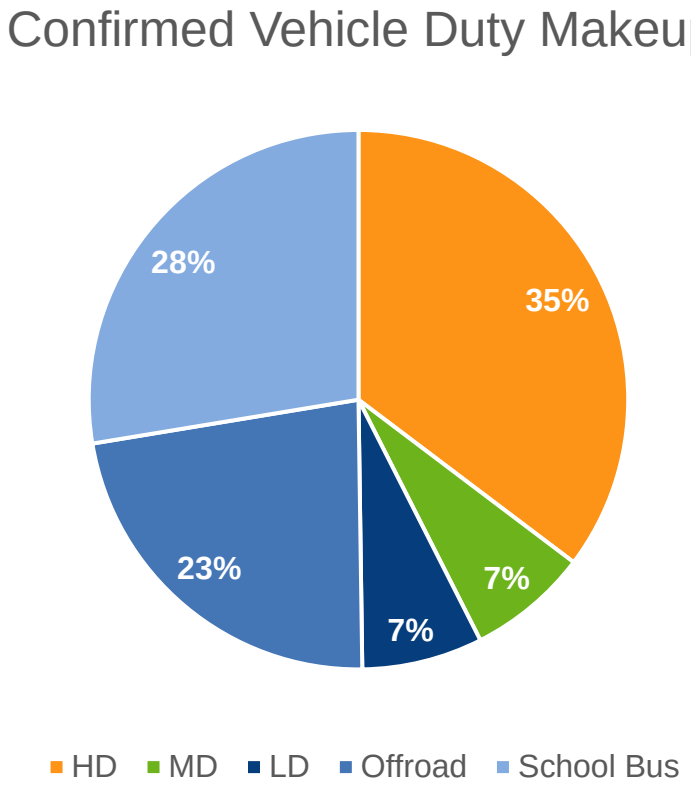


Metric	Quantity
Clean Cities Partnerships	5
Data Sharing Agreements Executed	26
Confirmed Participating Vehicles	221
Vehicle Datasets Uploaded	37

Project Accomplishments and Progress

221 vehicles signed data sharing agreements
Additional 253 vehicles under discussion

- **35%** of confirmed vehicles are heavy-duty *(transit or Class 8 trucks)*
- **28%** of confirmed vehicles are school buses
- **23%** of confirmed vehicles are off-road vehicles *(yard tractors)*
- **7%** of confirmed vehicles are medium-duty vehicles *(Class 6 trucks)*



	Confirmed	Identified
	Vehicles	
HD	78	162
MD	16	8
LD	16	0
Off Road	50	44
School Bus	61	39
Total	**221**	**253**

Collaboration & Coordination Among Project Team

Department of Energy

Project Sponsor

- National Renewable Energy Lab
- Argonne National Lab
- Idaho National Lab

National Lab Advisors

UCR

Sub-recipient

CALSTART

Prime/Project Manager

TETRA TECH

GEOTAB

VIRICITI

Implementation Partners

- Empire Clean Cities
- Live Green Connecticut
- Denver Metro Clean Cities
- Kansas City Regional Clean Cities
- Yellowstone-Teton Clean Cities

Clean Cities Coalitions

CALSTART

Overall Impact

Achievements to date

- Established a data collection process
- Exceeded our goal of securing 200 diverse electric vehicles for data transfer
- Successfully uploaded first batch of data to LiveWire

Market Impact and Sustainability

Barrier: M/HD vehicle data is sparse

- All data collected through this project will be made publicly accessible through DOE's LiveWire platform to better inform future deployments, policy decisions, and the larger industry.

Barrier: Trends in M/HD EV deployments need to be identified

- The project dataset will provide a diverse, cross-sectional look at real-world performance data for medium and heavy-duty EVs on both a regional and national scale.
- Improves insight into best-practices and key considerations for EV deployment strategies.

Barrier: M/HD Vehicles will have significant grid impacts

- Operational and charging data being collected will help better forecast and understand future grid impacts from M/HD EVs

Summary

Objectives	Collect, validate, analyze and provide summary results on operational data collected from more than 200 medium and heavy-duty (MD-HD) electric vehicles (EVs).
Approach	•Establish framework for data collection •Implement data collection and cleaning process •Perform data analysis, reporting, and sharing
Collaborators	•Sub-recipient: University of California, Riverside •Implementation Partners: Tetra Tech, Geotab, ViriCiti •National Labs: National Renewable Energy, Argonne National, Idaho National Labs •Clean Cities Coalitions: Empire Clean Cities, Live Green Connecticut, Denver Metro Clean Cities, Kansas City Regional Clean Cities, Yellowstone Clean Cities
Accomplishments	•Established data framework in collaboration with National Labs •Validated, prepared, and uploaded 37 vehicle datasets to LiveWire •Executed 26 fleet data sharing agreements •Confirmed 221 vehicles for data collection •Launched project landing page