PLUG-IN HYBRID ELECTRIC COMMERCIAL FLEET DEMONSTRATION AND EVALUATION

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South Coast Air Quality Management District

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ARRAVT083

Overview

Timeline

- Start – November 2009
- Finish – July 2015
- 40% Complete

Budget

Total project funding

- DOE - $45,443,325
- Contractor - $45,443,325

Barriers

- CARB approval
- Wide geographic distribution of demonstration fleet vehicles
- Fleet resistance to placing new technology in mission critical applications
- Fleet resistance since economic and secondary benefits not yet demonstrated

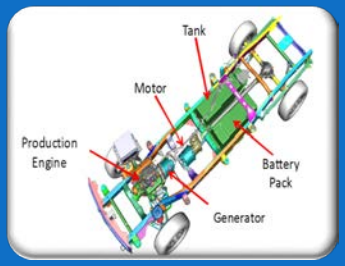
Partners

- SCAQMD
- EPRI
- VIA Motors
- Odyne Systems
- Pathway Technologies
- Utility Industry as a whole

Objectives

- Nationwide demonstration and evaluation of approximately 280 medium-duty PHEV's
- Develop a production-ready, commercializable PHEV system for class 2 to 7 vehicles
- Develop production-ready "smart charging" capability for the vehicle
- Build customer familiarity
- Use project results for system development to optimize performance and reduce costs
- Quantify performance attributes and environmental impact

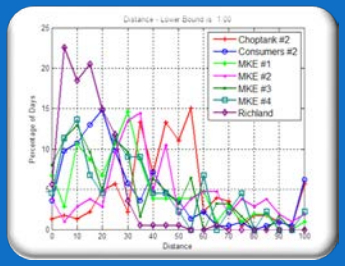
Approach



Design and Develop PHEV Drive Systems

- Class 2 Pick-up and Van
- Class 6/7 Work Trucks

Fleet Selection, Vehicle Build & Deployment



Performance Assessment

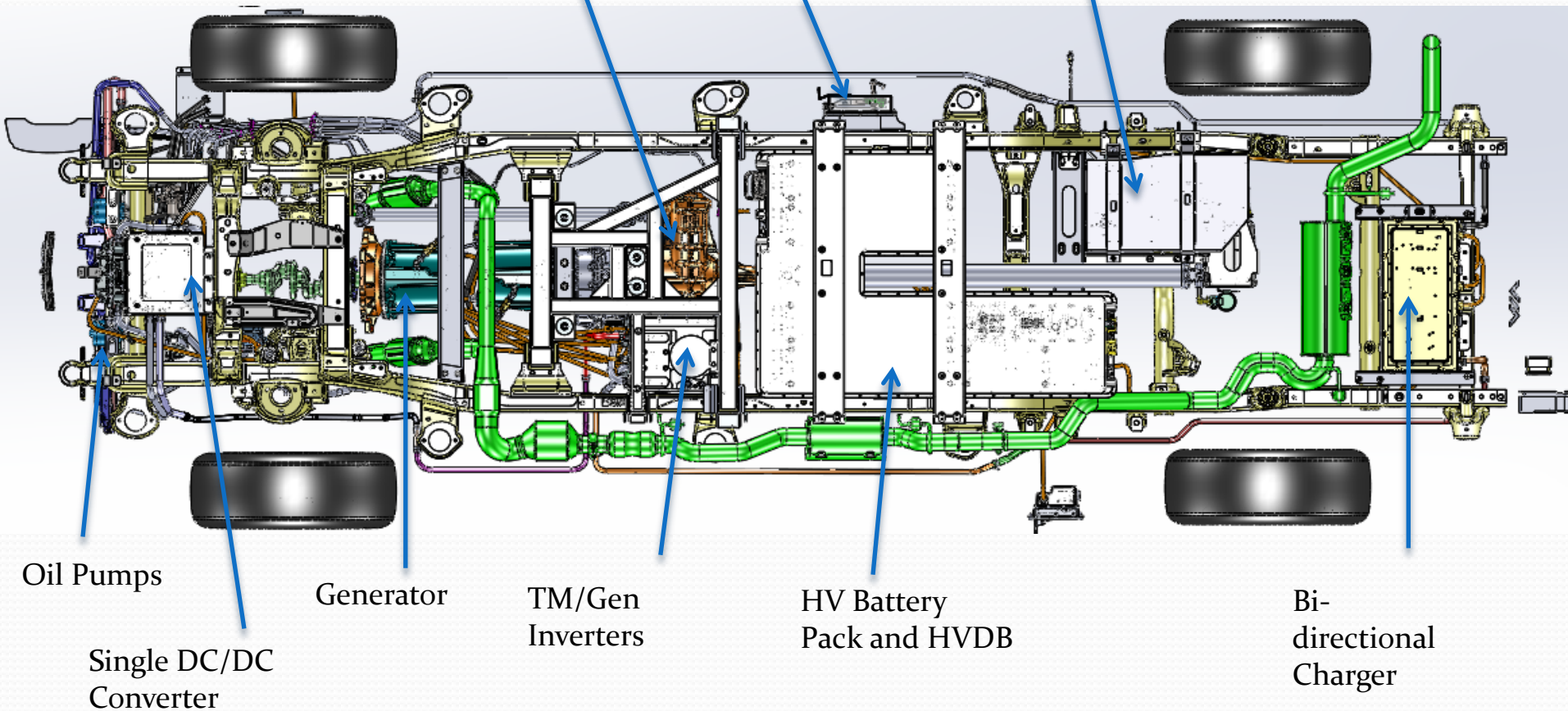
- In-use data collection
- User surveys
- Laboratory testing

Class 2 PHEV System -VIA Motors

Vehicle Design:

- Series hybrid system
- 4.3L gasoline V6 engine
- 4x4 or RWD
- High energy lithium-ion battery – 23 kWh
- Charging-Level 1 and Level 2
- Crew Cab, Extended Cab, or Regular Cab
- Optional: 10 kW Export power

VIA Motors System Design



Class 6/7 PHEV System – Odyne

- Odyne Hybrid System with Allison automatic transmission
- Diesel Engine
- High Energy Lithium-Ion Battery- JCS 28 kWh
- Launch Assist and Regen
- Worksite electrification
- On-board Charger (3.3 kW)
- Charging-Level 1 (120 Vac) and Level 2 (240 Vac)
- Export Power (5 kW)
- Redundant system that can be returned to conventional driving

Work Truck Applications

Hybrid Bucket Truck

Hybrid Digger Derrick

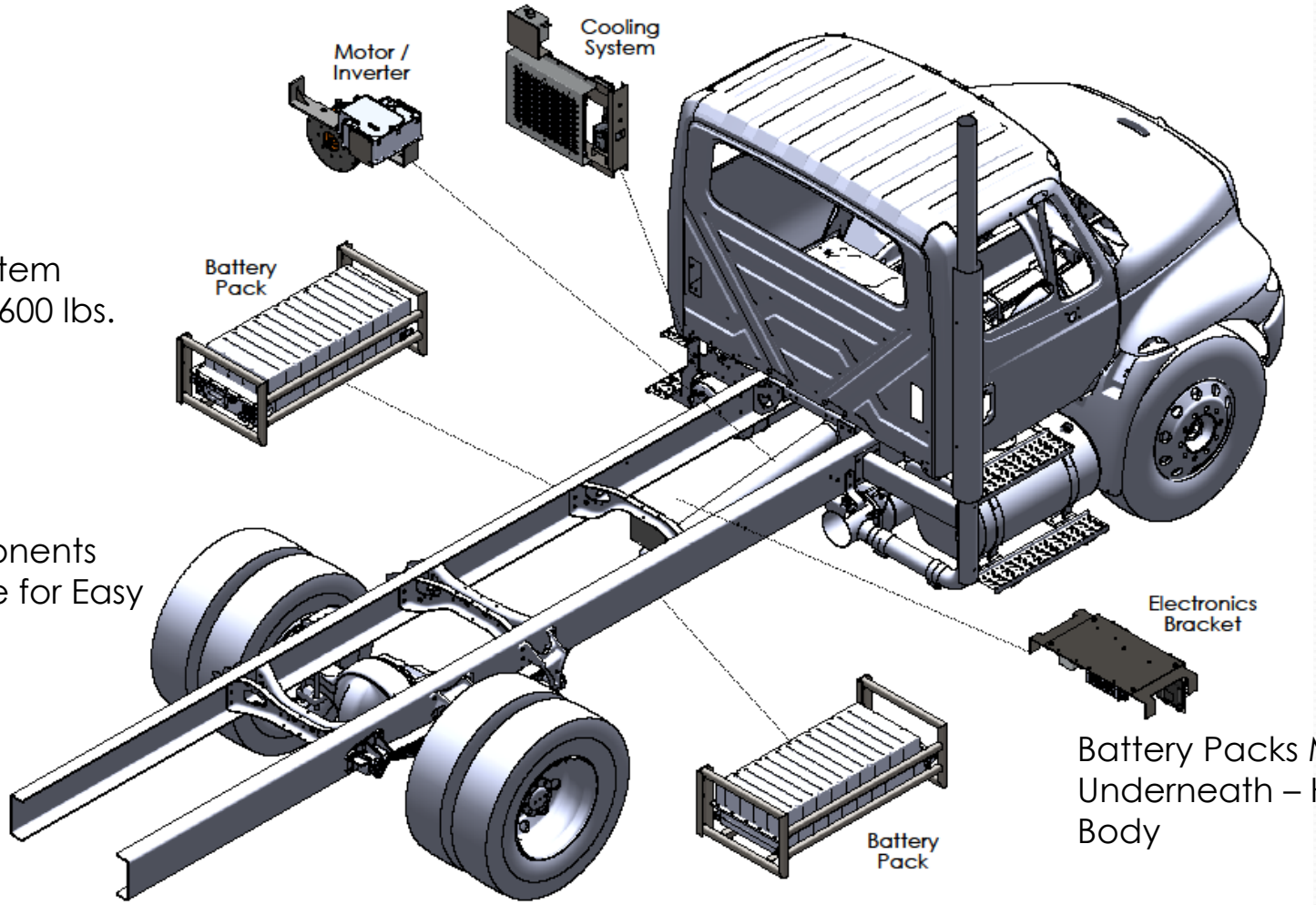
Hybrid Compressor Truck

Hybrid Crane Truck

Core Components

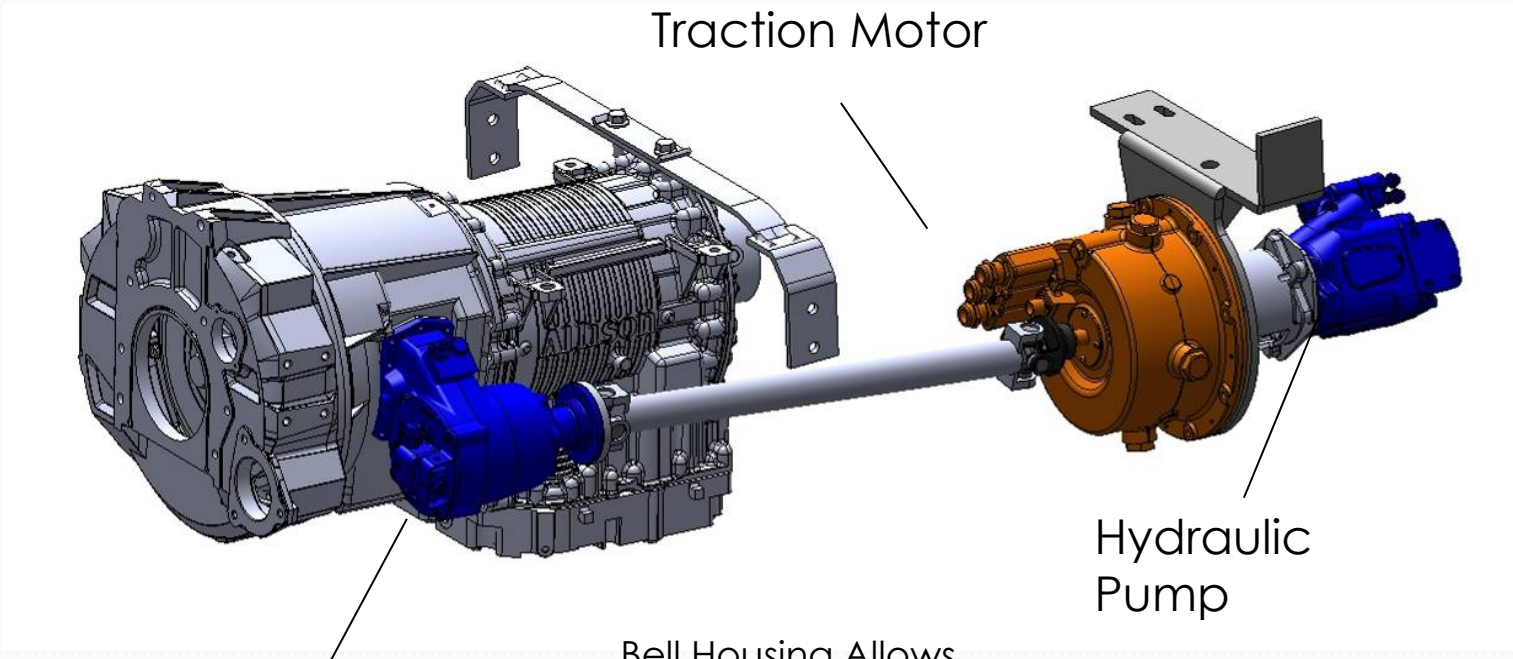
Hybrid System
Weight: 1600 lbs.

All Components Accessible for Easy Service



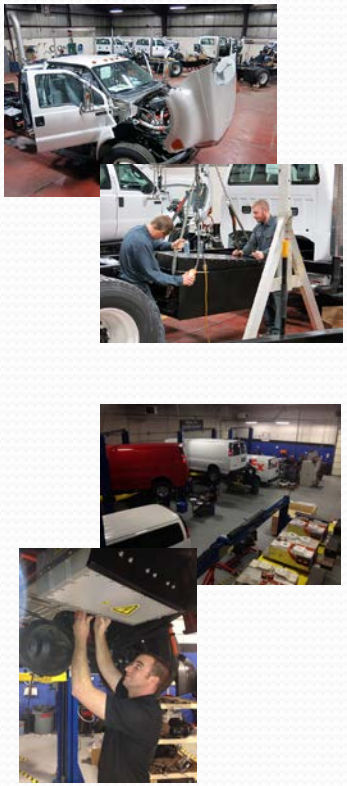
Battery Packs Mount from Underneath – Hidden by Body

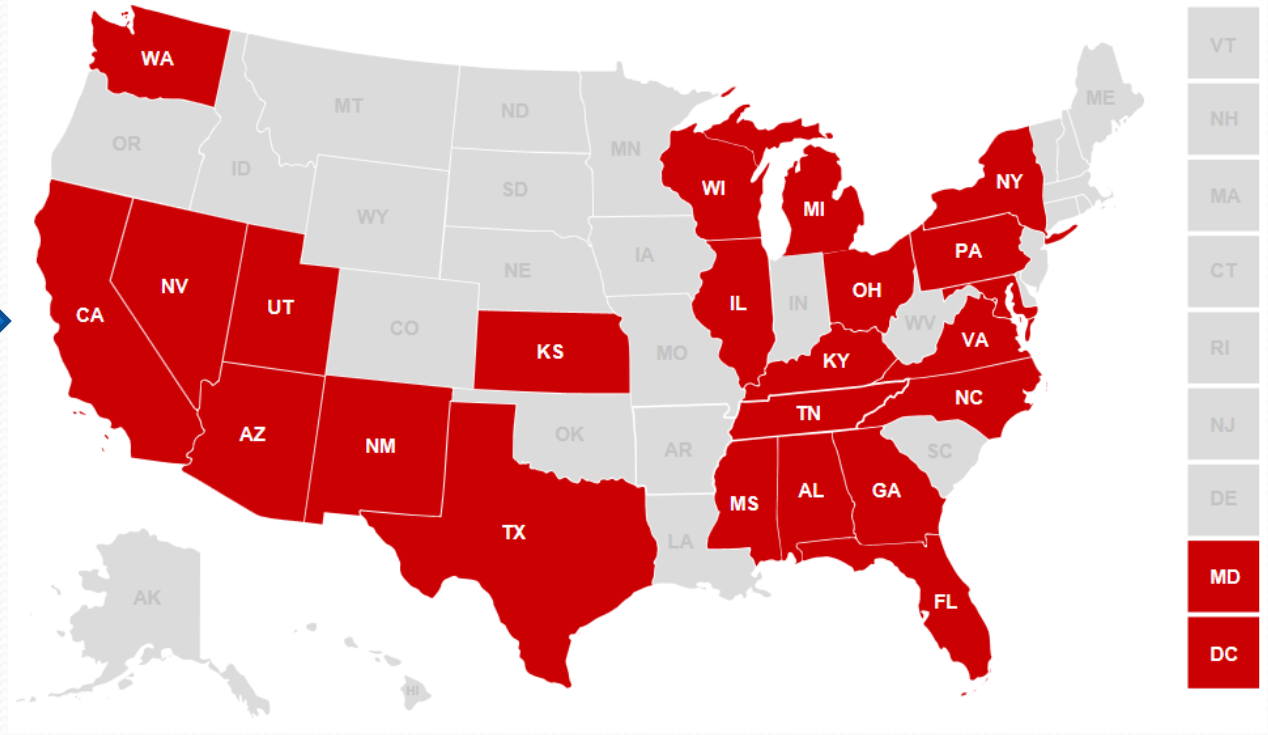
Electric Machine/ Transmission Interface



Fleet Build and Deployment

65 different participants in 23 States plus DC and two Provinces- Manitoba and British Columbia

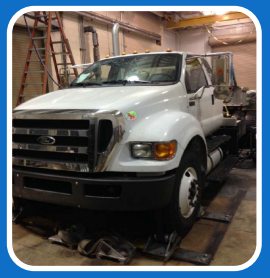




Performance Evaluation

In-Use Data Collection

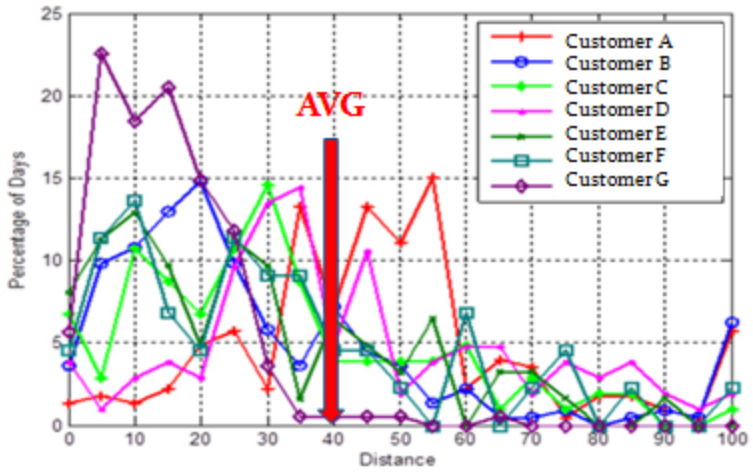
User Surveys



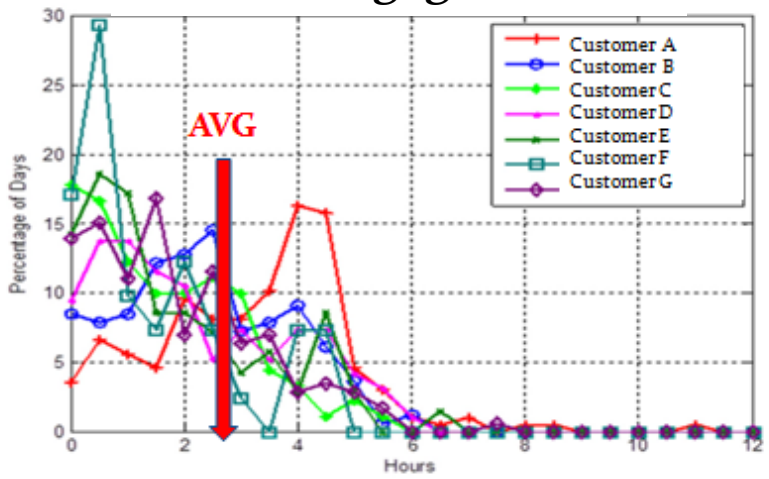
Chassis Dyno Emissions and Fuel Economy Testing

Odyne Beta Field Data

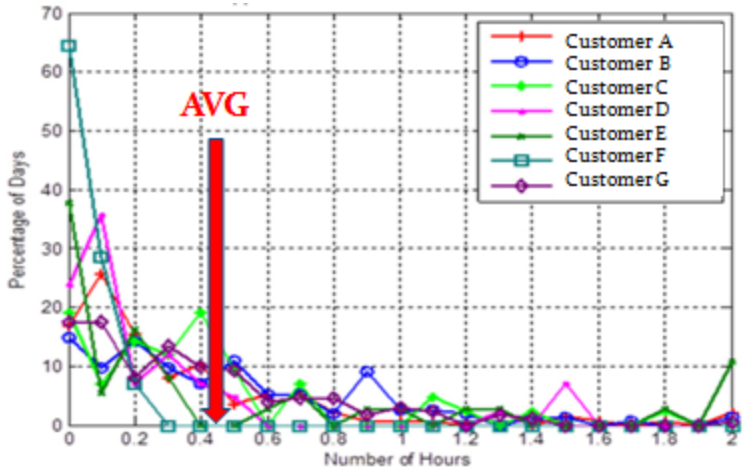
Driving Distance



PTO Engagement

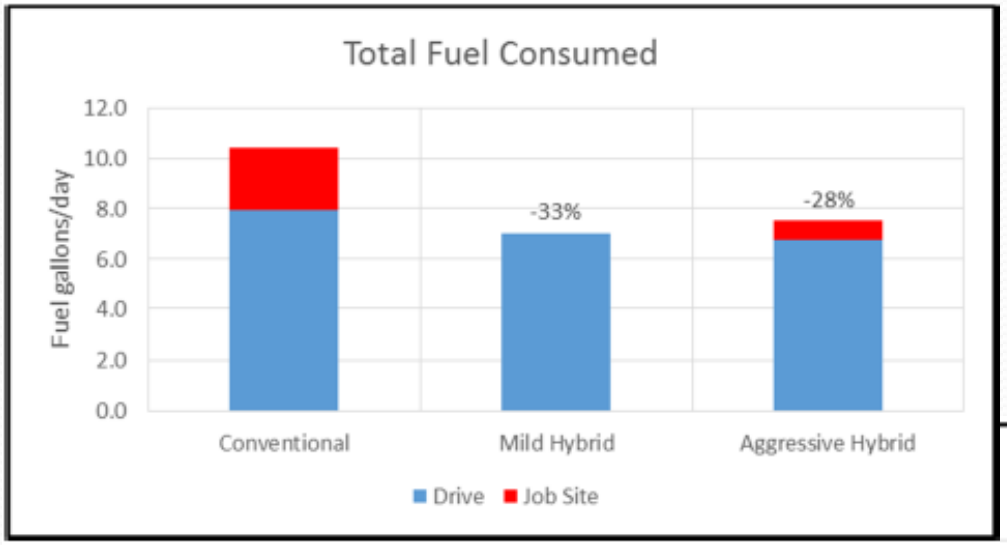


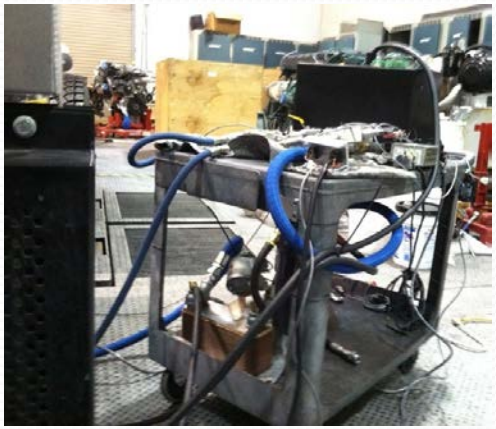
Boom Operation

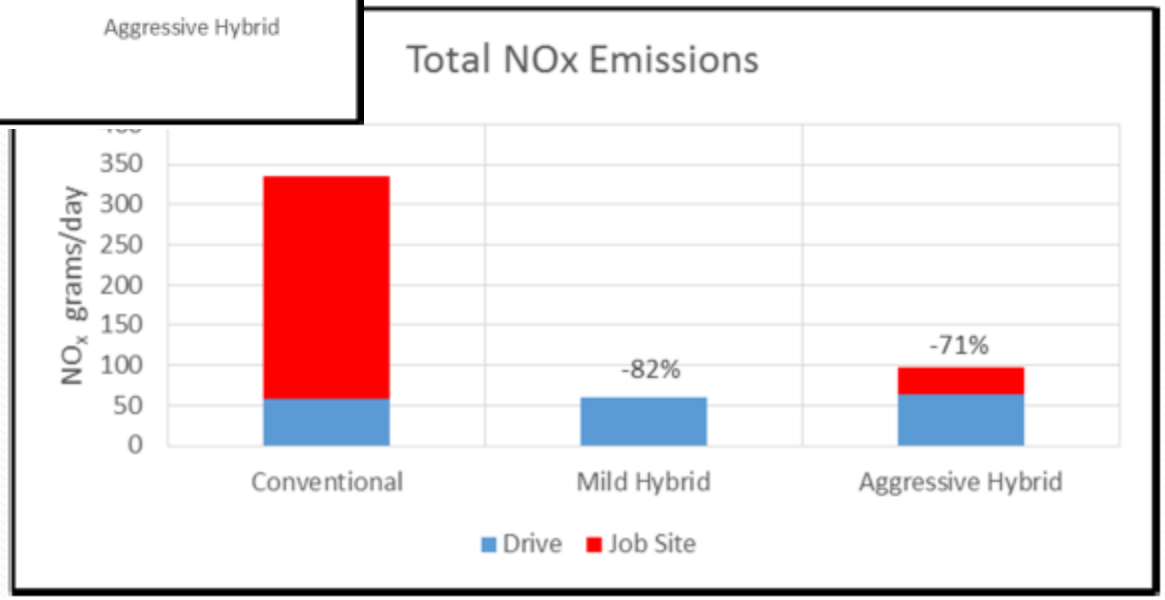


Averages	
Daily Driving Distance	40 miles
PTO on-time	2.32 hours
Boom time	0.42 hours

Odyne Emissions and Fuel Consumption Testing







Response to Previous Year Reviewers' Comments

Question: Setbacks could have been provided in better detail.

Answer:

Collaborations/Partnerships

- SCAQMD – Prime Recipient
- California Energy Commission – Funding Partner
- EPRI – Program Management and Fleet Coordinator
- VIA Motors – Hybrid System Developer
- Odyne Systems – Hybrid System Developer
- Pathway Technologies – Smart Charging Router
- Electric Utility Industry (Nationwide)

Future Work

- Complete the build of 54 VIA Vans
- Complete the build of 123 VIA Trucks
- Complete the build of 121 Odyne Work Trucks
- Conduct performance evaluation:
  - Data collection
  - User surveys
  - Emissions testing for VIA
  - Confirm assumption for Odyne workday emissions
- Evaluate system architecture for cost reduction and performance improvement

Project Summary

- The project will:
  - Develop and deploy 3 different work truck PHEV platforms
  - Quantify the attributes of performance attributes for each platform in terms of:
    - Criteria pollutant emissions
    - Greenhoouse gas reductions
    - Fossil fuel displacement
    - Operating cost reduction
  - Provide opportunity to further optimize the efficiency of the system based on field data
- The design specifications are complete to enable an EV capable medium-duty PHEV that can operate electrically at a job site and/or drive electrically.
- Fleet participants have been engaged to enable a nationwide demonstration program of ~280 vehicles
- Vehicle build and deployment activity is underway