

Plug-In Hybrid Trouble Truck: An EPRI/Utility Alliance with Eaton Corporation and Ford Motor Company



Ford F550 "Trouble" Truck

Large utilities operate fleets of several hundred diesel-powered service or "trouble" trucks to repair and maintain their transmission/distribution infrastructure. Trouble trucks typically are driven tens of thousands of miles per year, are operated in neighborhoods and are parked at the operator's home during on-call periods. Idling emissions from these vehicles are disruptive to residential areas and expose the operators to diesel exhaust for extended periods. EPRI is conducting a research and demonstration program focused on developing a plug-in hybrid power train system.

Value of Participation

Participants in the program have the opportunity to enable development and add medium-duty Plug-In Hybrid Electric Vehicle (PHEV) trouble trucks to their fleet that will:

- Reduce fuel consumption, emissions, and operating costs from stock vehicles; increase vehicle energy efficiency
- Minimize vehicle impact on neighborhoods and operators with standby time without engine idling
- Assist in complying with fleet environmental regulations
- Provide equivalent performance to stock vehicle

The Plug-In Hybrid Trouble Truck Project will:

- Create collaboration between vehicle and system manufacturers and utilities
- Develop and test both diesel and gasoline versions of the medium duty Plug-In Hybrid Drive trouble truck platform
- Acquire vehicles for utility evaluation in their own fleet

- Use grid electricity for part of the vehicle's daily duty cycle
- Use stored battery energy so the vehicles can operate at job site for several hours continuously, running the bucket, power tools, lights, and accessories without the need to run the engine
- Be less disruptive in operating and healthier for the operators and rate payers
- Provide field power generation by the electric-drive portion of the vehicle

Project Summary

The primary goal of this project is to develop a plug-in hybrid power train system suitable for widespread utility use in light/medium duty service vehicles. This will require simultaneous execution of advanced hybrid power train development as well as a chassis integration effort. The technology attributes will then be validated through the manufacture of two diesel and two gas vehicles and a fleet of 50 vehicles through a collaboration between participating utilities, Eaton, Ford, and EPRI. The chassis developed will have extensive use outside the utility industry

in areas such as shuttle buses, urban delivery trucks and cable service trucks, resulting in production volume that reduces the per-vehicle cost.

Preliminary Utility Vehicle Specification

- Ford F-550 regular cab truck, 140.8" wheelbase, 17,500 lbs. GVW.
- Engine: 6.0L V8 diesel or 6.8L V10 gas.
- 60–80% of the trucks are four-wheel drive.
- Unloaded vehicle curb weight: 14,000–14,500 lbs.
- Vehicle has a service life of 4–5 years and can exceed 150,000 miles.
- On-board high-energy battery capable of 4–6 hours of engine-off stand-by power at job site
- On-board charger capable of 3–4 hour recharge

Project Phases and Tasks

Phase 1A: (1) Integrate an available Eaton hybrid drive system into an F-550 Ford diesel truck chassis; the vehicle will be a hybrid with 5 kW of export power for customers and accessory power tools. (2) Begin the engineering required to develop an Eaton drive system for an F-550 gasoline version. Phase 1A was completed in 2007. The featured photo shows the F550 vehicle as built.

Phase 1B1: (1) Apply the knowledge acquired from Phase 1A to an existing Eaton PHEV drive system for a Ford F-550 diesel truck chassis; the vehicle will include a plug-in capable advanced battery system, on-board charging and stand-by mode charge depleting capability, 5 kW of export power for customers, and accessory power tools. (2) Integrate and deliver up to 10 vehicles of this specification. (3) Fleet testing will be performed on the four vehicles in California.

Phase 1B2: (1) Apply knowledge acquired from Phase 1B1 to an optimized Eaton PHEV drive system for a Ford F-550 diesel truck chassis. The plug-in vehicle will include electrified accessories enabling electric-only driving with up to 20 miles of all-electric range, over and above 1B1 functionality. (2) Integrate and deliver one vehicle to this specification.

Phase 2: Build up to 50 Ford F-550 chassis with an Eaton PHEV drive system developed in Phase 1B2. The chassis will

have either a gasoline or a diesel engine option and can be manufactured to support a trouble truck, shuttle bus or delivery vehicle.

Deliverables

The deliverables will be documented test results, vehicle specifications from the four prototype vehicles and in-house performance data from those vehicles in service in individual company operations.

Price of Project

The PHEV Trouble Truck Program has two parts: PHEV vehicle/system development and national fleet evaluation. The cost for participants in this project is \$50,000 and utilities have the option to fund at a higher level. Participants in Phase 1 will have first right of refusal to participate in Phase 2. The full program requires a minimum of 20 collaborative participants.

Project Status and Schedule

The PHEV Trouble Truck Project began in November 2006 and will be completed by February 1, 2010. Phase 1A was completed in December 2007. EPRI has contracted with Eaton Corporation to execute the engineering necessary to start both the diesel and gasoline versions of the PHEV Trouble Truck. We will solicit participation from other collaborative participants for Phases 1B and 2.

Who Can Participate

EPRI members and non-members can participate in this program. This project also qualifies for tailored collaboration (TC) funding, so utilities can apply their TC funds accordingly.

Contact Information

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Technical Contact

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