Performance Validation of Advanced PHEV Vehicle

Final CRADA Report

Energy Systems Division

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prepared by
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Energy Systems Division, Argonne National Laboratory

Participants: Ford Motor Company

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**Non Proprietary
Final CRADA Report**

Date: 12/21/2016

CRADA Number: ANL/ES-C0900401

CRADA Title: Performance Validation of Advanced PHEV Vehicle

CRADA Start/End Date: 6/17/2009 to 6/17/2011

Argonne Dollars: \$300,000

Participant Dollars: \$18,000 (est)

Argonne PI: Michael Duoba

Participant(s):

Ford Motor Company \$18,000 (est)
Name Participant Dollars

Research and Innovation Center, 2101 Village Road, MD 2149, Room 3150, Dearborn, MI 48121
Complete Address

N/A \$
Name Participant Dollars

Complete Address

N/A \$
Name Participant Dollars

Complete Address

DOE Program Lee Slezak, Vehicle Technologies Program
Manager:

Summary of Major Accomplishments:

Ford developed a PHEV Escape as part of a DOE contract to develop a production-ready PHEV prototype. Although conventional certification tests were conducted by Ford during their development, Argonne was brought in at the half-way point and at end of the development project to run their research-oriented benchmark testing on one of their prototype vehicles in different states of controls development. Here are the accomplishments:

- Prototype vehicle was instrumented by installing voltage and current probes and a resolver was installed for engine speed and position.
- Other signals were collected such as several temperatures and set up CAN network data collection.

Summary of Major Accomplishments:

- 51 individual tests were conducted on the 4WD chassis dynamometer in December 2008, in both CD and CS modes over UDDS, US06, HWY, SC03 cycles, and research cycles including preformance and steady-state
- 66 individual tests were conducted run on the 4WD chassis dynamometer in Aug 2009, in both CD and CS modes over UDDS, US06, HWY, SC03 cycles, and research cycles including prefoemance and steady-state
- Data was analyzed and summarized for DOE in several in-person briefings. One briefing was held in early 2009 and another in the fall of 2009.

Summary of Technology Transfer Benefits to Industry:

Argonne's benchmark testing program is the perfect platform from which to leverage DOE research assets and institutional knowledge to evaluate the product of a substaintial DOE-funded project. Different control strategies were tested and evaluated in the context of new and complex testing methods that provide overall efficiency results. Testing methods and results were provided to both Ford and DOE.

Other Information/Results: (Papers, Inventions, Software, etc.)

The standard PHEV testing protocols (still in early use) were excersized for this testing program. The procedures worked well and did not fail to work as intended with the blended-type depleting control design. Without a real OEM-level test vehicle, many test procedure ideas and concepts could not be validated. These experiences went directly into SAE test standards that were chaired by Argonne staff.

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