

**2011 DOE Vehicle Technologies
Program Review Presentation
Advanced Vehicle Electrification
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Navistar
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Project ID # ARRAVT069

This presentation does not contain any proprietary, confidential, or otherwise restricted information

Overview

- **Timeline**

- Phase 1 consists of preparing commercial EV (eStar™) for on road use and deploying to various customer locations and regions.
- Phase 2 Navistar will gather comprehensive vehicle data and analyze to gain a detailed understanding of vehicle in-use performance. This will support future vehicle development.

- **Budget**

- Government share \$39,200,000, Navistar cost share \$39,858,466

- **Barriers**

- Locally sourced increased kW battery pack integration with existing vehicle systems.
- Implementing a new product at the leading edge of supplier developed technologies. i.e. J1772, HVAC, high voltage vehicle systems
- Achieving major vehicle level cost reduction targets due to limited supply base and industry volumes.
- Grant requirement of 100 mile range excludes customers with limited budget and range requirements.

- **Partner**

- DOE (NREL) analysis of fleet data
- A123, battery pack manufacturer

Objective and Relevance

The objective of this project is to manufacture and distribute a zero tailpipe emission light-duty commercial electric vehicles (EV) in the United States. Navistar shall deploy at least 950 commercial medium duty EVs (Class 2c/3 trucks) in the U.S. market.

Specific objectives include demonstrating the applicability of EV technology for commercial transportation applications, demonstrating reliability in geographically and climatically diverse locations, and addressing the needs of the customers while enhancing the EV attributes to achieve mass market penetration in the future.

This project is creating and sustaining American jobs in support of the ARRA initiatives. This ARRA grant will advance and support the creation of new product and industry going forward.

It is estimated that each vehicle deployed will reduce carbon emission by at least 10 tons per annum, compared to ICE delivery vehicle.

It is estimated that each vehicle deployed will displace 1250 gallons per annum of fuel with domestically produced electricity.

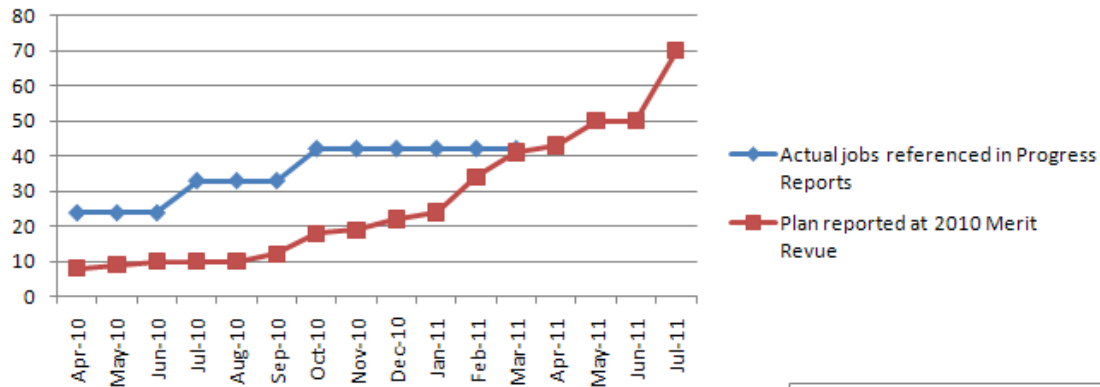
This project has had a positive impact on the barriers by introducing increased volumes into the development markets.

Milestones

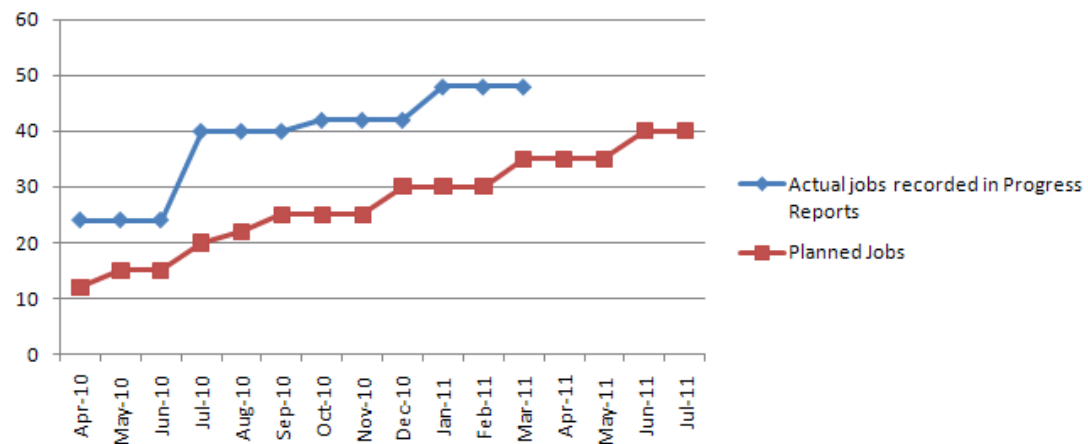
Month/Year	Milestone or Go/No-Go Decision
May-2010	Go/No-Go decision: Complete engineering review and sign off of initial SKD (semi knockdown) units for OK to ship to initial customer, MY2010 Completed 5/12/2010. Completed shipment of first sold units to FedEx® on 5/18/2010.
Oct-2010	Milestone: Complete transition to CKD (complete knockdown) units, with increased US manufacturing content. Due to component availability and pre-ordered product, this milestone slipped to 5/2011.
Sep-2011	Milestone: Complete/deploy all production units. This schedule is under review due to market introduction not progressing at planned rate.

Approach / Strategy – Jobs Created / Retained

Navistar and Supplier Manufacturing Jobs Created / Retained



Navistar and Supplier Support Functions

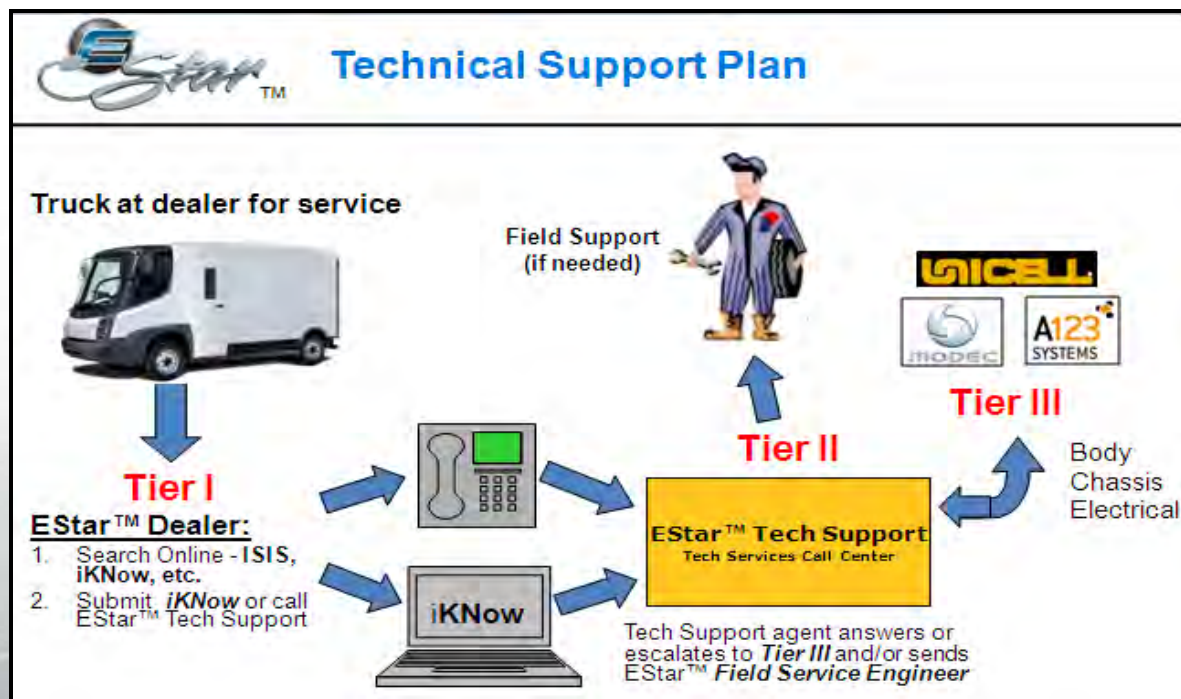


Approach / Strategy - 2011 eStar participation at industry launch events

Date	Event	Location	City State
3/1/2011	Smart Grid/Smart Energy	Prairie Convention Center Plaza	Springfield, IL
3/7-8/2011	Pepsico 2011 National Flt Summit	Alamo Dome	San Antonio, TX
3/7/2010 - 3-10	NTEA™	Indy Convention Ctr	Indianapolis, IN
3/21/2011	Defense Marketing Event	Navistar Defense Engineering	Madison Heights, Mi
3/28-30, 2011	Beverage World	M Resort	Las Vegas
3/31- 4/2, 2011	MATS	KY Fair & Expo	Louisville, KY
April 4-6, 2011	2011 Fortune Brainstorm Green	Ritz-Carlton Laguna Niguel	Laguna Nitel, CA
5-Apr-11	EarthDay	Chicago	Chicago
9-Apr-11	NYCC Symposium	Anheuser Busch Facility	NYC
April 9-12, 2011	NAFA		Charlotte, NC
April 9-II 2011	Parts Expo	Rosen Shingle Creek	Orlando, FL
21-Apr-11	2011 DATTCO Expo	Mohegan Sun Resort & Casino	Uncasville, CT
May 9-11, 2011	Canadian Flt Main. Sem (REGISTRATION FORM SENT TO ACCOUNTING 3/115/11	Hilton® Suites, Toronto	Toronto
May 19-20, 2011	eStar Dealer Event	Radisson Plaza Lord Baltimore	Baltimore, MD
18-May-11	Center City Event	OSU Fairgrounds	Columbus, OH
June 2-3, 2011	Green Fleet Expo	Court Hamilton	Hamilton, Ontario
June 19-22, 2011	EUFCM	Williamsburg Lodge	Williamsburg, VA
July 18-21, 2011	Plug IN	Raleigh Conv. Ctr.	Raleigh, NC
July 25-27, 2011	FedFleet	Shingle Creek Conv. CTR	Orlando, FL
Sept 26-29, 2011	EV2011		Toronto, CA

Approach / Strategy – Customer support

Initial Dealers have been trained in customer and product support. Additional training will be conducted as the eStar expands within Navistar's extensive dealer network.



Technical Accomplishments

- Prior Accomplishments
 - Vehicle meets FMVSS requirements
 - 80 kW battery pack integrated (to achieve 100 mile range objective)
 - On board charger integrated
 - Delivery vehicle body integration
 - Drive motor and battery pack synchronized
 - EPA and CARB certified for on road use
- 2011 Accomplishments
 - FRP battery pack enclosure/ increased kWh charger
 - Air conditioning option available
 - Enhanced windshield defrost / demist to expand geographic markets for cool / cold zones
 - We have completed vehicle life durability testing to confirm product application.
 - We have embarked upon R&Q fleet to ensure product integrity has been achieved.

Collaboration

- Reporting of deployed vehicle performance data to the DOE
- Integration of A123, battery pack manufacturer
 - In conjunction with their DOE project to develop domestic production
 - The critical system supplier
- Developing relationships with;
 - Utility companies (For example; Regional Leadership Council meeting conducted March 10-11th, Indianapolis, IN)
 - Local suppliers
 - Local and state governments

Proposed Future Work

- **Cost reduction**
 - TFT / Instrument cluster
 - Center IP and switch pack
 - Continued localization
- **Localization activities**
 - Height adjustment seats/belts
 - Electrical harnesses
 - Tubing/hose assemblies (brake lines)
 - Cab in White (panels)
 - Cab steel structure
 - Frame
 - Radiator
 - Brackets
 - Speakers
- **New functionality**
 - Integrated HVAC
 - Integrated Van body 16'
 - Motor / Inverter / DC to DC / HV Distribution box upgrade
 - Canadian Homologation
 - Door - back of Cab (FMVSS 206)
 - Possible drop side body
 - Ergonomics

Summary



- US homologation completed
- Product launched with units sold
- Integration of key system, A123 battery pack
- Technical challenges remain
 - Continue to identify qualified domestic suppliers while simultaneously reducing product cost
 - Vehicle range alternatives (increased and decreased range options)
 - Availability of charging stations for utilization by commercial vehicles. Integration into the electronic grid.