

# **2010 DOE Vehicle Technologies Program Review Presentation Advanced Vehicle Electrification**

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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 for on road use
  - Phase 2 will begin with vehicle deployment and continue for 2 years, during which Navistar will gather vehicle operating parameters via telematics
- Budget
  - Budget Period 1 - \$29,086,339 \* (Awaiting final contract)
- Barriers
  - Complexity of homologation from UK to US market
  - Battery storage capacity to achieve 100 mile range
  - Development of commercial vehicle charging capability
  - State of development of electrically driven HVAC to meet customer expectations to facilitate deployment in all 50 states
- Partner
  - DOE 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.

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

# 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.
Jul-2011	Milestone: Production release of MY2012 inclusive of; cost reduction targets, localization of systems, and Canadian market introduction. Increased model offerings.

# Approach / Strategy - Localization

	May-10 Jun-10 Jul-10 Aug-10 Sep-10	Oct-10 Nov-10 Dec-10 Jan-11 Feb-11 Mar-11 Apr-11 May-11 Jun-11	Jul-11
	MY 2010	MY 2010 1/2	MY2012
<b>% of Bill of Material Value of Localized content</b>	<b>68%</b>	<b>78%</b>	<b>95%</b>

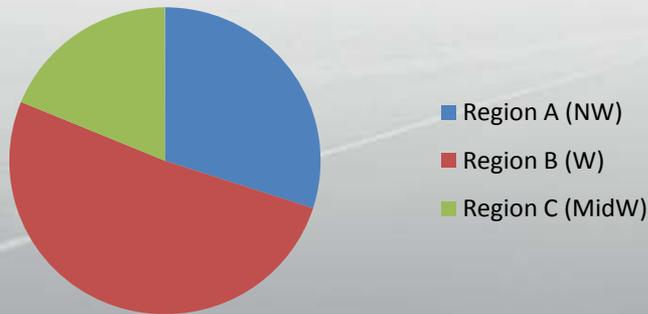
Battery pack	Adhesives	Chassis	Fabrications	Steering
On board charger	Windshield	Cab	Electric heater	Axle
Dry freight body	Fasteners	Exterior trim	Wiper system	Suspension
Headlights	Mirrors	Interior trim		Gear box
Tires	Seats	Harnesses		Brakes
Radio	Seat belts	Radiator		TFT
Back up alarm		Accelerator Pedal		Electric motor
Back up camera		Steering wheel		Springs
Floor Mats				Trailing arm



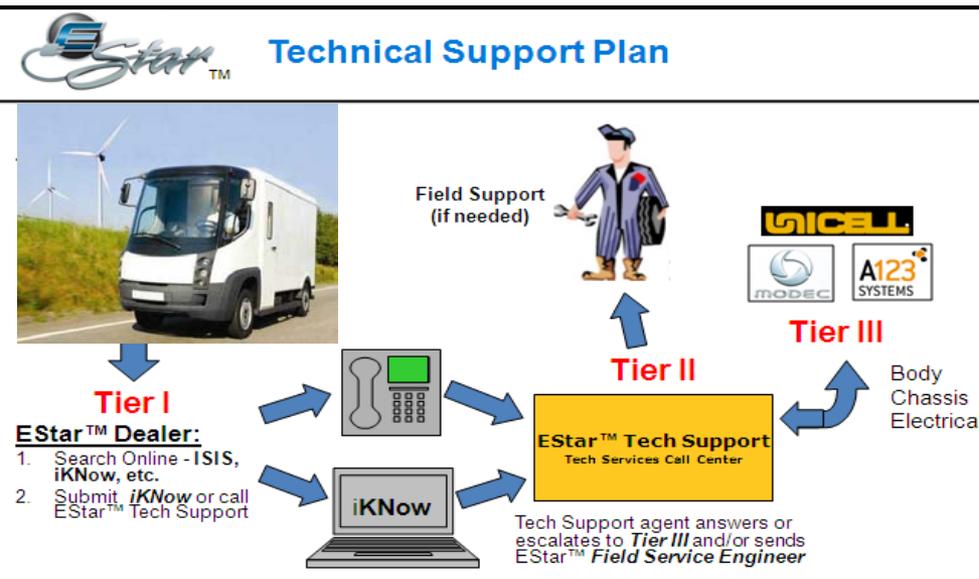
*Note: Within 5 years of product launch it is estimated that 700 manufacturing jobs will be created and retained.*

# Approach / Strategy - Market Development

- Product Launch: May 13, 2010 Elkhart, IN
- Regional Launch Event: May 25, 2010 Portland, OR
- Regional Launch Event: June, 2010 Sacramento, CA
- Regional Launch Event: July, 2010 Chicago, IL
- 1 Year Anniversary Event: ~ August, 2010 Elkhart, IN
  - Including representation from the White House?
- Sales forecast by region (first 400 units)



# Approach / Strategy – Customer support



## • Dealer Service Training:

- Overview and maintenance instructor-led training for salespeople (overview only) and technicians under development, regions/dates TBD as dealers sign

## • Dealer Sales Training:

- Driver walk around training (DVD/web-based) under development, available mid-July

## • Service Information:

- Final Operator's manuals under development, linked with vehicle design changes
- Service manual under development, available late 2010 / early 2011

## • Dealer Technical Field:

- Support Technical support 800# staffed by subject matter experts

# Technical Accomplishments

- Vehicle meets FMVSS requirements
- 80 kW battery pack integrated (to achieve 100 mile range objective)
  - A/B Sample – Steel case/ 7 kWh charger
  - C/D Sample – FRP enclosure/ increased kWh charger
- Initial on board charger integrated
- Delivery body integration
- Drive motor and battery pack synchronized
- EPA and CARB certified for on road use

# 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
  - Critical system supplier
- Developing relationships with;
  - Utility companies, inclusive of smart grids
  - Localized suppliers
  - Local and state governments
  - Not for profit electric vehicle advocates

# Proposed Future Work

- Cost reduction
  - TFT / Instrument cluster
  - Center IP and switch pack, and rotatable center
  - All localization items
- Localization activities
  - Speakers
  - Height adjustment seats/belts
  - Electrical harnesses
  - Tubing/hose assemblies (brake lines)
  - Cab in White (panels)
  - Cab steel structure
  - Frame
  - Radiator
  - Brackets
  - Front and rear suspension
  - Other (Purchasing to advise)
- New functionality
  - Integration into Navistar Release systems TCE / Purchasing Drawing support
  - Integrated HVAC
  - Stand alone air-conditioning
  - Integrated Van body 16'
  - Motor / Inverter / DC to DC / HV Distribution box
  - Canadian Homologation
  - Door - back of Cab (FMVSS 206)
  - Possible drop side body
  - Hill Hold (no rollback)
  - Ergonomics

# Summary

- US homologation completed
- Product launched with units already sold
- Integration of key system, A123 battery pack
- Unable to report and bill project costs as contract not yet finalized
- Technical challenges remain
  - Continue to identify domestic suppliers while simultaneously reducing product cost
  - Increase vehicle range
  - Availability of charging stations for utilization by commercial vehicles. Integration into the electronic grid.

