

# **US Electric Drive Manufacturing Center**



U.S. DEPARTMENT OF  
**ENERGY**



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# Overview

## Timeline

- Start: April 2010
- End: June 2013
- % Complete: 28%

## Budget

- Total project funding
  - DOE share: \$105 M
  - GM Share: \$ 141 M

## Barriers

- Acceptance of product by the consumer
- Implementation of new advanced vehicle technology
- Product affordability

## Partners

- None

# Objectives

- Construct and validate high-volume production capability for electric motor and electric drive manufacturing
- Develop domestic electric motor design, engineering, and manufacturing capabilities
- Enable the US to establish a leadership position in electric drive technologies



# Relevance

- Contribute to US economic recovery by creating domestic, advanced technology engineering and manufacturing jobs
- Create approximately 200 advanced technology manufacturing jobs in the White Marsh, Maryland facility at planned production volume
- Create or retain jobs throughout the domestic supply base, including production part suppliers, engineering and construction services, and manufacturing equipment providers

# Relevance

- Support Advanced Vehicle and Advanced Propulsion Technology
- Make significant new investments in the domestic manufacturing base
- Offer a portfolio of energy solutions for full range of vehicles
- Contribute to US national goals of energy independence
- Reduce petroleum consumption and greenhouse gas emissions

# Approach

- Utilize lessons learned from first generation electric drive technology to improve product performance, quality, reliability, and durability
- Develop domestic knowledge and capability required to manufacture current and future electric motors and electric drive components at low cost and high quality
- Design and build a lean, agile, flexible “world class” manufacturing system
- Perform simultaneous value engineering for the high-volume manufacturing system
- Utilize proven, industry standards and internal processes to achieve a flawless manufacturing validation and production launch

# Milestones

Milestone	Date	Criteria
Kickoff Meeting Completed	May 2010	Kickoff meeting planned and completed
NEPA Finding of No Significant Impact Issued	May 2010	Final signature of NEPA FONSI document issued
Project Management Plan Submitted	May 2010	SOPO deliverable submitted
Recycling, Product Cost, Risk Management and Mitigation Plans Submitted	June 2010	SOPO deliverable submitted
Test Plan Submitted	Dec 2010	SOPO deliverable submitted
Electric Motor Manufacturing Equipment Procured	January 2011	Awarded electric motor manufacturing equipment to supplier
Phase II Go/No Go Decision Point	March 2011	Exit Phase I, achieved “Go” decision to proceed to Phase II of the project
Groundbreaking Ceremony Electric Motor Manufacturing Facility	May 2011	Ceremony celebrating the first day of construction
Machinery, Tooling and Equipment Procured	Dec 2011	All long lead-time manufacturing tooling and equipment ordered

# Technical Accomplishments

- Program Management and Engineering personnel staffed
  - Jobs retained or created based on ARRA guidelines:  
25.3 FTE as of FY2011 Q1
- Technical reports submitted
  - All program reporting completed on time



# Technical Accomplishments

- Electric Motor Manufacturing Validation Center established and operational
  - Equipment, tooling, and machinery installed, qualified, and operational
  - Preproduction materials procured to support prototype validation build schedules. Prototype build requirements delivered on-time
  - Additional technicians staffed to support increasing prototype and validation build schedules
  - Manufacturing processes and design concepts developed and validated
  - Cost reductions of over \$200 per electric motor achieved. Roadmap to achieve future cost reductions and quality improvements established



**Electric Motor Manufacturing  
Validation Center Equipment**



# Technical Accomplishments

- Electric Motor facility layout refined and finalized to meet projected increased capacity requirements
  - Construction Groundbreaking Ceremony scheduled in May



- Electric motor manufacturing system equipment awarded and sourced to a integrated supplier, equipment design underway

# Technical Accomplishments

- Manufacturing technical specifications and best practices benchmarked and defined for high-volume manufacturing system
  - Equipment, tooling, methods, volumes, capacity, cycle time, throughput, layouts, labor, operating plans, defined
- Procurement of vendor tooling initiated
  - Total productive parts sourced at a 91% completion rate
- Production part system defined
  - Set Part Strategy and Plan for Every Part developed, including inbound container concepts
- Preproduction and validation builds underway. 188 total electric motors built and 31 total electric drive units built through FY2011 Q1

# Technical Accomplishments

- Participated in Department of Energy Events
  - Transportation Week July 2010
  - Electric Motor Manufacturing Validation Center Tour August 2010
  - Vehicle Technology Program FY2011 Kickoff Meeting for Advanced Power Electronics and Electric Motors R&D November 2010



**Plant Tour with Dr. Montgomery**  
**Transportation Week July 15, 2010**



**Dr. Edward B. Montgomery**  
**Transportation Week July 15, 2010**

# Collaborations/Partnerships

- No other external collaborations aside from Department of Energy assistance provided for this project

# Future Work

- 2011
  - Phase II Go/No-Go Decision Point
  - Building Groundbreaking Ceremony for electric motor facility
  - Construct the electric motor manufacturing facility
  - Procure manufacturing equipment
  - Design & build manufacturing equipment
- 2012
  - Phase III Go/No-Go Decision Point
  - Building Dedication Ceremony for electric motor facility
  - Runoff & validate manufacturing equipment at supplier facility
  - Install & qualify manufacturing equipment at plant
- 2013
  - Validate Manufacturing Process
  - Complete Production Part Approval Process
  - Witness Performance Test
  - Start of Production



# Summary Slide

- This is the first Annual Merit Review Meeting for this project. Guidance from the meeting will improve the FY12 activity
- The project supports advanced vehicle technology, establishes high-volume manufacturing capability, creates and retains jobs, and contributes to energy independence
- Our approach to develop engineering and manufacturing capability will allow GM to produce current and future electric drive components at low cost and high quality
- We have accomplished or exceeded all objectives for Phase I of the project
- The project cost, schedule, performance and technical deliverables are on track