Overview

Timeline

• Start: 10/2011
• Finish: 9/2014
• 50% complete

Budget

• Total project funding
  • DOE: $914k
  • Cost Share: $238k
• Phase 1: 10/2011-1/2013 - $367k (DoE)
• Phase 2: 1/2013-1/2014 - $308k (DoE)
• Phase 3: 1/2014-9/2014 - $241 (DoE)

Barriers

• Driver acceptance
• Safety concerns
• Cost effectiveness

Subcontractors

• UMTRI
  • Driver interface, pilot test
• ORNL:
  • Tech consulting & evaluation
• Con-Way Freight
  • End user
Relevance

• **Overall Project Objective**
  • Develop and demonstrate on real vehicles a driver assistance technology to reduce commercial fleet average fuel consumption by at least 2%

• **Phase 1 Goals**
  • Develop functional requirement specifications
  • Identify driver scenarios that impacts fuel consumption the most
  • Develop feedback strategy for target scenarios
  • Develop candidate driver interface and scenarios for driving simulator workload study

• **Phase 2 Goals**
  • Perform driving simulator study
  • Finalize HMI display and DAS
  • Pilot vehicle integration

• **Phase 3 Goals**
  • Pilot test
  • System evaluation
Approach

• Built upon existing and next-gen sensor and information technology
  • Will assess the impact of various options and their commercialization potential
• Scenario-specific feedback strategy
  • Leverage over 600k miles of naturalistic driving data from a recent DoT study
  • Separate environment caused inefficiency from driver caused inefficiency
• A combination of powertrain control and advisory feedback
  • Maximize fuel saving potential with minimum distraction
# Key Milestones in Phase I

<table>
<thead>
<tr>
<th>Month/Year</th>
<th>Milestone or Go/No-go Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2012</td>
<td>Milestone: Decide on target driving scenarios for fuel consumption impact analysis</td>
</tr>
<tr>
<td>3/2012</td>
<td>Milestone: Completion of look-ahead controller hardware design</td>
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<tr>
<td>6/2012</td>
<td>Milestone: Identify and prioritize the driving scenarios that have the most impact on fuel consumption</td>
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<tr>
<td>9/2012</td>
<td>Milestone: Completion of functional requirement specifications development</td>
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<tr>
<td>12/2012</td>
<td>Milestone: Completion of the development of driver interface candidates and the simulation study plan</td>
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<tr>
<td>12/2012</td>
<td>Go/No-go: Demonstrate through simulation the feasibility of the technology and the target fuel economy improvement</td>
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## Key Milestones in Phase II

<table>
<thead>
<tr>
<th>Month/Year</th>
<th>Milestone or Go/No-go Decision</th>
</tr>
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<tbody>
<tr>
<td>6/2013</td>
<td>Milestone: Perform driving simulator study and down select Human-to-machine Interface (HMI)</td>
</tr>
<tr>
<td>6/2013</td>
<td>Milestone: In-vehicle HMI Algorithm and Hardware Development</td>
</tr>
<tr>
<td>6/2013</td>
<td>Milestone: Data Acquisition System Integration</td>
</tr>
<tr>
<td>11/2013</td>
<td>Milestone: System Integration and Validation on the Prototype Vehicle</td>
</tr>
<tr>
<td>12/2013</td>
<td>Milestone: Pilot Test Planning</td>
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<tr>
<td>12/2013</td>
<td>Go/No-go: Pilot Test Vehicle Preparation</td>
</tr>
<tr>
<td>12/2013</td>
<td>Go/No-go: System functional on the test vehicle</td>
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Technical Accomplishments and Progress

• Task 2.1: Voice-of-customer collection and functional requirements development
  • VOC collection completed with 2 major trucking fleets
  • Functional specification document completed

• Task 2.2: High fuel-consumption impact scenario identification
  • Driving scenarios for system engagement finalized
Technical Accomplishments and Progress

• Task 3.1: Look-ahead System Development
  • Target platform is a Single Board Computer
  • DSRC devices (for V2V and V2I communication) – integrated with the system and tested on Mi V2I test-bed

* Dedicated Short Range Communication
Technical Accomplishments and Progress

• Task 3.1: Look-ahead System Development
  • Target platform is a Single Board Computer
  • DSRC devices (for V2V and V2I communication) – integrated with the system and tested on Mi V2I test-bed

* Dedicated Short Range Communication
** Single board computer
Technical Accomplishments and Progress

• Task 3.1: Look-ahead System Development
  • DSRC devices (for V2V and V2I communication) – integrated with the system and tested on Mi V2I test-bed
Technical Accomplishments and Progress

- Task 3.2: HMI concept development
  - HMI Display hardware for driving simulator procured
  - Display options created
Technical Accomplishments and Progress

• Task 4.1: Perform driving simulator study
  • Scenarios being programmed on the driving simulator

• Task 4.2: Finalize HMI display algorithm and hardware
  • Hardware being shortlisted for in-vehicle HMI
Technical Accomplishments and Progress

• Task 4.3: System integration and validation on the prototype truck
  • Prototype vehicle identified
  • Started the DAS system development

• Task 5.2: Pilot test planning
  • Initiated discussion with Con-Way for obtaining 2 trucks for the pilot testing
  • Developing a fuel consumption measurement plan
Collaborations

• Subcontractors
  • UMTRI:
    • Collaborated on scenario exposure and impact analysis
    • Collaborated on driver interface development
  • ORNL:
    • Exchanged experience on previous heavy-truck related studies and truck fuel efficiency measurement

• Others
  • USDot Michigan Test Bed (V2x Communication)
    • Helped on V2x communication integration
  • NavTeq
    • Collaborated on system design and map integration
Future Work

• Phase II
  • Down select and finalize driver interface
  • Finalize the prototype look-ahead system and integrate it onto pilot vehicles
  • Develop and verify the data acquisition system for the pilot vehicles
  • Pilot test vehicle preparation and validation of system

• Phase III
  • Pilot test
  • Technology evaluation
Summary

• Objective: Improve commercial fleet fuel efficiency by at least 2%
• A scenario-specific approach
  • A combination of advisory feedback and power control based on specific strategies for target scenarios to maximize fuel saving with minimum distraction
• Phase I completed, Phase II work is on-track and we are well positioned to continue the research in Phase III
  • Engaging with target end users to confirm the needs and to guide functional requirements development → paving the path for commercialization
  • Leveraging over 600k miles of naturalistic driving data from a previous study to identify high fuel consumption impact scenarios
  • Engaging with sensor and map suppliers to seek cost effective system design
  • Using the prototype truck to identify and address system design and retrofit risks upfront