MBtechnology:
University of Michigan Transportation Institute

“Focus on the Future”

The U.S. Government and the Automotive Industry

February 17, 2010
Background

• Presentation Objectives
  – How did we get here?
  – What was the role of Government in the past?
  – How is the role of the Government changing?
  – How did MBtech begin its journey to partner with the US Government?
  – What types of Partnerships are ideal for MBtech?
Slowing U.S. economic conditions have negatively affected new technology investment in the auto industry(1)

Source: (1) Frost & Sullivan, Economics Research and Analytics, January 2009
Traditionally, the government’s role has been to set policy for the U.S. auto industry\(^1\)

**Safety**
(NHTSA, 50 states)

**Roads & Highways**
(USDOT, 50 States)

**Energy Policy**

**Site Environment/Fuel Economy/Emissions**
(EPA, NHTSA)

**Legal Tort System**

**Corporate Restructuring**

**Trade**
(Customs/Commerce)

**Finance & Economy**
(Treasury/Federal Reserve)

**Labor Relations & Workplace Safety**

Source: (1) Sean P. McAlinden, Management Briefing Seminars, August 5, 2009, Traverse City, Michigan
How is the role of Government changing?

Industry and economic trends in the US has expanded the government's role in the industry

**U.S. Auto Industry Trends**
- Over capacity
- Consumer confidence eroding – Too few buyers
- Low to no new technology investment
- Industry wide product realignment

**U.S. Economic Trends**
- High unemployment rates with real income reductions
- Americans are reluctant to take on new financial commitments
- Although trending upward, currency performance continues to be low

**U.S. Government’s New Role in the U.S. Auto Industry Includes:**
- Taking on ownership roles in General Motors and Chrysler
- Leading to set the direction of technology development in the industry
- Providing funding for Research and Development Projects (Funding Opportunity Announcements – i.e. Electric Motor & Battery Development)
How is the role of Government changing?

One result of governments expanded role is that auto industry partnerships are forming...

Government’s Goals
- Technology Direction
- R&D Funding

### Reasons to Form Partnerships

- Further each organization's understanding and ability to reach the government's goals
- Allow different people and organizations to work together to address the interests and concerns of the government
- Exploit more efficient use of resources (i.e., people, finances, and knowledge)
- Creates an acceptable ways to educate each organization's people

### Key Success Elements

- Aligned Objectives
- Clear Communications
- Clear Decision Making
- Clarity of Accountabilities
- Necessary Skills
- Leadership
- Ways of Working
How is the role of Government changing?

... and the government will fund R&D projects for the partnerships to innovate and commercialize technologies

<table>
<thead>
<tr>
<th>Academia</th>
<th>Government’s New Role Includes:</th>
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<tbody>
<tr>
<td>• Theoretical ideas</td>
<td>• Innovation: Provides technical direction and funding</td>
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<tr>
<td>• Highly educated labor force (Professors and Graduate Students)</td>
<td>• Commercialization: Provides funding to develop working technology</td>
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<table>
<thead>
<tr>
<th>Industry</th>
<th>Innovation</th>
<th>Commercialization</th>
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<tbody>
<tr>
<td>• Opportunity to commercial technology</td>
<td><img src="image" alt="Innovation" /></td>
<td><img src="image" alt="Commercialization" /></td>
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<tr>
<td>• Industry experienced labor</td>
<td><img src="image" alt="Innovation" /></td>
<td><img src="image" alt="Commercialization" /></td>
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<tr>
<th>National Labs</th>
<th><img src="image" alt="Innovation" /></th>
<th><img src="image" alt="Commercialization" /></th>
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<tbody>
<tr>
<td>• Infrastructure</td>
<td><img src="image" alt="Innovation" /></td>
<td><img src="image" alt="Commercialization" /></td>
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<tr>
<td>• Highly developed testing facilities and procedures</td>
<td><img src="image" alt="Innovation" /></td>
<td><img src="image" alt="Commercialization" /></td>
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Consumers of the auto industry are demanding technology changes\(^{(1)}\)

How did MBtech begin its journey to partner with the US Government?

### Market Needs versus Competencies\(^{(1)}\)

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<tr>
<td>Market Demand (growth)</td>
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<tr>
<td>Number of Solutions Available</td>
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<tr>
<td>Funding by VC &amp; others</td>
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<td>++</td>
<td>++</td>
<td>0</td>
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<tr>
<td>Funding by Govt.</td>
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<tr>
<td>Ranking</td>
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<td>8</td>
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<td>7</td>
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**MBtech Competency**

- **Industry Portfolio**:
  - **Trans**: Full MBtech Competency
  - **Alt. Energy**: Significant MBtech Competency
  - **Alt. Energy**: Partial MBtech Competency
  - **Trans. Military**: Minimal MBtech Competency
  - **Trans**: Strong Market Potential
  - **High End**: Minimal Market Potential

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Notes: (1) Internal MBtechnology Study
What types of Partnerships are ideal for MBtech?

One such partnership includes the University of Michigan College of Engineering, MBtechnology, LLC and the Savannah River National Laboratory.

- Theoretical ideas
- Highly educated labor force (Professors and Graduate Students)
- Opportunity to commercial technology
- Industry experienced labor
- Specialized Infrastructure
- Highly developed testing facilities and procedures
This collaboration is exploring Hybrid/Electric Vehicle Battery Re-Purposing\(^{(1)}\)

Potential Lifecycle of Lithium Based Vehicle Batteries

- Lithium Based Batteries In Use In Vehicles
- Battery Reaches E.O.L. for Auto Application
- Battery Disposed or Re-Purposed for Stationary Use
- Re-Purposed Battery Packs Distributed
- Re-Purposed Battery Packs Disposed

Notes: (1) Submitted proposal to the Department of Energies ARPA-E’s Batteries for Electrical Energy Storage in Transportation funding opportunity

What types of Partnerships are ideal for MBtech?

- Providing test facilities capable of supporting algorithm development and battery charging testing
- Providing online state of health algorithm development
- Developing battery charging models and algorithms to extend lithium based battery life by 200%
- Providing program management
- Access to lithium based batteries used in electric and hybrid vehicles
- Provides selection criteria for re-purposed battery stationary facilities
- Identifies commercialization opportunities for models, algorithms and repurposed batteries
What types of Partnerships are ideal for MBtech?

In the future, this collaboration will also explore other funding opportunities presented by the U.S. Government

<table>
<thead>
<tr>
<th>The Partnership</th>
<th>Funding Opportunities</th>
</tr>
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<tbody>
<tr>
<td>MBtech</td>
<td>Current Funding Opportunities</td>
</tr>
<tr>
<td>M UNIVERSITY OF MICHIGAN MBtech</td>
<td>• U.S. Department of Defense: Advanced Real Time Battery Monitoring and Management System. This opportunity aims to develop and demonstrate a Lithium-Ion Battery Monitoring and Management System architecture that is capable of providing real-time indication of potential problems developing at the individual cell level</td>
</tr>
<tr>
<td>SRNL</td>
<td>Known Future Opportunities</td>
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<td>• ARPA-E: Second Round for “Building Efficiency”. This opportunity focuses on building energy reduction through technology development and enhancement</td>
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<td>• ARPA-E: “Energy Storage”. This opportunity focuses on high-amperage energy storage for neighborhoods</td>
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<tr>
<td></td>
<td>Potential Discussion Topics</td>
</tr>
<tr>
<td></td>
<td>• Commercialization of developed charging algorithms</td>
</tr>
</tbody>
</table>
Summary

• Due to economic, technology and industry trends, the role of the U.S. Government for the auto industry is changing to become more collaborative
  – Job Creation
  – Social Topics
  – Infrastructure

• Although the government has kept its traditional role, the government has expanded its role to include:
  – Research & Development funding provider
  – Setting Direction for Technology Innovation
  – Auto industry owner participant

• MBtechnology will continue to expand its partnership with the Government via:
  – Agencies
  – National Labs
  – Universities