U.S. Army Sustainability Needs
NCMS Sustainability Conference
June 12, 2012 – Ann Arbor, MI

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U.S. Army National Automotive Center (NAC)
Tank Automotive Research Development and Engineering Center

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- Provides full life-cycle engineering support and is provider-of-first-choice for all DOD ground combat and combat support vehicle systems. - Develops and integrates the right technology solutions to improve Current Force effectiveness and provide superior capabilities for the Future Force.

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Standard Form 298 (Rev. 8-98)  
Prescribed by ANSI Std Z39-18
- Provides full life-cycle engineering support and is provider-of-first-choice for all DOD ground combat and combat support vehicle systems.

- Develops and integrates the right technology solutions to improve Current Force effectiveness and provide superior capabilities for the Future Force.

Responsible for Research, Development and Engineering Support to 2,800 Army systems and many of the Army’s and DOD’s Top Joint Warfighter Development Programs

Ground Systems Integrator for the Department of Defense

TARDEC Mission

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
Reach back to over 8,500 Scientists and Engineers
The Energy Challenge for the U.S. Military – Energy Intensity

The chart illustrates the fuel consumption per soldier per day for various wars and projected future wars. It shows a trend line with Best Case and Worst Case scenarios. The chart spans from 1860 to 2060, with a focus on historical consumption patterns for WWI, Civil War, Korean War, Vietnam War, Desert Storm, Iraq War, and Future Wars. The region of projected fuel consumption is highlighted, indicating the potential increase in energy demand.

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Army Power and Energy

OPERATIONAL ENERGY

Basing
Installation
Contingency

Soldier

Vehicles
Tactical
Non Tactical

Air
Land

NET ZERO STRATEGY

“Grand Challenges”
• Give Soldiers and leaders capability to manage energy status, resources and performance
• Significantly reduce energy footprint
• Provide flexibility and resiliency by developing alternatives and adaptable capabilities


UNCLASSIFIED
The Energy Challenge for the U.S. Military – Goals

<table>
<thead>
<tr>
<th>OSD S&amp;T Strategy for Power &amp; Energy</th>
<th>Army Energy Security Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce platform energy consumption</td>
<td>Reduce Consumption</td>
</tr>
<tr>
<td>Smart energy management</td>
<td>Increase Energy Efficiency</td>
</tr>
<tr>
<td>More efficient power sources</td>
<td>Increase Use of Renewable/Alternative energy</td>
</tr>
<tr>
<td>Proactive thermal management</td>
<td>Assured access to sufficient energy supplies</td>
</tr>
<tr>
<td>Provide energy options</td>
<td>Reduced adverse impacts on the environment</td>
</tr>
</tbody>
</table>

*Army Tact Veh Strategy*
*Improve Fuel Economy 10-15% by 2025*

<table>
<thead>
<tr>
<th>USMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce the Demand&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

*SECNAV Goals*
*By 2015 Reduce Petroleum in Commercial Fleet by 50%*

*SECNAV Goals*
*By 2020 Total DON Energy come from alternative sources*

1  2010 USMC Commandant Planning Guidance
2 USMC Energy Assessment 2011

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End-to-End Energy Business: From Generation to Application

- Generation
- Distribution
- Transfer
- Vehicle
  - Energy Storage
  - Power & Thermal Management
  - Pulse Power
  - Prime Power
  - Non-primary Power
### Tactical Vehicles

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Description</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Tactical Vehicles (LTV)</td>
<td>HMMWV vehicle variants made up of 1 ¼ ton payload class</td>
<td>163,661</td>
</tr>
<tr>
<td>Medium Tactical Vehicles (MTV)</td>
<td>14 variants in 2.5 and 5 ton payload class</td>
<td>57,535</td>
</tr>
<tr>
<td>Heavy Tactical Vehicles (HTV)</td>
<td>Heavy-duty trucks, 10 ton and up, used for cargo, moving heavy equipment, tractors, tankers, wreckers, fire fighting trucks, dump trucks and others</td>
<td>55,236</td>
</tr>
<tr>
<td>Mine Resistant Ambush Protected (MRAP)</td>
<td>A family of armored fighting vehicles designed to survive IED attacks and ambushes</td>
<td>22,600</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>299,032</td>
</tr>
</tbody>
</table>

### Non-Tactical Vehicles

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Description</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Vehicles</td>
<td>Sedans, station wagons, passenger vans, SUVs</td>
<td>86,138</td>
</tr>
<tr>
<td>Light Trucks</td>
<td>Vans, pickup trucks</td>
<td>42,665</td>
</tr>
<tr>
<td>Medium Trucks</td>
<td>Miscellaneous cargo, flatbed, boxvan, others</td>
<td>43,762</td>
</tr>
<tr>
<td>Trucks</td>
<td>Heavy-duty trucks</td>
<td>17,598</td>
</tr>
<tr>
<td>Other</td>
<td>Ambulances, buses and support vehicles</td>
<td>6,633</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>196,796</td>
</tr>
</tbody>
</table>

- All tactical vehicles are considered medium or heavy-duty by commercial standards (they are above 10,000 GVW, and all use JP8)
- About 30 percent of non-tactical vehicles are also medium or heavy-duty
- In total, about 72% of the total DoD fleet is medium or heavy-duty vehicles
One in 8 US Army casualties in Iraq was the result of protecting fuel convoys. A 1% fuel savings will lead to 6444 fewer Soldier trips in dangerous battlefield convoys.

Reducing the Fuel Logistics Burden

Modeling and Simulation: Optimize the System

Research and Testing

Demonstrate Systems and Technologies

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Reducing the Battery Logistics Burden

**AGM Battery Failures 2002-2008**

<table>
<thead>
<tr>
<th>Issue</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorrect Voltage Output</td>
<td>50%</td>
</tr>
<tr>
<td>Damaged - Transport Issues</td>
<td>30%</td>
</tr>
<tr>
<td>Improper Electrical Performance</td>
<td>20%</td>
</tr>
</tbody>
</table>

Approximately 80% of incorrect voltage failures were serviceable.

**Field Battery Maintenance & Training**

- Annual Purchase of Vehicle Batteries: 700,000
- **AGM = Advanced Glass Mat.: “maintenance free”**

**Improved Charging**

- Improved charging techniques can lead to 2X life improvement.

**Battery Management**

- Fire Suppression
- Hit Avoidance System
- Communications Systems
- Autonomous Navigation System
- Crew Station/Displays
- Embedded Training

**Technology Driven. Warfighter Focused.**
Integration of microgrids on installations

Mobile, bi-directional sources of power

Replace petroleum fueled, non-tactical vehicles H2ICE/ HFCV

Plug-in electric vehicles and bi-directional charging

- Feb 2009 – Hybrid hydrogen vehicles operational in Hawaii
- Nov 2010 – US Army Aloha Microgrid #1 opens
- Jan 2012 – US Army Aloha Microgrid #2 scheduled to be operational
Mission: "The Center will serve as the Army focal point for the development of dual-use automotive technologies and their application to military ground vehicles. It will focus on facilitating joint efforts between industry, government and academia in basic research, collaboration, technology, industrial base development and professional development."

"Leveraging Opportunities to Fill Technology Gaps."
How to Work with TARDEC

https://tardec.groundvehiclegateway.com


http://tardec.army.mil/


CRADA, SBIR, Contracts
TARDEC Upcoming Events

- **Robotics Rodeo**
  20-29 June (Fort Benning, GA)

- **Ground Vehicle Systems Engineering & Technology Symposium (GVSETS)**
  14-16 August at Troy Marriott (in conjunction with NDIA)

- **Hybrid, Electric and Advanced Truck Users Forum**
  18 - 20 September (Charlotte, N.C.)

- **Society of Automotive Engineers Commercial Vehicle Congress**
  2 - 3 October in Rosemont, Illinois

- **AUSA Annual Meeting and Expo**
  22 - 24 October in Washington DC

- **Dual Use Technology Briefing & How to do Business with Primes**
  25 Oct (Flint, MI)

- **TACOM LCMC Advanced Planning Briefs for Industry**
  31 Oct – 2 NOV (Warren, MI)

[http://tardec.army.mil/events.aspx]
It’s All About the Warfighter