Hybrid Trucks Users Forum (HTUF): A National Program to Speed Commercialization of Heavy-Duty Hybrids

Advanced Transportation Technologies

Clean Transportation Solutions

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Clean Cities Web Cast
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MISSION STATEMENT

WESTSTART-CALSTART IS DEDICATED TO CREATING AND EXPANDING A GLOBAL ADVANCED TRANSPORTATION TECHNOLOGIES INDUSTRY AND ITS MARKETS THAT WILL:

• Clean the air;
• Increase energy efficiency in transportation; and
• Create high-quality jobs
WestStart: A Strategic Broker for Advanced Transportation

2005
120+ Worldwide Participant Network
3 Offices in Western States

CALSTART is WestStart’s California Operating Division
WestStart-CALSTART Participants (partial list)
Some Current Trends Impacting Heavy-Duty

- Trucks and equipment have increasing basic electrical needs on board
- Some truck makers already adding secondary electrical systems, larger battery packs, readying move to higher voltage systems
- Idle Management is a growing issue
- Optimizing urban truck drivelines is becoming critical for fuel efficiency, emissions
Hybrid Technology exhibiting
- 25% Better Fuel Economy
- Potential of up to 50%

Hybrids also offer opportunities to
- Reduce Stateside Emissions
- Audible Noise through Electric Only Drive
- Heat Signatures
- Improved terrain Mobility
- Fast Launch technology
- Elimination of Generator Trailers

21ST Century Truck Initiative

Trucks are Vital to the Army

Trucks Provide the Logistical Backbone to the Army

Fuel constitutes 70% of bulk tonnage needed to sustain a military force on the battlefield. This equates to about 600,000 gallons per day.

- Fuel Efficient AAN Task Force

The US Army has a fleet of over 246,000 tactical wheeled vehicles and drives 823 million miles annually.

Army After 2010 Goal:
“...75% Reduction in Fuel Requirements for a Deployed Force...”
Hybrid Platforms Are Being Tested

- Multiple military platforms moving forward
- All help advance hybrid drivelines
- Multiple hybrid “flavors”
  - Hybrid electric; Hybrid hydraulic
- FMTV, HMMWV, HEMMT of most interest to commercial users for capability
- NAC now launching FTTS – Future Tactical Truck Systems – focus is light platform (10,000+ GVRW) and med/heavy platform
## Hybrid Electric Propulsion Technology Benefits

### Military Benefits
- 25% - 50% Better Fuel Economy
- Flexible Electrical Power Generation
- Reduced Signature (Stealth Mode)
- Improved Performance
- Reduced Maintenance (brakes, transmission)
- Uses Standard Fuels
- Similar to Today’s Vehicles

### Commercial Benefits
- Reduced Emissions (up to 90%)
- 25% - 50% Better Fuel Economy
- Improved Driveability, Quieter
- Improved Performance
- Reduced Maintenance (brakes, transmission)
- Uses Standard Fuels
- Similar to Today’s Vehicles

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**Technology that Benefits Military and Commercial Markets**
Joint WestStart/US Army National Automotive Center (NAC) effort to expand commercial market for heavy-duty hybrid vehicles

Link commercial needs with military development to drive down cost, increase volumes

Forum proceeding through stages of:
- education/outreach
- familiarization
- specification and business case development
- commitment/deployment

Forum now in specification development stage, moving toward pre-production purchase commitments
H-TUF: A National Program Continues to Expand

Goal for 2004/5 is to expand in targeted fleets and most promising segments

Total of over 60 National Fleets representing nearly 1-million trucks on road participating.
Hybrid Truck Users Forum Meeting: Kalamazoo 2004

- 250 fleet and industry attendees (45% increase over 2003)
- 14 hybrid medium- and heavy-duty trucks in ride and drive
<table>
<thead>
<tr>
<th>Beverage Company</th>
<th>Power Company/Utilities (over 25)</th>
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<tbody>
<tr>
<td>• Coca Cola Sacramento</td>
<td>• Alabama Power</td>
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<tr>
<td>• Danone Waters</td>
<td>• AEP</td>
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<td>• Perrier (Nestles Water Group)</td>
<td>• Baltimore Gas &amp; Electric</td>
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<tr>
<td>• Pepsico/Frito-Lay</td>
<td>• Duke Energy</td>
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<tr>
<td>• Yosemite Waters</td>
<td>• Electric Power Research Institute</td>
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<td>• Florida Power and Light</td>
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<td>• Illinois Power</td>
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<td>• New York Power Authority</td>
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<td>• Texas Utilities</td>
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<td>• Los Angeles Dept of Water and Power</td>
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<td>• Sacramento Municipal Utility District</td>
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<td>• Houston Sanitation</td>
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<td>• TXU</td>
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<thead>
<tr>
<th>Government Agency</th>
<th>Parcel/Mail Delivery</th>
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<tbody>
<tr>
<td>• Canadian Army</td>
<td>• FedEx Express</td>
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<tr>
<td>• General Services Administration</td>
<td>• FedEx Ground</td>
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<tr>
<td>• Idaho National Energy labs</td>
<td>• United Parcel Service</td>
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<td>• San Joaquin Valley Clean Cities</td>
<td>• United States Postal Service</td>
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<tr>
<td>• United States Army</td>
<td>• DHL Worldwide Express</td>
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<td>• United States Army Aviation</td>
<td>• Purolator Courier</td>
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<tr>
<td>• United States Air Force</td>
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<thead>
<tr>
<th>Less Than Load &amp; Regional Delivery and Line Haul</th>
<th>Refuse</th>
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<tbody>
<tr>
<td>• American Trucking Association (TMC)</td>
<td>• Waste Management</td>
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<tr>
<td>• Ryder Transportation Services</td>
<td>• Los Angeles Dept of General Services</td>
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<tr>
<td>• Schneider National</td>
<td>• New York City Sanitation</td>
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<tr>
<td>• Wal-Mart Transportation</td>
<td>• Houston Sanitation</td>
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<tr>
<td>• Enterprise Truck Rental</td>
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<td>• GE Fleet Services</td>
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<tr>
<td><strong>Grocery Chain</strong></td>
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<tr>
<td>• Safeway/Vons</td>
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<tr>
<td>• Kroger</td>
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<tr>
<td><strong>University</strong></td>
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<tr>
<td>• Indiana University Motor pool</td>
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'H-TUF Member Fleets (partial list)'
**Focus Area for H-TUF: Top Early Hybrid Applications**

<table>
<thead>
<tr>
<th>Class 7/8 Refuse trucks</th>
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<tbody>
<tr>
<td>Class 3-6 Urban delivery trucks</td>
</tr>
<tr>
<td>- package delivery</td>
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<tr>
<td>- beverage delivery</td>
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<tr>
<td><strong>Specialty Truck Applications</strong> (Class 4-6)</td>
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<tr>
<td>- Utility “Bucket” trucks</td>
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<td>- Telecom/cable trucks</td>
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<tr>
<td>- Fire/rescue trucks</td>
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<tr>
<td>Class 6-8 Heavy Urban delivery trucks</td>
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<tr>
<td>- regional heavy distribution (beverage, grocery, postal)</td>
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H-TUF Working Groups

- User-focused effort led by fleets
- 4 Working Groups of fleet truck users operating; two forming (refuse trucks, transit)
  - Utility/ Specialty trucks – George Survant, Florida Power & Light, lead
  - Parcel Delivery trucks – Sid Gooch, Fed Ex Express, lead
  - Beverage Delivery/ Heavy Regional trucks – Frank Guercio, Danone Waters NA, lead
  - Hybrid Ground Service Equipment (GSE) – User lead TBD
  - Refuse Working Group (forming)
  - Hybrid Transit Bus (forming)
H-TUF “Commercialization Funnel”

Initial Phase
- Indianapolis Forum
- Target Application Market Assessment
- Working Groups Launched
- Chattanooga Forum 2
- Commercialization Barriers Assessment

Current Phase
- WG Application 1
  - Fleet Characterization
  - Spec Development
  - Business Case
  - OEM Negotiations
  - Purchase Agreements
- San Antonio Forum 3
  - Develop Pre-Production
  - Buy Down Funding
- WG 2+
  - Fleet Characterization
  - Spec Development

Next Steps
- Pre-Production Deployment
  - 15-50 Vehicles per application
- Kalamazoo Forum 4
- New policy incentives
  - Testing Evaluation Validation
  - Initial Production

Copyright WestStart-CALSTART 2004
Just Announced: Hybrid Electric Utility Trouble Truck

Class 6/7
Hybrid Electric
40-60% Fuel Economy Improvement
Greatly Improved Total Emissions
Idle Reduction (shuts off at work site)
25 kW power export
Meets or exceeds driving performance requirements
20+ pre-production trucks to be built and assessed
Utility Hybrid Truck Fleet Deployment

Original RFP Task Force

Fleets Wanting to Join the RFP
Performance Requirements for Fleets – Are We Meeting Them?

- Maintain base vehicle dimensions and core functionality
  - 65 mph top speed; Able to merge with freeway traffic
  - No decreased payload capacity
  - Able to tow trailer

- Transparent to user from vehicle and lift perspective
  - Hydraulic power for lift/tools

- Reliability equal to or exceeds baseline vehicle
  - Measured by cost to maintain/mean time to failure

No change in frame
25-30% improvement
Small weight gain
Better performance
Meet or exceed – builds on base of existing components
Fleet Requirements
continued

• Significant increase in fuel economy
  – 50% increase desired
• Reduce emissions over diesel
  – Meet or exceed 2010 requirements
• Overall life-cycle costs less than or equal to diesel
• Reduced noise levels compared to diesel
  – Operate at work sites on stored energy
• Generate field power
  – 25 kW output

40-60%+ fuel economy gains expected!
To be determined: Up to 50% reduction over current truck expected
Meet/exceed
Considering fuel savings and benefits
Idle reduction – average 2 hours without engine
120/240 V power, 5 kW and 25 kW
H-TUF – Entering Initial Buy-Down Phase

• CALSTART has raised $1+-million in federal DOD funding for H-TUF partial “buy-down” of incremental cost of commercial path pre-production trucks – nationwide
  – Will be matched by several million ($4-5M) investment from Working Group participants

• Teaming with different state and regional funds to extend reach of program

• $5.5-7M in federal and private sector funding
H-TUF Summary

• HTUF assisting the largest commercial deployments of hybrid trucks in nation

• HTUF commercial hybrid trucks match the size and powertrain requirements of Army platforms – helping speed commercialization and lower overall costs (leveraging investments)

• Goal is 20-60 commercial path hybrids deployed by end 2005- including hybrid utility trouble trucks deploying to fleets nationwide in early 2005 – and deployments of hybrid urban and regional delivery trucks, specifications for refuse trucks and GSE

• Rigorous emission, performance and business case evaluation for 2005

• Hybrid electric and hybrid hydraulic platforms
What Does HTUF Need?

• More Fleets Always Wanted to Participate!
• Working Groups continue to expand, new ones form
• Good opportunity to:
  – Learn
  – Share information
  – Shape commercial offerings
  – Be involved in early deployments
Clean Transportation Solutions℠

Advanced Transportation Technologies℠

www.weststart.org

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