21st Century Truck Partnership
“Unprecedented Collaboration for Unparalleled Results”

Truckstop--and Truck!---Electrification

The Truck Manufacturers’ Perspective

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Customer Needs Come First

- Government lives at a distance from the real world of trucking
- OEMs live closer to the truckers’ world but not in it
- Fleets live in the real world through their drivers
- Drivers/owner operators eat, sleep, and drink in the real world
- OEMs must integrate technology to maximize customer and societal benefit - work WITH fleets AND drivers
- Trucks are homes or at least homes away from homes – both government and industry need to recognize that
- Listen to the voice of the customer and react to/proact with it
- Encourage “customers” to become meaningful partners with government and industry--the Ground Freight Partnership can become a good starting point under the 21CTP umbrella
- U.S. economy depends on cost effective transportation system
Current State of the Art

• Engine block heaters pervade the industry and have for decades
• “Shore power” has become commonplace, >5,000 Volvo 770’s have been sold with it since introduction in 1997 on that model alone; Volvo now offers on high volume 610 and 660 as well
• “Large car” (motorhome-like) sleeper cabs dominate in the marketplace (61-80” sleeping compartments prevail)
• TVs, VCRs, PCs, microwave ovens, etc. are widely used
• Electrical demands vary widely--motorhome history can teach
• Inverters are also common but they provide only short duration 110 VAC low power conversion and require battery charging (typ. from engine driven alternator for continuous AC power)
• Inverters with integral battery charging circuitry have been commercialized but require 110 VAC to function (a la TSE)
• OEM integrated systems are best but penalized via 12% tax
• Industry is no longer male dominated--some fleets have more than 25% female drivers
• Couples are now commonplace as team drivers--young and old
• Some to many long haul drivers/teams live in their trucks
• Above demographic changes have increased electrical needs
• Overall shortage of parking space for big rigs varies from annoying to acute--NTSB has raised it as a safety issue
• Truckstop electrification (TSE) deployment for big rigs is miniscule--must grow quickly if meaningful truck electrification (TE) based idle reduction is to follow in the near term
• Entertainment based services have surfaced, sunk, and have re-emerged at many truckstops but they still do not include TSE infrastructure--enter/infotainment is nice; electricity is essential
Current State of the Art

• Assorted on-board systems are, and have been, available for many years--OEM integration is needed to accelerate deployment as is 12% Federal Excise Tax (FET) elimination
• Diesel fired heaters use miniscule amounts of fuel vs. diesel engines but they are seldom (never?) factory installed
• On-board gen sets provide TE regardless of infrastructure and use far less fuel than 600 hp truck engines; typically (never?) are they OEM installed
• On-board auxiliary HVAC systems also reduce fuel use but are seldom (never?) OEM installed
• A truck is only given one chance to be built with integrated componentry; add-on systems cannot be optimized like as-built systems can--OEMs have better opportunities to provide quality and safety than do aftermarket schemes to do so
Current/Evolving State of the Art

- **Engine based systems** that reduce idle fuel consumption have been deployed and can be enhanced via additional RD³
- **Infrastructure based systems** are evolving but not widespread; airport jetway-like systems now provide HVAC to truck cabs along with enter/infotainment and other services to improve life on the road
- **Hard infrastructure installations** require hard cash to deploy; from a truck OEM perspective, electricity is important to enable meaningful anti-idling results
- 110(/220?)VAC refrigerated truck body/trailer power
Hurdles to Resolve--TOGETHER!

- TSE--where, when, how much?
- Think big, start small?
- TE power requirements vs. infrastructure industry standards?
- Options discussed above range from single socket 110 VAC @ 15A to multiple socket 110 VAC/60A service
- Engine block heaters alone typically consume 1500W
- OEM VAC thinking varies--most 110, some 220; std. needed
- Motorhome-like future won’t likely decrease power demand
- Electric industry standards include different plug type for 110 VAC @ 15, 20, or 30A service; TSE and TE plans must fit “together” and neither 110 or 220 VAC plans can be taken lightly from either infrastructure or truck perspectives
- Wireless technology can make “gingerbread” accoutrements much less costly and difficult to deploy vs. hard wire juice
R&D Prospects

• Fuel cells offer promise for on-board TE; some have cited a 10 year time horizon for this technology
• Hydrogen based fuel cells are undesirable for lack of readily available fuel and for other, obvious, reasons
• Diesel based fuel cells eliminate the fuel objection but likely extend the deployable lead time
• Assorted energy storage devices may have nearer term prospects but carry other nasty problems
• Solar power technology
• Battery technology
R&D Prospects

- 42 V DC (ACDC? 36?) system voltage
- EPUs - air compressors, alternators, coolant pumps, cooling fans, oil pumps, power on demand, power steering pumps
- Ultracapacitors
- Flywheel alternator/starter
- Photovoltaic and thermo electric technologies
- Lots of other promising R&D could, and should, be engaged; OEMs are best able to deploy and, thus, should be engaged from the get go to enhance Demonstration and Deployment
- The BAA has proven a good means by which to solicit R&D concepts that best fulfill RD³ objectives and R&D without the D² suffix does virtually nothing to reduce idling or fuel waste
Truckstop and Truck Electrification

References:


21st Century Truck Partnership (21 CTP) - as a group + truck OEMs:
   (Freightliner, International, Mack, PACCAR, and Volvo Trucks North America)

DOD conferences and NAC presentations - assorted

DOE Essential Power Systems Workshop (Washington, DC) 12/12-13/01

DOT Intelligent Vehicle Initiative and Transportation Security BAA’s

EPA/DOT led anti-idling workshop/Great American Truck Show (Dallas, TX) 9/6/01/NEP

EPA Ground Freight Partnership

and numerous DOD, DOE, DOT, EPA + industry sponsored events to follow/21CTP
Conclusions and Recommendations

• 0.5-1.5 G/H and/or BUSG/Y—how much time and money will it take to quantify and…WHY BOTHER TO DO SO?
• No shortage of things to do re truckstop--+ truck!--electrification
• Better that government and industry should put many eggs in lots of baskets vs. all in one or few
• Best concepts will surface as most viable
• Economic appeal better than regulation or brute force
• Launch Ground Freight Partnership and give it a chance to work
• Demonstration is an effective means to educate, and learn from, customers--learning is a two way street
• Research, Development, Demonstration, and Deployment (RD³) are all important but only deployment gets results
• TSE can start small in numbers of spaces to accommodate economically inspired growth but upfront plans should be made for expansion if meaningful idle reduction is to follow via TE
Conclusions and Recommendations (cont.)

• 110VAC 15A service/parking space is minimal--if infrastructure starts like this, upfront plans must be made to increase capacity
• Increased electrification of truckstop and truck alike will result in much better life on the road
• Improved sleep will improve driver alertness and safety
• Reduced idling will significantly reduce fuel use and emissions
• Universal appeal for DOD, DOE, DOT, EPA, OEMs, and users alike
• Clean coal, gas, hydro, nuclear, or wind energy sources are all distinctly American means by which to generate electricity
• Nothing can compete with diesel fuel to serve mobile truck needs; stationary trucks are like power plants--they don’t move and should NOT be powered by petroleum products whenever possible
• Use American fueled power plants--electricity--to serve truck idling needs wherever practical to do so; encourage economic aspect
• Create and reward industry initiatives to reduce fuel use
Conclusions and Recommendations (cont.)

- **Eliminate FET** on new trucks, provide tax credits (non highway fuel use and investment), provide incentives based on results
- **Encourage newer/cleaner truck use**; solicit BAAs with mandatory OEM/fleet participation/lead
- A gallon saved is a gallon earned--start **NOW**, not later