Fuels & Lubricants R&D

Kevin Stork
Team Lead
• Undertake High-Risk Mid- to Long-Term Research
• Utilize Unique National Lab Expertise and Facilities
• Help Create a National Consensus
• Work Cooperatively with Industry
• Reduce/Displace Petroleum Use
Why do we have a fuels and lubricants activity in VTP?

• Enable advanced combustion through elucidation of fuel effects in such regimes
• Evaluate suitability of new fuels and fuel components for use in developing and legacy engines, with particular emphasis on biofuels

Who are our customers?

• Internal: Advanced Combustion Engine Team, Biomass Office
• External: Engine companies, autos, suppliers, energy companies (traditional and alternative), additive companies, academic research community
High energy density of liquid fuels is ideal for transportation use.

Battery maintained between 20-80% SOC

174(104*)
Overall R&D Approach: Pre-FY 11

Primary Technical Targets

2015 Fuel Target: Expand operational range of low-temperature combustion to 75% of Federal Test Procedure

2015 Lubricant Target: Demonstrate cost effective lubricant with 2% fuel economy improvement
Subprogram Activities

**Fuel Effects:**
- Correlate chemical/physical properties to bulk fuel properties, combustion characteristics
- Supply open-source/public, reliable data on fuels and fuel effects on combustion
- Develop information to enable design of advanced combustion engines

**Renewables & Synthetics:**
- Evaluate advanced biofuels and other alternatives to petroleum
- Supply feedback on end-use suitability of new fuel/lubricant candidates to producers
- Allows fuel producers to make fit-for-service fuels

**Analysis:**
- Objective analyses of transportation energy pathways
- Help set R&D priorities
Natural Gas:

• U.S. reserves increased dramatically
• Currently far cheaper than petroleum
• Reserves suggest it will remain cheap for a long time

*What to do with all this natural gas?*

• Transportation – one of several potential uses; displace petroleum

Lubricants:

• 2-3% potential fuel economy improvement
• Retrofittable to legacy fleet in near-term
• Advanced engines may require different lubes

*How to influence huge industry with small investment?*

• Precompetitive research – advanced additives and base oils; reduce petroleum
### Budget & Accomplishments 2002-2011

**Fuels Budget at a Glance**

- **2002**: $24,650
- **2004**: $15,887
- **2006**: $13,356
- **2008**: $17,376
- **2010**: $23,421
- **2012**: $18,503

**Years: 1998-2003**

Diesel fuel sulfur effects on exhaust emission control testing program – resulted in diesel sulfur reduction to 15PPM – enables diesel engines to meet current emissions regulation

**Years: 2007-2011**

Developed and implemented DOE Intermediate Ethanol Blends Test Program – E15 approved for use in 2001 and newer vehicles – enables additional 7 bgy of ethanol potential (displace 3% of light-duty petroleum use)

**Years: 2008-2010**

Critical research led to improved biodiesel ASTM standards – enables B20 approved engines

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[Graphs and data visualizations are not transcribed.]
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