Beyond Demonstration:
The Role of Fuel Cells in DoD's Energy Strategy

Briefing to

Hydrogen and Fuel Cell Technical Advisory Committee

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Defense Logistics Agency (DLA) Hydrogen and Fuel Cell R&D Program

Objectives

- Be an early adopter and principal demonstrator
- Create market demand & exercise the supply chain
- Support improved Technology and Manufacturing Readiness Levels (TRLs and MRLs)

Approach

- Up to 2-year pilot projects at 4 locations
- 4 different H_2 production techniques
- Additional spiral developments

DoD Benefits

- Support DoD energy strategy
  - Promote energy independence
  - Reduce environmental impact
  - Improve operational efficiencies

Ribbon cutting at Defense Distribution Susquehanna, PA (DDSP) in February 2009. Pictured L-R: CAPT John King (Commander, DDSP), RADM Mark Heinrich (Director, Logistics Operations and Readiness, DLA); BG Peter Talleri, (Commander, Defense Distribution Command); Mr. Kim Huntley (Director, Defense Energy Support Center); Dr. JoAnn Milliken (Program Manager, Hydrogen Program, Department of Energy)

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DLA Pilot Projects

Approach:

- Pilot multiple H_2 generation, dispensing, and fuel cell technologies to power MHE in warehouse operations
- Analyze operational data to establish an operational business case

Collaborators:

3 Leading fuel cell mfgs, 2 leading H_2 mfgs, DLA/DOE/NSWC Crane/NREL with multiple prime contractors

Locations:

Susquehanna: 40 forklifts, delivered (cryogenic) H_2, indoor dispensing (**Completed Sep 11**); 15 additional forklifts added by DOE in December 2010

Warner Robins: 20 forklifts, on-site natural gas reformation for H_2, mobile refueling (**Completed Nov 11**)

JBLM: 19 forklifts, 1 bus, wastewater digester gas H_2 (**Completed Oct 12**)

San Joaquin: 20 forklifts, electrolysis for H_2 (**ECD Dec 13**)

Duration: ~2 years each

Business case analysis: Performance/cost data collected by NREL & LMI

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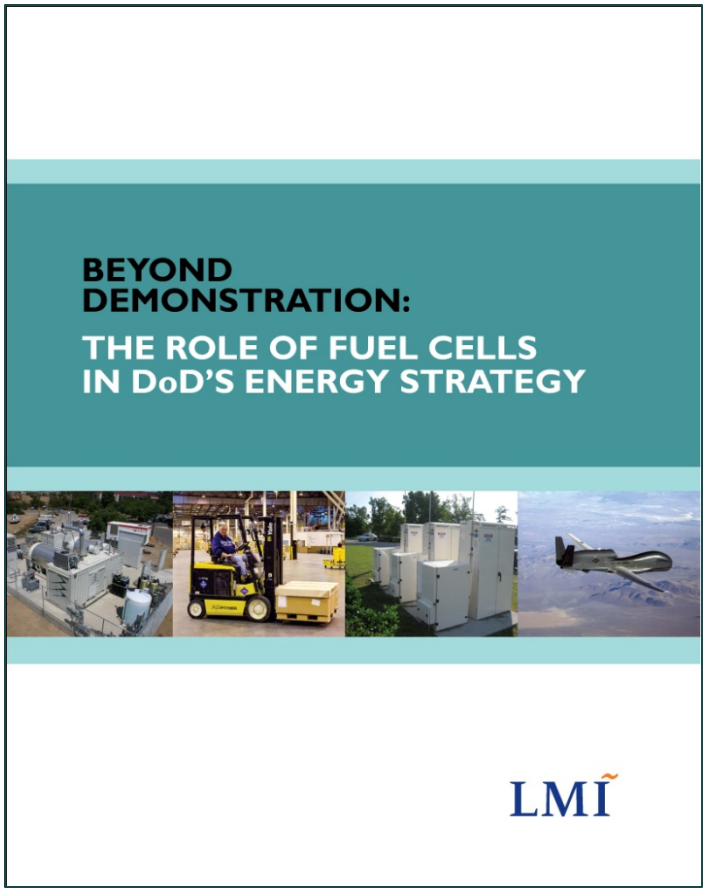
Beyond Demonstration: The Role of Fuel Cells in DoD's Energy Strategy

- DLA sponsored a report analyzing how fuel cells can help meet DoD's power needs in the near term—i.e., the next 5 years
- The report is intended to assist DoD in establishing priorities and taking actions that reflect:
  - The potential energy, environmental, and economic benefits of fuel cells
  - The current fuel cell readiness to support DoD missions
  - DoD's role as an early adopter of technology



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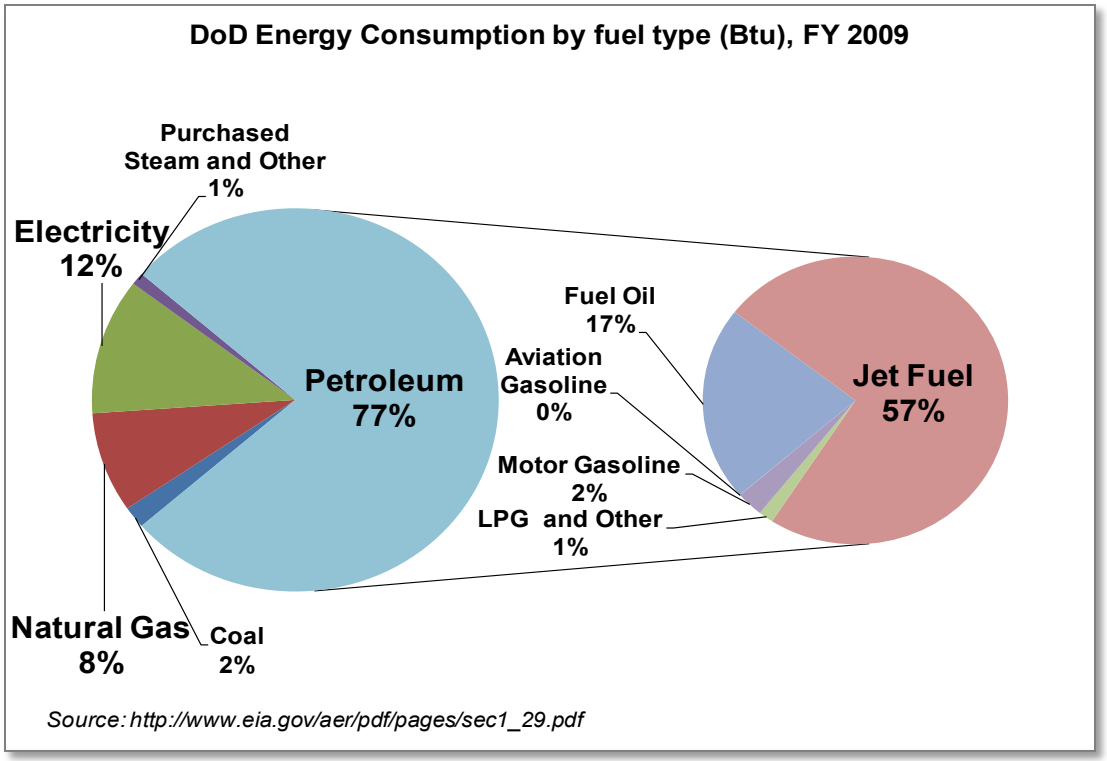
DoD Energy Overview

- DoD is the nation's largest energy consumer
- Facilities energy cost $4 B in FY09
- Many directives, mandates, goals and targets
- $44 – $60 M spent on fuel cell RDT&E in FY10



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Project Approach

- Identify fuel cell applications of interest to DoD
- Select applications with potential for fuel cells to be a DoD “technology of choice” within 5 years
- Assess the DoD market and “value proposition” for the selected applications
- Develop recommendations for DoD actions

Fuel Cell Applications with Near-Term Potential

1. Soldier Wearable and Portable Power
2. Remote Sensors and Surveillance
3. Unmanned Air, Ground and Underwater Vehicles (UXVs)
4. Non-tactical Material Handling and Ground Support Equipment
5. Back-up Power
6. Auxiliary Power Units for Ground Vehicles, Ships and Aircraft
7. Non-tactical Light Duty Vehicles
8. Mobile Electric Power (MEP)
9. Power for Ships
10. Distributed Power Generation
11. Non-tactical Personnel Transport (Buses)

Findings

- The report concluded that DoD should more proactively evaluate and acquire fuel cell systems for three applications:
  1. *Distributed power generation*
  2. *Backup power*
  3. Unmanned vehicles

Benefits of Fuel Cells

- Contribution to compliance with installation energy mandates
- Response to DSB concerns about electric grid

> ***"Critical national security and Homeland defense missions are at an unacceptably high risk of extended outage from failure of the grid."***
>
> ***--Defense Science Board Task Force on Energy Strategy***

- Lower costs resulting from improved efficiency
- Environmental benefits

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Distributed Power Generation

DoD Market Characteristics

- Over 500,000 buildings at 5,000 sites
- Combined heat and power opportunities
- Mission-critical needs for uninterruptible power

Fuel Cell Activities

- Demonstrations at DoD installations
- A growing private sector market

Value Proposition

- Lower energy costs, assured power supply and reduced emissions

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Backup Power

DoD Market Characteristics

- 1,000's of facilities with continuous power needs
- Highly dependent on vulnerable electricity grid
- Risk assessments being undertaken

Fuel Cell Activities

- Demonstrations at DoD installations
- A growing private sector market

Value Proposition

- Longer system life, lower maintenance, reduced emissions and noise

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Recommendations for DoD

- Support, monitor and evaluate fuel cell RD&D projects
- Consider fuel cells in:
  - Planning and designing facilities
  - Acquisition of backup power systems
  - Designing and procuring unmanned vehicles
- Develop and implement procurement models that support consideration of fuel cell options

Opportunity: RE baseload/storage for military services 1 GW initiatives?

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Questions?

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Energy and Climate Change

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