

Defense Logistics Agency (DLA) Hydrogen Demonstration Projects and Fuel Cell Report

NDIA's E2S2 Symposium and Exhibition

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LMI

Outline

- Defense Logistics Agency (DLA) Overview
- DLA Hydrogen and Fuel Cell R&D Program
 - Lessons Learned
 - Safety
- DoD Fuel Cell Report
 - Applications
 - Findings/Recommendations
- Questions

Defense Logistics Agency (DLA) Overview

- Department of Defense's (DoD's) largest logistics combat support agency
- Provides worldwide logistics support in war and peace time
- Supports military and civilian agencies
- Good test subject for hydrogen-powered material handling equipment (MHE)



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 H₂ 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)

Lessons Learned

- Cost planning is currently difficult
- H₂ infrastructure sizing is important...but...plan for future expansion in initial design
- Indoor refueling raises eyebrows (safety)
- High level evangelists can make things happen, but...
- Plan on buying and maintaining spare fuel cells
- Some related topics experienced:
 - Power Purchasing Agreement (PPA) for DoD facilities takes a long time and can be complicated
 - Solar array placement has limitations (rooftop installations have load concerns)

Safety

- Detailed safety plans at all sites
 - Developed in partnership with all stakeholders
 - All designs reviewed and coordinated with local fire chiefs
 - Hazard and Operability (HAZOP) Plans were developed
- Training
 - General awareness training for all in contact with H₂
 - Additional training for operators and first responders
 - Held hydrogen-specific training at DDJC sponsored by PNNL
 - Positive results observed (DDWG)



DDWG Fuel Cell Pilot Project

Hydrogen Production and Use

- Current world production approaching 50 million tons/year
- U.S. uses about 9 million tons/year for:
 - Agricultural chemicals
 - Petroleum industry
 - Pharmaceuticals
 - Fuel (e.g., space shuttle)
 - & Other
- Transported by truck and pipeline

Hydrogen Fuel Cell Pilot Project DDWG Hydrogen General Awareness Training Slide 7

Summary

Operational

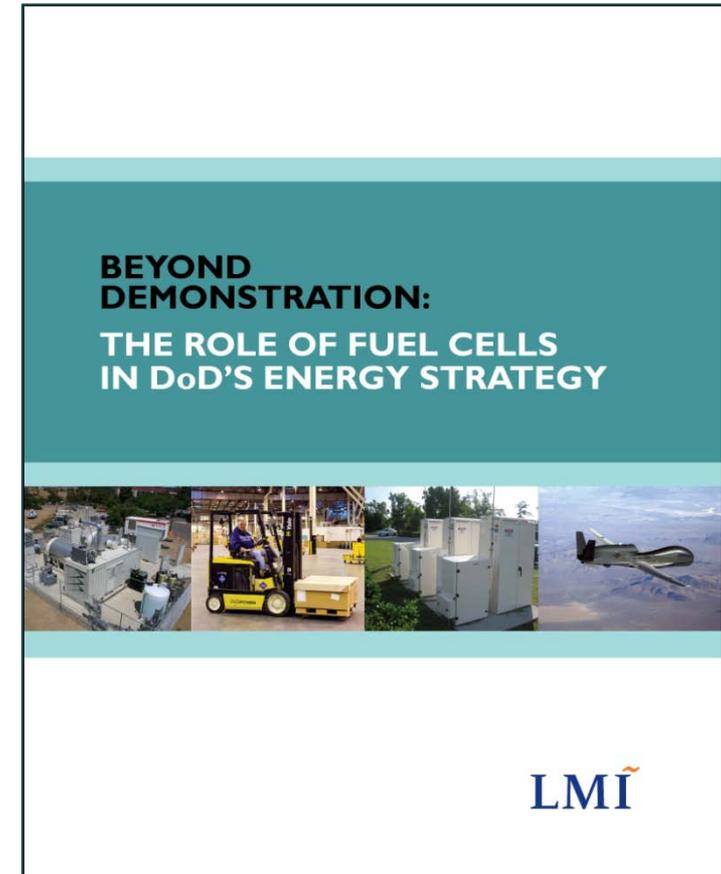
- DLA pilot projects offer opportunity to learn about various implementation options for the manufacturers and end users
- Experience relevant outside of DLA/DoD
- Fuel cells can make a difference when mission success can be enhanced
- Cost continues to be a factor

Safety

- A culture of safety within DLA is important to operational successes
- Important to leverage existing resources within the community (PNNL first responder training)

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

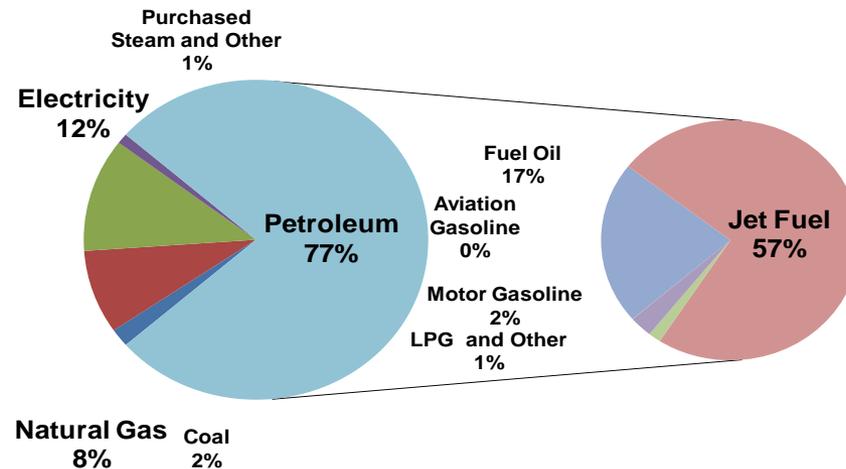
- DLA sponsored report analyzing how fuel cells can help meet DoD's power needs in the next 5 years
- Report is intended to assist DoD in establishing priorities and taking actions that reflect:
 - Potential energy, environmental & economic benefits of fuel cells
 - Current fuel cell readiness to support DoD missions
 - DoD's role as an early adopter of technology



DoD Energy Overview

- DoD is the nation's largest energy consumer

DoD Energy Consumption by fuel type (Btu), FY 2009



Source: http://www.eia.gov/aer/pdf/pages/sec1_29.pdf

- Facilities energy cost \$4 B in FY09
- Many directives, mandates, goals and targets
- \$44 – \$60 M spent on fuel cell RDT&E in FY10

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

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



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



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

As the largest single energy user in the U.S., DoD has a significant stake in advanced energy technologies...including fuel cells.

Questions

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Energy and Climate Change

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