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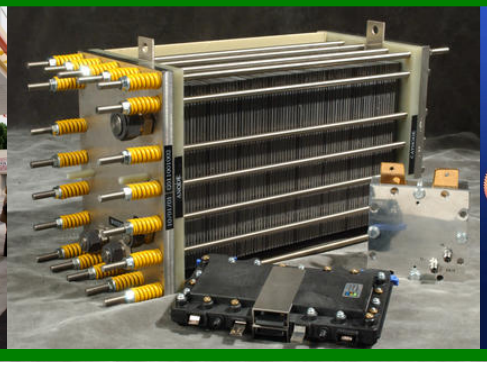
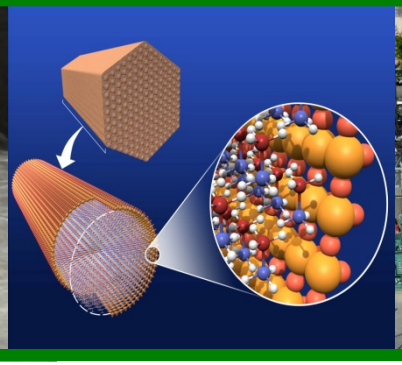

Market Transformation
- Session Introduction -

Pete Devlin

2012 Annual Merit Review and Peer Evaluation Meeting
May 16, 2012

Goals and Objectives

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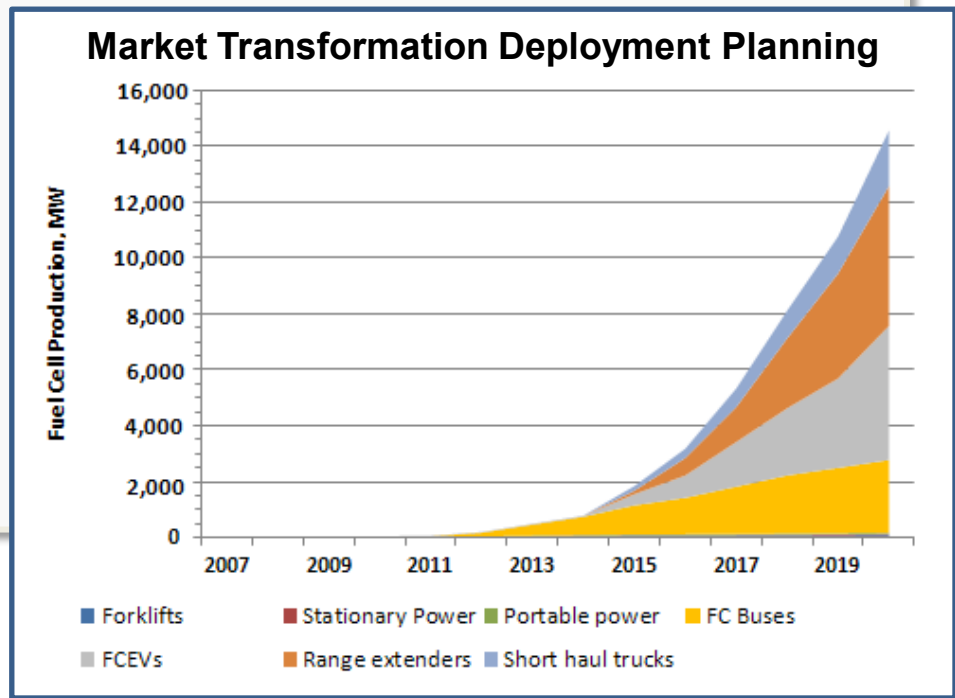
GOALS

- Ensure continued technology utilization growth for domestically produced hydrogen and fuel cell systems
- Lower life cycle costs of fuel cell power by identifying and reducing non-technical barriers

OBJECTIVES

- Catalyze key implementation projects and partnerships with state and local governments and other stakeholders
- Increase domestic market penetration by standardizing and stimulating institutional and financial market practices
- Increase data analysis associated with siting and deployment (e.g., insurance, permitting, and installation)



Data stems from research conducted by the California Fuel Cell Partnership and Pike Research

Challenges

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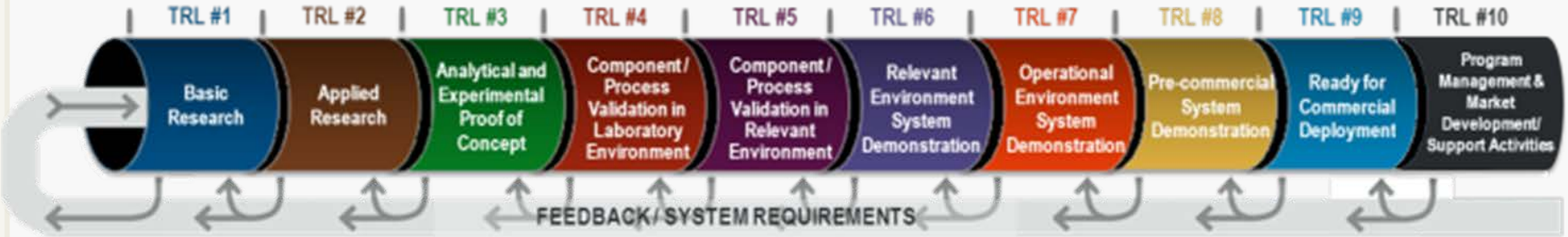
- To test emerging applications at the Technology Readiness Level (TRLs) 7-9 level to expand user and servicing expertise



- To test new technology applications in user operating conditions to establish baseline energy efficiency and reliability performance and determine commercial viability

Examples:

A 1-kW fuel cell system providing power for this FAA radio tower near Chicago

(Photo courtesy of ReliOn)

Material Handling Equipment at work in U.S. airports

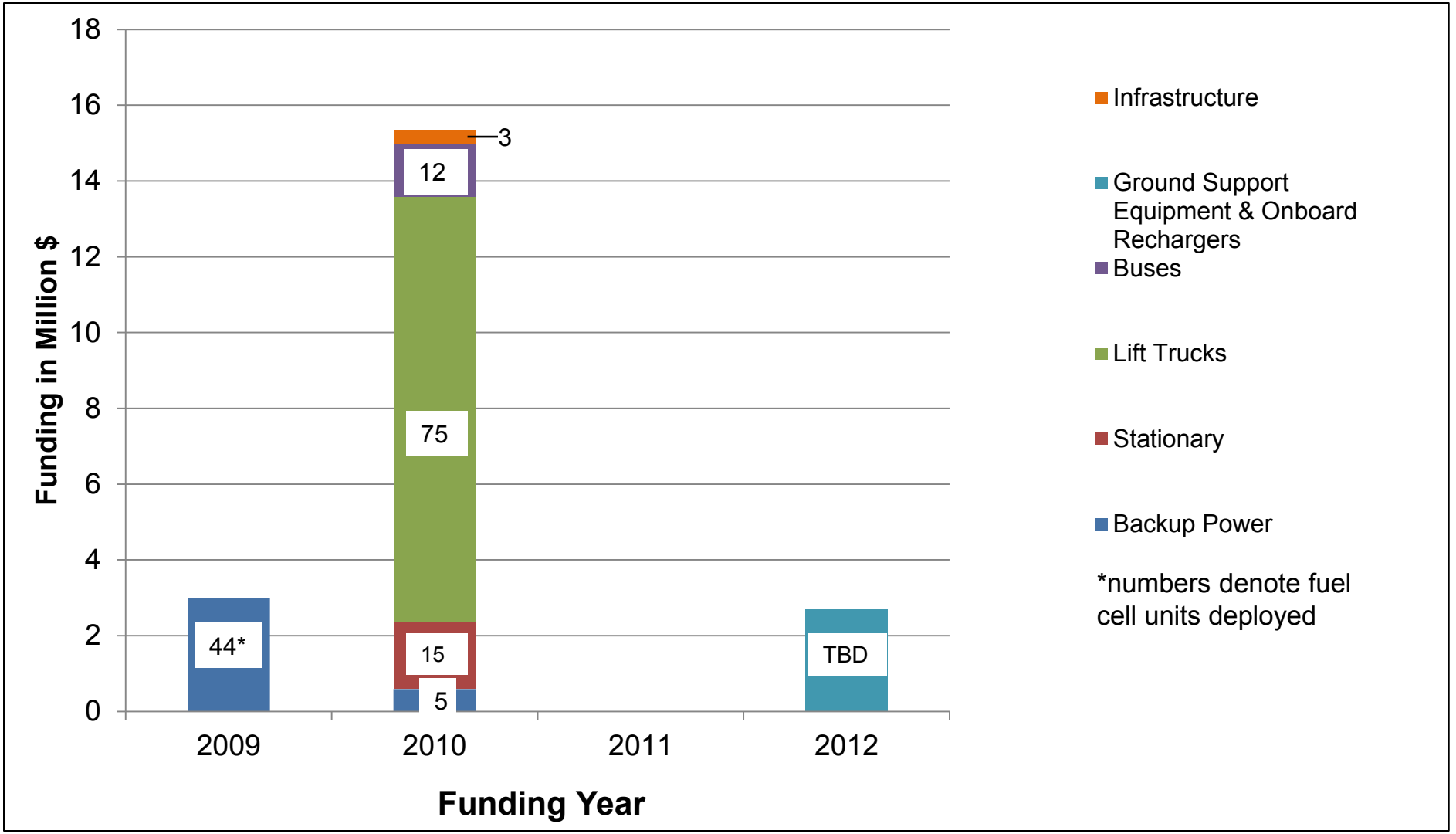
(Photo courtesy of Hydrogenics)

Challenges

- To develop strategies to mitigate commercial risks and develop new approaches to ensure high hydrogen and system utilization and reliability under mass market penetration scenarios

- To obtain data from operating experience and develop replicable business cases

Market Transformation Activities and Demonstrations



2011 Progress

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- **Deployed and collected data on 75 DMFC-powered lift truck operations in 4 locations**
- **With US Army CERL, installed 102 kW (out of 217 kW total) back up power systems at DOD, NASA and NPS sites**
- **Installed and collected data on 15 Micro-CHP systems for light commercial facilities (PNNL)**
- **Completed feasibility study for industry fuel cell lift truck project using LFG feedstock and started test equipment phase (SCRA/BMW)**

Oorja Protonics Lift Truck

ClearEdge MicroCHP

2011 Progress

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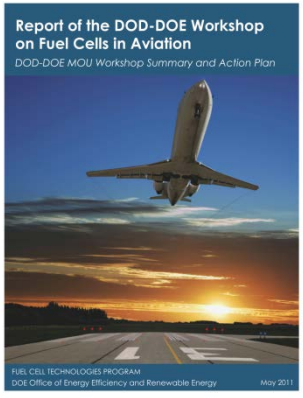
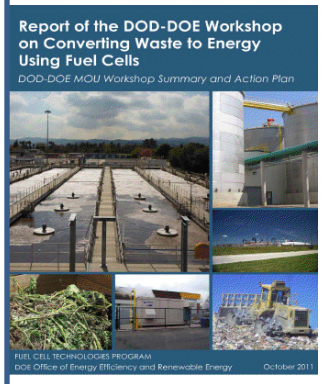
Completed two reports on DOD MOU fuel cell uses (aircraft APUs and WTE FCs)



Detailed investigation of three proposed uses for H_2 and fuel cells at the DOD:

- Auxiliary power for GSE at airports and on board DOD aircraft
- Auxiliary power on surface warships
- Utilizing biowaste as feedstock for fuel cell applications in fixed and deployed military operations



In-depth study of utilizing biowaste as an energy feedstock for fuel cells:

- Identify appropriate candidates for WTE projects
- Develop a project screening tool
- Develop a detailed guidance document on third-party financing.
- Assess current fuel cell WTE demonstration projects (in both public and private operations)

- **Proposed three "big ideas" as next steps**:
  - Multisite mobile fuel cell plasma lighting demonstration
  - Fuel cell battery range extender APU demonstration
  - Collaborative ground support equipment deployment
- **SCRA Feasibility Study Conclusion:** Key take away message – "At the 500 kg/day level, with the existing landfill gas (LFG) supply and equipment at the host facility, onsite production of hydrogen using LFG as the hydrocarbon feedstock appears to be cost competitive, if not advantageous, over hydrogen sourced from vendors, produced offsite and transported to the facility."

Landfill Gas as Feedstock

Plans for Remainder of FY12

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- Complete DMFC MHE data collection and analysis
- Complete installations and collect data on 15 micro CHPs
- Begin operations of Renewable H_2 Plant (Hawaii)
- Complete Landfill Gas SCRA project startup and 2 month deployment
- Initiate 2 ad hoc IWG committees (Advanced Vehicles and Waste to Energy)
- Award Electric Transportation Technology Projects with VTP
- Award Ground Support Equipment Projects
- Launch Federal government-wide IDIQ PPA FPA procurement process and identify 4 MW of projects
- Publish success stories from early market projects

GSE at Hawaii Center for Advanced Transportation Technologies

Summary

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Key milestones & future plans

FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016 - 2020
Complete multi-site backup power award with DOD, NASA, and NPS	Complete Government Facilities Procurement Guide	Begin operations of Renewable H_2 Plant (Hawaii)	Complete MicroCHP Business Case Analysis	GSE Deployment and Business Case Analysis	Deploy Test and Business Case for BEVx	Deployment and Finance Test for 1st Gen FCEVs
	Complete 3 DOD-DOE Workshops	Award with VTP ETT Projects*	Operate Interagency Renewable H2 Grid Management Project	REx Electric Trucks for Short Haul – Business Case Analysis	Financing Methods Test for Mobile Power / Lighting	Deployment Test for HDV APUs
	Complete MYRD&D Plan	Award GSE Projects*	Data Collection & Assessment of DMFC Powered Lift Trucks	MHE Refueling Case Study		Deployment Test for Renewable H_2 Refueling
			Publish MHE and Backup Power Business Cases			

**Subject to appropriations*

Reviewer Reminders

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- Deadline to submit your reviews is **May 25th at 5:00 pm EDT.**
- ORISE personnel are available on-site for assistance.
  - **Reviewer Lab Hours:** Tuesday – Thursday, 7:30 am – 8:30 pm; Friday 7:30 am – 1:00 pm.
  - **Reviewer Lab Locations:**
    - Crystal Gateway Hotel—Rosslyn Room (downstairs, on Lobby level)
    - Crystal City Hotel—the Roosevelt Boardroom (next to Salon A)
- Reviewers are invited to a brief feedback session – at 10:30 am today, in this room.

Session Instructions

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- This is a review, not a conference.
- Presentations will begin precisely at scheduled times.
- Talks will be 20 minutes and Q&A 10 minutes.
- Reviewers have priority for questions over the general audience.
- Reviewers should be seated in front of the room for convenient access by the microphone attendants during the Q&A.
- Please mute all cell phones and other portable devices.
- Photography and audio and video recording are not permitted.

For More Information

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Current Partners

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Industry

- Plug Power
- Gas Technology Institute
- Clear Edge
- Oorja Protonics
- BMW

Laboratory

- Pacific Northwest National Laboratory
- National Renewable Energy Laboratory
- Oak Ridge National Laboratory
- Sandia National Laboratory
- Argonne National Lab

Government

- Office of Naval Research
- Army CERL
- SCRA
- DOT
- FAA
- NASA
- NPS

University

- Hawaii Natural Energy Institute