

# 2007 DOE Hydrogen Program Intergovernmental Stationary Fuel Cell Demonstration Project

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Project ID#:  
FCP-13



DOE Hydrogen Program Topic 7C's project will build on lessons learned with the US Army Engineer Research and Development Center's Construction Engineering Research Laboratory (CERL). The demonstration unit will be sited at CERL's facilities in Illinois.



## Timeline

Start: Oct. 2007\*  
End: July 2010\*  
Duration: 33 months

\* Sooner, if possible.

## Barriers

- Fuel processor capital costs
- Stack reliability w/ reformat
- Electric-only efficiency target
- Stack and system capital costs

## Budget

CY	Total \$	DOE \$
Y1	\$ 2.56 M	\$ 1.28 M
Y2	\$ 3.56 M	\$ 1.78 M
Y3	\$ 1.88 M	\$ 0.94 M
<b>Total</b>	<b>\$ 8.00 M</b>	<b>\$ 4.00 M</b>

## Partners

- Plug Power - Latham, New York
- US Army ERDC CERL  
- Champaign, Illinois
- 3M Co., St. Paul, Minnesota
- Entegris, Chaska, Minnesota

**Overall Objective: Develop and demonstrate a renewable fuel reformer-based stationary fuel cell system that promotes public awareness of fuel cell technology for distributed generation and other hydrogen economy applications.**

<b>Topic 7C Objectives</b>	<b>DOE Targets</b>
Renewable Fuel	Ethanol (liquid)
Electrical Output	AC grid-connected
Electrical Efficiency (max)	35-37% on the path to 40%
Cost per kW	Path to \$400*
Operational Reliability	40,000 h**
Safety	UL and CE certifiable

\*- Commercial volume production will have an impact on cost; however, DFMA will have greater impact.  
\*\*- Achieved with required preventive maintenance and periodic parts replacement.





Topic 7C will leverage:

- Concurrent Engineering
- Lean Product Development
- High performing integrated project teams

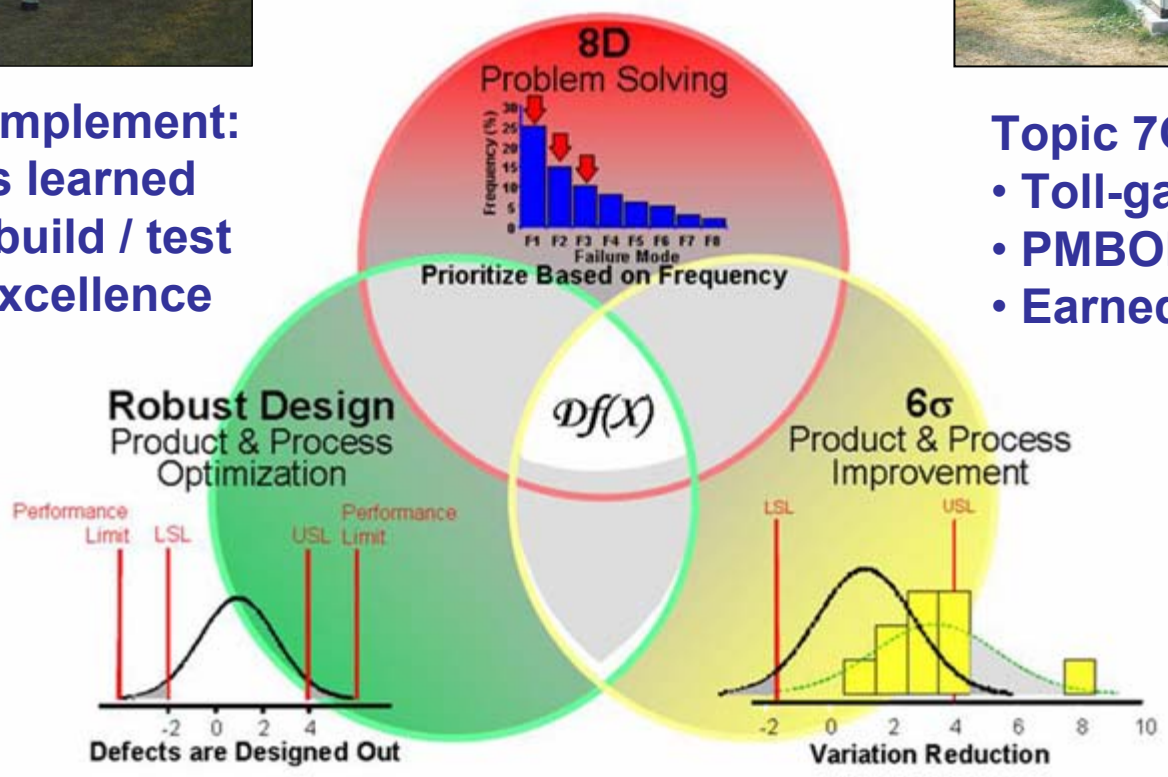


Topic 7C will implement:

- Prior lessons learned
- Incremental build / test
- Design-for-Excellence

Topic 7C will apply:

- Toll-gate process
- PMBOK Practices
- Earned Value Mgm't



The logo for GenSys, featuring the word "Gen" in blue and "Sys" in red, with a red curved line above the "S".

- ❖ Develop and execute project plan
- ❖ Develop ethanol reforming capability
- ❖ Evaluate and down-select technologies
- ❖ Evaluate on-site H<sub>2</sub> storage methods
- ❖ Enable AC-inverter in system design
- ❖ Increase inverter efficiency by design
- ❖ Reduce product direct material cost
- ❖ Improve product reliability by design
- ❖ Successfully demonstrate system
- ❖ Support grid-interconnection standards

## *Plug Power Inc. – Latham, New York*

- ❖ Plug Power is a development stage enterprise involved in the design, development and manufacture of on-site energy systems. The Company is organized in the State of Delaware and was originally formed as a joint venture between Edison Development Corporation and Mechanical Technology Incorporated on June 27, 1997 and succeeded by merger to all the assets, liabilities and equity of Plug Power L.L.C. on Nov. 3, 1999.
- ❖ Plug Power is focused on its proprietary PEM fuel cell and fuel processing technology platforms, from which multiple products are being offered or are under development. The Company is currently offering for commercial sale its GenCore<sup>®</sup> product, a backup power product for telecommunications equipment.
- ❖ Some of Plug Power's R&D has been accomplished in highly successful programs sponsored by the Department of Energy.

## *U.S. Army CERL – Champaign, Illinois*

- ❖ CERL, the U.S. Army's Construction Engineering Research Laboratory, is part of the U.S. Army Engineer Research and Development Center (USAERDC), which is the Army Corps of Engineers' integrated research and development organization.
- ❖ CERL has managed the Department of Defense Field Demonstration Program for 10 years over which 96 PEM fuel cell systems, including many of Plug Power's SU1 systems, have been evaluated at the Champaign, Illinois and other military facilities.
- ❖ Since 1969, its location in Champaign has facilitated work with the College of Engineering and other organizations at the University of Illinois at Urbana-Champaign.
- ❖ CERL will field test the prototype system developed under this program.



## ***3M Corporation – St. Paul, Minnesota***

- ❖ 3M's technology, manufacturing, and commercialization abilities, and reputation as an innovative product company are world renown. 3M has over 35 technology platforms producing multiple products for multiple markets; they manufacture more than 50,000 products.
  
- ❖ A considerable amount of 3M's manufacturing relates to high-volume, roll-coated goods which is important for this program, especially as related to new MEA design for manufacturing and assembly (DFMA) needs.
  
- ❖ 3M's fuel cell experience includes successfully completed cooperatives with the DOE. Work in this project will utilize knowledge gained from these projects, including three currently in progress:
  - DE-FC04-02AL6762 for development of advanced MEA
  - DE-FC36-03GO13098 (with Plug Power) focused on factors contributing to MEA and stack durability, and
  - DE-FC36-03GO13106 for lower cost, more durable catalysts.

## ***Entegris — Chaska, Minnesota***

- ❖ Entegris' core competencies in polymer material science and manufacturing enable the company to support its PEM fuel cell customers from proof-of-concept through the alpha and beta stages and pilot production, ending in commercial use.
- ❖ Entegris applies materials expertise gained from 36 years of experience and 2700 employees and 14 worldwide manufacturing facilities to design and fabricate components. Products include bipolar plate blanks, custom-machined and -molded plates, cell stack subassemblies, balance-of-plant components, and packaging and shipping products.
- ❖ In 2001, Entegris received *Forbes* Magazine's Best Small Companies Award.