

# DoD-ERDC Fuel Cell Program

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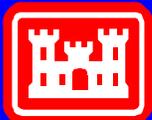
Mr. Nick Josefik

Dr. Mike Binder

Fuel Cells Summit VI

University of Maryland Inn & Conference Center

30 MAY 02

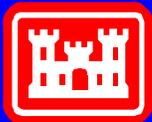


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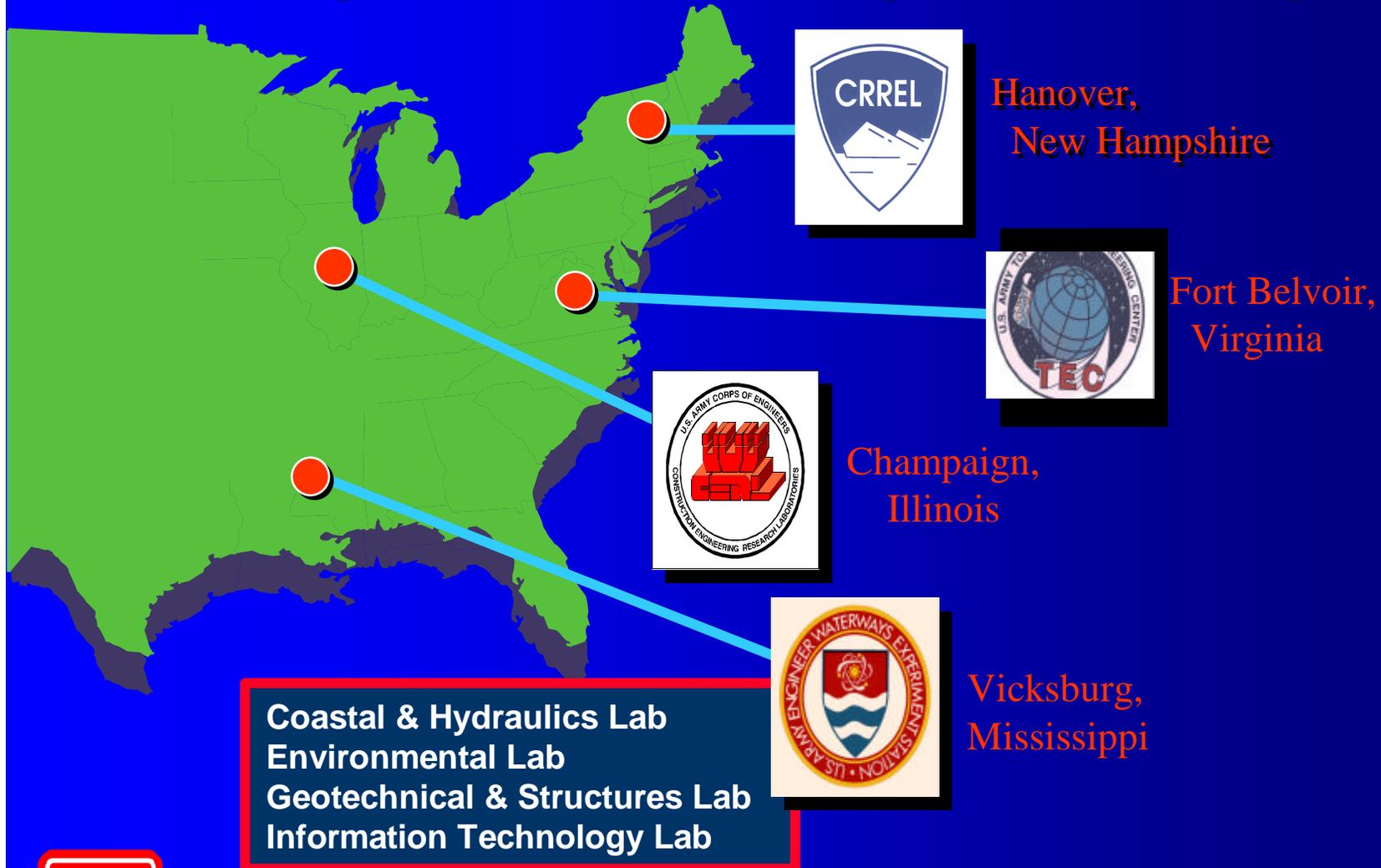
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# Presentation Outline

- Intro to ERDC
- PAFC 200 kW Demonstration Program
- Climate Change “Rebate” Fuel Cell Program
- Residential PEMFC Demonstration Program
- DoD Fuel Cell Test and Evaluation Center (FCTEC)
- Logistics Fuel Reformer
- Ft. Meade SOFC Demonstration
- Thermoelectric Program
- Advanced Power & Energy Program (APEP)
- DoD Fuel Cell Program Website



# U.S Army Engineer Research and Development Center (USAERDC)



Hanover,  
New Hampshire



Fort Belvoir,  
Virginia



Champaign,  
Illinois



Vicksburg,  
Mississippi

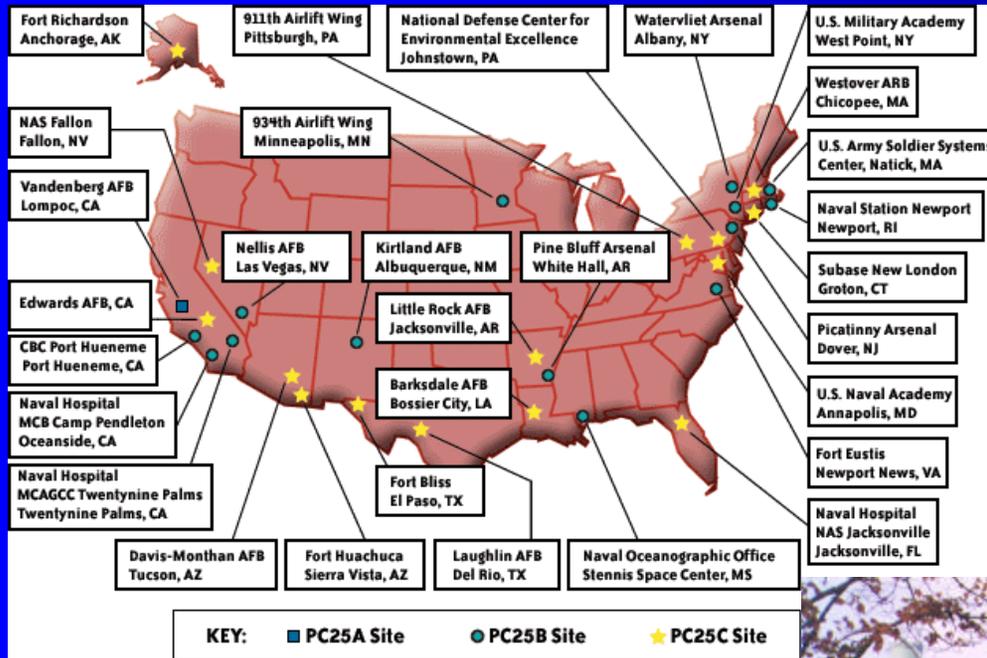
Coastal & Hydraulics Lab  
Environmental Lab  
Geotechnical & Structures Lab  
Information Technology Lab



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# PC25 POWER PLANT DoD SITES

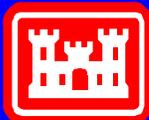


Funding:

FY94 \$18.75M

FY93 \$18M

PC25 B Installed at  
Picatinny Arsenal, NJ

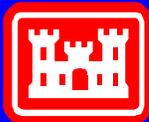
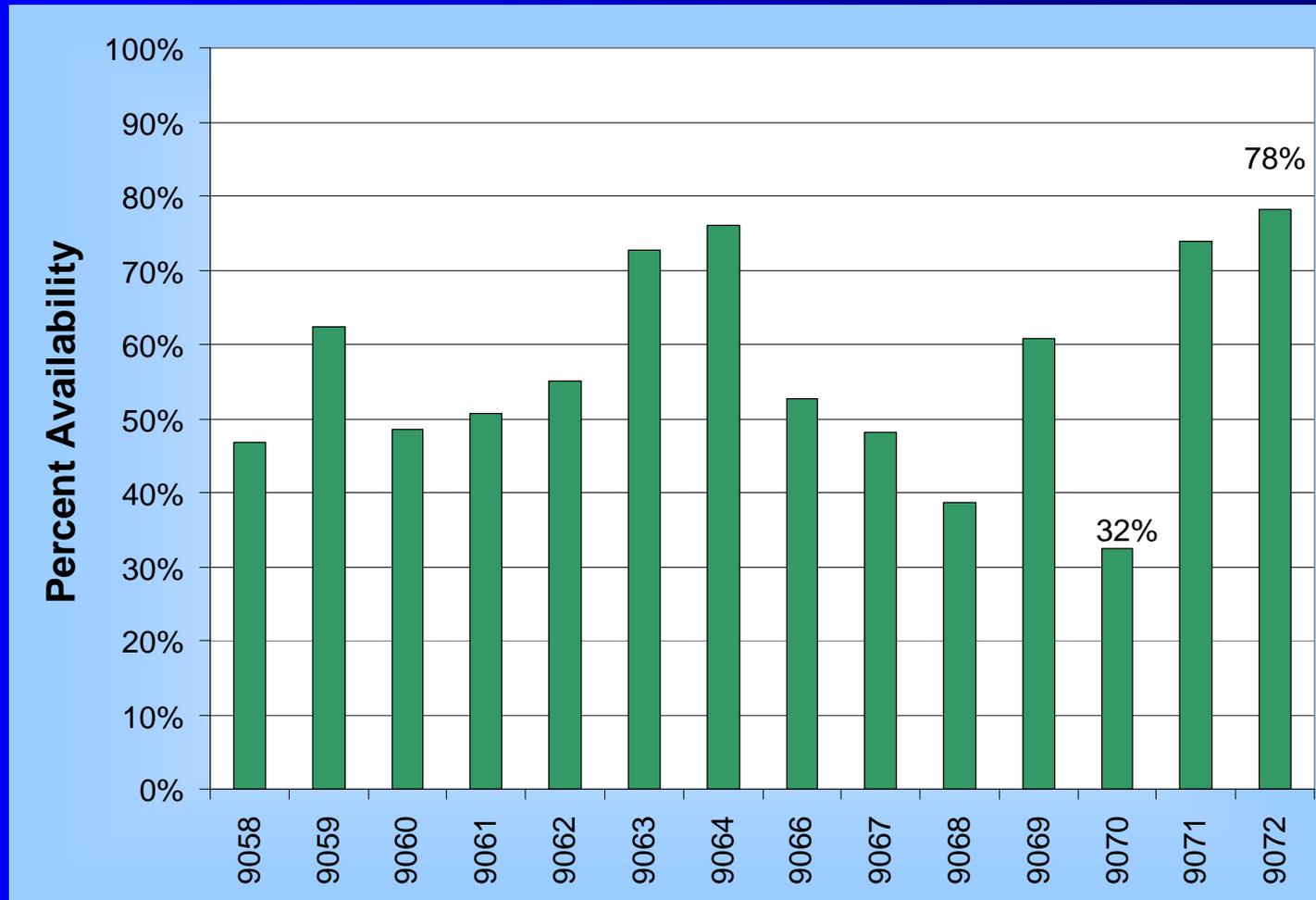


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# PC25B Availability

Lifelong Average for 14 Sites as of 3/31/02

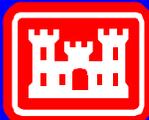
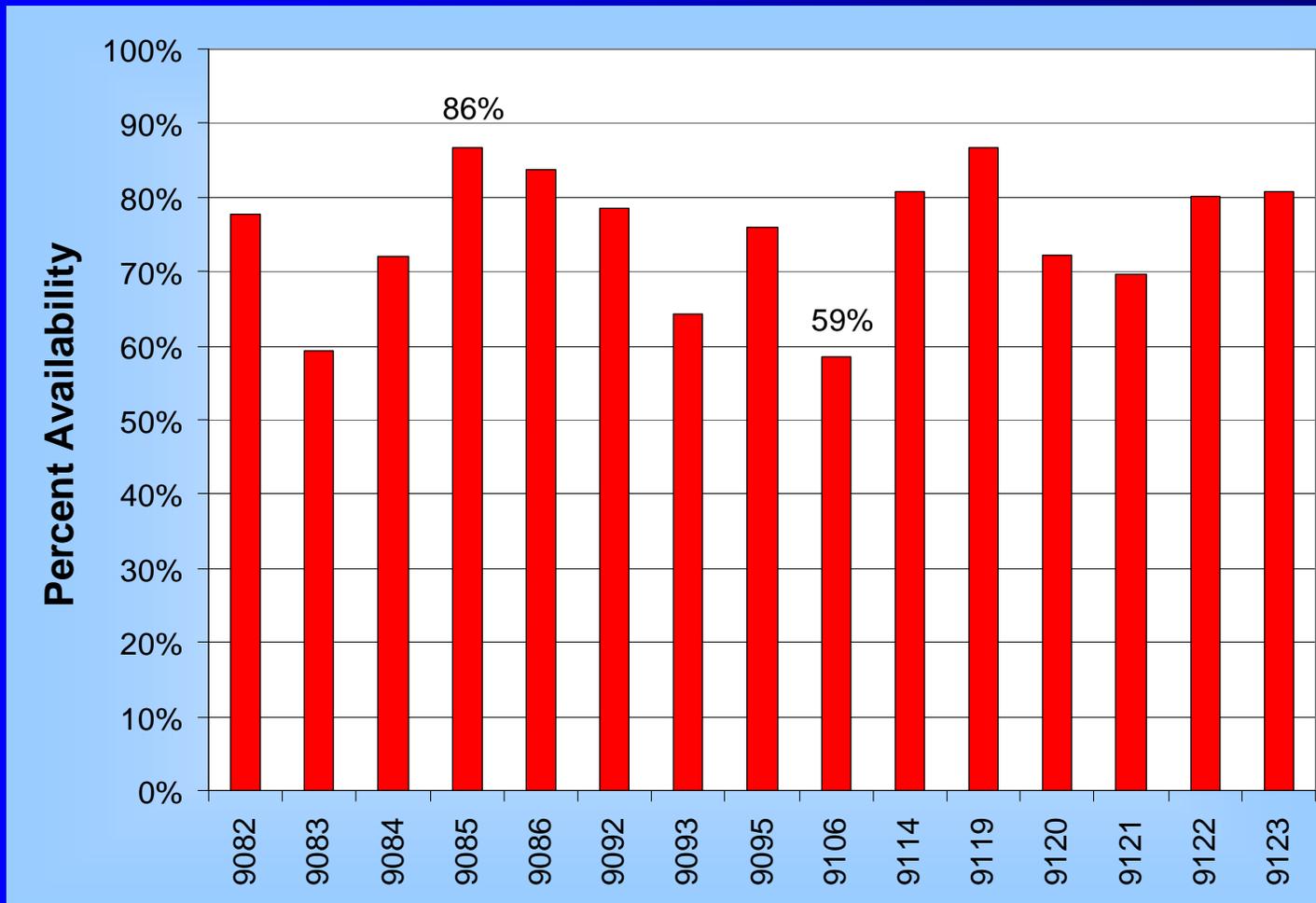


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# PC25C Availability

Lifelong Average for 15 Sites as of 3/31/02



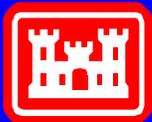
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# Fleet Performance Summary

(29 Power Plants)  
As of 31 March 2002

- Total Run Time 805,187 hrs
- Availability
  - Model B Fleet 57%
  - Model C Fleet 75%
- Energy \$ Saved \$5,640,298
- NOx Abated 264.0 tons
- SOx Abated 559.1 tons
- CO Abated 22.7 tons
- CO<sub>2</sub> Abated 33,986.0 tons



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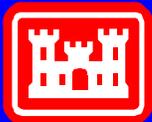
# Climate Change “Rebate” Program Objectives

- Reduction of Fuel Cell Prices via Economy of Scale
- Proactive Approach for DoD Involvement



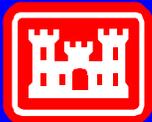
# “Rebate” Program Highlights

- **Grant Money Available / Fiscal Year**
  - FY02                   \$ 3.0M (approximate)
  - FY00                   \$ 2.0M
  - FY99                   \$ 2.3M
  - FY98                   \$ 4.2M
  - FY96/97               \$10.6M
  - FY95                   \$ 8.2M
- **Cost-Shared Program Incentives**
  - \$1,000 / kW up to 1/3 of the total cost



# Residential PEMFC Demonstration Program

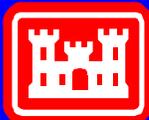
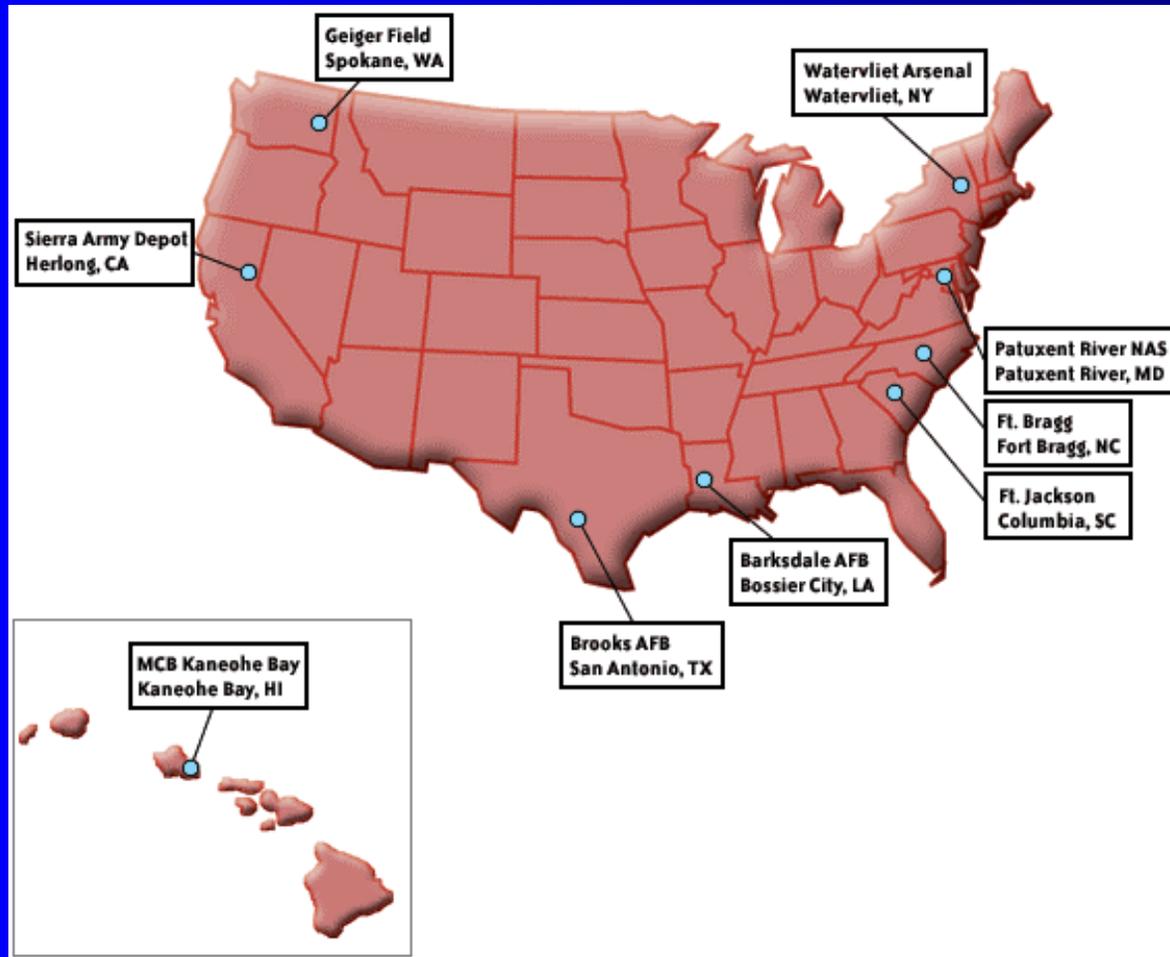
- PEM Units, 1 kW to 20 kW
- US Military Facilities/Embassies, etc.
- Turn Key Packages Requested
- Maximum Diversity Desired
- 1 Year of “Fuel Cell Power” Required
- ~ \$3M Awarded on 6 Contracts (FY01)
- ~ \$3M Anticipated for FY02 Projects



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# FY01 Residential PEMFC Demonstration Program



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# FY01 Residential PEMFC Demonstration Program

## SITE APPLICATION MATRIX

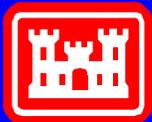
Site Name	Building Application	Fuel Cell Manufacturer	Input Fuel	Size (kW)	No. Units	Cogen. Y/N
Sierra Army Depot	Barracks	H Power	Propane	4.5	1	Yes
Brooks AFB	Base Housing	DCH Tech.	Natural Gas	3	3	No
MCB Kaneohe Bay	Base Housing	Avista Labs	Propane	5	1	No
Ft. Bragg	TBD	Avista Labs	Natural Gas	5	1	No
Ft. Jackson	TBD	DCH Tech.	Natural Gas	3	1	No
Barksdale AFB	TBD	Avista Labs	Natural Gas	5	1	No
Patuxent River NAS	Office Building	H Power	Propane	4.5	1	No
Patuxent River NAS	Office Building	H Power	Natural Gas	4.5	1	Yes
Geiger Field	Office Building?	Avista Labs	Hydrogen	3	1	No
Watervliet Arsenal	Research Facility	Plug Power	Natural Gas	5 (2.5)	3	No
Watervliet Arsenal	Manufacturing Facility	Plug Power	Natural Gas	5 (2.5)	3	No
Watervliet Arsenal	Officer's Quarters	Plug Power	Natural Gas	5 (2.5)	4	No



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# PEMFCs Installed at Watervliet Arsenal



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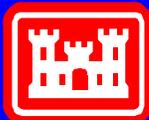
# DoD Fuel Cell Test & Evaluation Center (FCTEC)



**FCTEC Site - Johnstown, PA**



**FCTEC Partial Layout**

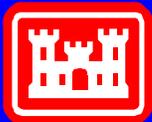


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# FCTEC - Benefits

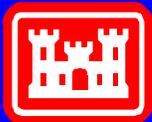
- Accelerated Development of Fuel Cell Power Plants / Components
- Access to Both Government & Industry Clients
- Designed for Simple Operation, Maximum Flexibility



# Logistics Fuel Reformer



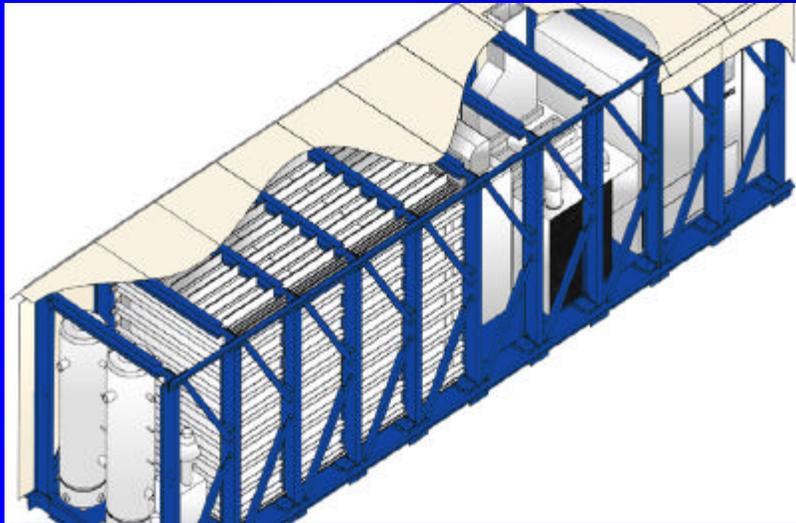
- AFRL / ERDC Joint Effort
- Mobile Electric Power (MEP)



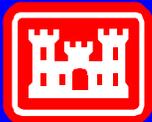
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# FY02 Ft. Meade Solid Oxide Fuel Cell (SOFC) Demo



- EPA Laboratory at Ft. Meade
- FY02 DoD Funding
  - \$2.4M
- EPA & DOE Contributing other funds
- Project Scope (size) not fully Identified (two 250 kW proposed as of APR 02)

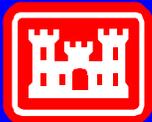


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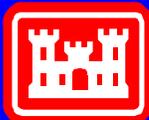
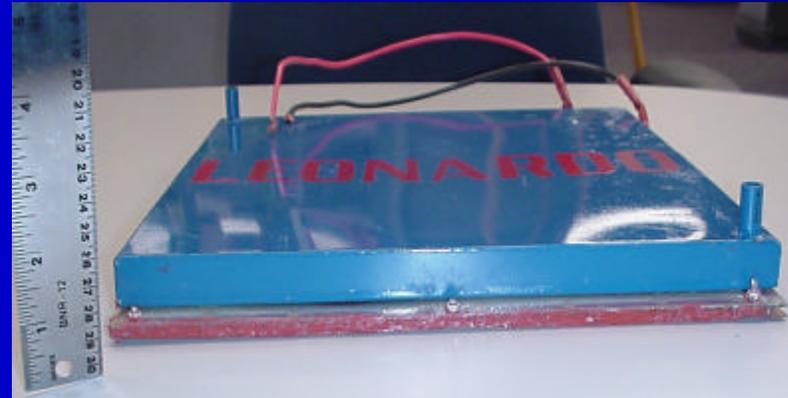
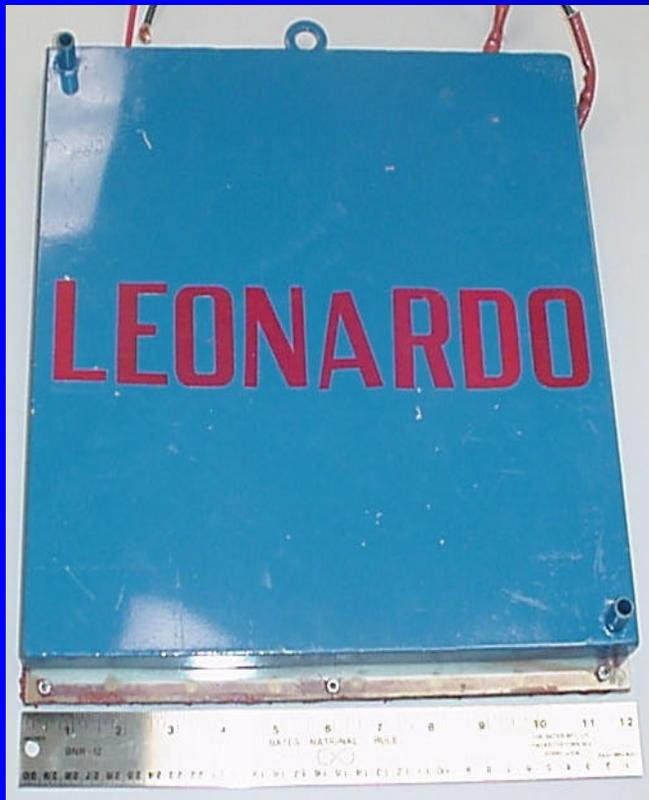
# FY02 Thermoelectric Power Generation Project

- Long known as the “*Seebeck Effect*” - thermoelectric power generation results from electricity induced in particular materials by a temperature differential.
- New materials / processes promise 12-14% efficiencies. Lab and Field demonstrations planned using fuel cells, boilers as heat sources.



# Leonardo Technologies Thermoelectric Tiles

- Minimum 100°C  $\Delta T$ , Maximum Hot Side of 300°C
- Power Output of 8-800 Watts, 8-80 Volts DC



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# FY01 & 02 Advanced Power & Energy Program (APEP)

- **UC-Irvine Partner**
- **Goals**
  - National Universities for Fuel Cells Program
  - National Fuel Cell Center Coordinating Committee
  - Advancement of Fuel Cell Fuel Flexibility for DoD applications
  - Advancement of Hybrid Fuel Cell Gas Turbine Systems for DoD Applications
  - Technology Transfer for Advanced Power and Energy Technologies for DoD Applications

