

DoD Fuel Cell Inverter Experiences

briefing to

Power Electronics for Fuel Cells Workshop

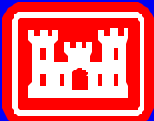
8 August 2002

Roch Ducey, CEM

Engineer Research and Development Center

Construction Engineering Research Laboratory

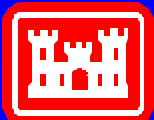
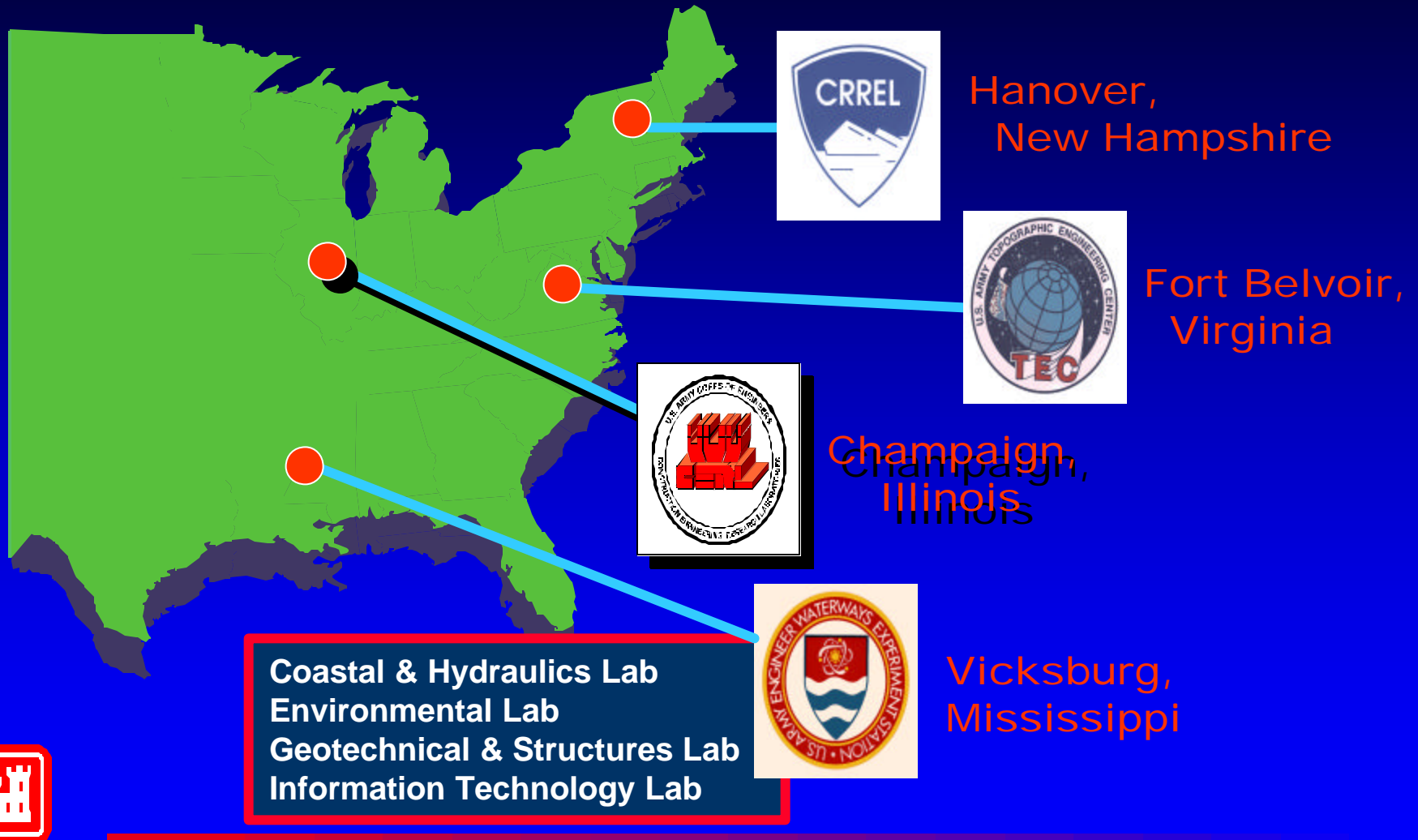
800 USA CERL x7444 or roch.ducey@us.army.mil



US Army Corps
of Engineers

Engineer Research & Development Center

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

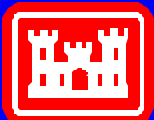


US Army Corps
of Engineers

Engineer Research & Development Center

www.dodfuelcell.com

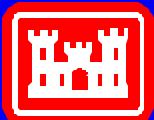
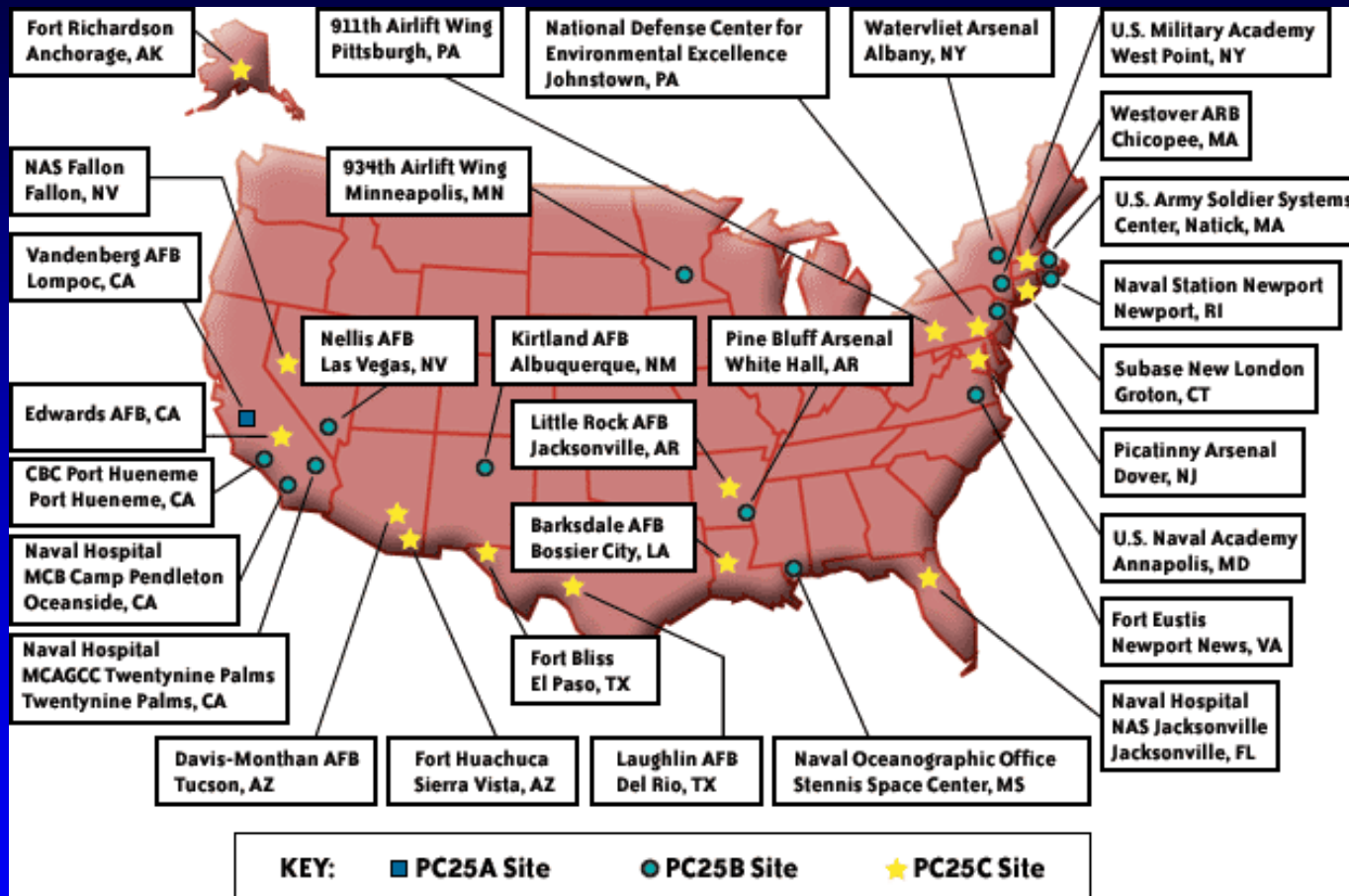
The screenshot shows a Netscape browser window titled "DoD FUEL CELL Demonstration Program". The address bar contains "http://www.dodfuelcell.com/". The browser toolbar includes buttons for Back, Forward, Stop, Refresh, Home, AutoFill, Print, and Mail. Below the toolbar, there are several search engines and services listed: Best of the Web, Today's Links, Web Gallery, Product News, Microsoft, and Office for Macintosh. The main content area features a navigation menu on the left with links: Program Overview, Demo Sites, Site Performance, Application Guide, Program Library, Helpful Websites, Calendar of Events, What's New, and Feedback Form. The main heading is "DoD FUEL CELL" in large red letters, with "Demonstration Program" in blue below it. To the right is a photograph of a man in a military uniform speaking at a podium. Below the photo are links for Website Outline, Browser Settings, and Design Credits. At the bottom, there is a logo for the U.S. Army Corps of Engineers Engineer Research and Development Center, and the text "Construction Engineering Research Laboratory". A visitor counter shows "You are Visitor 83026 since November, 1997." and a status bar at the bottom indicates "Applet Loaded".



US Army Corps
of Engineers

Engineer Research & Development Center

PC25 DoD Power Plant Sites



US Army Corps
of Engineers

Engineer Research & Development Center

PAFC Facility Applications

- **Central Heat Plants**

11 Sites



- **Hospital Utility Plants**

7 Sites



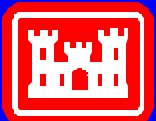
- **Pool/Gymnasiums**

3 Sites

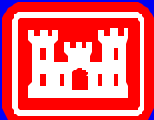


- **Others**

Barracks, Dining Facility, Laundry,
NG Armory, Launch Control Bldg.,
Office, Evaporator process



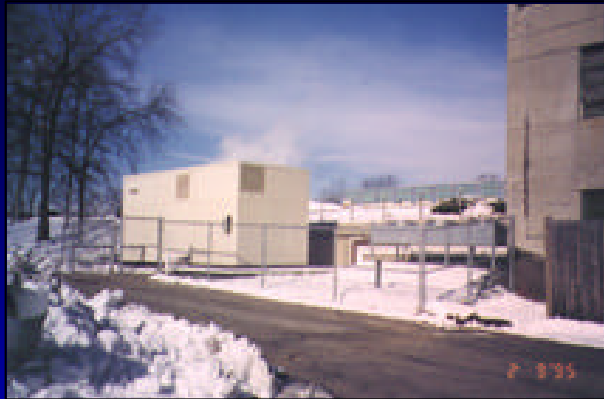
PC25B Installed at Picatinny Arsenal, NJ



US Army Corps
of Engineers

Engineer Research & Development Center

FY93 Program Sites



U.S. Army Soldier Systems Command, Natick MA



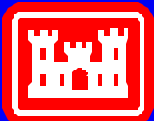
Ft. Eustis, Newport News VA



Picatinny Arsenal, Dover NJ



U.S. Military Academy, West Point NY



US Army Corps
of Engineers

Engineer Research & Development Center

FY94 Program Sites



Edwards AFB, CA



Barksdale AFB, Bossier City LA



Ft. Huachuca, Sierra Vista AZ



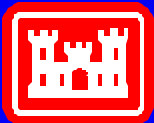
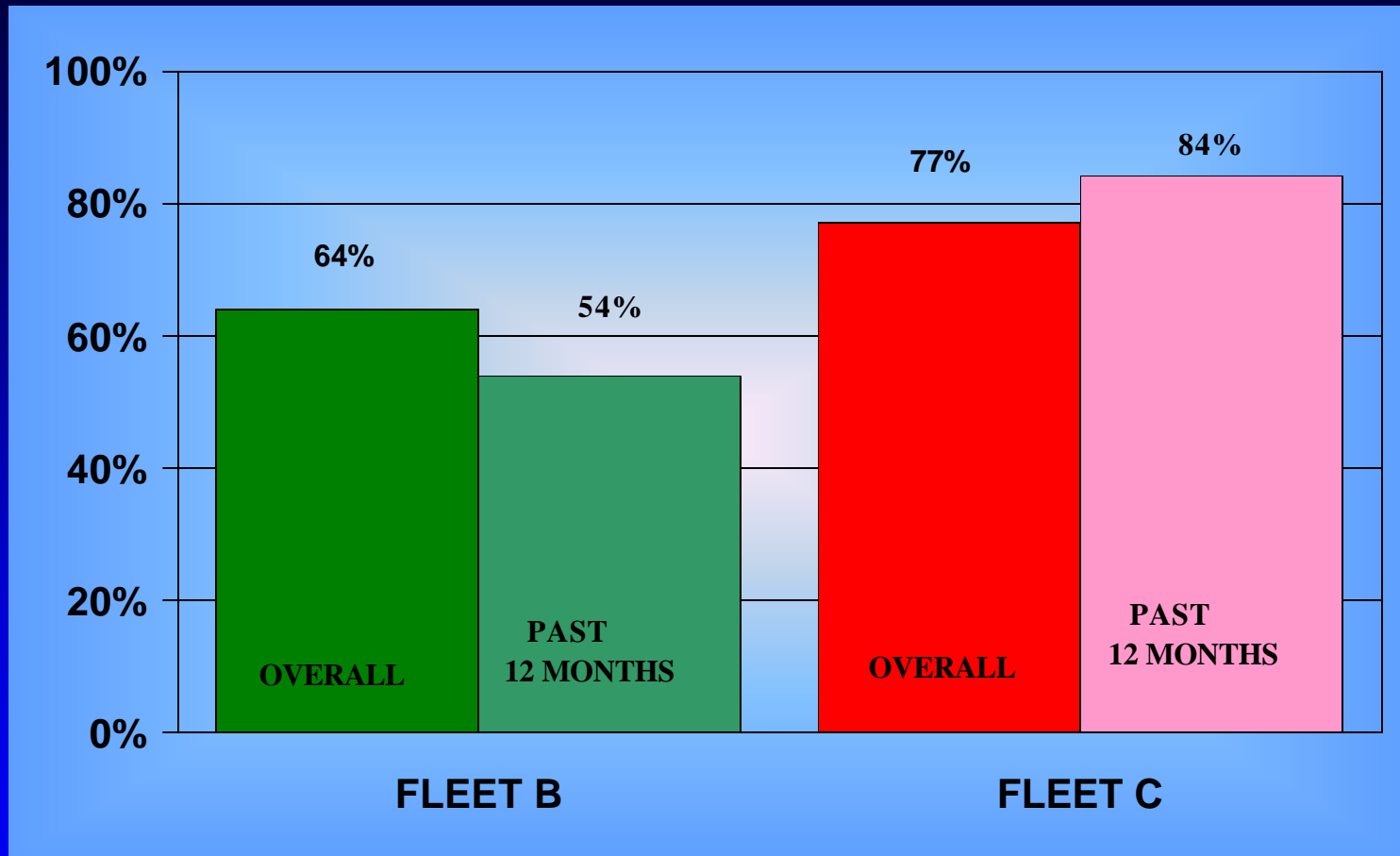
National Defense Center for Environmental Excellence
(NDCEE), Johnstown PA



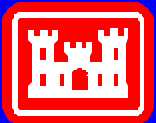
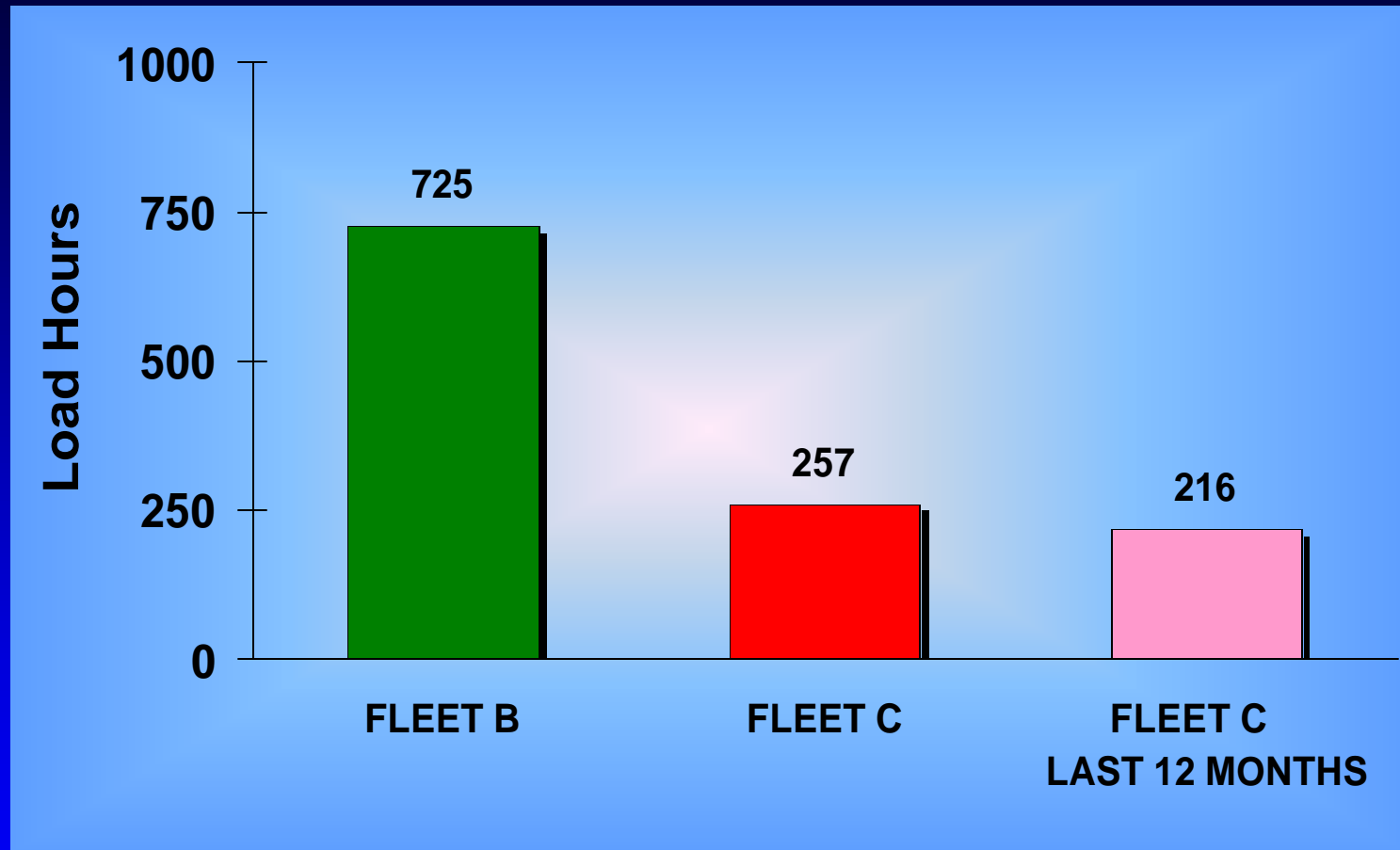
US Army Corps
of Engineers

Engineer Research & Development Center

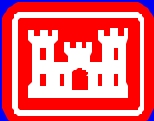
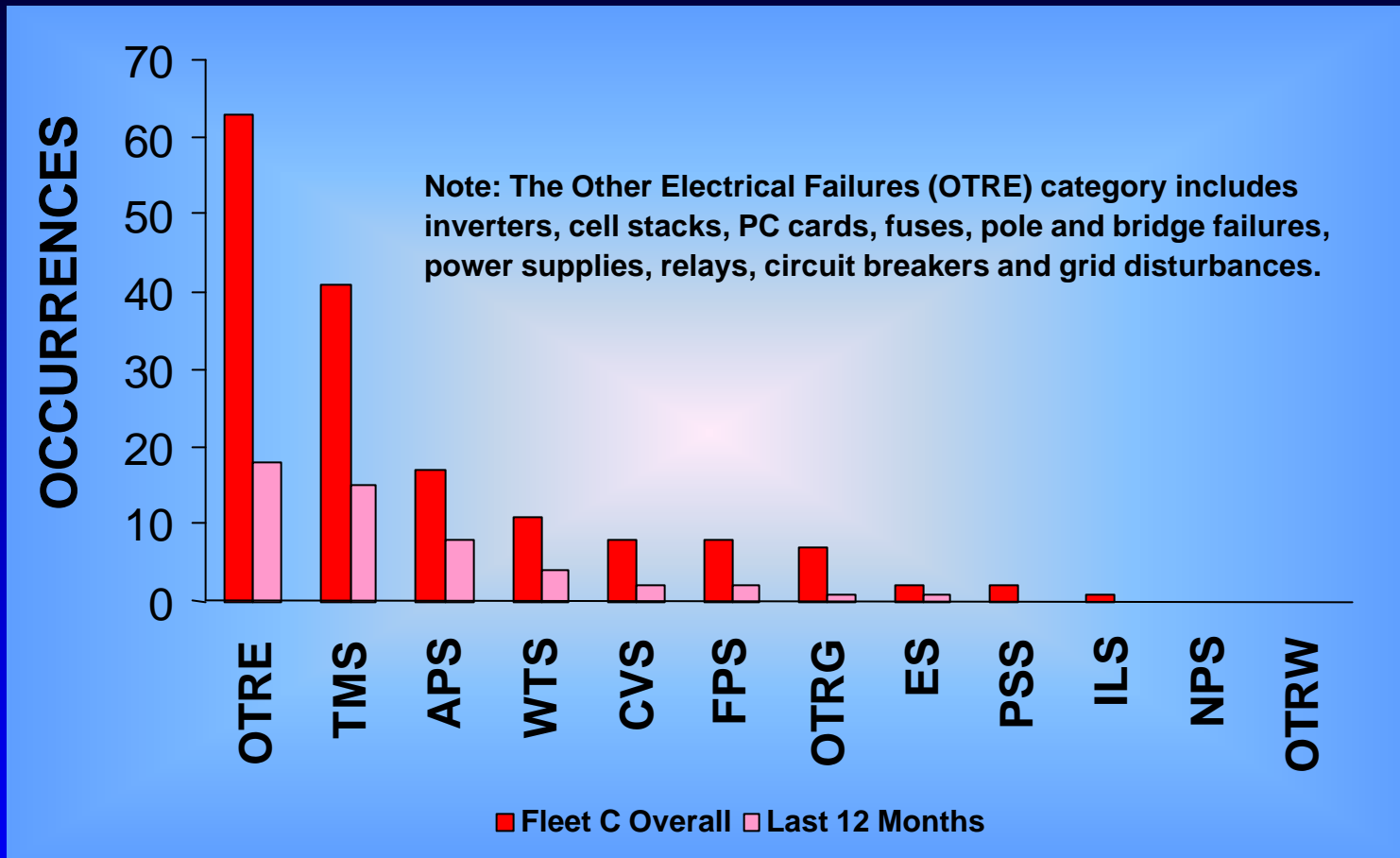
Fleet Availability



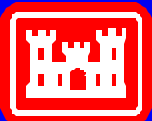
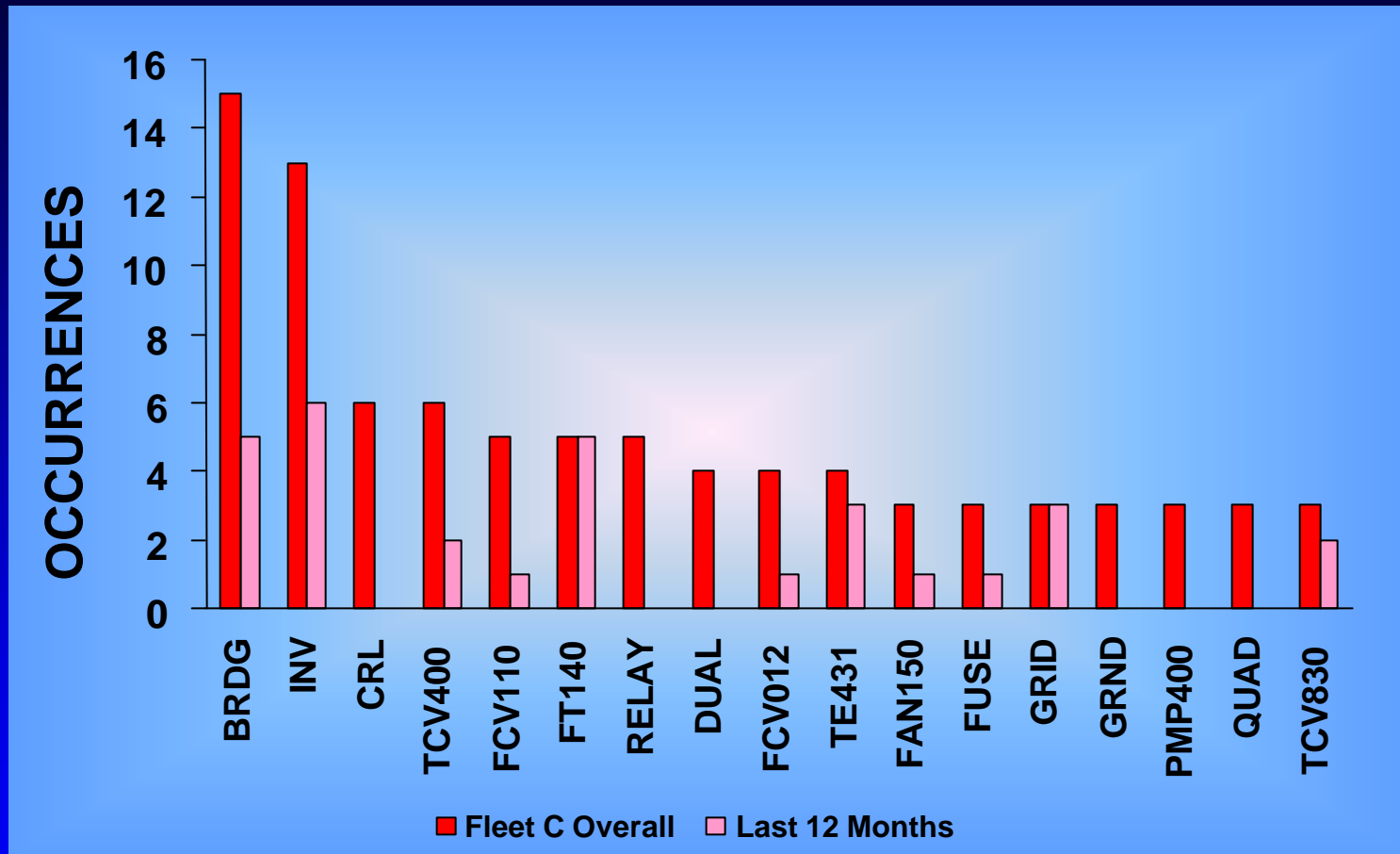
Average Duration of Outage



Subsystem Outage Causes



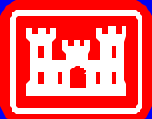
Specific Electrical Failures



Future Energy Challenge 2003



Colorado School of Mines
Drexel University
Michigan State University
Ohio State University
Seoul National University of Technology
Texas A&M University
University of Akron
University of Central Florida
University of Missouri-Rolla
University of Wisconsin
Virginia Tech
West Virginia University

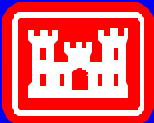


US Army Corps
of Engineers

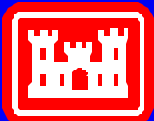
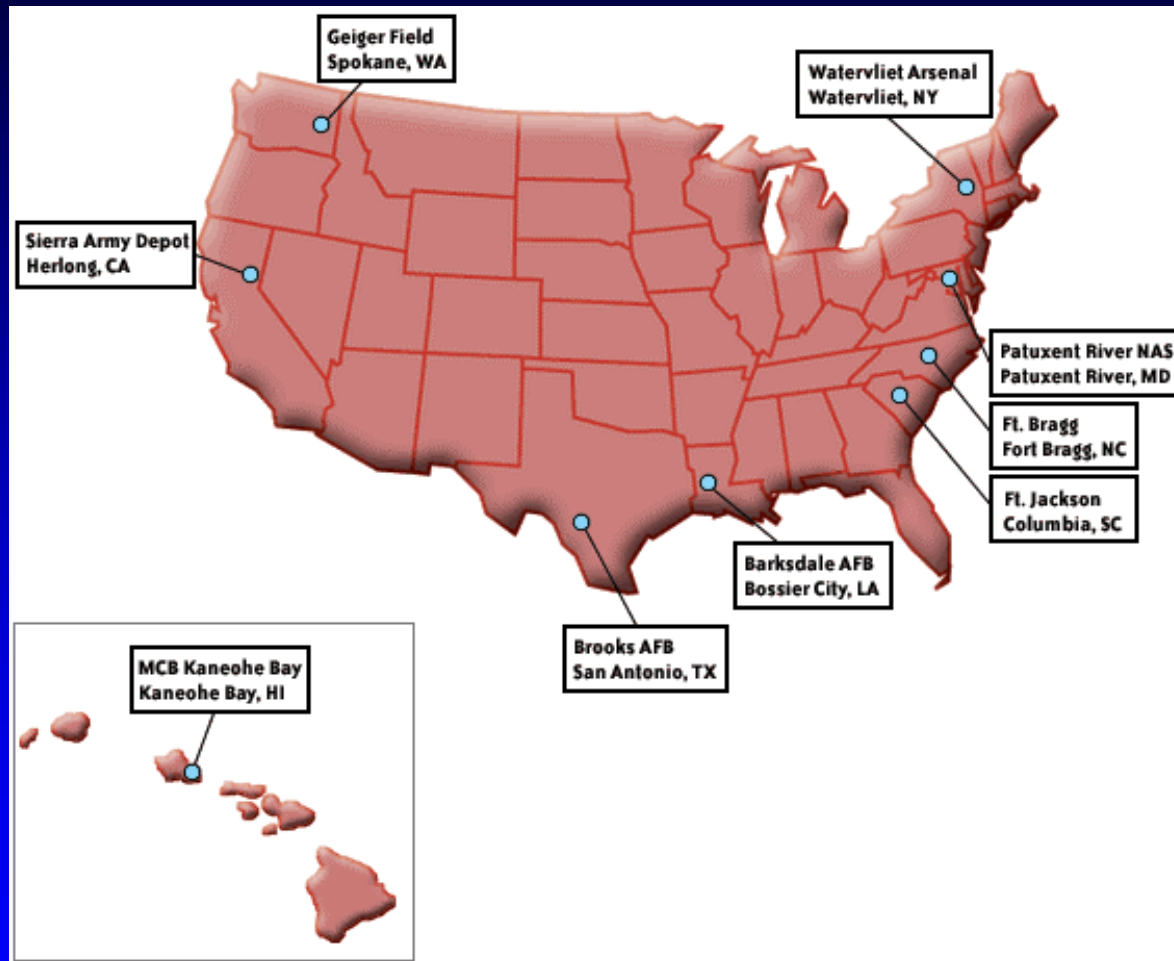
Engineer Research & Development Center

Residential PEMFC Demo 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



PEMFC Demo Sites



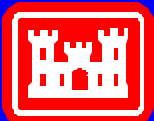
US Army Corps
of Engineers

Engineer Research & Development Center

PEMFC Application Stats

SITE APPLICATION MATRIX

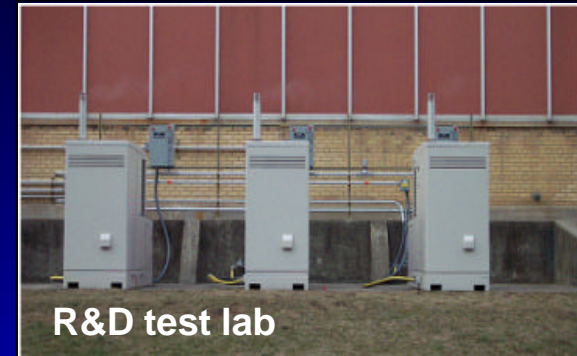
Site Name	Building Application	Fuel Cell Manufacturer	Input Fuel	Size (kW)	No. Units	Cogen. Y/N
Sierra Army Depot	Barracks	H Power	Propane	4.5	1	Yes
Brooks AFB	Base Housing	DCH Tech.	Natural Gas	3	3	No
MCB Kaneohe Bay	Base Housing	Avista Labs	Propane	5	1	No
Ft. Bragg	TBD	Avista Labs	Natural Gas	5	1	No
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



US Army Corps
of Engineers

Engineer Research & Development Center

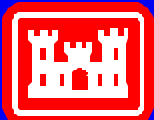
Watervliet Arsenal Case Study



10 (5 kW) systems

*“The installation of these units
represent the largest
implementation of PEM fuel cells
at a military facility”*

Frank Holcomb



US Army Corps
of Engineers

Engineer Research & Development Center

Watervliet Site 1

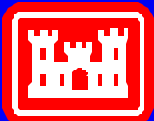
Officer's Quarters, Building 19

Four 5 kW SU-1 PEM Fuel Cells

Single Phase, Grid Parallel

Output Setpoint: 2.5 kW

Building 19 is an historic building at the Arsenal that has been converted to four family housing units. Each of the fuel cells serves a single unit in a single phase grid parallel mode.



Watervliet Site 2



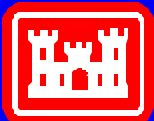
Manufacturing Facility, Building 110

Three 5 kW SU-1 Units

Three Phase, Grid Parallel

Output Setpoint: 2.5 kW

Building 110 is a heavy machining facility. All three fuel cells support the load in this single facility.



US Army Corps
of Engineers

Engineer Research & Development Center

Watervliet Site 3

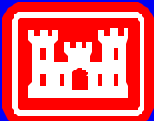
Research Facility, Building 115

Three 5 kW SU-1 Units

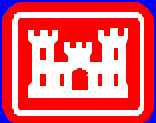
Three Phase, Grid Parallel

Output Setpoint: 2.5 kW

Building 115 is a laboratory facility.
The three fuel cells support the electrical
load for a destructive testing facility.



Questions?



US Army Corps
of Engineers

Engineer Research & Development Center