

# Federal CHP Market and Fuel Cells

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**(note: NTRC case study slides updated 3/03)**

# Topics

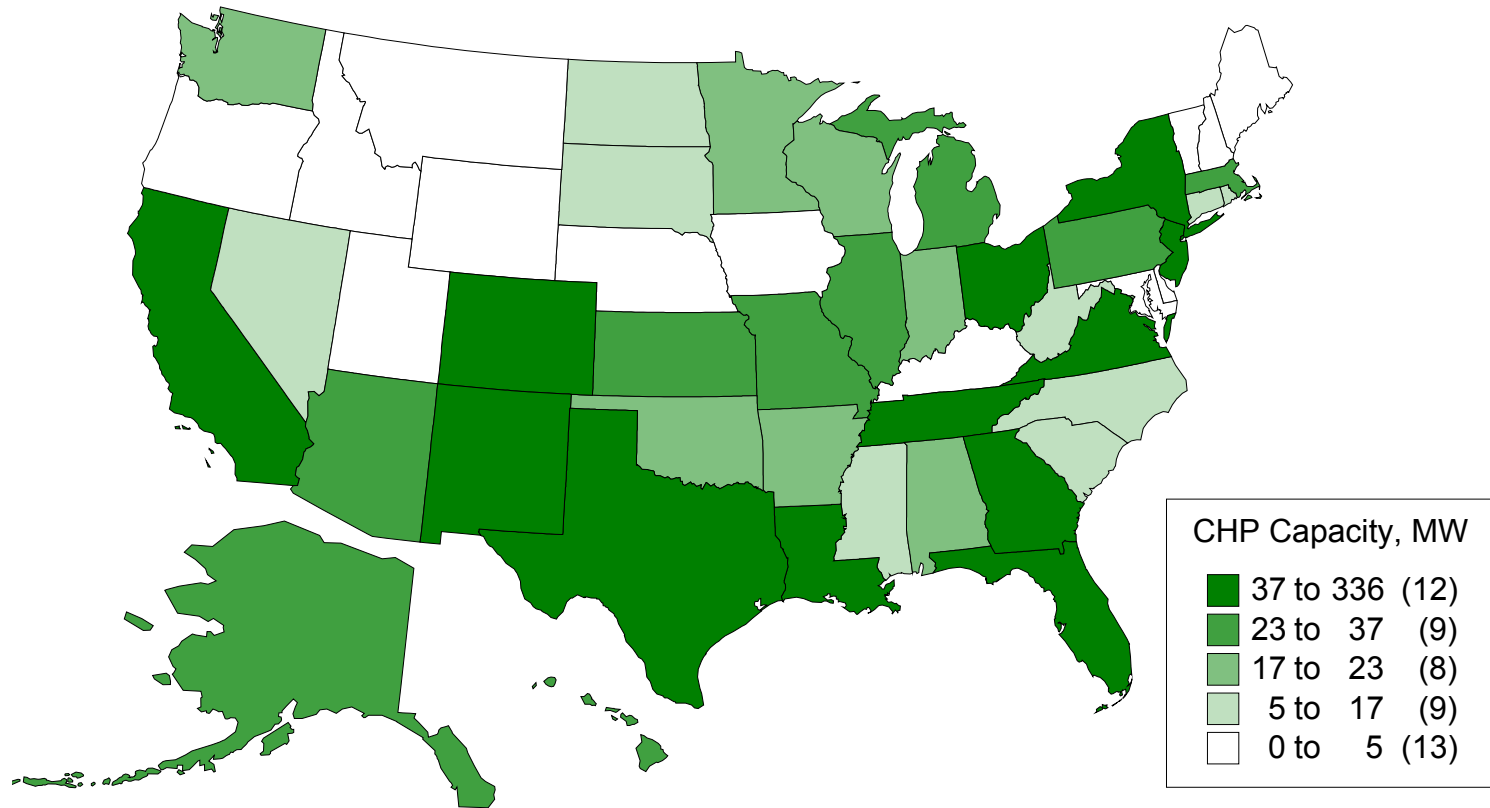
Assessment of federal market potential for CHP  
Same methodology assessed PAFCs  
(phosphoric acid fuel cells)—commercially  
available now  
FEMP team is available to help

# Estimating CHP Potential

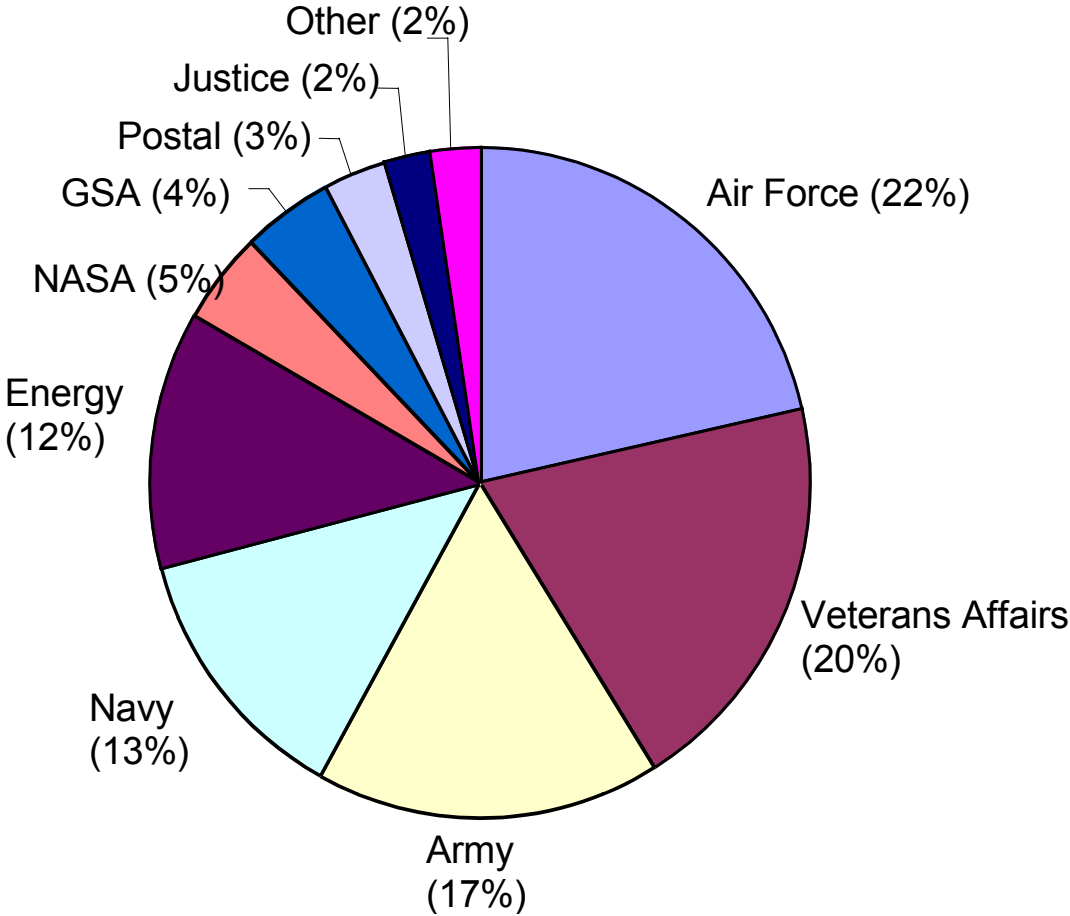
- **“Analysis of CHP Potential at Federal Sites” (Feb. 2002) on web site**
- **Based on:**
  - **GSA federal building database**
  - **EIA-CBECS energy intensities**
  - **EIA Year 2000 industrial energy rates**
  - **CHP system cost and O&M data**
  - **Application-specific assumptions**
  - **Maximum simple payback of 10 years**

# Federal CHP Potential

## 1500-1600 MW (Base case for engines or turbines with payback <10 yrs)



# Federal CHP potential by agency



# **Market Assessment Estimates CHP Impacts 1500 MW Federal CHP Potential =**

- **\$170 million/year in energy cost savings**
- **Average simple payback <8 years**
- **50 trillion Btu/yr of source energy savings**
- **4 million metric tons/yr of avoided CO2**
- **Increase reliability/security representing 13% of total federal electricity purchased**

**—this is significant!**

# **Why CHP potential may be relevant to the future of hydrogen/fuel cells**

- **Developing CHP can finance and catalyze:**
  - “Hydrogen/fuel-cell-ready” infrastructure
  - Essential human knowledge base for operating DG
- **Infrastructure + knowledge**
  - Keys to attracting private capital for commercialization

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# **Federal PAFC Potential (Assumptions/Scenarios)**

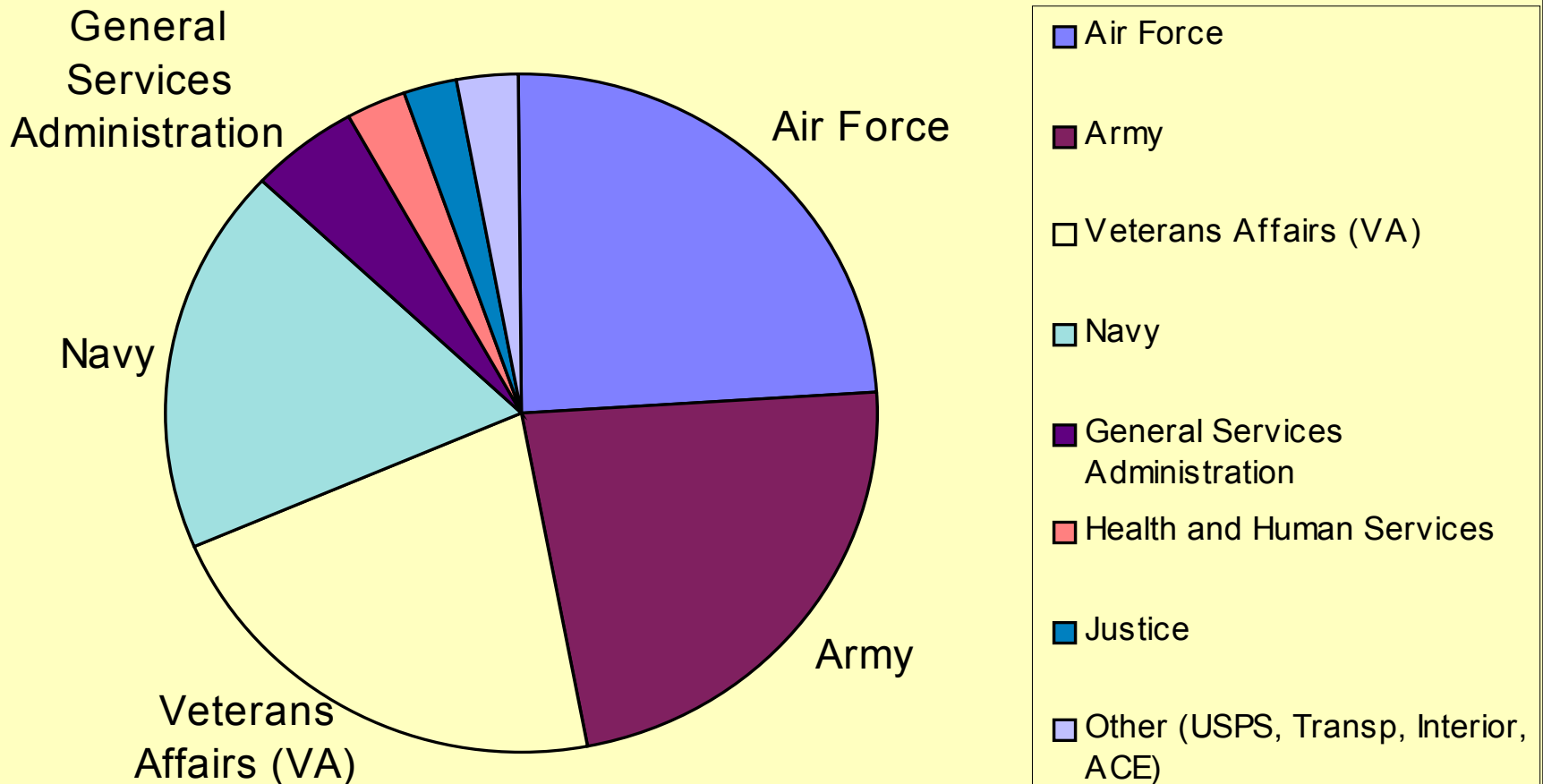
- **Base case—today's costs: \$5000/kW, 4.5 cent/kWh O&M, 40% efficient =  
no projects with payback periods less than 10 years**
- **Optimistic/future scenario: \$1500/kW, 1.5 cent/kWh O&M, 50% efficiency =  
90 MW of potential with payback <10 yrs (mostly in Hawaii and Alaska)**

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# Federal Fuel Cell Potential— Future/Optimistic Scenario

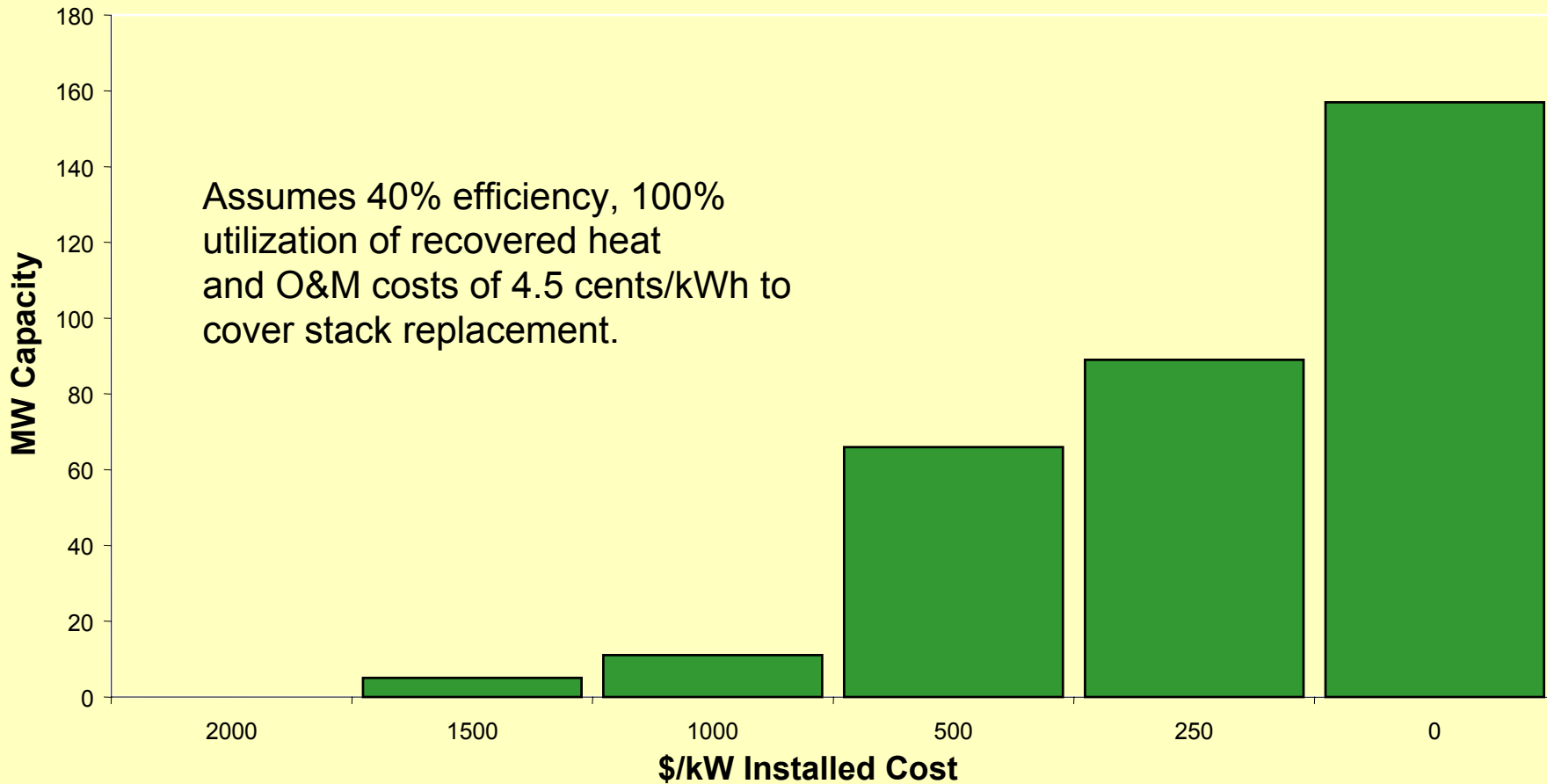
Fuel Cell Potential by Federal Agency (90 MW total)



# **“What if” funding is available to buy-down costs? Assuming:**

- **Efficiency = 40%**
- **O&M including stack replacement is 4.5 cents/kWh**
- **Gas fuel**
- **All waste heat can be utilized**
- **Installed cost is \$5000/kW, but resources are available to buy-down part of cost...**

# MW of Economic PAFC Potential in Federal Sector Versus Installed Cost



# Key parameters

- **Installed cost**
- **Stack replacement intervals & cost**
- **Reliability of reformers & periphery equip**
- **O&M costs including stack replacement**
- **Electric generation efficiency**
- **Temperature/rate of waste heat**
- **Fuel considerations (costs, supply management and storage)**

# Case Study: Nat'l Transportation Research Center Fuel Cell Retrofit

- **Commercially available UTC PAFC**
  - Consumes 2,050 cft/hr gas to generate 200 kW electricity
  - Generates 450,000 Btu/hr hot water @ 140 and 250°F
  - Quiet—conversational level
  - 59% efficiency in Summer using 250°F water for temperature control
- **SEMCO desiccant system**
  - recovers enthalpy
  - controls humidity from exhaust



# Case Study: NTRC Costs/Benefits—barely break even

- Fuel Cell installed cost \$1,250,000 (\$6250/kW)
- Stack replacement \$375,000 (\$0.045/kWh)
- O&M \$35k/yr contracted
- Electricity ~\$0.08/kWh
  - Scheduled rate increase in Fall 2003
- Heat recovery offsets gas consumption by ~25% (winter months)

Operating costs are sensitive to gas rate

Gas price is variable (\$/decatherm)	Projected Savings/yr (\$)
4.00	10,000
5.00	1,000
6.00	Net loss

Gas utility approved special commercial rate structure



# **FEMP—available to help**

- **Find least cost host sites**
  - **Assessment methodology for likely states, agencies, and building types**
  - **Screenings with site-specific data**
- **Support sites to plan, implement**
- **Share federal experiences/manage expectations**
- **Ensure informed next steps**

# FEMP CHP Contacts

- **DER/CHP Programs at FEMP HQ:**  
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- **Keith Kline, ORNL FEMP CHP coordinator**  
**(865) 574-4230 [Klinekl@ornl.gov](mailto:Klinekl@ornl.gov)**

## Web-based Info:

- **Call for Projects (funding) and upcoming DER Workshops for federal facilities:**  
[http://www.eren.doe.gov/femp/techassist/der\\_resources.html](http://www.eren.doe.gov/femp/techassist/der_resources.html)
- **Full CHP Market Assessment Report:**  
[www.ornl.gov/femp/pdfs/chp\\_market\\_assess.pdf](http://www.ornl.gov/femp/pdfs/chp_market_assess.pdf)
- **DOE Websites:**  
**FEMP** <http://www.eren.doe.gov/femp/>  
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