Kevin DeGroat,
McNeil Technologies

- Working for DOE renewable energy programs since 1985
- Supporting FEMP with renewable energy tracking, analysis of DG potential
- Research & education in energy and natural resource economics, energy and environmental policy

Key Numbers

- PV: $6–$9K/kW; efficiency NA because of $0 fuel costs; capacity factor: 20% or less
- Wind: $1,500/kW, efficiency NA because of $0 fuel costs; 30% or higher
- PAFC Fuel Cell: $3000-$4000/kW; 40% electrical efficiency; up to 60-70% CHP
- PEM Fuel Cell: $4000-$5000/kW; 40% electrical efficiency; CHP in theory

PV Observations

- Sources: lots of experience and sources of data from installations at NPS, DoD, Coast Guard, BLM, USFS
- $6-9/W among highest first costs; compares to Distribution Lines, Remote Power, Peak Rates
- O&M costs 1/10th cost of fuel cells

Wind Power Observations

- Sources:
  - Large and small federal installations, lots of commercial experience
  - Low costs from utility size turbines – smaller turbines cost more per per kWh
- $1500/kW (large turbines; less than half fuel cell costs, ¼ the cost of PV) – compares to grid extension, remote power, utility power in wind farms
- O&M costs 1-2 cents/kWh, declining

Fuel Cell Observations

- Sources: DoD fuel cell program, numerous private sector characterizations
- PAFCs proven – potential for niche applications with high value combined heat and power or reliable backup power supply
- PEMs are still in demonstration
- O&M in the 1-2 cents/kWh range – lots of variation
- Important numbers that didn't fit:
  - PAFC temperatures at: 140-250^{o}F
  - PEM temperature at: 135-165^{o}F
  - Natural gas costs at $4.69 to $5.06/MMBTU on July 30

1 MW PAFC Fuel Cell Demonstration, USPS Facility, Alaska