National Initiatives

• Clean Coal
• Global Climate Change (CO₂)
• Clear Skies (NOₓ)
• Hydrogen
• Energy Security

Advanced Coal Technology/FutureGen

Distributed Generation

Advanced Coal Technology/FutureGen

Distributed Generation
Why Future Gen and Sequestration?

- Abundant reserves
- Low and stable prices
- Technology improvements
  - Enable near-zero emissions of air pollutants/GHGs

U.S. Fossil Fuels Reserves/Production Ratio
Shows Years Supply at Current Production

- Coal: 246 years
- Oil: 11.7 years
- Natural Gas: 9.2 years

EIA- U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves: 2001 Annual Report, November 2002;
Hydrogen Economy & Fuel Cells

Hydrogen from Domestic Resources can significantly reduce our demand for oil by the year 2040

Source: US DOE Energy Efficiency & Renewable Energy
SECA Fuel Cells in 2010

Low Cost/High Volume
$400/kW / > 50,000 units/yr
SECA: Making Fuels Cells a Reality

2005
- 1st Generation Prototypes
  - Testing & Evaluation

2010
- $400/kW Modules
  - Residential, Commercial, Industrial CHP
  - Transportation APUs

2012 - 2015
- FutureGen - SECA fuel cells available

2020
- MW-Scale SECA fuel cells for Advanced Coal Power Plants
### Priorities: *Core Technology Program*

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<td>• Modifying components in alloys</td>
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<td>• Mixed conduction</td>
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<td>Fuel Processing/Anode</td>
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<td>• Catalyst surface modification</td>
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<td>• Characterize thermodynamics/kinetics</td>
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<td>• Lower cost precursor processing</td>
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