SOLID OXIDE FUEL CELL TEST CENTER (SOFCto) DEVELOPMENT AND DEMONSTRATION

GOAL
BUILD SOFC DEVELOPMENT & DEMONSTRATION TEST CENTER (SOFCto) to help NETL achieve its mid-2020s target of 10MWp SOFC demonstration with coal-derived syngas and carbon capture, utilization, and storage.

OBJECTIVES
- Design SOFC development and demonstration test center with the tools needed to advance system- and component-level SOFC performance.
- Build and validate SOFC test facility.
- Perform component- and system-level SOFC testing using a variety of fuels.

FUEL PRODUCTION, CLEANUP, AND STORAGE TECHNOLOGY
EERC SOFC test stands integrated with syngas production, cleanup, storage, and fuel delivery system.

OBJECTIVES
Multicell Test Station
< 5 ppbv
Concentration
Industrial Gasifier
25 ppbv
0.4%
Fiaxell Test Station
Multicell Test Station
< 10
1.7%
1900 ppbv
< 1000 ppbv
25 ppbv
XRF
< 0.5 ppbv
Concentration*
Fuel delivery
Bypass
Planar or tubular
Planar
Single cell or short stack
< 1 ppbv
150
Any fuel from gas storage
Additional gas cleanup and acid
0.0%
Bypass
Planar
< 0.5 ppbv
N/A
~500 ppbv
Fiaxell Test Station
0.9%
Electronic Load & EIS

GOAL
CENTER (SOFC)
SOLID OXIDE FUEL CELL TEST
FUEL DELIVERY SYSTEM
•
•
•
FUEL OPTIONS:
•
•
ALL GASIFIERS
• Wide range of feedstocks: coal, biomass, other solid or liquid feedstocks
• Bench-scale warm-gas cleanup train
• Gas-sweetening absorption system
  - Additional gas cleanup and acid gas removal
  - Produce up to 120 sofh of syngas
  - Syngas storage and delivery system
• Wide range of H₂/CO ratio
• Low-contaminant level

EERC GASIFICATION CAPABILITY | THREE GASIFIERS

EERC GASIFICATION CAPABILITY | CARBON CAPTURE

EERC GASIFICATION CAPABILITY | FUEL STORAGE
STORAGE TANK CAPACITY | 20,900 scf at 2600 psi

FUEL OPTIONS:
- Syngas from EERC gasifier (coal, biomass, waste, blend)
- Natural gas (desulfurized)
- Bottled gas (single or blends of H₂, CO, CH₄, CO₂, N₂, other)
- Added contaminants

FUEL DELIVERY SYSTEM

SOFCE DEVELOPMENT AND DEMONSTRATION TEST CENTER AT THE EERC

COAL-DERIVED SYNGAS QUALITY

EERC Gas Component
Carbon Monoxide
49.5%
Carbon Dioxide
0.7%
Hydrogen
8.6%
Argon
0.4%
Methane
0.08%
Dissolved Oxygen
3.2%
Carbon Dioxide
1.7%

MATERIALS ANALYTICAL CAPABILITIES

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SOFCE DEVELOPMENT AND DEMONSTRATION TEST CENTER AT THE EERC
1 kW Stack Test Station
Multicell Test Station
Power Test Station
Electronic Load & EIS

TEST CONDITIONS
- 750°C
- Constant current load at 230 mA/cm²
- 75% fuel utilization
- Methane reformer

CONTAINTABLE LEVEL | EERC Syngas vs. Industrial Syngas
Industrial Gasifier
Carbon Monoxide
< 100 ppm
Argon
< 10 ppm
Methane
< 10 ppm
Carbon Dioxide
< 100 ppm
Dissolved Oxygen
< 10 ppm

MATERIALS ANALYTICAL CAPABILITIES

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