

U.S. DEPARTMENT OF ENERGY  
OFFICE OF FOSSIL ENERGY  
NATIONAL ENERGY TECHNOLOGY LABORATORY



## DOE FUEL CELL VALIDATION TESTING

### Background

The goal of this project is to perform independent fuel cell validation testing for the Solid State Energy Conversion Alliance (SECA) program. The SECA program will develop fuel cell technology for future coal-based power plants that support an efficient and clean hydrogen and electric economy, as illustrated in Figure 1. To achieve these goals, the SECA program will focus on 3-10kW scale solid oxide fuel cell (SOFC) systems that, in the future, can be scaled up to larger central plant applications. Before these coal-based power plants can be realized, significant improvements are needed in the performance and reliability of SOFC systems. Industrial developers under the SECA program are performing the necessary research and development to achieve the following key goals of the SECA program:

- Reduce the cost of fuel cell systems to less than \$400/kW
- Achieve greater than 40 percent fuel conversion efficiency on natural gas
- Reduce degradation per 500 hrs to less than 0.1 percent
- Achieve greater than 95 percent availability

Developers assess their progress by performing complete system tests at their facility following each of the SECA program's three phases. This project tests these units further to validate the results obtained by the developer.

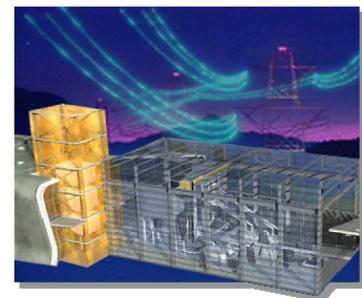
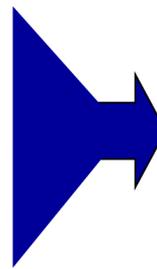
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**SECA Technology**



**FutureGen**

Figure 1. SECA fuel cell technology will be employed in future near-zero emission coal based power systems.

### DOE Fuel Cell Test Facility

The test facility at the National Energy Technology Laboratory (NETL) is designed to evaluate the performance of fuel cell systems capable of up to 30kW of power output. A photo of the facility is shown in Figure 2.



## ADDRESS

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The facility was designed with the goal of following the test methods identified by the American Society of Mechanical Engineers Performance Test Code 50. This test standard provides specific requirements for evaluating the efficiency performance of fuel cell systems. Specific technical features and capabilities of the facility are given below.

- Power Testing
  - Stationary power generation: e.g., 120 VAC, split phase, 60 Hz; grid- and non-grid-tied option
  - Auxiliary Power Unit for truck, automobile, motor home – e.g., 120 VAC @ 60 Hz, 42 VDC
- Fuel
  - Diesel (ca. 2008)
  - Natural Gas
  - Methane
- 0-12 kW AC and DC Load Banks and Load Profile Controller
- Continuous Power Measurement
  - Aux input: real power, power factor, frequency
  - AC: real power, power factor, frequency
- Revenue quality meter (kW-hr)
- Solid state metering (watt/var/pf/freq)
  - DC: power
- Continuous Fuel Measurement
  - High accuracy coriolis meter
  - On-line gas chromatograph for fuel energy
  - Revenue quality meter
- Power Quality Monitoring
  - Voltage sags/swells
  - Total Harmonic Distortion
- Exhaust Gas Analysis
- On-line Uninterruptible Power System
- De-ionized Water
- Spare Input/Output Capability
- Vent Hood
- Purge Gas
- Safety Instrumentation
- Safety Communication



Figure 2. DOE Fuel Cell Test Facility

## Opportunities

Because test facilities can be expensive to build, maintain, and operate, any organization wishing to perform independent testing of fuel cell systems as described here is encouraged to consider collaboration with NETL. For more information, please contact any of the personnel listed on the front of this document.