

# PROJECT facts

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



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## SOLID OXIDE FUEL CELL PROGRAM

### Description

Delphi Technical Innovation Center, in partnership with Battelle, proposed to the U.S. Department of Energy to develop cost-effective solid oxide fuel cell (SOFC) systems for automotive and heavy duty truck auxiliary power units, stationary distributed power generation, and niche applications in the military sector. A Delphi/Battelle team is working on the development of SOFC systems, and understands the key issues that must be addressed to achieve the functional requirements and the aggressive cost goals of the DOE's SECA project to successfully commercialize SOFC systems. Our team is committed to the earliest commercialization of SOFC systems and intends to expend substantial private resources.

Our proposed team combines Delphi's extensive and proven systems and integration engineering capability, manufacturing expertise, and access to the automotive marketplace with Battelle's internationally recognized experience in solid oxide fuel cell and micro system technologies, and knowledge of the energy and military markets. SOFCs offer a highly efficient, low-emission energy conversion technology, and the Delphi/Battelle team views SOFC-based systems as highly competitive power sources with enormous potential for a variety of stationary and mobile applications.

The major components of our proposed SOFC systems, including the SOFC stack, will be designed to be common to as many applications as possible. By developing a modular system suitable to the automotive market and the market for stationary distributed power, we project early-stage product volumes



Generation 2 SOFC APU Non-Functional Mock-Up

# SOLID OXIDE FUEL CELL PROGRAM

## Description (continued)

necessary to achieve the ambitious cost goals required to penetrate these markets while meeting the particular demands of each. This is the embodiment of "mass customization" concept typically employed in Delphi's automotive product lines. Pursuing this market will provide the impetus for the stack and reformer designs that will meet SECA's goals and facilitate volume production of SOFC systems. Systems for stationary applications using natural gas are simpler and should be ready for commercialization at affordable cost earlier.

The Delphi/Battelle team has identified the key items for which breakthrough developments are essential to meet the team's and SECA's goals and for successful commercialization of SOFC systems. Specifically, under the proposed SECA project, we will focus on: system design and integration, SOFC stack development (including seals and interconnects), and reformer development.

## Goals

Our overall goal is to develop an SOFC based power system that can be economically produced in high volumes and mass customized for different applications in transportation, stationary power generation, and military market sectors. In Phase I of the proposed project, work will be conducted on system design and integration, stack development, and development of reformers for natural gas and gasoline. Specifically, we will fabricate and test a 5 kW stationary power generation system consisting of an SOFC stack, a steam reformer for natural gas, and balance-of-plant components.

In Phases II and III, our emphasis will be to improve the SOFC stack, reduce start-up time, improve thermal cyclability, demonstrate operation on diesel fuel, and substantially reduce materials and manufacturing cost by integrating several functions into one component and thus reducing the number of components in the system.

## Benefits

The Solid Oxide Fuel Cell is one of the cleanest, most efficient power-generating technologies now being developed. Benefits of this source of power include, but are not limited to:

- Provides electric power with high efficiency and essentially zero regulated emissions
- Operates independent of engine or power grid
- Can be integrated with internal combustion engines to reduce engine emissions
- Can be utilized in Combined Heat and Power (CHP) systems for higher efficiency
- Highly compatible with conventional fossil fuels due to simple reforming process
- Solid-state device with minimal moving parts
- Achieves high efficiency power generation in a compact package

## PRIMARY PROJECT PARTNER

**Delphi Corporation**  
Troy, Michigan

## MAIN SITES

**Delphi, Technical Center Rochester**  
Henrietta, New York

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## STRATEGIC CENTER FOR NATURAL GAS WEBSITE

[www.netl.doe.gov/scng](http://www.netl.doe.gov/scng)

## CUSTOMER SERVICE

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