

SECA: powering the future



SOLID STATE ENERGY CONVERSION ALLIANCE

vision

Solid oxide fuel cells will play an important role in powering the future. They are highly efficient and generate electricity from a variety of fuels on demand and on location, without harmful emissions. With broad public acceptance, these fuel cell systems will—

- Reduce harmful emissions such as carbon dioxide.
- Enable effective central and distributed power generation and allow rapid response to emergent energy needs.
- Provide a bridge to a hydrogen future.



fuel cells

the alliance

SECA: A Unique Alliance

The Solid State Energy Conversion Alliance (SECA) was formed to promote and accelerate the development and commercialization of low-cost, environmentally friendly solid oxide fuel cells for stationary, transportation, and military applications. U.S. industry, universities, and other research organizations are active participants in this collaborative and tightly coordinated alliance.

SECA is led by two U.S. Department of Energy national laboratories—the National Energy Technology Laboratory (NETL) and the Pacific Northwest National Laboratory (PNNL). They are supported by the DOE Office of Fossil Energy and the NETL Strategic Center for Natural Gas. The alliance is pursuing solid oxide fuel cell prototypes for diverse applications that will reduce the nation's dependence on imported oil, mitigate environmental concerns associated with current methods of generating electricity from fossil fuels, and provide a bridge to a hydrogen future.

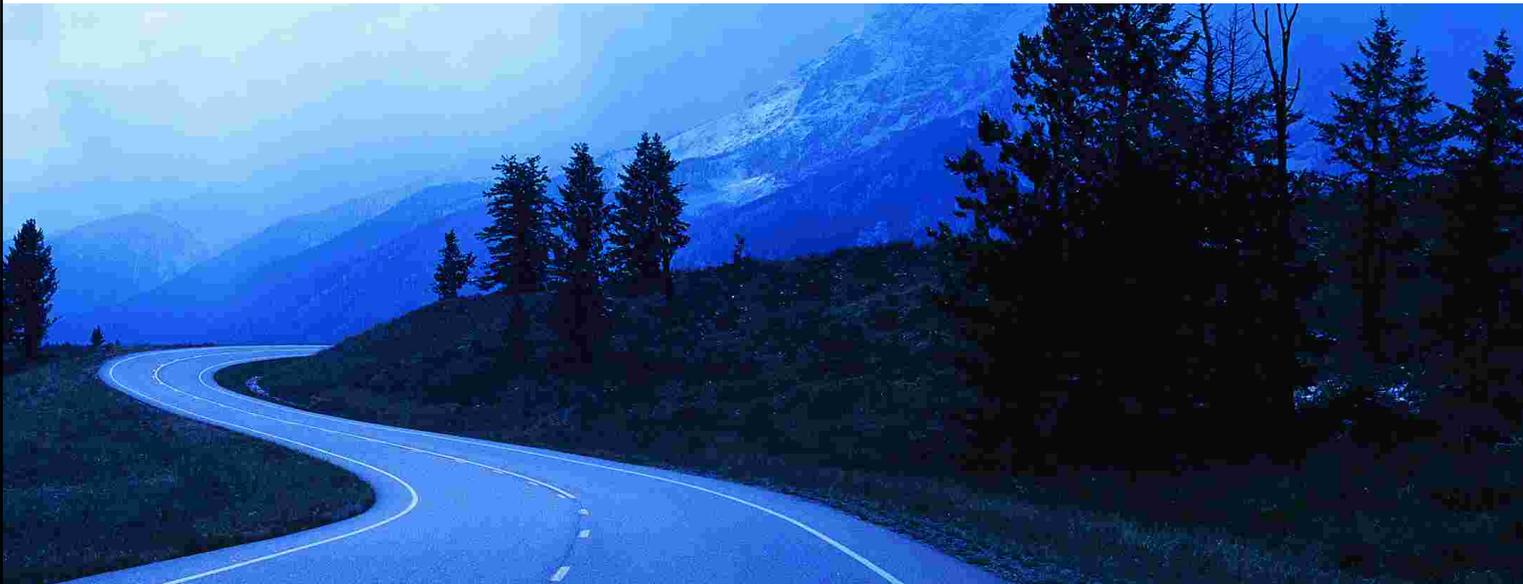
mission

SECA's goal is to make solid oxide fuel cells an attractive choice for a variety of energy needs. To achieve that goal, SECA wants to create a commercially available 3- to 10-kilowatt solid oxide fuel cell by 2010 that can be mass-produced in modular form at a target price of \$400 per kilowatt. Modular fuel cells can be used individually or in clusters. High-volume production of solid oxide fuel cells will enable further reductions in unit costs, making the technology an affordable energy choice resulting in reduced emissions and less dependence on imported fuels.



fuel cells

A solid oxide fuel cell, or SOFC, converts the chemical energy of a fuel directly into electrical energy. Because it is an electrochemical device that doesn't rely on a combustion process, a fuel cell generates energy more efficiently and does not emit pollutants such as nitrogen oxides, sulfur oxides, hydrocarbons, and particulate matter. SOFCs are fuel flexible, which means that, in addition to operating on hydrogen, they can convert fuel such as natural gas, coal-derived synthetic gas, reformed gasoline or diesel into electrical energy. In addition,



Teaming for Success

SECA plans to jump-start the production of a cost competitive, commercial solid oxide fuel cell by removing existing barriers to its development. A government-led project management team will coordinate the two major program elements:

Industrial Development Teams

Four industrial teams selected in response to SECA's first solicitation in 2001 have begun the quest for low-cost, high-performance fuel cells.

- Cummins Power Generation/ McDermott Technology is pursuing stationary and mobile markets by producing a modular, 10-kilowatt system.

- Delphi Automotive Systems is developing a 5-kilowatt solid oxide design that can be

mass produced at a low cost for automotive and truck auxiliary power units, distributed power generation, and military markets.

- Siemens Westinghouse Power Corp. is developing a 7- to 10-kilowatt solid oxide combined heat and power system for residential applications.

- GE Power Systems is designing, developing, and demonstrating a modular, 3- to 10-kilowatt solid oxide fuel cell system for a wide range of power-generation needs.

These teams and future industrial teams will determine the large-scale, low-cost processes, manufacturing capability, and packaging needed for specific markets and products.

Additional industry teams will be added in 2003 under the second round of the SECA

solicitation. Information about new solicitations and solicitation awards can be found at www.netl.doe.gov/business.

Core Technology Program

Underpinning the efforts of the industrial development teams is the Core Technology Program. Composed of universities, national laboratories, and other research organizations, the Core Technology Program provides problem-solving research to overcome barriers identified by the industrial teams and to address fundamental understanding required to optimize the fuel cell system.

Coordination and technical resources for the Core Technology Program are provided by NETL and PNNL, which possess decades of experience in forming and managing collaborative research with industry.

they offer the following benefits:

Efficiency and fuel extension – Fuel cells are 40 to 60 percent efficient in individual electric systems and up to 80 percent efficient in hybrid systems. This efficiency extends the use of fossil fuels, including vast domestic coal reserves.

Options for energy delivery – Bringing electricity to remote locations where no transmission exists and providing centralized generation of power to serve significant electrical load.

Domestic Security – Reduces dependence on imported oil and allows rapid response to emergent energy needs.

Broad applications

Stationary – Solid oxide fuel cells will efficiently provide clean, economical electricity in urban or remote locations. Potential users include industry, businesses, homes, hospitals, farms, and recreation facilities, as well as public and private utilities.

national player

SECA will be a key player in three major national venues designed to help reduce the nation's dependence on imported fuels, and reduce greenhouse gas emissions, and provide hydrogen for the future.

■ **FutureGen** – This cooperative program between the federal government and industry aims to create the power plant of the future, a pollution-free energy plant that would produce multiple products, including electricity and hydrogen. SECA will play a pivotal role in helping to achieve this vision by creating fuel cell modules that can be interconnected to produce large quantities of electricity and hydrogen. FutureGen is a DOE Office of Fossil Energy program.



■ **21st Century Truck Program** – A program that supports the development and implementation of cost-effective, heavy-duty vehicles that will significantly improve fuel efficiency, reduce emissions, enhance safety



and performance, and lower operating costs. Because of its high efficiency, fuel flexibility, and ability to operate over a range of temperatures, the SECA fuel cell will be used to produce electricity for the truck's auxiliary and essential power systems, improving the overall efficiency by as much as 20 percent. The 21st Century Truck Program is part of DOE's Office of FreedomCAR and Vehicle Technologies.

■ **Solid State Energy Conversion for Aircraft Power and Propulsion (SECAP)** – NASA and DOE are coordinating efforts to extend SECA fuel cell development for aircraft and space applications.

The SECAP program would support the development of Solid Oxide Fuel Cells for aviation auxiliary power units to supply electrical power both on the ground and in the air to save large quantities of fuel and reduce pollution.

Transportation – Solid oxide fuel cells can use all standard transportation fuels to provide auxiliary power for the growing inventory of features that require electricity in cars, trucks, and other vehicles.

Military – Fuel cells are attractive for military uses because they supply quiet, clean,

uninterruptible energy that can be delivered at the point of power application—from individual electronic devices essential to the modern soldier to the distributed power needed for a field operation.

Solid oxide fuel cells (SOFCs) will play an important role in securing the U.S. energy future. SOFCs will provide efficient, environmentally friendly electrical energy while extending the capacity of the nation's fossil fuel supply and providing a smooth transition to a hydrogen-fueled future. In furthering that goal, SECA will play a prominent role in helping DOE to achieve the President's Hydrogen Fuel and Clear Skies initiatives by expanding its focus to develop even larger fuel cell clusters that use coal to power next generation energy plants at reasonable cost.



a look to the future



**SOLID STATE ENERGY
CONVERSION ALLIANCE**

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Operated by Battelle for the
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contracts