

SECA: Pushing the Frontier of Fuel Cells

The Solid State Energy Conversion Alliance is accelerating advanced technology development that will enable commercialization of low-cost solid oxide fuel cells for diverse applications reducing the nation's dependence on imported oil, mitigating environmental concerns associated with current methods of generating electricity from fossil fuels, and providing clean efficient power with the fuels of today and the hydrogen of tomorrow.

An alliance composed of U.S. industry, universities and other research organizations, 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). SECA is funded through the DOE Office of Fossil Energy.



teaming for success

SECA has made exceptional progress since its inception. SECA has six industry teams working on different approaches to achieve the cost and performance goals. The SECA Industry Teams receive core technology research and development support from leading researchers at industries, universities and national laboratories. The Core Technology Program raises the bar of technology for all the SECA Industry Teams.

Industrial Development Teams

Six industrial teams are making significant progress developing innovative SOFC systems to achieve breakthrough performance with a factor of ten cost reduction:

- Cummins/SOFCo
- Delphi/Battelle
- Siemens Westinghouse Power Corp.
- General Electric
- Acumentrics
- FuelCell Energy

Core Technology Program

The Core Technology Program provides the advanced technology needed by the SECA Industrial Teams. Composed of universities, national laboratories and other research organizations, the Core Technology Program provides problem-solving research to overcome issues identified by the industrial teams and to address fundamental understanding required to make revolutionary advances in fuel cell technology.

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 for national programs.

Core Technology Program R&D encompasses the entire fuel cell system and is focused in these areas:

- Fuel processing
- Manufacturing
- Controls and diagnostics
- Power electronics
- Modeling and simulation
- Materials



SECA provides technology for today's fuels and tomorrow's hydrogen. SECA supports these important Presidential energy initiatives:

- Hydrogen
- Clean Coal
- Clear Skies (Reduce pollutants such as nitrogen oxides, sulfur oxides and mercury)
- Climate Change (Reduce greenhouse gases such as carbon dioxide)
- Energy Security.

SECA also supports various Department of Defense and National Aeronautics and Space Administration programs that aim to maintain national security and freedom.

SECA fuel cells will have wide-ranging impact on the nation. SECA technology is important to the five Presidential energy initiatives and will have an important positive economic effect on U.S. energy production. DOE projects that SECA technology will save the nation more than \$50 billion by 2025.



SECA also is important to other U. S. government programs:

FutureGen – This cooperative program between the federal government and industry will create the power plant of the future, a pollution and greenhouse gas free power plant that will produce electricity and supply hydrogen for the future economy. SECA will play a pivotal role in achieving this vision by creating the highly efficient and fuel flexible fuel cell modules used in these advanced plants.

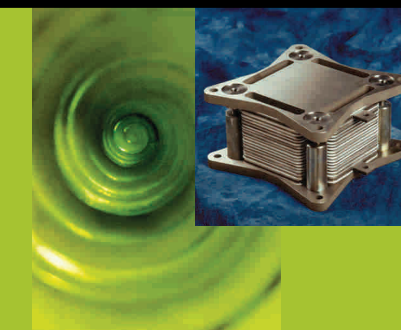
21st Century Truck Program – A program that supports the development and implementation of cost-effective, heavy-duty vehicles that will help to significantly improve fuel efficiency, reduce emissions, enhance safety and performance, and lower operating costs. Because of its high efficiency, fuel flexibility 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, significantly increasing the overall efficiency.

fuel cells

A solid oxide fuel cell is an electrochemical device that converts the chemical energy of a fuel (hydrogen, coal, natural gas, gasoline or diesel) into electrical energy without combustion. The absence of the combustion process in fuel cells eliminates the formation of pollutants including nitrogen oxides, sulfur oxide, hydrocarbons and particulate matters, and significantly improves electrical power generation efficiency.

SOFCs offer the following benefits:

- Efficiency and fuel extension**— Extends the use of fossil fuels, including vast domestic coal reserves, as fuel cells are 40- to 60-percent efficient in small electric systems, 75-percent efficient in larger hybrid systems, and up to 85 percent efficient with co-generation. This nearly doubles the efficiency in many applications.
- Options for energy delivery**— Provides electricity to remote locations where no transmission exists and provides significant efficiency improvement and multi-fuel options for centralized generation.
- Domestic security**—Provides an option to decentralize power generation and permits rapid response to emergent energy needs.





**SOLID STATE ENERGY
CONVERSION ALLIANCE**

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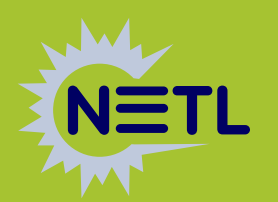
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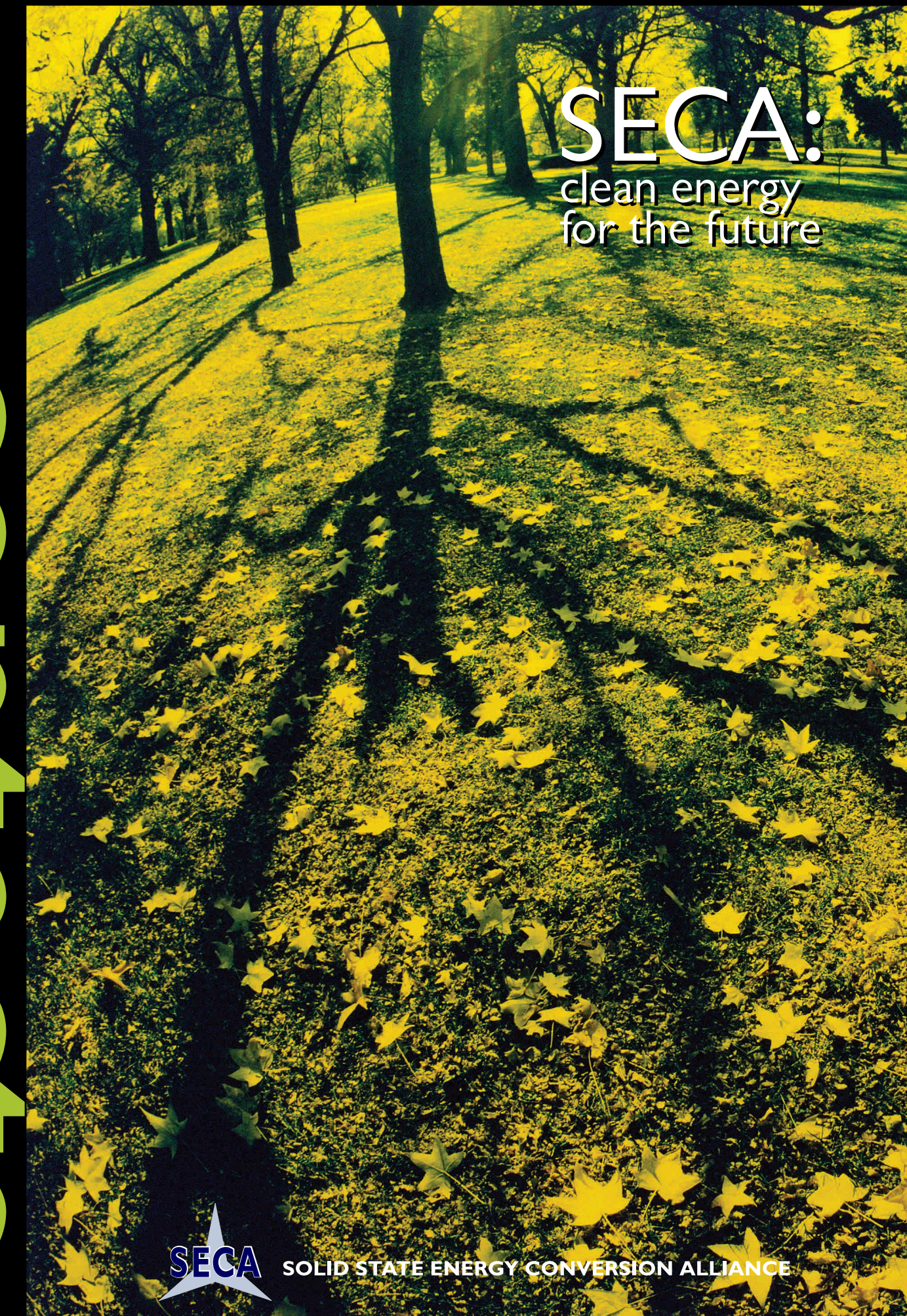
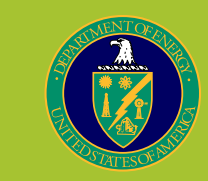
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**Pacific Northwest
National Laboratory**
Operated by Battelle for the
U.S. Department of Energy



SECA:
clean energy
for the future



SOLID STATE ENERGY CONVERSION ALLIANCE

contacts

fuel cells

breakthrough

Solid Oxide Fuel Cells (SOFCs) will be instrumental in providing clean energy for the future. SOFCs are highly efficient and generate electricity from a variety of fuels on demand and on location. They will reduce harmful emissions and will provide clean and efficient power with the fuels of today and the hydrogen of tomorrow.

SECA will provide the advanced technology needed to accelerate the commercialization of low-cost SOFCs over the next decade. To achieve the goal of creating a 3- to 10-kilowatt solid oxide fuel cell that can be mass produced in modular form for \$400 per kilowatt will require technology advances in the design and manufacture of SOFC systems.

