

General announcement of the international

2003 Future Energy Challenge

A student competition sponsored by the

Institute of Electrical and Electronics Engineers (IEEE) – Power Electronics Society, Industry Applications Society, and Power Engineering Society

by the U.S. Department of Energy and the U.S. Department of Defense

and other sponsors – *Revised Announcement, March 2002*

Scope: *An international student competition for innovation, conservation, and effective use of electrical energy.* The competition is open to college and university student teams from recognized engineering programs in any location. Participation is on a proposal basis.

Introduction: In 2001, the U.S. Department of Energy (DOE), in partnership with the National Association of State Energy Officials (NASEO), the Institute of Electrical and Electronics Engineers (IEEE), the Department of Defense (DOD) and other sponsors, organized the first Future Energy Challenge competition. The objective was to build prototype, low-cost inverters to support fuel cell power systems. This competition was originally open to schools in North America with accredited engineering programs. The 2001 Future Energy Challenge focused on the emerging field of distributed electricity generation systems, seeking to dramatically improve the design and reduce the cost of dc-ac inverters and interface systems for use in distributed generation systems. The objectives were to design elegant, manufacturable systems that would reduce the costs of commercial interface systems by at least 50% and, thereby, accelerate the deployment of distributed generation systems in homes and buildings. The 2001 Challenge was a success, and is now the first in a biannual series of energy-based student team design competitions.

To continue and expand the 2001 success, the 2003 Future Energy Challenge has been organized as a worldwide student competition. The theme of the 2003 Future Energy Challenge is "*Energy Challenge in the Home.*" The objective is to introduce engineering design innovations that can demonstrate dramatic reductions in residential electricity consumption from utility sources or that can lead to the best use of electricity in newly connected homes in developing nations. The innovations should be low in cost, and should have broad potential for the future. Student teams will choose their general area of technology contribution from the broad topics described below.

Total prize money of at least \$100,000 will be awarded for work that meets aggressive targets for engineering design innovation. The first requirement is a Letter of Intent, due by April 1, 2002.

Topics and Descriptions:

1. Energy processing to support the use of solid-oxide fuel cells to provide non-utility and ultra-clean residential electricity. The US Department of Energy and Department of Defense have agreed to provide prize money for substantial cost reductions in inverter technology for such sources. The target cost is less than US\$40/kW for a 5 kW inverter interface system (not including an electric grid interface). The hardware prototypes judged as best will be tested in a fuel cell system at the DOE National Energy Technology Laboratory. The school with the most cost-effective design and that can meet or exceed the aggressive cost target, and that provides a fully functional prototype, will be awarded with a large prize.
2. Innovations in motors and motor drive systems that produce deep cuts in losses and costs for home (appliance) use, or that could replace “universal motor” brush machines in residential applications. For example, use three-phase motors and motor drives that operate from single-phase power, reduce appliance in-rush currents associated with motor starting, and enhance motor efficiency across a wide load range are of interest. Target hardware costs are US\$40 for a combination motor and motor controller that can operate from a single-phase residential source, deliver rated shaft load of 3/4 HP (or 500 W) at 1500 RPM, exhibit a useful speed control range of at least 150 RPM to 5000 RPM, and provide power efficiency of at least 70% for loads ranging from 50 W to 500 W at a specified speed. The hardware prototypes judged as best will be tested at a DOE or DOD National Laboratory. The school with the most cost-effective design and that can meet or exceed the aggressive cost target, and that provides a fully functional prototype, will be awarded with a large prize.
3. Efficient, cost-effective electrification for homes in developing nations. This could include low-cost use of local energy, or it could emphasize innovations to allow small amounts of power to make significant impacts on standards of living. One example addresses ways to make use of a power-limited 100 W source. The objective is to improve the quality of life in the most effective manner for a household if just a small power level is available. A specific system target involves the design of small, low-cost, self-contained solar power systems (including any energy storage), capable of delivering an average of 100 W over 24 hours at a cost not to exceed US\$0.10/kWhr when amortized over a required ten-year life. The system should maximize efficiency and provide for prioritized control of three different domestic loads. Entries and prototypes will be judged with the assistance of the Construction Engineering Research Laboratory, U.S. Department of Defense, or through arrangements with government or scientific facilities in other nations.

The U.S. Department of Energy and the IEEE societies will provide at least US\$100,000 in total prizes. Each topic for which a team is able to meet or exceed the targets will be awarded with prizes ranging up to \$50,000.

Deadlines: Schools who are interested in any above topic shall submit a Letter of Intent to Robert Myers by April 8, 2002, indicating your topic area of interest and confirming the school’s intention to form a team. The Letter of Intent should be prepared on official

school letterhead, and should be signed by an official such as a Head of Department or Dean.

The Letter of Intent is a necessary submission for potential participants, but does not obligate your school to submit a proposal. The purpose of the Letter of Intent is to identify potential participating teams and to allow the organizers to plan competition events and activities in the topic areas.

Request for Proposals (RFP) will be sent (electronically) by April 15, 2002 to schools that provide a Letter of Intent. Proposals are due May 31, 2002. Detailed proposal instructions will be available in the RFP. When the proposal is submitted, it will be necessary for school officials to submit a formal Letter of Support. The Letter of Support is needed to confirm that the school will support undergraduate study related to the project, that basic support in the form of facilities and equipment will be available to the team, and that contributions from outside sponsors will be augmented by cash and in-kind matching. There will be limitations on matching requirements to be sure costs are manageable. In addition, statements and plans regarding the prize money use should be included in the proposal. The cash awards are intended by the sponsors to provide incentives to the students. Proposals will be judged by a distinguished panel of experts from the IEEE.

Important deadlines are listed below:

April 8, 2002 - schools submit letter of intent

April 15, 2002 - Request for Proposals (RFP) sent (electronically) to schools that provide a Letter of Intent

May 31, 2002 - proposals due

August 1, 2002 - schools informed of acceptance into competition

February 2003 - Future Energy Challenge Workshop held during National Engineers Week

March 15, 2003 - preliminary reports due

April 15, 2003 - finalists notified

May 27, 2003 - final competition begins, and final reports due

July, 2003 - awards ceremony at 2003 PES general meeting

Contacts:

Robert Myers
IEEE Industry Application Society
IEEE Power Electronics Society
799 North Beverly Glen
Los Angeles, CA 90077 USA
Web site: <http://www.energychallenge.org>

Phone: +1 (310) 446-8280
Fax: +1 (310) 446-8390
E-mail: bob.myers@ieee.org