

Results of the 2005 International Future Energy Challenge

The 2005 Future Energy Challenge (FEC) was held August 15-19 and was a tremendous success. The challenge focused upon two topics near and dear to the hearts of many PELS members: (a) the design of motors and motor drive systems that produce deep cuts in losses and costs for home appliance use, and (b) the design of a flexible utility interactive inverter for small distributed generation.

The design constraint posed for Topic A was to create a combination motor, power electronic driver, and 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 any speed in the specified range for less than \$40US. MPC Products Corporation (MPC) and Illinois Institute of Technology (IIT) hosted the competition. Piyush Desai (MPC), Ali Emadi (Topic A Coordinator - Illinois Institute of Technology), Mehdi Ferdowsi (University of Missouri-Rolla), Nick Nagel (MPC), Shailesh P. Waikar (Black & Decker), and Jia Xiaochuan (Regal-Beloit Corporation) served as judges. The University of Belgrade, the University of Illinois at Urbana-Champaign, and the University of South Carolina demonstrated their motor/drive designs. At the end of the three-day competition, the judging committee presented the following awards:

Topic A – Motor/Drive Design

- First Place (\$10,000) - University of Belgrade, Serbia
- Outstanding Design Innovation (\$6,500) - University of South Carolina, USA
- Outstanding Educational Impact (\$2,000) - University of Illinois at Urbana-Champaign, USA
- Outstanding Presentation (\$2,000) - University of Belgrade, Serbia
- Outstanding Technical Report (\$2,000) - University of Belgrade, Serbia

For Topic B, the design goal was to create an inverter that can operate from a dc input voltage varying from 30 volts to 60 volts to supply up to 1000W of power to a single-phase utility line (efficiency of at least 90%) for under \$200US. The National Renewable Energy Laboratory and the Colorado School of Mines (CSM) hosted the competition. Marcelo Simoes (CSM) served as

the Topic B Coordinator. Nick Josefik (CERL), Paul Nielsen (CERL), Don Collins (NETL), Steve Pekarek (Purdue University), and Matt Zolot (NREL) served as judges. Seven schools from five countries brought their inverters for testing. After three days of testing and presentations, the judging committee presented the following awards:

Topic B – Inverter Design

- 1st Place - Monash University, Australia (\$10,000)
- 2nd Place - Seoul National University of Technology, South Korea (\$8,000)
- 3rd Place - University of Illinois at Chicago, USA (\$5,000)
- Outstanding Presentation - University of Applied Sciences Cologne / RWTH Aachen University, Germany (\$2,000)
- Outstanding Technical Report - University of Applied Sciences Cologne / RWTH Aachen University, Germany (\$2,000)
- Outstanding Educational Impact – Federal University of Mato Grosso do Sul, Brazil (\$1,500)
- Innovative Design - University of Central Florida, USA (\$1,500)
- Innovative Packaging - University of Wisconsin – Madison, USA (\$1,000)
- Outstanding Teamwork - Monash University, Australia, USA (\$1,000)
- Honorable Mention - Bangladesh University of Engineering & Technology, Bangladesh

The organizing committee thanks the management and engineers of MPC and NREL, particularly Nick Nagel, Piyush Desai, Brianna Swenson, Ben Kroposki, and Christopher Pink for their excellent job in preparing the experimental setup and testing the motor drive and inverter systems. The Generous support of MPC, NREL, PELS, IAS, and PES, IIT's Armour College of Engineering, and CSM is also gratefully acknowledged.

Based upon the significant interest of this year's competition another Future Energy Challenge will be issued for 2007. More information on the competitions can be found at <http://www.energychallenge.org/>.

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University of Belgrade receiving the First Place Award (Topic A) from judges.



Inverter competition (Topic B) teams and their hardware at the awards ceremony.