Request for Proposals (RFP)

The IEEE 2011 International Future Energy Challenge (IFEC'11)

A student competition sponsored by the

Institute of Electrical and Electronics Engineers (IEEE) Power Electronics Society (PELS)

Power & Energy Society (PES), and Industrial Electronics Society (IES).

Summary of Competition and Proposal Requirements

General Information

Competition Title: 2011 International Future Energy Challenge (IFEC) Student Competition

Topic Areas: (A) Low Cost Lithium-Ion Battery Charger for Automotive and Renewable Energy Applications and (B) Low Power Induction Motor Drive System Supplied From a Single Photovoltaic Panel For an Emergency Water Treatment Device.

Period of Competition: February 15, 2010 to July 20, 2011

Challenge Award: At least US$10,000 will be awarded for highest score among entries meeting all minimum requirements as confirmed through reports and hardware tests.

Program Awards (actual number depends on availability): Best in specific topic areas (design innovation, educational impact, technical reports, presentations, and others); expected levels are $1,000 to $5,000 each. The final amounts are subject to the recommendations of the judges.

Intellectual Property and Use of Prize Money:
The International Future Energy Challenge does not restrict the use or protection of inventions or other intellectual property produced by participating teams. There are no special licenses or rights required by the sponsors. However, the Final Test Events that begin July 20, 2011 will include public disclosure of each team's technology. Teams interested in securing protection for their inventions should be aware of this date when making arrangements.

The prizes provided to schools are intended to benefit the team members and student team design project activities. There is a Letter of Support (Attachment II) required for submission with the proposal and it should outline the plans of the school in the event that a prize is received.

Outside Support:

Individual schools should solicit project funding from companies, foundations, utilities, manufacturers, government agencies, or other sources. There is no limitation for the sources of project funding.

Eligibility Information:

- **Eligible schools must:** have an accredited or similarly officially recognized engineering program (through the Accreditation Board for Engineering Technology (ABET) or equivalent); be a college or university with engineering curricula leading to a full first degree or higher; have the support of the school's administration; establish a team of student engineers with an identified faculty advisor; demonstrate the necessary faculty and financial support commitments; and demonstrate a strong commitment to undergraduate engineering education through their proposal.

- **University Eligibility Limit:** **Each university is limited to one topic area; each school can support only one team.**

To confirm eligibility, potential participating schools must submit a Letter of Support (Attachment II) together with a Preliminary Team Information Form (Attachment I) when they submit the proposal.

How to Participate: Participation is on a proposal basis. Those schools that are interested must submit a proposal no later than October 31, 2010. Proposals will be judged by a distinguished panel of volunteer experts from the IEEE and from industry. Schools with successful proposals will be notified December 15, 2010. Student teams will then carry out the work and prepare hardware prototypes and reports. Organization reports are due January 11, 2011. The progress reports are due February 08, 2011. Qualification reports are due April 18, 2011. The reports will be judged by a similar expert panel. By May 02, 2011, the panel will select a group of teams as Finalists. These teams will be invited to a competition event that will begin July 20, 2011. A Final Report will be due at the competition event. The team achieving the best overall results that meet all the requirements will receive a Challenge Award of no less than US$10,000 (and more based on sponsorship levels). The best results in individual categories, including design innovation, educational impact, technical reports, presentations, and other categories to be determined, will win special monetary prizes of approximately $1,000 to $5,000 each.

Please be aware that each of the two topic areas of the 2011 International Future Energy Challenge will be judged separately, against a separate specification set. Each team proposal must address a single topic area.

Judging Panels

Experts from IEEE Power Electronics Society (and others to be announced) and representatives from manufacturers, national labs, independent test labs, utilities, and R&D engineers.

Judging

Student team project results will be judged based on cost effectiveness, performance, quality of the prototype and other results, engineering reports, adherence to rules and deadlines, innovation, future promise, and related criteria. Each aspect of judging will be scored according to a point list and test protocol.

Proposals

Proposals will be judged on the quality of plans, the likelihood that a team will be successful in meeting the International Future Energy Challenge objectives, technical and production feasibility and degree of innovation. Other key criteria are evidence of the school's commitment, capability, experience, and resources to implement their design over the one-year span of the competition. Commitment to excellence in undergraduate education is important, and acceptable proposals will involve undergraduate students as the primary team members. Interdisciplinary teams are encouraged. Graduate students are not excluded, but the impact on undergraduate education is a critical judging criterion. **Proposals are limited to 12 double-spaced pages total, including all diagrams, attachments, and appendixes.** Schools that are invited to participate in 2011 International Future Energy Challenge are expected to adhere to the basic plans described in their proposals. Approval of the competition organizers must be sought for significant changes in plans or engineering designs. **Only one proposal will be considered for each school. Electronic copies of the proposals in PDF format are due, to be received by October 31, 2010 at the address provided below.**

A. Proposal Objectives

Respondents should express their ideas and plans relevant to their interested topic area. The project should include the construction and operation of a complete hardware prototype. The proposal must address both technical and organizational issues for each phase of the prototype's development and testing. It must contain a realistic project budget, along with a plan to secure the necessary funding. The educational goals, including any course credit provided for work related to the 2011 International Future Energy Challenge, and how the project relates to other efforts within the school and at the regional or national level should be addressed. A Letter of Support from an official of the school confirming a commitment to participate in the competition, and stating the type(s) and level of support for the team's participation in the competition should be attached, and is not counted toward the 12-page limit. Refer to the attachments at the end of this document for a sample.

B. Administrative Considerations and Limitations

This section describes the limitations placed on the proposal. Compliance is mandatory.

Language Proposals must be written in English.

Length Proposals are limited to 12 single-sided double-spaced pages of text, figures, and appendixes. The page size must be 8.5" x 11" or A4 and the font size must be no smaller than 10 point. Margins should be at least 25 mm. The Preliminary Team Information Form (Attachment I in this RFP), Support Letter (Attachment II in this RFP) from the school, government entities, or private sector organizations will not count in the proposal length.

Authors Proposals are to be prepared by the student team in collaboration with the faculty advisors.

Signatures Proposals must be signed by all authors of the proposal (or the student team leader) and the faculty advisor.

Letter of Support

Proposals must be accompanied by a letter of support from an appropriate Dean, Department Chair, or other authorized school official. The letter must confirm the school's commitment to participate. It must also state the type(s) and value of support from the institution. School support should match the value of cash and in-kind support from the team's principal sponsors. Additional letters of support from other team sponsors are optional. A sample letter is provided as Attachment II.

Preliminary Team Data

Submit one copy of the Preliminary Team Information Form (Attachment I) with the proposal, then an updated copy with the progress reports to the address below. This form does not count in the 12-page limit.

Due Date

All proposals must be received at the address below by close of business on October 31, 2010 for full consideration.

Proposal Submission

The electronic copy of the proposal in PDF format must be sent to the following topic coordinators via email (with a copy to the IFEC'11 chairman). The electronic copy of the proposal can also be delivered on other type of memory device currently in use.

Competition Administrator:
Prof. João Onofre Pereira Pinto
Chairman, 2011 IFEC
Federal University of Mato Grosso do Sul
Department of Electrical Engineering
Campo Grande, MS CP:2521, Brazil
Tel: +55 67 3345-7543
Fax: +55 (67) 3345 7543
E-mail: jpinto@nin.ufms.br.

Information

The volunteer Organizing Committee for the 2009 International Future Energy Challenge maintains a web site at http://www.energychallenge.org/. The site will include the most recent schedule and rule updates, frequency-asked questions, details about judging and scoring, and other team information. It should be checked regularly. The committee chair is Prof. João Onofre Pereira Pinto.

Coordinator for Topic (A) Low Cost Lithium-Ion Battery Charger for Automotive and Renewable Energy Applications:

Prof. Chunting (Chris) Mi
University of Michigan-Dearborn
Department of Electrical and Computer Engineering
DTE Power Electronics Laboratory
Dearborn, MI 48128, USA
Phone: +1- 313 583-6434
Fax: +1- 313 583-6336
E-mail: chrismi@umich.edu

Coordinator for Topic (B) Low power induction motor drive system supplied from a single photovoltaic panel for an emergency water treatment device:

Prof. Maurício Beltrão de Rossiter Corrêa
Federal University of Campina Grande
Department of Electrical Engineering
Rua Aprígio Veloso, 882 - Bodocongó
Campina Grande, PB 76019, Brazil
Tel: +55 83 2101-1715
Fax: +55 83 3310-1418
E-mail: mbrcorrea@dee.ufcg.edu.br

Non-technical or administrative questions should be directed to Luiz Henrique Silva Colado Barreto, secretary of the IFEC'11:

Prof. Luiz Henrique Silva Colado Barreto
Administrative Secretary of IFEC'11
Federal university of Ceará
Department of Electrical Engineering
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E-mail: lbarreto@dee.ufc.br

Time Schedule

Calendar Events

April 02,201	Request for proposals (RFP) posted.
October 31, 2010	Proposals due.
December 15, 2010	Schools informed of acceptance into the competition.
January 11, 2011	Organization summary reports due (Organization reports are limited to 5 pages double-spaced, single-column pages total, including team organization, school support along with basic diagrams, attachments, and appendixes).
February 08, 2011	Progress reports due (Progress reports are limited to 10 double-spaced, single-column pages total, including with basic diagrams, preliminary experimental results, attachments, and appendixes).
March 5, 2011	Workshop at APEC 2011.
April 18, 2011	Qualification reports due (Qualification reports must include preliminary experimental results. It is limited to 25 single-column pages total, including all diagrams, attachments, and appendixes).
May 02, 2011	Finalists notified (Selection is based upon likelihood of deliverable hardware, quality of design, and likelihood of success in meeting all the challenge objectives).
July 20, 2011	Final reports and working units due (Final reports are limited to 50 single-column pages total, including all diagrams, attachments, and appendixes).

July 20-22, 2011	Final competition.

2011 International Future Energy Challenge

Organizing Committee

Chair: Dr. João Pinto – Federal University of Mato Grosso do Sul

Secretary: Prof. Luiz Henrique Silva Colado Barreto – Federal University of Ceará

Topic A Coordinator: Prof. Chunting (Chris) Mi – University of Michigan-Dearborn

Topic B Coordinator: Prof. Maurício Beltrão de Rossiter Corrêa - Federal University of Campina Grande

Future Planning:

Webmaster: Prof Luiz Henrique Silva Colado Barreto.

European Liaison:

Asia Liaison:

Australia Liaison:

South America Liaison:

IEEE Inter-Society Associate: Donna Florek – IEEE

Steering Committee

Abdellatif Miraoui –- abdellatif.miraoui@utbm.fr

Babak Fahimi - University of Dallas - bob_fahimi@yahoo.com

Donna Florek –- d.florek@ieee.org,

F.Dong F. Tan –- dong.tan@ngc.com

Helen Li –- hli@caps.fsu.edu

Ira J. Pitel - ipitel@magna-power.com

Jason Lai – VirginiaTech - laijs@vt.edu

Marcelo Godoy Simões – Colorado School of Mines - mgodoysimoes@gmail.com

Competition Description

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. Final events were conducted at the National Energy Technology Laboratory (NETL) in Morgantown, WV, USA. Speakers from IEEE, DOE, and DOD introduced the competition and interacted with students during the event week. Hardware was tested with an experimental fuel cell at the NETL site. 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 International Future Energy Challenge (IFEC) was organized as a worldwide student competition. The 2003 IFEC had two topics, a revised topic on fuel cell power conditioning, and a topic for high-efficiency motor drive systems suitable for home appliances. Major sponsors included three IEEE societies, DOE, and DOD. Fuel cell inverter events were again held at NETL. Motor system events were held at Advanced Energy in Raleigh, NC, USA.

The 2005 IFEC had two topics. The inverter topic was revised to incorporate photovoltaic sources and grid interaction, while the motor topic was revised only slightly. Major sponsors included three IEEE societies and DOD, with more modest sponsorship from DOE. Inverter events were held at the National Renewable Energy Laboratory (NREL) in Golden, CO, USA. Motor events were held at MPC Products in Skokie, IL, USA.

The 2007 IFEC had two topics. An integrated starter/alternator and a Universal battery charger system were chosen as the two topics. Major sponsors included IEEE Power Electronics society, and Power Supply Manufacturer Association (PSMA). The final competitions were held at MPC Products in Skokie, IL and Texas Instrument in Richardson, TX.

The 2009 IFEC, similar to the previous editions, had two topics. The Integrated Starter/Alternator-Motor Drive for Automotive Applications topic was repeated, a new topic, the Power Wind Turbine Energy Maximizer was included. Major sponsors included IEEE Power Electronics society, Industrial Electronics Society, MPC Products, Monash University, IEEE Power Electronics Society, IEEE Industrial Electronics Society, and Power Sources Manufacturers Association (PSMA). The final competitions were held at Illinois Institute of Technology in Chicago, IL, USA, and in Monash University, VIC, Australia.

2011 Topics and Descriptions: The 20011 competition addresses two broad topic areas:

TOPIC A: Low Cost Lithium-Ion Battery Charger for Automotive and Renewable Energy Applications.

TOPIC B: Low power induction motor drive system supplied from a single photovoltaic panel for an emergency water treatment device.

Detailed specifications, system requirements, and test procedures for each of the two topics will be announced through the IFEC Web page.

Topic A

Low Cost Lithium-Ion Battery Charger for Automotive and Renewable Energy Applications.

Objective:

- Encourage the development of the low cost lithium ion battery charger systems for vehicle and other lower power applications.
- Encourage the use of green vehicle (EV, HEV, and PHEV) systems.
- To effectively integrate the theoretical and practical aspects of battery and corresponding electronics education with innovative experiments and design projects.
- To promote practicality and affordability into the low cost design target improving the system performance.
- To foster practical learning and hands on experience with the problem solving skills through the team based development.

Goal

Develop a unidirectional 3kW (maximum capacity) lithium-ion battery charger for electric vehicles and other energy conversion systems.

- Achieve maximum energy transfer.
- Optimize the state of charge without overcharging and over *di/dt* which can damage batteries.
- Be a leading edge solution in the areas of performance, reliability, and safety.
- Design to minimize power density and component cost and count (consider packaging) while satisfying performance requirement.
- Run the system safely under various operating conditions employing protections for over current/temperature, over charging, and power failure.

Background

Lithium-ion batteries were introduced in the early 1990’s and since then they have been popularly used in very high volumes in low power applications such as mobile phones, laptops, cameras. Recently, it becomes attractive for higher power applications such as hybrid electric and pure electric vehicles. For higher power/energy applications, the control and charging/discharging management of the battery system are significantly important. The main objective of this topic is to develop a low cost lithium ion battery charger for electric vehicles or other renewable energy conversion applications while satisfying minimum requirements. Since a typical lithium-ion battery charger utilizes constant current constant voltage controlled strategy, it can be damaged in the case of high level battery voltage which can exceed the safety limit if not regulated properly. Thus, to prevent the battery overcharging, switching strategy before the cell voltage reaches its upper limit must be properly developed not to damage the battery.

During the charging the temperature of battery must be regulated within safety limits. To avoid over heating and over charging/discharging, a special circuitry/controller must be designed. Commercial lithium-ion packs contain a protection circuits that limit the charge voltage a little higher than the voltage threshold of the charger. Most of lithium-ion cells are charged to 3.65 to 4.20 volts (depending on chemistry) with a tolerance of +/- 0.05V/cell. Temperature sensing disconnects the charge if the cell temperature approaches around 60°C, and a mechanical pressure switch on many cells permanently interrupt the current path if a safe pressure threshold is exceeded.

For the battery, deep over charging/discharging must be prevented. In the case the battery is discharged below 2.50V/cell, the safety circuit may cut off the current path and make the battery unserviceable. Commercially, when the cell reaches 2.7 to 3.0V/cell, the protection circuit of the battery is already in active.

In this topic, any advanced charging methods, such as faster charging and new cell equalizing technique are encouraged as long as the system is operating safely with high reliability.

General requirement

All teams are encouraged to develop cost effective, novel solutions with proper protection circuits. The lithium-ion battery charger should be designed to have higher performance, lower weight, faster charging with longer battery effective usage times, and consistent reliability.
The general lithium-ion battery charger requirements are as follows:

1. The battery charging system needs to be designed using a microprocessor based on a digital control system which has capability to minimize the size of control board.

2. The system must have circuit protection capable of handling over current, over charge/discharge, over temperature and power failure. The lithium-ion battery charger needs to monitor temperature for safety.

3. A method called "Constant Current Constant Voltage" (CCCV) is often used for charging of lithium-ion batteries to avoid over charging. For the Challenge, advanced fast charging and cell balancing method will receive bonus points.

4. Comply with all relevant IEC and IEEE standards.

5. Design to suit minimum cost for high volume manufactures.
Design concepts are expected to be validated with working prototypes. Bonus points will be set up for improvements beyond the general requirements.

Minimum Converter Specification

- Input: 110V and 220V dual input capability
- Output voltage: nominal 365V, range 0 to 500V
- Output power: >3kW at nominal voltage
- Power factor: >0.98 (a power factor correction stage should be included in the design)
- Efficiency: >0.96 at nominal output
- Communication: CAN protocol preferred

– User interface: the charger shall include a user interface keyboard

Minimum Battery Spec

– Nominal voltage 332V
– Cut off voltage: 250V
– Maximum charge voltage: 370V
– Absolute maximum voltage: 410V
– Capacity: 30Ah
– Nominal Energy: 11kWh
– Maximum discharge rate: 4C
– Maximum charge rate: 4C
– Continuous charge rate: C/2
– Trickle charge: C/5
– Operating temperature: -10 to 60C

Final Testing

Final testing of the wining designs will be conducted XXX, 2011 at the DTE Power Electronics Laboratory, Electrical and Computer Engineering Dept., University of Michigan-Dearborn.

The designed battery chargers will be assessed for their ability to operate reliably under a variety of load conditions measuring efficiency, charging/discharging characteristics, and temperatures.

Before the testing, the system weight and size will be measured and the system cost will be analyzed based on the team's report. The system cost table must be prepared by each team in detail.

Funding Sources.

IEEE and other sponsors provide the Challenge Award as well as the Program Awards.

Individual schools should solicit project funding from local, national, or international sources. There is no limitation for the sources of project funding.

Topic B

Low power induction motor drive system supplied from a single photovoltaic panel for an emergency water treatment device.

Objectives

- Encourage development of equipment based of power electronics principia for water treatment powered from renewable energy source;
- Provide an alternative way to people have treated water, improve life quality, or save lives;
- Give opportunity to students work on a multiple subject challenge that involves energy processing and efficiency;
- Achieve hardware solution that includes practicality, manufacturability, and affordability;
- Develop a project with acceptable levels of performance, reliability, and safety.

Goals

Develop an autonomous and fractional power (0,2hp) induction motor drive system. It will be supplied from a single photovoltaic panel, and will be responsible to drive a nanofiltration system without using any electrical energy storage device. Some characteristics need to be achieved.

- Maximum efficiency along the whole energy processing, which include panel, converter and motor;
- Autonomous control for start up and shut down;
- Minimum need of human interference (a single on/off switch).

Background

Use of high performance induction motor drives provides a great energy saving in all applications when speed variation is involved. In spite of efforts from researches teams around the world to improve such systems, there still room for improvements. Certainly, this is the main reason that let us to find out new papers in this subject.

Water treatment powered from photovoltaic panels is not a novelty. Nevertheless, these systems are designed on a conventional basis. On another words, despite using photovoltaic generators, motor control is still based on availability of a stiff dc voltage. This is possible due to use of batteries that ensure energy even when sunlight is unavailable. Design of a photovoltaic powered motor drive system that does not use batteries requires creative solutions to face the challenge to operate under power restrictions. For this system it is worth noting that water storage replaces energy storage.

Use of power electronics and control knowledge to develop the proposed system is very creative way to call attention to problems like: 900 million of people without safe drinking water; 2.5 billion of people lack adequate sanitation; diarrhea kills 1.8 million of people.

General Requirements

Develop an autonomous and fractional horse power (0,2hp) induction motor drive system for water treatment is an amazing challenge. Nevertheless it must fulfill some specifications and functionalities as described below:

- High efficiency power processing to ensure effective input voltage (panel voltage) step up along the whole operational range;
- Motor start up and shut down must be a function of: sun light, on/off button and water storage tank level (NO/NC contact);
- Effective induction motor control to ensure that maximum available power is transferred from panel to a mechanical pump;
- Safety conditions to allow panel cleaning procedure;
- Comparison with solutions based on another technologies (brushluess, dc motor, pm motor, ….) must be part of the design procedure.

Minimum Specifications

Input power: 130Wp photovoltaic panel

Maximum rated output voltage: tree-phase 220V; 60Hz

Efficiency: >0.9 at nominal maximum output voltage

User interface: ON/OFF button

Safety isolation to allow photovoltaic panel cleaning procedure

Equipment embedded in an isolated box

Final Testing

The final test will be done in a real water treatment system where motor and panel will be available. In case of running out of sun light test will be conducted by using a programmable power source with power profiles of a panel running under MPP conditions.

Funding Sources

IEEE and other sponsors provide the Challenge Award as well as the Program Awards.

Individual schools should solicit project funding from local, national, or international sources. There is no limitation for the sources of project funding.

ATTACHMENT I

2011 INTERNATIONAL FUTURE ENERGY CHALLENGE
PRELIMINARY TEAM INFORMATION FORM
TOPIC (X)
Submit with Proposal

NAME OF UNIVERSITY:

CORRESPONDING ADDRESS (PLEASE INCLUDE NAME):

TELPHONE:
FAX:
EMAIL:

FACULTY ADVISOR(S):

Name	Department	E-Mail
______________________	______________________	____________________
______________________	______________________	____________________

PRELIMINARY TEAM MEMBERS:

Name	Major Field of Study	Degree and Expected Graduation Date
____________________	________________________________	_______________
____________________	________________________________	_______________
____________________	________________________________	_______________
____________________	________________________________	_______________
____________________	________________________________	_______________
____________________	________________________________	_______________
____________________	________________________________	_______________

ATTACHMENT II

LETTER OF SUPPORT

Submit with Proposal

[The letter below is a typical sample and should not simply be copied. Please send a letter with similar content on your university letterhead.]

For Topic (A) Low Cost Lithium-Ion Battery Charger for Automotive and Renewable Energy Applications:

To: Prof. Chunting (Chris) Mi
University of Michigan-Dearborn
Department of Electrical and Computer Engineering
DTE Power Electronics Laboratory
Dearborn, MI 48128, USA
Phone: +1- 313 583-6434
Fax: +1- 313 583-6336
E-mail: chrismi@umich.edu

For Topic (B) Low power induction motor drive system supplied from a single photovoltaic panel for an emergency water treatment device:

To: Prof. Maurício Beltrão de Rossiter Corrêa
Federal University of Campina Grande
Department of Electrical Engineering
Rua Aprígio Veloso, 882 - Bodocongó
Campina Grande, PB 76019, Brazil
Tel: +55 83 2101-1715
Fax: +55 83 3310-1418
E-mail: mbrcorrea@dee.ufcg.edu.br

Dear International Future Energy Challenge Coordinator,

Our university has organized a student team to participate in the 2011 International Future Energy Challenge. Our proposal for the topic ***(X)*** is enclosed. A Preliminary Team Participation Form is attached, listing our contact person, the faculty advisor(s), and some of the students who plan to be involved. The team will keep an eye on the Energy Challenge web site for detailed rules and other information. We understand that we will be notified whether we have been accepted to participate by December 15, 2010. If we are accepted, we agree to have our student team perform the design tasks and prepare the reports and hardware prototypes required for the competition. Our school is prepared to support the team with the following resources:

- A final year project course, ***XXX***, has been authorized to provide engineering students across several disciplines with the opportunity to include this project in their curricula. Laboratory space has been arranged for this course.
- A faculty advisor, Prof. ***XXX***, has been identified, and has been formally assigned to teach the project course and to advise the student team as a portion of his/her regular duties.
- A graduate student assistant has been identified to help manage the student team and to supervise direct laboratory activity. This student is supported with a Teaching Assistantship, which represents a funding commitment of our university of approximately ***$X.***
- The student team will be provided with an appropriate level of technician and machine shop support to assist them with package preparation and assembly. This assistance represents a funding commitment of approximately ***$X***, and we consider this as a matching commitment for any in-kind support received from external sponsors.
- In addition, we will provide limited funds to help secure special parts and equipment, with a total commitment of up to ***$X.***
- The student team will be encouraged to secure outside sponsorship. Our university strongly supports all these efforts, and will match any outside cash support 1:1 up to an additional total of ***$X***.

In the event that our school receives prizes from the competition, we are committed to using approximately X% of this money for scholarships for the student team members. The remainder of the funds will be added to our Team Design Program fund, which supports this and similar projects through sponsorship matching, travel funds for participation in competition events, and other direct costs of large team design projects. In the event that our team creates new inventions in the topic area, our university also provides the possibility of assisting with organization of a start-up company.

We understand the importance of student team projects in the engineering curriculum and look forward to our participation in the 2011 International Future Energy Challenge.

Sincerely,

(Head of Department, Dean of Engineering or similar school official)