

Capstone Proposal

Modular, Expandable, “Plug and Play” Solar Arrays

Objective

With the world demanding ever larger amounts of electric power, and the sociopolitical problems created by the planet’s dwindling fossil fuel supplies, the development and implementation of renewable power sources is at a premium.

The student design team will design, and demonstrate key components of, a modular solar array. We hope to convince the University Regents and the University Architect to incorporate large arrays into the University Master Plan. To this end we have discussed this proposal with Mr. Rickenbacker, NMSU architect. *Mr. Rickenbaker indicates that the State of New Mexico may require state building master plans to address the use of renewable energy.*

This system will include:

1. A photovoltaic panel (s) and related hardware
2. Electronic DC-AC interface
3. Control System
4. Distribution System

The final product will be a ‘plug and play’ system that can be installed on NMSU buildings. The deliverable is a prototype. It is the intent of the proposed capstone to pursue an economically viable system, to include economic feasibility studies.

It is emphasized that the student team may use ‘off the shelf’ components when available and appropriate. The technical design issues and challenges involved include but are not limited to ‘plug and chug electronic design’. Central questions to be answered as part of the design effort include: Is there an optimal size for the plug and play module?; How should the module be designed and packaged so as to meet aesthetic requirements? How do we design for maintainability and safety? Do commercial products meet the requirements defined by the team or do new designs need to be evolved?

Budget

Assuming, for the moment, that the module will be 500 W, and target of \$6/W a budget of \$ 3,000 is assumed. (Dr. Ranade has guaranteed this level of funding)

Registration

Fall 2006/Spring 2007

Scope of Work:

Specific tasks are as follows:

1. Develop Requirements and Schedule (Milestones)
2. Develop System Design and Budget
3. Fabricate or Procure System Components
4. Conduct Economic Studies on Cost/Benefits of Renewable Energy Systems
5. Demonstrate Key System Components (Prototype Module)

EE Content

Power
Power Electronics
Controls(Analog)
Controls(Digital)
Controls(Hybrid)

Interdisciplinary Content

1. Electric Construction/Codes
2. Application Software
3. **Structures**
4. Power Systems
5. Renewable energy and Electric Energy Storage
6. Economics
7. Public Policy

Schedule/Milestones:

Specific milestones will be developed by the Team but will include, as a minimum, the following items:

Biweekly

Progress Report via email; include documentation of completed subtasks where appropriate

Late September- Early October

Project Proposal and Preliminary Design

Before Thanksgiving break

Interim Draft Report, CDR

End of Fall semester

Final Interim report and presentation to SNL, Prototype Demonstration, Final Design Review

March 2007

Final Design, Prototype Demonstration, Final Design Review

May 2007

Final Design, Prototype Demonstration, Final Design Review

Evaluators:

Howard Smolleck, Joydeep Mitra NMSU

Stan Atcitty, John Boyes SNL

Mr. Rickenbaker(Tentative)