

IOWA STATE UNIVERSITY

Department of Electrical and Computer Engineering

Senior Design Project Proposal Form

Client/Company/Organization: US DOE/National Renewable Energy LaboratorySubmitter (name): James McCalleyEmail: jdm@iastate.eduProject Contact: James McCalleyEmail: jdm@iastate.edu

Project Title:

Hydropower Vision

Project Abstract (include ALL project goal(s), design constraints, and technical approaches and tools):

The U.S. Department of Energy (DOE) Wind and Water Power Technologies Office is looking toward the future of the hydropower community in developing a long-range national Hydropower Vision in close coordination with industry, agencies, and stakeholders. This landmark vision will establish the analytical basis for responsible growth in domestic hydropower over the next half century as a key part of the national renewable energy mix. Included in this effort will be:

- A close examination of the current state of the hydropower industry
- An analytically-supported target for hydropower growth within a specific timeframe
- A discussion of the costs and benefits to the nation arising from additional hydropower
- A roadmap that clearly captures the activities and steps necessary to maximize the probability of achieving the Vision.

In this senior design project, students will provide input to the activities of one of the DOE task forces supporting the Hydropower Vision effort. The specific task force is called the Grid Integration and Transmission Impacts task force. To this end, students will do the following:

1. identify a region of the US likely to see the largest expansion in hydroelectric power;
2. obtain or develop a power flow (or production cost) model of the existing power system in that region;
3. identify likely non-hydro generation expansion for the region;
4. modify the model of the existing power system to represent the hydro and non-hydro generation expansion in the region;
5. design a transmission expansion to accommodate the hydro and non-hydro generation expansion in the region.

Dr. McCalley is a member of the DOE Hydrovision Grid Integration and Transmission Impacts task force. This task force has just started its work and will be meeting monthly from now until May 2015 when their work is to be completed. All task force meetings are by conference call or by internet. Senior design team student members will be able to participate in these meetings during the time their two-semester senior design project efforts (which is synchronized with the task force time line very well).

Expected Deliverables (include expected schedule, cannot be open-ended, must list at least one deliverable):

1. hydro-generation expansion for the chosen region;
2. a power flow (or production cost) model of the existing power system in that region;
3. non-hydro generation expansion for the region;
4. a modified model of the existing power system which represent the hydro and non-hydro generation expansion in the region;
5. a design of a transmission expansion to accommodate the hydro and non-hydro generation expansion in the region.

Specialized Resources Provided by Client (be as specific as you can):

Anticipated Cost: 0Financial Resources Provided by Client (if any): \$0

NOTE: General Resources Provided by ISU/ECpE: MSDNAA software, and access to resources in ECpE teaching and research labs, e.g., electronics, embedded systems, etc.

Enter # Students Preferred/Required:

- Electrical Engineering
- Computer Engineering
- Software Engineering
- Other (specify):

Special Skills Required of Students (be specific):

At least some of the students should have taken or are taking EE 456.

Anticipated Client Interaction (estimate):

- 1 meeting per week
 - phone, internet, live
- 1 meeting per month
 - phone, internet, live
- 2 or more meetings per month
 - phone, internet, live
- 1 meeting per semester
 - phone, internet, live

Meeting ABET Criteria

Please rate the following statements as they relate to your proposed project:

0 – Not at all

1 – A Little

2 – Somewhat

3 – A Lot

4 – Completely

On this project, students will need to apply knowledge of mathematics, science, and engineering 0 1 2 3 4

This project gives students an opportunity to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability 0 1 2 3 4

This project involves students from a variety of programs, i.e., SE, EE, and CprE 0 1 2 3 4

This project requires students to identify, formulate, and solve engineering problems 0 1 2 3 4

This project gives students an opportunity to use the techniques, skills, and modern engineering tools necessary for engineering practice 0 1 2 3 4

Project Approval – for use by ECpE Senior Design Committee

Approved Not Approved

Faculty Advisor Assigned: _____

Project Number Assigned: _____