Introduction

As part of its charter to support research to create options for energy transformations that have low greenhouse gas emissions, the Global Climate and Energy Project (GCEP) requests preproposals for research in the area of grid network communication and control. It is anticipated that a single proposal may be funded with a cumulative total of up to $3,000,000. Since we intend to fund just a single proposal, we anticipate submissions to be multidisciplinary collaborations involving several investigators.

Transforming the power system in a carbon-constrained world would benefit from integrating more carbon-free energy carriers from renewable resources and reducing greenhouse gas emissions from fossil fuels. In most countries, energy from low-carbon renewable resources is a small percentage of the total electricity generated. However, changes in policy, legislation and technological innovations support greater contributions. These changes pose challenges for the current operating parameters for of our power system—and necessitate a different operating paradigm for grid networks to accommodate the variable and deeply distributed characteristics of renewable electricity generation. The overall generation mix would range in load response times and capacities, posing complex issues for power quality, asset management, network control and reliability. A scenario where renewable resources comprise 50% of the power generation mix raises many questions regarding grid network, communication, and control. These questions provide opportunities for fundamental research, stretching beyond the ideas today and offering options for successful implementation.

GCEP is seeking preproposals from academic institutions for research on grid network communication and control under a scenario where at least 50% of the electricity generated is from variable and widely distributed renewable resources. To be successful, a preproposal must summarize a research concept that has ALL the following attributes:

1. an excellent scientific basis rooted in the fundamentals;
2. enables a step-out or game-changing improvement to network analysis, communication, and control in the context of ongoing research; and
3. involves an approach that may have significant risk but could result in a large impact in a 10 to 50 year timeframe; and
4. the tools enabled by the research are demonstrable and on a pathway to meet or exceed the criteria described within this request.

This request for preproposals outlines the procedures to be followed for submission of a three-page preproposal whitepaper and summarizes the subsequent process of proposal invitation, submission and review.

Criteria for a Successful Preproposal

A successful preproposal will outline a program of multidisciplinary research which advances the information science and develops a set of models and/or tools that analyze and manage the communication, control and operation of a multi-scale power system under a scenario with least 50% renewable penetration. The research should provide a pathway for viable network design, communication architecture, optimized control and operating scenarios. Technologies such as sensors, active control devices, and independent agents may be incorporated, but the research should also identify the extent of deployment and performance needs.

Successful preproposals will provide a set of models and/or tools that must maintain system reliability and power quality for a system with 50% renewable penetration that is variable and deeply distributed and should address some of the following issues:

- Identifying the capacity and types of storage needed to match electricity demand and supply in an optimal way—and the extent to which grid-integrated storage could contribute to reliability, power quality and cost effectiveness;
- Providing the intelligence and information at high granularity and small scale to maintain reliable and high quality power supply;
- Addressing the opportunities and challenges posed by large-scale integration of plug-in vehicles into the grid; and
- Demonstrating optimal network communication and control.

Successful preproposals must outline concepts and research on a clear and potential pathway to meeting all of the above criteria. In addition, the research outlined must be scientifically excellent, highly distinct from other research in the field, and of a sufficiently fundamental nature that the research is unlikely to be performed by private industry. **Preproposals outlining research that could be considered incremental with respect to the previous work of the proposer or other research groups will not be successful.** This request is an opportunity to explore creative but credible ideas. GCEP welcomes research agendas that contain a high element of risk such that funding through other sources is difficult. Since GCEP funds research that may have a significant impact on greenhouse gas emissions in the 10 to 50 year timeframe, research that is more long term than is often undertaken in this field is acceptable. Joint research among multiple academic institutions and research disciplines is encouraged.

This request is intended only for academic institutions whose primary role is educating students and granting advanced academic degrees. Preproposals received from commercial organizations will not be considered.
Preproposal Format, Review, and Proposal Invitation

GCEP is requesting a three-page pre-proposal whitepaper summarizing a research concept in the area of grid network, communication and control. The white papers will be internally evaluated, and the most promising pre-proposals will be selected for submission as full length proposals.

Format
The submitted white paper should be a maximum of three (3) pages. Given such limited space, it is expected that the bulk of the preproposal will focus on the core science and technology ideas. However, each of the following sections is required:
- Description of the proposed research;
- Fundamental science that will be advanced as part of the proposed research program;
- How the proposed work is “step-out” and game-changing in the context of current scientific and technological state-of-the-art;
- Potential for application at a significant scale; and
- Pathway towards substantially reducing global greenhouse gas emissions over the long-term if the research is successful.

In addition to the three-page preproposal, a short (no longer than one page) summary of the relevant expertise and/or facilities of the research team is optional.

Review
The review of three-page white papers will be performed internally by GCEP staff according to the criteria outlined above. All reviewers will be asked to treat proposal information and materials as confidential. If unusual issues of confidentiality, sensitivity, or intellectual property exist surrounding a proposal, the faculty submitting the proposal is asked to bring these to the attention of GCEP staff before proposal submission.

Proposal Invitation
If the preproposal appears to include concepts that fulfill the attributes required for GCEP funding, we will invite the proposal teams to submit a 20-page full-length proposal. Invitations for full-length proposals will be made on or around June 27, 2008 with a submission deadline on or before August 31, 2008. Full details about the criteria for a successful full-length proposal and proposal format, review, and project awards will be given with the invitations. However, a brief summary of this process is provided below.

Summary of Invited Proposal Format, Review, and Project Awards

Invited, full-length proposals will be up to 20 pages in length. Budgets will be constructed for projects extending for not more than 36 months. Budget requests will be expected to reflect the level of effort proposed. Subcontracts from Stanford to other institutions for any intellectually significant portion of your proposed project are permitted under the GCEP agreement. Normal contracts for standard research services which are not intellectually significant are also allowable. The submitted proposals will go through a three-tier review process including 1) independent experts in the project area; 2) independent and Sponsor experts who have a broad knowledge of the greenhouse gas impact of energy technologies; and 3) GCEP staff who will evaluate the reports provided in the previous stages of review to develop a set of funding recommendations. The final funding recommendations require approval by the GCEP Sponsor
Management Committee. We plan to announce award decisions by December 31, 2008 and have research begin on or after March 1, 2009.

**Terms and Intellectual Property Provision Highlights**

The Office of Sponsored Programs at academic institutions other than Stanford University should review the GCEP subcontract template, available on the GCEP web site at [http://gcep.stanford.edu/pdfs/subcontract_agreement.pdf](http://gcep.stanford.edu/pdfs/subcontract_agreement.pdf). This document is the basis for the terms of subcontract agreements with institutions external to Stanford University. Noteworthy intellectual property terms include: (1) subcontractor institutions will hold formal title to all technology developed on their campus solely by their employees or students, (2) Stanford, Subcontractor and each Sponsor will have a perpetual, nonexclusive, worldwide, irrevocable, royalty-free license to technology developed under the award, (3) this license is available only to Stanford, Subcontractor and their controlled entities and to Sponsors and their affiliates for five years after issuance of a patent or copyright, (4) after this five-year period, Subcontractor and each Sponsor may grant licenses to unaffiliated third parties. The GCEP agreement, which contains the general terms of the Project as well as intellectual property provisions specific to research performed by Stanford University faculty, is available on the GCEP web site at [http://gcep.stanford.edu/pdfs/gcep_agreement.pdf](http://gcep.stanford.edu/pdfs/gcep_agreement.pdf).

**Preproposal Submission Procedure and Deadline**

GCEP is accepting only three-page preproposals summarizing a research concept at this time. Please submit an electronic copy of the three-page preproposal along with an optional one page institution description as a single document in PDF format by the submission deadline to Lee Wood [leewood@stanford.edu](mailto:leewood@stanford.edu). Alternatively preproposals may be uploaded onto the GCEP website at [http://gcep.stanford.edu/research/preproposal.html](http://gcep.stanford.edu/research/preproposal.html). Preproposals are due by June 2, 2008.

**Contacts**

Questions about any aspect of this RFPP are welcome. For technical or programmatic issues, please contact:
Prof. Sally Benson, Executive Director: smbenson@stanford.edu
Dr. Richard Sassoon, Managing Director: rsassoon@stanford.edu
Ms. Emilie Hung, Assessment Analyst: emilieh1@stanford.edu

For all other issues associated with the submission procedure, budgets, and collaborations with external institutions, please contact:
Mr. Lee Wood, Administrative Manager: leewood@stanford.edu