

**Proposed Amendment between California Energy Commission
and
The Regents of the University of California on behalf of the
California Institute for Energy and Environment**

Title: UC/CIEE research to improve transmission of renewable energy.
Amount: \$0.00
Term: 3 months
Contact: Jamie Patterson
Committee Meeting: 7/28/2011

Recommendation

Approve this amendment with The Regents of the University of California on behalf of the California Institute for Energy and Environment to provide a no cost time extension to allow CIEE to complete three of their seven projects. This extension will add 3 months to the existing contract creating a 46 month contract that will end on February 29, 2012. Staff recommends placing this item on the discussion agenda of the Commission Business Meeting.

Issue

Three more months is needed to write, revise, edit, and publish the final reports for three of CIEE's seven projects. These are the last remaining tasks to be completed for these projects which include:

Analysis of Seismic Performance of Transformer Bushings

Transformer bushings that are intended to perform adequately during and after seismic activities under IEEE Standard 693 are failing to do so. It is necessary that IEEE Standard 639 be revised to ensure that transformer bushings are built to survive an earthquake.

Adaptive Relaying Technology Development & Measurements

Due to inadequate designs, protection systems operating in unanticipated fashions and errors in setting and calibration, protection systems in electrical power systems are failing. These protection systems must be updated to secure electrical power systems and reduce the frequency and scale of cascading blackouts.

Developing Tools for Online Analysis and Visualization of Operational Impacts of Wind and Solar Generation

Intermittent electrical power output, such as solar and wind, can change rapidly and is not under operational control. This can create significant challenges for grid operators to minimize costs while maintaining reliability of the power supply. In order for the use of intermittent power to become more prevalent, a system that integrates intermittent power effectively with the current power system must be developed.

Completion of these three projects by CIEE will fulfill the original contract which detailed the following issues:

Extensive improvements are needed to California's electric transmission infrastructure to get the electricity generated by new renewable power facilities to consumers.

California must take immediate action to develop and maintain a cost effective, reliable transmission system capable of responding to important policy challenges, including global climate change. California must also ensure that projects meeting traditional reliability and congestion management objectives are developed in a timely manner. Actions already underway at the state and federal levels to address planning, permitting, financing, and integration barriers to renewable generation interconnection need to be assessed to ensure that state objectives are met. California must address important transmission project and transmission corridor planning and permitting barriers to help achieve the state's renewable generation and environmental policy goals.

Background

Analysis of Seismic Performance of Transformer Bushings has shown that current IEEE Standard 693 allows for manufacturers to build inadequate transformer bushings. It has been found that in the event of an earthquake the transformer bushings can become damaged and render transformers useless which will hinder the power grid. The objective of this research is to develop improved techniques to determine the seismic stress capacity of bushings at the Structural Engineering and Earthquake Simulation Lab. These techniques will help develop a revised IEEE Standard 693 that will result in more adequate bushings and transformers.

Currently, CAISO is setting to improve several specific types of protection systems by using time-synchronized phasor measurements. The objective is to develop and evaluate four protection system enhancement tools that can be simulated and evaluated using a model of the California grid.

To reach California's goal of having 20% of its electricity supplied by renewable energy, the use of intermittent electric power has increased. The objective of this project is to develop a system that integrates the use of intermittent electric power into the power grid without compromising the reliability of the power supply.

Proposed Work

Write, revise and edit, and publish final reports for three of CIEE's seven projects which are; Analysis of Seismic Performance of Transformer Bushings, Adaptive Relaying Technology Development & Measurements, and Developing Tools for Online Analysis and Visualization of Operational Impacts of Wind and Solar Generation.

Research how to facilitate new transmission investment.

Research how to Increase power flows in a given corridor.

Research how to manage increased power flows & associated reliability risks.

Research how to reduce response times for wide-area network protection to less than minutes for operators and less than seconds for automation.

Research how to enhance the integration of renewable power with the grid

Research how to reduce greenhouse gas impacts and increase energy efficiency of the electric grid in California.

Justification and Goals

This project "[will develop, and help bring to market] advanced electricity technologies that reduce or eliminate consumption of water or other finite resources, increase use of renewable energy resources, or

improve transmission or distribution of electricity generated from renewable energy resources" (Public Resources Code 25620.1.(b)(4)), (Chapter 512, Statutes of 2006)).

This will be accomplished by:

- Address the "path to market" for these new technologies
- Identify the greenhouse gas emissions and energy inefficiencies of the electric transmission systems for improvements and technology gaps
- Develop technical solutions to the special problems of wind integration into the transmission system
- Develop operational decision support tools to improve operational response times
- Develop technologies and systems for controlling power flow
- Develop technologies and systems for increased power flows.
- Develop a more deterministic cost/benefit allocation process
- Develop methods for congestion planning, and uncertainty forecasting.