

## ITEM #

### Agreement between California Energy Commission and Trustees of the California State University

**Title: CSU - Small Grant Program – Electricity Solicitation 09-01**

**Amount: \$0 New Encumbrance**

**Term: 15 months**

**PIER Contact: Matt Coldwell**

**RD&D Committee:**

#### Funding

This Energy Innovations Small Grant solicitation requests \$0 in new encumbrance. Funding comes from a previously approved Agreement with the Trustees of the California State University to conduct the Energy Innovations Small Grant solicitations.

#### Recommendation

Staff respectfully recommends approving the eight highest ranking research grant applications from the Energy Innovations Small Grant electricity solicitation 09-01 in the amount of \$617,245. Staff recommends placing this item on the discussion agenda of the Energy Commission Business Meeting.

#### The Problem

The Energy Innovations Small Grant (EISG) Program is a component of the Public Interest Energy Research (PIER) Program that is managed by the California Energy Commission (Commission). The purpose of the PIER Program is to provide benefit to California electric and gas ratepayers by funding energy research, development and demonstration (RD&D) projects that are not adequately provided for by competitive and regulated energy markets.

The Commission recognizes the need for a program to support the early development of promising new energy technology concepts, a niche not covered by PIER general solicitations that focus primarily on development of established concepts. The Commission established the EISG program to meet this need. The EISG program provides up to \$95,000 for hardware projects and \$50,000 for modeling projects to small businesses, non-profits, individuals and academic institutions to conduct research that establishes the feasibility of new, innovative energy concepts. Research projects must target one of the PIER R&D areas, address a California energy problem and provide a potential benefit to California electric and natural gas ratepayers.

#### Proposed Research

The RD&D Committee binders summarize each of the recommended projects in detail, ranked according to the selection process.

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The Energy Innovations Small Grant Program solicitation 09-01 yielded the following response:

- 79 grant applications were received for consideration
- 29 passed initial screening and advanced to technical review
- 20 exceeded the minimum required score in technical review and advance to the PTRB
- 8 proposals were recommended for funding by the PTRB valued at \$617,245.

The eight proposals that are being recommended for funding are as follows:

**Project Title:** Proof-of-Concept of Co-Production of Electrical Power and Lithium from Geothermal Fluids

**Principle Investigator:** Paula Moon, Paula Moon & Associates (Naperville, IL)

**Rank:** 1

**Amount:** \$95,000

**Project Summary:**

This project will determine the feasibility of extracting lithium from geothermal fluids to help geothermal energy become more cost-competitive with other energy sources. Lithium extraction would reduce the cost of geothermal energy generation by providing the generator a marketable material. An increase in supply could lower the cost of lithium for battery applications and would reduce the waste disposal procedure by removing lithium from the end-process.

**Project Title:** A light-assisted Biomass Fuel Cell for Renewable Electricity Generation

**Principle Investigator:** Frank Osterloh, University of California, Davis

**Rank:** 2

**Amount:** \$95,000

**Project Summary:**

The goal of this project is to determine the feasibility of a light-assisted biofuel cell that converts chemical energy stored in biomass from municipal waste water into usable electricity. This would be performed via a light-assisted microbial fuel cell, using titanium and copper based anodes, which would convert the biomass into water, carbon dioxide and hydrogen while generating electrical energy.

**Project Title:** Solar Heat Engine Driven Hydraulic Ram for Low-Cost Irrigation

**Principle Investigator:** Thomas Smith, Thermofluidics, Ltd. (U.K.)

**Rank:** 3

**Amount:** \$95,000

**Project Summary:**

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The goal of this project is to create a pollution free and sustainable method for pumping irrigation water without the need for electricity by developing a solar heat engine driven hydraulic ram. This Sterling-like water pump will use state-of-the art solar collectors as heat-pipe evaporators, which will drive tandem pistons that will enable this proof-of-concept pump to deliver 264 gallons per hour without the need for electricity.

**Project Title:** Concentrated Photovoltaic Module with Zero-Cost Thermal Management

**Principle Investigator:** Kanchan Ghosal, Semprius, Inc. (Durham, NC)

**Rank:** 4

**Amount:** \$95,000

**Project Summary:**

The goal of this project is to determine the feasibility of negating the need for thermal management in concentrated photovoltaic applications by using only the solar interconnects between cells for heat-transfer. By significantly reducing or eliminating thermal management, concentrated photovoltaic cells would be able to increase the efficiency of a concentrated photovoltaic system.

**Project Title:** Modeling Blade Pitch and Solidities in Straight Bladed Vertical-Axis Wind Turbines.

**Principle Investigator:** Kevin Wolf, Wind Harvest International (Davis, CA)

**Rank:** 5

**Amount:** \$50,000

**Project Summary:**

The goal of this project is to improve existing designs of the company's currently marketed Vertical-Axis Wind Turbine (VAWT) by modeling the performance to measure the benefits of tightly spacing together vertical axis turbines, and for establishing proper blade angles and connecting structures. The company's VAWT design will allow for ground level installation due to their ability to operate efficiently at low wind speeds.

**Project Title:** Wind Power Generation on High-Rise Buildings in Urban Centers

**Principle Investigator:** Dr. Tai-Ran Hsu, San Jose State University

**Rank:** 6

**Amount:** \$50,000

**Project Summary:**

This project proposes to determine the feasibility of developing new wind deflectors and wind fences to mitigate and control the turbulent air flow found at the top of urban high-rise buildings. Also, it will evaluate the use of wind deflectors and wind fences for prevention of possible debris and the reduction of noise of operating turbines from impacting public safety. By taking advantage of the height of urban buildings, the need to build expensive towers is avoided, and using rooftops in urban centers will generate electricity near the consumer eliminating the need for extensive transmission lines.

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**Project Title:** Growth of Cavity Light Emitting Diode on a Reflective Substrate

**Principle Investigator:** Robert Jorgenson, Lightwave Photonics, Inc (Encinitas, CA)

**Rank:** 7

**Amount:** \$95,000

**Project Summary:**

This project will determine the feasibility of increasing light extraction and electrical efficiency, and reducing manufacturing costs of a light-emitting diode (LED). The project will test the feasibility of removing a conventional secondary processing step in LED manufacturing, and bond a highly reflective surface to the LED.

**Project Title:** Low Cost Energy Storage for Solar Thermal Power Plants

**Principle Investigator:** Robert A. Hogue (Menlo Park, CA)

**Rank:** 8

**Amount:** \$42,245

**Project Summary:**

This project proposes to model the feasibility of using the ground underneath solar collectors as an energy storage medium, which would replace conventionally used molten salts as thermal storage. This method would reduce the need for the specialized pumps and related equipment and infrastructure required for processing molten salts, and would use the existing footprint of the solar thermal site. This project will model the feasibility of this theory in an effort to provide justification for further work.

## Research Justification and Goals

Contributes to the Commission's long term energy research portfolio by identifying innovative energy technology concepts that, when proven feasible through the proposed grant work, can enter the market either directly through such mechanisms as licensing agreements or indirectly via the capture of follow-on research and development funding leading to commercialization. Multiple solicitations covering the seven PIER program areas, seek projects that can lead to improved reliability, affordability, and environmental attributes as mandated by the Warren-Alquist Act.

The EISG program tests the feasibility of innovative energy research concepts that can lead to new and improved technologies; enlarges the PIER portfolio of valuable long term energy research opportunities; and taps into sources of innovation outside main-stream energy research and development programs.

## Background

The Energy Commission has conducted the EISG program since its initiation in 1998 by issuing multiple competitive solicitations a year for new and innovative concepts that, if proven feasible, are expected to open new paths to public interest energy research and development and subsequent public

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benefit. Three annual surveys of completed projects show that 50 percent of the completed projects attract follow-on RD&D funding from a wide variety of sources, thus enabling the innovative development to continue beyond EISG grant funding. The gross follow-on funding is some ten times the total Energy Commission grant funding to all completed EISG projects since the beginning of the program. Approximately 85 percent of the follow-on development work is located in California.