

## Backup Documentation for Business Meeting February 25, 2015

### EISG Program Solicitation 14-03

TRUSTEES OF THE CALIFORNIA STATE UNIVERSITY. Proposed resolution approving the six highest ranking grant applications totaling \$891,550 from the Public Interest Energy Research (PIER) program's Energy Innovations Small Grant Solicitation 14-03 Natural Gas and Transportation Natural Gas. These grants were competitively selected and are capped at \$150,000 each. (PIER natural gas funding) Contact: James Lee (10 minutes)

#### List of recommended grants are:

##### Natural Gas 14-03G

Three projects values at \$450,000

Project Title: Tar Reforming Catalyst for Producer Gas Cleaning for BioSNG Production:

Principal Investigator: Robert Cattolica, University of California San Diego, CA

Rank: 1

Amount: \$150,000

Project Summary:

The goal of this project is to demonstrate the use of a catalyst (Ni-Fe-CaO) to remove tar from producer gas from an operational biomass gasifier. This innovation has the potential to lead to the removal of expensive downstream gas cleaning processes that are currently needed to remove tar prior to the production of Bio-Synthetic Natural Gas.

Project Title: In Situ Sensors for the Control of Synthetic Natural Gas Production:

Principal Investigator: Ronald Hanson, Stanford University, CA

Rank: 2

Amount: \$150,000

Project Summary: The goal of this project is to demonstrate a novel sensor technology that provides rapid feedback during turbulent gas flow within a reactor system. Previous technologies often do not perform adequately in turbulent gas flow because of signal losses caused, for example, by particulate scattering. This technology is needed to control steam addition in a reactor system which protects catalyst reformation and also needed to efficiently control the biomass gasifier. This is expected to improve the long term efficiency and catalyst care and/or replacement costs in the system.

Project Title: Pyroelectric-assisted Heat and Power System for Distributed Co-generation:

Principal Investigator: Kevin Lu , Pyro-E LLC, Oakland, CA.

Rank: 3

Amount: \$150,000

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Project Summary: The goal of this project is to demonstrate a micro CHP device that is expected to be more efficient and have increased reliability compared to other micro CHPs. The project is proposed in collaboration with a leading manufacturer of 30W-100kW reciprocating Stirling engines. The device to be demonstrated uses synthetic ceramics in a low-cost manufacturing process capable of scale. The use of solid-state pyroelectric materials to convert heat directly into electricity is expected to be ten times more powerful than traditional thermoelectrics.

### Transportation Natural Gas 14-03TNG

Three projects values at \$441,550

Project Title: Algae Purification of Agricultural Waste Biogas for Biomethane Production:

Principal Investigator: Natalie Cookson, Quantitative BioSciences, Inc, San Diego, CA.,

Rank: 1

Amount: \$150,000

Project Summary: The goal of this project is to demonstrate a biogas purification technology that will be designed to “clean” the biogas resulting from waste water treatment by passing it through algae raceway pond water. The carbon dioxide and hydrogen sulfide components of the biogas will transfer to the water, leaving only purified biomethane that will be compressed and used as a transportation fuel. Compared to typical lagoon methods used on farms, this technology is expected to use less land while reducing greenhouse gas emissions and producing energy from additional waste sources.

Project Title: Spiral Tube Low-Profile Natural Gas Tank:

Principal Investigator: Daniel Recht, Otherlab, San Francisco, CA.,

Rank: 2

Amount: \$145,267

Project Summary: The goal of this project is to determine the feasibility of using spiral tubes made of braided fiber composite to create a low-profile natural gas tank with a height of no more than seven inches for use in compressed natural gas vehicles. This technology is expected to free up cargo space and increase driving range by lying flat in the bottom of a truck bed or the undercarriage of a passenger car.

Project Title: Direct Natural Gas Ceramic Fuel Cell Hybrid Vehicle Feasibility:

Principal Investigator: Kenneth Pearson, DBA, Ascend Energy Systems, Shingle Springs, CA.,

Rank: 3

Amount: \$146,283

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Project Summary: The goal of this project is to determine the feasibility of using a newly developed small solid oxide fuel cell (SOFC) to utilize natural gas directly to generate electricity in an electric all-terrain vehicle. Older SOFC technology has typically been heavier, bulkier, and more sensitive to shock and vibration. This project is expected to be able to serve as a model for examining the merits of SOFCs in other hybrids for larger on-road vehicles. This will be done by showcasing an expected increased efficiency compared to natural gas and hydrogen fuel cell vehicles while decreasing total emissions.

### **Benefits to California**

The EISG program is bringing energy solutions to California ratepayers. It encourages growth in the clean tech industry by proving the feasibility of numerous innovative energy concepts. Many new California companies have been started after successful completion of EISG projects. These companies are providing benefits to California and California ratepayers.

The EISG program funds help bring to market energy technologies that provide increased environmental benefits, greater system reliability, lower system costs, and tangible benefits to electric utility customers through the following investments:

Advanced transportation technologies that reduce air pollution and greenhouse gas emissions beyond applicable standards and that benefit electricity and natural gas ratepayers.