Back-up Documentation for Business Meeting March 20, 2013

EISG Program Solicitation 112-01, 12-01G, 12-01TE, 12-01TNG

TRUSTEES OF THE CALIFORNIA STATE UNIVERSITY. Possible approval of the twenty highest ranking grant applications totaling $1,815,274 from the Public Interest Energy Research (PIER) program's Energy Innovations Small Grant Solicitation 12-01. There are three projects totaling $276,420 under Transportation Electricity, two projects totaling $188,177 under Transportation Natural Gas, six projects under Natural Gas totaling $540,928 and nine projects under electricity totaling $809,749.(PIER electricity and natural gas funding)These grants were competitively selected and are capped at $95,000. Contact: Raquel E. Kravitz (10 minutes)

List of recommended grants are:

1. Transportation Electrical (12-01TE)
Three Proposals recommended for funding by the PTRB valued at $276,420

Project Title: INCEPTIVE - Adaptive Electric Vehicle Fast Charging Station
Principal Investigator: Giubbolini, Luigi, Andromeda Power LLC, Costa Mesa, CA
Rank: 1
Amount: $95,000
Project Summary: To determine the feasibility of using a fast charging station for electric vehicles to encourage its integration with alternative sources to avoid peak demand fee. This energy management system device can communicates with the vehicle and grid; negotiate the charging power, merge energy from the grid and alternative sources and shed fix power loads. It will result in the first electric vehicle fast charging station fully integrated with alternative power sources and capable of demand response. If successful, this technology has the potential to reduce at least 50% of the operational costs of fast charging stations by eliminating the demand fees. It also has the potential to use less energy from the grid with proportionally less pollution.

Project Title: New Portable Electricity Storage Units Using Nanostructured Supercapacitors
Principal Investigator: Pan, Hing, University of California Davis, Davis CA
Rank: 2
Amount: $86,420
Project Summary: To determine the feasibility of developing fast charging portable electricity storage/supply units using nanostructured supercapacitors for enhance energy capacity. The novel processing method is involving vacuum filtration deposition (VFD) of grapheme suspension to fabricate nickel foam electrodes for the supercacitors. If successful this technology has the potential to reduce the cost of supercapacitor electricity storage to 10 cents/F (farad), and transportation electrification could be accelerated to achieve the 30% greenhouse gas emission reduction target by 2016 for California passenger vehicles. This technology also has potential to facilitate the goal of 33% renewable energy by 2020 in California with the anticipated massive integration of supercapacitors into solar/PV systems and wind turbines.

Project Title: Tour Engine: High Efficiency Split-Cycle Engine for Battery Electric Vehicles with small range eXtender (BEVx) Applications
Principal Investigator: Tour, Oded, Tour Engine, Inc., San Diego, CA

Rank: 3
Amount: $95,000
Project Summary: To determine the feasibility of a new crossover valve that will enable a 20% increase in efficiency and reduction in emissions of a new Tour engine split-cycle design. The goal of this project is to develop a new mechanical crossover valve that has high volumetric efficiency ensuring minimal pressure gradient across the valve. If successful this technology has the potential to increase brake thermal efficiency by 20% and reduce emissions.

2. Transportation Natural Gas (12-01TNG)
Two Proposals recommended for funding by the PTRB valued at $188,177

Project Title: Crashworthy Subframe Compressed Natural Gas (CNG) Freight and Passenger Locomotive Fuel Tank Enclosure
Principal Investigator: Vierheller, Fred, SolidMasters, Fullerton, CA
Rank: 1
Amount: $93,218
Project Summary: To determine the feasibility of using frame mounted CNG tanks in safety enclosures that meet current Federal Railroad Administrative side impact and derailment crash safety guidelines to accelerate the transition of over 4000 locomotives from diesel fuel to natural gas consumption. The innovation is to develop and test fuel storage tanks using CNG for use in switching locomotives. The project proposes to bundle four CNG cylindrical tanks together, inserting into existing diesel enclosures under the carriage of the locomotive for protection against side crashes and rollovers. If successful, this technology has the potential to provide 90% reduction in emissions over Tier 0 locomotives and save the locomotive operator $50,000 per year in fuel costs for each locomotive. This technology has also the potential to be an integral part of a Tier 4 natural gas conversion package that will cost half as much as the current diesel multi engine gensets, and each switcher should displace 37,000 gallons of diesel fuel per year.

Project Title: Biodiesel Production Via Poly Functional Reactive Distillation
Principal Investigator: Smoot, James, C/e Solutions, Inc., West Sacramento, CA
Rank: 2
Amount: $94,959
Project Summary: To determine the feasibility of simplifying biodiesel production into a single, cost-effective unit so that California wastewater treatment plant operators and other sources have an economically viable method of biodiesel production. This goal is to tests catalysts used in the esterification at above 100C and to remove glycerol from the biodiesel production through the use of acetone and hexane. If successful, this technology has the potential to produce 5L of biofuel per person per year in California equaling to an annual offset potential for the State of 423 Million Tonne carbon dioxide. It also has the potential to reduce the cost of biodiesel production by $1.48/gallon and the potential to mitigate the societal issue of food vs. fuel plaguing the biodiesel industry that relies on transesterification approaches and focuses biodiesel development on low-cost, sustainable feedstock.

3. Natural Gas (12-01G)
Six Proposals recommended for funding by the PTRB valued at $540,928

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Project Title: Achieving High Efficiency Through Solid State Microwave Assisted Spark Plugs
Principal Investigator: Dibble, Robert, University of California, Berkeley, Berkeley, CA
Rank: 1
Amount: $95,000
Project Summary: To determine the feasibility of using microwave enhanced spark ignition allowing leaner combustion and increasing efficiency. This project proposes to apply microwave spark plug system to a spark-ignited engine fuelled with natural gas. The new spark plug uses common solid state electronics which generate powerful and easily controllable microwaves source to achieve lean operating conditions. If successful, this technology has the potential to significantly reduce Nitrogen Oxide emissions by 20% at the leanest operating conditions when compared to the leanest operating point for a standard spark plug.

Project Title: Low Cost Glazed Polymer Solar Water Heater
Principal Investigator: Rhodes, Richard, Rhotech Solar, South San Francisco, CA
Rank: 2
Amount: $66,300
Project Summary: To determine the feasibility of adding a glazing layer to improve thermal performance, and reduce stagnation temperature losses of a low cost thin-film polymer solar water heater. If successful, the proposed technology has the potential to improve performance and savings by at least 20%. Assuming a 10% market penetration of single-family unit homes in California, it would save $94 million/year to natural gas ratepayers using the solar water heater.

Project Title: Electroporation of Algal Biomass to Enhance Methane Gas Production
Principal Investigator: Garoma, Temesgen; San Diego State University, San Diego, CA
Rank: 3
Amount: $95,000
Project Summary: To design and build a continuous bench-scale electroportation system for the pretreatment of algal biomass, and determines if electroporation of algal biomass used as a feedstock for anaerobic digesters can enhance methane gas yield. If successful, this project has the potential to be developed into a renewable energy source with multiple benefits to California. It will reduce the demand for natural gas at wastewater treatment plants; reduce energy imports from out of state sources, lowering the energy costs and will play a significant role in meeting the California's Renewable Portfolio Standard goals.

Project Title: Improved Energy Efficiency of Natural Gas/Producer Gas Fuel Mixtures
Principal Investigator: Seshadri, Kalyanasundaram, University of California San Diego, San Diego, CA
Rank: 4
Amount: $95,000
Project Summary: This project proposes to generate a data base of engine knock characteristics versus methane/producer gas composition as a basis set for the development of a neural network model using commercial software. If successful, this technology has the potential to reduce the carbon intensity of natural gas power generation, a benefit for California.

Project Title: Waste Heat Reformation of Renewable Feedstocks to Offset Natural Gas

Principal Investigator: Vernon, David, Humboldt State University, Humboldt, CA
Rank: 5
Amount: $94,993
Project Summary: To determine the feasibility of using renewable biomass to convert waste heat energy into chemical energy. This project will design and build a new recirculation reactor. If successful, this technology has the potential to reduce emissions by reducing total fuel consumed because of the increased efficiency and the Nitrogen Oxide reductions achieved through hydrogen enrichment. This technology may also be useful in agricultural packing organizations.

Project Title: Two-Track Heat Storage: Very Hot Solar Thermal Storage
Principal Investigator: Olsen, Rolf, Individual, San Diego, CA
Rank: 6
Amount: $94,635
Project Summary: This two track innovation proposes to modify the typical design of expensive ceramic brick thermal media for packed bed thermal storage and use inexpensive solids such as local rocks/pebbles or sand in place of expensive packed bricks and drive heat transferring gas through the interstitial passages between pebbles in the first track while providing second tracks for fast gas flow in perforated vertical pipes with path controls assisted by vertically moving flow diverters. If successful, this project has the potential to use gases such as air that can function at higher temperatures, as an alternative storage medium, increasing overall plant efficiencies and lowering costs of power.

4. Electrical (12-01E)

Nine Proposals recommended for funding by the PTRB valued at $809,749

Project Title: HVAC Management System with Dynamic Energy and Demand Optimization
Principal Investigator: Esser, Marc, Negawatt Consulting, Inc., San Diego, CA
Rank: 1
Amount: $95,000
Project Summary: To determine the feasibility of a cost-effective control system and strategy for buildings with multiple package HVAC systems that reduce peak demand, energy consumption, and operating costs by at least 10%. This project includes implementing control algorithms and finalizing hardware and communications architecture for production use. The project team will vet their concepts by conducting comprehensive field tests in close cooperation with SDG&E's Emerging Technology Program which provided additional funding. If successful, the proposed distributed energy technology has the potential to provide affordable, environmentally safe energy with significant reduction in CO2; generate clean energy; increase reliability and efficiency of electricity for California rate payers.

Project Title: Enhanced Light Extraction of LEDs Through Ultra-Fast Laser Nano-Fabrication
Principal Investigator: Yuan, Dajun, Torrey Hills Technologies LLC, San Diego, CA
Rank: 2
Amount: $94,954

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Project Summary: LEDs are replacing other light sources because of efficiency and long life but the light produced inside LED crystal is partially trapped due to reflection at the boundary. By roughening surface and reducing reflection, more light is produced. If proven successful they will sell or license ablation system to LED manufacturers. The benefit for California's rate payers is the potential to significantly reduce manufacturing costs for LED manufacturers, LED initial installation and the potential to generate significant energy savings by switching from fluorescent to LED lighting.

Project Title: Cooling Tower Fouling Prevention through Surface Modification of Fill Media
Principal Investigator: Boyd, Peter H., Nano Hydrophobics, San Francisco, CA
Rank: 3
Amount: $95,000
Project Summary: To determine the feasibility of improving evaporative cooling tower efficiency by up to 30% through the development of nano-scale polymeric coatings to prevent the formation and build up of mineral scale and biological organisms. This project aims to lower energy usage in evaporative cooling towers and lower water usage in cooling and power generation. If successful, this project could benefit California rate payers by reducing power generation cost, reducing cooling cost for industrial and commercial user, and reducing less water usage, wastewater treatment and chemical discharge for the communities.

Project Title: Static/Dynamic Compilation for Quality of Service and Energy Efficiency in Datacenters
Principal Investigator: Tang, Lin, University of California, San Diego, San Diego CA
Rank: 4
Amount: $95,000
Project Summary: To design and develop an effective software system to significantly improve energy efficiency and improving server utilization for data centers. The approach is to diagnose and mitigate contention for various hardware resources, enforce quality of service priorities and guarantee quality of service goals for applications co-running on a multi-core platform. If successful, the expected outcome is a 50-80% energy efficiency improvement in data centers at various scales, a massive savings for energy consumption in California.

Project Title: High Performance Lithium-Ion and Silicon Carbide (SiC) Based Powerpack for Renewable Energy
Principal Investigator: Lin, Limin, Bioenno Tech, LLC, Santa Ana,CA
Rank: 5
Amount: $95,000
Project Summary: This project proposes to have a class of powerpacks that will have improved energy efficiency, light weight, longer service life and environmentally safe. If successful, this technology can be used to generate cost effective clean electrical energy that can yield up to 2.75 billion kilo watt or more for California's' ratepayers and has the potential to reduce energy consumption from the power grid and reduce harmful emissions to generate clean energy in California.

Project Title: Tracking Optimization of Self-Orienting High-Concentrating Photovoltaic Elements

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Principal Investigator: Hoffmann, James T., Sun Synchrony, Alameda, CA
Rank: 6
Amount: $95,000
Project Summary: This project will demonstrate a micro-mount that will have improved pointing accuracy, increased drive efficiency, be more robust, and durable than current products. The benefit for California's' rate payer is the potential to significantly reduce energy consumption from the power grid and significantly lower the cost of photovoltaic elements.

Project Title: Crystallization of Electrodepositied Cadmium Indium Selenide (CIS) Thin Films on Flexible Foil
Principal Investigator: Menezes, Shalin, InterPhase Solar, Moorepark, CA
Rank: 7
Amount: $95,000
Project Summary: To develop a pulsed laser annealing tool to crystallize thin films of CIS solar cells to increase the efficiency of cells, reduce manufacturing and lower the cost of electricity generated. This project proposes to crystallize the amorphous film by ultra-fast heating and rapid cooling (quench anneal) with a laser. Heating will be fast enough that no chemical reactions will take place, but material will crystallize to form micro crystals one micron or greater that increases efficiency. The benefit is the reduction of energy costs for photovoltaic for California rate payers.

Project Title: Optimum Design of Secondary Optical Element (SOE) for Concentrating Photovoltaics
Principal Investigator: Stone, Kenneth W., Butler Sun Solutions, Solana Beach, CA
Rank: 8
Amount: $94,900
Project Summary: To determine the feasibility of a new SOE design for use in concentrating photovoltaic systems that will increase the daily-generated energy by more than 5% and lower the levelized cost of energy by more than 4%. This project will design, fabricate, and test SOEs that will decrease the power spillage allowing the manufacture to decrease system cost, and increasing the annual energy. If successful, this renewable technology has the potential to significantly reduce energy costs for California ratepayers.

Project Title: Low-Cost Energy Management System for Small Commercial Buildings
Principal Investigator: Raghavendra, Gayathri, EZ Green, Foster City, CA
Rank: 9
Amount: $49,895
Project Summary: To determine the feasibility of a low-cost energy management system that can provide a payback period of less than 1 year for small commercial buildings. The proposed software-based energy management system integrates analytics with automated control of Heating, Ventilation, Air conditioning and Lighting systems to help end-users reduce energy consumption while maintaining or enhancing occupant comfort. If successful, this project has the potential for cost-effective building end-use energy technologies, decreasing the consumption of energy and provides efficient energy usage in buildings.

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