RESOLUTION NUMBER:

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

WHEREAS, pursuant to Public Utilities Code Section 381 the State Energy Resources Conservation and Development Commission (Energy Commission) is authorized to establish and administer the Public Interest Energy Research Program (PIER); and

WHEREAS, the Energy Commission has recognized that California's electricity ratepayers benefit from energy research, development and demonstration (RD&D) activities conducted by individuals, small businesses, academics and small non-profit institutions; and

WHEREAS, the Energy Commission has created the Energy Innovations Small Grant Program within the PIER Program to provide funding for the aforementioned public interest RD&D activities; and

WHEREAS, the Energy Commission has designated the Trustees of the California State University (CSU) to serve as the Small Grant Program Administrator (under Inter-agency Agreement Number 500-98-014, Amendment 8) to solicit grant applications, recommend grant awards to the Energy Commission, and manage authorized grant projects; and

WHEREAS, CSU has now completed its thirty-ninth electricity solicitation and has recommended for PIER funding the small grant projects listed in the "Notice of Proposed Grant Awards" attached to this Resolution; and

WHEREAS, the Energy Commission's RD&D Staff has reviewed and concurs with CSU's recommendations.

NOW THEREFORE BE IT RESOLVED THAT, the Energy Commission approves and authorizes PIER funding for the small grant projects listed in the attached "**Notice of Proposed Grant Awards, EISG Solicitation Cycle 13-01.**"

The Energy Commission hereby directs the Program Administrator to execute grant agreements pursuant to the Inter-agency Agreement in this matter.

Dated: August 27, 2013

STATE OF CALIFORNIA
ENERGY RESOURCES CONSERVATION
AND DEVELOPMENT COMMISSION

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Chairman

Notice of Proposed Grant Awards, Energy Innovations Small Grant Program (EISG) Solicitation Cycle 13-01: $1,208,638
Electrical, Natural Gas, Transportation Electrical, and Transportation Natural Gas

a) Transportation Electric (13-01TE)

i. University of California Merced, Merced, CA., *Cost-Effective Thermal Management Design for Electric Vehicle Batteries,* Ma, Yanbao, $95,000. This is project proposes to increase EV battery life by reducing uneven temperature distribution in the batteries by providing an efficient cooling design at the cell level. It also proposes to reduce battery weight, volume and manufacturing cost by at least 20% in the battery cooling systems of electric vehicle batteries. If successful, this project will accelerate EV adoption by reducing the system cost and improving the life of the EV batteries, which will help California, meets its Zero-Emissions Vehicle Mandate.

ii. University of California, Davis, Davis, CA., *Intelligent Energy Management for Solar Powered EV Charging Stations,* Zhao, Hengbing, $94,917. This project proposes to determine the feasibility of introducing real-time weather forecast and actual load statistics into the energy management of solar powered electric vehicle charging stations with battery storage. This project will use forecast data from major weather services via the internet and historical demand profiles for charging stations as inputs to this management system. This project will also use software to determine optimum charge/discharge periods to maximize the use of renewable energy and reduce draws of grid power in high demand/cost periods. If successful, this project will be the first electric vehicle charging station in the US that is solar powered with battery storage that includes weather forecasts and load requests.

b) Transportation Natural Gas (13-01TNG)

iii. Whole Energy Pacifica, Corte Madera, CA., *Utilizing Glycerin to Produce Renewable Natural Gas for Transportation Use,* Wahl, Martin, $95,000. This project proposes to determine the feasibility of designing a skid-mounted biogas scrubbing system to assess the effectiveness of using glycerin to remove contaminants from raw biogas to produce biomethane. This skid-mounted biogas scrubber will utilize counter-flow absorption, replacing the water with glycerin. Glycerin used as a scrubbing solution can effectively remove hydrogen sulfide, water vapor, carbon dioxide and other contaminants found in raw biogas. If this project is successful, this technology has the potential to increase biomethane production by 10% annually.

c) Natural Gas (13-01G)

iv. Altex Technologies Corporation, Sunnyvale, CA., *High Efficiency and Turndown and Low Power Ultra-low Emissions Burner,* Kelly, John T., $94,877. This project proposes to determine the feasibility of fabricating a high efficiency and ultra-low emissions burner to meet emission requirements while increasing burner efficiency. This project will use a standard matrix burner and adds a supplementary partially premixed fuel/air injector at the downstream end of the burner to improve efficiency. In addition, this project will alter the supplementary burner output, and increase the turndown ability relative to ultra-low NOx burners.

v. CHA Corporation, McClellan, CA., *Cracking Raw Fuels for Hydrogen Stations Without Greenhouse Gas Emission,* Cha, Chang, $95,000. This project proposes to determine the feasibility of producing on-site hydrogen for hydrogen fueling stations using a single microwave reactor that combines desulfurization and hydrocarbon cracking to eliminate the emission of carbon dioxide and other air pollutants. This process is a way of efficiently and cost-effectively producing hydrogen from natural gas. If successful, this project will allow hydrogen stations to directly supply hydrogen to fuel cell electric vehicles without greenhouse gas emissions.

d) Electric (13-01E)

vi. Paulsson, Inc., Van Nuys, CA., *An Ultra-Compact Fiber-Optic Seismic Sensor for Geothermal Applications,* Paulsson, Björn, $95,000. This project proposes to determine the feasibility of using ultra-compact, fiber-optic seismic sensors to create a 3D image and monitor geothermal reservoirs. This project will design borehole seismic sensors that can operate at temperatures up to 300°C and pressures up to 30,000 psi in the corrosive environments found in geothermal wells. These fiber-optic based sensors can be attached to either the inside or outside of geothermal well casings, eliminating the need to drill a larger borehole when deploying the sensors. If successful, this project will allow for cost-effective long-term site characterization and monitoring studies at geothermal exploration sites.

vii. California Institute Technology, Pasadena, CA., *Paintable Spectrally Selective Window Coatings for Efficient Cooling,* Grubbs, Robert Howard, $95,000. This project proposes to determine the feasibility of developing window coatings that selectively reflect solar thermal radiation to reduce energy cooling costs while maintaining visible light transparency for commercial and residential buildings. This project will use copolymer-based materials that are easy to apply and can be painted on as retrofittable window coatings to reflect infrared and UV light. If successful, this product will reduce an annual residential energy bill by nearly 20 cents per square foot of floor space.

viii. University of California, San Diego, La Jolla, CA., *Cloud Speed Sensor*, Kleissl, Jan, $95,000. This project proposes to determine the feasibility of a tripod-mounted Cloud Speed Sensor system to improve short-term solar power performance and variability forecast. This project will use a common solar sensor that provides instant measurement of direction and speed of passing, variable clouds and provide real-time measurement, enabling grid operators to respond quickly and efficiently to real-time changes in local cloud cover. If successful, this project will increase the accuracy of solar plant ramp rate predictions by 25%.

ix. Miami University, Oxford, Ohio, *Using Patterned Surface Wettability for Improved Frosting/Defrosting Performance,* Sommers, Andrew, $83,042. This project proposes to determine the feasibility of using different surface patterns and surface tension gradients to grow a thinner, denser frost layer on air conditioners to improve the defrosting performance. The goal of this project is to study the effect of frost build-up on the air-side surface of these systems and to examine the relative ability of various surfaces to improve the defrosting performance. Although the principal investigator is based in Ohio, over 80% of this project funding is with San Jose State University in San Jose, CA. If successful, this project will reduce California ratepayers' air-conditioner kWh consumption and it will save an estimated $100 per heat exchanger per year.

x. GridCom Technologies, Inc., Bakersfield, CA., *Quantum-Protection System for Secure Grid Automation Communications,* Earl, Duncan, $95,000. This project proposes to determine the feasibility of a smart grid communications protection device that improves machine to machine communication encryption by using quantum key distribution to randomly generate encrypted keys. Quantum key distribution enables two parties to produce a shared random secret key known only to the parties that are communicating. This process enables a secure and more reliable authentication and encryption solution that overcomes the drawbacks and reduces the cost of conventional encryption processes.

xi. University of California, Los Angeles, Los Angeles, CA., *Low Band Gap Antimony-Based Thermophotovoltaics Grown on Gallium Arsenide Substrates*, Huffaker, Diana, $81,015. This project proposes to determine the feasibility of developing a more efficient thermophotovoltaic device that can convert waste heat into electricity. This project will explore using a lower cost material that has the potential to increase the conversion efficiency of the thermophotovoltaic cell.

xii. University of California, San Diego, La Jolla, CA., *Dampening System Oscillations Utilizing Phasor Measurement Units and Photovoltaic Inverters,* Torre, William, $95,000. This project proposes to determine the feasibility of building and installing a control system interface with phasor measurement units (PMU) and photovoltaic inverters. This project will test and model grid dynamics using signal techniques applied to the PMU data and will identify the best approach for photovoltaic

inverters to ease grid oscillation. If successful, this project will improve utility dispatch of electricity generation while accommodating increased penetration levels of photovoltaics.

xiii. University of California, Davis, Western Cooling Efficiency Center, Davis, CA., *Heat Pump Assisted Diurnal Heat Rejection System,* Modera, Mark, $94,787*.* This project proposes to determine the feasibility of designing and constructing a residential conventional split air condenser with a water exchanger. This proposed project is a cost-effective residential retrofit that reduces and partially shifts cooling load to off-peak. The split system will take advantage of existing air conditioning components by operating the condensing section at a reduced temperature and moving air through the condenser and operating the exchanger section by replacing fan energy with an efficient process of pumping a small amount of water instead of a large amount of air. The project will determine the expected performance from this system under various weather conditions over the course of one year and determine energy saved and peak load shift when installed in various California climate zones.