



Small Business Vouchers Pilot

U.S. DEPARTMENT OF ENERGY

ROUND 3 AWARDEES

ADVANCED MANUFACTURING

GDC Industries, LLC

Argonne National Laboratory has been awarded \$300,000 to work with GDC Industries, LLC to test and develop a more efficient means of producing covetic alloys, by varying mixer-speeds, DC currents, and the rate of carbon addition and reaction time. This project's partnership with ANL will result in a set of optimum process conditions for the reactor setup, as well as to provide the insight needed to scale the current reactor to larger batches for commercialization. This will result in 50% energy savings in service under current commercial practices.

Vacuum Process Engineering, Inc.

Sandia National Laboratory has been awarded \$300,000 to work with Vacuum Process Engineering, Inc. towards developing a process to greatly increase heat exchanging capacity of microchannel heat exchangers, while reducing the costs of hazardous waste. This project will use SNL's 3D printing capabilities to develop the process necessary for testing and fabricating this process. This project aims to integrate existing manufacturing capabilities, reduce the costs of manufacturing, and provide significantly larger thermal-duty microchannel heat exchangers than currently available.

BASiC 3C, Inc.

The National Renewable Energy Laboratory has been awarded \$70,000 to work with BASiC 3C, Inc. towards developing a new semiconductor as a replacement for silicon. This would provide greater efficiency, voltage capability, temperature operation, and higher tolerance to harsh operating conditions than existing models. The project will work with NREL to identify any remaining impurities in the current model, with the goal of disrupting the silicon power switch industry, currently a \$12B market. Additionally, according to Toyota, development of a semiconductor material will increase the range of electric vehicles by 10%.

Astrileux Corporation

Lawrence Berkeley National Laboratory has been awarded \$300,000 to work with Astrileux Corporation towards developing extreme ultraviolet (EUV) materials that are cheaper and more durable than current EUV materials. This project will use an ALS Beamline and the LBNL Molecular Foundry to characterize and validate their existing EUV model, resulting in the deployment of cleaner, lower power light sources.

ThermoAura, Inc.

Argonne National Laboratory has been awarded \$80,000 to work with ThermoAura Inc. to develop a bottom-up manufacturing method that uses microwave wet-chemistry to make nanocrystals. This project will identify defect structures using high-resolution X-ray or electron spectroscopies to quantify dopant levels and probe defects. The results of this project have the potential to vastly expand existing thermoelectrics technologies.

Lilac Solutions, Inc.

Lawrence Berkeley National Laboratory has been awarded \$120,000 to work with Lilac Solutions, Inc. to develop new inorganic ion exchange materials to extract lithium from brine resources. Existing ion exchange materials require large volumes of water in desert environments and only yield lithium at low concentrations. This project will partner with LBNL to help control chemical composition, phase purity, particle size, and surface chemistry to optimize protocols for synthesis and processing with the goal of reducing water consumption by 40x and increasing lithium concentration by 40x.

Peroxygen Systems, Inc.

The National Renewable Energy Laboratory has been awarded \$265,197 to work with Peroxygen Systems, Inc. to improve methods of manufacturing on-site hydrogen peroxide production. This project aims to use the capabilities at NREL to scale up its current electrolyzer stack which will enable Peroxygen Systems, Inc. to reach the production capacity needed for a commercial pilot trial with a customer.

Redox Power Systems

Oak Ridge National Laboratory has been awarded \$200,000 to work with Redox Power Systems towards developing an integrated, roll-to-roll process for cell manufacturing at ORNL's Battery Manufacturing Facility. This project will lead to development of lower cost roll-to-roll laminating, calendaring, and slot die cell manufacturing processes for scaling of millions of cells per year.

InnaVenture

Pacific Northwest National Laboratory has been awarded \$250,000 to work with InnaVenture towards developing their metal organic frameworks (MOFs), whose applications include gas separations, energy storage, heterogeneous catalysis, drug delivery, and rare earth element extraction. The project will work with PNNL to scale up production methods and reduce costs using the lab's synthesis process, which will lead to faster commercialization while reducing greenhouse gas emissions.

Iris PV

The National Renewable Energy Laboratory has been awarded \$250,000 to work with Iris PV of Berkeley, CA on scaling up their innovative solar panel technology, which uses inkjet printing to stack thin-film metal halide perovskite solar cells on top of silicon or copper indium gallium selenide cells. This has the potential to improve the efficiency of solar panels while leveraging existing manufacturing resources, and could substantially lower the cost of solar energy.

Inpria Corporation

Lawrence Berkeley National Laboratory has been awarded \$300,000 to work with Inpria Corporation to use LBNL's Micro Exposure Tool and Dose Calibration Tool in order to improve their highly advanced photoresists, a key component in semiconductor manufacturing. This project has the potential to improve, as well as reduce, the power consumption by the semiconductors used in electronic devices. Inpria Corporation, of Corvallis, OR, employs 22 people.

BIOENERGY

Gevo

Argonne National Laboratory and the National Renewable Energy Laboratory has been awarded \$200,000 to work with Gevo to create the next-generation of biofuels that augment or replace petrochemicals. This project will specifically focus on creating a model that measures the synergistic and antagonistic relationship between gasoline and isobutanol with the goal of creating a blending model that works over a variety of representative gasoline base fuel compositions.

Cogent

Idaho National Laboratory has been awarded \$200,000 to work with Cogent towards improving its small-scale gasifier for distributed waste-to-energy applications and markets. The gasifier can be used to make many profitable end-use products such as electricity, liquid fuels, hydrogen and/or chemical precursors. This project seeks to partner with INL to properly homogenize and size the feedstock material so that it can be continuously fed into the gasifier and meet real-world feedstock processing requirements.

Kalion, Inc.

Lawrence Berkeley National Laboratory has been awarded \$200,000 to work with Kalion to reach full manufacturing scale production of glucaric acid and glucuronic acid by creating a manufacturing-ready production strain and then scaling up that strain to generate an appropriate process. The availability of such a process will expand the food, pharma, and polymer applications requiring a purity of 99+%.

Synvitrobio

Oak Ridge National Laboratory has been awarded \$200,000 to work with Synvitrobio towards development of cell-free based analytical tools to convert renewable biomass to higher-order chemicals mevalonate and vanillin. This project has the potential to lead to a 10-fold reduction in R&D time by accelerating design-build-test cycles from weeks down to eight hours.

ThermChem

Pacific Northwest National Laboratory has been awarded \$200,000 to work with ThermChem to determine how to valorize the hydrothermal carbonization (HTC) process liquids. This project aims to identify the potentially valuable and intermediate chemicals in these aqueous phases and convert them into value-added biochemical/bioproducts. The results will accelerate the commercial deployment of HTC which will benefit customers like farmers and rural food processors.

BUILDINGS

FluxTeq

Oak Ridge National Laboratory has been awarded \$120,000 to work with FluxTeq to develop an inexpensive and noninvasive BTU meter to replace current models, which are expensive and require intrusive installations. The project will partner with ORNL to test and validate the system before commercialization can occur. The final product, if successful, will significantly help FluxTeq increase product sales and expand as a company.

SkyCool Systems

Oak Ridge National Laboratory has been awarded \$150,000 to work with SkyCool Systems on improving the efficiency of their fluid-cooling panels for use in commercial refrigeration systems. ORNL will help verify and validate the energy savings of the panels when used to sub-cool a refrigeration system, such as a walk-in freezer, and to model the enhanced system's performance in a range of climate zones.

Radiant Labs

The National Renewable Energy Laboratory has been awarded \$200,000 to work with Radiant Labs to expand the capabilities of their ResStock platform, which provides municipalities with modeling tools to trace energy consumption. This will help cities assess their carbon-saving goals and provide calculated annual energy savings by scaling and modeling existing conditions.

FUEL CELLS

Hawaii Hydrogen Carriers

Savannah River National Laboratory has been awarded \$300,000 to work with Hawaii Hydrogen Carriers to perform analysis on the performance and design of low pressure hydrogen storage systems to power mobile applications of Proton Exchange Membrane hydrogen fuel cells. Using SRNL's unique modeling and system testing capabilities for metal hydride-based systems will help provide potential partners with realistic performance and cost estimates.

Emerald Energy NW, LLC

Pacific Northwest National Laboratory has been awarded \$160,000 to work with Emerald Energy NW, LLC to fabricate and test a low-friction, low-loss, versatile rotary magnetic wheel seal test apparatus in collaboration with the PNNL magnetic liquefier team. This project could result in the design of a breakthrough rotary wheel to allow for a more rapid transition to cleaner, domestic, and less expensive gaseous fuels for the transportation sector.

GEOHERMAL

US Geothermal, Inc.

The National Renewable Energy Laboratory and Idaho National Laboratory have been awarded \$150,000 to work with US Geothermal Inc. (US Geo) towards developing and deploying an integrated solar topping cycle for US Geo's existing Raft River Geothermal Power Plant, creating a profitable Geothermal-Solar Hybrid Cycle. A new, thermodynamically efficient approach would integrate concentrated solar power and binary geothermal energy to provide a lower levelized cost of electricity.

SOLAR

Folsom Labs, Inc.

The National Renewable Energy Laboratory has been awarded \$56,000 to work with Folsom Labs, Inc. to validate their existing HelioScope technology, a modeling software that helps design solar projects. Using NREL's analysis and comparisons of similar existing projects, this project aims to validate the HelioScope model and provide municipalities and financial institutions with the confidence to adopt this model over other, more costly, and time-consuming processes.

Sundog Solar Technology

The National Renewable Energy Laboratory has been awarded \$50,000 to work with Sundog Solar Technology towards developing its advanced reflector technology. With NREL's support, Sundog will improve its weatherization design and move the technology closer to commercialization. This also supports the Department of Energy's SunShot Initiative's goal of lowering the levelized cost of electricity of Concentrated Solar Power to six cents/kWh.

Arable Labs, Inc.

The National Renewable Energy Laboratory has been awarded \$140,000 to work with Arable Labs, Inc. on refining its Pulsepod technology, which quantifies solar resources such as detection, data storage, and data transmission by measuring variables and reporting data via integrated radios. This approach represents an order of magnitude cost reduction compared to what is currently available.

Ceramic Tubular Products

Sandia National Laboratory has been awarded \$160,000 to work with Ceramic Tubular Products towards developing high efficiency, low emissivity receiver tubes for Concentrated Solar Power (CSP) plants, which serve as a receiver and must retain temperatures up to 900 degrees Celsius. This project will enable future CSP plants to operate at higher temperatures and efficiency, helping to achieve the SunShot goal of six cents/KWHR levelized cost of electricity by 2020.

Terrafore Technologies LLC

Argonne National Laboratory has been awarded \$170,000 to work with Terrafore Technologies LLC, a Minnesota-based small business with three employees, to develop efficient, compact energy storage systems. This project specifically aims to coat clay capsules using advanced materials and to measure their properties, with the goal of developing a more efficient prototype for CSP. This will enable more efficient, compact energy storage at high temperatures for distributed CSP.

VEHICLES

Efficient Drivetrains, Inc.

The National Renewable Energy Laboratory has been awarded \$140,000 to work with Efficient Drivetrains to test a lightweight, plug-in hybrid electric vehicle (PHEV) powertrain. This project will help get the first heavy-duty Class 6 vehicle to the commercial market, offering consumers an option that provides significant fuel economy without limiting driving range or fuel options. Efficient Drivetrains is located in Milpitas, CA and employs 24 people.

Phinix, LLC

Argonne National Laboratory has been awarded \$300,000 to work with Phinix, LLC to validate and scale up a method for extracting magnesium from magnesium aluminide scrap metal alloys. This energy, environmental, and cost-efficient method of sourcing magnesium has the potential to reduce the amount of magnesium – the third most commonly used structural metal – needed to import from foreign countries. Phinix, LLC is located in Lexington, KY and employs 80 people.

Precision Polyolefins LLC

Argonne National Laboratory has been awarded \$180,000 to work with Precision Polyolefins LLC, of College Park, MD, to test its new technology that converts inexpensive and abundant feedstocks derived from natural gas into synthetic oils for use in auto lubricant. This project

could potentially improve fuel economy by up to 0.5%, as well as have applications beyond vehicles, such as for industrial gear oils and wind turbine gear oils.

Advano

Argonne National Laboratory has been awarded \$180,000 to work with Advano to develop functionalized silicon nanoparticles, which are used in the growing demand for lithium-ion batteries. By partnering with ANL, this project seeks to lower the cost of silicon nanoparticles which will dramatically increase the specific energy of lithium-ion batteries. This has the potential to uniquely impact the lithium-ion battery industry.

WATER-HYDROPOWER

Natel Energy, Inc.

The National Renewable Energy Laboratory has been awarded \$145,000 to work with Natel Energy, Inc. of California to model and evaluate the potential value streams of a portfolio of networked small hydropower generators. Large-scale hydropower has consistently played a significant role to the grid by providing support and flexibility to the integration of additional clean energy resources. This project is designed to advance the understanding of the value of small hydro generation to the grid of the future.

Telluride Energy

Oak Ridge National Laboratory has been awarded \$75,000 to work with Telluride Energy to identify new project opportunities at existing water treatment plants, which historically receive very few hydro development proposals. By using existing ORNL data on existing non-powered dams along with EPA data on existing water treatment plants, this project will significantly increase the number of conduit projects that receive Federal Energy Regulatory Committee approval and proceed to construction.

WATER-MARINE HYDROKINETIC ENERGY

M3 Wave LLC

The National Renewable Energy Laboratory and Sandia National Laboratories were awarded \$175,000 to work with M3 Wave LLC and adapt the company's deep-water modeling tool, NEXUS, to track differential wave energy by recreating conditions common on the ocean floor. This will be accomplished with the assistance of NREL and SNL with the goal of developing a more complex modeling system to predict and increase areas of efficiency up to 25%.

California Wave Power Technologies, LLC

Sandia National Laboratories has been awarded \$150,000 to work with CalWave to identify, design, and assess suitable decision making systems to advance Wave Energy Converter technology, then to conduct scaled prototype testing for those systems. By enhancing the efficiency of wave energy converters, which continuously tune to the ocean environment, and tying them to micro-grid solutions, this project has the potential to accelerate the adoption and increase the capacity of Marine Hydrokinetics energy in the U.S. by factors of 70% and higher.

WIND

Sentient Science Corp

Sandia National Laboratories and the National Renewable Energy Laboratory have been awarded \$295,000 to work with Sentient Science Corp on development of a prognostic solution to predict and extend wind turbine blade life. A single defective turbine blade, if not identified early, could cost wind operators up to \$300,000. The low costs of predictive health monitoring solutions for wind turbine blades could lead to millions of dollars of savings, reducing the cost of wind energy.

Wind Tower Technologies

The National Renewable Energy Laboratory has been awarded \$170,000 to work with Wind Tower Technologies, a design, service, and consulting engineering firm specializing in tall towers, to conduct economic analysis of wind farm construction and levelized costs of energy of a Self-Erecting Concrete wind turbine Tower (SECT) system. While current wind farm construction consists of a series of component installations, a systematic approach, such as the one proposed by Wind Tower Technologies via their SECT economic study, could greatly reduce the cost of electricity from wind.

WindESCo, Inc.

The National Renewable Energy Laboratory has been awarded \$200,000 to work with WindESCo, Inc. to develop and apply roto-based sensors and cloud analytics to improve their energy output, reduce component failure, and increase the length of wind farms' operational lifetimes. This Internet of Things (IoT) approach to wind farm operation can improve power production by 2% by utilizing wake mitigation strategies to optimize groups of turbines.