

PMC-ef2a

(20102)

**U.S. DEPARTMENT OF ENERGY
EERE PROJECT MANAGEMENT CENTER
NEPA DETERMINATION**



RECIPIENT: Renewable Power Conversion, Inc.

STATE: CA

PROJECT TITLE : PV String to 3-Phase Inverter with Highest Voltage Capabilities, Highest Efficiency and 25 Year Lifetime; Renewable Power Conversion, Inc. (RPC); NREL Tracking No. 11-028

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
		NREL-11-028	GO10337

Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Order 451.1A), I have made the following determination:

CX, EA, EIS APPENDIX AND NUMBER:

Description:

- B3.6** Siting, construction (or modification), operation, and decommissioning of facilities for indoor bench-scale research projects and conventional laboratory operations (for example, preparation of chemical standards and sample analysis); small-scale research and development projects; and small-scale pilot projects (generally less than two years) conducted to verify a concept before demonstration actions. Construction (or modification) will be within or contiguous to an already developed area (where active utilities and currently used roads are readily accessible).
- A9** Information gathering (including, but not limited to, literature surveys, inventories, audits), data analysis (including computer modeling), document preparation (such as conceptual design or feasibility studies, analytical energy supply and demand studies), and dissemination (including, but not limited to, document mailings, publication, and distribution; and classroom training and informational programs), but not including site characterization or environmental monitoring.
- A11** Technical advice and planning assistance to international, national, state, and local organizations.

Rational for determination:

The SunShot Incubator program represents a significant component of the U.S. Department of Energy (DOE) business strategy of partnering with U.S. industry to accelerate the commercialization of solar energy system research and development (R&D) to meet aggressive cost and installed capacity goals. The specific goal of the SunShot Incubator, and projects funded through this program, is the acceleration of solar energy technologies towards near term commercialization (2-4 years depending on the Tier). In addition, funded technologies must possess the disruptive potential to reach the DOE SunShot Initiative goal of an unsubsidized cost-competitive levelized cost of energy (≈ 6 cents/kW-hr at utility scale) by the end of the decade.

A 10kW DC-to-AC power converter (inverter) would be designed and tested for this proposed project by the recipient, Renewable Power Conversion, Inc. (RPC) of San Louis Obispo, California. The specific objective of the proposed effort is to develop a modular photovoltaic (PV) inverter which supports and enables a new utility-scale PV system approach with cost, performance, reliability and safety benefits. The research approach would use a novel inverter packaging design and a PV-specific, $\geq 98\%$ efficient, three-level neutral point clamp (3LNPC) switching topology employing silicon carbide clamp diodes. This research is expected to result in a low cost product with a 25-year maintenance-free lifetime.

The work for this proposed project would be done in six tasks, as shown below:

- Task 1 - Inverter Baseline Quantification. This would include the development of a proof-of-concept thermal model and development of a 3D SolidWorks computer thermal model that will corroborate the physical model data.
- Task 2 – Inverter Prototype Design. This would include completion of the prototype inverter design including all the formal documentation required to manufacture the inverter prototype. The subcontractor would also fully assemble two inverter prototypes employing a 3LNPC switching topology. This is expected to result in two complete, but non-functional, inverter prototypes ready to serve as target hardware for the software design task, Task 3 and thereafter Design Verification Testing (DVT) in Task 4.
- Task 3 – Inverter Software Design, including a confidential inverter Software Design Summary Report to be submitted to NREL.
- Task 4 – Inverter Design Verification Testing. This would include bench-testing, troubleshooting, hardware/software integration, hardware retrofit and substantially demonstrate design verification.
- Task 5 – Regulatory Compliance Testing. This would include the fabrication, testing and delivery of four inverter prototypes to third party testing agencies to qualify the proposed inverter to UL1741 and FCC Part 15 Class A.
- Task 6 – Inverter Highly Accelerated Life Testing (HALT). For this task, the subcontractor would purchase a HALT chamber and perform Highly Accelerated Life Testing on the developed inverter according to a reliability test plan for temperature cycling and vibrations.

