



# U.S. Department of Energy Categorical Exclusion Determination Form

Submit by E-mail

Proposed Action Title: (0474-1512) Rutgers University - First in Class Demonstration of Completely New type of SiC Bipolar Switch (15kV-20kV) for Utility Scale Inverters

Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): New Jersey

Proposed Action Description:

Funding will support development of the Voltage-Gated Bipolar Transistor (VGBT), a novel silicon carbide (SiC) bipolar power switch that could drastically improve the efficiency, performance, and reliability of power converters used in high voltage, high energy systems, including utility-scale inverter applications, solar/wind farm to grid power converters, solid-state power substations, and high voltage direct current transmission lines.

Proposed work consists of indoor laboratory-based research and development (R&D) and device testing, including (1) computer-based design, modeling, and optimization of the VGBT at voltages ranging from 15-20 kV; (2) computer-based data fitting with experimental results of VGBT modeling; (3) process development for VGBT fabrication, including novel spin-on glass processes; (4) experimental fabrication of SiC VGBTs using commercial wafers with basal plan defect density; (5) packaging and characterization of the VGBTs using AlN-sealed housing, and (6) testing of VGBTs in a LEMsys Power System mimicking inductively loaded half-bridge converter and inverter operations up to 4000V and 200A.

Indoor laboratory-based R&D and testing will be performed in dedicated laboratory and cleanroom facilities at Rutgers University's Micro Electronics Research Laboratory in Piscataway, NJ. No R&D or testing activities will take place outside of these facilities.

Categorical Exclusion(s) Applied:

A9 - Information gathering, analysis, and dissemination

B3.6 - Small-scale research and development, laboratory operations, and pilot projects

For the complete DOE National Environmental Policy Act regulations regarding categorical exclusions, including the full text of each categorical exclusion, see Subpart D of [10 CFR Part 1021](#).

Regulatory Requirements in 10 CFR 1021.410(b): (See full text in regulation)

The proposal fits within a class of actions that is listed in Appendix A or B to 10 CFR Part 1021, Subpart D.

To fit within the classes of actions listed in 10 CFR Part 1021, Subpart D, Appendix B, a proposal must be one that would not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, or similar requirements of DOE or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities (including incinerators), but the proposal may include categorically excluded waste storage, disposal, recovery, or treatment actions or facilities; (3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that preexist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources, including, but not limited to, those listed in paragraph B(4) of 10 CFR Part 1021, Subpart D, Appendix B; (5) involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity would be contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements, such as those listed in paragraph B(5) of 10 CFR Part 1021, Subpart D, Appendix B.

There are no extraordinary circumstances related to the proposal that may affect the significance of the environmental effects of the proposal.

The proposal has not been segmented to meet the definition of a categorical exclusion. This proposal is not connected to other actions with potentially significant impacts (40 CFR 1508.25(a)(1)), is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1508.27(b)(7)), and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211 concerning limitations on actions during preparation of an environmental impact statement.

Based on my review of the proposed action, as NEPA Compliance Officer (as authorized under DOE Order 451.1B), I have determined that the proposed action fits within the specified class(es) of action, the other regulatory requirements set forth above are met, and the proposed action is hereby categorically excluded from further NEPA review.

NEPA Compliance Officer:

Date Determined: 12/08/2011