U.S. Department of Energy
Categorical Exclusion Determination Form

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Proposed Action Title: Creating Innovative and Reliable Circuits Using Inventive Topologies and Semiconductors (CIRCUITS) Program (FOA Nos. DE-FOA-0001727 & DE-FOA-0001736 (SBIR))

Program or Field Office: Advanced Research Projects Agency - Energy (ARPA-E)

Location(s) (City/County/State): AR, CA, CO, CT, GA, IL, IN, MA, MI, NC, NJ, PA, TX, VA, WI

Proposed Action Description:

The CIRCUITS program seeks to accelerate the development and deployment of a new class of efficient, lightweight, and reliable power converters, based on wide-bandgap (WBG) semiconductors. Innovations from CIRCUITS projects have the potential to make significant impacts in any number of applications where electrical power is generated or used, including the electric grid, automotive electrification, and consumer electronics. The CIRCUITS Program is composed of 21 small-scale research and development projects conducted by universities, non-profit entities, for-profit entities, and federal laboratories. If successful, CIRCUITS projects will develop a revolutionary new class of power converters capable of more than doubling the power density and specific power (resulting in reduced size and weight) versus today's power converters at extremely high conversion efficiencies of >97.5% and a two-fold increase in the average time to failure.

All of the 21 CIRCUITS projects (listed in Attachment A) are covered by this Determination and fit within the class of actions identified under the DOE Categorical Exclusions identified below and do not involve any extraordinary circumstances that may affect the significance of the environmental effects of the projects. This assessment was based on a review of the proposed scope of work and the potential environmental impacts of each project. Project tasks for all of the projects under the CIRCUITS Program will be conducted in accordance with established safety and materials/waste management protocols and pursuant to applicable Federal, State, and Local regulatory requirements.

Categorical Exclusion(s) Applied:

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)

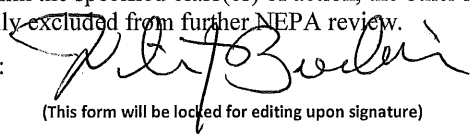
☑ The proposal fits within a class of actions that is listed in Appendix A or B to 10 CFR Part 1021, Subpart D.

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: 11/15/2017

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Attachment A: Projects in the CIRCUITS Program (FOA No. DE-FOA-0001727 & 0001736 SBIR)

Prime Recipient	Project Title	Categorical Exclusion
UTRC (1727-1505)	Capacitor Oriented Noise-Nullifier Based Ultra-Dense Converter for Advanced Electrical Systems (CONDENCE)	B3.6
Illinois Institute of Technology (1727-1507)	Wide Bandgap Solid State Circuit Breakers for AC and DC Microgrids	B3.6
UTRC (1727-1510)	Power Converstion Through Novel Current Source Matrix Converter	B3.6
Virginia Polytechnic Institute and State University (1727-1519)	High Power Density 10-kv SiC-MOSFET-based Modular, Scalable Power Converters for Medium Voltage Applications	B3.6
University of Wisconsin – Madison (1727-1539)	WBG-Enabled Current Source Inverters for Integrated PM Machine Drives	B3.6
Teledyne Scientific Company (1727-1550)	SiC-Based Direct AC-AC Power Converters (SAAC)	B3.6
University of Arkansas (1727-1566)	Reliable, High Power Density Inverters for Heavy Equipment Applications	B3.6
Eaton (1727-1573)	SiC-Based Wireless Power Transformation for Data Centers & Medium Voltage Applications	B3.6
University of Colorado – Boulder (1727-1575)	A High-Voltage High-Reliability Scalable Architecture for Electric Vehicle Power Electronics	B3.6
Marquette University (1727-1607)	Advanced parallel Resonant 1MHz, 1MW, Three Phase AC to DC Ultra Fast EV Charger	B3.6
Georgia Institute of Technology (1727-1609)	Grid-Connected Modular Soft-Switching Solid State Transformers (M-S4T)	B3.6
University of California - Berkeley (1727-1612)	Enabling Ultra-Compact, Lightweight, Efficient, and Reliable 6.6kW On-Board Bi-Directional Electric Vehicle Charger with Advanced Topology and Control	B3.6

Attachment A: Projects in the CIRCUITS Program (FOA No. DE-FOA-0001727 & 0001736 SBIR)

Prime Recipient	Project Title	Categorical Exclusion
Cree Fayetteville, Inc. (1727-1615)	Smart, Compact, Efficient 500kW DC Fast Charger	B3.6
Northeastern University (1727-1622)	A Universal Converter for DC, Single-phase AC, and Multi-phase AC Systems	B3.6
University of Illinois – Chicago (1727-1625)	Universal Battery Supercharger	B3.6
Virginia Polytechnic Institute and State University (1727-1632)	Single DC Source Based Cascaded Multilevel Inverter	B3.6
Infineon Technologies Americas Corp. (1727-1633)	Low Cost e-mode GaN HEMT Gate Driver IC enables Revolutionary Energy Savings in Variable Speed Drives for Appliance Motors	B3.6
University of California - Berkeley (1727-1639)	Extreme Efficiency 240 Vac to Load Data Center Power Delivery Topologies and Control	B3.6
Opcondys, Inc. (1736-1501) SBIR	A Bidirectional, Transformerless Converter Topology for Grid-tied Energy Storage Systems	B3.6
Empower Semiconductor, Inc. (1736-1515) SBIR	Resonant Voltage Regulator Architecture Eliminates 30-50% Energy Consumption of Digital ICs	B3.6
Imagen Energy, LLC (1736-1516) SBIR	1200V SiC Based Extremely Compact, 500 kW, 2 kHz Inverter for High Speed PMSM Applications	B3.6