U.S. Department of Energy
Categorical Exclusion Determination Form

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Proposed Action Title: University of Southern California/Information Sciences Institute -- PhAST-Gate: (Photonic Absorption Saturation-based Thresholding Gate): All-optical logic circuits to transform digital computing in the AI/ML age

Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): Berkeley, California; Ann Arbor, Michigan; Arlington, Virginia

Proposed Action Description:

Funding will support the project team's small-scale research and development of an integrated photonics-based logic gate concept (Photonic Absorption Saturation-based Thresholding Gate - PhAST-Gate) to enable all-optical computing circuits that avoid the extreme energy costs associated with training and implementing modern electronics-based generative Artificial Intelligence/Machine Learning (AI/ML) models. Specifically, the project team will (1) design and fabricate first stage chips for testing and validation; (2) make needed adjustments for final circuit and component testing and performance validation; and (3) apply testing results for development of complete PhAST-Gate system. If successful, this project will enable faster, reduced cost, and more efficient cloud computing.

Project activities will be conducted at existing facilities at the University of Southern California/Information Sciences Institute (Arlington, VA), University of Michigan (Ann Arbor, MI), and Lawrence Berkeley National Laboratory (Berkeley, CA) designed for the applicable activities. Project tasks fit within the class of actions identified under the DOE Categorical Exclusions identified below. This assessment was based on a review of the proposed scope of work and the potential environmental impacts of the project. The project team has certified that project tasks will be conducted in accordance with established safety and materials/waste management protocols and pursuant to applicable Federal, State, and local regulatory requirements. No modifications will be made to the existing facilities to accommodate the proposed work.

Categorical Exclusion(s) Applied:

A9 - Information gathering, analysis, and dissemination

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

B3.15 - Small-scale indoor research and development projects using nanoscale materials

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: GEOFFREY GOODE Digitally signed by GEOFFREY GOODE Date: 2025.03.05 08:41:42 -05'00' Date Determined:

(This form will be locked for editing upon signature)