U.S. Department of Energy
Categorical Exclusion Determination Form

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Proposed Action Title: Nitricity Inc. -- Non-Equilibrium Plasma for Energy-Efficient Nitrogen Fixation

Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): San Francisco, CA

Proposed Action Description:

Funding will support the project team's small-scale research and development activities to develop a non-thermal plasma-based reactor that produces nitrogen fertilizer using inputs of air, water, and renewable electricity. Specifically, the project team will (1) evaluate nitrogen fixation efficiency, and identify a regime to achieve less than 90 kWh/lb Nitrogen energy cost for NOx generation; (2) demonstrate a nitrogen fixation energy efficiency of 11 kWh/lb Nitrogen using a non-thermal microwave plasma reactor; and (3) conduct a techno-economic analysis and life cycle assessment. If successful, the team will demonstrate oxidation of nitrogen from the air and fixing of nitrogen in nitric acid at a tiny fraction of the current carbon intensity of the typical Haber-Bosch process. Ultimately, the project team's research could mitigate fertilizer-production emissions by hundreds of Mtons CO2eq/yr. Further, the team's technology would scale down and couple to irrigation systems, thereby enabling a further mitigation of field-based N2O emissions amounting to additional hundreds of Mtons of CO2eq/yr.

Project activities will be conducted at an existing Nitricity facility in San Francisco, CA and at Lawrence Berkeley National Lab (Berkeley, CA). 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. While no modifications will be made to existing facilities to accommodate the proposed work, the project team will procure a high-powered MW plasma generation system and a FTIR gas analyzer system.

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: GEOFFREY GOODE Digitally signed by GEOFFREY GOODE Date: 2021.06.22 06:00:11 -04'00'

Date Determined:

(This form will be locked for editing upon signature)