



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

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Proposed Action Title: University of Colorado, Boulder - Precision Agriculture using Networks of Degradable Analytical Sensors (PANDAS)

Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): Boulder, Colorado; Fort Collins, Colorado; Berkeley, California; Manhattan, Kansas

Proposed Action Description:

AMENDED NEPA DETERMINATION: (See attached original Determination, dated January 24, 2019)

This Amended Determination follows the approval of additional funds to support the project team's small-scale, research and development activities to develop, fabricate, and test a network of additively manufactured, biodegradable soil sensor nodes with costs of < \$1 per unit. The specific work the team will perform, and the goals of such work, remain as described under the original Determination. The additional funds compensate for delays due to COVID-19 restrictions. However, one of the project team members, who was to perform work under the original Determination at Colorado State University has moved to Kansas State University.

Project activities will be conducted at existing facilities at University of Colorado, Boulder (Boulder, CO); Colorado State University (Fort Collins, CO); and Kansas State University (Manhattan, Kansas) designed for the applicable activities. Project tasks continue to fit within the class of actions identified under the DOE Categorical Exclusion identified below and do not involve any extraordinary circumstances that may affect the significance of the environmental effects of the project. This assessment was based on a review of the proposed scope of work and the potential environmental impact of the project. 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.

Categorical Exclusion(s) Applied:

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

A9 - Information gathering, analysis, and dissemination

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: 2021.12.16 11:01:14 -05'00'

Date Determined:



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Location(s) (City/County/State): Boulder, Colorado; Fort Collins, Colorado; Berkeley, California

Proposed Action Description:

Funding will support the project team's small-scale research and development activities to develop, fabricate, and test a network of additively manufactured, biodegradable soil sensor nodes with costs of < \$1 per unit. Specifically, the project team will (1) develop the biodegradable materials for the sensor, (2) fabricate sensor components using print-based additive manufacturing, and (3) field test the biodegradable sensor system under appropriate agricultural conditions. If successful, these sensor nodes will enable a > 100x increase in information density over current technology, thereby enhancing input use efficiency, crop yields, and farm profitability while mitigating environmental losses and substantially decreasing energy use for fuel crops.

Project activities will be conducted at existing facilities at University of Colorado, Boulder (Boulder, CO), Colorado State University (Fort Collins, CO), and University of California, Berkeley (Berkeley, CA) designed for the applicable activities. 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 facility to accommodate the proposed work. University of Colorado, Boulder under the terms of its ARPA-E Cooperative Agreement, is prohibited from commencing applicable project work involving pesticides before (1) obtaining the necessary permits and approvals and (2) providing written assurances to ARPA-E of the same.

Categorical Exclusion(s) Applied:

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 Good)* Date Determined: 01/24/2019  
*for William Bierbauer*  
(This form will be locked for editing upon signature)