



U.S. Department of Energy Categorical Exclusion Determination Form

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Proposed Action Title: (0470-1530) Lawrence Berkeley National Laboratory - FOLIUM - Developing Tobacco as a Platform for Foliar Synthesis of High-Density Liquid Biofuels

Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): Berkeley, CA and Lexington, KY.

Proposed Action Description:

Funding will support development of a genetically modified (GM) tobacco plant with leaves that produce liquid biofuels during photosynthesis by installing unique bio-accumulating pathways from cyanobacteria (*Synechocystis* sp. PCC6803) and microalgae (*Botryococcus braunii*) into tobacco. The intended outcome of this effort would be the creation of a crop plant capable of directly converting atmospheric carbon dioxide into alkane and terpenoid oils suitable for immediate use as a drop-in fuel.

Proposed work will consist of (1) designing and installing the biosynthetic pathway from *Synechocystis* sp. PCC68603 into tobacco to enable accumulation of alkane hydrocarbon fuel molecules; (2) designing and installing a botryococcene oil (Btc-oil) biosynthetic pathway from *Botryococcus braunii* into tobacco to enable accumulation of terpenoid hydrocarbon fuel molecules; (3) analyzing, modeling, and engineering an optimized pathway to direct carbon towards the production of alkane and terpenoid hydrocarbons; (4) modeling and genetically engineering the chlorophyll antenna size of the photosystems within tobacco to optimize absorption and utilization of sunlight, minimize wasteful dissipation of sunlight, and enable re-sprouting of tobacco; (5) in-lab testing, analysis, and evaluation of GM tobacco plants; and (6) outdoor field testing of non-GM tobacco plants to optimize biomass production. This project will not involve field testing with GM plants.

Proposed work will take place at Lawrence Berkeley National Laboratory (Berkeley, CA), University of California (Berkeley, CA), University of Kentucky research facilities (Lexington, KY). All participants will carry out all activities involving recombinant DNA molecules, GM microorganisms, and GM plants in accordance with the NIH Guidelines for Research Involving Recombinant DNA Molecules

Categorical Exclusion(s) Applied:

- B3.6 - Small-scale research and development, laboratory operations, and pilot projects
- B3.8 - Outdoor terrestrial ecological and environmental research

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: 12/5/2011