PMC-ND
(1.08.09.13)

U.S. DEPARTMENT OF ENERGY
OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY
NEPA DETERMINATION

RECIPIENT: IBM, Almaden Research Center **STATE:** CA

PROJECT TITLE: Upcycling PET via VolCat process

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002245	DE-EE0009298	GFO-0009298-001	GO9298

Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Policy 451.1), I have made the following determination:

CX, EA, EIS APPENDIX AND NUMBER:
Description:

A9 Information gathering, analysis, and dissemination	Information gathering (including, but not limited to, literature surveys, inventories, site visits, and audits), data analysis (including, but not limited to, computer modeling), document preparation (including, but not limited to, conceptual design, feasibility studies, and analytical energy supply and demand studies), and information dissemination (including, but not limited to, document publication and distribution, and classroom training and informational programs), but not including site characterization or environmental monitoring. (See also B3.1 of appendix B to this subpart.)
B3.6 Small-scale research and development, laboratory operations, and pilot projects	Siting, construction, modification, operation, and decommissioning of facilities for smallscale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment.

Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide funding to IBM - Almaden Research Center to optimize, scale-up, and demonstrate the existing VolCat (volatile catalyst) process for upcycling plastic bottles and polyester textile waste into new bottles, new garments, and new high value plastics.

IBM would validate the VolCat technology and would verify baseline yields at the bench scale. Experiments at both IBM and the National Renewable Energy Laboratory (NREL) would determine the extent of recovery and change in composition of feedstocks (bottles and polyester from waste textiles). Feedstocks and plastic fibers would be provided by, and resultant materials evaluated and utilized by, a variety of project partners, as identified below. IBM would then develop a global model for the overall process to use for scale-up. A scaled up pilot-scale system capable of continuous flow operation by use of an auger to supply feedstocks would then be integrated at NREL and would include a reactor, catalyst separation (flash tank or similar), filtration, ion exchange, and activated carbon. The continuous flow operation would be designed to demonstrate fabric-to-bottle open-loop upcycling and synthesis of a higher-value polymer. Over the life of the project, IBM and NREL would utilize up to 400 kg of feedstock and plastic fibers and up to 150 kg of ethylene glycol, and would produce up to 50 kg of a higher quality (rPET) product. Final rPET product would then be both tested and utilized in a variety of molding operations by project partners, as identified below. Techno-economic and lifecycle analyses would be run throughout the project.

Proposed project activities by location are listed below:

IBM, Almaden Research Laboratory – San Jose, CA

• Perform VolCat baseline optimization activities including testing the new inputs in the depolymerization process, analysis of product from the process, and synthesizing the monomer for testing/polymerization.

National Renewable Energy Laboratory – Golden, CO

• Perform baseline and pilot-scale VolCat optimization activities including development and optimization of downstream separations processes and reactor and reaction engineering.
• Run technoeconomic analysis and life cycle assessment.

Unifi Manufacturing, Inc. – Reidsville, NC

• Provide various grades of plastic flake and waste polyester inputs to the VolCat process and provide fiber spinning capabilities utilizing product made from the output.

Unifi Manufacturing, Inc. – Yadkinville, NC

• Spin fibers from resin produced from VolCat output.

UnderArmour – Baltimore, MD

• Supply PET fiber materials as inputs for the VolCat process, evaluate fiber materials from the project, demonstrate closed loop recycling fiber to fiber and garment to garment.

Niagara Bottling – Ontario, CA

• Provide plastic processing for bottle fabrication, provide samples of preforms and bottles prepared using their process, and provide range of analyses on the resin prepared from the VolCat product.
• Test the resin physical properties, make preform, blow bottles, test the bottle performance against a standard bottle.

Milliken and Company Corporate Headquarters – Spartanburg, SC

• Provide textile inputs for the VolCat process, characterize fibers post-VolCat process, and provide spinning, weaving, dyeing, and finishing capability to process product.
• Small scale activities would be done at the headquarter's Rapid Prototyping Center, large scale activities would be at several Milliken plants located across the southeastern United States.

Husky Injection Molding Systems Headquarters – Bolton, ON

• Utilize Injection Molding lab to rapidly assess performance of polymer produced from VolCat product in modern injection molding equipment.

Oklahoma State University – Tulsa, OK

• Provide a range of polymer testing and analytic capabilities and possibly modify the material produced from VolCat for testing in packaging.

Project activities would occur in purpose-built facilities. No changes in the use, mission, or operation of existing facilities would be required as part of this project and no additional permits would be required in order to conduct any of the work activities.

Project activities would involve the use and handling of hazardous materials, including industrial organic materials. Any risks associated with the handling of these materials would be mitigated through adherence to established health and safety policies and procedures. Protocols would include employee training, the use of personal protective equipment, monitoring, internal assessments, and engineering controls. All waste products would be disposed of by licensed waste management service providers. IBM - Almaden Research Center and its project partners would observe all applicable Federal, state, and local health, safety, and environmental regulations.

Any work proposed to be conducted at a federal facility may be subject to additional NEPA review by the cognizant federal official and must meet the applicable health and safety requirements of the facility.

NEPA PROVISION

DOE has made a final NEPA determination.

Notes:

Bioenergy Technologies Office
This NEPA determination does not require a tailored NEPA provision.
Review completed by Shaina Aguilar on 7/7/21.

FOR CATEGORICAL EXCLUSION DETERMINATIONS

The proposed action (or the part of the proposal defined in the Rationale above) 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 proposed action that may affect the significance of the environmental effects of the proposal.

The proposed action 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.

DOE has determined that work to be carried out outside of the United States, its territories and possessions is exempt from further review pursuant to Section 5.1.1 of the DOE Final Guidelines for Implementation of Executive Order 12114; “Environmental Effects Abroad of Major Federal Actions.”

The proposed action is categorically excluded from further NEPA review.

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature: Electronically Signed By: Roak Parker Date: 7/14/2021

NEPA Compliance Officer

FIELD OFFICE MANAGER DETERMINATION

- [x] Field Office Manager review not required
- [ ] Field Office Manager review required

BASED ON MY REVIEW I CONCUR WITH THE DETERMINATION OF THE NCO :

Field Office Manager's Signature: _____ Date: _____

Field Office Manager