

PMC-ND

(1.08.09.13)

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

**RECIPIENT:**Arzeda Corp.**STATE:** WA

**PROJECT TITLE:** Fermentative production of Tulipalin A: a next-generation, sustainable monomer that drastically improves the Performance of pMMA

<b>Funding Opportunity Announcement Number</b>	<b>Procurement Instrument Number</b>	<b>NEPA Control Number</b>	<b>CID Number</b>
DE-FOA-0001916	DE-EE0008495	GFO-0008495-001	GO8495

**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 federal funding to Arzeda Corp. to produce polymer-grade alpha-methylene butyrolactone (MBL) via a fermentation-downstream process and confirm the performance-enhanced properties of MBL-containing polymers. Project work would seek to optimize and lower the costs of production of MBL.

The project would be completed over three Budget Periods (BPs), with a Go/No-Go Decision Point in between each BP. Larger scale fermentations (300 L) would be completed in BP3 at a facility that has yet to be identified. This work would be conducted as part of BP 3 Task 7. Because the work to be conducted as part of Tasks 7 and 8 would be dependent on the facility chosen (e.g. available equipment, staff, and expertise), these tasks will be reviewed at a later date when additional information is available. Accordingly, this review only covers BP1, BP2 and BP3 Tasks 1-6.

Proposed project activities would include data analysis, computer modeling (e.g. computation protein/enzyme design), genetic engineering (e.g. gene synthesis, DNA sequencing, chromosomal integration), fermentation of lignocellulosic hydrolysate using bacterial and fungal strains, strain optimization, and fermentation process optimization (1L and 10L batches).

All project activities would be completed in existing, purpose-built laboratory facilities. Strain development and fermentation (in batches up to 10L) would be completed at Arzeda's laboratory facility in Seattle, WA. Additional polymer testing would be completed at the Pacific Northwest National Laboratory (PNNL), in Richland, WA. Both facilities regularly conduct work similar in nature to that proposed as part of the project's scope. No change in the use, mission or operation of existing facilities would be required.

Industrial chemicals, lignocellulosic hydrolysate, and microorganisms would be used and handled throughout the project. One of the microorganisms that would be handled is a fungal strain that would generally require biosafety

level 1 (BSL-1) containment and accordingly, would be handled adhering to BSL-1 level safety requirements. However, the spores of this strain are classified as requiring BSL-2 containment precautions. For this project, the only steps that have the potential to create spores are plating procedures. Consequently, for plating and handling plates, Arzeda would implement BSL-2 safety measures. Among protocols to be implemented, a ductless benchtop hood with a HEPA filter installed would be used during plating. Plates would be sealed in autoclave bags and only opened inside of the hood. They would also be decontaminated before removal from the hood. Arzeda would take all necessary precautions to ensure that this organism, as well as all other project materials are handled safely. All project activities would be completed indoors, in laboratory settings. Established health and safety policies and procedures would be adhered to at all times. Protocols would include the use of personal protective equipment, staff training, monitoring, and internal assessments.

Biological materials and organisms would be handled in controlled laboratory conditions with no floor drains or risks of contamination to the outside environment. All materials would be contained and disposed of properly. DNA and biological organisms would be disposed of in bio-hazard waste containers for incineration. All non-disposable pieces of equipment would be sterilized using an autoclave. Any DNA or production organism stored for future experimentation would be stored at -80°C.

Arzeda and its project partners would adhere to all applicable Federal, State and local health, safety and environmental regulations.

Any work proposed to be conducted at a DOE laboratory may be subject to additional NEPA review by the cognizant DOE NEPA Compliance Officer for the specific DOE laboratory prior to initiating such work. Further, any work conducted at a DOE laboratory must meet the laboratory's health and safety requirements.

#### **NEPA PROVISION**

DOE has made a conditional NEPA determination.

The NEPA Determination applies to the following Topic Areas, Budget Periods, and/or tasks:

Budget Period 1

Budget Period 2

Budget Period 3 (Task 6 only)

The NEPA Determination does not apply to the following Topic Area, Budget Periods, and/or tasks:

Budget Period 3 (Tasks 7 and 8)

Include the following condition in the financial assistance agreement:

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.

Notes:

Bioenergy Technologies Office

This NEPA determination requires a tailored NEPA Provision.

NEPA review completed by Jonathan Hartman, 12/31/2018

#### **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.

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: \_\_\_\_\_



**Casey Strickland**

NEPA Compliance Officer

Date: 1/2/2019

**FIELD OFFICE MANAGER DETERMINATION**

- 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: \_\_\_\_\_

Field Office Manager

Date: \_\_\_\_\_