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

**RECIPIENT:** Texas Tech University **STATE:** TX

**PROJECT TITLE:** Designing a Methane Dehydroaromatization (MDA) Process for Feedstock Flexibility and High-On-Stream Time via Dynamic Kinetic and Thermodynamic Control

| Funding Opportunity Announcement Number | Procurement Instrument Number | NEPA Control Number | CID Number |
|---|---|---|---|
| DE-FOA-0002252 | DE-EE0009412 | GFO-0009412-001 | GO9412 |

**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 Texas Tech University (TTU) to develop a process for the production of aromatics, hydrogen, and small alkene co-products using natural gas feedstocks. Specifically, a non-oxidative direct conversion process would be utilized, which would be enabled through the synthesis of stable methane dehydroaromatization (MDA) catalysts. A pilot-scale reactor would be designed and fabricated for the project and utilized for catalyst testing. The project would be completed over two Budget Periods, with a Go/No-Go Decision Point in between each BP. This NEPA Determination is applicable to both BPs.

Proposed project activities would include computer modeling, material synthesis (e.g., catalysts, membranes), material characterization, kinetic testing of catalysts, and technoeconomic analysis. All synthesis would be performed at laboratory scales, with approximately 205 kg of catalyst material to be synthesized over the life of the project. Kinetic testing would be performed at the facilities of the Idaho National Laboratory (INL), TTU, and Stanford University. For kinetic testing, two gradient feed membrane reactors (GFMRs) would be assembled on-site at TTU and Stanford University's Stanford Synchrotron Radiation Lightsource (SSRL). The GFMRs would be assembled from commercial off-the-shelf components (e.g., test tubes, pipes, pressure gauges, etc.) in a catalyst test bed. No facility modifications would be required for the assembly of the GFMRs.

TTU would manage the project and coordinate all project activities between the project team. TTU would perform computer modeling, material synthesis, material characterization, kinetic testing, and technoeconomic analysis at laboratory facilities at its campus in Lubbock, TX. Shepherd Chemical would perform material synthesis and material characterization at its laboratory facilities in Norwood, OH. Additional material characterization would be performed at Stanford University's SSRL, in Menlo Park, CA. Forge Nano would perform material characterization and material synthesis at its manufacturing facility in Thornton, CO. Additionally, Forge Nano would fabricate an atomic layer deposition (ALD) particle coating system, which would be used by TTU for catalyst synthesis. No physical modifications to existing facilities, ground disturbance, or changes to the use, mission, or operation of existing facilities would be required. No additional permits or authorizations would be required.

Project work would involve the use and handling of metals, industrial chemicals, and pressurized gases. All such handling would be performed in controlled laboratory environments that engage in experimental chemistry as part of their regular course of business. In order to mitigate potential hazards, TTU and its project partners would adhere to established institutional health and safety policies and procedures. Protocols would include personnel training, the use

of personal protective equipment, engineering controls, monitoring, and regular internal assessments. Experiments involving chemical reactions would be performed under fume hoods to properly ventilate any emissions generated. Waste materials would be disposed of by a qualified waste management company. TTU and its project partners would observe all applicable Federal, state, and local health, safety, and environmental regulations. Nanoscale thin film materials would be synthesized as part of the project. However, loose nanoparticles would not be generated, since synthesis would occur through deposition processes.

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:

Advanced Manufacturing Office
This NEPA determination does not require a tailored NEPA Provision.
NEPA review completed by Jonathan Hartman, 04/21/2021

**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.

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: Casey Strickland Date: 4/22/2021

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