

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



RECIPIENT: University of Arizona

STATE: AZ

PROJECT TITLE : Agrivoltaics creates more sustainable energy, food, and water futures for the Southwestern United States: Opportunities at the MW scale

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002697	DE-EE0010438	GFO-0010438-001	

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.)

A11 Technical advice and assistance to organizations

Technical advice and planning assistance to international, national, state, and local organizations.

B3.1 Site characterization and environmental monitoring

Site characterization and environmental monitoring (including, but not limited to, siting, construction, modification, operation, and dismantlement and removal or otherwise proper closure (such as of a well) of characterization and monitoring devices, and siting, construction, and associated operation of a small-scale laboratory building or renovation of a room in an existing building for sample analysis). Such activities would be designed in conformance with applicable requirements and use best management practices to limit the potential effects of any resultant ground disturbance. Covered activities include, but are not limited to, site characterization and environmental monitoring under CERCLA and RCRA. (This class of actions excludes activities in aquatic environments. See B3.16 of this appendix for such activities.) Specific activities include, but are not limited to: (a) Geological, geophysical (such as gravity, magnetic, electrical, seismic, radar, and temperature gradient), geochemical, and engineering surveys and mapping, and the establishment of survey marks. Seismic techniques would not include large-scale reflection or refraction testing; (b) Installation and operation of field instruments (such as stream-gauging stations or flow-measuring devices, telemetry systems, geochemical monitoring tools, and geophysical exploration tools); (c) Drilling of wells for sampling or monitoring of groundwater or the vadose (unsaturated) zone, well logging, and installation of water-level recording devices in wells; (d) Aquifer and underground reservoir response testing; (e) Installation and operation of ambient air monitoring equipment; (f) Sampling and characterization of water, soil, rock, or contaminants (such as drilling using truck- or mobile-scale equipment, and modification, use, and plugging of boreholes); (g) Sampling and characterization of water effluents, air emissions, or solid waste streams; (h) Installation and operation of meteorological towers and associated activities (such as assessment of potential wind energy resources); (i) Sampling of flora or fauna; and (j) Archeological, historic, and cultural resource identification in compliance with 36 CFR part 800 and 43 CFR part 7.

Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide federal funding to the University of Arizona (UA) to design, develop, and implement an agrivoltaic project at a utility-scale photovoltaic (PV) developer, as well as developing a laboratory to examine food production practices, native grass mixes, and climate smart crops and their interaction with PV installations.

The proposed project would consist of plant, soil, and microclimate monitoring at three agrivoltaic research zones at the AES PV facility (Casa Grande, AZ). UA would carry out the design and deployment of the research plan, laboratory analyses, and equipment calibration. The National Renewable Energy Laboratory (Golden, CO) and the University of Maryland (UMD) (College Park, MD) would assist in design and development of the research plan and data analysis.

During Tasks 2, 3, 4, 9, 10, and 11, the project team would carry out planting and field sampling at the field site. The field site would contain a 121 megawatt (MW) traditional utility-scale PV facility. Three different agrivoltaic treatments would be established, in addition to agricultural and PV control plots. Proposed planting and sampling methods would

include the following:

1) PV and climate smart crops

- a. Five replicates of five different types of climate smart crops would be planted.
- b. Holes would be dug and nutrient amendments would be added for 100 linear feet of each climate smart crop planted in rows between PV panels.
- c. Soils would be analyzed prior to planting by taking five replicate soil samples from areas within the treatment area by sterilized trowels to remove approximately 100 grams (g) of the soil from the top 25 centimeters (cm) of the surrounding soils.
- d. The research plots would be established by rebar stakes in the ground with high-visibility flagging added.
- e. Drip irrigation would be established.
- f. Sites would be checked biweekly.
- g. Microclimate monitoring sensors would be established by installing a minimum of three sensors 1 meter (m) above the soil surface mounted on a post placed within the center of the rows of PV panels where crops would be planted, and three sensors would be placed 5 cm into the soil in the center of the rows between the PV panels.
- h. Photosynthesis and transpiration data would be collected from at least five replicates by inserting a leaf from the selected plant into a portable photosynthetic device.
- i. Leaves would be collected to analyze leaf chemistry from five replicate samples.
- j. Crops would be harvested routinely by hand and biomass would be calculated with a balance in the field.

2) PV and native grasses

- a. Five replicates of mixes of native grasses and single species would be planted.
- b. The site would be tilled, and nutrients would be added before planting.
- c. Soils would be analyzed prior to planting by taking five replicate soil samples from areas within the treatment area by sterilized trowels to remove approximately 100 g of the soil from the top 25cm of the surrounding soils.
- d. The research plots would be established by rebar stakes in the ground with high-visibility flagging added for 100 linear feet of grass in a row between PV panel pivot points to create some areas shaded under PV panels and some full sun areas.
- e. Drip irrigation would be established.
- f. Biweekly checks would be carried out for the first six months to ensure germination and reseed accordingly.
- g. Microclimate monitoring sensors would be established by installing a minimum of three sensors 1m above the soil surface mounted on a post placed within the center of the rows of PV panels where crops would be planted, and three sensors would be placed 5cm into the soil in the center of the rows between the PV panels.
- h. Sensors would also be installed at the western- and eastern-drip edges of the PV panels, as well as under the PV panel.
- i. Photosynthesis and transpiration data would be collected from at least five replicates by inserting a leaf from the selected plant into a portable photosynthetic device.
- j. Leaves would be collected to analyze leaf chemistry from five replicate samples.
- k. Grasses would be harvested routinely by hand and biomass would be calculated with a balance in the field.

3) PV and current agricultural crops

- a. Five replicates of crop species and control treatment areas would be established.
- b. Holes would be dug, and nutrients would be added before planting.
- c. Soils would be analyzed prior to planting by taking five replicate soil samples from areas within the treatment area by sterilized trowels to remove approximately 100 g of the soil from the top 25 cm of the surrounding soils.
- d. The research plots would be established by rebar stakes in the ground with high-visibility flagging added for 100 linear feet of each crop row between PV panels.
- e. Drip irrigation would be established.
- f. Sites would be checked biweekly.
- g. Microclimate monitoring sensors would be established by installing a minimum of three sensors 1m above the soil surface mounted on a post placed within the center of the rows of PV panels where crops would be planted, and three sensors would be placed 5cm into the soil in the center of the rows between the PV panels.
- h. Photosynthesis and transpiration data would be collected from at least five replicates by inserting a leaf from the selected plant into a portable photosynthetic device.
- i. Leaves would be collected to analyze leaf chemistry from five replicate samples.
- j. Crops would be harvested routinely by hand and biomass would be calculated with a balance in the field.

After sampling, laboratory analyses would be performed on collected leaves and harvested crops, as well as calculations and analyses on collected microclimate, transpiration, and photosynthesis data. Economic benefits and tradeoffs would be calculated.

Outreach and engagement would be performed to engage a wide variety of stakeholders. Pending Institutional Review Board review for UA and UMD, stakeholder interviews would be conducted. In addition, a website would be created, tours of the research site would be hosted, and results would be disseminated to Minority Serving Institutions.

The U.S. Fish and Wildlife Service Endangered Species Program website (IPaC) identifies two threatened or endangered species, the Monarch Butterfly and the Yellow-billed Cuckoo. Migratory bird species of conservation concern may be present seasonally within the project areas. However, because the site is a working industry-scale PV site and equipment installations would be temporary, limited to standard types of noninvasive surveying tools, and result in negligible ground disturbance, DOE has determined that no adverse impacts to species of concern are to be expected as a result of the proposed activities at this location.

The proposed project activities may include the use of pesticides if needed to successfully grow the crops. Only natural or non-hazardous pesticides would be used, and all staff would be appropriately trained. All working condition would be managed in accordance with federal, state, and local environmental regulations. Existing corporate health and safety policies and procedures would be followed, including employee training and proper protective equipment.

The proposed project would not involve the permanent modification of existing/planned facilities or any change in the use, mission, or operation of these facilities. DOE also conducted a review of potential issues related to other resources of concern, including prime farmland, and found no effects that would be expected to result from the proposed project activities.

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.

Include the following condition in the financial assistance agreement:

If during project work cultural or archaeological artifacts are encountered, the recipient shall stop the site-based activities immediately and inform the DOE Project Officer of the finding. A Class III: Intensive Cultural Resources Inventory shall be required prior to re-commencing project work.

Notes:

Solar Energy Technologies Office (SETO)
NEPA review completed by Alex Colling on 07/12/2023.

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: Andrew Montano

NEPA Compliance Officer

Date: 7/24/2023

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: _____