



U.S. Department of Energy Categorical Exclusion Determination Form

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Proposed Action Title: University of Tennessee, Knoxville - A Smart and Flexible Microgrid with a Low-cost Scalable Open-source Controller

Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): Knoxville, TN; Chattanooga, TN; Austin, TX; Raleigh, NC

Proposed Action Description:

Funding will support the project team's small-scale, research and development activities to develop an open source microgrid controller to accommodate dynamic changes in microgrid boundaries based on the current status of power availability and thereby dynamic topology management at the grid distribution level. Specifically, the project team will: (1) design the microgrid in a community power system; (2) design open-source microgrid controller based on industrial standards; and (3) testing the microgrid system and controller in the field.

Project tasks will be conducted on a small-scale basis in dedicated laboratory, testing, and fabrication and research facilities at Chattanooga Electric Power Board (Chattanooga, TN); National Instruments (Austin, TX); Electric Power Research Institute (Chattanooga, TN); Green Energy Corp (Raleigh, NC); and Tennessee Valley Authority (Knoxville, TN). The project team will comply with applicable local, state, and federal regulations and incorporate appropriate control technologies and best management practices in all project activities. Minor modifications will be made to existing facilities at the Chattanooga Electric Power Board location to accommodate the proposed work. Approximately 4'x7' of previously-disturbed and developed ground will be disturbed to install a storage unit for the battery-based energy storage system. Prime Recipient University of Tennessee, Knoxville is required, under the terms of its ARPA-E Cooperative Agreement, to secure all necessary permits and authorizations prior to conducting facility modification and to provide ARPA-E with written assurances of acquiring such permits.

Categorical Exclusion(s) Applied:

B3.6 - Small-scale research and development, laboratory operations, and pilot projects

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: 03/24/2016

(This form will be locked for editing upon signature)





**PROJECT ENVIRONMENTAL REVIEW
MEMORANDUM TO THE RECORD**

Lead Organization: University of Tennessee, Knoxville

Project Title: A Smart and Flexible Microgrid with a
Low-cost Scalable Open-source
Controller

Date: March 24, 2016

<p>Approved: </p> <p>William J. Bierbower ARPA-E NEPA Compliance Officer</p> <p>Concurred: </p> <p>Dr. Sonja Glavaski ARPA-E Program Director</p>

INSTRUCTIONS: Please complete Sections I - V of this memorandum form. Please complete all relevant fields. Where a particular field is irrelevant to the project under review, please indicate "N/A" in the field.

SECTION I. PROJECT INFORMATION

Funding Opportunity Announcement (if any): DE-FOA-0001261: Open Funding Opportunity Announcement 2015 (OPEN 2015)

Lead Organization: University of Tennessee, Knoxville

Other Participants (Subrecipients, Contractors, etc.): Chattanooga Electric Power Board; National Instruments; Electric Power Research Institute; Green Energy Corp; Tennessee Valley Authority

Locations of Work (City, State): Knoxville, TN; Chattanooga, TN; Austin, TX; Raleigh, NC

SECTION II. NEPA ANALYSIS

A. CATEGORICAL EXCLUSION(S) APPLIED

The activities to be conducted under this project fit within the class(es) of actions listed in Categorical Exclusion(s) B3.6 (Small-scale research and development, laboratory operations, and pilot projects). Categorical Exclusion(s) cover(s):

B3.6: Small-scale research and development, laboratory operations, and pilot projects. Siting, construction, modification, operation, and decommissioning of facilities for small-scale 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.

The proposed activities satisfy the elements and requirements of Categorical Exclusion(s).

Funding will support research and development activities to develop an open source microgrid controller to accommodate dynamic changes in microgrid boundaries based on the current status of power availability and thereby dynamic topology management at the grid distribution level. Specifically, the project team will: (1) design the microgrid in a community power system; (2) design open-source microgrid controller based on industrial standards; and (3) testing the microgrid system and controller in the field at the Chattanooga Electrical Power Board facility. If successful, a universal, open source, flexible microgrid controller would significantly improve the efficient use of microgrids and decrease their management costs.

Minor modifications will be made to existing facilities at the Chattanooga Electric Power Board location to accommodate the proposed work. Approximately 4'x7' of previously-disturbed and developed ground will be disturbed to install a storage unit for the battery-based energy storage system and the the existing photovoltaic generation interconnection may also be modified. The project team will obtain all necessary approvals before installing the storage unit.

The project team will comply with applicable local, state, and federal regulations and incorporate appropriate control technologies and best management practices in all project activities. University of Tennessee, Knoxville is required, under the terms of its ARPA-E

Cooperative Agreement, to secure all necessary permits prior to facility modification and to provide ARPA-E with written assurances of acquiring such permits prior to facility modification.

B. EXTRAORDINARY CIRCUMSTANCES ANALYSIS (All Categorical Exclusions)

The proposed project will involve the following:

- a. Use, handling, storage, transport, or disposal of radioactive, toxic, or hazardous chemicals or materials Yes No

- b. Use, handling, storage, transport, or disposal of genetically engineered organisms recombinant DNA. Yes No

- c. Use, handling, storage, transport, or disposal of nanoscale materials Yes No

- d. Use, handling, storage, transport, or disposal of solid wastes Yes No

- e. Emissions into the ambient air Yes No

- f. Release of pollutants/contaminants into water resources Yes No

- g. Substantial noise pollution Yes No

- h. Adverse community-based environmental impacts Yes No

Comments: The proposed scope of work includes research and development activities for an open source microgrid controller in laboratory and research facility settings. The project team also intends to conduct field testing of the electrical system in dedicated electrical facilities at the Chattanooga Electric Power Board location. Field testing will require approximately 4'x7' of ground disturbance to install a storage unit for the battery-based energy storage system and may also require modification of existing photovoltaic generation interconnection.

Project activities will include the use, handling, storage, transport, and disposal of small quantities of routine, non-hazardous, solid wastes from normal laboratory operations and typical equipment installation requiring minimal ground disturbance. Solid wastes will be disposed according to existing facility management plans, and in accordance with all federal, state, and local requirements.

C. INTEGRAL ELEMENTS ANALYSIS (Appendix B Categorical Exclusions Only)

The proposed project will:

- a. Threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health or similar requirements of DOE or Executive Orders.

Yes No

- b. Require siting/construction or major expansion of waste storage, disposal, recovery, or treatment facilities.

Yes No

- c. Disturb hazardous substances, pollutants, contaminants, or petroleum/natural gas products that preexisted in the environment, resulting in an uncontrolled/unpermitted release.

Yes No

- d. Have potential to cause significant impacts on environmentally sensitive resources.

Yes No

- e. For projects involving genetically engineered (GE) organisms, synthetic biology, governmentally designated noxious weeds, or invasive species:

- i. Such organisms will be contained and confined in a manner designed and operated to prevent unauthorized release into the environment.

N/A Yes No

- ii. Activities involving recombinant DNA will be conducted in accordance with NIH Guidelines for Research Involving Recombinant DNA Molecules

N/A Yes No

- iii. Activities involving GE organisms with pesticidal qualities will be conducted in accordance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. § 136 et seq.) and EPA's FIFRA Implementing Regulations (40 C.F.R. Parts 150-189).

N/A Yes No

- iv. Activities involving GE organisms that may pose a risk to plant/animal health will be conducted in accordance with the APHIS Regulations (7 C.F.R. Part 340).

N/A Yes No

- v. Activities involving new GE organisms will be conducted in accordance with the Toxic Substances Control Act (TSCA) (15 U.S.C. § 2601 et seq.) and EPA's TSCA Implementing Regulations (7 C.F.R. Parts 700-790).

N/A Yes No

Comments: None

SECTION III. ADDITIONAL COMMENTS/ANALYSIS

The proposed scope of work includes research and development activities for an open source microgrid controller in laboratory and research facility settings. The project team also intends to conduct field testing of the electrical system in dedicated electrical facilities at the Chattanooga Electric Power Board location. At this time, University of Tennessee, Knoxville has not secured the necessary permits or authorizations to perform this portion of the proposed project. To ensure that facility modification activities comply with all applicable local, state, and federal regulations, a condition on award will be required as part of the NEPA determination.

SECTION IV. RECOMMENDATION FOR CONDITION ON AWARD

It is recommended that the following condition be included in the award:

Facility modification may begin only after the Prime Recipient demonstrates that it has secured all necessary permits in accordance with applicable local, state, and federal regulations.

If the Prime Recipient moves forward with the facility modification without obtaining and submitting the permits to ARPA-E, the Prime Recipient is doing so at the risk of not receiving federal funding. In addition, any costs incurred for those activities may not be recognized as allowable cost share.

Notwithstanding the obligation of funds shown on the Assistance Agreement Form, the availability of funds to the Prime Recipient for payment of costs incurred is conditioned upon the amended NEPA determination.

This restriction does not prevent the use of funding to apply for or obtain the necessary permits, as stipulated within this cooperative agreement.

No NEPA-related condition need be included in the award.

SECTION V. RECOMMENDATION FOR CATEGORICAL EXCLUSION

The activities to be conducted under this project fit within the class of activities identified under the Department of Energy Categorical Exclusion(s) identified above.

The review has not identified any extraordinary circumstances related to the specific project that may affect the significance of the environmental effects of the project.

It is recommended that no further review under NEPA is required; however, any changes to the project may require further review.

Please find attached the selectee's completed and signed NEPA Questionnaire.