



U.S. Department of Energy

Categorical Exclusion Determination Form

Submit by E-mail

Proposed Action Title: University of Vermont -- Packetized Energy Management: Coordinating Transmission and Distribution

Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): Burlington, Vermont; Pleasant Hill, California

Proposed Action Description:

THIRD AMENDED NEPA DETERMINATION: (See attached original Determination, dated May 13, 2016, first amended Determination dated September 24, 2019, and second amended Determination dated April 8, 2022.)

The second amended Determination remains in effect with the following, sole amendment: Project activities will be conducted at existing facilities at Packetized Energy (Burlington, VT) in addition to locations described in the second amended Determination.

Categorical Exclusion(s) Applied:

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

A9 - Information gathering, analysis, and dissemination

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: **GEOFFREY GOODE** Digitally signed by GEOFFREY GOODE
Date: 2022.08.16 08:41:58 -04'00'

Date Determined:



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Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): Burlington, VT; Pleasant Hill, CA

Proposed Action Description:

SECOND AMENDED NEPA DETERMINATION: (See attached original Determination, dated April 13, 2016, and first Amended Determination, dated September, 24, 2019.) This Second Amended Determination follows the approval of additional funds and schedule to support the small-scale, research and development activities to advance the capability of the packetized energy management (PEM) scheme and demonstrate the technology. Specifically, the project team will enhance integration of energy devices into grid resources that will (1) extend PEM to smart thermostats and plug loads and (2) take steps to expand the technology for market testing and commercial production.

Project activities will be conducted at existing facilities at University of Vermont (Burlington, VT) and Southern California Edison and PG&E sites in Pleasant Hill, CA. Project tasks continue to fit within the class of actions identified under the DOE Categorical Exclusions identified below and do not involve any extraordinary circumstances that may affect the significance of the environmental effects of the project. This assessment was based on a review of the proposed scope of work and the potential environmental impact of the project. Project tasks will be conducted in accordance with established safety and materials/waste management protocols and pursuant to applicable Federal, State, and local regulatory requirements.

Categorical Exclusion(s) Applied:

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

A9 - Information gathering, analysis, and dissemination

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: **GEOFFREY GOODE** Digitally signed by GEOFFREY GOODE
Date: 2022.04.08 11:02:59 -04'00'

Date Determined:



U.S. Department of Energy Categorical Exclusion Determination Form

Submit by E-mail

Proposed Action Title: University of Vermont - Packetized Energy Management: Coordinating Transmission and Distribution

Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): Burlington, VT; Houghton, MI; Gaithersburg, MD; Rutland, VT

Proposed Action Description:

Funding will support the project team's small-scale, research and development activities to develop a new approach for demand-side management called packetized energy management (PEM) that builds on approaches used to manage data in communication networks without centralized control. Specifically, the project team will: (1) develop realistic distribution and transmission grid models; (2) develop tools to incorporate Level 1 transmission system under PEM; (3) develop mathematical optimization methods and formulations for level 2 distribution; (4) design, develop, and test performance of PEM for different load types and adapt Virtual Power Plant to PEM; and (5) conduct hardware validation of PEM for small-scale hardware-in-the-loop (HiL), large-scale HiL, and in-situ demonstration in Green Mountain Power's distribution feeder. If successful, the PEM system could allow large numbers of small end-use devices to cooperatively balance energy supply and demand in real time without jeopardizing the reliability of the grid or the quality of service to consumers.

Project tasks will be conducted in dedicated laboratory and testing facilities at the University of Vermont (Burlington, VT); Michigan Technological University (Houghton, MI); National Institute of Standards and Technology (Gaithersburg, MD); and Green Mountain Power (Rutland, VT). Project tasks will be conducted in accordance with established safety and materials/waste management protocols and pursuant to applicable Federal, State, and local regulatory requirements. No modifications will be made to the existing facilities to accommodate the proposed work.

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: 04/13/2016

(This form will be locked for editing upon signature)



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Proposed Action Title:

University of Vermont – Packetized Energy Management: Coordinating Transmission and Distribution

Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): Burlington, Vermont; Houghton, MI

Proposed Action Description:

AMENDED NEPA DETERMINATION (See attached original Determination, dated April 13, 2016)

This Amended Determination follows changes to the project team and approval of additional funds and project milestones. Additional funding will support the project team's small-scale, research and development activities to advance the capability of the packetized energy management (PEM) scheme. Specifically, the project team will (1) design a privacy-aware, fair, scalable, and plug-and-play packetized load management scheme that permits devices to respond to grid variability; (2) integrate the constraints of physical transmission and distribution systems with the PEM via a model-predictive control framework; and (3) validate the PEM scheme with software simulation, hardware-in-loop simulations, and full-scale demonstration in a physical MW-scale distribution feeder with 2.5MW renewable penetration (greater than 50% of load by energy during day-time), energy storage, and >150 controllable loads. If successful, the project team will demonstrate a PEM scheme capable of cost-effective penetration of renewable generation of at least 50% on an energy basis (kWh of total; with at least 15% from distributed generation resources).

Project activities will be conducted at existing facilities at the University of Vermont (Burlington, VT) and Michigan Technological University (Houghton, MI). Project tasks continue to fit within the class of actions identified under the DOE Categorical Exclusion(s) identified below and do not involve any extraordinary circumstances that may affect the significance of the environmental effects of the project. This assessment was based on a review of the proposed scope of work and the potential environmental impact of the project. Project tasks will be conducted in accordance with established safety and materials/waste management protocols and pursuant to applicable Federal, State, and local regulatory requirements

Categorical Exclusion(s) Applied:

A9 - Information gathering, analysis, and dissemination

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: 09/24/2019