



# U.S. Department of Energy

## Categorical Exclusion Determination Form

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Proposed Action Title:

Program or Field Office:

Location(s) (City/County/State):

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Proposed Action Description:

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Categorical Exclusion(s) Applied:

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For the DOE procedures regarding categorical exclusions, including the full text of each categorical exclusion, see 10 CFR 1021.102 and Appendix B to [10 CFR Part 1021](#), and also Section 5.4 (Applying one or more categorical exclusions to a proposal) and Appendices B and C of [DOE's National Environmental Policy Act Implementing Procedures](#) (June 30, 2025).

**Requirements and guidance in 10 CFR 1021.102 and DOE's NEPA Implementing Procedures:** (See full text in regulation and in Implementing Procedures)

The proposal fits within a class of actions that is listed in Appendix B to 10 CFR Part 1021 or Appendix B and C of DOE's NEPA Implementing Procedures (June 30, 2025).

To fit within the classes of actions listed in Appendix B to 10 CFR Part 1021, or Appendix B of DOE's NEPA Implementing Procedures, a proposal must satisfy the conditions that are integral elements of the classes of actions in Appendix B of both 10 CFR Part 1021 and DOE's NEPA Implementing Procedures.

There are no extraordinary circumstances related to the proposal that may affect the significance of the environmental effects of the proposal. DOE or an applicant may modify the proposal to avoid reasonably foreseeable adverse significant effects such that the categorical exclusion would apply.

The proposal has not been segmented to meet the definition of a categorical exclusion.

[Note: For proposals that fit within the categorical exclusions listed in Appendix C of DOE's NEPA Implementing Procedures, see DOE's notice of adoption for the subject Appendix C categorical exclusion for additional considerations. DOE notices of adoption for other agency categorical exclusions may be found on [DOE's Section 109 webpage](#).]

Based on my review of the proposed action, as NEPA Compliance Officer, I have determined that the proposed action fits within the specified class(es) of action, the other requirements and guidance set forth above are met, and the proposed action is hereby categorically excluded from further NEPA review.

NEPA Compliance Officer:

Date Determined:



# U.S. Department of Energy

## Categorical Exclusion Determination Form

Submit by E-mail

Proposed Action Title: Grid-free Renewable Energy Enabling New Ways to Economical Liquids and Long-term Storage Program -- GREENWELLS and GREENWELLS SBIR/STTR (FOA Nos. DE-FOA-0003234 and DE-FOA-0003235)

Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): AZ, CA, CO, GA, IL, IN, MA, NC, NJ, NY, OH, TX, WA

Proposed Action Description:

SECOND AMENDED PROGRAMMATIC NEPA DETERMINATION (See attached original Determination, dated August 21, 2024 and First Amended Determination dated September 16, 2024.) The Grid-free Renewable Energy Enabling New Ways to Economical Liquids and Long-term Storage (GREENWELLS) program seeks to develop chemical reactors and supporting units that economically store at least 50% of incoming intermittent electrical energy from renewable sources in carbon-containing liquids. Specifically, GREENWELLS projects will create chemical reactor systems to efficiently convert carbon dioxide and an intermittent feedstock of electricity or hydrogen to carbon-containing liquids. If successful, the GREENWELLS technologies will provide low-cost carbon-containing liquids to enable transportation and storage of renewable energy, serve as needed fuels for difficult-to-decarbonize sectors, and speed the development of renewable energy projects by supporting off-grid applications.

The GREENWELLS program is composed of 14 small-scale research and development projects that will be conducted by universities, large businesses, and small businesses. This Determination covers 2 of the 14 projects (listed in Attachment A). All 14 projects fit within the class of actions identified under the DOE Categorical Exclusions identified below. This assessment was based on a review of the proposed scope of work and the potential environmental impacts of each project. All 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

B3.15 - Small-scale indoor research and development projects using nanoscale materials

B3.11 - Outdoor tests and experiments on materials and equipment components

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: 2024.11.14 12:39:03 -05'00'

Date Determined:

**Attachment A: Projects in the GREENWELLS (FOA Nos. DE-FOA-0003234 and DE-FOA-0003235) Program**

| <b>Prime Recipient<br/>(Control No.)</b>                    | <b>Project Title</b>                                                                                                     | <b>Categorical<br/>Exclusion</b> |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>NexTech Materials, Ltd.<br/>Dba Nexceris (3234-1517)</b> | <b>SIMPLE Process to Dynamic Methanol Synthesis</b>                                                                      | <b>A9, B3.6</b>                  |
| <b>RTI International<br/>(3234-1508)</b>                    | <b>Next-Generation Flexible Modular e-Methanol Production</b>                                                            | <b>A9, B3.6,<br/>B3.11</b>       |
| Georgia Institute of<br>Technology (3234-1564)              | AIRCAP: Advancing Integration and Reactors for Carbon Capture<br>and Conversion                                          | A9, B3.6,<br>B3.15               |
| SRI International<br>(3234-1559)                            | Printed Microreactor for Renewable Energy Enabled Fuel<br>Production (PRIME-Fuel)                                        | A9, B3.6,<br>B3.15               |
| CarbonBridge Inc.<br>(3234-1544)                            | Microbial Production of Methanol from Methane and<br>Intermittent Power Sources                                          | A9, B3.6                         |
| North Carolina State<br>University (3234-1570)              | Distributed Methanol from CO2 via Plasma-Enhanced Catalysis<br>(PEC)                                                     | A9, B3.6                         |
| New York University<br>(3234-1563)                          | The Renewthanol Process: CO2-Derived Ethanol Production via<br>Tandem Electro- and Thermo-Catalytic Conversions          | A9, B3.6,<br>B3.15               |
| Illinois Institute of<br>Technology (3234-1520)             | Renewable Propane Production using Dynamic CO2 Electrolysis<br>(E-PROPANE)                                               | A9, B3.6,<br>B3.15               |
| Columbia University<br>(3234-1542)                          | Low Temperature Membraneless Carbon Dioxide Electrolyzers<br>for Low-Cost Production of Ethanol Under Dynamic Conditions | A9, B3.6,<br>B3.15               |
| Emvolon, Inc. (3235-1509)                                   | Novel Reciprocating Reactor for Intermittent Renewables to<br>Liquid Sustainable Fuels                                   | A9, B3.6                         |
| Northeastern University<br>(3234-1552)                      | Modular Electrochemical Ethanol Production Using Intermittent<br>Power (Electricity)                                     | A9, B3.6,<br>B3.15               |
| Susteon, Inc. (3234-1536)                                   | ECHO-SAF: Electrified CO2 Hydrogenation to Olefins for<br>Sustainable Aviation Fuel                                      | A9, B3.6                         |

**Attachment A: Projects in the GREENWELLS (FOA Nos. DE-FOA-0003234 and DE-FOA-0003235) Program**

| <b>Prime Recipient<br/>(Control No.)</b>             | <b>Project Title</b>                                                                                    | <b>Categorical<br/>Exclusion</b> |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------|
| University of California,<br>Los Angeles (3234-1556) | e-CO2LUMN: The Dynamic CO2 Electrolyzer Column                                                          | A9, B3.6,<br>B3.15               |
| Washington State<br>University (3234-1571)           | Dynamic CO2 Hydrogenation to Produce Liquid Hydrocarbon<br>Fuels in Induction Heating Catalytic Reactor | A9, B3.6,<br>B3.15               |

**Bold text indicates the two projects included in the Second Amended CX.**



# U.S. Department of Energy

## Categorical Exclusion Determination Form

Submit by E-mail

Proposed Action Title: Grid-free Renewable Energy Enabling New Ways to Economical Liquids and Long-term Storage Program -- GREENWELLS and GREENWELLS SBIR/STTR (FOA Nos. DE-FOA-0003234 and DE-FOA-0003235)

Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): CA, CO, GA, IL, IN, MA, NC, NJ, NY, TX, WA

Proposed Action Description:

FIRST AMENDED PROGRAMMATIC NEPA DETERMINATION (See attached original Determination, dated August 21, 2024.) The Grid-free Renewable Energy Enabling New Ways to Economical Liquids and Long-term Storage (GREENWELLS) program seeks to develop chemical reactors and supporting units that economically store at least 50% of incoming intermittent electrical energy from renewable sources in carbon-containing liquids. Specifically, GREENWELLS projects will create chemical reactor systems to efficiently convert carbon dioxide and an intermittent feedstock of electricity or hydrogen to carbon-containing liquids. If successful, the GREENWELLS technologies will provide low-cost carbon-containing liquids to enable transportation and storage of renewable energy, serve as needed fuels for difficult-to-decarbonize sectors, and speed the development of renewable energy projects by supporting off-grid applications.

The GREENWELLS program is composed of 14 small-scale research and development projects that will be conducted by universities, large businesses, and small businesses. This Determination covers 6 of the 14 projects (listed in Attachment A). All 12 projects covered in this and the prior Determination fit within the class of actions identified under the DOE Categorical Exclusions identified below. This assessment was based on a review of the proposed scope of work and the potential environmental impacts of each project. All 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

B3.15 - Small-scale indoor research and development projects using nanoscale materials

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: 2024.09.16 15:49:39 -04'00'

Date Determined:

**Attachment A: Projects in the GREENWELLS (FOA Nos. DE-FOA-0003234 and DE-FOA-0003235) Program**

| <b>Prime Recipient<br/>(Control No.)</b>                 | <b>Project Title</b>                                                                                                         | <b>Categorical<br/>Exclusion</b> |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>Georgia Institute of Technology (3234-1564)</b>       | <b>AIRCAP: Advancing Integration and Reactors for Carbon Capture and Conversion</b>                                          | <b>A9, B3.6, B3.15</b>           |
| <b>SRI International (3242-1559)</b>                     | <b>Printed Microreactor for Renewable Energy Enabled Fuel Production (PRIME-Fuel)</b>                                        | <b>A9, B3.6, B3.15</b>           |
| <b>CarbonBridge Inc. (3234-1544)</b>                     | <b>Microbial Production of Methanol from Methane and Intermittent Power Sources</b>                                          | <b>A9, B3.6</b>                  |
| <b>North Carolina State University (3234-1570)</b>       | <b>Distributed Methanol from CO2 via Plasma-Enhanced Catalysis (PEC)</b>                                                     | <b>A9, B3.6</b>                  |
| <b>New York University (3234-1563)</b>                   | <b>The Renewthanol Process: CO2-Derived Ethanol Production via Tandem Electro- and Thermo-Catalytic Conversions</b>          | <b>A9, B3.6, B3.15</b>           |
| <b>Illinois Institute of Technology (3234-1520)</b>      | <b>Renewable Propane Production using Dynamic CO2 Electrolysis (E-PROPANE)</b>                                               | <b>A9, B3.6, B3.15</b>           |
| <b>Columbia University (3234-1542)</b>                   | <b>Low Temperature Membraneless Carbon Dioxide Electrolyzers for Low-Cost Production of Ethanol Under Dynamic Conditions</b> | <b>A9, B3.6, B3.15</b>           |
| <b>Emvolon, Inc. (3235-1509)</b>                         | <b>Novel Reciprocating Reactor for Intermittent Renewables to Liquid Sustainable Fuels</b>                                   | <b>A9, B3.6</b>                  |
| <b>Northeastern University (3234-1552)</b>               | <b>Modular Electrochemical Ethanol Production Using Intermittent Power (Electricity)</b>                                     | <b>A9, B3.6, B3.15</b>           |
| <b>Susteon, Inc. (3234-1536)</b>                         | <b>ECHO-SAF: Electrified CO2 Hydrogenation to Olefins for Sustainable Aviation Fuel</b>                                      | <b>A9, B3.6</b>                  |
| <b>University of California, Los Angeles (3234-1556)</b> | <b>e-CO2LUMN: The Dynamic CO2 Electrolyzer Column</b>                                                                        | <b>A9, B3.6, B3.15</b>           |
| <b>Washington State University (3234-1571)</b>           | <b>Dynamic CO2 Hydrogenation to Produce Liquid Hydrocarbon Fuels in Induction Heating Catalytic Reactor</b>                  | <b>A9, B3.6, B3.15</b>           |

**Bold text indicates the six projects included in the First Amended CX.**



# U.S. Department of Energy

## Categorical Exclusion Determination Form

Submit by E-mail

Proposed Action Title: Grid-free Renewable Energy Enabling New Ways to Economical Liquids and Long-term Storage Program -- GREENWELLS and GREENWELLS SBIR/STTR (FOA Nos. DE-FOA-0003234 and DE-FOA-0003235)

Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): CA, IL, IN, MA, NC, NY, WA

Proposed Action Description:

The Grid-free Renewable Energy Enabling New Ways to Economical Liquids and Long-term Storage (GREENWELLS) program seeks to develop chemical reactors and supporting units that economically store at least 50% of incoming intermittent electrical energy from renewable sources in carbon-containing liquids. Specifically, GREENWELLS projects will create chemical reactor systems to efficiently convert carbon dioxide and an intermittent feedstock of electricity or hydrogen to carbon-containing liquids. If successful, the GREENWELLS technologies will provide low-cost carbon-containing liquids to enable transportation and storage of renewable energy, serve as needed fuels for difficult-to-decarbonize sectors, and speed the development of renewable energy projects by supporting off-grid applications.

The GREENWELLS program is composed of 14 small-scale research and development projects that will be conducted by universities, large businesses, and small businesses. This Determination covers 6 of the 14 projects (listed in Attachment A). The 6 projects fit within the class of actions identified under the DOE Categorical Exclusions identified below. This assessment was based on a review of the proposed scope of work and the potential environmental impacts of each project. All 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

B3.15 - Small-scale indoor research and development projects using nanoscale materials

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: 2024.08.21 12:26:29 -04'00'

Date Determined:

**Attachment A: Projects in the GREENWELLS (FOA Nos. DE-FOA-0003234 and DE-FOA-0003235)  
Program**

| Prime Recipient (Control No.)                     | Project Title                                                                                                         | Categorical Exclusion |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------|
| Columbia University (3234-1542)                   | Low Temperature Membraneless Carbon Dioxide Electrolyzers for Low-Cost Production of Ethanol Under Dynamic Conditions | A9, B3.6, B3.15       |
| Emvolon, Inc. (3235-1509)                         | Novel Reciprocating Reactor for Intermittent Renewables to Liquid Sustainable Fuels                                   | A9, B3.6              |
| Northeastern University (3234-1552)               | Modular Electrochemical Ethanol Production Using Intermittent Power (Electricity)                                     | A9, B3.6, B3.15       |
| Susteon, Inc. (3234-1536)                         | ECHO-SAF: Electrified CO2 Hydrogenation to Olefins for Sustainable Aviation Fuel                                      | A9, B3.6              |
| University of California, Los Angeles (3234-1556) | e-CO2LUMN: The Dynamic CO2 Electrolyzer Column                                                                        | A9, B3.6, B3.15       |
| Washington State University (3234-1571)           | Dynamic CO2 Hydrogenation to Produce Liquid Hydrocarbon Fuels in Induction Heating Catalytic Reactor                  | A9, B3.6, B3.15       |