

Idaho National Laboratory (INL) Notice of Opportunity:

High-assay Low Enriched Uranium (HALEU) for Fuel Development and Microreactor Demonstration at Idaho National Laboratory

Overview

To support United States leadership in the development and demonstration of microreactor technologies, Idaho National Laboratory (INL) is providing the opportunity for access to High Assay Low Enriched Uranium (HALEU) for the development of fuel and subsequent demonstration of microreactor technology on the INL site. The goal of this opportunity is to accelerate demonstration of commercially viable microreactor technologies.

Background

DOE is recovering an inventory of approximately 10 metric tons of HALEU from used Experimental Breeder Reactor-II reactor fuel. The material contains residual impurities and radioactive contamination that will require glovebox handling for fuel fabrication or will otherwise require further decontamination processing. The availability and description of the HALEU is provided in Appendix A.

For this opportunity, DOE will retain ownership of the material during and after use, and therefore the material must be used and retained on the INL site. By DOE retaining ownership of the material and it remaining on the INL site, there is no liability for spent fuel storage or disposition and the environmental impact has already been completed by DOE. Reactor demonstration sites are available through a site use permit or other facility use arrangements. Potential sites and buildings are available to support fabrication of the HALEU into required fuel forms (See Appendix B). The capital and operating costs for fuel fabrication, fuel qualification, reactor demonstration, and post-demonstration disposition will be the responsibility of the applicant and will be negotiated along with terms and conditions of a Cooperative Research and Development Agreement (CRADA), which is expected to be the predominant agreement mechanism. (See Appendix C for CRADA standard terms and conditions and Appendix D for CRADA general description). The use of Strategic Partnership Project (SPP) agreements in combination with the CRADA will be considered to facilitate additional support of the demonstration. The HALEU material will be retained by DOE after the demonstration. A plan for post-demonstration disposition of the reactor and fuel (including, but not limited to, Post Irradiation Examination [PIE] and other potential research and development [R&D] activities) will be required as part of the request for access to the HALEU material.

Technical, regulatory, and other support may be provided by DOE and DOE laboratories as requested by the applicant.

Eligibility Requirements

This opportunity is open to United States-owned industry entities. United States means the 50 States, the District of Columbia, and all commonwealths, territories, and possessions of the United States. United States-owned company means a company that is either –

- i. A United States-owned company; or
- ii. Incorporated or organized under the laws of any state and has a parent company¹ which is incorporated or organized under the laws of a country which –
 - a. Affords to the United States-owned companies opportunities comparable to those afforded to any other company, to participate in any joint venture similar to those authorized under applicable law
 - b. Affords to the United States-owned companies local investment opportunities comparable to those afforded to any other company; and
 - c. Affords adequate and effective protection for the intellectual property rights of United States-owned companies.

Costs

Capital and operational cost of fuel fabrication, fuel qualification, microreactor demonstration, and microreactor post-demonstration disposition are expected to be borne by the participant and included in the CRADA scope. The DOE contribution to the CRADA will be the access to HALEU material and availability of sites for fuel fabrication and reactor demonstration, subject to available funding.

Key Dates

Issue Notification of Opportunity: August 22, 2019

Requests Due: 5 pm EDT, October 11, 2019

Selections are anticipated to be announced within two months of the request due date.

Review Criteria

Requests for access to the HALEU material will be reviewed and selected based on the following merit review criteria:

- Feasibility of overall approach, including design, testing, siting and licensing approach and ability to utilize the HALEU material that is being made available (45%)
- Well-defined schedule with performance milestones for development and demonstration of the microreactor design, with emphasis on timing for demonstration (25%)
- Financial plan corresponding to milestones that demonstrates the ability to fund fuel fabrication, fuel qualification, licensing-related costs, microreactor demonstration, and post-demonstration disposition activities (20%)
- Commercial deployment plan following demonstration (10%)

¹The degree of foreign influence will affect the length of the DOE review and approval process, per DOE Policy 485.1 FOREIGN ENGAGEMENTS WITH DOE NATIONAL LABORATORIES

Expected Number of Selections

The number of selections may range from zero to multiple participants up to the quantity of material that is being made available based on the review criteria.

Submission Instructions

The request for material must be submitted by **5 p.m. EDT October 11, 2019, electronically by email to arthur.baker2@inl.gov**. Requests submitted after this deadline will not be considered until the review and selection process for this Notice of Opportunity is complete. Material not allocated through this Notice of Opportunity could be made available for applications submitted after the deadline.

The submission must be provided in Portable Document Format (PDF) or Microsoft Word (DOC) format. The document must be formatted with not less than 1 in. margins and with not less than 12-point font.

Please do not provide any proprietary information in the request or in supporting documentation.

The following information is requested to enable evaluation relative to the merit review criteria noted above:

1. Microreactor development (not to exceed 10 pages)
 - Microreactor demonstration plan and objectives, including description of design and performance attributes
 - Description of fuel form, quantity of HALEU material required, fabrication process, and ability to use the material being made available by INL
 - Approach and current status for licensing / authorization
 - Siting plan and requirements for required facilities for fuel fabrication and reactor demonstration, including facility size, special requirements, and support structures
 - INL / DOE technical, infrastructure, and other support required
 - Disposition plan for facilities, reactor, and fuel (including PIE and other potential R&D activities) after demonstration.
2. Detailed Gantt Chart with schedule and milestones (Not to exceed 2 pages)
 - Design finalization
 - Fuel fabrication
 - Fuel qualification
 - Regulatory submissions and approval
 - Microreactor fabrication
 - Microreactor operations
 - Post-demonstration disposition
3. Estimated cost to perform demonstration, including fuel fabrication, fuel qualification, microreactor fabrication, licensing, microreactor demonstration and post-demonstration disposition activities and funding plan to support costs. Costs for work to be performed by INL in support of the demonstrations such as material polishing, fuel fabrication, etc. will be finalized during the CRADA negotiation. If you need an estimate as a place holder or in order to determine if you would like to submit to this Notice of Opportunity, INL can discuss your application and requirements in order to provide directional budgetary information. (Not to exceed 3 pages).
4. Commercialization plan for microreactor deployment after demonstration (Not to exceed 4 pages).

Appendix A - HALEU Description

The HALEU material being prepared in the Fuel Conditioning Facility (FCF) at INL's Materials & Fuels Complex (MFC) is recovered through treatment of discharged EBR-II fuel. The material is being down blended to produce U-235 enrichment of up to roughly 19.5% and decontaminated to the extent possible using an enhanced casting process recently implemented. The recovered material contains residual fission products and transuranic contaminants but is being decontaminated sufficiently to allow manufacturing of fuel in gloveboxes to protect personnel from contamination rather than requiring shielded hot cells to protect personnel from high radiation fields.

The fuel fabrication ready material form is that of a uranium metal "regulus" ingot. A prototypic regulus is approximately 3 kg in mass and measuring roughly 2.5 in. diameter by 3.5 in. long, but other size and weight configurations of the regulus may be produced based on fuel fabrication needs.

Examples the regulus composition are provided in the tables below. The information available to date is not sufficient to bound ranges in compositional variation but is indicative of expected contamination levels in FCF HALEU.

Uranium isotopic composition

Analyte	Units ^a	Average	Minimum	Maximum
Total U	wt %	99.9	99.89	99.92
U232 ^b	ppbU	1.07	0.16	10.20
U233 ^b	ppbU	80.19	65.18	113.72
U234 ^c	iso. % U	0.18	0.18	0.18
U235 ^c	iso. % U	19.45	19.21	19.80
U236 ^c	iso. % U	0.53	0.52	0.55
U237 ^b	pptU	0.37	0.20	0.87
U238 ^c	iso. % U	79.84	79.47	80.09

^aUnit definitions: wt % = g per 100 g of total material

iso. % U = g of isotope per g of total uranium

ppbU = g per billion grams of uranium

pptU = g per trillion grams of uranium

^bIsotope content beyond detection limits, calculated value provided

^cIsotope content measured analytically

Description of Chemical and Isotopic Composition of Typical Regulus Ingots^a

Analyte	Units ^b	Weighted Average	Minimum	Maximum
Total U	wt. %	99.60	99.44	99.90
Zr	ppm	200	200	100
Si	ppm	ND	ND	ND
Y	ppm	126	36	215
Fe	ppm	170	91	267
Cr	ppm	31	17	41
Ni	ppm	109	67	150
Mo	ppm	302	286	333
Mn	ppm	276	261	290
Ru	ppm	ND	ND	ND
Cd	ppm	ND	ND	ND
Al	ppm	100	100	100
Tc	ppm	ND	ND	ND
Li	ppm	ND	ND	ND
K	wt. %	ND	ND	ND
Na	ppm	55	55	55
Ba	ppm	ND	ND	ND
Sr	ppm	ND	ND	ND
Sr90	ppb	ND	ND	ND
Nd	ppm	ND	ND	ND
Sm	ppm	ND	ND	ND
Tc99	ppm	ND	ND	ND

Analyte	Units ^b	Weighted Average	Minimum	Maximum
Cs135	ppm	ND	ND	ND
Mn54	ppb	ND	ND	ND
Co60	ppt	ND	ND	ND
Nb95	ppb	ND	ND	ND
Zr95	ppb	ND	ND	ND
Rh106	ppb	ND	ND	ND
Ru106	ppb	ND	ND	ND
Sb125	ppt	ND	ND	ND
Cs134	ppt	ND	ND	ND
Cs137	ppb	22	10	29
Ce144	ppb	ND	ND	ND
Eu154	ppt	ND	ND	ND
Eu155	ppt	ND	ND	ND
Am241	ppb	ND	ND	ND
U234	wt. % U	0.18	0.18	0.18
U235	wt.% U	19.45	19.21	19.80
U236	wt. % U	0.53	0.52	0.55
U238	wt. % U	79.84	79.47	80.09
Np237	ppm	60	57	64
Pu239	ppm	82	73	95
Pu240	ppm	ND	ND	ND
Total	ppm	NM	NM	NM

^aNOTE:

- The elemental impurities consist of isotopes in their natural isotopic abundance based on cooling time and the original source of the elements.
- Measurements below the MDL are listed at the MDL for conservatism. Elemental Sr and Ba were below the minimum detection limit (MDL) of 5 ppm.

^bDefinition of units: ppm = parts per million, by mass

ppb = parts per billion, by mass

ppt = parts per trillion, by mass

iso. % U = isotope wt.% of total U

ND = Not detected

NM = Not measured; total Pu was not measured. Np237, Pu239, and Pu240 isotopes are shown as ppm of material mass.

The anticipated production schedule and total availability of HALEU (at approximately 19.5 wt% U-235) material is as follows:

Year	Production Rate (kg/yr)	Cumulative Availability (kg)
2019	600	600
2020	1000	1600
2021	1000	2600
2022	1200	3800
2023	1200	5000
2024	950	5950
2025	950	6900
2026	950	7850
2027	950	8800
2028	700	9500

Appendix B – Siting

All projects sited at INL are considered by DOE through an established process that can start through the GAIN website. (<https://gain.inl.gov/SitePages/SitePermitProcess.aspx>) Siting requests are submitted to the GAIN website and forwarded to DOE-NE, which evaluates project goals, resources, timeline, financing, and other factors in relation to the proposed project.

After project information has been received, a number of environmental factors and site resource requirements are evaluated for project siting to optimize the benefits. Avoiding impacts on the proposed projects by existing INL activities is also considered.

Some additional factors that are considered include land uses, transportation routes, power distribution systems, communication systems, utility systems, water availability, seismic conditions, volcanic issues, soils, biota, cultural resources, natural hazards and flooding. Balancing these factors against project needs has been successfully demonstrated on previous projects.

INL has a well-developed infrastructure and enough site knowledge to prevent unexpected events during project development. Multiple locations with the potential to site a reactor exist across the site. Existing facilities and adjacent spaces have the potential for relatively rapid development for a new reactor project. The proposed reactor design and operating goals guide the selection of a site on INL.

There is a high-level description of the site properties in “INL Site Conditions and Properties” (INL/EXT-15-36721), which is publicly available on the GAIN website noted above.

**STEVENSON-WYDLER (15 USC 3710a)
COOPERATIVE RESEARCH AND DEVELOPMENT
AGREEMENT (hereinafter CRADA) No. _____**

BETWEEN

Battelle Energy Alliance, LLC (BEA)

under its U.S. Department of Energy Contract

No. DE-AC07-05ID14517 (hereinafter Contractor)

AND

(hereinafter Participant), both being

hereinafter referred to singularly as “Party” and jointly as “Parties”

ARTICLE I: DEFINITIONS

- A. “Background Intellectual Property” means the Intellectual Property identified by the Parties in Annex B, Background Intellectual Property, which was in existence prior to or is first produced outside of this CRADA, except that in the case of inventions in those identified items, the inventions must have been conceived outside of this CRADA and not first actually reduced to practice under this CRADA to qualify as Background Intellectual Property.
- B. “Contracting Officer” means the DOE employee administering the Contractor’s DOE contract.
- C. “DOE” means the Department of Energy, an agency of the Federal Government.
- D. “Generated Information” means information, including data, produced in the performance of this CRADA.
- E. “Government” means the Federal Government of the United States of America and agencies thereof.
- F. “Intellectual Property” means patents, trademarks, copyrights, mask works, Protected CRADA Information, and other forms of comparable property rights protected by Federal law and foreign counterparts, except trade secrets.

- G. “Proprietary Information” means information, including data, which is developed at private expense outside of this CRADA, is marked as Proprietary Information, and embodies (i) trade secrets or (ii) commercial or financial information which is privileged or confidential under the Freedom of Information Act (5 U.S.C. 552 (b)(4)).
- H. “Protected CRADA Information” means Generated Information which is marked as being Protected CRADA Information by a Party to this CRADA and which would have been Proprietary Information had it been obtained from a non-Federal entity.
- I. “Subject Invention” means any invention of the Contractor or Participant conceived or first actually reduced to practice in the performance of work under this CRADA.

ARTICLE II: STATEMENT OF WORK, TERM, FUNDING AND COSTS

- A. The Statement of Work is attached as Annex A.
- B. Notices: The names, postal addresses, telephone and email addresses for the Parties are provided in the Statement of Work. Any communications required by this CRADA, if given by postage prepaid first-class U.S. Mail or other verifiable means addressed to the Party to receive the communication, shall be deemed made as of the day of receipt of such communication by the addressee, or on the date given if by email. Address changes shall be made by written notice and shall be effective thereafter. All such communications, to be considered effective, shall include the number of this CRADA.
- C. The effective date of this CRADA shall be the latter date of: (1) the date on which it is signed by the last of the Parties; (2) the date on which it is approved by DOE; or (3) the date on which the advance funding referred to in this Article is received by the Contractor. The work to be performed under this CRADA shall be completed within (XX) months/years from the effective date.
- D. The Participant’s estimated contribution is \$____, of which \$____ is fund-in to the Laboratory. The Government’s estimated contribution, which is provided through the Contractor’s contract with DOE, is \$____, subject to available funding.
- E. The Participant shall provide to the Contractor, prior to any work being performed, a budgetary resource sufficient to cover anticipated work that will be performed for the Participant’s directly funded share for the first billing cycle. In addition, the Participant shall provide sixty (60) days of additional funding to ensure that funds remain available for the Participant’s directly funded share for subsequent billing cycles.

ARTICLE III: PERSONAL PROPERTY

All tangible personal property produced or acquired under this CRADA shall become the property of the Participant or the Government, depending upon whose funds were used to obtain it unless identified in the Statement of Work as being owned by the other Party.

Personal property shall be disposed of as directed by the owner at the owner’s expense. All jointly funded property shall be owned by the Government. The Participant shall maintain records of receipts, expenditures, and the disposition of all Government property in its custody related to the CRADA.

ARTICLE IV: DISCLAIMER

THE GOVERNMENT, THE PARTICIPANT, AND THE CONTRACTOR MAKE NO EXPRESS OR IMPLIED WARRANTY AS TO THE CONDITIONS OF THE RESEARCH OR ANY INTELLECTUAL PROPERTY, GENERATED INFORMATION, OR PRODUCT MADE OR DEVELOPED UNDER THIS CRADA, OR THE OWNERSHIP, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE OF THE RESEARCH OR RESULTING PRODUCT. NEITHER THE GOVERNMENT, THE PARTICIPANT, NOR THE CONTRACTOR SHALL BE LIABLE FOR SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES ATTRIBUTED TO SUCH RESEARCH OR RESULTING PRODUCT, INTELLECTUAL PROPERTY, GENERATED INFORMATION, OR PRODUCT MADE OR DEVELOPED UNDER THIS CRADA.

ARTICLE V: PRODUCT LIABILITY

Except with respect to public liability (42 USC 2014(w)) arising from a nuclear incident (42 USC 2014(q)), and for which a nuclear hazards indemnity is provided by the Government as per the Price Anderson Act 42 USC 2210, as amended, (implemented by DEAR 952.250-70) and except for any liability resulting from any negligent acts, willful misconduct or omissions of the Contractor and the Government, the Participant indemnifies the Government and the Contractor for all damages, costs, and expenses, including attorney's fees, arising from personal injury or property damage occurring as a result of the making, using, or selling of a product, process, or service by or on behalf of the Participant, its assignees, or licensees, which was derived from the work performed under this CRADA. In respect to this article, neither the Government nor the Contractor shall be considered assignees or licensees of the Participant, as a result of reserved Government and Contractor rights. The indemnity set forth in this paragraph shall apply only if the Participant shall have been informed as soon and as completely as practical by the Contractor and/or the Government of the action alleging such claim and shall have been given an opportunity, to the maximum extent afforded by applicable laws, rules, or regulations, to participate in and control its defense, and the Contractor and/or the Government shall have provided all reasonably available information and reasonable assistance requested by the Participant. No settlement for which the Participant would be responsible shall be made without the Participant's consent unless required by final decree of a court of competent jurisdiction.

ARTICLE VI: RIGHTS IN SUBJECT INVENTIONS

Wherein DOE has granted the Participant and the Contractor the right to elect to retain title to their respective Subject Inventions, and wherein the Participant has the option to choose an exclusive license, for reasonable compensation, for a pre-negotiated field of use to the Contractor's Subject Inventions,

- A. Each Party shall have the first option to elect to retain title to any of its Subject Inventions and that election shall be made: (1) for the Participant, within 12 months of disclosure of the Subject Invention to DOE or (2) for the Contractor, within the time period specified in its prime contract for electing to retain title to Subject Inventions. However, such election shall occur not later than 60 days prior to the time when any statutory bar might foreclose filing of a U.S. Patent application. The electing Party has one year to file a patent application after such election unless any statutory bar exists. If a Party elects not to retain title to any of its Subject Inventions or fails to timely file a patent application, the other Party shall have the second option to elect to obtain title to such Subject Invention within the time period specified in paragraph B below.
- B. The Parties agree to assign to DOE, as requested by DOE, the entire right, title and interest in any country to each Subject Invention where the Parties (1) do not elect pursuant to this article to retain/obtain such rights, or (2) elect to retain/obtain title to a Subject Invention but fail to have a patent application filed in that country on the Subject Invention or decide not to continue prosecution or not to pay any maintenance fees covering the Subject Invention. If DOE is granted a patent on Participant's Subject Invention, the Participant may request a non-exclusive license and DOE will determine whether to grant such license pursuant to statutory authority.
- C. The Parties acknowledge that the Government retains a nonexclusive, nontransferable, irrevocable, paid-up license to practice or to have practiced for or on behalf of the United States every Subject Invention under this CRADA throughout the world. The Parties agree to execute a Confirmatory License to affirm the Government's retained license.
- D. The Parties agree to disclose to each other each Subject Invention which may be patentable or otherwise protectable under U.S. patent law. The Parties agree that the Contractor and the Participant will disclose their respective Subject Inventions to DOE and each other within two (2) months after the inventor first discloses the Subject Invention in writing to the person(s) responsible for patent matters of the disclosing Party.

These disclosures should be in sufficiently complete technical detail to convey a clear understanding, to the extent known at the time of the disclosure, of the nature, purpose, and operation of the Subject Invention. The disclosure shall also identify any known actual or potential statutory bars, e.g., printed publications describing the Subject Invention or the public use or "on sale" of the Subject Invention. The Parties further agree to disclose to each other any subsequently known actual or potential statutory bar that occurs for a Subject Invention disclosed but for which a patent application has not been filed. All Subject Invention disclosures shall be marked as confidential under 35 U.S.C. 205.

- E. The Parties agree to include within the beginning of the specification of any U.S. patent applications and any patent issuing thereon (including non-U.S. patents) covering a Subject Invention, the following statement: "This invention was made under a CRADA (identify CRADA number) between (name the Participant) and Battelle Energy Alliance, LLC, operator of Idaho National Laboratory for the United States Department of Energy. The Government has certain rights in this invention."

- F. The Parties acknowledge that DOE has certain march-in rights to any Subject Inventions in accordance with 48 CFR 27.304-1(g) and 15 U.S.C. 3710a(b)(1)(B) and (C).
- G. The Participant agrees to submit, for a period of five (5) years from the date of termination or completion of this CRADA and upon request of DOE, a nonproprietary report no more frequently than annually on efforts to utilize any Intellectual Property arising under the CRADA including information regarding compliance with U.S. Competitiveness provision of this CRADA.

ARTICLE VII: RIGHTS IN DATA

- A. The Parties agree that they shall have no obligations of nondisclosure or limitations on their use of, and the Government shall have unlimited rights in, all Generated Information produced and information provided by the Parties under this CRADA, except for restrictions on data provided for in this Article or data disclosed in a Subject Invention disclosure being considered for Patent protection.
- B. PROPRIETARY INFORMATION: Each Party agrees to not disclose Proprietary Information provided by the other Party to anyone other than the CRADA Participant, Contractor and its subcontractors (if any) performing work under this CRADA without written approval of the providing Party, except to Government employees who are subject to the statutory provisions against disclosure of confidential information set forth in the Trade Secrets Act (18 U.S.C. 1905). Government employees shall not be required to sign non-disclosure agreements due to the provisions of the above-cited statute.

If Proprietary Information is orally disclosed to a Party, it shall be identified as such, orally, at the time of disclosure and confirmed in a written summary thereof, appropriately marked by the disclosing Party, within 30 days as being Proprietary Information.

All Proprietary Information shall be protected for a period of 3 years from the effective date of this CRADA, unless such Proprietary Information becomes publicly known without the fault of the recipient, shall come into recipient's possession without breach by the recipient of any of the obligations set forth herein, can be demonstrated by the recipient by written record that it is known prior to receipt from disclosing Party, is disclosed by operation of law, or is independently developed by recipient's employees who did not have access to such Proprietary Information.

- C. PROTECTED CRADA INFORMATION: Except where a Participant's Federal funding agreement prohibits such protection, each Party may designate and mark as Protected CRADA Information any Generated Information produced by its employees, which meets the definition in Article I and, with the agreement of the other Party, so designate any Generated Information produced by the other Party's employees which meets the definition in Article I. All such designated Protected CRADA Information shall be appropriately marked.

For a period of ____ [not to exceed 5 years] from the date Protected CRADA Information is produced, the Parties agree not to further disclose such information and to use the same degree of care and discretion, but no less than reasonable care and discretion, to avoid

disclosure, publication or dissemination of such information to a third party, as the Party employs for similar protection of its own information which it does not desire to disclose, publish, or disseminate except:

- (1) as necessary to perform this CRADA;
- (2) as published in a patent application or an issued patent before the protection period expires;
- (3) as provided in Article X [REPORTS AND PUBLICATIONS];
- (4) as requested by the DOE Contracting Officer to be provided to other DOE facilities for use only at those DOE facilities solely for Government use only with the same protection in place and marked accordingly.
- (5) when a specific maximum time period for delaying the public release of data is authorized in the terms of a Government funding agreement used to fund this CRADA and that maximum period is shorter than the time period set forth in this Article for protecting Protected CRADA Information;
- (6) to existing or potential licensees, affiliates, customers, or suppliers of the Parties in support of commercialization of the technology with the same protection in place. Disclosure of the Participant's Protected CRADA Information under this subparagraph shall only be done with the Participant's consent; or
- (7) as mutually agreed to by the Parties in advance.

The obligations of this paragraph shall end sooner for any Protected CRADA Information which shall become publicly known without fault of either Party, shall come into a Party's possession without breach by that Party of the obligations of paragraph above, or shall be independently developed by a Party's employees who did not have access to the Protected CRADA Information. Federal Government employees who are subject to 18 USC 1905 may have access to Protected CRADA Information and shall not be required to sign non-disclosure agreements due to the provisions of the statute.

- D. COPYRIGHT: The Parties may assert Copyright in any of their Generated Information. Assertion of Copyright generally means to enforce or give an indication of an intent or right to enforce such as by marking or securing Federal registration. Copyrights in co-authored works by employees of the Parties shall be held jointly, and use by either Party shall be without accounting.

For all Generated Information, the Government has for itself and others acting on its behalf, a royalty-free, nontransferable, nonexclusive, irrevocable worldwide copyright license to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government, in all copyrightable works produced in the performance of this CRADA, subject to the restrictions this Article places on publication of Proprietary Information and Protected CRADA Information.

The Parties agree that no computer software will be created under this CRADA. If the scope of work changes to create computer software, then the CRADA will be amended accordingly.

The Parties agree to place Copyright and other notices, as appropriate for the protection of Copyright, in human-readable form onto all physical media, and in digitally encoded form in the header of machine-readable information recorded on such media such that the notice will appear in human-readable form when the digital data are off-loaded or the data are accessed for display or printout.

ARTICLE VIII: U.S. COMPETITIVENESS

The Parties agree that a purpose of this CRADA is to provide substantial benefit to the U.S. economy.

- A. In exchange for the benefits received under this CRADA, the Participant therefore agrees to the following:
 - (1) Products embodying Intellectual Property developed under this CRADA shall be substantially manufactured in the United States, and
 - (2) Processes, services, and improvements thereof which are covered by Intellectual Property developed under this CRADA shall be incorporated into the Participant's manufacturing facilities in the United States either prior to or simultaneously with implementation outside the United States. Such processes, services, and improvements, when implemented outside the United States, shall not result in reduction of the use of the same processes, services, or improvements in the United States.
- B. The Contractor agrees to a U.S. Industrial Competitiveness clause in accordance with its prime contract with respect to any licensing and assignments of its Intellectual Property arising from this CRADA, except that any licensing or assignment of its intellectual property rights to the Participant shall be in accordance with the terms of paragraph A of this Article.

ARTICLE IX: EXPORT CONTROL

THE PARTIES UNDERSTAND THAT MATERIALS AND INFORMATION RESULTING FROM THE PERFORMANCE OF THIS CRADA MAY BE SUBJECT TO EXPORT CONTROL LAWS AND THAT EACH PARTY IS RESPONSIBLE FOR ITS OWN COMPLIANCE WITH SUCH LAWS. EXPORT LICENSES OR OTHER AUTHORIZATIONS FROM THE U.S. GOVERNMENT MAY BE REQUIRED FOR THE EXPORT OF GOODS, TECHNICAL DATA OR SERVICES UNDER THIS AGREEMENT. THE PARTIES ACKNOWLEDGE THAT EXPORT CONTROL REQUIREMENTS MAY CHANGE AND THAT THE EXPORT OF GOODS, TECHNICAL DATA OR

SERVICES FROM THE U.S. WITHOUT AN EXPORT LICENSE OR OTHER APPROPRIATE GOVERNMENTAL AUTHORIZATION MAY RESULT IN CRIMINAL LIABILITY.

ARTICLE X: REPORTS AND PUBLICATIONS

- A. The Parties agree to produce the following deliverables to DOE Office of Scientific and Technical Information (OSTI):
- (1) an initial abstract suitable for public release at the time the CRADA is executed;
 - (2) a final report, upon completion or termination of this CRADA, to include a list of Subject Inventions; and
 - (3) other scientific and technical information in any format or medium that is produced as a result of this CRADA that is useful to the Government or the public as specified by and upon request from DOE no later than two years from submission of the final report to OSTI.

The Parties acknowledge that the Contractor has the responsibility to timely provide the above information to OSTI. Furthermore, item (2) above should also be provided to the DOE field office.

- B. The Parties agree to secure pre-publication review from each other wherein the non-publishing Party shall provide within 30 days any written objections to be considered by the publishing Party.
- C. The Parties agree that neither will use the name of the other Party or its employees in any promotional activity, such as advertisements, with reference to any product or service resulting from this CRADA, without prior written approval of the other Party.

ARTICLE XI: FORCE MAJEURE

No failure or omission by the Contractor or the Participant in the performance of any obligation under this CRADA shall be deemed a breach of this CRADA or create any liability if the same shall arise from any cause or causes beyond the control of the Contractor or the Participant, including but not limited to the following, which, for the purpose of this CRADA, shall be regarded as beyond the control of the Party in question: Acts of God, acts or omissions of any government or agency thereof, compliance with requirements, rules, regulations, or orders of any governmental authority or any office, department, agency, or instrumentality thereof, fire, storm, flood, earthquake, accident, acts of the public enemy, war, rebellion, insurrection, riot, sabotage, invasion, quarantine, restriction, transportation embargoes, or failures or delays in transportation.

ARTICLE XII: DISPUTES

The Parties shall attempt to jointly resolve all disputes arising from this CRADA. In the event a dispute arises under this CRADA, the Participant is encouraged to contact Contractor's Technology Partnerships Ombudsman in order to further resolve such dispute before pursuing third-party mediation or other remedies. If the Parties are unable to jointly resolve a dispute within 60 days, they agree to submit the dispute to a third-party mediation process that is mutually agreed upon by the Parties. To the extent that there is no applicable U.S. Federal law, this CRADA and performance thereunder shall be governed by the laws of the State of Idaho, without reference to that state's conflict of laws provisions.

ARTICLE XIII: ENTIRE CRADA, MODIFICATIONS, ADMINISTRATION AND TERMINATION

- A. This CRADA with its annexes contains the entire agreement between the Parties with respect to the subject matter hereof, and all prior representations or agreements relating hereto have been merged into this document and are thus superseded in totality by this CRADA.
- B. Any agreement to materially change any terms or conditions of this CRADA or the annexes shall be valid only if the change is made in writing, executed by the Parties hereto, and approved by DOE.
- C. The Contractor enters into this CRADA under the authority of its prime contract with DOE. The Contractor is authorized to and will administer this CRADA in all respects unless otherwise specifically provided for herein. Administration of this CRADA may be transferred from the Contractor to DOE or its designee with notice of such transfer to the Participant, and the Contractor shall have no further responsibilities except for the confidentiality, use and/or nondisclosure obligations of this CRADA.
- D. This CRADA may be terminated by either Party upon 60 days written notice to the other Party. If Article II provides for advance funding, this CRADA may also be terminated by the Contractor in the event of failure by the Participant to provide the necessary advance funding.

In the event of termination by either Party, each Party shall be responsible for its share of the costs incurred through the effective date of termination, as well as its share of the costs incurred after the effective date of termination, and which are related to the termination.

BATTELLE ENERGY ALLIANCE, LLC:

<&PARTICIPANT&>:

BY: _____

BY: _____

PRINTED NAME: _____

PRINTED NAME: _____

TITLE: _____

TITLE: _____

DATE: _____

DATE: _____

Appendix D – CRADA General Description

A Cooperative Research and Development Agreement (CRADA) is a written agreement between one or more federal laboratories and one or more non-federal parties under which the government, through its laboratories, provides personnel, facilities, equipment or other resources with or without reimbursement (but not funds to non-federal parties). The non-federal parties provide personnel, funds, services, facilities, equipment or other resources to conduct specific research or development efforts that are consistent with the mission of the laboratory.

“Contractor” means the DOE Facility Contractor/Laboratory Operator.

“Participant” means the non-federal party to the CRADA.

All CRADA negotiations are subject to DOE review and approval. DOE does not allow altering of the double-underlined text found in the terms and conditions.

Confidentiality: Information properly marked and provided by the Participant as “Proprietary Information” under the CRADA is generally to be treated by BEA as confidential, subject to the applicable terms and conditions. In addition, certain generated information produced during the performance of the CRADA may be marked as “Protected CRADA Information” if it would have been proprietary information had it had been produced by a non-federal entity. Protected CRADA Information can be subject to limited confidentiality for up to 5 years.

Liability and Indemnity: A CRADA generally includes a disclaimer of express or implied warranties as to conditions of research or any intellectual property, information or items generated thereby. It also typically includes provisions requiring a participant to indemnify the US Government and BEA from costs related to personal injury or property damage that may result from the participant’s commercialization or use of a product, process or service resulting from research under the CRADA.

Intellectual Property: As a general rule, patentable inventions made solely by the Participant under the CRADA may be pursued and owned by the Participant if the Participant provides appropriate notification to DOE of its intent to elect title; likewise, patentable inventions made only by Contractor employees may be elected by BEA. Jointly invented patentable inventions may be elected by both Contractor and the Participant and then jointly owned by BEA and the Participant or assigned by one to the other in a manner consistent with BEA’s contract with DOE. CRADA Participants are given an option to negotiate up to an exclusive field-of-use license to inventions made under the CRADA for reasonable compensation. Though rarely used, DOE also retains “March-in Rights” to grant licenses to intellectual property in exceptional circumstances (health, safety, failure to comply with law, etc.) The US Government also retains a non-exclusive, irrevocable, paid-up license to all inventions resulting from the CRADA for governmental purposes.