

DOE-ID NEPA CX DETERMINATION

Idaho National Laboratory

SECTION A. Project Title: Aquagga, Inc. - An Additively Manufactured Reactor for Emerging Contaminant Destruction

SECTION B. Project Description and Purpose:

The purpose of this project is to advance manufacturing capabilities to improve energy efficiency.

The Idaho National Laboratory (INL) proposes to additively manufacture several Functionally Graded Material (FGM) test coupons and transfer them to Aquagga for corrosion exposure testing. Aquagga Inc., a Delaware Public Benefit Corporation, incorporated August 2019 is a University of Alaska Fairbanks start-up that is headquartered in Juneau, Alaska. The company is focused on developing new water-treatment opportunities using transformative additive manufacturing technologies.

INL will manufacture the coupons using Digital Light Processing (DLP) 3D manufacturing methods using a specialized ink formulated by INL in collaboration with Aquagga. The FGM coupons will be comprised of Inconel 625 basis metal with a FGM formulation containing hexagonal phase boron nitride, and cubic phase boron nitride. Other formulations under development could contain gold. Green body printed pieces will be de-bindered using conventional thermal treatment. INL will use spark plasma sintering (SPS) techniques to complete densification and final green body processing.

The graded alloys will combine the functionally graded layers. The layers may include (but not limited to) Inconel 625, stainless steel 316, gold Hexagonal Boron Nitride (HBN), and other structural or corrosion resistant materials.

INL will manufacture the following:

1. At least 2 simple, flat, square, rectangular, or circular test pieces of at least 2 cm on a side or 2 cm diameter.
2. At least 2 complex test pieces having a complex part curvature, inherent stress, and having similar dimensions to the simple test pieces.

INL will perform work at the Energy Innovation Laboratory (EIL) in laboratories C219/C220 and C314 and at the INL Research Center (IRC) room B15. The project duration is anticipated to be 12 months. Purchasing materials for the project are consumables such as chemicals, wipes, gloves, etc. The project is not expecting to replace the super-critical water reactor (~5K) but will plan for it if the test conditions cause damage to the existing reactor in place.

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions

Air emissions from the project are to be expected. The air emissions are from the small quantities of common volatile solvents (<100 mL per use). These solvents are isopropanol and acetone. There will also be emissions from the debinding process when the coupons are being heated. The emissions are within the limits of existing APAD INL-13-007.

Discharging to Surface-, Storm-, or Ground Water

N/A

Disturbing Cultural or Biological Resources

N/A

Generating and Managing Waste

Waste will be generated, and three different types of waste are anticipated. 1) Non-hazardous landfillable materials such as gloves/wipes/etc. 2) Hazardous liquids and solids having some RCRA tag (toxic, flammable, corrosive, reactive). These materials may also include hazardous nanomaterials. 3) Nanomaterials that have no RCRA tags and are classified as non-hazardous waste will be disposed of as industrial waste.

Discharge of waste will be from washing glassware/dishes that have encountered inks and printing formulations used to fabricate the materials. All waste discharged into the sewer will not exceed any regulated or sewer permitted items based on the sewer permits under the city of Idaho Falls, ID.

Releasing Contaminants

Whenever chemicals are used there is a potential for spills or releases.

Using, Reusing, and Conserving Natural Resources

Waste shall be diverted from the landfill whenever practicable.

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SECTION D. Determine Recommended Level of Environmental Review, Identify Reference(s), and State Justification: Identify the applicable categorical exclusion from 10 Code of Federal Regulation (CFR) 1021, Appendix B, give the appropriate justification, and the approval date.

For Categorical Exclusions (CXs), the proposed action must not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environmental, safety, and health, or similar requirements of Department of Energy (DOE) or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment or facilities; (3) disturb hazardous substances, pollutants, contaminants, or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources (see 10 CFR 1021). In addition, no extraordinary circumstances related to the proposal exist that would affect the significance of the action. In addition, the action is not "connected" to other action actions (40 CFR 1508.25(a)(1)) and is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1608.27(b)(7)).

References:

The R&D activities identified in this ECP are covered by CX B3.6 "Small-scale research and development, laboratory operations, and pilot projects."

Justification:

The proposed R&D activities are consistent with CX B3.6 "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); 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 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."

Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act) Yes No

Approved by Jason Anderson, DOE-ID NEPA Compliance Officer on: 6/7/2021