DOE-ID NEPA CX DETERMINATION

CX Posting No.: DOE-ID-13-001

SECTION A. Project Title: Development of ASTM Standard for SiC-SiC Joint Testing – General Atomics

SECTION B. Project Description

General Atomics (GA) proposes to develop an instrumented test rig and standard test method to measure the strength of joints between cylindrical SiC-SiC tubing and endplugs at elevated, reactor-relevant temperatures. The test will be an endplug pushout method in which an axial load is applied to the internal surface of the endplug while the outer tubular ceramic surface is fixed in place. GA will use ancillary equipment to diagnose failure modes of a ceramic joint under realistic conditions.

SECTION C. Environmental Aspects / Potential Sources of Impact

Chemical Use/Storage – Precursors are used to produce silicon carbide (SiC) coatings, including methyltrichlorosilane CH_3SiCl_3 (MTS), and hydrogen. In addition, NaOH is used to neutralize byproducts and maintain the scrubber water pH at ~10.5. These chemicals are stored according to all appropriate safety regulation, and the storage conditions have been reviewed and are periodically checked by the Environmental Health and Safety department at General Atomics. Amounts are approximately 55 gal NaOH at 50% solution, 200 L of MTS, 2500 ft^3 H_2.

Chemical Waste Disposal – The SiC deposition process can produce certain reactive byproducts that can collect on the walls of the exhaust system. Water is used when cleaning the system, and reacts with the byproducts to form SiO2 powder and HCL, which can reduce the pH of the cleaning water to ~2-3. This acidic cleaning water is disposed of as hazardous waste and properly managed by the Environmental Health and Safety department - about 10 L/month.

Hazardous Waste Generation – The SiC deposition process can produce certain reactive byproducts that can collect on the walls of the exhaust system. Water is used when cleaning the system, and reacts with the byproducts to form SiO2 powder and HCL, which can reduce the pH of the cleaning water to ~2-3. This acidic cleaning water is disposed of as hazardous waste and properly managed by the Environmental Health and Safety department - about 10 L/month. This is the same material cited above in the chemical waste disposal.

Discharge of Wastewater – During fabrication of SiC matrix composites, process byproducts are neutralized using a scrubber. The scrubber water is slightly basic (pH ~10.5), and contains a mix of NaCl, NaOH, and SiC and SiO_2 particulates. Periodically, the scrubber water is changed, and after letting any solid particulates settle, the liquid is discharged to the sewer system. This water discharge has been analyzed several times, and the results have consistently shown that the water discharge constituents are well within local wastewater discharge limits and adhere to GA wastewater discharge permit conditions. About 500 L/month is discharged.

SECTION D. Determine the Level of Environmental Review (or Documentation) and Reference(s): Identify the applicable categorical exclusion from 10 CFR 1021, Appendix B, give the appropriate justification, and the approval date.

Note: 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, including requirements of DOE orders; 2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities; 3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; 4) adversely affect environmentally sensitive resources. In addition, no extraordinary circumstances related to the proposal exist which would affect the significance of the action, and the action is not "connected" nor "related" (40 CFR 1508.25(a)(1) and (2), respectively) to other actions with potentially or cumulatively significant impacts.

References: 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); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial development.

Justification: The activity consists of evaluating a ceramic matrix composite for research purposes.

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

Approved by Jason Sturm, DOE-ID Deputy NEPA Compliance Officer on 6/19/2013