

SECTION A. Project Title: A Transient Reactor Physics Experiment with High-Fidelity, 3-D Flux Measurements for Validation and Verification – Kansas State University

SECTION B. Project Description

Kansas State University, in collaboration with the University of Wisconsin, proposes to instrument a research reactor with novel micro-pocket fission detectors (MPFDs) for measuring three-dimensional flux distributions. The measured data will be compared to simulation using the PROTEUS tool from the NEAMS toolkit and other tools, paving the way for future evaluated benchmark efforts. The work will use a 3-D array of MPFDs and standard reactor instrumentation to capture highly-resolved flux and temperature distributions for several steady-state and transient conditions.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use – Miniture fission chambers will be produced, tested, and deployed as part of this work. Each device contains a small mass (~ug) containing Th-232, U-235, and U-238, each of which is naturally radioactive. However, the masses involved render this natural radioactivity negligible.

Radioactive Waste Generation – The detectors produced and any housing containing them will be irradiated in a reactor and, hence, will become activated. This activation will depend on the irradiation time. For short-term testing at KSU, total irradiation times will be on the order of hours, for which the per-device activities are estimated to be in the nCi range after one week. Samples with such low activities can easily be store in present on-site facilities for radioactive materials. The detectors deployed to UW are expected to be in useful service beyond the project period. These detectors may acquire larger activities than from testing alone, however, satisfactory methods are in place to handle and store the materials either in the pool or in dry storage.

Mixed Waste Generation – The chemical processes used to construct the detectors uses thorium and uranium dissolved in solution. The volume of solution involved is on the order of liters, but the radioactivity is very low. Processes are in place to properly dispose of the material through the KSU environmental health and safety department.

Chemical Use/Storage – Various solvents are used, including isopropyl alcohol, acetone, and ethanol. Nitric acid is also used to clean glassware. Processes are in place for appropriate on-site storage and subsequent disposal. In addition, ammonium nitrate, urinal- and thorium-nitrate salts are used, and all are stored on-site.

Chemical Waste Disposal – All chemical waste is disposed through the KSU environmental health and safety department.

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 university-scale research aimed at measuring three-dimensional flux distributions using micro-pocket fission detectors.

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 08/12/2015