DOE-ID NEPA CX DETERMINATION

CX Posting No.: DOE-ID-21-088

SECTION A. Project Title: Probabilistic Validation and Risk Importance Ranking Methodology for Automation Trustworthiness and Transparency in Nuclear Power Plants– University of Illinois

SECTION B. Project Description

The University of Illinois proposes to develop a Probabilistic Validation (PV) methodology for automation technologies to evaluate and improve automation trustworthiness in Nuclear Power Plants (NPPs). Uncertainties associated with the automation-related processes will be characterized and propagated, and the degree of automation trustworthiness will then be measured based on the estimated epistemic uncertainty associated with the automation output. Acceptability of a degree of automation trustworthiness for an NPP application can be evaluated by utilizing predefined acceptance criteria at various levels of the analysis (e.g., risk acceptance criteria). This acceptability evaluation, along with an advanced risk importance ranking, helps identify and rank factors that significantly contribute to the automation trustworthiness and guides the improvement of automation trustworthiness. To enhance automation transparency, this project will develop an advanced risk monitoring methodology for monitoring plant risk emerging from the human-automation-physics processes. This risk monitoring and importance ranking will help improve automation transparency as they provide necessary information for plant personnel to clarify "why" the behavior of automation systems would deviate from expectations and "which automation factors" significantly contribute to this deviation. The results of risk monitoring and importance ranking will guide and improve operator situation awareness and help operators prioritize their efforts in interacting with automation technologies, especially when plant operation is at conditions near performance margins. The feasibility of the proposed methodologies will be demonstrated by two types of automation technologies

SECTION C. Environmental Aspects / Potential Sources of Impact

The proposal involves some experimental fire tests and, hence, is expected to generate a small amount of air emissions (from the fire tests) and use a small amount of water (for fire suppression). The University of Illinois Fire Service Institute (IFSI), which is a partner of this proposal, will be in charge of the fire experiments and will follow necessary safety and environmental protection procedures.

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). For purposes of this category, "demonstration actions" means actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment. Demonstration actions frequently follow research and development and pilot projects that are directed at establishing proof of concept.

Justification: The activity consists of an investigation to develop a systematic and scientifically justifiable approach for evaluating automation trustworthiness and improving automation transparency that is applicable for different types and levels of automation being considered for NPPs.

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 09/17/2021.