Development of the Technical Bases to Support Flexible Siting of Microreactors based on Right-Sized Emergency Planning Zones

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ABSTRACT:

The objective of the proposed project is to provide the technical basis to support the application of a right-sized Emergency Planning Zone (EPZ), to aid in the deployment of a microreactor research, development, and deployment (RD&D) platform at the Penn State University (PSU) Park campus as proposed by the Post-Industrial Midwest and Appalachia (PIMA) Nuclear Alliance (NA). The proposed research study will serve as a template to provide flexible siting in support of future microreactor deployments that may be placed closer to demand centers and industrial facilities, thereby making them more economically competitive.

The scope of the proposed project includes the development of theoretical models and constructs to model and simulate microreactor post-accident fission product transport and deposition within and beyond the primary containment. These models will then be verified and validated against existing data and empirical data from experiments. The appropriate and optimum site for the microreactor on the PSU campus will be determined based on input from the PSU Office of Physical Plant (OPP). This will allow the collection and utilization of real-time, site-specific weather data, as well as the identification of the topography and building interactions, in the near-field (distance of 100 m or lower from the microreactor) of the potential microreactor deployment site.

The technical approach includes a generic aspect to establish applicable methods and models associated with fission product transport and deposition. Probabilistic Risk Assessments (PRAs) for microreactors, and a site-specific study, where the models established in the generic study will be used to characterize atmospheric fission product transport and dispersion specific to the microreactor site at the PSU campus.

Dr. Jean Paul Allain is the principal investigator, and the project team consists of academic research experts who will support a range of technical activities including community engagement, along with professionals from the PSU OPP, who will assist with the identification of an optimum reactor deployment site. Other partners include Westinghouse Electric Corporation, who will eventually provide their eVinci microreactor to PSU for deployment.

In summary, the project aims to deploy a microreactor on the PSU campus by performing a generic assessment of post-accident in-containment and near-field transport and deposition of fission products, through a process that includes community engagement, followed by the identification of the optimum microreactor deployment site on the PSU campus based on a site-specific analysis of near-field dispersion using the identified particle transport models. The project team is well-equipped to execute the project scope within a two-year timeline.