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## **Development of a Consequence-Informed Safety and Security Framework for Microreactor Transportation**

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### **ABSTRACT:**

The overarching goals of this project are to:

- Development of methods for consequence-informed assessment of the safety and security of advanced microreactor designs during transportation, and
- Reduction in regulatory uncertainties and enhancement of the safety and security of the transportable reactor by proposing a framework with which to assess potential vulnerabilities due to being in transit and to propose methods by which to compensate for the vulnerabilities.

This project aims to develop a consequence-informed framework for assessing the safety and security of advanced microreactor designs during transport and enable appropriate physical protection. The methods and framework to be pursued in this project will address the licensing gaps in a safety+security integrated manner. The focus will include both accident scenarios (safety) and security scenarios (accident-induced, intentional action, forced release). An essential feature is the solicitation and incorporation of stakeholder feedback throughout the development process, in pursuit of stakeholder acceptance of microreactor transportation.

The project tasks include designing a Physical Protection System using methodologies recently published by members of the proposing team for fixed-site reactors; modeling of a selected non-LWR microreactor design; assessment of microreactor source terms; analysis of associated health consequences; characterization of the risk space; determination of whether an Emergency Planning Zone is needed during transportation; incorporation of stakeholder (to include Tribes, States, Federal agencies) input; proposal of a framework with which to assess any potential vulnerabilities of the microreactor while being transported and proposal of methods by which to compensate for the vulnerabilities.

This proposed project is novel in that it is using a consequence-informed approach to guide the design of transportable microreactor physical protection features. A key technical contribution will be the inclusion of conditions particular to transportation into the safety+security framework for PPS design.

This project will provide the following outcomes and benefits:

- A new methodology for consequence-informed assessment of the safety and security of advanced microreactor designs during transportation;
- Reduction in regulatory uncertainties and enhancement of the safety and security of the transportable reactor by proposing a framework with which to assess potential vulnerabilities and to propose methods by which to compensate for the vulnerabilities; and
- A means to define the level of risk for microreactors during transportation which is based on an integrated analysis of security and safety effects.

Major deliverables will include:

- A new methodology for optimized PPS design and consequence assessment for use during microreactor transportation
- A new framework for assessment of vulnerabilities and proposal of countermeasures to these vulnerabilities, for portable reactors during transit