

The Implications of a Risk-Informed Transportation Package Approval Process for Highway Transport of Microreactors on Transportation Security

Microreactors are compact reactors capable of producing less than 50 megawatts of electrical energy. Typically, these reactors are factory-fabricated and designed to be transportable by truck, rail, vessel, or air. Microreactor designs often assume that the reactor can be transported containing either unirradiated or irradiated fuel. The interest in microreactors is driven by several factors, including the need to generate power at remote locations, at military installations, at facilities such as data centers, and in areas recovering from natural disasters.

The report *Development and Demonstration of a Risk Assessment Approach for Approval of a Transportation Package of a Transportable Nuclear Power Plant for Domestic Highway Shipment* lays out and demonstrates a risk-informed transportation package approval process by which a factory fueled microreactor containing its irradiated or unirradiated fuel could be approved by the U.S. Nuclear Regulatory Commission (NRC).

In the traditional non-risk-informed transportation package approval process, compensatory measures are not typically required as a condition of transportation package approval. However, when implementing a risk-informed transportation package approval process, compensatory measures may be required. Potential compensatory measures include:

- The use of interstates, beltways around cities, and state identified preferred highway routes
- Specific heavy haul truck or superload permit requirements, e.g., the use of warning signs and lights
- Increased exclusion zone around the microreactor because of possible radiation dose rate increase
- Real time health/fitness onboard monitoring/diagnostics of reactor package
- Escorting of the reactor forward and aft for the entire route
- Rolling road closures
- Travel at reduced speeds
- Choosing a route that avoids bodies of water (balanced by quality of road)
- Controls for bridges over bodies of water (bridge inspection, speed reduction, close bridge to other traffic)
- Judicious use of time-of-day and day-of-week restrictions
- Avoid shipping during severe weather
- Conduct training for emergency responders along the route.

These potential compensatory measures have been shown to be effective from a safety perspective and are often used when shipping non-radioactive hazardous materials or when shipping overdimension or overweight commodities. However, the security implications of many of these potential compensatory measures are not well understood for radioactive materials shipments.

Many of the compensatory measures listed above would have positive impacts on security; for example, rolling road closures, and judicious use of time-of-day and day-of-week restrictions would have the potential to increase security. Several of the compensatory measures listed above have the potential to decrease security depending on how they were implemented. An example of this is the use of interstates, beltways around cities, and state identified preferred highway routes, where the use of these alternative routes would have to be examined to determine their effect on transportation security.

The purpose of this paper is to evaluate these potential compensatory measures to determine their effect on transportation security where the commodity being shipped is a microreactor containing its unirradiated or irradiated fuel where the transportation package approval has been obtained through a risk-informed transportation package approval process. A companion paper presented at this conference examines potential compensatory measures from the perspective of maritime transport of a microreactor containing its unirradiated or irradiated fuel.

Country or International Organization

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Instructions

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