

Nuclear Energy University Programs (NEUP) Fiscal Year (FY) 2014 Annual Planning Webinar

IRP-FC-1: Sensors and Delivery Devices for Dry Storage of Used Nuclear Fuel

JC de la Garza

NEUP Federal Point of Contact Office of Nuclear Energy U.S. Department of Energy

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IRP-FC-1:Sensors and Delivery Devices for Dry Storage of Used Nuclear Fuel

Introduction

- The U.S. commercial nuclear power industry is quite diverse with power stations located inland and on seaboards
- Most plant operators are moving used nuclear fuel from wet to dry storage
- Dry storage likely for several more decades and the "health" of dry storage systems is essential
- Focus is needed on the development of methodologies that can help industry and DOE resolve potential technical issues



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Background

- Previous work focused on instrumentation development and monitoring systems
- This IRP focuses on new sensors development for difficult locations and the delivery to dry storage systems
- Challenges include the existence of several dry storage systems in use today
- The dry storage systems are located at Independent Spent Fuel Storage Installations (ISFSIs), are highly secure and present radiological and safety hazards



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• Work to be Performed:

- Innovative Approaches for Acquiring Samples
 - Innovative approaches for acquiring samples from the surfaces of used nuclear fuel dry storage system components

Access into Dry Storage Systems

 How to gain access into dry storage systems, including inside concrete over-packs to access used fuel canisters (where used). Remotely operated systems requiring minimal, or preferably, no human interaction are of interest.

• Sensor Development Access into Dry Storage Systems

 Although many sensors exist, sensors may need to be smaller and more accurate for inside high radiation conditions and in areas not easily reachable

• Surface Sample Collection

- A system must be developed to acquire surface dusts and deposits that can accumulate on the surface of the dry storage system components to remote sense or to analyze these parameters in place
- Inspecting Dry Storage Systems
 - Innovative approaches for characterizing/inspecting dry storage system components are of interest, including:
 - Difficult to access locations
 - Canister welds and other welds
 - Bolts and seals
 - Potential cracks in concrete for those systems with exposed concrete
 - Presence of water
 - Measurement of surface temperatures
 - Visual inspection of surfaces
 - Documentation



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Work to be Performed (Continued):

Remote Sample Analysis

- Innovative approaches to perform sample analysis remotely
- Integration of the delivery system with sampling and analysis
- Deployment of existing instruments, sensors, detectors, as well as novel approaches

Data Collection

- Innovative approaches to data collection, management and storage
- Data quality must be ensured and protected

• Cyber Security

- Cyber security and potential transmission of data from a highly secure environment

• Systems Performance

- Success will include a system where all the features discussed/analyzed can be evaluated through at least one delivery/analysis system prototype for testing and evaluation in mockups of different used fuel dry storage systems
- If sensors are proposed to be used to generate the desired data, they should be developed to analyze the materials in place and transmit the data so it can be collected outside the cask



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Deliverables

• Alternatives Analysis

 Because of the variability of solutions that can be used, a 6 month progress report shall be submitted discussing how the data required above will be collected

Progress Report

 After 18 months into the project, a progress report shall be submitted that discusses the technical progress made toward solving the issues

• Final Report

 After 36 months into the project, a final report shall be submitted that discusses the technologies developed and how they can be implemented