

ADDENDUM  
to  
MEMORANDUM OF UNDERSTANDING  
BETWEEN  
U.S. NUCLEAR REGULATORY COMMISSION  
and  
ELECTRIC POWER RESEARCH INSTITUTE, INC.  
on  
NUCLEAR SAFETY RESEARCH OF  
NON-LIGHT WATER REACTOR TECHNOLOGIES

## **I. Introduction**

The U.S. Nuclear Regulatory Commission (NRC) and the Electric Power Research Institute, Inc. (EPRI) are the Parties to a Memorandum of Understanding on Cooperative Nuclear Safety Research dated September 30, 2016 (the MOU). Pursuant to the MOU, to conserve resources and to avoid needless duplication of effort, the Parties agreed it is in the best interest of both Parties to cooperate and share data and technical information and, in some cases, the costs related to such research whenever such cooperation and cost sharing may be done in a mutually beneficial fashion. This Addendum to the MOU (the Addendum) is entered into by and between the NRC and EPRI effective as of the date of signature of the last of the Parties to execute this Addendum (the Effective Date).

This Addendum is authorized pursuant to Section 31 of the Atomic Energy Act (AEA) and/or Section 205 of the Energy Reorganization Act (ERA). The roles, responsibilities, terms, and conditions of this MOU should not be interpreted in a manner inconsistent with and shall not supersede applicable Federal laws and regulations.

This Addendum describes a cooperative research and development (R&D) program between EPRI and the NRC in the area of non-light water reactor (non-LWR) technologies.

## **II. Objectives**

The primary points of contact between the NRC and EPRI will be staff in the NRC's Office of Nuclear Regulatory Research (RES) and EPRI's Advanced Nuclear Technology (ANT) program. The principal areas of interaction will be:

- Reactor Kinetics and Criticality
- Fuel Performance
- Thermal-fluid Phenomena
- Severe Accident Phenomena
- Offsite Consequence Analysis
- Materials and Reactor Component Integrity
- Internal and External Events
- Instrumentation and Controls
- Human and Organizational Factors
- Probabilistic Risk Assessment
- Application of Process Hazard Analysis Methods

- Used Fuel and Waste Management
- Radiation Protection
- Decontamination and Decommissioning
- Non-Destructive Examination

### **III. Scope and Plan**

EPRI is coordinating with the nuclear industry on research, technology development, and safety analysis for a number of advanced reactor designs. EPRI's goal is to facilitate consistent evaluation of non-LWR designs and to support the nuclear utilities in making decisions about the related licensing activities.

The NRC is preparing to review and regulate a new generation of non-LWRs by conducting work related to six individual strategies:

1. Acquire/develop sufficient knowledge, technical skills, and capacity to perform non-LWR regulatory activities.
2. Acquire/develop sufficient computer codes and tools to perform non-LWR regulatory reviews.
3. Establish a more flexible, risk-informed, performance-based, non-LWR regulatory review process within the bounds of existing regulations including the use of conceptual design reviews and staged-review processes. This flexibility will accommodate potential applicants having a range of financial, technical, and regulatory maturity and a range of application readiness.
4. Facilitate industry codes and standards needed to support the non-LWR life cycle (including fuels and materials).
5. Identify and resolve technology-inclusive (not specific to a particular non-LWR design or category) policy issues that impact regulatory reviews, siting, permitting, and/or licensing of non-LWR nuclear power plants (NPPs).
6. Develop and implement a structured, integrated strategy to communicate with internal and external stakeholders having interests in non-LWR technologies.

In this spirit, the NRC and EPRI will coordinate in the following manner:

- The NRC staff and EPRI staff will discuss data needs for: (1) updating analytical codes and models, qualifying materials, (2) demonstrating performance of structures, systems, and components (SSCs), or (3) verifying operational characteristics of non-LWR technologies. NRC staff and EPRI staff may also discuss approaches to obtaining needed data.
- The NRC staff and EPRI staff will participate in workshops on research and development progress of non-LWR designs and technologies.
- The NRC staff and EPRI staff will share information about modeling approaches for non-LWR designs, possibly including code comparison exercises.

- The NRC staff and EPRI staff will cooperate on research activities related to advanced sensors and instrumentation and controls (I&C) systems needed for non-LWR designs.
- The NRC staff and EPRI staff will discuss the methods, modeling assumptions, and data important for developing probabilistic risk assessment models to support risk-informed decisionmaking.
- The NRC staff and EPRI staff will discuss the approaches that would support determining appropriate risk metrics and end-state conditions for assessing the risk significance of SSCs important to the safe operation of non-LWR designs.
- The NRC staff and EPRI staff will discuss the approaches for the evaluation of human and organizational factors in the area of advanced concepts for conduct of operations (advanced control technologies, new operational concepts, and different accident types).
- The NRC and EPRI will exchange information related to:
  - Technical gaps for materials and component integrity issues for advanced non-light water reactors (ANLWRs) including candidate materials, dominant physical phenomena impacting materials degradation, materials compatibility, and high-temperature corrosion under molten salt and liquid metal environments.
  - Gaps in industry consensus Codes and Standards commonly used in U.S. nuclear applications.
  - Computational modeling needs to evaluate materials degradation and component integrity for ANLWRs.
  - Computational modeling needs with regards to neutronic and thermo-fluidic analysis of non-LWR technologies (fast reactors, molten salt reactors, and high temperature gas-cooled reactors).

#### **IV. Deliverables and Products**

This collaboration is primarily centered around sharing of information, progress reports, and perspectives on potential regulatory issues and approaches. To maintain the NRC's regulatory independence, the parties shall not jointly interpret the results or implications of information derived under this addendum. There are no formal or written deliverables. To the extent any potential jointly developed deliverables or products are identified for pursuit during the activities under this MOU addendum, a separate MOU addendum will be developed and approved for those purposes.

#### **V. Costs and Schedules**

This collaboration does not involve any cost-sharing terms for either party. The schedule for the interactions is largely driven by the industry's still evolving progress on non-LWR designs and technologies development and adoption and therefore cannot be defined definitively at this time.

**VI. Other Provisions**

Nothing in this MOU shall limit the rights or ability of either agency to exercise its authority independently with regard to matters that are the subject of this MOU. Activities being conducted under this MOU are closely related to other NRC activities being conducted under the advanced reactor Implementation Action Plans. Therefore, both parties shall appropriately coordinate activities under this addendum with other ongoing initiatives being coordinated by the Office of New Reactors.

**VII. Project Direction and Coordination**

A kick-off meeting will be organized once this MOU addendum is implemented. The NRC and EPRI staff expect to meet periodically to discuss progress and any emergent issues. All technical interactions will be managed through a single point of contact for each part. Technical meetings to coordinate this effort will be arranged through the project contacts. The project contacts are:

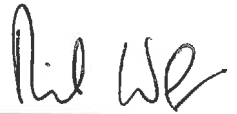
NRC:  
Michael Case

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**AGREEMENT**



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Date: December 12, 2018

Date: Jan 7 2019