

ADDENDUM  
to  
MEMORANDUM OF UNDERSTANDING  
between  
U.S. NUCLEAR REGULATORY COMMISSION  
and  
ELECTRIC POWER RESEARCH INSTITUTE  
on  
COOPERATIVE NUCLEAR ENERGY RESEARCH

Benchmarking of Emergency Planning and Response Radiological Assessment  
Software Tools Using Fukushima Accident Radiological Data

This Addendum to the Memorandum of Understanding (the "Addendum") is entered into by and between the Office of Nuclear Regulatory Research of the U.S. Nuclear Regulatory Commission ("USNRC") and the Electric Power Research Institute ("EPRI"), effective as of the date of signature of the last of the parties to this Addendum (the "Effective Date"). The USNRC and EPRI are parties to the Memorandum of Understanding on Cooperative Nuclear Safety Research, dated March 14, 2007 (the "MOU"). The MOU allows and encourages cooperation in nuclear safety research that benefits both the USNRC and the nuclear power industry. These benefits include the exchange of technical information and the sharing of costs whenever such cooperation and cost sharing can be accomplished in a beneficial manner.

This Addendum to the MOU is authorized pursuant to Section 31, "Research Assistance," of the Atomic Energy Act of 1954, as amended, and/or Section 205 of the Energy Reorganization Act of 1974. The roles, responsibilities, terms, and conditions of this Addendum to the 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 program between the USNRC and EPRI in the area of emergency planning and response.

EPRI is conducting various research projects to support the nuclear power industry by investigating lessons learned and experiences from the Fukushima Dai-ichi nuclear power plant accident. One of these projects is the benchmarking of emergency planning and response radiological assessment software tools using radiological data from the Fukushima accident. This benchmarking project will assess the capabilities of these radiological assessment software tools using the Fukushima accident scenario, source term, meteorological data, and associated airborne radioactivity and deposition measurements. Also, it will identify opportunities for enhancements of the radiological assessment software tools to best support emergency planning and response.

The Parties have AGREED as follows:

## ARTICLE 1 - OBJECTIVE

The USNRC and EPRI, in accordance with the provisions of this Addendum and subject to applicable laws, regulations and national policy in force in the United States, will benchmark emergency planning and response radiological assessment software tools, namely the USNRC Radiological Assessment System for Consequence Analysis (RASCAL) code, using radiological data from the Fukushima Dai-ichi nuclear power plant accident.

## ARTICLE 2. SCOPE OF ADDENDUM

- 2.1 EPRI has developed a publicly available database of radiological data from the Fukushima Dai-ichi nuclear power plant accident from publicly available and credible data sources including the national and municipal government organizations of Japan, federal government organizations of the United States, the Tokyo Electric Power Company (TEPCO), and a related EPRI research project. The data and information that will be used in this benchmarking project include: the Fukushima accident timeline and scenario, the accident source term as generated by EPRI using the Modular Accident Analysis Program (MAAP) software code, meteorological data, and associated airborne radioactivity and deposition measurements.

EPRI has developed a benchmarking plan for this project, which describes the benchmarking exercises that will be run in order to assess accident scenario modeling, source term estimation, atmospheric transport and dispersion, and associated airborne radioactivity, deposition, and dose estimation capabilities of the radiological assessment software tools. This benchmarking plan also describes the methods by which the radiological assessment software tools will be evaluated. The USNRC staff will use information contained in the benchmarking plan and database to benchmark the RASCAL code. This task will also involve reviews of EPRI draft reports and final reports, and providing comments and feedback to EPRI during the execution of the benchmarking plan, as considered necessary by the USNRC staff to run the RASCAL code for this project.

- 2.2 Benchmarking of the RASCAL Code

USNRC staff and contractors and EPRI will run the RASCAL code based on the benchmarking exercises and data provided by the EPRI team. USNRC staff and contractors will provide detailed information on the inputs to the RASCAL code and the outputs of the RASCAL code to be used in the evaluations of the software code by the EPRI team. USNRC may conduct their own evaluation of the RASCAL code based on the benchmarking exercise results as appropriate. This task will involve one or more working group meetings where the software codes will be run collaboratively between USNRC and EPRI. The USNRC staff will make a reasonable and realistic effort to participate in these meetings and support EPRI's schedule for benchmarking the RASCAL code in accordance with the benchmarking plan.

### 2.3 USNRC Review of Benchmarking Results

USNRC staff will review EPRI evaluations of the RASCAL code and provide feedback. This task will involve participation in one or more 2-day committee meetings and conference calls, reviewing of EPRI draft reports and providing comments and feedback. USNRC will be afforded adequate time and opportunity to review and provide feedback on the draft report (60 days) and review and concur on portions of the final report that contain data, descriptions or assessments of the RASCAL code prior to publication (30 days).

## ARTICLE 3 - ESTIMATED PROJECT COSTS, SCHEDULE AND PAYMENT

### 3.1 Project Activities and Schedule

The period of performance is anticipated to be from Fall 2013 through December 2016. USNRC staff participation in this project includes, but is not limited to, the following activities and schedules:

1. Benchmark of the RASCAL code using EPRI's benchmarking plan: Fall 2013 to Spring 2015.
2. Review of benchmarking results: Fall 2014 to Spring 2015.
3. Participation in Working Group and Review Committee meetings for this study: Fall 2013 to December 2016.

### 3.2 Cost and Payment

EPRI and USNRC will independently evaluate, estimate, and take responsibility for costs of participation in this project. Funds will not be exchanged between EPRI and USNRC.

EPRI is funding the database development, benchmarking plan development, technical bases development, benchmarking and results analysis. EPRI is also funding costs associated with the conduct of working and committee meetings and conference calls. The anticipated total cost of the EPRI funded portion of this project is around \$700K.

USNRC will fund its participation in this project. This may include man-hours costs for participating in working and committee meetings; benchmarking that includes analysis of results; management review of the final report; and associated travel costs. The anticipated total cost of the USNRC funded portion of this project is approximately \$100K.

## ARTICLE 4 - PROGRAM MANAGEMENT

The responsible EPRI Project Managers are David Perkins, Karen Kim, or other project managers as assigned. The EPRI team includes contractor staff [or personnel] responsible for developing the benchmarking plan, maintaining the database, and supporting benchmarking and results analysis. These team members are comprised of ERIN Engineering, RTI International, and Chesapeake Nuclear Services. EPRI has also formed a committee comprised of representatives from nuclear power plant utilities and related organizations (NEI, INPO, and ANI), and federal government agencies (USNRC, USDOE, etc.) to support the project implementation and execution.

The responsible USNRC Project Manager is Anthony Huffert. The USNRC team may include Patricia Milligan and Edward Fuller and other USNRC representatives and their consultants, who are subject matter experts in radiological atmospheric dispersion and dose modeling, nuclear reactor thermo hydraulic modeling, and emergency preparedness and response.

#### ARTICLE 5 – DISPUTES

If a dispute arises out of or relating to this Addendum or any breach thereof, the parties will first attempt to settle the dispute through direct negotiation between the Project Managers. If the Project Managers cannot settle such a dispute, the dispute shall be submitted to the Senior Management Contacts (as defined in Article 1, Section 1.2 of the MOU between USNRC and EPRI signed 3/14/2007) for resolution.

#### ARTICLE 6 - RESPONSIBILITY

In view of the research and developmental nature of the work hereunder, it is understood by all the Participants that EPRI's responsibility shall be limited to applying its best efforts in the performance of such work by competent staff within the limits of time and funds provided. Accordingly, it is understood that:

(a) EPRI provides no warranty, or guarantee, whatsoever including warranties of fitness for purpose or of merchantability for any item or research result, including any resulting inventions, which may be delivered under this Addendum.

(b) Neither EPRI nor the USNRC nor any other entity collaborating in the Project:

Makes any warranty, expressed or implied, or assumes any liability with respect to the accuracy, completeness or usefulness of the information that results from the implementation of the study; or

Assumes any liability with respect to the use of any information, instruction, design, apparatus, methods or process disclosed or applied in the implementation of the Project.

#### ARTICLE 7 - AVAILABILITY OF FUNDS

All activities under this Addendum are subject to the availability of appropriated funds.

#### ARTICLE 8 - TERMINATION

The USNRC or EPRI may withdraw from the present Addendum after providing the other party written notice of withdrawal at least 90 days prior to the anniversary date of the Addendum.

#### ARTICLE 9 - MODIFICATION AND INTEGRATION

No modification to this Addendum shall be valid unless written and signed by an authorized representative of EPRI and the USNRC. This Addendum contains the entire understanding

between the parties pertaining to the subject matter hereof and there are no understandings not set forth or incorporated by reference herein.

#### ARTICLE 10 – SHARING OF DATA AND PUBLICATION OF COOPERATIVE RESEARCH RESULTS

USNRC will provide to EPRI the output data and supporting technical information from benchmarking calculations performed for this study using the RASCAL code. This information will be assessed and analyzed by EPRI for research purposes.

EPRI will provide to USNRC all draft and final EPRI reports that are developed during the course of this collaboration for implementation, review, and/or comment. The USNRC will use said EPRI reports for the purpose of this collaborative research project only. Per Article 2, Section 2.2 of the MOU, proprietary information supplied by EPRI to support conduct of the research will be marked and protected in accordance with applicable Federal laws, and regulations, including 10 CFR §2.390. In accordance with 10 CFR §2.390, and contemporaneous with such exchange, EPRI will submit an affidavit covering such material and stating the basis for withholding it from public disclosure if the information has not been described in a previous affidavit. The USNRC may use information contained in final reports for regulatory purposes, and reference final reports in other documents prepared by the USNRC or its contractors.

EPRI maintains the right to independently assess and analyze the data and information provided by the USNRC, reach independent conclusions, and report the results of this EPRI research in reports that may be made available to the public. In the event resolution of comments between NRC and EPRI cannot be achieved, EPRI shall publish the study as an EPRI report with a Disclaimer conspicuously noted on the report, article, summary, abstract or related document that EPRI intends to release, display, disseminate or publish to other persons, the public or any other entities: "The views expressed in this [paper, journal article, report, summary, or abstract] do not represent those of the U.S. Nuclear Regulatory Commission."

#### ARTICLE 11 - ENTRY INTO FORCE

This Addendum shall enter into force upon signature by both parties, with effect from [date ], 2014, and shall remain in force through to the end of the term of the MOU.

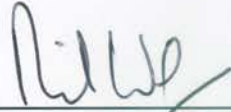
FOR THE UNITED STATES NUCLEAR  
REGULATORY COMMISSION:



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Brian Sheron, Director  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission

Date: Sept 26, 2014

FOR THE ELECTRIC POWER  
RESEARCH INSTITUTE:



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Neil Wilmshurst, Vice President and  
Chief Nuclear Officer  
Electric Power Research Institute, Inc.

Date: 10-13-2014