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## FRAME WORKSHOP

# WORKSHOP ON FUTURE RESEARCH FOR ACCIDENT MANAGEMENT ENHANCEMENT IN OPERATING AND FUTURE REACTORS, INFORMED BY FUKUSHIMA DAIICHI INSIGHTS

**26-27 September 2024, start 8:30 CDT**

***Argonne National Laboratory, 9700 S Cass Ave, Lemont, IL 60439, US***

Since its inception, the Nuclear Energy Agency (NEA) has served as a flexible and powerful platform for multinational research co-operation, particularly in areas related to nuclear safety. The projects conducted under the NEA's auspices have for decades enabled nuclear safety regulators, industry and research organizations to share research costs and results. That, in turn, has supported safety regulations and practices and facilitated their harmonisation around the world.

The NEA held the [Nuclear Safety Research Joint Projects Week: Success Stories and Opportunities for Future Development](#) from 9 to 13 January 2023 to review the accomplishments of the [Joint Nuclear Safety Projects](#) over the last four decades and to discuss future perspectives. A key point of the event's discussions was related to the challenges ahead, particularly for safety research for accident management in operating and future reactors with:

- The need to maintain, thirteen years after the Fukushima-Daiichi accident, international interest as well as public and private support for related research to address identified knowledge gaps and to benefit from enhanced use of insights gained from accident analyses for accident management approaches,
- The closure in 2024 and 2025 of seven NEA collaborative projects (ATLAS-3, ETHARINUS, QUENCH-ATF, THEMIS, ESTER, PANDA and ROSAU) addressing issues identified through

the Fukushima-Daiichi accident investigations and analyses, with the risk of losing unique capabilities with long-term built experimental facilities and expertise with significant investments. As built facilities and expertise can address some remaining gaps, especially for advanced fuel technologies (ATFs, high burnups, increased enrichment) for existing reactors and emerging issues for new reactors, their loss would certainly be detrimental,

- The need to focus the research, considering remaining gaps (from the viewpoints of industry, regulators, and researchers) and developing frameworks around sets of complementary experimental facilities, to address needs for both operating and future reactors.

It was recommended to continue the discussions in fora reuniting regulators, industry and operating agents to collaboratively identify core capabilities needed, in the nearer and longer term, to address the safety issues for operating and future reactors.

## Workshop objectives

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The workshop is organized as a response to the above recommendation. It shall enable nuclear safety regulators, industry, and research organizations to share their views on how the Fukushima-Daiichi accident has been used to inform accident management approaches for operating and future reactors, and on remaining potentials for their enhancement.

It shall also provide an opportunity to review research capabilities and opportunities offered by research facilities' operating agents.

As such, it will be a forum where regulators, industry and research operating agents will share views on potentials for future collaborative research.

Discussions should establish recommendations on research directions, needed capabilities and stakeholder involvement to continue supporting the development of optimized accident management strategies for operating and future reactors.

These recommendations shall, in turn, support operating agents to defend maintaining and developing core capabilities, and designing collaborative projects proposals to answer stakeholders' research needs.

## Workshop structure

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The workshop is organised into three sessions:

- Session 1 presentations to review safety knowledge gaps and emerging issues for accident management in reactors, considering insights from the Fukushima-Daiichi accident,
- Session 2 presentations to review collaborative research programs, capabilities and potentials for future research offered by operating agents,
- Session 3 panel to discuss further dissemination and integration of Fukushima Daiichi insights, key research capabilities, related frameworks and needed stakeholder involvement for the future.

## Organizing committee and sponsors

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**General Chair:** Toyoshi FUKETA, the Nuclear Regulation Authority (NRA), University of Tokyo, Japan

### Members of the Organizing Committee

- Alice DUFRESNE, Nuclear Energy Agency (NEA), France
- Hossein ESMAILI, US Nuclear Regulatory Commission (USNRC), United States
- Mitch FARMER, Argonne National Laboratory (ANL), United States
- Toyoshi FUKETA, the Nuclear Regulation Authority (NRA), University of Tokyo, Japan
- Didier JACQUEMAIN, Nuclear Energy Agency (NEA), France
- Yuji KUMAGAI, Nuclear Energy Agency (NEA), France
- Terttaliisa LIND, Paul Scherrer Institute (PSI), Switzerland
- Shinya MIZOKAMI, Tokyo Electric Power Company Holdings (TEPCO), Japan
- Andrew MORREALE, Canadian Nuclear Laboratories (CNL), Canada
- Damian PEKO, US Department of Energy (DOE), United States
- Joy REMPE, Rempe and Associates, LLC, United States

**Sponsors:** ANL, DOE, Electric Power Research Institute (EPRI), NEA, USNRC

## Day 1 – Thursday, 26 September 2024

08:30-08:40 Welcoming address, Paul KEARNS, Argonne National Laboratory Director

### Session 1: Safety knowledge gaps and emerging issues for accident management in reactors, Fukushima Daiichi's insights

Chairs: Didier JACQUEMAIN (NEA), Joy REMPE (REMPE and Associates, LLC)

- ▶ History and perspectives in R&D for enhancing accident management

08:40-09:20 Ray FURSTENAU, Director, Office of Nuclear Regulatory Research, United States Nuclear Regulatory Commission (USNRC), United States

- ▶ Fukushima Daiichi insights

09:20-10:00 Shinya MIZOKAMI, Research Director, Fukushima-Daiichi Accident Specialist, Tokyo Electric Power Company Holdings (TEPCO), Japan

10:00-10:25 Morning Break

- ▶ Regulator views

10:25-11:00 Toyoshi FUKETA, Advisor, Nuclear Regulation Authority (NRA), Senior Researcher, University of Tokyo, Japan

11:00-11:35 Tomi ROUTAMO, Deputy Director for New Nuclear Power Plant Regulation, Radiation and Nuclear Safety Authority (STUK), Finland

- ▶ Industry views

11:35-12:10 Randy BUNT, Manager of Severe Accident Management, Southern Nuclear, Boiling Water Reactors Owner's Group (BWROG), United States

12:10-13:30 Working Luncheon

**13:30-14:05**      **Philippe LAURENT**, Deputy Director of the Design and Technology Branch of the New Builds Engineering and Projects Directorate, Électricité de France S.A. (EdF), France

▶ [Technical Support Organization and Research Laboratory views](#)

**14-05-14:40**      **Jean-Christophe NIEL**, Director-General, Institut de Radioprotection et de Sûreté Nucléaire (IRSN), France

**14-40-15:15**      **Robert HILL**, Program Manager, Advanced Nuclear Energy Research and Development, Argonne National Laboratory (ANL), Generation IV International Forum Technical Director, United States

**15:15-15:40**      **Afternoon Break**

## Session 2: Collaborative research programs, capabilities and future potential

**Chairs: Andrew MORREALE (CNL), Terttaliisa LIND (PSI)**

**15-40-16:10**      **Kyoung-Ho KANG**, Korea Atomic Energy Research Institute (KAERI), Korea

**16:10-16:40**      **Vesa RIIKONEN**, Lappeenranta-Lahti University of Technology (LUT University), Finland

**16:40-17:10**      **Sanjeev GUPTA**, Becker Technologies, Germany

**17:10-17:40**      **Domenico PALADINO**, Paul Scherrer Institute (PSI), Switzerland

**17:40**              **End of Day 1**

## Day 2 – Friday, 27 September 2024

### Session 2 (continued): Collaborative research programs, capabilities and future potential

Chairs: Andrew MORREALE (CNL), Terttaliisa LIND (PSI)

#### 8:30 Opening

8:30-9:00 Steve BAJOREK, US Nuclear Regulatory Commission, United States

9:00-09:30 Martin STEINBRUCK, Karlsruhe Institute of Technology (KIT), Germany

09:30-10:00 Jeremy LICHT, Argonne National Laboratory (ANL), United States

#### 10:00-10:20 Morning Break

Chairs: Mitch FARMER (ANL), Shinya MIZOKAMI (TEPCO)

10:20-10:50 Christophe JOURNEAU, Commissariat à l'Énergie Atomique et aux Énergies Alternatives (CEA), France

10:50-11:20 Marc BARRACHIN, Institut de Radioprotection et de Sûreté Nucléaire (IRSN), France

11:20-11:50 Satoshi ABE and Yu MARUYAMA, Japan Atomic Energy Agency (JAEA), Japan

#### 11:50-13:00 Working Luncheon

Chairs: Mitch FARMER (ANL), Shinya MIZOKAMI (TEPCO)

13:00-13:30 Andrew MORREALE, Canadian Nuclear Laboratories (CNL), Canada

13:30-14:00 Eve-Lyne PELLETIER, International Atomic Energy Agency (IAEA), International Organization

**14:00-15:30**

**Panel Discussion**

**Chair and Moderator: Toyoshi FUKETA (NRA, University of Tokyo)**

**Panellists:**

- Shinya MIZOKAMI (TEPCO)
- Philippe LAURENT (EdF)
- Matthew NUDI (EPRI)
- Jean-Christophe NIEL (IRSN)
- Alexandre VIKTOROV (CNSC), Director General for Power Reactor Regulation
- Ray FURSTENAU (USNRC)
- Tomi ROUTAMO (STUK)
- Won-Pil BAEK (KAERI), Senior Researcher and President of the Korean Nuclear Society

**Topics**

- Insights from Fukushima Daiichi, dissemination, and meeting code data needs
- Key research capabilities to prepare for the future
- Research frameworks and stakeholder's involvement

**15:30-15:50**

**Afternoon Break**

**15:50-16:10**

**Concluding Session**

**Summary of workshop sessions by Session Chairs**

**General chair final message, Toyoshi FUKETA, (NRA, University of Tokyo)**

**16:10**

**End of Day 2**