

International Congress on Advances in Nuclear Power Plants (ICAPP 2017)

A New Paradigm in Nuclear Power Safety

Fukui, Japan
24 – 25 April 2017

Kyoto, Japan
26 – 28 April 2017

Volume 1 of 3

ISBN: 978-1-5108-5000-2

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2017) by Atomic Energy Society of Japan
All rights reserved.

Printed by Curran Associates, Inc. (2018)

For permission requests, please contact Atomic Energy Society of Japan
at the address below.

Atomic Energy Society of Japan
2-3-7 Shimbashi,
Minato-ku, Tokyo 105-0004
Japan

Phone: +81-(0)3-3508-1261
Fax: +81-(0)3-3581-6128

hensyu@aesj.or.jp

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

Track 5: Generic Safety Improvement, Evaluation and Regulation 1:20 pm - 3:00 pm / Tenzan (Hotel Fujita Fukui)

Chair: Masutake Sotsu (*Japan Atomic Energy Agency*)

Co-Chair: Hongbin Zhang (*Idaho National Laboratory*)

- 17093 **Defence in Depth Perspectives** 1
Tania Veneau, Agnès Ferrier, Jean Barbaud (*EDF*)
- 17277 **Beyond Design Basis External Flooding - Generic Design Assessment and Lessons Learned from the Fukushima Dai-ichi Accident** 11
Tanya MacLeod, Leslie Smith, Tim Allmark, Peter Ford (*Office for Nuclear Regulation*)
- 17353 **Our Reflections and Lessons from the Fukushima Nuclear Accident** 17
Takeshi Matsuoka, Takashi Sawada, Genki Yagawa, Naoto Sekimura, Ayao Tsuge, Hideki Nariai, Hiroyuki Kameda, Masaki Shiratori, Hiroshi Miyano, Yoshitaka Yoshida (*Science Council of Japan*)
- 17460 **Development of the Risk Monitoring System "COSMOS" and Risk-Informed Activities for Safety Enhancement in Kansai Electric's Plants** 32
Kazuhisa Takegoshi, Jun Sugahara, Satoru Fukui, Gaku Okubo (*The Kansai Electric Power Co., Inc.*), Kagetomo Miyahara, Takamasa Kurokawa, Kaoru Ikeda (*Nuclear Engineering, Ltd.*)

Track 4: Examination and Monitoring

1:20 pm - 3:00 pm / Sakae (Hotel Fujita Fukui)

Chair: Shinobu Ookido (*Hitachi-GE Nuclear Energy Ltd.*)

Co-Chair: Hidehiko Kuroda (*Toshiba Corporation*)

- 17092 **Neutron Radiography Method under High Gamma-Ray Environment Using Dysprosium Foil** 36
Kohichi Nakayama, Syuji Yamamoto (*Toshiba Corporation*), Koichi Nittoh (*Toshiba Nuclear Engineering Service Corporation*), Kenichi Yoshioka, Tsukasa Sugita (*Toshiba Corporation*)
- 17157 **Development of Ultrasonic Inspection Technique for Cast Stainless Steel and Its Application in the Field** 42
Hitoshi Ishida (*Institute of Nuclear Safety System, Inc.*)
- 17708 **Monitoring of Pipe Wall Thinning Using High-Temperature Thin-Film UT Sensor** 46
Takeshi Kodaira, Takayuki Matsuura, Isao Seki, Yuko Yamamoto, Seiichi Kawanami (*Mitsubishi Heavy Industries, Ltd.*)
- 17459 **Study on Condition Monitoring Techniques for Low Voltage Electrical Cables in Nuclear Power Plants** 50
Hideo Hirao, Takeshi Sakai (*Nuclear Engineering, Ltd.*), Yuusaku Kajimura (*Institute of Nuclear Safety System, Inc.*)

Track 1: Advances in LWR I

1:20 pm - 3:00 pm / Mizuho 1 (The Westin Miyako Kyoto)

Chair: Franck Morin (CEA)**Co-Chair:** Chikako Iwaki (Toshiba Corporation)

- 17036 **The European Utility Requirements for Advanced Light Water Reactors (EUR): Recent Achievements and New Challenges** 54
Emmanuel Vieilletoile (EDF)
- 17217 **ALISA Project: Large-Scale Experimental Facilities for Severe Accidents Studies in Europe and in China** 60
A. Miassoedov (Karlsruhe Institute of Technology), Y. Liao (China Nuclear Power Technology Research Institute), X. Gaus-Liu (Karlsruhe Institute of Technology), C. Journeau, N. Cassiaut-Louis (CEA), H. Zhang (China Nuclear Power Technology Research Institute), W. Bai (State Nuclear Power Software Development Center), Y.P. Zhang (Xi'an JiaoTong University), B. Kuang, P. Hu (Shanghai Jiao Tong University)
- 17709 **In-Containment Hydrogen Sensor System against Harsh Environment during a Severe Accident** 70
Shohei Hasegawa, Hiroyuki Ukon, Masato Oba (Mitsubishi Heavy Industries, Ltd.)
- 17688 **Load Bearing Capacities and Elastic-Plastic Behavior of Reactor Vessel Internals** 76
Keita Watanabe, Ryuichi Nagase (Mitsubishi Heavy Industries, Ltd.)
- 17446 **The Effect of Mass Transfer Processes on Accumulation and Crystallization of Boric Acid in VVER Core in Case of Accident** 83
A. V. Morozov, A. V. Pityk, S. V. Ragulin, A. R. Sahipgareev, A. S. Shlepkin (Institute for Physics and Power Engineering)

Track 3: SFR Design and Technologies I

1:20 pm - 3:00 pm / Mizuho 2 (The Westin Miyako Kyoto)

Chair: Hidemasa Yamano (Japan Atomic Energy Agency)**Co-Chair:** Bernard Carlucci (AREVA NP)

- 17155 **IAEA NAPRO Coordinated Research Project: Equations of State for Sodium** 88
O. Azpitarte, E. Vazquez, M. Japas, M. Chocrón, A. Villanueva (National Atomic Energy Commission of Argentina), S. Passerini, C. Gerardi, C. Grandy (Argonne National Laboratory), E. Bubelis, S. Perez-Martin (Karlsruhe Institute of Technology), S. Jayaraju, F. Roelofs (Nuclear Research and Consultancy Group), C. Latgé, A. Gerschenfeld (CEA), Bin Long (China Institute of Atomic Energy), P. Selvaraj (Indira Gandhi Centre for Atomic Research), E. Marinenko, Y. Zagorulko (Institute of Physics and Power Engineering), H. Ohira (Japan Atomic Energy Agency), V. Kriventsev (IAEA)
- 17428 **The Collaboration of Japan and France on the Design of ASTRID Sodium Fast Reactor** 96
Frédéric Varaine, Gilles Rodriguez (CEA), Jean-Marie Hamy (AREVA NP), Hiroki Hayafune (Japan Atomic Energy Agency), Toru Iitsuka (Mitsubishi Heavy Industries, Ltd.), Haruo Mochida (Mitsubishi FBR Systems Inc.)
- 17573 **Development of Electro-Magnetic Pump for the ASTRID Sodium-Cooled Fast Reactor** 104
Tetsu Suzuki, Rie Aizawa, Shingo Wakasaki (Toshiba Corporation Energy Systems & Solutions Company), Frank Dechelette, Fabrice Benoit (CEA)
- 17645 **Development of Prototype Reactor Maintenance (1) Application to Piping System of Sodium-Cooled Reactor Prototype** 112
Shoji Kotake (The Japan Atomic Power Company), Yoshitaka Chikazawa, Shigeru Takaya, Masahiko Ohtaka, Shigenobu Kubo, Masanobu Arai, Kosuke Kunogi (Japan Atomic Energy Agency), Takaya Ito (Mitsubishi FBR Systems Inc.), Akira Yamaguchi (The University of Tokyo)
- 17772 **Development of Prototype Reactor Maintenance (2) Application to Piping Support of Sodium-Cooled Reactor Prototype** 118
Masanobu Arai, Kosuke Kunogi, Kosuke Aizawa, Yoshitaka Chikazawa, Shigeru Takaya, Shigenobu Kubo (Japan Atomic Energy Agency), Shoji Kotake (The Japan Atomic Power Company), Takaya Ito (Mitsubishi FBR Systems Inc.), Akira Yamaguchi (The University of Tokyo)

Track 5: Safety Analysis I

1:20 pm - 3:00 pm / Cosmos Hall (The Westin Miyako Kyoto)

Chair: Tania Veneau (EDF)**Co-Chair:** Koichi Nakamura (Central Research Institute of Electric Power Industry)

- 17047 **Demonstration of Uncertainty Quantification and Sensitivity Analysis for PWR Fuel Performance with BISON** 124
Hongbin Zhang (Idaho National Laboratory), Jacob Ladd (Brigham Young University), Haihua Zhao, Ling Zou, Douglas Burns (Idaho National Laboratory)
- 17737 **Modeling of Accident Tolerant Fuel for PWR and BWR Using MAAP5** 134
Eugene van Heerden, Chan Y. Paik, Sung Jin Lee, Martin G. Plys (Fauske & Associates, LLC)
- 17464 **The Analysis of Kuosheng Nuclear Power Plant Spent Fuel Pool by Using FRAPTRAN-2.0** 144
Wan-Yun Li, Yu Chiang (National Tsing Hua University), Jong-Rong Wang (National Tsing Hua University / Nuclear and New Energy Education and Research Foundation), Yung-Shin Tseng (National Tsing Hua University), Hao-Tzu Lin (Atomic Energy Council), Jung-Hua Yang, Yuh-Ming Ferng, Shao-Wen Chen (National Tsing Hua University), Chunkuan Shih (National Tsing Hua University / Nuclear and New Energy Education and Research Foundation)
- 17729 **Fuel Cycle Facility Safety Analysis and Source Term Tool FATE** 150
Martin Plys, Sung Jin Lee, Robert Apthorpe, James Burelbach (Fauske & Associates, LLC)
- 17614 **Simplified Pipe-To-Pipe Impact and Break Evaluation Method for Postulated Pipe Rupture** 158
Redha Mahzar, Xu Qiang, Yushi Sakamoto, Akira Nebu, Akihiko Hirano, Noriyuki Takamura (Hitachi-GE Nuclear Energy Ltd.)

Track 3: SFR Core Design I

1:20 pm - 3:00 pm / Hiei (The Westin Miyako Kyoto)

Chair: Shigeo Ohki (Japan Atomic Energy Agency)

Co-Chair: Thierry Beck (CEA)

- 17247 **Design Study of a 750 MWe Japan Sodium-Cooled Fast Reactor with Metal Fuel** 168
Kazuya Ohgama (Japan Atomic Energy Agency), Hirokazu Ohta (Central Research Institute of Electric Power Industry), Yoshihisa Ikusawa, Shigeo Ohki (Japan Atomic Energy Agency), Takanari Ogata (Central Research Institute of Electric Power Industry)
- 17169 **Comparative Study on Burnup Characteristics of a 1500 MWe Metal Fuel Sodium-Cooled Fast Reactor** 174
Kazuya Ohgama (Japan Atomic Energy Agency), Gerardo Aliberti, Nicolas E. Stauff (Argonne National Laboratory), Shigeo Ohki (Japan Atomic Energy Agency), Taek K. Kim (Argonne National Laboratory)
- 17207 **Tradeoff Analysis of Metal-Fueled Fast Reactor Design Concepts** 182
Nicolas E. Stauff (Argonne National Laboratory), Kazuya Ohgama (Japan Atomic Energy Agency), Gerardo Aliberti (Argonne National Laboratory), Shigeo Ohki (Japan Atomic Energy Agency), Taek K. Kim (Argonne National Laboratory)
- 17171 **Core Concept of Minor Actinides Transmutation Fast Reactor with Improved Safety** 192
Koji Fujimura (Hitachi-GE Nuclear Energy Ltd. / Hitachi, Ltd.), Satoshi Itooka (Hitachi-GE Nuclear Energy Ltd.), Shigeo Ohki (Japan Atomic Energy Agency), Toshikazu Takeda (University of Fukui)
- 17739 **Concept of Small Candle Burning Reactor with Melt and Refining Process** 198
Toru Obara, Van Khanh Hoang, Jun Nishiyama (Tokyo Institute of Technology)

Track 7: CHF and Reactor Simulations

1:20 pm - 3:00 pm / Atago (The Westin Miyako Kyoto)

Chair: Michio Murase (Institute of Nuclear Safety System, Inc.)

Co-Chair: Gumersindo Verdu (Institute for Industrial, Radiophysical and Environmental Safety)

- 17429 **A Critical Heat Flux Model for Flow Boiling in the IVR Conditions** 202
Hae Min Park (CEA / Korea Advanced Institute of Science and Technology), Sofia Carnevali, Fabrice Gaudier (CEA), Yong Hoon Jeong (Korea Advanced Institute of Science and Technology)
- 17755 **Enhanced Pool Boiling Critical Heat Flux with Cr-Sputtered Superhydrophilic Metal Surface** 212
Hong Hyun Son, Gwang Hyeok Seo, Uiju Jeong, Sung Joong Kim (Hanyang University)
- 17218 **An Experimental Investigation on CHF Enhancement of Saturated Water with Coated Surfaces by Cellulose Nano Fiber** 222
Won-Ki Hwang, Minji Hyun, Hundong Choi (Handong Global University), Seunghwan Choy, Dong Soo Hwang (Pohang University of Science and Technology), Kwon-Yeong Lee (Handong Global University)
- 17472 **NPP Process Systems Testing by Means of CSS "VEB" on the Example of Operating Regimes Verification of the Make-Up and Boron Control System** 227
Evgenii Obratsov, Maxim Gavrilov, Evgeny Tretyakov, Vladimir Bezlepkin (JSC ATOMPROEKT)

Track 8: MA Recycle

1:20 pm - 3:00 pm / Take (The Westin Miyako Kyoto)

Chair: Supathorn Phongikaroon (Virginia Commonwealth University)

Co-Chair: Koichi Uozumi (Central Research Institute of Electric Power Industry)

- 17322 **Control of Fine Particles Accumulation in the Extraction Chromatography Column System for Minor Actinide Recovery** 236
Sou Watanabe, Ichiro Goto, Yuichi Sano, Kazunori Nomura, Yoshikazu Koma (Japan Atomic Energy Agency)
- 17356 **Granulation Study of Porous Silica Particles for MA Recovery Process** 243
Ichiro Goto, Hirohide Kofuji, Akio Oriuchi, Sou Watanabe, Masayuki Takeuchi (Japan Atomic Energy Agency)
- 17392 **Minor Actinides Recovery from Irradiated Fuel for SmART Cycle Test** 249
M. Takeuchi, Y. Sano, S. Watanabe, M. Nakahara, H. Aihara, H. Kofuji, T. Koizumi, T. Mizuno (Japan Atomic Energy Agency)
- 17252 **Study on Full Recycling Scheme of TRU Utilizing Features of LWR and FR** 255
R. Shimada, H. Yamaguchi, S. Takeda, T. Kitada (Osaka University)
- 17388 **Americium Early Transmutation in Thermal Reactors: An Option to a Better Nuclear Spent Fuel Management** 261
A.-A. Zakari-Issoufou, X. Doligez, A. Somaini, M. Ernoult, S. David, S. Bouneau (Université Paris-Sud), F. Courtin, B. Leniau, N. Thiollière (SUBATECH), B. Mougnot (University of Wisconsin-Madison), A. Bidaud (Phelma-INP Grenoble)

Track 9: Advanced Cladding/Materials

1:20 pm - 3:00 pm / Ran (The Westin Miyako Kyoto)

Chair: Masahiro Furuya (*Central Research Institute of Electric Power Industry*)**Co-Chair:** Ken Kurosaki (*Osaka University*)

- 17227 **Study of Microstructure and Mechanical Properties of Dilute Binary Zr-Nb Model Alloys for the Applications of Nuclear Fuel Cladding** 270
H.L. Yang, S. Kano (*The University of Tokyo*), Z.G. Duan, Y. Matsukawa (*Tohoku University*), K. Murakami (*The University of Tokyo*), H. Abe (*The University of Tokyo / Tohoku University*)
- 17288 **Improvement of In-Situ Transmission Electron Microscope Technique for Analysis of Cascade Damage** 276
Kenta Murakami, Dongyue Chen, Hiroaki Abe, Naoto Sekimura (*The University of Tokyo*)
- 17290 **Irradiation Effects on Localized Deformation Behaviors in Zr-Nb Alloys** 278
Sho Kano, Huiilong Yang, Kenta Murakami, Hiroaki Abe (*The University of Tokyo*)
- 17790 **Development of M-MDA as Reliable Cladding and Structural Materials** 285
Yuji Okada, Seiichi Watanabe, Hideyuki Teshima (*Mitsubishi Nuclear Fuel Co., Ltd.*), Toshiya Kido (*Nuclear Development Corp.*), Yasushi Kameda (*The Kansai Electric Power Co., Inc.*)
- 17481 **Zirconium Hydride: The Physical Properties and High-Temperature Stability** 291
Ken Kurosaki (*Osaka University / JST PRESTO*), Yuji Ohishi, Hiroaki Muta (*Osaka University*), Shinsuke Yamanaka (*Osaka University / University of Fukui*)

Track 4: Plant Management

1:20 pm - 3:00 pm / Kiku (The Westin Miyako Kyoto)

Chair: Masutake Sotsu (*Japan Atomic Energy Agency*)**Co-Chair:** Norimasa Mori (*Mitsubishi Heavy Industries, Ltd.*)

- 17313 **Development of Sub-Criticality Monitoring Method during Shutdown Modes of Nuclear Power Plants** 294
Shoichi Tashiro (*Global Nuclear Fuel-Japan Co., Ltd. / University of Fukui*), Masayuki Tojo (*Global Nuclear Fuel-Japan Co., Ltd.*), Yoichiro Shimazu (*University of Fukui*)
- 17564 **Verification of Sub-Criticality Monitoring Method with Actual Startup Range Neutron Monitor Signals during Shutdown Modes in a BWR** 302
Masayuki Tojo (*Global Nuclear Fuel-Japan Co., Ltd.*), Shoichi Tashiro (*Global Nuclear Fuel-Japan Co., Ltd. / University of Fukui*), Yoichiro Shimazu (*University of Fukui*), Suguru Murakami (*Hokuriku Electric Power Co., Inc.*)
- 17725 **Impact of the Primary Coolant ⁵⁸Co Activity at Last Reactor Cooling Pump Shutdown on the Reactor Cavity Floor Dose Rates** 312
T. Jobert, C. Dinse (*EDF*)
- 17536 **Experiences of Takahama Unit 3 and 4 Plant Start-Up Water Chemistry Management after Long Term Outage** 319
Masanori Aoki, Tetsuya Tanabe (*The Kansai Electric Power Co., Inc.*), Akihiro Maeda, Nobuo Ishihara, Yasuhiko Shoda (*Mitsubishi Heavy Industries, Ltd.*)
- 17637 **Result of Water Quality during Restart at Ikata Unit 3** 327
Seitaro Mishima, Hiroyuki Urado, Yasuhiro Miyoshi, Akihiro Okita, Kazushi Fujita (*Shikoku Electric Power Co., Inc.*)

Track 10: Society and Technology

1:20 pm - 3:00 pm / Shirakawa (The Westin Miyako Kyoto)

Chair: Kazuaki Matsui (*The Institute of Applied Energy*)**Co-Chair:** Kazuhiro Tsuzuki (*The Institute of Applied Energy*)

- 17213 **Key Technologies for the Current and Future Challenges of the Nuclear Industry** 334
Lou Martinez-Sancho, Martin Roulleaux Dugage (*AREVA NP*)
- 17233 **A Study of Environmental Design Planning for Nuclear Power Plants** 343
Yeonjung Kim, Selin Kim (*Ewha Womans University*)
- 17554 **Nuclear Safety Cooperation in Southeast Asia: Lessons from Asia's Regional Networks** 347
Julius Cesar I. Trajano (*Nanyang Technological University*)

Track 1: Advances in LWR II

3:20 pm - 5:00 pm / Mizuho 1 (The Westin Miyako Kyoto)

Chair: Tomohiko Ikegawa (*Hitachi, Ltd.*)

Co-Chair: Franck Morin (*CEA*)

- 17443 **iB1350 #1– A Generation III.7 Reactor after the Fukushima Daiichi Accident** 360
Takashi Sato, Keiji Matsumoto, Kenji Hosomi, Yoshihiro Kojima, Keisuke Taguchi (*Toshiba Corporation*)
- 17253 **iB1350 #2 - Level 1 PRA for Optimization of Safety Systems of the iB1350** 375
Yuji Komori, Go Tanaka, Tetsuro Yamaoka, Takashi Sato, Geoffrey Carter (*Toshiba Corporation*)
- 17447 **iB1350 #3 – Passive Double Confinement and SA Population Dose Evaluation for the iB1350** 387
Takashi Sato, Keiji Matsumoto, Kenji Hosomi, Ryuji Iwasaki (*Toshiba Corporation*)
- 17445 **iB1350 #4 – Innovative Passive Containment Cooling System for the iB1350** 397
Takashi Sato, Keiji Matsumoto, Nobuhiro Hara, Ryuji Iwasaki (*Toshiba Corporation*)
- 17583 **Mitigations of Station Blackout Accident of an Advanced Boiling Water Reactor** 407
Y.S. Wang, F.J. Tsai, Min Lee (*National Tsing Hua University*)

Track 3: SFR Severe Accident I

3:20 pm - 5:00 pm / Mizuho 2 (The Westin Miyako Kyoto)

Chair: Yoshitaka Fukano (*Japan Atomic Energy Agency*)

Co-Chair: Frederic Olivier Serre (*CEA*)

- 17270 **Analysis of SCARABEE BE+3 Experiment with ASTEC-Na and Comparison with Other SFR Safety Analysis Codes** 414
Giacomino Bandini, Stefano Ederli (*Italian Agency for New Technologies, Energy and Sustainable Economic Development*), Sara Perez-Martin, Werner Pfrang (*Karlsruhe Institute of Technology*), Nathalie Girault, Laure Cloarec (*Institute for Radiological Protection and Nuclear Safety*)
- 17144 **Fundamental Experiments of Jet Impingement and Fragmentation Simulating the Fuel Relocation in the Core Disruptive Accident of Sodium-Cooled Fast Reactors** 426
Yuya Imaizumi, Kenji Kamiyama, Ken-ichi Matsuba, Mikio Isozaki, Tohru Suzuki, Yuki Emura (*Japan Atomic Energy Agency*)
- 17111 **A New Design of Experimental System and Preliminary Numerical Analysis of Local Fuel-Coolant Interactions in a Simulated Molten Fuel Pool** 431
Ting Zhu, Songbai Cheng, Shaopeng Lin, Minli Chen, Wanqi Feng, Qingyun Hu (*Sun Yat-Sen University*)

Track 5: External Events I

3:20 pm - 5:00 pm / Cosmos Hall (The Westin Miyako Kyoto)

Chair: Ichiro Tamura (*The Chugoku Electric Power Co., Inc.*)

Co-Chair: Tanya MacLeod (*Office for Nuclear Regulation*)

- 17197 **Seismic Margin Analysis for Reactor and Spent Fuel Storage Pool** 439
Bumpei Fujioka, Naoki Hirokawa, Daisuke Taniguchi (*Hitachi-GE Nuclear Energy Ltd.*)
- 17358 **Continuous Improvements of Earthquake and Tsunami Resistant Measures at Onagawa Nuclear Power Station** 445
Kenzo Nakano (*Tohoku Electric Power Co., Inc.*)
- 17577 **Development of Evaluation Method for Seismic Isolation Systems of Nuclear Power Facilities - Proposal of Fragility Evaluation Method and Study on Application of Fail-Safe System -** 448
Takahide Akimoto (*Obayashi Corporation*), Tetsuo Imaoka (*Hitachi-GE Nuclear Energy Ltd.*), Kunihiko Sato (*MHI Nuclear Systems And Solution Engineering Co., Ltd.*), Tomofumi Yamamoto (*Mitsubishi Heavy Industries, Ltd.*), Masakazu Jimbo (*Toshiba Corporation*), Tsutomu Hirofumi (*Shimizu Corporation*), Koichi Yabuuchi (*Kajima Corporation*), Yasuo Okouchi (*Chubu Electric Power Co. Inc.*)
- 17757 **Dynamic Approach for Scenario Quantification of Combined Event of Internal Flooding and Earthquake in Nuclear Power Plant** 458
Sunghyon Jang, Akira Yamaguchi (*The University of Tokyo*)
- 17783 **The Seismic Assessment of Wheeled Vehicle Type Equipment (e.g. Emergency Power Supply Vehicle) against Severe Accident for Nuclear Power Plant in Japan** 465
Takuya Ikeda, Daisuke Mitsuzawa, Yoshikazu Yamaguchi, Motohiko Hasebe, Ryutaro Imamura, Yuji Tomitani (*Mitsubishi Heavy Industries, Ltd.*), Ippei Ueyama (*The Kansai Electric Power Co., Inc.*), Takahiro Kawamoto (*Hokkaido Electric Power Co., Inc.*)

Track 3: SFR Core Design II

3:20 pm - 5:00 pm / Hiei (The Westin Miyako Kyoto)

Chair: Koji Fujimura (*Hitachi-GE Nuclear Energy Ltd.*)**Co-Chair:** Paolo Ferroni (*Westinghouse Electric Company LLC*)

- 17374 **Core Performance Requirements and Design Conditions for Next-Generation Sodium-Cooled Fast Reactor in Japan** 470
Shigeo Ohki, Shuhei Maruyama, Yoshitaka Chikazawa, Akira Ohtaki, Shigenobu Kubo (*Japan Atomic Energy Agency*), Koki Hibi (*Mitsubishi FBR Systems Inc.*), Taro Kan (*Mitsubishi Heavy Industries, Ltd.*)
- 17221 **Core Design of the Next-Generation Sodium-Cooled Fast Reactor in Japan** 479
Taro Kan (*Mitsubishi Heavy Industries, Ltd.*), Masashi Ogura, Koki Hibi (*Mitsubishi FBR Systems Inc.*), Shigeo Ohki, Seiichiro Maeda, Shuhei Maruyama, Kazuya Ohgama (*Japan Atomic Energy Agency*)
- 17201 **Improvement of Minor Actinides Transmutation Performances in Fast Reactors Using Fissile Material** 489
Timothée Kooyman, Laurent Buiron, Gérald Rimpault (*CEA*)
- 17248 **Conceptual Design of ASTRID Radial Shielding Sub-Assemblies** 499
T. Beck (*CEA*), N. Chapoutier (*AREVA NP*), J-M. Esclaine (*CEA*), L. Gauthier, D. Occhipinti, B. Perrin (*AREVA NP*), M. Phelip, C. Venard (*CEA*)

Track 7: Severe Accident Related Simulations

3:20 pm - 5:00 pm / Atago (The Westin Miyako Kyoto)

Chair: Marco Pellegrini (*The Institute of Applied Energy*)**Co-Chair:** Kazuyuki Takase (*Nagaoka University of Technology*)

- 17134 **Modeling of RPV Lower Head under Core Melt Severe Accident Condition Using OpenFOAM** 507
Hiroshi Madokoro, Frank Kretzschmar, Alexei Miassoedov (*Karlsruhe Institute of Technology*)
- 17345 **Assessment on Direct Debris Interaction at High Pressure Melt Ejection Scenario** 514
Hiromasa Chitose, Tomohiko Ikegawa, Naoya Kamei, Ryusuke Kimura (*Hitachi-GE Nuclear Energy Ltd.*)
- 17640 **Development of a Numerical Simulation Method to Evaluate Molten Material Behavior in Nuclear Reactors** 523
Susumu Yamashita, Shinichiro Uesawa, Hiroyuki Yoshida (*Japan Atomic Energy Agency*)
- 17168 **Numerical Analysis of Effect of Solidification on Molten Jet Breakup** 533
Yuan Zhou (*Sichuan University*), Mingjun Zhong (*Shanghai Jiao Tong University*), Xing Fan, Jing Tan Chen (*Sichuan University*)
- 17102 **Preliminary Numerical Analysis of Flow-Regime Characteristics in Debris Bed Formation Behavior with Eulerian Model** 541
Shixian Wang, Songbai Cheng, Shuo Li, Guangyu Jiang, Zhiyi Pan, Hantao Lin, Jiahuan Yu (*Sun Yat-Sen University*)

Track 8: SNF Reprocessing

3:20 pm - 5:00 pm / Take (The Westin Miyako Kyoto)

Chair: Masayoshi Uno (*University of Fukui*)**Co-Chair:** Jong-Il Yun (*Korea Advanced Institute of Science and Technology*)

- 17263 **Development of U and Pu Co-Processing Process -Demonstration of U, Pu and Np Co-Recovery with Centrifugal Contactors-** 554
Atsunari Kudo, Kazuaki Kurabayashi, Futoshi Yanagibashi, Shunichi Sasaki, Takehiko Sato, Ikuo Fujimoto, Tomoyuki Ohbu (*Japan Atomic Energy Agency*)
- 17494 **Sulfur-Free HPLC Method for Quantification Assay of Uranium in Nuclear Fuel Reprocessing Plants** 560
Satsuki Kai, Hirofumi Hayashibara, Takashi Miyazaki (*Mitsubishi Heavy Industries, Ltd.*), Takaaki Ichinohe, Kouichi Nishimura, Nobuharu Sato (*Japan Nuclear Fuel Limited*)
- 17727 **Measurement of Exchange Current Density of LaCl₃ in LiCl-KCl Eutectic Salt** 563
Hunter B. Andrews, Supathorn Phongikaroon (*Virginia Commonwealth University*)
- 17612 **Development of Zeolite Column Systems for Treatment of Molten Chloride Salt Generated in Pyro-Reprocessing of Nuclear Fuel** 571
K. Uozumi, T. Hijikata, K. Inagaki (*Central Research Institute of Electric Power Industry*)

Track 9: LWR Plant Materials and Structures 3:20 pm - 5:00 pm / Ran (The Westin Miyako Kyoto)

Chair: Masayuki Kamaya (Institute of Nuclear Safety System, Inc.)

Co-Chair: Naoki Soneda (Central Research Institute of Electric Power Industry)

- 17305 **Research Plan of Irradiation Embrittlement Using Decommissioning Hamaoka Unit-1** 578
Hideki Yuya, Masataka Oyama (Chubu Electric Power Co. Inc.)
- 17398 **APT Analysis of Neutron-Irradiated Stainless Steels** 584
Katsuhiko Fujii, Koji Fukuya (Institute of Nuclear Safety System, Inc.)
- 17136 **Coupled 3D CFD and FEM Assessments of RPV Stress Intensity Factor during PTS Events** 590
Xiaoyong Ruan, Toshiki Nakasuji, Kazunori Morishita (Kyoto University)
- 17642 **Safety Design of MSF-Type Cask for Long Term Storage and Subsequent Transportation of Spent Nuclear Fuels** 599
Hideaki Mitsui, Yoshiyuki Saito, Yuichi Saito, Junichi Kishimoto (Mitsubishi Heavy Industries, Ltd.)
- 17638 **Stator Winding Service Life Analysis of Wet Winding Motor RCP** 609
Eing Yee Yeoh, Linsen Li, Ziguan Wang, Feng Shen (State Power Investment Corporation Research Institute)

Track 4: Maintenance Experiences 3:20 pm - 5:00 pm / Kiku (The Westin Miyako Kyoto)

Chair: Nobuo Tada (The Japan Electrical Manufacturers' Association)

Co-Chair: Thomas Jobert (EDF)

- 17116 **Wearable System for Supporting Field Operation of Nuclear Power Plant** 613
Musashi Shigeyama, Kenji Osaki, Takaki Kato, Yukinori Hirose (Toshiba Corporation)
- 17625 **Maintenance Service for Major Component of PWR Plant: Replacement of Pressurizer Safe End Weld** 618
Yoshiyuki Miyoshi, Yuki Kobayashi, Kazuhide Yamamoto, Takeshi Ueda, Naoki Suda, Takashi Shintani (Mitsubishi Heavy Industries, Ltd.)
- 17693 **Development of Maintenance Procedure for Plate Type Heat Exchanger Taking into Account Preventing Radioactive Contamination** 623
Kensuke Terai, Hiroyuki Someki, Yuya Ueda (Mitsubishi Heavy Industries, Ltd.)
- 17655 **Maintenance Services of Nuclear Power Plant Using 3D As-Built Database Management System** 632
Kazutaka Okumura, Kazuhito Nakashima (Nuclear Plant Service Engineering Co., Ltd.), Norimasa Mori, Takashi Azuma (Mitsubishi Heavy Industries, Ltd.)

Track 10: Modeling and Analysis on Nuclear Energy in the Future 3:20 pm - 5:00 pm / Shirakawa (The Westin Miyako Kyoto)

Chair: Charles Forsberg (Massachusetts Institute of Technology)

Co-Chair: Kazuhiro Tsuzuki (The Institute of Applied Energy)

- 17582 **Environmental Life Cycle Assessment of High Temperature Nuclear Fission and Fusion Biomass Gasification Plants** 636
Shutarō Takeda, Shigeki Sakurai, Ryuta Kasada, Satoshi Konishi (Kyoto University)
- 17674 **Feasibility of Waste to Bio-Diesel Production via Nuclear-Biomass Hybrid Model; System Dynamics Analysis** 640
Hoseok Nam, Ryuta Kasada, Satoshi Konishi (Kyoto University)
- 17758 **Integrating Nuclear and Renewable Electricity in a Low-Carbon World: MIT-Japan Future of Nuclear Power Studies** 650
Geoffrey Haratyk (Massachusetts Institute of Technology), Ryoichi Komiyama (The University of Tokyo), Charles Forsberg, Richard Lester (Massachusetts Institute of Technology), Yasumasa Fujii (The University of Tokyo), Akira Omoto, Tomihiro Taniguchi (Tokyo Institute of Technology), Daniel Curtis, Nestor Sepulveda (Massachusetts Institute of Technology)
- 17797 **Investigation of Role of Nuclear toward 2050 -World and Japanese Cases-** 664
Kazuhiro Tsuzuki, Hidetaka Shimizu, Syuichi Takeji, Tomoyuki Takeda, Etsushi Kato, Atsushi Kurosawa, Takanori Tanaka (The Institute of Applied Energy)

Track 1: SMR (LWR)

5:10 pm - 6:50 pm / Mizuho 1 (The Westin Miyako Kyoto)

Chair: John Sulley (Rolls-Royce)**Co-Chair:** Ko Mizutani (Mitsubishi Heavy Industries, Ltd.)

- 17308 **SMR Built-In Pressurizer Operation Transients Analysis** 671
Songwei Li, Yu Liu, Xi Chen, Zhongchun Li, Danrong Song (Nuclear Power Institute of China)
- 17135 **Preliminary Study of Load-Following Operation in Small Modular Boiling Water Reactor Combined with Gas Fired Superheater** 677
Andhika Feri Wibisono, Eugene Shwageraus (University of Cambridge)
- 17442 **Verification of DeCART/CAPP Code System for VHTR Core with PMR-200 Benchmark** 686
Eun Jeong, Jinsu Park, Deokjung Lee (Ulsan National Institute of Science and Technology), Hyun Chul Lee (Pusan National University)
- 17332 **Conceptual Design of Heat Transfer System for the Co-Generation Small-To-Medium Sized BWR** 693
Tomohiko Ikegawa, Kazuaki Kito (Hitachi, Ltd.), Koji Nishida (Hitachi-GE Nuclear Energy Ltd.)

Track 3: SFR Severe Accident II

5:10 pm - 6:50 pm / Mizuho 2 (The Westin Miyako Kyoto)

Chair: Hidemasa Yamano (Japan Atomic Energy Agency)**Co-Chair:** Bernard Carlucc (AREVA NP)

- 17147 **SAS4A Analysis Study on the Initiating Phase of ATWS Events for Generation-IV Loop-Type SFR** 701
Ryuzaburo Kubota (Japan Atomic Energy Agency), Kazuya Koyama, Hiroyuki Moriwaki, Yumi Yamada, Yoshio Shimakawa (Mitsubishi FBR Systems Inc.), Suzuki Tohru, Kenichi Kawada, Shigenobu Kubo, Hidemasa Yamano (Japan Atomic Energy Agency)
- 17378 **France-Japan Collaboration on the Severe Accident Studies for ASTRID: Outcomes and Future Work Program** 711
F. Serre, F. Bertrand, A. Bachrata, N. Marie (CEA), S. Kubo, K. Kamiyama (Japan Atomic Energy Agency), B. Carlucc, B. Farges (AREVA NP), K. Koyama (Mitsubishi FBR Systems Inc.)
- 17654 **Effect of Rupture Size in Ex-Pin Phenomena of Severe Accident in SFR** 720
Min Ho Lee, Hyo Heo (Ulsan National Institute of Science and Technology), Dong Wook Jerng (Chung-Ang University), In Cheol Bang (Ulsan National Institute of Science and Technology)
- 17072 **Analytical Study on Safety Margins against Significant Core Damage during Loss-of-Heat-Removal-System Events in a Sodium-Cooled Fast Reactor** 725
Yoshitaka Fukano (Japan Atomic Energy Agency)

Track 5: External Events II

5:10 pm - 6:50 pm / Cosmos Hall (The Westin Miyako Kyoto)

Chair: Akira Nakamura (Institute of Nuclear Safety System, Inc.)**Co-Chair:** Tania Veneau (EDF)

- 17209 **Impact of Cable Fire Products on Severe Accident Processes** 734
H.-J. Allelein (RWTH Aachen University / Forschungszentrum Jülich), C. Kubelt (RWTH Aachen University), E.-A. Reinecke (Forschungszentrum Jülich)
- 17506 **Improvement of Flame Resistance of Non-Flame Retardant Cables by Applying Fire Protection Measures** 743
Yujiro Takemura, Yoshinori Segoshi, Susumu Jinno, Kazuki Mii (The Kansai Electric Power Co., Inc.)
- 17548 **Development of Long Life Volcanic Ash Filters Which Reduce Replacement Frequency** 750
Ryota Isobe, Yoshitaka Suzuki, Michita Mizuno, Takanori Nagura (Chubu Electric Power Co. Inc.), Mamoru Hosaka, Akiko Kojima (Shin Nippon Air Technologies Co., Ltd.), Akihiko Matsue (UNIPAC Co., Ltd.)
- 17763 **Study on Lightning Protection for Structures of Hamaoka Nuclear Power Station** 759
Satoshi Ozawa, Yoshitaka Suzuki, Hiroyasu Takeyama, Takanori Nagura (Chubu Electric Power Co. Inc.)
- 17768 **Development of a Method to Evaluate the Effect of Forest Fire Thermal Radiation by Using FARSITE "Fire Area Simulator"** 766
Nobuhide Suzuki, Hironori Noguchi, Tomoyuki Hayakawa, Kohei Sugita (Mitsubishi Heavy Industries, Ltd.), Jun-ichi Masuzawa, Makoto Enosawa (Mitsubishi Research Institute, Inc.), Shigenori Hatazawa (The Kansai Electric Power Co., Inc.), Taku Shibata (Hokkaido Electric Power Co., Inc.), Keiji Fujita (Shikoku Electric Power Co., Inc.), Takashi Kasamo (Kyushu Electric Power Co., Inc.), Shogo Wada (The Japan Atomic Power Company)

Track 3: SFR Design and Technologies II

5:10 pm - 6:50 pm / Hiei (The Westin Miyako Kyoto)

Chair: Shoji Kotake (*The Japan Atomic Power Company*)

Co-Chair: Osvaldo Enrique Azpitarte (*National Atomic Energy Commission of Argentina*)

- 17091 **Enhancement of Structural Design Margin for the Commercial Scale JSFR** 773
Yoshifumi Niitsu, Shigenobu Kubo, Koji Dozaki (*The Japan Atomic Power Company*),
Masahiro Yui, Junichi Orita (*Mitsubishi Heavy Industries, Ltd.*),
Mikio Toda, Koichi Kurita, Tomoyuki Inoue (*Mitsubishi FBR Systems Inc.*)
- 17383 **Dry Cleaning Process Test for Fuel Assembly of Fast Reactor Plant System** 780
Atsushi Katoh, Keiichi Nagai, Kuniaki Ara, Masahiko Ohtaka (*Japan Atomic Energy Agency*),
Nobuki Oka, Masako Tanaka, Yuichi Ohtani (*Mitsubishi Heavy Industries, Ltd.*),
Akihiro Ide (*Mitsubishi FBR Systems Inc.*)
- 17385 **Numerical and Experimental Validation of the Performance of an Electromagnetic Pump for a Sodium Fast Reactor** 788
E. Martin Lopez (*CEA / Université Grenoble Alpes*), Y. Delannoy (*Université Grenoble Alpes*),
F. Benoit, R. Martinie, S. Vitry (*CEA*)
- 17408 **Status of ASTRID Architecture in Starting of Basic Design Phase** 796
Philippe Amphoux (*CEA*), Philippe Gama (*AREVA NP*), Loïc Raquin, Benoît Levoir (*NOX*)
- 17419 **Status of the ASTRID Sodium Fast Reactor Project: From Conceptual Design to Basic Design Phase** 807
Frédéric Varaine, Gilles Rodriguez (*CEA*), David Settimo (*EDF*), Jean-Marie Hamy (*AREVA NP*),
Hiroki Hayafune (*Japan Atomic Energy Agency*), Salah Romdhane (*Airbus Safran Launchers*), René-Paul Benard (*ALCEN SEIV*),
Alain Remy (*General Electric / ALSTOM*), Thomas Chauveau (*BOUYGUES*), Ludovic Vandendriesche (*CNIM*),
Grégoire Lambert (*COMEX Nucléaire*), Jean-Philippe Helle (*NOX/JACOBS France*), Haruo Mochida (*Mitsubishi FBR Systems Inc.*),
Toru Iitsuka (*Mitsubishi Heavy Industries, Ltd.*), Dan Robertson (*Rolls-Royce*), Michel Lefrançois (*TECHNETICS*),
Masaru Fukuie (*Toshiba Corporation*), Jean-Luc Mazel (*VELAN*)

Track 7: LOCA Analysis and Experiment

5:10 pm - 6:50 pm / Atago (The Westin Miyako Kyoto)

Chair: Chikako Iwaki (*Toshiba Corporation*)

Co-Chair: In Cheol Bang (*Ulsan National Institute of Science and Technology*)

- 17333 **Experimental Investigation on Small Break Loss of Coolant Accident of Direct Vessel Injection Line** 814
Chuan-Xin Peng, Yan Zhang, Zhi-Gang Huang, Yuan-Feng Zan, Wen-Bin Zhuo, Xiao Yan (*Nuclear Power Institute of China*)
- 17334 **Experimental Study of the Core Makeup Tank Injection Characteristics under Different DVI Break Size Conditions** 820
Zhi-Gang Huang, Chuan-Xin Peng, Yuan-Feng Zan, Xue-Song Bai, Wen-Bin Zhuo, Xiao Yan (*China National Nuclear Corporation*)
- 17341 **Mechanism Study of Siphon Break Using RELAP5/MOD3** 824
Yi-Yun Cheng, Min Lee (*National Tsing Hua University*)

Track 8: LLW and ILW Management

5:10 pm - 6:50 pm / Take (The Westin Miyako Kyoto)

Chair: Jong-Il Yun (*Korea Advanced Institute of Science and Technology*)

Co-Chair: Mamoru Numata (*Kurion-Veolia*)

- 17367 **Development of the Reasonable Confirmation Methods Concerning Radioactive Wastes from Research Facilities** 831
Hirokazu Hayashi, Shota Okada, Sari Izumo, Yuzuru Hoshino, Tomoyuki Tsuji, Hisakazu Nakata, Akihiro Sakai,
Hiroya Amazawa, Yoshiaki Sakamoto (*Japan Atomic Energy Agency*)
- 17448 **Optimization for Radioactivity Conversion Factor of Portable Semiconductor Detector for Clearance (Free Release)** 838
Masato Watanabe, Hanae Kanzaki, Motonori Nakagami (*Chubu Electric Power Co. Inc.*)
- 17685 **Countermeasure against the Tight Condition of Radioactive Waste Drum Yard — Promote Burning Activity of the Substances Difficult to Incinerate—** 845
Yoshitaka Nimura, Hiroshi Nishio (*KANDEN POWER-TECH, Corporation*)
- 17061 **Effective Sequestering of Cobalt, Copper and Nickel Using Ethylenediaminetetraacetic Acid Modified Mesoporous Silica** 851
Sajid Iqbal, Jong-Il Yun (*Korea Advanced Institute of Science and Technology*)

Track 9: Seismic Resistance

5:10 pm - 6:50 pm / Ran (The Westin Miyako Kyoto)

Chair: Yusaku Maruno (*Hitachi, Ltd.*)**Co-Chair:** Ken-ichi Kimura (*Fujita Corporation*)

- 17229 **Establishment of the Technical Basis for Applying Viscous Dampers to Nuclear Power Plants** 856
Yukiko Narahara, Tomokazu Higuchi, Hiroshi Katayama, Ryo Ito, Kiyoshi Hattori, Jun Nakajima (*Toshiba Corporation*)
- 17543 **A Study about the Effectiveness of Seismic Safety Improvement by Installing Viscoelastic Dampers at Piping Systems and Components** 866
Ichiro Tamura, Masashi Kuramasu (*The Chugoku Electric Power Co., Inc.*)
- 17482 **A Fatigue Damage Assessment Procedure for Seismic Loads Considering Aftershocks** 876
Masayuki Kamaya (*Institute of Nuclear Safety System, Inc.*)
- 17498 **On-Site Vibration Test of PWR Nuclear Power Plant Reactor Coolant Loop Using Large Size Hammering Device** 883
Taisuke Nosaka (*Mitsubishi Heavy Industries, Ltd.*), Shinichiro Kuhara, Teruhisa Tanaka (*The Kansai Electric Power Co., Inc.*), Takeo Baba (*Mitsubishi Heavy Industries, Ltd.*), Takeshi Numata, Hiroaki Shirako (*The Kansai Electric Power Co., Inc.*)
- 17537 **Development of Seismic Design Method for Free Standing Rack and Applicability to Japanese Nuclear Power Plant** 888
Yu Takaki, Katsuhiko Taniguchi, Junichi Kishimoto, Akihisa Iwasaki, Yoshitsugu Nekomoto (*Mitsubishi Heavy Industries, Ltd.*), Tohru Kuga, Masashi Kameyama (*The Kansai Electric Power Co., Inc.*)

Track 4: Maintenance Technologies

5:10 pm - 6:50 pm / Kiku (The Westin Miyako Kyoto)

Chair: Kosei Taguchi (*Toshiba Corporation*)**Co-Chair:** Takehiro Kusunoki (*The Japan Atomic Power Company*)

- 17163 **Stereo Camera Localization System for Remotely Operated Robots** 898
Takaaki Konishi, Ryosuke Kobayashi (*Hitachi, Ltd.*)
- 17584 **Development of Bus Duct Inspection Robot at Nuclear Power Plant** 905
Mamoru Hamada, Teruaki Hoshi, Yoshinari Komura (*Kanden Plant Corporation*)
- 17236 **Wireless System Controlling of Electromagnetic Wave Distribution in Nuclear Power Plant Use** 912
Hidehiko Kuroda, Naoto Kume, Tomomi Oshima, Kei Takakura, Naotaka Oda, Takeshi Hasegawa, Shigeru Odanaka (*Toshiba Corporation*)
- 17095 **Driftless Pressure Transmitter** 916
Ryo Kuwana, Daisuke Shinma, Atsushi Fushimi, Isao Hara (*Hitachi, Ltd.*), Hiroyuki Sugimoto (*Hitachi High-Tech Solutions Corp.*), Takayuki Ichikawa (*Hiroshima University*)

Track 7: Mixed Flow Phenomena

5:10 pm - 6:50 pm / Shirakawa (The Westin Miyako Kyoto)

Chair: Kazuyuki Takase (*Nagaoka University of Technology*)**Co-Chair:** Koroush Shirvan (*Massachusetts Institute of Technology*)

- 17129 **Monitoring Procedure for Wall Temperature Fluctuation by Temperature Measurement of Pipe Outer Surface at a Mixing Tee** 923
Koji Miyoshi, Masayuki Kamaya (*Institute of Nuclear Safety System, Inc.*)
- 17673 **Flow Rate Influence on Temperature Fluctuations in Thermal-Mixing Pipe-Flow Experiments at a 90° T-Junction** 931
Mi Zhou, Rudi Kulenovic, Eckart Laurien (*University of Stuttgart*)
- 17190 **CFD and System Analysis Code Investigations of the Multidimensional Flow Mixing Phenomena in the Reactor Pressure Vessel** 941
S. C. Ceuca, J. Herb, P. J. Schoeffel, T. Hollands, H. Austregesilo, H. V. Hristov (*Gesellschaft für Anlagen- und Reaktorsicherheit gGmbH*)
- 17137 **CFD Analysis and Experimental Validation of Mixed Convection Sodium Flow** 951
U. Bieder (*CEA*), L. Ishay, G. Ziskind (*Ben-Gurion University of the Negev*), A. Rashkovan (*Nuclear Research Center Negev*)

Track 1: Innovative LWR

10:20 am - 12:00 pm / Mizuho 1 & 2 (The Westin Miyako Kyoto)

Chair: Hiroki Takezawa (Tokyo City University)

Co-Chair: Eugene Shwageraus (University of Cambridge)

- 17249 **Development of RBWR (Resource-Renewable BWR) for Recycling and Transmutation of Transuranium Elements (1) Overview and Concept** 960
Takeshi Mitsuyasu, Tetsushi Hino, Junnichi Miwa, Masaya Ohtsuka (Hitachi, Ltd.)
- 17222 **Development of RBWR (Resource-Renewable BWR) for Recycling and Transmutation of Transuranium Elements (2) Dynamic Insertion Analyses of Control Rods under Seismic Condition** 965
Shigeyuki Koyama, Yuichi Koide (Hitachi, Ltd.)
- 17117 **Development of RBWR (Resource-Renewable BWR) for Recycling and Transmutation of Transuranium Elements (3) Materials for Core Component** 973
Takahiro Ishizaki, Yusaku Maruno (Hitachi, Ltd.)
- 17194 **Preliminary Study on Flexible Core Design of Super FBR with Multi-Axial Fuel Shuffling** 979
Sukarman, Akifumi Yamaji, Takayuki Someya, Shogo Noda (Waseda University)
- 17534 **Fuel Performance Modeling of Transuranic Burning Boiling Water Reactor** 987
Yanin Sukjai, Koroush Shirvan, Ronald G. Ballinger (Massachusetts Institute of Technology)

Track 5: Severe Accident

10:20 am - 12:00 pm / Cosmos Hall (The Westin Miyako Kyoto)

Chair: Michio Murase (Institute of Nuclear Safety System, Inc.)

Co-Chair: Michael Klauck (RWTH Aachen University)

- 17086 **Development of a Regime Map for Predicting Debris Bed Formation Behavior** 998
Guangyu Jiang, Songbai Cheng, Shixian Wang, Shaopeng Lin, Jiahuan Yu, Zhiyi Pan, Hantao Lin (Sun Yat-Sen University)
- 17133 **Study on In-Vessel Retention - Effect of Nanofluids on CHF Enhancement under Flow Conditions during In-Vessel Retention -** 1006
Chikako Iwaki, Hisaki Sato, Satoshi Tsuda (Toshiba Corporation), Daisuke Kanamori (The Kansai Electric Power Co., Inc.)
- 17170 **Study on In-Vessel Retention -Analysis of In-Vessel Retention Using Risk Oriented Accident Analysis Methodology-** 1011
Satoshi Tsuda, Yoshio Kawano, Hisaki Sato, Chikako Iwaki (Toshiba Corporation), Daisuke Kanamori (The Kansai Electric Power Co., Inc.)
- 17324 **Failure Evaluation Analysis of Reactor Pressure Vessel Lower Head in BWR Due to Severe Accident** 1016
Yoshiyuki Kaji, Jinya Katsuyama, Yoshihito Yamaguchi, Yoshiyuki Nemoto, Masahiko Osaka (Japan Atomic Energy Agency)
- 17646 **Development of Non-Transfer Type Plasma Heating Technology to Address CMR Behavior during Severe Accident with BWR Design Conditions** 1022
Yuta Abe, Ikken Sato, Toshio Nakagiri, Akihiro Ishimi, Yuji Nagae (Japan Atomic Energy Agency)

Track 3: SFR Safety Design and Assessment

10:20 am - 12:00 pm / Hiei (The Westin Miyako Kyoto)

Chair: Hidemasa Yamano (Japan Atomic Energy Agency)

Co-Chair: Kazuhiro Kamei (Toshiba Corporation)

- 17327 **Design Study on Measures to Prevent Loss of Decay Heat Removal in a Next Generation Sodium-Cooled Fast Reactor** 1029
Yoshitaka Chikazawa, Shigenobu Kubo (Japan Atomic Energy Agency), Yoshio Shimakawa, Fumiaki Kaneko, Takashi Shoji, Shuhei Nakata (Mitsubishi FBR Systems Inc.)
- 17439 **Safety Evaluation of Self Actuated Shutdown System for Gen-IV SFR** 1036
Hiroyuki Saito, Yumi Yamada, Kazuhiro Oyama, Shoko Matsunaga (Mitsubishi FBR Systems Inc.), Hidemasa Yamano, Shigenobu Kubo (Japan Atomic Energy Agency)
- 17500 **ASTRID Project: Main Progress on Safety Design Provisions** 1046
P. Lo Pinto, L. Costes, P. Quellien (CEA), B. Carlucc, S. Beils, A. Verdier (AREV ANP), L. Bourgue (EDF)
- 17046 **Investigation of CO₂ Pipe Break Accidents for a sCO₂ Brayton Cycle Coupled to a Sodium-Cooled Fast Reactor** 1054
Anton Moisseytsev, James J. Sienicki (Argonne National Laboratory)
- 17661 **Development of Seismic Evaluation Method Considering Three Dimensional Fuel Assembly Displacement in FBR Core** 1064
Shinichiro Matsubara, Akihisa Iwasaki, Masatsugu Monde, Yuto Homma, Toru Tsuboi, Yohei Kamiyama (Mitsubishi Heavy Industries, Ltd.)

Track 7: Single-Phase Flow Thermal Hydraulics 10:20 am - 12:00 pm / Atago (The Westin Miyako Kyoto)**Chair:** Ulrich Bieder (CEA)**Co-Chair:** Shiro Takahashi (Hitachi, Ltd.)**17400 Evaluation of the Thermal Hydraulics Phenomenon at Upper Plenum in the Reactor Vessel for the Improvement in Safety of PWR** 1073

Kazuhiro Yoshida, Hideyuki Sakata, Tomoaki Ogata, Yasushi Makino, Hirokazu Sugiura, Shigeyuki Watanabe (Mitsubishi Heavy Industries, Ltd.), Daisuke Kanamori (The Kansai Electric Power Co., Inc.)

17452 Evaluation of the Thermal Hydraulic Phenomenon at Lower Plenum in the Reactor Vessel for the Improvement in Safety of PWR 1083

Kei Higashi, Kazuhiro Yoshida, Hideyuki Sakata, Tomoaki Ogata, Yasushi Makino, Hirokazu Sugiura, Shigeyuki Watanabe (Mitsubishi Heavy Industries, Ltd.), Daisuke Kanamori (The Kansai Electric Power Co., Inc.)

17643 Mitigation of Heat Transfer Deterioration in Supercritical Water Using Vortex Generator 1091

Hui Cheng, Jiyun Zhao (City University of Hong Kong)

Track 8: Fukushima Daiichi NPP - Fuel Debris - 10:20 am - 12:20 pm / Take (The Westin Miyako Kyoto)**Chair:** Christine Georges (CEA)**Co-Chair:** Takeshi Tsukada (Central Research Institute of Electric Power Industry)**17731 Process Modeling and Optimization for Fukushima Fuel Debris Using FATE Software** 1098

Martin Plys, James Burelbach, Sung Jin Lee, Robert Apthorpe (Fauske & Associates, LLC)

17103 Characterization of Fuel Debris by Large-Scale Simulated Debris Examination for Fukushima Daiichi Nuclear Power Stations 1105

Shohei Kawano, Takahiro Hayashi, Yasuo Morishima, Yuya Takahashi, Masamitsu Toyohara (International Research Institute for Nuclear Decommissioning / Toshiba Corporation), Viktor V. Baklanov, Alexander A. Kolodeshnikov, Vladimir A. Zuev (National Nuclear Center)

17225 Criticality Control System Development for Fuel Debris Removal in Fukushima Daiichi 1110

Yasuhiro Harada, Makoto Nakano (International Research Institute for Nuclear Decommissioning / Mitsubishi Heavy Industries, Ltd.), Yamato Hayashi (International Research Institute for Nuclear Decommissioning / Toshiba Corporation), Kazuya Ishii (International Research Institute for Nuclear Decommissioning / Hitachi-GE Nuclear Energy Ltd.)

17279 Development of Criticality Prevention Technology by Using Insoluble Neutron Absorbers for Fuel Debris Removal in the Fukushima-Daiichi Nuclear Power Plants 1118

Ryo Ishibashi (International Research Institute for Nuclear Decommissioning / Hitachi-GE Nuclear Energy Ltd.), Toshiyuki Fujita (International Research Institute for Nuclear Decommissioning / Toshiba Corporation), Kazuya Ishii (International Research Institute for Nuclear Decommissioning / Hitachi-GE Nuclear Energy Ltd.), Yasuhiro Harada (International Research Institute for Nuclear Decommissioning / Mitsubishi Heavy Industries, Ltd.)

17551 Synthesis and Microstructural Properties of Porous UO₂/B₂O₃ Eutectic Ceramic Composites as Mock Nuclear Fuel Debris 1128

Aikebaier Yusufu, Masayoshi Uno (University of Fukui)

17749 Effects of High Burn-Up Operation of LWR and Extended Cooling Period of Spent Fuel on High-Level Waste Properties for Vitrification and Storage 1133

Kota Kawai, Hiroshi Sagara, Kenji Takeshita (Tokyo Institute of Technology), Masahiro Kawakubo, Hidekazu Asano (Radioactive Waste Management Funding and Research Center), Yaohiro Inagaki (Kyushu University), Yuichi Niibori (Tohoku University), Seichi Sato (Hokkaido University)

Track 9: Fast Reactor Materials

10:20 am - 12:00 pm / Ran (The Westin Miyako Kyoto)

Chair: Shigeharu Ukai (Hokkaido University)**Co-Chair:** Yeon Soo Kim (Argonne National Laboratory)**17024 Quantum Chemical Comparison between the Reaction of Water with Liquid Sodium Containing Ti-Nanoparticles and Pure Liquid Sodium** 1142

Ai Suzuki, Patrick Bonnaud, Masayuki Miyano, Hokuto Hata, Ryuji Miura (Tohoku University), Jun-ichi Saito (Japan Atomic Energy Agency), Kuniaki Ara (Tohoku University / Japan Atomic Energy Agency)

17124 Study on Performance of Oxygen Sensors with Solid and Liquid Reference Electrodes in Liquid LBE with the Parameters of Oxygen Potential and Temperature 1147

Pribadi Mumpuni Adhi, Masatoshi Kondo, Minoru Takahashi (Tokyo Institute of Technology)

17538 Evaluation on Tolerance to Failure of ODS Ferritic Steel Claddings at the Accident Conditions of Fast Reactors 1153

Tomoyuki Uwaba, Yasuhide Yano, Satoshi Ohtsuka, Masayuki Naganuma, Takashi Tanno, Hiroshi Oka, Shoichi Kato, Takeji Kaito (Japan Atomic Energy Agency), Shigeharu Ukai (Hokkaido University), Akihiko Kimura (Kyoto University), Shigenari Hayashi (Tokyo Institute of Technology), Tadahiko Torimaru (Nippon Nuclear Fuel Development Co., Ltd.)

17299 Study on Cobalt Free Hardfacing Materials for Wear Resistance in Sodium Fast Reactors 1160

Pascal Aubry, Cécile Blanc, Fabien Rouillard (Université Paris-Saclay), Gilles Rolland (EDF), Thorsten Marlaud (AREVA NP), Rafael Robin, Hicham Maskrot (Université Paris-Saclay), Martine Blat-Yrieix (EDF), Laetitia Nicolas (Université Paris-Saclay)

17475 Evaluation of Fuel Assembly Inlet Boundary Conditions and Methodology for Inclusion in Core Restraint Analysis Software 1169

James J. Grudzinski, Rick Fischer (Argonne National Laboratory), H.-K. Kim, Y.-H. Lee, J.-S. Cheon, K.-H. Yoon (Korea Atomic Energy Research Institute), C. Grandy (Argonne National Laboratory)

Track 4: Emergency Assessment and Measures 10:20 am - 12:20 pm / Kiku (The Westin Miyako Kyoto)

Chair: Masutake Sotsu (Japan Atomic Energy Agency)

Co-Chair: Richard F. Wright (Westinghouse Electric Company LLC)

- 17276 **Sizing of Lithium-Ion Stationary Batteries for Nuclear Power Plant Use** 1174
Exavier Zakaria Barie, Choong-Koo Chang (KEPCO International Nuclear Graduate School)
- 17149 **Lithium-Ion Backup Batteries for Coping Extended Loss of AC Power (ELAP)** 1179
Choong-Koo Chang (KEPCO International Nuclear Graduate School)
- 17112 **Aspects of Heat Transfer in Containment Spot Cooling Circuit** 1185
A.M. Khizbullin, M.A. Kamnev, O.V. Tyurikov (Afrikantov OKB Mechanical Engineering)
- 17113 **Heat Transfer during Steam Condensation from the Steam Gas Mixture on Coiled- and Straight-Tube Heat Exchangers of the Emergency Heat Removal System** 1192
M. Kamnev, A. Khizbullin (Afrikantov OKB Mechanical Engineering)
- 17321 **Transient Evaluation Using EMTP at Single Open Phase with the Offsite Power Transformer for the Emergency Power Supply Systems of Nuclear Power Plants** 1198
Yoshio Shimada (Institute of Nuclear Safety System, Inc.)
- 17776 **Emergency Power Systems with Gas Turbine for Nuclear Power Plant** 1208
Ryutaro Imamura, Seiji Nishikawa, Kazuto Yoshida, Yasuhito Oshima (Mitsubishi Heavy Industries, Ltd.)

Track 6: LWR Core Design 10:20 am - 12:00 pm / Shirakawa (The Westin Miyako Kyoto)

Chair: Rei Kimura (International Research Institute for Nuclear Decommissioning / Toshiba Corporation)

Co-Chair: Gumersindo Verdu (Institute for Industrial, Radiophysical and Environmental Safety)

- 17174 **Validations of BWR Nuclear Design Code Using ABWR MOX Numerical Benchmark Problems** 1212
Shou Takano, Masaru Sasagawa, Teppei Yamana, Tadashi Ikehara (Global Nuclear Fuel-Japan Co., Ltd.), Naoki Yanagisawa (Electric Power Development Co., Ltd.)
- 17450 **Validations of BWR Nuclear Design Code Using MOX Critical Experiments and Operational Data of MOX Loaded BWR Core** 1221
Masaru Sasagawa, Hiroko Hayakawa, Asuka Matsui, Tadashi Ikehara (Global Nuclear Fuel-Japan Co., Ltd.), Naoki Yanagisawa (Electric Power Development Co., Ltd.)
- 17096 **PARCS-Subchanflow-Transuranus Multiphysics Coupling for Improved PWR's Simulations** 1231
Joaquín R. Basualdo, Victor H. Sánchez-Espinoza, Robert Stieglitz (Karlsruhe Institute of Technology), Rafael Macián-Juan (Technische Universität München)
- 17657 **Centrally-Shielded Burnable Absorber for LWR Fuel** 1239
Mohd-Syukri Yahya, Yonghee Kim (Korea Advanced Institute of Science and Technology)
- 17487 **Validation of AEGIS/SCOPE2 System through Actual Core Follow Calculations with Irregular Operational Conditions** 1245
M. Tabuchi, M. Tatsumi (Nuclear Engineering, Ltd.), Y. Ohoka, H. Nagano (Nuclear Fuel Industries, Ltd.), K. Ishizaki (The Kansai Electric Power Co., Inc.)

Track 1: Accident Tolerant Fuel in LWR 1:20 pm - 3:00 pm / Mizuho 1 & 2 (The Westin Miyako Kyoto)

Chair: Tomohiko Ikegawa (Hitachi, Ltd.)

Co-Chair: Paolo Ferroni (Westinghouse Electric Company LLC)

- 17387 **Preliminary Study on the Radiation Heat Removal Capacity in SMR Core under High Temperature Condition** 1253
Zhongchun Li, Shuhua Ding, Songwei Li, Jian Deng (Nuclear Power Institute of China)
- 17707 **Preliminary Performance Evaluation of FeCrAl-ODS Steel Fuel Cladding under Accident Conditions of BWRs** 1260
K. Sakamoto, T. Torimaru (Nippon Nuclear Fuel Development Co., Ltd.), S. Ukai, N. Oono (Hokkaido University), T. Kaito (Japan Atomic Energy Agency), A. Kimura (Kyoto University), S. Hayashi (Tokyo Institute of Technology)
- 17162 **Fuel Behavior Analysis of Accident Tolerant Fuel with SiC/SiC-Composite Cladding** 1266
Hiroshi Matsumiya, Kenichi Yoshioka, Shungo Sakurai, Kazuo Kakiuchi (Toshiba Corporation), Shinichiro Yamashita, Fumihisa Nagase (Japan Atomic Energy Agency)

Track 5: Gas Combustion/Radioactive Material Release I 1:20 pm - 3:00 pm / Cosmos Hall (The Westin Miyako Kyoto)**Chair:** Naoyuki Ishida (*Hitachi, Ltd.*)**Co-Chair:** Melany Gouello (*VTT Technical Research Centre of Finland Ltd.*)

- 17206 **Investigation of Ignition Characteristics of Passive Autocatalytic Recombiners** 1272
A. Chakraborty, E.-A. Reinecke (*Forschungszentrum Jülich*),
N. Meynet, A. Bentaib (*Institute for Radiological Protection and Nuclear Safety*), N. Chaumeix (*Laboratoire ICARE*),
H.-J. Allelein (*Forschungszentrum Jülich / RWTH Aachen University*)
- 17216 **CFD-Based Blind Simulation of Medium-Scale Hydrogen Deflagration Experiment** 1283
Tadej Holler (*Jožef Stefan Institute*), Po Hu, Shuwei Zhai (*Shanghai Jiao Tong University*),
Ed M.J. Komen (*Nuclear Research and Consultancy Group*), Mike Kuznetsov (*Karlsruhe Institute of Technology*),
Ivo Kljenak (*Jožef Stefan Institute*)
- 17266 **Effect of Steam Condensation on Pressure and Temperature under Hydrogen Jet Fire in a Vented Enclosure** 1289
Mike Kuznetsov, Jianjun Xiao (*Karlsruhe Institute of Technology*), Jack Travis (*Engineering and Scientific Software Inc.*)
- 17284 **Experimental Studies on PAR Start-Up under Severe Accident Conditions** 1299
M. Klauk, D. Heidelberg (*RWTH Aachen University*), P.-M. Steffen, E.-A. Reinecke (*Forschungszentrum Jülich*),
H.-J. Allelein (*RWTH Aachen University / Forschungszentrum Jülich*)
- 17304 **Study on the Combustion Behavior of Radiolytically Generated Hydrogen Explosion in Small Scale Annular Vessels at the Reprocessing Plant** 1307
Tatsuya Kudo, Yoshikazu Tamauchi, Nobuyuki Arai (*Japan Nuclear Fuel Limited*),
Wenbin Dai, Motohiro Sakaiharu, Osamu Kanehira (*Mitsubishi Materials Corporation*)

Track 3: Thermal Hydraulics in SFR

1:20 pm - 3:00 pm / Hiei (The Westin Miyako Kyoto)

Chair: Takero Mori (*Japan Atomic Energy Agency*)**Co-Chair:** Gilles Rodriguez (*CEA*)

- 17230 **Study on Reactor Vessel Coolability of Sodium-Cooled Fast Reactor under Severe Accident Condition - Water Experiments Using a Scale Model -** 1313
Ayako Ono, Akikazu Kurihara, Masaaki Tanaka, Hiroyuki Oshima, Hideki Kamide (*Japan Atomic Energy Agency*),
Yasuhiro Miyake (*NDD corporation*), Masami Ito (*Ascend Co., Ltd.*), Shigeru Nakane (*NESI Incorporation*)
- 17733 **Optimized Design of an Ex-Vessel Cooling Thermosyphon for Decay Heat Removal in SFR** 1323
Jae Young Choi (*Korea Advanced Institute of Science and Technology*), Sub Lee Song (*BEES Inc.*),
Soon Heung Chang (*Handong University*), Yong Hoon Jeong (*Korea Advanced Institute of Science and Technology*)
- 17407 **The Qualification Processes of Simulation Tools, Components and Systems within the Framework of the ASTRID Project – Description and Examples** 1332
Geneviève Gaillard-Groleas, Marie-Sophie Chenaud, Lionel Cachon, Thierry Lambert (*CEA*),
Alejandro Mourgues, Benoit Perrin, Claude Bois (*AREVA NP*)
- 17652 **Experimental Study on Performance of U-Pattern Wire Wrap Spacer of Fast Reactor Fuel Assembly Using PIV** 1342
Yeong Shin Jeong, In Cheol Bang (*Ulsan National Institute of Science and Technology*)

Track 7: Multi-Phase Flow Thermal Hydraulics I

1:20 pm - 3:00 pm / Atago (The Westin Miyako Kyoto)

Chair: Kenichi Katono (*Hitachi Ltd.*)**Co-Chair:** Kazuyuki Takase (*Nagaoka University of Technology*)

- 17049 **Interfacial Friction for Countercurrent Flows in Nearly Horizontal Pipes** 1347
Michio Murase, Yasunori Yamamoto, Takayoshi Kusunoki, Ikuo Kinoshita (*Institute of Nuclear Safety System, Inc.*)
- 17418 **Experimental Investigation of Temperature Distribution in Condensing Steam-Air Flow in a Circular Tube** 1353
Katsuya Mori, Kosuke Hayashi, Shigeo Hosokawa, Akio Tomiyama (*Kobe University*),
Yoichi Utanohara, Yasunori Yamamoto, Michio Murase (*Institute of Nuclear Safety System, Inc.*)
- 17394 **Preliminary Study on Numerical Simulations for Temperature Field of Steam-Air Mixture in a Circular Tube with Condensation** 1361
Yoichi Utanohara, Yasunori Yamamoto, Michio Murase (*Institute of Nuclear Safety System, Inc.*),
Katsuya Mori, Shigeo Hosokawa, Akio Tomiyama (*Kobe University*)
- 17337 **The Application of Lagrangian Particle Tracking Method in the Study of Steam Generator Sludge Collector** 1368
Ge Wu, Xiang Cheng, Wei Huang (*Nuclear Power Institute of China*)

Track 8: LLW and ILW Processing and Treatment 1:20 pm - 3:00 pm / Take (The Westin Miyako Kyoto)

Chair: David L. Perkins (*Electric Power Research Institute*)

Co-Chair: Yoshihiko Horikawa (*Nuclear Engineering, Ltd.*)

- 17774 **Development of Technology for Biotreatment of Laundry Drain in Nuclear Power Plant** 1377
Sho Kato, Atsushi Kinugasa, Naoki Ogawa, Yuji Nakajima (*Mitsubishi Heavy Industries, Ltd.*)
- 17426 **A Tritium Management Tool for Light Water Detritiation** 1382
J. Whitcomb, N. Bonnet, D. Carlson (*Kurion-Veolia*)
- 17373 **Treatment of Electric Hydraulic Control Fluid (EHC Oil) with Steam-Reforming System** 1387
Yoshihiro Okadome, Yoshio Aoyama, Yu Sasaki, Mineo Fukushima (*Japan Atomic Energy Agency*)
- 17395 **Impurity Removal Technologies of Heavy Water** 1393
Takashi Hashimoto, Yuji Sato (*Japan Atomic Energy Agency*)
- 17128 **Development of a Geopolymer Solidification Method for Radioactive Wastes by Compression Molding and Heat Curing** 1399
Chiaki Shimoda, Kanae Matsuyama, Hirofumi Okabe, Masaaki Kaneko, Shinya Miyamoto (*Toshiba Corporation*)

Track 2: HTR Engineering 1:20 pm - 3:00 pm / Ran (The Westin Miyako Kyoto)

Chair: Matt Richards (*Ultra Safe Nuclear Corporation*)

Co-Chair: Sunao Oyama (*Mitsubishi Heavy Industries, Ltd.*)

- 17223 **Design Space Exploration Studies of an FHR Concept Leveraging AGR Technologies** 1404
Zhiyao Xing, Eugene Shwageraus (*University of Cambridge*)
- 17659 **Study of ETF-HC for Helium Circulator with Dry Gas Seal for HTR-PM** 1414
Ping Ye, Gang Zhao, Jie Wang, Wei Peng (*Tsinghua University*)
- 17566 **Effect of Internal Coolant Crossflow with Two Rows of Film Cooling Holes on Film-Cooling of HTGR** 1418
Xiaokai Sun, Wei Peng, Jie Wang, Peixue Jiang (*Tsinghua University*)
- 17244 **Benchmark Study on Realized Random Packing Model for Coated Fuel Particles of HTTR Using MCNP6** 1423
H. H. Quan (*Japan Atomic Energy Agency*), K. Morita (*Kyushu University*), Y. Honda (*Japan Atomic Energy Agency*), N. Fujimoto (*Kyushu University*), S. Takada (*Japan Atomic Energy Agency*)
- 17090 **Measurement of Temperature Response of Intermediate Heat Exchanger in Heat Application System Abnormal Simulating Test Using HTTR** 1431
Masato Ono, Yusuke Fujiwara, Yuki Honda, Hiroyuki Sato, Yosuke Shimazaki, Daisuke Tochio, Fumitaka Homma, Hiroaki Sawahata, Kazuhiko Iigaki, Shoji Takada (*Japan Atomic Energy Agency*)

Track 4: Severe Accident Management 1:20 pm - 3:00 pm / Kiku (The Westin Miyako Kyoto)

Chair: Takashi Shoji (*Chubu Electric Power Co. Inc.*)

Co-Chair: Choong-Koo Chang (*KEPCO International Nuclear Graduate School*)

- 17251 **Development of High-Performance Monitoring System under Severe Accident Condition** 1436
T. Takeuchi, K. Tsuchiya (*Japan Atomic Energy Agency*), H. Komanome (*Ikegami Tsushinki Co., Ltd.*), K. Miura (*Sukegawa Electric Co., Ltd.*), M. Ishihara (*Japan Atomic Energy Agency*)
- 17692 **Monitoring and Operation System for Severe Accidents** 1442
Toshiki Fukui, Shinji Niida, Yumeto Kato (*Mitsubishi Heavy Industries, Ltd.*)
- 17610 **Monitoring and Periodic Evaluation of Caldera Volcanoes for Nuclear Safety** 1450
Kazutoshi Eto, Katsuhiko Hongou, Jirou Akashi, Takehiro Ootsubo, Hisaya Okano (*Kyushu Electric Power Co., Inc.*)
- 17441 **The Raising of Tsunami-Wall Based on Tsunami Evaluation at Onagawa Nuclear Power Plant** 1460
Jun Takahashi, Kazuo Hirata (*Tohoku Electric Power Co., Inc.*)
- 17431 **An Application of Gravel Bed to Extinguish a Large-Scale Fire** 1469
Hiroaki Yamashita, Akihiro Shima, Kazuyuki Nagasawa (*Tokyo Electric Power Company Holdings, Inc.*), Seiichi Hamada (*Maritime Disaster Prevention Center*), Izumi Fukasawa, Natsumi Kurabe (*Toyo Engineering Corporation*)

Track 6: Advanced Core Design and Management 1:20 pm - 3:00 pm / Shirakawa (The Westin Miyako Kyoto)

Chair: Masao Chaki (*Hitachi, Ltd.*)

Co-Chair: Laurent Buiron (*CEA*)

- 17664 **Erbium Burnable Absorber to Improvement Safety Parameters of CANDU Loaded with Recovered Uranium** 1480
 Mohammad Abdul Motalab, Woosong Kim, Yonghee Kim (*Korea Advanced Institute of Science and Technology*)
- 17281 **Impact of Thorium-Enrichment on the PWR Core-Characteristics of Plutonium-Thorium Mixed Oxide Fuels and Uranium Oxide Fuels** 1487
 Kazumasa Kobayashi, Ren Shimada, Satoshi Takeda, Takanori Kitada (*Osaka University*)
- 17212 **Development of an In-Core Fuel Management Tool for Boiling Water Reactors** 1493
 Luca Gilli, Pieter H. Wakker (*Nuclear Research and Consultancy Group*), Brian R. Elder (*Tennessee Valley Authority*)
- 17309 **Reactor Physics Assessment of Candidate Accident-Tolerant Cladding Concepts for Long-Life Civil Nuclear Marine Propulsion Cores** 1500
 Syed Bahauddin Alam (*University of Cambridge*), Cameron Goodwin (*Rhode Island Nuclear Science Centre*), Geoffrey T. Parks (*University of Cambridge*)
- 17528 **Evaluation of the n/γ Discrimination Performance of the Neutron Detector with Eu Doped TRUST-LiCaAlF₆** 1510
 Kensuke Maeno, Tomohiro Endo, Akio Yamamoto (*Nagoya University*)

Track 5: Gas Combustion/Radioactive Material Release II 3:20 pm - 5:00 pm / Cosmos Hall (The Westin Miyako Kyoto)

Chair: Michael Klauck (*RWTH Aachen University*)

Co-Chair: Yoichi Wada (*Hitachi, Ltd.*)

- 17631 **Hydrogen Concentration Measurement Technique in Gases Containing Oxygen by Proton Conductive Solid Electrolyte** 1517
 Kaoru Tanigawa, Ikumasa Koshiro, Akihiro Sawata, Masato Oba (*Mitsubishi Heavy Industries, Ltd.*)
- 17678 **Examination of Airborne Release Fraction of Hydrogen Explosion at a Reprocessing Plant** 1523
 Yoshikazu Tamauchi, Tatsuya Kudo, Takashi Kodama (*Japan Nuclear Fuel Limited*)
- 17037 **Combination of Ozone Feed and Wet Electrostatic Precipitator: Experimental Study of an Innovative System to Filter Gaseous Iodine and Iodine Containing Particles** 1531
 Mélany Gouëllou, Jouni Hokkinen, Teemu Kärkelä, Ari Auvinen (*VTT Technical Research Centre of Finland Ltd.*)
- 17087 **The European PASSAM Project: R&D Outcomes Towards Enhanced Severe Accident Source Term Mitigation** 1537
 T. Albiol (*Institute for Radiological Protection and Nuclear Safety*), L. Herranz (*CIEMAT*), E. Riera (*CSIC*), C. Dalibart (*EDF*), T. Lind (*PSI*), A. Del Corno (*RSE*), T. Kärkelä (*VTT Technical Research Centre of Finland Ltd.*), N. Losch (*AREVA GmbH*), B. Azambre (*Université de Lorraine*)
- 17328 **Assessment of Medium-Term Radioactive Releases in case of a Severe Nuclear Accident on a Pressurized Water Reactor: Experimental Study of Fission Products Re-Vaporisation from Deposits (Cs, I)** 1547
 D. Obada (*Institute for Radiological Protection and Nuclear Safety / Lille 1 University*), L. Gasnot, A.-S. Mamede (*Lille 1 University*), A.-C. Grégoire (*Institute for Radiological Protection and Nuclear Safety*)

Track 3: Innovative Plant Design 3:20 pm - 5:00 pm / Hiei (The Westin Miyako Kyoto)

Chair: Kazuhiro Kamei (*Toshiba Corporation*)

Co-Chair: Anton Moiseyev (*Argonne National Laboratory*)

- 17471 **Investigation to Reduce Mass of an Ultra-Light Solid Reactor for Electricity Supply in Environments without Human Maintenance** 1556
 Hiroshi Akie (*Japan Atomic Energy Agency*), Akifumi Yamaji (*Waseda University*), Teruhiko Kugo, Takamichi Iwamura, Kenya Suyama (*Japan Atomic Energy Agency*)
- 17514 **Ship Collision Security for an Offshore Nuclear Platform** 1564
 G. Genzman, K. Shirvan, N. Todreas, J. Buongiorno, M. Golay (*Massachusetts Institute of Technology*)
- 17608 **Performance Analysis of Brayton Cycle System for Space Power Reactor** 1575
 Zhi Li, Xiaoyong Yang, Gang Zhao, Jie Wang, Zuoyi Zhang (*Tsinghua University*)
- 17705 **A Physics Study for Passively-Autonomous Daily Load-Follow Operation in Soluble-Boron-Free SMR** 1583
 Ahmed Amin E. Abdelhameed, Haseeb ur Rehman, Yonghee Kim (*Korea Advanced Institute of Science and Technology*)

Track 7: Multi-Phase Flow Thermal Hydraulics II 3:20 pm - 5:00 pm / Atago (The Westin Miyako Kyoto)

Chair: Yoichi Utanohara (*Institute of Nuclear Safety System, Inc.*)

Co-Chair: Fang Chen (*CEA*)

- 17234 **Estimation of Primary Containment Vessel Pressure of Fukushima Daiichi NPS Unit-3 Considering Occurring of Thermal Stratification in Suppression Chamber** 1589
Daisuke Yamauchi (*Tokyo Electric Power Company Holdings, Inc.*),
Nejdet Erkan, Byeongnam Jo, Koji Okamoto (*The University of Tokyo*)
- 17121 **Applicability of Numerical Simulations to Counter-Current Flow Limitation at Lower End of a Vertical Pipe Simulating Inverted U-Tubes in Steam Generator** 1595
Takayoshi Kusunoki, Yoichi Utanohara, Michio Murase (*Institute of Nuclear Safety System, Inc.*),
Shigeo Hosokawa, Akio Tomiyama (*Kobe University*)
- 17188 **Condensation Heat Transfer Coefficient of Air-Cooled Condensing Heat Exchanger of Emergency Cooldown Tank in Long-Term Passive Cooling System** 1602
Seon Jeong Huh (*Kookmin University*), Joo Hyung Moon, Youngmin Bae, Young In Kim (*Korea Atomic Energy Research Institute*),
Hee Joon Lee (*Kookmin University*)
- 17331 **Hot Channel Analysis of a 333 MWth High Power Density Civil Marine Core Using 3D Neutronic/Thermal-Hydraulic Coupling of Hybrid Monte Carlo MONK with Sub-Channel Analysis COBRA-EN Code** 1607
Syed Bahauddin Alam, Rodrigo G. G. de Oliveira, Eugene Shwageraus, Geoffrey T. Parks (*University of Cambridge*)

Track 8: SNF and HLW Management 3:20 pm - 5:00 pm / Take (The Westin Miyako Kyoto)

Chair: Martin G. Plys (*Fauske & Associates, LLC*)

Co-Chair: Hiroshi Suzuki (*Mitsubishi Research Institute, Inc.*)

- 17650 **Safe Transport and Storage of Spent Fuel for 40 Years in Japan** 1617
Kyosuke Fujisawa (*Transnuclear, Ltd.*)
- 17675 **Conceptual Study of Dry Storage Method for Spent Fuel Assemblies Based on Honeycomb Concrete Overpack (COP): Phase 1** 1619
Yoshio Hida (*WATS Co., Ltd.*), Shigeki Hayashi, Yoshiaki Katsuyama (*Kanden Plant Corporation*),
Hirohide Hashimoto (*IHI Construction Materials Co., Ltd.*), Takashi Murata (*Murata Engineering Co., Ltd.*)
- 17109 **Sizing of the Overpacks Containing High-Level Radioactive Waste Packages from French Nuclear Facilities** 1625
Claudia Codau, Roméo Fernandes (*EDF*)
- 17434 **Study of Shielding Analysis Methods for Casks of Spent Fuel and Radioactive Waste** 1630
Ai Saito (*Transnuclear, Ltd.*)

Track 2: HTR PRA 3:20 pm - 5:00 pm / Ran (The Westin Miyako Kyoto)

Chair: Jie Wang (*Tsinghua University*)

Co-Chair: Nozomu Fujimoto (*Kyushu University*)

- 17078 **Probabilistic Risk Assessment Method Development for High Temperature Gas-Cooled Reactors (1) Project Overviews** 1634
Hiroyuki Sato, Akemi Nishida, Hirofumi Ohashi (*Japan Atomic Energy Agency*),
Ken Muramatsu, Hitoshi Muta (*Tokyo City University*),
Tatsuya Itoi, Tsuyoshi Takada, Takenori Hida (*The University of Tokyo*),
Masayuki Tanabe, Tsuyoshi Yamamoto, Hidemitsu Shimada, Takao Ikeda (*JGC Corporation*)
- 17687 **Probabilistic Risk Assessment Method Development for High Temperature Gas-Cooled Reactors (2) Development of Accident Sequence Analysis Methodology** 1641
Kosuke Matsuda, Ken Muramatsu, Hitoshi Muta (*Tokyo City University*),
Hiroyuki Sato, Akemi Nishida, Hirofumi Ohashi (*Japan Atomic Energy Agency*),
Tatsuya Itoi, Tsuyoshi Takada, Takenori Hida, Masayuki Tanabe (*The University of Tokyo*),
Tsuyoshi Yamamoto, Hidemitsu Shimada, Takao Ikeda (*JGC Corporation*)
- 17060 **Probabilistic Risk Assessment Method Development for High Temperature Gas-Cooled Reactors (3) Development Plan of Seismic Fragility Analysis Method** 1648
Tatsuya Itoi (*The University of Tokyo*), Akemi Nishida (*Japan Atomic Energy Agency*),
Tsuyoshi Takada, Takenori Hida (*The University of Tokyo*), Ken Muramatsu (*Tokyo City University*),
Hiroyuki Sato (*Japan Atomic Energy Agency*)
- 17089 **Probabilistic Risk Assessment Method Development for High Temperature Gas-Cooled Reactors (4) Use of Operational and Maintenance Experiences with the High Temperature Engineering Test Reactor** 1653
Atsushi Shimizu, Hiroyuki Sato, Shigeaki Nakagawa, Hirofumi Ohashi (*Japan Atomic Energy Agency*)
- 17079 **Probabilistic Risk Assessment Method Development for High Temperature Gas-Cooled Reactors (5) Accident Progression Analysis** 1661
Yuki Honda, Hiroyuki Sato, Hirofumi Ohashi (*Japan Atomic Energy Agency*)

Track 4: Plant Assessment

3:20 pm - 5:00 pm / Kiku (The Westin Miyako Kyoto)

Chair: Takashi Shoji (*Chubu Electric Power Co. Inc.*)**Co-Chair:** Kosei Taguchi (*Toshiba Corporation*)

- 17508 **Seawater Intrusion Event Consequence Assessment for RPV and Core Internals, Hamaoka NPS Unit5** 1669
Tomiyasu Imai, Kouhei Kurono, Yuta Niwa, Takanori Nagura (*Chubu Electric Power Co. Inc.*)
- 17274 **Study of the Reduction Method of the Helium Gas Leakage from Bolted Gasket Flanged Connection for HTGRs** 1677
Shimpei Hamamoto, Shoji Takada (*Japan Atomic Energy Agency*)
- 17220 **Completion of Solidification and Stabilization for Pu Nitrate Solution to Reduce Potential Risks at Tokai Reprocessing Plant** 1681
Yasunobu Mukai, Hideo Nakamichi, Daisuke Kobayashi, Kazuaki Nishimura, Sakae Fujisaku, Hideki Tanaka, Hidemi Isomae, Hironobu Nakamura, Tsutomu Kurita (*Japan Atomic Energy Agency*), Masayoshi Iida, Kazuma Tajiri (*E&E Techno Service Co., Ltd.*)
- 17320 **Current Status and Future Plan of INSS's Analysis of Overseas Trouble Information** 1689
Takashi Akazawa (*Institute of Nuclear Safety System, Inc.*), Masaru Okumoto (*former Institute of Nuclear Safety System member*)

Track 6: Application and Verification of Reactor Physics

3:20 pm - 5:00 pm / Shirakawa (The Westin Miyako Kyoto)

Chair: Kenichi Tada (*Japan Atomic Energy Agency*)**Co-Chair:** Tatjana Jevremovic (*IAEA*)

- 17457 **Representativity Studies of ZEPHYR Fast/Thermal Coupled Cores for SFR-Like Reactivity Effects during Core Meltdown** 1693
Patrick Blaise (*CEA*), Marat Margulis (*CEA / Ben-Gurion University of the Negev*), Laurent Buiron, Gérald Pruhlière, Bruno Fontaine (*CEA*), Erez Gilad (*Ben-Gurion University of the Negev*)
- 17467 **Spectral Adaptation to Emphasize the 10 eV to 10 keV Energy Domain for ZEPHYR, a Future Multipurpose ZPR for CEA** 1701
Paul Ros, Patrick Blaise, Pierre Leconte (*CEA*)
- 17594 **Application of Bias Factor Method Using Random Sampling Technique for Prediction Accuracy Improvement of Critical Eigenvalue of BWR** 1709
Motohiro Ito, Tomohiro Endo, Akio Yamamoto (*Nagoya University*), Yusuke Kuroda, Takashi Yoshii (*TEPCO SYSTEMS CORPORATION*)
- 17298 **Verification of Mixed Stochastic/Deterministic Approach for Fast and Thermal Reactor Analysis** 1717
Nicolas E. Stauff, Changho Lee, Paul K. Romano, Taek K. Kim (*Argonne National Laboratory*)
- 17228 **Application of Hybrid Resonance Self-Shielding Treatment Based on Integration of Equivalence Theory and Ultra-Fine-Group Calculation** 1725
Hiroki Koike, Kazuya Yamaji, Kazuki Kirimura, Shinya Kosaka (*Mitsubishi Heavy Industries, Ltd.*)

Track 5: PSA/PRA

5:10 pm - 6:50 pm / Cosmos Hall (The Westin Miyako Kyoto)

Chair: Hans-Josef Allelein (*RWTH Aachen University*)**Co-Chair:** Akira Nakamura (*Institute of Nuclear Safety System, Inc.*)

- 17151 **Study of Accident Sequences Using Refined Plant Damage States in Level 2 PSA** 1732
Takeshi Takahashi, Naoki Hirokawa, Daisuke Taniguchi (*Hitachi-GE Nuclear Energy Ltd.*)
- 17401 **Development of Dynamic Probabilistic Risk Assessment Model for PWR Using Simplified Plant Simulation Method** 1737
Shohei Otsuki, Tomohiro Endo, Akio Yamamoto (*Nagoya University*)
- 17760 **Analysis on Key Issue of Source Term Behavior Based on Seismic Level 2 PRA Evaluation by Application of Up-To-Date Knowledge and Methodology** 1743
K. Nakamura (*Central Research Institute of Electric Power Industry*), Y. Yamane (*Advancesoft*), K. Murata (*Trust Tech*), T. Kanai, A. Ui, H. Endo (*Central Research Institute of Electric Power Industry*)

Track 3: GFR and ITER

5:10 pm - 6:50 pm / Hiei (The Westin Miyako Kyoto)

Chair: Yoshitaka Chikazawa (Japan Atomic Energy Agency)

Co-Chair: Kazuhiro Kamei (Toshiba Corporation)

- 17496 **Advanced I&C Technologies: Design, Qualification, Fabrication, Installation and Testing of an I&C SIL4 Hardwired Technology** 1749
 Maria Teresa Dominguez Bautista (Empresarios Agrupados)
- 17550 **Development of Manufacturing Technologies for the ITER Toroidal Field Coil - Welding and Machining Processes -** 1754
 Katsusuke Shimizu, Naoki Sawa, Mikio Wakabayashi, Masahiko Inoue, Takashi Miyake, Takashi Kagawa, Daisuke Hara, Takeru Okamoto (Mitsubishi Heavy Industries, Ltd.), Shinji Ando, Kunihiro Matsui, Masataka Nakahira, Norikiyo Koizumi (National Institutes for Quantum and Radiological Science and Technology)

Track 7: Multi-Phase Flow Thermal Hydraulics III

5:10 pm - 6:50 pm / Atago (The Westin Miyako Kyoto)

Chair: Ge Wu (Nuclear Power Institute of China)

Co-Chair: Daisuke Yamauchi (Tokyo Electric Power Company Holdings, Inc.)

- 17593 **Void Fraction and Interfacial Velocity Distributions of Gas-Liquid Two-Phase Flow Just behind an Obstacle Simply Simulating the Spacer Shape Measured by Wire-Mesh Sensors** 1764
 K. Takase, T. Sakka (Nagaoka University of Technology)
- 17686 **CFD Simulation and Validation of Turbulent Mixing in a Rod Bundle with Vaned Spacer Grids Based on LDV Test** 1772
 Xi Chen, Songwei Li, Zhongchun Li, Sijia Du, Yu Zhang, Haunhuan Peng (Nuclear Power Institute of China)
- 17189 **Influence of Rod-Pitch on Void Fraction Distribution in an Unheated 5 × 5 Rod Bundle under High Pressure and Low Flow Rate Conditions** 1779
 Kenichi Katono, Kiyoshi Fujimoto (Hitachi, Ltd.), Goro Aoyama, Yuma Nagasawa (Hitachi-GE Nuclear Energy Ltd.), Takuji Nagayoshi (Hitachi, Ltd.), Takahiro Arai (Central Research Institute of Electric Power Industry)

Track 7: System Analysis Code Simulations

5:10 pm - 6:50 pm / Take (The Westin Miyako Kyoto)

Chair: Kazuaki Kito (Hitachi Ltd.)

Co-Chair: Jiyun Zhao (City University of Hong Kong)

- 17167 **Spray Cooling Performance during Spent Fuel Pool Accident with MAAP Code** 1786
 Kenichi Kanda, Satoshi Nishimura, Masaaki Satake, Kazuma Abe, Masahiro Furuya, Yoshihisa Nishi (Central Research Institute of Electric Power Industry)
- 17484 **Construction of the PWR Analysis Model with MAAP5.01 - Parametric Survey of TMLB' and ADCB' Sequences -** 1794
 Yoshihisa Nishi, Satoshi Nishimura, Masaaki Satake (Central Research Institute of Electric Power Industry), Toshihiko Miyamoto, Yuusuke Katakami (Shikoku Electric Power Co., Inc.), Hiroyuki Sakamoto, Kenta Kobayashi, Tomohiro Kodaira (Hokkaido Electric Power Co., Inc.)
- 17604 **The Ultimate Response Guideline Simulation and Analysis by Using RELAP5/SNAP for Lungmen ABWR Nuclear Power Plant under Fukushima-Like Condition** 1802
 Jong-Rong Wang, Wen-Shu Huang, Shao-Wen Chen, Chunkuan Shih, Yuh-Ming Ferng (National Tsing Hua University), Show-Chyuan Chiang, Tzu-Yao Yu (Taiwan Power Company)

Track 2: HTR Design

5:10 pm - 6:50 pm / Ran (The Westin Miyako Kyoto)

Chair: Charles W. Forsberg (*Massachusetts Institute of Technology*)**Co-Chair:** Hiroyuki Sato (*Japan Atomic Energy Agency*)

- 17567 **Nuclear Combined Cycle Gas Turbines for Variable Electricity and Heat Using Firebrick Heat Storage and Low-Carbon Fuels** 1809
Charles Forsberg (*Massachusetts Institute of Technology*), Per F. Peterson (*University of California*), Patrick McDaniel (*University of New Mexico*), Hitesh Bindra (*Kansas State University*)
- 17542 **Opportunities for International Collaboration on Modular High Temperature Reactors** 1819
Matt Richards, Chris Hamilton (*Ultra Safe Nuclear Corporation*), Donald Hoffman (*EXCEL Services Corporation*), Kazuhiko Kunitomi (*Japan Atomic Energy Agency*), Min-Hwan Kim (*Korea Atomic Energy Research Institute*), Michael A. Fütterer (*European Commission*), Grzegorz Wrochna (*National Centre for Nuclear Research*)
- 17662 **Study on Thermodynamic Cycle of High Temperature Gas-Cooled Reactor** 1828
Xinhe Qu, Xiaoyong Yang, Jie Wang (*Tsinghua University*)
- 17630 **Mitsubishi Small Module High Temperature Gas-Cooled Reactor “MHR” Conceptual Design - A Comparison Analysis between a Steam Turbine Cycle and a Gas Turbine Cycle -** 1836
Sunao Oyama, Hiroki Tsukamoto, Kazumasa Suyama, Takuya Kono (*Mitsubishi Heavy Industries, Ltd.*)
- 17241 **Cost Performance Design for High Temperature Helium Heat Transport Piping of GTHTTR300C and HTTR-GT/H₂ Plants** 1843
Yasunobu Nomoto, Shoichi Horii, Junya Sumita, Hiroyuki Sato, Xing L. Yan (*Japan Atomic Energy Agency*)

Track 4: Operation Supporting System

5:10 pm - 6:50 pm / Kiku (The Westin Miyako Kyoto)

Chair: Hironobu Nakamura (*Japan Atomic Energy Agency*)**Co-Chair:** Richard F. Wright (*Westinghouse Electric Company LLC*)

- 17142 **A Full Scope Nuclear Power Plant Simulator for Multiple Reactor Types with Virtual Control Panels** 1852
Hisanori Yonezawa, Hiroki Ueda, Takahisa Kato (*Toshiba Corporation Energy Systems & Solutions Company*)
- 17382 **Development of Emergency Response Training Program for On-Site Commanders (1)** 1857
Masaru Hikono, Yuko Matsui, Masaki Kanayama (*Institute of Nuclear Safety System, Inc.*)
- 17437 **Development of Emergency Response Training Program for On-Site Commanders (2) - Extraction of Non-Technical Skills -** 1862
Yuko Matsui, Masaru Hikono (*Institute of Nuclear Safety System, Inc.*), Mari Iwasaki, Miduho Morita (*Inter Quest*)
- 17691 **Development of the Decision Make Supporting System on Incident Management** 1867
Mizuki Kasamatsu, Satoshi Hanada, Eisuke Noda (*Mitsubishi Heavy Industries, Ltd.*)
- 17697 **CRDM Motion Analysis Using Machine Learning Technique** 1875
Takuya Nishimura, Hiroyuki Nakayama, Mayumi Saitoh, Seiji Yaguchi (*Mitsubishi Heavy Industries, Ltd.*)

Track 9: Accident Tolerant Fuel Materials

5:10 pm - 6:50 pm / Shirakawa (The Westin Miyako Kyoto)

Chair: Tomoyuki Uwaba (*Japan Atomic Energy Agency*)**Co-Chair:** Mirco Grosse (*Karlsruhe Institute of Technology*)

- 17722 **Surface Modification Technology of Fuel Cladding, Fresh Green to Mitigate Corrosion and Hydrogen-Pickup in High-Temperature Steam Environment** 1883
Masahiro Furuya (*Central Research Institute of Electric Power Industry*)
- 17319 **Finite Element Simulation for Microstructural Evolution in U-Mo/Al Dispersion Fuel** 1887
Yeon Soo Kim (*Argonne National Laboratory*), G.Y. Jeong (*Ulsan National Institute of Science and Technology*), L.M. Jamison, W. Mohamed (*Argonne National Laboratory*), D.-S. Sohn (*Ulsan National Institute of Science and Technology*)
- 17599 **Development of FeCrAl-ODS Steel Claddings for Accident Tolerant Fuel of Light Water Reactors** 1892
Shigeharu Ukai, Naoko Oono (*Hokkaido University*), Kan Sakamoto, Tadahiko Torimaru (*Nippon Nuclear Fuel Development Co., Ltd.*), Takeji Kaito (*Japan Atomic Energy Agency*), Akihiko Kimura (*Kyoto University*), Shigenari Hayashi (*Tokyo Institute of Technology*)
- 17796 **Fuel Performance of Multi-Layered Zirconium Based Accident Tolerant Fuel Cladding** 1898
Malik Wagih, Yifeng Che, Koroush Shirvan (*Massachusetts Institute of Technology*)
- 17681 **High-Temperature Oxidation Behavior of Advanced Fuel Cladding SiC under Various Oxygen Partial Pressures** 1906
Aikebaier Yusufu, Souichirou Yamaguchi, Takuma Shirahama, Hiroyuki Murakami, Masayoshi Uno (*University of Fukui*)

Track 8: Fukushima Daiichi NPP - Characterization and Waste Treatment -

10:20 am - 12:00 pm / Mizuho 1 & 2 (The Westin Miyako Kyoto)

Chair: Takeshi Tsukada (*Central Research Institute of Electric Power Industry*)

Co-Chair: Christine Georges (*CEA*)

- 17153 **Radioactive Waste Water Treatment for Fukushima Daiichi Nuclear Power Station** 1911
Hiroko Abe, Shunsuke Susa, Naoki Tajima, Hisao Oomura, Shuji Seki, Seiji Yamamoto, Teruki Fukumatsu, Akira Ikeda, Norihiko Tanaka (*International Research Institute for Nuclear Decommissioning / Toshiba Corporation*), Keiji Ishikawa (*Tokyo Electric Power Company Holdings, Inc.*)
- 17795 **Purification of Accumulated Waste Water and Groundwater in Fukushima Dai-ichi Nuclear Power Station** 1918
Yusuke Kitamoto, Takashi Nishi, Takashi Asano, Kenji Noshita, Shunsuke Miyake (*Hitachi-GE Nuclear Energy Ltd.*), Yuko Kani, Toshimasa Ohashi, Yutaka Sangu (*Hitachi, Ltd.*), Ken Yamaguchi, Kei Kobayashi, Yuichi Kurosaki, Keiji Ishikawa (*Tokyo Electric Power Company Holdings, Inc.*)
- 17077 **Characterization of Carbonate Slurry Generated from Multiple Radio-Nuclides Removal System in Fukushima Daiichi Nuclear Power Station** 1923
Yuhei Fukuda, Yoichi Arai, Hiroshi Hinai (*International Research Institute for Nuclear Decommissioning / Japan Atomic Energy Agency*), Masashi Ichikawa, Ryota Takahashi, Fumio Hirayama (*Nippon Nuclear Fuel Development Co., Ltd.*), Masamichi Obata, Masaki Akagi, Teruki Fukumatsu (*International Research Institute for Nuclear Decommissioning / Toshiba Corporation*), Atsuhiko Shibata, Kazunori Nomura (*International Research Institute for Nuclear Decommissioning / Japan Atomic Energy Agency*)
- 17618 **Heat Treatment of Phosphate-Modified Cementitious Matrices for Safe Storage of Secondary Radioactive Aqueous Wastes in Fukushima Daiichi Nuclear Power Plant** 1930
Keita Irisawa, Takumi Taniguchi, Masahiro Namiki (*Japan Atomic Energy Agency*), Ines Garcia-Lodeiro (*The University of Sheffield*), Takeshi Osugi, Tetsuro Sakakibara, Osamu Nakazawa, Yoshihiro Meguro (*Japan Atomic Energy Agency*), Hajime Kinoshita (*The University of Sheffield*)
- 17444 **Demonstration of Laser Processing Technique Combined with Water Jet Technique for Retrieval of Fuel Debris at Fukushima Daiichi Nuclear Power Station** 1936
Toshihide Hanari (*Japan Atomic Energy Agency*), Toshihiko Takebe (*Japan Atomic Energy Agency / Sugino Machine*), Tomonori Yamada, Hiroyuki Daido (*Japan Atomic Energy Agency*), Ippei Ishizuka, Shinya Ohmori, Koichi Kurosawa (*Hitachi-GE Nuclear Energy Ltd.*), Go Sasaki, Masahiro Nakada, Hideaki Sakai (*Sugino Machine*)

Track 5: Safety Analysis Code Development 10:20 am - 12:20 pm / Cosmos Hall (The Westin Miyako Kyoto)

Chair: Yoshinisa Nishi (*Central Research Institute of Electric Power Industry*)

Co-Chair: Thierry Albiol (*Institute for Radiological Protection and Nuclear Safety*)

- 17677 **New MHI Safety Analysis Code Package for DBA (1) Overview of New MHI DBA Code Package** 1939
Ryo Fukuda, Seiji Arita (*Mitsubishi Heavy Industries, Ltd.*)
- 17591 **New MHI Safety Analysis Code Package for DBA (2) Core Design Code, GalaxyCosmo-S** 1944
Kazuya Yamaji, Hiroki Koike, Kazuki Kirimura, Shinya Kosaka (*Mitsubishi Heavy Industries, Ltd.*)
- 17613 **New MHI Safety Analysis Code Package for DBA (3) Thermal Hydraulic Design Code - MIDAC -** 1954
Naohiro Takeda, Tadakatsu Yodo (*Mitsubishi Heavy Industries, Ltd.*)
- 17602 **New MHI Safety Analysis Code Package for DBA (4) Three-Dimensional Coupled Code SPARKLE-2 for PWR Non-LOCA** 1959
Hikaru Sakamoto, Manabu Maruyama, Junto Ogawa (*Mitsubishi Heavy Industries, Ltd.*)
- 17596 **New MHI Safety Analysis Code Package for DBA (5) LOCA Analysis Code - MCOBRA/RELAP5-GOTHIC -** 1967
Tetsuya Teramae, Hideki Miwa, Michiaki Okamoto, Takafumi Noda (*Mitsubishi Heavy Industries, Ltd.*)
- 17615 **New MHI Safety Analysis Code Package for DBA (6) Updated Mitsubishi PWR Fuel Rod Design Code, FINE4** 1973
Nozomu Murakami, Teruhisa Yamamoto, Hideyuki Teshima (*Mitsubishi Nuclear Fuel Co., Ltd.*)

Track 3: LFR Design and R&D

10:20 am - 12:00 pm / Hiei (The Westin Miyako Kyoto)

Chair: Toru Obara (*Tokyo Institute of Technology*)

Co-Chair: Kazuhiro Kamei (*Toshiba Corporation*)

- 17264 **Experimental and Numerical Study of the MYRRHA Control Rod System Dynamics** 1978
G. Kennedy, D. Lamberts (*SCK•CEN*), M. Profir, V. Moreau (*Centre for advanced Studies, Research and Development in Sardinia*), K. Van Tichelen (*SCK•CEN*)
- 17211 **Component Qualification in Lead Bismuth Eutectic for Remote Handling in MYRRHA** 1986
B. Caers, K. Van Tichelen, P. Schuurmans (*SCK•CEN*)
- 17470 **Westinghouse Demonstration Lead Fast Reactor in the Context of the U.S. DOE Advanced Demonstration and Test Reactor Options Study** 1996
P. Ferroni, F. Franceschini, C. Stansbury, A. Harkness (*Westinghouse Electric Company LLC*), G. Grasso (*Italian National Agency for New Technologies, Energy and Sustainable Economic Development*)
- 17713 **Sensitivity and Uncertainty Studies for a Lead Cooled Fast Reactor Core** 2007
Péter German, Máté Szieberth, Ádám Aranyosy (*Budapest University of Technology and Economics*)
- 17641 **System Level Thermal-Hydraulic Assessment of a Natural Circulating LFR** 2017
Koroush Shirvan (*Massachusetts Institute of Technology*), Ji-Hyun Kim (*Ulsan National Institute of Science and Technology*), Il-Soon Hwang (*Seoul National University*), Ronald Ballinger (*Massachusetts Institute of Technology*)

Track 7: Reactor Thermal Hydraulics

10:20 am - 12:00 pm / Atago (The Westin Miyako Kyoto)

Chair: Min Lee (*National Tsing Hua University*)**Co-Chair:** Hiroyuki Sato (*Japan Atomic Energy Agency*)

- 17115 **Numerical Study of the Underexpanded Nitrogen Jets Submerged into Liquid Sodium in the Frame of Sodium-Cooled Fast Reactor (SFRS)** 2024
F. Chen (*CEA / French Air Force Academy*), A. Allou (*CEA*), J. D. Parisse (*French Air Force Academy*)
- 17127 **Development of New PCV Cooling System for Severe Accidents** 2029
Naoyuki Ishida, Naohisa Watahiki, Hideaki Hosoi (*Hitachi, Ltd.*),
Yasunori Nagata, Yukiko Kushima, Kouji Andou (*Hitachi-GE Nuclear Energy Ltd.*)
- 17156 **Suppression Methods of Flow-Induced Acoustic Resonance in Piping Systems** 2036
Shiro Takahashi, Akinori Tamura (*Hitachi, Ltd.*), Toshitaka Goto, Shunichi Sato (*Mitsubishi Hitachi Power Systems, Ltd.*)
- 17300 **Flow Visualization in a Simplified Helically Coiled Steam Generator Geometry** 2042
Saya Lee, Marilyn Delgado, Samuel J. Lee, Yassin A. Hassan (*Texas A&M University*)
- 17505 **Development of Temperature Profile Sensor at High Temporal and Spatial Resolution** 2047
Hiroki Takiguchi, Masahiro Furuya, Takahiro Arai (*Central Research Institute of Electric Power Industry*)

Track 1: Computational Technique for Design and Simulations

10:20 am - 12:00 pm / Take (The Westin Miyako Kyoto)

Chair: Masafumi Utsumi (*Mitsubishi Heavy Industries, Ltd.*)**Co-Chair:** Takehiro Kusunoki (*The Japan Atomic Power Company*)

- 17268 **COPERNIC, a New Tool Based on Simplified Calculation Methods for Innovative LWRs Conceptual Design Studies** 2051
Franck Morin, Guy-Marie Gautier, Oceane Bizeau, Stephane Cathalau, Elisabetta Stratta, Michel Belliard (*CEA*)
- 17173 **Improvements on Computerized Procedure System of Advanced Power Reactor 1400MWe** 2059
Noky Seong, Yeonsub Jung, Chanho Sung, Sungkon Kang (*Korea Hydro & Nuclear Power Central Research Institute*)
- 17348 **Effective Use of Engineering Reactor Simulator for Education of Nuclear Safety** 2065
Akio Yamamoto, Tomohiro Endo (*Nagoya University*)
- 17712 **Development of the Distributed Simulation System for Nuclear Power Plant Simulator for Operator Training** 2070
Yujiro Tani, Tomohiro Komine (*Mitsubishi Heavy Industries, Ltd.*)
- 17261 **Simulation of Operational Transients for AP1000™ Plant Primary and BOP Systems** 2075
Yoshio Kawano, Kenya Takiwaki, Naoyuki Takado, Yukitaka Yamazaki, Kenji Arai (*Toshiba Corporation*)

Track 9: Stainless Steel and Concrete

10:20 am - 12:20 pm / Ran (The Westin Miyako Kyoto)

Chair: Shohei Kawano (*Toshiba Corporation*)**Co-Chair:** Eing Yee Yeoh (*State Power Investment Corporation Research Institute*)

- 17210 **Evaluation of the Stability and Precipitation Behavior of G Phase in Dual-Phase Stainless Steels by Thermodynamic Calculations** 2079
Toshiaki Horiuchi (*Hokkaido University of Science*), Satoshi Minamoto (*National Institute for Materials Science*),
Shota Ito (*Hokkaido University of Science*)
- 17588 **New Stress Distribution Scaling Method to Predict Fracture Toughness Temperature Dependency** 2085
Toshiyuki Meshii, Kenichi Ishihara, Hiroki Nakano (*University of Fukui*)
- 17690 **Improvement of Alloy 52 Filler Metal for Weldability** 2094
Yasushi Nishijima, Yusuke Sano, Kenji Kawasaki, Masahiko Toyoda, Seiji Asada (*Mitsubishi Heavy Industries, Ltd.*),
Teiichiro Saito, Norihito Ogawa, Tetsuya Sango (*Nippon Welding Rod Co., Ltd.*)
- 17120 **Metallurgical Investigations on Creep Rupture Mechanisms of Dissimilar Welded Joints between Gr.91 and 304SS** 2102
Takuya Yamashita, Yuji Nagae (*Japan Atomic Energy Agency*), Koichi Kikuchi (*Mitsubishi FBR Systems Inc.*),
Kenji Yamamoto (*Mitsubishi Heavy Industries, Ltd.*)
- 17699 **Discussion on the Standardization of Concrete Composite for Radiation Shielding Design I - Concept of Standard Concrete for Radiation Shielding -** 2110
Ken-ichi Kimura (*Fujita Corporation*), Tomohiro Ogata (*Mitsubishi Heavy Industries, Ltd.*),
Mikihito Nakata (*MHI Nuclear Systems And Solution Engineering Co., Ltd.*), Nobuhiro Shigyo (*Kyushu University*),
Yoshihiro Hirao (*National Maritime Research Institute*), Yukio Sakamoto (*ATOX Co., Ltd.*)
- 17663 **Discussion on the Standardization of Concrete Composition for Radiation Shielding Design II - Evaluation of the Effect of the Composition Variance on the Shielding Property -** 2116
Tomohiro Ogata (*Mitsubishi Heavy Industries, Ltd.*), Ken-ichi Kimura (*Fujita Corporation*),
Mikihito Nakata (*MHI Nuclear Systems And Solution Engineering Co., Ltd.*),
Koichi Okuno (*Hazama Ando Corporation*), Tomoyuki Ishikawa (*ITOCHU Techno-Solutions Corporation*)

Track 6: Nuclear Data

10:20 am - 12:20 pm / Kiku (The Westin Miyako Kyoto)

Chair: Takeshi Mitsuyasu (*Hitachi, Ltd.*)

Co-Chair: Frédéric Damian (*CEA*)

- 17035 **Development of an Automatic Nuclear Data Validation System VACANCE** 2120
Kenichi Tada, Kenya Suyama (*Japan Atomic Energy Agency*)
- 17203 **Nuclear Data Propagation with Burnup: Impact on SFR Reactivity Coefficients** 2124
Laurent Buiron, Danièle Plisson-Rieunier (*CEA*)
- 17455 **Interpretation of the SNEAK-12A/B Experimental Programs on Severe Core Accidents in LMFBRs – Some Feedback on Nuclear Data Re-Assimilation for the Prediction of Reactivity Changes** 2134
Marat Margulis (*Ben-Gurion University of the Negev / CEA*), Patric Blaise, Gérald Rimpault (*CEA*), Erez Gilad (*Ben-Gurion University of the Negev*)
- 17469 **A Revision of Sensitivity Analysis for Small Reactivity Effects in ZPRs** 2144
Paul Ros, Patrick Blaise, Pierre Leconte, Adrien Gruel (*CEA*)
- 17377 **Uncertainty Quantification of Activation Due to Cross Section Data in Neutron Shielding Calculation** 2152
Kimihiro Yokoi, Tomohiro Endo, Akio Yamamoto (*Nagoya University*), Ryoji Mizuno, Yoshio Kimura (*Chuden-CTI*)
- 17473 **Sensitivity and Uncertainty Analysis in Nuclear Data with SCALE 6.2 Code Application to LWRs Assemblies** 2157
A. Labarile, C. Mesado, R. Miró, T. Barrachina, G. Verdú (*Universitat Politècnica de València*)

Track 5: Safety Analysis II

1:20 pm - 3:00 pm / Cosmos Hall (The Westin Miyako Kyoto)

Chair: Mike Kuznetsov (*Karlsruhe Institute of Technology*)

Co-Chair: Ryo Fukuda (*Mitsubishi Heavy Industries, Ltd.*)

- 17158 **Dose Evaluation in the BWR Reactor Building with MAAP-DOSE** 2167
Kazuma Abe, Kenichi Kanda, Satoshi Nishimura, Masahiro Furuya, Yoshihisa Nishi (*Central Research Institute of Electric Power Industry*)
- 17250 **Safe Shutdown Analysis for Submerged Equipment inside Containment** 2172
Dong Soo Song, Seung Chan Lee, Duk Joo Yoon, Sang Jun Ha (*Korea Hydro & Nuclear Power Co., Ltd.*)
- 17292 **Safety Analyses for Preventing Core Damage by ATWS in Kashiwazaki-Kariwa 6, 7** 2177
Shoichi Suehiro, Masanori Takeuchi, Akinori Hayakawa, Satoshi Mizuno, Yoshihiro Oyama (*Tokyo Electric Power Company Holdings, Inc.*)
- 17293 **Safety Analyses for Preventing PCV Damage by FCI in Kashiwazaki-Kariwa 6,7** 2189
Akinori Hayakawa, Shoichi Suehiro, Satoshi Mizuno, Yoshihiro Oyama (*Tokyo Electric Power Company Holdings, Inc.*)
- 17339 **Assessment of Location-Specific LOCA** 2200
Daichi Shiota, Yuki Ishiwatari (*Hitachi-GE Nuclear Energy Ltd.*), Jonathan Li, Dennis Henneke (*GE Hitachi Nuclear Energy*)

Track 3: MSR Design and R&D

1:20 pm - 3:00 pm / Hiei (The Westin Miyako Kyoto)

Chair: Kazuhiro Kamei (*Toshiba Corporation*)

Co-Chair: Paolo Ferroni (*Westinghouse Electric Company LLC*)

- 17107 **Feasibility of Using (Li, Na, K)F-UF₄-TRUF₃ Fuels for the U-Pu Fast-Spectrum Molten-Salt Reactors** 2207
Yasuo Hirose (*Retired*)
- 17260 **Feasibility Studies of a Breed and Burn Molten Salt Reactor** 2217
Alisha Kasam, Eugene Shwageraus (*University of Cambridge*)
- 17219 **A Starting Procedure for the MSFR: Approach to Criticality and Incident Analysis** 2227
D. Heuer, A. Laureau, E. Merle-Lucotte, M. Allibert, D. Gerardin (*Université Grenoble Alpes*)
- 17539 **Seismic Probabilistic Safety Assessment of the 10MWt Solid Fuel Molten Salt Test Reactor at the Power Operating Condition** 2237
Qun Yang, Xiaowei Jiao, Zhaozhong He, Kun Chen (*Chinese Academy of Sciences*)

Track 7: Code Verification and Validation

1:20 pm - 3:00 pm / Atago (The Westin Miyako Kyoto)

Chair: Angel Aleksandrov Papukchiev (*Gesellschaft für Anlagen- und Reaktorsicherheit gGmbH*)**Co-Chair:** Susumu Yamashita (*Japan Atomic Energy Agency*)

- 17289 **Verification of CTF/PARCSv3.2 Coupled Code in a Turbine Trip Scenario** 2244
A. Abarca, P. Hidalgo, R. Miró, G. Verdú (*Universitat Politècnica de València*), A. Sekhri (*Kernkraftwerk Leibstadt AG*)
- 17507 **Validation of MAAP Code for the Analysis of Liquid Waste Boiling Accident in the Reprocessing Plant** 2251
Daisuke Fujiwara, Tatsuya Hayasaki, Ryuta Akimoto, Ryunosuke Yamaguchi (*TEPCO SYSTEMS CORPORATION*), Takashi Kodama, Takahiro Ishio, Satoshi Segawa, Mirai Kuramata (*Japan Nuclear Fuel Limited*)
- 17409 **Validation and Applicability of Reactor Core Modeling in a Plant Dynamics Code during Station Blackout** 2261
T. Mori, H. Ohira, M. Sotsu, Y. Fukano (*Japan Atomic Energy Agency*)

Track 8: Decommissioning Planning of Nuclear Facilities

1:20 pm - 3:00 pm / Take (The Westin Miyako Kyoto)

Chair: Satoshi Yanagihara (*University of Fukui*)**Co-Chair:** David L. Perkins (*Electric Power Research Institute*)

- 17509 **Decommissioning of the Pressurized Water Reactor** 2270
Hajime Ito, Koichi Kamahori, Yasuhiro Sugahara, Kazuhiro Fukuda (*The Kansai Electric Power Co., Inc.*)
- 17682 **Efforts to Perform Safe and Efficient Decommissioning for Tsuruga Power Station Unit 1** 2278
Shiro Saito, Toyoaki Yamauchi (*The Japan Atomic Power Company*), Colin R. Austin (*EnegeySolutions, Inc.*)
- 17694 **Current Status of Decommissioning Activities at Ningyo-Toge Environmental Engineering Center** 2282
Yuu Ishimori (*Japan Atomic Energy Agency*)
- 17354 **Markerless Tracking in Nuclear Power Plants: A Line Segment-Based Approach** 2289
Hirotake Ishii, Taro Kimura, Hiroki Tokumaru, Hiroshi Shimoda (*Kyoto University*), Yuya Koda (*Japan Atomic Energy Agency*)
- 17611 **Decommissioning Engineering Support System Based on an Intelligent 3D Model Database** 2296
Hiroshi Seki, Atsuko Enomoto (*Hitachi, Ltd.*), Mitsutaka Imamura, Takashi Kitahara (*Hitachi-GE Nuclear Energy Ltd.*)

Track 9: Maintenance and Related Materials

1:20 pm - 3:00 pm / Ran (The Westin Miyako Kyoto)

Chair: Kunihiko Ito (*Nuclear Development Corporation*)**Co-Chair:** Pascal Aubry (*CEA*)

- 17172 **Influence of Nitrogen on the Oxidation Behavior of Zircaloy-4 – Results of In-Situ Neutron Radiography Investigations** 2301
M. Grosse, S. Pulvermacher, M. Steinbrueck (*Karlsruhe Institute of Technology*), B. Schillinger (*Technische Universität München*)
- 17273 **Effect of Addition of Sodium Tungstate and Zinc / Sodium Molybdate Mixed Phosphate on Corrosion of Carbon Steel under Diluted Artificial Seawater Environment** 2309
Tetsuji Kaneko, Mikiro Itow, Norihiko Tanaka, Yoshiyuki Kawaharada (*International Research Institute for Nuclear Decommissioning / Toshiba Corporation*), Kazumi Fujii, Shinichi Ishioka (*International Research Institute for Nuclear Decommissioning / Hitachi-GE Nuclear Energy Ltd.*), Yutaka Yokoyama, Ryuji Umehara (*International Research Institute for Nuclear Decommissioning / Mitsubishi Heavy Industries, Ltd.*), Chiaki Kato, Tomonori Sato, Fumiyoshi Ueno (*International Research Institute for Nuclear Decommissioning / Japan Atomic Energy Agency*), Yuichi Fukaya, Katsuhiko Kumagai (*Tokyo Electric Power Company Holdings, Inc.*)
- 17430 **Long-Term Progress Prediction for the Carbon Steel Corrosion in Diluted Artificial Seawater with and without Zinc / Sodium Carbonate Mixed Phosphate** 2316
Kazumi Fujii, Shinichi Ishioka, Masaru Iwanami (*International Research Institute for Nuclear Decommissioning / Hitachi-GE Nuclear Energy Ltd.*), Tetsuji Kaneko, Norihiko Tanaka, Yoshiyuki Kawaharada (*International Research Institute for Nuclear Decommissioning / Toshiba Corporation*), Yutaka Yokoyama, Ryuji Umehara (*International Research Institute for Nuclear Decommissioning / Mitsubishi Heavy Industries, Ltd.*), Chiaki Kato, Fumiyoshi Ueno (*International Research Institute for Nuclear Decommissioning / Japan Atomic Energy Agency*), Yuichi Fukaya, Katsuhiko Kumagai (*Tokyo Electric Power Company Holdings, Inc.*)
- 17440 **Effect of Addition of Corrosion Inhibitors on Corrosion Behavior of Piping Material in Flowing Diluted Seawater** 2323
Ryuji Umehara, Yutaka Yokoyama (*International Research Institute for Nuclear Decommissioning / Mitsubishi Heavy Industries, Ltd.*), Tetsuji Kaneko, Norihiko Tanaka, Yoshiyuki Kawaharada (*International Research Institute for Nuclear Decommissioning / Toshiba Corporation*), Kazumi Fujii, Shinichi Ishioka (*International Research Institute for Nuclear Decommissioning / Hitachi-GE Nuclear Energy Ltd.*), Chiaki Kato, Tomonori Sato, Fumiyoshi Ueno (*International Research Institute for Nuclear Decommissioning / Japan Atomic Energy Agency*), Yuichi Fukaya, Katsuhiko Kumagai (*Tokyo Electric Power Company Holdings, Inc.*)
- 17182 **Maintenance for Pre-Stressed Concrete Containment Vessel of Tsuruga Unit 2** 2328
Tomohiro Nishizawa, Kyouchi Chuda, Yuichiro Morishita (*The Japan Atomic Power Company*), Akira Shimizu (*Obayashi Corporation*)

Track 6: Methods for Neutronics

1:20 pm - 3:00 pm / Kiku (The Westin Miyako Kyoto)

Chair: Kazumi Ikeda (*Mitsubishi FBR Systems, Inc.*)

Co-Chair: Tatjana Jevremovic (*IAEA*)

- 17295 **Transient Coupled Neutronics-Thermalhydraulics Study of ULOF Accidents in Sodium Fast Reactors Using Spatial Kinetics: Comparison of the TFM Monte Carlo and S_N Approaches** 2335
 A. Laureau (*CEA*), Y. Lederer (*Nuclear Research Center Negev*), A. Krakovich (*Soreq Nuclear Research Center*), L. Buiron, B. Fontaine (*CEA*)
- 17065 **Development of Analysis Code PORCAS-F for Dynamic Behavior of Re-Critical Fuel Debris** 2345
 Rei Kimura, Yutaka Takeuchi, Yamato Hayashi (*Toshiba Corporation / International Research Institute for Nuclear Decommissioning*), Hiromi Maruyama, Satoshi Takeo (*Hitachi-GE Nuclear Energy Ltd. / International Research Institute for Nuclear Decommissioning*)
- 17317 **The Eigenvalue Problem: Alpha, Lambda and Gamma Modes and Its Applications** 2352
 A. Carreño, A. Vidal-Ferrández, D. Ginestar, G. Verdú (*Universitat Politècnica de València*)

Track 5: Evaluation of Fukushima Daiichi Accident

3:20 pm - 5:00 pm / Cosmos Hall (The Westin Miyako Kyoto)

Chair: Kazuya Yamaji (*Mitsubishi Heavy Industries, Ltd.*)

Co-Chair: Dongsoo Song (*Korea Hydro & Nuclear Power Co., Ltd.*)

- 17100 **Sensitivity Study of Accident Scenarios on MCCI for Fukushima Daiichi Unit-1 by MELCOR** 2359
 Takumi Noju, Akifumi Yamaji, Kiyoshi Matsumoto (*Waseda University*), Xin Li (*Japan Atomic Energy Agency*)
- 17265 **Fukushima Daiichi Unit 3 Explosion and a Metal Water Reaction Accident** 2366
 Takashi Tsuruda (*Akita Prefectural University*)
- 17357 **Numerical Simulations of Cesium Distribution of Fukushima-Daiichi Nuclear Power Plant Accident and Its Uncertainty Caused by Computational Mesh** 2372
 Akira Nakamura, Takayoshi Kusunoki (*Institute of Nuclear Safety System, Inc.*)

Track 3: Thermal Hydraulics in MSR

3:20 pm - 5:00 pm / Hiei (The Westin Miyako Kyoto)

Chair: Yasuo Hirose (*Retired*)

Co-Chair: Elsa Merle (*Université Grenoble Alpes*)

- 17511 **Key Parameter Uncertainty and Sensitivity Analysis in the Nitrate Natural Circulation Loop** 2377
 Xiaowei Jiao (*Chinese Academy of Sciences / University of Chinese Academy of Sciences*), Kai Wang, Shiwei Shao, Chuangxiaong Cai, Qun Yang, Zhaozhong He, Kun Chen (*Chinese Academy of Sciences*)
- 17581 **Preliminary Model Validation for Integral Stability Behavior in Molten Salt Natural Circulation** 2387
 Chuanxiong Cai, Zhaozhong He, Kun Chen (*Chinese Academy of Sciences*)
- 17647 **Numerical Study on Heat Transfer Characteristics of Liquid-Fueled Molten Salt Using OpenFOAM** 2393
 Yeong Shin Jeong, In Cheol Bang (*Ulsan National Institute of Science and Technology*)

Track 7: CFD Analysis

3:20 pm - 5:00 pm / Atago (The Westin Miyako Kyoto)

Chair: Yoshio Kawano (Toshiba Corporation)**Co-Chair:** Syed Bahauddin Alam (University of Cambridge)

- 17716 **Steady-State Thermal-Hydraulics Analysis of a TMSR-SF1 Reactor Concept Design Using CFD Method** 2399
Linsen Li, Kai Xie, Feng Shen (State Power Investment Corporation Research Institute),
Qiming Li, Naxiu Wang (Chinese Academy of Sciences)
- 17318 **Single Phase Analytical Models for Terry Turbine Nozzle** 2404
Haihua Zhao, Hongbin Zhang, Ling Zou, James O'Brien (Idaho National Laboratory)
- 17336 **The CFD Calculation of a Stratification Break-Up Test of Light Gas in a Closed Vessel** 2412
Yazhe Lu, Yu Zhang, Xu Ran (Nuclear Power Institute of China)
- 17032 **Simulation of Rod Induced Vibrations in a Flow Channel Using Coupled ANSYS CFX - MOR Approach** 2420
Angel Papukchiev (Gesellschaft für Anlagen- und Reaktorsicherheit gGmbH),
J. Einzinger (ANSYS Germany GmbH)

Track 8: Dismantling and Decontamination Technologies

3:20 pm - 5:00 pm / Take (The Westin Miyako Kyoto)

Chair: Hiroshi Rindo (The Institute of Applied Energy)**Co-Chair:** Noritake Sugitsue (Japan Atomic Energy Agency)

- 17684 **Confirmation of the Decontamination Ability Using the Dry Blasting Device** 2430
Hiroataka Izuka, Yuuki Tshara (KANDEN POWER-TECH, Corporation),
Hajime Ito, Kazuhiro Fukuda, Yasuhiro Sugahara (The Kansai Electric Power Co., Inc.),
Yoji Kanamori (ATOX Co.,Ltd)
- 17587 **Development of Splitting Device in Axial Direction for Small Diameter Pipes** 2435
Kazuhiro Tanabe (Kanden Plant Corporation)
- 17476 **Design of Test Methods for Remotely Operated Robots Utilized for Decommissioning Tasks** 2441
Kuniaki Kawabata, Yuta Tanifuji, Fumiaki Mori, Norihito Shirasaki, Toshihide Hanari (Japan Atomic Energy Agency)
- 17453 **Technical Development of Repairing Method for Lower Section of PCV at Fukushima Daiichi NPS** 2445
H. Masaki, Y. Hijioka, T. Dekura (Toshiba Corporation / International Research Institute for Nuclear Decommissioning),
Y. Murakami, H. Imai, T. Wakui, S. Sawada, R. Yamashita (Hazama Ando Corporation),
Y. Morigaki, Y. Taniguchi, H. Kawabata (IHI Corporation), Y. Takeuchi, T. Tabara (Kyokuto Sangyo Co., Ltd.)

Track 9: SCC

3:20 pm - 5:00 pm / Ran (The Westin Miyako Kyoto)

Chair: Ken Kurosaki (Osaka University)**Co-Chair:** Koji Fujimoto (Nuclear Development Corporation)

- 17360 **The Role of Grain Boundary Cavities on SCC Initiation and Propagation in Alloy 690** 2455
Takumi Terachi, Nobuo Totsuka, Takuyo Yamada, Tomoki Miyamoto, Koji Arioka (Institute Nuclear Safety System, Inc.)
- 17403 **Stress Corrosion Crack Growth Behavior of Strain Hardened Strainless Steels Evaluated by FRI Model Calculations** 2462
Masato Koshiishi, Tsuneyuki Hashimoto (Nippon Nuclear Fuel Development Co., Ltd.),
Naoto Shigenaka (Hitachi-GE Nuclear Energy Ltd.), Shigeaki Tanaka (Toshiba Corporation)
- 17432 **Influence of Long-Term Thermal Aging on SCC Behavior of Stainless Steel Weld Metals and Cast Stainless Steels in High-Temperature Water** 2469
Takuyo Yamada, Takumi Terachi, Tomoki Miyamoto, Koji Arioka (Institute of Nuclear Safety System, Inc.)
- 17175 **Grain Boundary Oxidation of Neutron Irradiated Stainless Steels in Simulated PWR Environment** 2475
T. Fukumura, K. Fukuya, K. Fujii, T. Miura (Institute of Nuclear Safety System, Inc.),
Y. Kitsunai (Nippon Nuclear Fuel Development Co., Ltd.)
- 17350 **A Micro-Mechanical Study of Grain Boundary Fracture in Neutron-Irradiated Stainless Steels** 2484
Terumitsu Miura, Katsuhiko Fujii, Koji Fukuya (Institute of Nuclear Safety System, Inc.)

Track 6: Next Generation Reactor Physics

3:20 pm - 5:00 pm / Kiku (The Westin Miyako Kyoto)

Chair: Hiroki Koike (*Mitsubishi Heavy Industries, Ltd.*)

Co-Chair: Nicolas Stauff (*Argonne National Laboratory*)

17178 Model Verification and Validation Procedure for a Neutronics Design Methodology of Next Generation Fast Reactors 2490

Kazuya Ohgama (*Japan Atomic Energy Agency*), Kazumi Ikeda (*Mitsubishi FBR Systems Inc.*),
Makoto Ishikawa (*Japan Atomic Energy Agency*), Taro Kan (*Mitsubishi Heavy Industries, Ltd.*),
Shuhei Maruyama, Kenji Yokoyama, Kazuteru Sugino, Yasunobu Nagaya, Shigeo Ohki (*Japan Atomic Energy Agency*)

17789 Discrepancy of Fast Reactor Neutron Flux Calculations Caused by Assembly Homogenization 2500

Kazumi Ikeda, Masashi Ogura, Koki Hibi (*Mitsubishi FBR Systems Inc.*)

17696 Effect of Homogenization of Breeding Zone in Small Candle Burning Reactor with Melt and Refining Process 2509

Van Khanh Hoang, Jun Nishiyama, Toru Obara (*Tokyo Institute of Technology*)