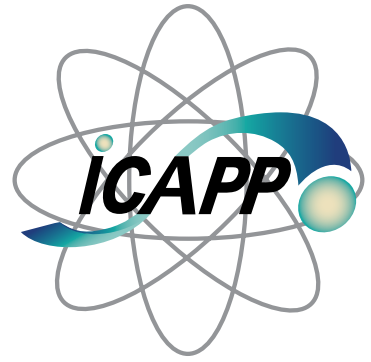




# ANS Meetings



2018 International Congress on  
Advances in Nuclear Power Plants

## Official Program

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April 8-11, 2018  
Charlotte, NC, USA  
The Westin Charlotte





# ANS

## ICAPP 2018 Meeting Contributors

2018 International Congress on Advances in Nuclear Power Plants (ICAPP 2018)

*Our most sincere thanks to our contributors for their support!*

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### SPONSORSHIP

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Southern  
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### EXHIBITORS

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Argonne National Laboratory

EK USA

Oak Ridge National Laboratory



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# Organizing Committee

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## 2018 International Congress on Advances in Nuclear Power Plants (ICAPP 2018)



HONORARY COCHAIR:  
Preston Gillespie  
*Duke Energy*



HONORARY COCHAIR:  
Mitsuru Uesaka  
*The University of Tokyo*



GENERAL COCHAIR:  
Glen Watford  
*GE-Hitachi Nuclear Energy*



GENERAL COCHAIR:  
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TECHNICAL PROGRAM COCHAIR:  
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TECHNICAL PROGRAM COCHAIR:  
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ASSISTANT TECHNICAL  
PROGRAM COCHAIR:  
Koroush Shirvan  
*Massachusetts Institute of Technology*



ASSISTANT TECHNICAL  
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Igor Bolotnov  
*North Carolina State University*



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STEERING COMMITTEE MEMBER  
Atam Rao  
*Principal Consultant*



STEERING COMMITTEE MEMBER  
Jacopo Buongiorno  
*Massachusetts Institute of Technology*



STEERING COMMITTEE MEMBER  
Travis W. Knight  
*University of South Carolina*

# Daily Schedule

## Sunday, April 8

3:00-8:00 pm  
6:00-8:00 pm

Registration  
Welcome Reception

Stonewall Promenade  
Grand Ballroom B

## Monday, April 9

7:00-8:00 am

Continental Breakfast

*Sponsored by*



Grand Ballroom B

7:00 am-5:00 pm  
7:00 am-5:00 pm  
8:00-10:00 am  
10:00-10:20 am

Registration  
Exhibits  
Opening Plenary  
Morning Beverage Break

*Sponsored by*



Stonewall Promenade  
Grand Ballroom B  
Grand Ballroom A  
Grand Ballroom B

10:20 am-12:05 pm  
12:05-1:05 pm

Plenary 2  
Attendee Luncheon

*Sponsored by*



Grand Ballroom A  
Grand Ballroom B

1:05-2:45 pm

Technical Sessions

- Computational Fluid Dynamics Modeling and Analysis—I
- Fast Neutron Reactors: Safety and Accident Analysis
- Structural Issues and Advanced Processes
- High Temperature Reactors—I
- Nuclear Fuel Cycle Analysis
- Reactor Physics and Analysis—I

Kings  
Tryon  
Harris  
Trade  
Independence  
Sharon

2:45-3:05 pm  
3:05-5:05 pm

Afternoon Break

Technical Sessions

- CHF Modeling and Analysis
- Fast Neutron Reactors: Analysis and Performance
- Severe Accident Testing, Modeling and Analysis—I
- Advances in Water Cooled Reactor Design and Technology
- Operation, Performance and Reliability Management—I
- Severe Accident Analysis

Kings  
Tryon  
Harris  
Trade  
Independence  
Sharon


# Daily Schedule

## Tuesday, April 10

7:00-8:00 am	<p>Continental Breakfast</p> <p><i>Sponsored by</i></p> 	Grand Ballroom B
<p>7:00 am-5:00 pm</p> <p>7:00 am-3:00 pm</p> <p>8:00-10:00 am</p>	<p>Registration</p> <p>Exhibits</p> <p>Technical Sessions</p> <ul style="list-style-type: none"> <li>• Computational Fluid Dynamics Modeling and Analysis—II</li> <li>• Advanced Reactors: Construction Innovation</li> <li>• Thermal Hydraulics Experiment, Testing, and Analysis</li> <li>• Innovative Hybrid Nuclear Energy Systems</li> <li>• Molten Salt Reactors and Systems—I</li> <li>• Probabilistic Risk and Hazard Analyses</li> </ul>	<p>Stonewall Promenade</p> <p>Grand Ballroom B</p> <p>Kings</p> <p>Tryon</p> <p>Harris</p> <p>Trade</p> <p>Independence</p> <p>Sharon</p>
10:00-10:20 am	<p>Morning Beverage Break</p> <p><i>Sponsored by</i></p> 	Grand Ballroom B
10:20-11:50 am	<p>Technical Sessions</p> <ul style="list-style-type: none"> <li>• General Thermal Hydraulics</li> <li>• Fast Neutron Reactors: ASTRID Research and Development—I</li> <li>• Severe Accident Testing, Modeling and Analysis—II</li> <li>• Accident Tolerant Fuel Research and Development—I</li> <li>• Waste Management</li> </ul>	<p>Sharon</p> <p>Tryon</p> <p>Harris</p> <p>Trade</p> <p>Independence</p>
12:00-1:00 pm	<p>Attendee Luncheon</p> <p><i>Sponsored by</i></p> 	Grand Ballroom B
1:00-2:30 pm	<p>Technical Sessions</p> <ul style="list-style-type: none"> <li>• Computational Fluid Dynamics Modeling and Analysis—III</li> <li>• Fast Neutron Reactors: ASTRID Research and Development —II</li> <li>• Accident Tolerant Fuel Research and Development—II</li> <li>• Spent Fuel and Structural Monitoring</li> <li>• Reactor Physics and Analysis—II</li> </ul>	<p>Harris</p> <p>Tryon</p> <p>Trade</p> <p>Independence</p> <p>Sharon</p>
<p>2:30-3:00 pm</p> <p>3:00-5:00 pm</p>	<p>Afternoon Break</p> <p>Technical Sessions</p> <ul style="list-style-type: none"> <li>• Code Development, Validation and Application—I</li> <li>• Molten Salt Reactors and Systems—II</li> <li>• Heat Exchanger Testing, Modeling and Analysis</li> <li>• Nuclear Energy and Global Environment</li> <li>• Safety and Accident Analysis</li> <li>• Design, Licensing and Safety Insights</li> </ul>	<p>Kings</p> <p>Tryon</p> <p>Harris</p> <p>Trade</p> <p>Independence</p> <p>Sharon</p>
6:30-10:00 pm	Banquet	Grand Ballroom A

# Daily Schedule

Wednesday, April 11

<p>7:00-8:00 am</p>	<p>Continental Breakfast <i>Sponsored by</i></p> 	<p>Grand Ballroom B</p>
<p>7:00 am-1:00 pm 8:00-10:00 am</p>	<p>Registration Technical Sessions</p> <ul style="list-style-type: none"> <li>• Code Development, Validation and Application—II</li> <li>• Advanced Reactors: Economics Innovation</li> <li>• Environmental Compatibility at High Temperature</li> <li>• Small Modular Reactors and Innovative Water Cooled Reactors</li> <li>• Advanced Transmutation Systems and Modeling</li> <li>• Advanced Safety Models and Issues</li> </ul>	<p>Stonewall Promenade  Kings Tryon Harris Trade Independence Sharon Grand Ballroom B</p>
<p>10:00-10:20 am 10:20-11:50 am</p>	<p>Morning Beverage Break Technical Sessions</p> <ul style="list-style-type: none"> <li>• Computational Fluid Dynamics Modeling and Analysis—IV</li> <li>• Light Water Reactors: Advanced Concepts and Technologies</li> <li>• High Temperature Reactors—II</li> <li>• Operation, Performance and Reliability Management—II</li> <li>• Reactor Physics and Analysis of Fast Reactors</li> </ul>	<p>Harris Tryon Trade Independence Sharon Grand Ballroom B Hotel Lobby</p>
<p>12:00-1:00 pm 12:30-4:30 pm</p>	<p>Attendee Luncheon Technical Tour</p>	<p>Grand Ballroom B Hotel Lobby</p>



**#ANSMeeting**

# General Information

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## MEETING INFORMATION

The International Congress on Advances in Nuclear Power Plants (ICAPP) is cosponsored by the American Nuclear Society, the Atomic Energy Society of Japan, the Korea Nuclear Society, the French Nuclear Society, and a number of major international nuclear societies. The meeting's annual host location cycles through the U.S., Europe, and Asia, giving it a global flair.

ICAPP provides a forum for nuclear industry leaders to exchange information, present results from their work, review the state of the industry, and discuss future directions and needs for the deployment of new nuclear power plant systems.

Uniting the business and technical interests of participants and exhibitors, ICAPP attracts 300+ specialists from around the world, offers more than 250 scientific/technical presentations in plenary and parallel sessions, and features additional panel and discussion sessions. The American Nuclear Society, as host for 2018, invites you to join us for this unique event.

## REGISTRATION

Location: Stonewall Promenade

Name badges must be worn during all technical sessions, in the expo and events. Certain events require a ticket, and may entail an additional cost.

## REGISTRATION HOURS

Sunday, April 8	3:00 - 8:00 pm
Monday, April 9	7:00 am-5:00 pm
Tuesday, April 10	7:00 am-5:00 pm
Wednesday, April 11	7:00 am-1:00 pm

## SPEAKER READY ROOM

Location: Caldwell

Monday, April 9	7:00 am-5:00 pm
Tuesday, April 10	7:00 am-5:00 pm
Wednesday, April 11	7:00 am-12:00 pm

## NOTICE TO SPEAKERS

All speakers and session chairs must check in at the ANS Registration Desk.



# General Information

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## ATTENDEE MEAL FUNCTIONS

The Welcome Reception on Sunday at 6 pm in Grand Ballroom B and the Banquet on Tuesday at 6:30 pm in Grand Ballroom A are included with the full meeting registration fee. Badges are required. Additional tickets for guests can be purchased at the ICAPP Registration Desk for these events.

Continental Breakfast will be provided to all registered meeting attendees Monday-Wednesday.

Morning coffee and tea will be provided to all registered meeting attendees Monday-Wednesday.

Lunch will be provided to all registered meeting attendees Monday-Wednesday.

## INTERNET CONNECTION

Follow the instructions below to connect to the complimentary Internet connection that is available in all meeting spaces:

1. Connect to “Westin Meeting”
2. Once connected, simply open your web browser.

The hotel’s network should instinctively welcome you to the Westin site. If you are having difficulty connecting, try opening a website such as Google. This may support the computer’s efforts to connect.

3. Once on the Westin’s page, please read the terms and conditions and utilize the personal code, **ANS2018**, that was created for the ICAPP 2018 Conference.

If you are experiencing difficulties logging on, check with the registration desk and a PSAV representative will assist you in connecting to the network.

The ICAPP 2018 code to connect is **ANS2018** and is valid for wireless connections.

# General Information

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## ABOUT ANS

### Mission

ANS provides its members with opportunities for professional development. It also serves the nuclear community by creating a forum for sharing information and advancements in technology, and by engaging the public and policymakers through communication outreach.

### Code of Ethics

Recognizing the profound importance of nuclear science and technology in affecting the quality of life throughout the world, members of the American Nuclear Society (ANS) are committed to the highest ethical and professional conduct.

ANS members as professionals are dedicated to improving the understanding of nuclear science and technology, appropriate applications, and potential consequences of their use.

To that end, ANS members uphold and advance the integrity and honor of their professions by using their knowledge and skill for the enhancement of human welfare and the environment; being honest and impartial; serving with fidelity the public, their employers, and their clients; and striving to continuously improve the competence and prestige of their various professions. The Code of Ethics can be found at [www.ans.org/about/coe](http://www.ans.org/about/coe).

### Statement on Diversity

The American Nuclear Society (ANS) is committed, in principle and in practice, to creating a diverse and welcoming environment for everyone interested in nuclear science and technology. Diversity means creating an environment – both in ANS and in the profession – in which all members are valued equitably for their skills and abilities and respected equally for their unique perspectives and experiences. Diverse backgrounds foster unique contributions and capabilities, and so creation of an inclusive Society ultimately leads to a more creative, effective, and technically respected Society.

ANS believes that everyone deserves opportunities for learning, networking, leadership, training, recognition, volunteering in Society activities, and all the other benefits that involvement in the Society brings, regardless of age, color, creed, disability, ethnicity, gender identity and expression, marital status, military service status, national origin, parental status, physical appearance, race, religion, sex, or sexual orientation. The selection of a member to serve in ANS's volunteer leadership structure shall be based solely on the member's ability, interest and commitment to serve. In particular, ANS encourages members at each level of the Society and in each Professional Division and Technical Group to make special efforts to recruit underrepresented minorities and women to ensure that they are adequately represented in the Society.

### Respectful Behavior Policy (Abbreviated)

The open exchange of ideas, freedom of thought and expression, and productive scientific debate are central to the mission of the American Nuclear Society (ANS). These require an open and diverse environment that is built on dignity and mutual respect for all participants and ANS staff members, and is free of bias and intimidation.

ANS is dedicated to providing a safe, welcoming, and productive experience for everyone participating in Society events and other Society activities regardless of age, color, creed, disability, ethnicity, gender identity and expression, marital status, military service status, national origin, parental status, physical appearance, race, religion, sex, or sexual orientation. Creation of a safe and welcoming environment is a shared responsibility held by all participants. Therefore, ANS will not tolerate harassment of or by participants (including ANS volunteer leaders and staff members) in any form. Disciplinary action for participants found to have violated this principle may include reprimand, expulsion from an event or activity with or without a refund, temporary or permanent exclusion from all ANS events and activities, suspension or expulsion from volunteer leadership positions or groups, and/or suspension or expulsion from Society membership, as appropriate.

***If you or someone else experiences harassment, regardless of how you otherwise choose to initially handle the situation***, you are encouraged to report the situation to ANS. It is possible that the behavior you experienced is part of a larger pattern of repeated harassment. Please alert ANS to behavior you feel to be harassment regardless of the offender's identity or standing in the Society.

The designated contact for reports at the 2018 ICAPP is ANS President Bob Coward. Bob can be reached at the hotel.

The complete Respectful Behavior Policy can be found at [www.ans.org/about/rbp](http://www.ans.org/about/rbp). If you have questions about the policy, please contact ANS Executive Director Robert C. Fine at 708-579-8200 or [rfine@ans.org](mailto:rfine@ans.org).

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Consent to Use Photographs and Videos: All attendance of registered participants, attendees, exhibitors, sponsors and guests ("you") at American Nuclear Society ("ANS") meetings, courses, conventions, conferences, or related activities ("Events") constitutes an agreement between you and ANS regarding the use and distribution of your image, including but not limited to your name, voice and likeness ("Image"). By attending the ANS Events, you acknowledge and agree that photographs, videotaping, live feed video and audio, and/or audio recordings may be taken of you and you grant ANS the right to use, in perpetuity, your Image in any electronic or print distribution, or by other means hereinafter created, both now and in the future, for media, art, entertainment, promotional, marketing, advertising, trade, internal use, educational purposes or any other lawful purpose.

## SUNDAY, APRIL 8

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### Welcome Reception

**Time:** 6:00-8:00 pm

**Location:** Grand Ballroom B

## MONDAY, APRIL 9 & TUESDAY, APRIL 10

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### Tabletop Exhibits

**Location:** Grand Ballroom B

Monday, April 9 | 7:00 am-5:00 pm

Tuesday, April 10 | 7:00 am-3:00 pm

## MONDAY, APRIL 9

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### Opening Plenary: Advances in Plant Design, Construction and Operation

**Time:** 8:00-10:00 am

**Organizer:** Samim Anghaie (*Nuclear Power Consulting*), **Cochairs:** T. Preston Gillespie (*Senior VP and CNO, Duke Energy*) USA, Mitsuru Uesaka (*Professor of the University of Tokyo and President AESJ*) Japan

**Location:** Grand Ballroom A

The Opening Plenary includes discussion on the advances made in deployment of new nuclear power plants which includes design, licensing, construction and startup issues and economics as well as excellence achieved in the operation of existing plants in the U.S. and around the world. Leading experts will address the progress made and challenges faced in the design and all other aspects of new plant deployment. Speakers will share their respective experiences in implementation of new design features, licensing practices, construction accomplishments and challenges, and early stage of operation of the new power reactors around the world. The discussion will also include new accomplishments in safe and reliable operation of existing plants which are pivotal to the growth and expansion of nuclear power.

#### Speakers:

##### Honorary Co-Chair

T. Preston Gillespie, *Senior VP and CNO, Duke Energy, USA*

##### Honorary Co-Chair

Mitsuru Uesaka, *Professor of The University of Tokyo and President, AESJ, Japan*

##### Can Nuclear Energy Thrive in a Carbon-Constrained World? – Findings from a New MIT Study

Jacopo, Buongiorno, *TEPCO Professor, MIT, USA*

##### Coaching and Mentoring International High Potential Individuals and Executives in Nuclear Industry

Amir Shahkarami, *Chairman, TEPCO Nuclear Safety Advisory Board, Japan/USA*

##### Barakah Project: A New Entrants Journey to Safe Operations

Daniel L. Shamblin, *Chief Program Officer, ENEC, UAE*

##### Reducing New NPP Cost through Simplification and Innovation

Glen Watford, *VP & Chief Engineer, GE Hitachi Nuclear Energy, USA*

# Plenary, Special Sessions & Events

## MONDAY, APRIL 9 CONTINUED

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### Plenary 2: Leveraging Innovations in Construction Technologies to Reduce New NPP Cost and Schedule

**Time:** 10:20 am-12:05 pm

**Organizer and Chair:** Jacopo Buongiorno (MIT)

**Location:** Grand Ballroom A

The capital cost of new nuclear is not dominated by the NSSS and BOP technologies, but rather by the indirect costs, i.e. how the plants are built (including labor costs), engineering costs (including licensing) and owner's costs (especially interest during construction). Therefore, cross-cutting technologies that can reduce the indirect costs and construction schedule for any NSSS design warrant careful consideration. Examples of such technologies include ultra-high performance concrete (allowing for elimination of formwork and drastic reduction of rebar), advanced seismic isolation (allowing for site-independent design of NSSS structures, systems and components), below-grade embedment using modern giant drilling machines (potentially eliminating the need for the shield building), design-for-fabrication approaches (embedding design with manufacturing, thus reducing the probability of redesign and rework), modular construction (including the use of super-modules that are barge-transported), and advanced site workforce management software. This plenary session will highlight a promising subset of these innovations in the hope that will be considered for adoption by the nuclear industry in the next wave of NPP builds.

**Speakers:**

**Advanced Concrete for NPPS**

Andrew Pinneke, *Ductal® Architecture Business Development Manager (Lafarge-Holcim)*

**Using Seismic Isolation To Simplify And Standardize NSSS Designs**

Ben Kosbab, *Principal Engineer (SC SOLUTIONS)*

**Design for Fabrication**

Bradley Dunkin, *Vice President (ret.), Nuclear Products Division (Oregon Iron Works, Inc. / Vigor.)*

**Implementing Advanced Construction Solutions In The Design Of A New NPP**

TBD

## TUESDAY, APRIL 10

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### Banquet: Government and Industry Roles in Commercialization of Nuclear Power: Historical "Food for Thought" on Public – Private Partnerships

**Time:** 6:30-10:00 pm

**Location:** Grand Ballroom A

Access to the Evening Banquet is included in the full meeting registration fee. Badges are required. Tickets can be purchased for guests at the Registration Desk for \$125.

The speaker for the banquet has changed since the program was printed. We are very pleased to announce that Andrew Sowder, Ph.D., CHP, (EPRI) is now the speaker at this event. Andrew Sowder is a Technical Executive in the Advanced Nuclear Technology program at the Electric Power Research Institute (EPRI). He currently leads EPRI's strategic program on advanced reactors. His previous activities at EPRI encompassed R&D on accident tolerant fuel for LWRs, used nuclear fuel management and disposal, and advanced nuclear fuel cycle analysis.

**Speaker:** Andrew Sowder, Ph.D., CHP, *Technical Executive Advanced Nuclear Technology Electric Power Research Institute (EPRI)*

## WEDNESDAY, APRIL 11

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### Technical Tour: McGuire Nuclear Station

**Time:** 12:30-4:30 pm

Registration for this tour is full. Board the bus at the Westin lobby. All U.S. visitors must have a valid government ID (e.g., drivers licenses or passport) and all international visitors must have a valid passport.

## MONDAY, APRIL 9

### TECHNICAL SESSIONS - 1:05-2:45 PM

#### Computational Fluid Dynamics Modeling and Analysis—I

Sponsored by THD

Session Organizer: Matthew D. Zimmer (NCSU)

Cochairs: Igor A. Bolotnov (NCSU), Abdennaceur Mansour (Univ of Stuttgart)

Location: Kings

- 1:05 pm:** Simulation of Two-Phase Flows with Condensation in CFD Applications, A. Mansour, E. Laurien (Univ of Stuttgart)
- 1:35 pm:** Multi-Bubble Flow Boiling Simulation Using Interface Tracking Method, Mengnan Li, Igor A. Bolotnov (NCSU)
- 2:05 pm:** Simulating Sodium Pool Natural Circulation in RVACS Operation Using CFD, Min Ho Lee (UNIST), Dong-Wook Jerng (Chung-Ang Univ), In Cheol Bang (Unist)

#### Fast Neutron Reactors: Safety and Accident Analysis

Sponsored by OPD

Session Organizer: Koroush Shirvan (MIT)

Cochairs: Paolo Ferroni (Westinghouse), Duane M. Twine (South Carolina Electric & Gas)

Location: Tryon

- 1:05 pm:** Proposal of New Safety Measures for European Sodium Fast Reactor to be Evaluated in Horizon-2020 ESFR-SMART Project, Guidez Joel Serge (CEA), Andrei Rineiski (KIT), Gérard Prêle, Enrico Girardi (EDF), Janos Bodi, Konstantin Mikityuk (PSI)
- 1:35 pm:** Means of Meeting Adapted Chapter 15 Requirements for a Small Modular Reactor Cooled by Lead-Bismuth, D. Wootan, R. Omberg, A. Casella, N. Lahaye, B. McDowell (PNNL), W. Stokes (Columbia Basin Consulting Group)

#### Structural Issues and Advanced Processes

Sponsored by OPD Cosponsored by THD

Session Organizer: Celine J. Cabet (CEA, Saclay)

Cochairs: Wei Tang (ORNL), Hiroyuki Fukuyama (Tohoku Univ)

Location: Harris

- 1:05 pm:** Load Carrying Capacity of Thrust Bearing for Nuclear Coolant Pump with Boundary Slippage and Elastic Deformation, B. Zhu, Y. P. Li, X. P. Zhu, M. K. Lei (Dalian Univ of Technology)
- 1:30 pm:** Considerations from the Benchmark Comparison of OXBOW against IWGFR Mechanical Analysis Codes, Jason B. Meng, Francesco Deleo (TerraPower)
- 1:55 pm:** High-Cycle Acoustic Loads Structural Evaluation of BWR Steam Dryer Modification, Yan Han, Karen K. Fujikawa, Inessa E. Berman, Sanjaybir Bakshi, David A. Suddaby (Westinghouse)
- 2:20 pm:** Advanced Welding Technology Development for Nuclear Reactor Repair, Wei Tang, Jian Chen, Brian Gibson, Roger Miller, Scarlett Clark, Mark Vance, Zhili Feng, Keith Leonard (ORNL), Jonathan Tatman, Benjamin Sutton, Gregory Frederick (EPRI)

#### High Temperature Reactors—I

Sponsored by OPD Cosponsored by THD

Session Organizer: Piyush Sabharwall (INL)

Chair: Matthew J. Memmott (Brigham Young Univ)

Location: Trade

- 1:05 pm:** Neutronics Modelling and Analysis of the TMSR-SF1 Core with Explicitly Described Fuel Pebble Loadings, Jarod Wilson, Sara Hauptman, Akshay Dave, Kaichao Sun, Lin-wen Hu (MIT), Ruimin Ji, Yang Zou (CAS)
- 1:35 pm:** A FEM Study on the Particle-Wall Impaction of Graphite Dusts in High Temperature Gas-Cooled Reactors (HTGR), Yiyang Zhang, Zhu Fang, Xinxin Wu, Haitao Wang, Libin Sun, Xiaowei Luo, Xiaowei Li (Tsinghua Univ)
- 2:05 pm:** The Redistribution of Forces in a Pebble Bed Reactor due to Radiation Induced Pebble Shrinkage and Other Property Changes, Jordan Cox, Brian Woods (Oregon State Univ)

Technical  
Sessions:  
Monday  
April 9

# Technical Sessions: Monday April 9

## MONDAY, APRIL 9

### TECHNICAL SESSIONS - 1:05-2:45 PM

#### Nuclear Fuel Cycle Analysis

**Sponsored by** OPD; **Cosponsored by** THD

**Session Organizer and Chair:** Taek Kyum Kim (ANL)

**Location:** Independence

- 1:05 pm:** French Scenarios Toward Fast Plutonium Multi-Recycling in PWR, Guillaume Martin, Maxime Guyot (CEA), Frédéric Laugier (EDF DCN), Gérald Senentz (Framatome), Guillaume Krivtchik (CEA), Bertrand Carlier (ORANO), David Lecarpentier, Frédéric Descamps (EDF R&D), Christine Chabert, Romain Eschbach (CEA)
- 1:35 pm:** Study of a Mixed Fleet of Breeder SFR and EPR Supplied with LEU and MOX Fuels to Balance the Plutonium Inventory, Guillaume Martin (CEA)
- 2:05 pm:** Fuel Cycle Developments and Safety Analysis of Transition Core Plan for Supporting MIT Reactor Low Enriched Uranium Conversion, Kaichao Sun, Akshay Dave, Lin-wen Hu (MIT), Erik Wilson, Thad Heltemes, Son Pham, David Jaluvka (ANL)

#### Reactor Physics and Analysis—

**Sponsored by** OPD **Cosponsored by** THD

**Session Organizer:** Frederic Damian (CEA)

**Chair:** Travis W. Knight (Univ of South Carolina)

**Location:** Sharon

- 1:05 pm:** CATHARE3 Transient Analysis of an Innovative Power Conversion System based on the Brayton Cycle Modelled with Real Gas Equations of State, Jean-Baptiste Droin, Vincent Pascal, Paul Gauthé, Frédéric Bertrand, Gédéon Mauger (CEA)
- 1:35 pm:** Advanced Fuel Cost Performance Assessment for the Westinghouse LFR, F. Franceschini (Westinghouse), G. Grasso (ENEA), P. Ferroni (Westinghouse)
- 2:05 pm:** Development of a TRACE/PARCS Core Model for APR1400 MSRB Accident Analysis, Moo-Hoon Bae, Gwanyoung Kim (KINS), Taewan Kim (Incheon National Univ), Ae Ju Cheong (KINS)

### TECHNICAL SESSIONS - 3:05-5:05 PM

#### CHF Modeling and Analysis

**Sponsored by** THD

**Session Organizer:** Igor A. Bolotnov (NCSU)

**Cochairs:** Akshay Dave (MIT), Jiyun Zhao (City Univ of Hong Kong)

**Location:** Kings

- 3:05 pm:** Mechanistic Modeling of Departure from Nucleate Boiling under Transient Scenarios, X. Zhao (MIT), A. Wysocki, R. Salko (ORNL), K. Shirvan (MIT)
- 3:35 pm:** Safety Margin Characterization for ATR High Power Fueled Experiments, Akshay Dave, Yu-Jou Wang, Lin-Wen Hu, Kaichao Sun (MIT), Joseph Nielsen, Paul Murray, Ryan Marlow (INL)
- 4:05 pm:** Treatment of Heat Loss during Critical Heat Flux Testing, M. Bradbury, R. Ratnayake (NuScale Power)
- 4:35 pm:** The Latest Review of CHF Enhancement Methods in Nuclear Systems, Shangzhen Xie, Jiyun Zhao (City Univ of Hong Kong)

#### Fast Neutron Reactors: Analysis and Performance

**Sponsored by** OPD

**Session Organizer:** Koroush Shirvan (MIT)

**Cochairs:** Paolo Ferroni (Westinghouse), Duane M. Twing (South Carolina Electric & Gas)

**Location:** Tryon

- 3:05 pm:** Multi-Discipline Considered Design of Reactor Shutdown System for Prototype GEN-IV Sodium-Cooled Fast Reactor, Kyungho Yoon, Hyun-Seung Lee (KAERI)
- 3:35 pm:** Analytical and Numerical Study of the Stalling Phenomenon in an Electromagnetic Pump for a Sodium Fast Reactor, E. Martin Lopez (CEA/Grenoble INP), Y. Delannoy (Grenoble INP), F. Benoit, A. Muñoz Medina, R. Martinie (CEA)
- 4:05 pm:** Extending the Capabilities of Fast Reactor Transient Analysis Tool GeN-transFOAM Account for Burnup Effects, Xinyu Zhao, Eugene Shwageraus (Univ of Cambridge)
- 4:35 pm:** Sodium Thermal-Hydraulic Test Program for Design Validation of Prototype Gen-IV Sodium-Cooled Fast Reactor, Jaehyuk Eoh, Jewhan Lee, Hyungmo Kim, Jung Yoon, Hyeong-Yeon Lee, Ji-Young Jeong (KAERI)

## MONDAY, APRIL 9

### TECHNICAL SESSIONS - 3:05-5:05 PM

#### Severe Accident Testing, Modeling and Analysis—I

Sponsored by THD

Session Organizer: Igor A. Bolotnov (NCSU)

Chair: Paolo Ferroni (Westinghouse)

Location: Harris

- 3:05 pm:** Influence of Steam Production on Particulate Debris Bed Spreading, Wael Hilali, Michael Buck, Joerg Starflinger (*Univ of Stuttgart*)
- 3:35 pm:** Development of Passive Debris Cooling System, Yoshiro Nishioka, Satoru Kuboya, Yuya Takahashi, Hideki Horie, Mika Tahara (*Toshiba Energy Systems & Solutions Corp*), Tadashi Fujii (*Hitachi-GE Nuclear Energy, Ltd*), Takafumi Tsuji (*Chubu Electric Power Co., Inc.*)
- 4:05 pm:** Application of Several Numerical Methods for Ex-Vessel Debris Bed Formation in a LWR Severe Accident, Wael Hilali, Nihed Lasmar, Michael Buck, Joerg Starflinger, Eckart Laurien (*Univ of Stuttgart*)
- 4:35 pm:** A Method for Predicting the Configuration of Corium Pool in RPV Lower Plenum, Lili Liu, Hongxing Yu, Liang Chen, Deng Jian, Deng Chunrui, Zhang Dan, Wu Xiaoli (*Nuclear Power Inst of China*)

#### Advances in Water Cooled Reactor Design and Technology

Sponsored by OPD Cosponsored by THD

Session Organizer: Mark W. Peres (*Fluor Corp.*)

Co-chairs: Travis W. Knight (*Univ of South Carolina*), Mark W. Peres (*Fluor Corp.*)

Location: Trade

- 3:05 pm:** Safety Design and Evaluation of Loss of Forced Flow Accident of CRS1000, Dan Zhang (*Nuclear Power Inst of China*)
- 3:35 pm:** Comparative Studies of Sensitivity Analyses for Coupled VERA-CS/FRAPCON and VERA-CS/BISON Simulations, Hongbin Zhang (*INL*), Cole Blakley (*Utah State Univ*)
- 4:05 pm:** Evaluation of Degradation Effect of Fluoroelastomer in Simulated Severe Accident Environment of Nuclear Power Plants, Inyoung Song, Seung Chang Yoo (*UNIST*), Taehyun Lee, Kyungha Ryu (*KIMM*), Ji Hyun Kim (*UNIST*)
- 4:35 pm:** Comparison of Net Present Value for Construction Projects of Two Offshore Floating Nuclear Power Plant Designs, Using a Monte Carlo Method for Evaluation of the Project Uncertainties, P. Minelli, M. Golay, J. Buongiorno, N. Todreas (*MIT*)

#### Operation, Performance and Reliability Management—I

Sponsored by OPD Cosponsored by THD

Session Organizer: Richard F. Wright (*Westinghouse Electric Co. LLC*)

Chair: Choong-koo Chang (*KEPCO*)

Location: Independence

- 3:05 pm:** Design Vulnerability of the Ground Fault Protection System for the Preferred Power Supply of Nuclear Power Plants, Choong-koo Chang (*KINGS*)
- 3:35 pm:** HuREX: An Integrated Analysis Framework for Operator Reliability Data and Its Supporting System, Seunghwan Kim, Yochan Kim, Sun Yeong Choi, Wondea Jung, Jinkyun Park (*KAERI*)
- 4:05 pm:** Industrial Control System Testbed for Cybersecurity Research with Industrial Process Data, Fan Zhang, J. Wesley Hines, Jamie Coble (*Univ of Tennessee*)
- 4:35 pm:** Human Performance Benefits Gained by Dynamic Instructions Compared to Smart PDFs, Johanna Oxstrand, Rachael Hill, Katya Le Blanc (*INL*)

#### Severe Accident Analysis

Sponsored by OPD Cosponsored by THD

Session Organizer: George F. Flanagan (*ORNL*)

Chair: Randall O. Gauntt (*SNL*)

Location: Sharon

- 3:05 pm:** Experimental Study of the Effect of Molybdenum on Iodine Transport in the Primary Circuit during a Severe Nuclear Power Plant Accident, Mélanie Gouëlle, Jouni Hokkinen, Teemu Kärkelä (*VTT Technical Research Centre of Finland*)
- 3:35 pm:** Effect of Hydrodynamics on Retention of Elemental Iodine in a Wet Scrubber, Ignazio Beghi, Sabrina Tietze, Terttaliisa Lind (*PSI*), Horst-Michael Prasser (*ETH Zürich*)
- 4:05 pm:** Effects of Filtered Containment Venting System Operating Strategies on the Cesium Releases during Severe Accidents, Eun-Hye Lee, Hoe-Yeol Kim, Dong-Wook Jerng (*Chung-Ang Univ*), Tae Woon Kim (*KAERI*)
- 4:35 pm:** Progress in Understanding Fukushima Unit 1 Severe Accident Through a Forensic Analysis with MELCOR, Luis E. Herranz, Claudia López (*CIEMAT*)

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## TUESDAY, APRIL 10

### TECHNICAL SESSIONS - 8:00-10:00 AM

#### Computational Fluid Dynamics Modeling and Analysis—II

**Sponsored by** THD

**Session Organizer:** Xiaodong Sun (*Univ of Michigan*)

**Cochairs:** Jinyong Feng (*MIT*), Mengnan Li (*NCSU*)

**Location:** Kings

- 8:00 am:** Experimental and Numerical Investigation of Flow Phenomena in a Vertical T-Junction Configuration, A. Isaev, J. Felbinger, C. Evrim, R. Kulenovic, E. Laurien (*Univ of Stuttgart*)
- 8:30 am:** Bubble Dynamics Analysis in PWR Two-Phase Flow Simulations Using Interface Tracking Methods, Joseph J. Cambareri, (*NCSU*), Jun Fang (*ANL*), Andre Gouws, Igor A. Bolotnov (*NCSU*)
- 9:00 am:** Assessment of a Robust Second Generation URANS Turbulence Model for Prediction of Thermal Striping in T-Junction Configurations, Jinyong Feng (*MIT*), Tarek Frahi (*Institut National des Sciences et Techniques Nucléaires*), Emilio Baglietto (*MIT*)
- 9:30 am:** Reducing BWR Jet Pump Vibration of Slip Joints by Full Scale Experiments and Theoretical Studies, Dong-Yuan Sheng, David Mauritzson, Sven Perzon (*Westinghouse Electric Sweden*), Karen Fujikawa, Bobby Bakshi (*Westinghouse*)

#### Advanced Reactors: Construction Innovation

**Sponsored by** OPD **Cosponsored by** THD

**Session Organizer:** Andrew G. Sowder (*EPRI*)

**Chair:** Cory Stansbury (*Westinghouse*)

**Location:** Tryon

- 8:00 am:** Extending Modularization from Modules to Super Modules: A Cost Evaluation of Barge-Transportable Small Modular Reactors, Giovanni Maronati, Bojan Petrovic (*Georgia Tech*)
- 8:30 am:** Impact of Technological Innovation on Nuclear Power Plant Capital Costs, Giovanni Maronati, Abdalla Abou-Jaoude, Bojan Petrovic (*Georgia Tech*)
- 9:00 am:** Advanced Manufacturing to Enable the Next Generation of Nuclear Plants, David Gandy, Craig Stover (*EPRI*), Hongqing Xu, Vernon Pence (*NuScale Power*), Steven Lawler, Matthew Cusworth (*Nuclear AMRC*)
- 9:30 am:** Seismic Evaluation for a Large-Sized Reactor Vessel Targeting SFRs in Japan, Masato Uchita, Takayuki Miyagawa, Koji Dozaki (*JAPC*), Yoshitaka Chikazawa, Shigenobu Kubo, Hiroki Hayafune (*JAEA*), Tetsuji Suzuno, Tsuyoshi Fukasawa, Yoshio Kamishima (*Mitsubishi FBR Systems, Inc.*), Satoshi Fujita (*Tokyo Denki Univ*)

#### Thermal Hydraulics Experiment, Testing, and Analysis

**Sponsored by** THD

**Session Organizer:** Shripad T. Revankar (*Purdue Univ*)

**Cochairs:** Pablo R. Rubiolo (*Grenoble Inst of Technol*), Taku Nagatake (*JAEA*)

**Location:** Harris

- 8:00 am:** Investigation of Interfacial Waves Behavior During Quenching of a Vertical Cylinder Using an Image Processing Technique, Shikha A. Ebrahim, Nurali Virani, Shi Chang, Fan-Bill Cheung (*Penn State*)
- 8:30 am:** Design of Close and Open Channels Experiments to Study Molten Salt Flows, Pablo Rubiolo, Mauricio Tano, Julien Giraud, Veronique Ghetta, Juan Blanco, Olivier Doche, Nicolas Capellan (*LPSC Univ*)
- 9:00 am:** Analysis of Initially Subcooled Leakage Flows in a Narrow Through-Wall Crack at Low Reynolds-Numbers, Stefan Schmid, Rudi Kulenovic, Eckart Laurien (*Univ of Stuttgart*)
- 9:30 am:** Study of CCFL Two-Phase Flow at Upper Tie Plate of Fuel Bundle to Evaluate Spray Cooling Capability in Spent Fuel Pool, Taku Nagatake, Yasuo Koizumi, Mitsuhiko Shibata, Hiroyuki Yoshida, Yoshiyuki Nemoto, Yoshiyuki Kaji (*JAEA*)



## TUESDAY, APRIL 10

### TECHNICAL SESSIONS - 8:00-10:00 AM

#### Innovative Hybrid Nuclear Energy Systems

Sponsored by OPD Cosponsored by THD

Session Organizer: Sama Bilbao y Leon (*Virginia Commonwealth Univ*)

Chair: Matthew George Shalloo, Jr. (*Univ of South Carolina*)

Location: Trade

- 8:00 am:** Design and Operation of an Electric Peaking/Industrial Steam Production Unit for SMRs, Konor Frick, J. Michael Doster (*NCSU*), Shannon M. Bragg-Sitton (*INL*)
- 8:30 am:** Absorption Chiller and Stratified Chilled-Water Storage Tank Configurations for Coupling to a Small Modular Reactor, Corey Misenheimer, Konor Frick, Stephen Terry, J. Michael Doster (*NCSU*), Shannon M. Bragg-Sitton (*INL*)
- 9:00 am:** Supercritical Carbon Dioxide Brayton Cycle for Hybridization of a Small Modular Reactor and a Concentrated Solar Power Plant with Thermal Energy Storage, Q. T. Pham, N. Tauveron (*Grenoble Alps Univ*), N. Alpy (*CEA*)
- 9:30 am:** Predictive Modeling of a Paradigm Mechanical Cooling Tower, Ruixian Fang, Dan G. Cacuci (*Univ of South Carolina*)

#### Molten Salt Reactors and Systems—I

Sponsored by OPD Cosponsored by THD

Session Organizer: Koroush Shirvan (*MIT*)

Chair: Travis W. Knight (*Univ of South Carolina*)

Location: Independence

- 8:00 am:** Dynamics and Stability Analysis of DFR Concept Using U-PU and TRU Fuel Salts, Xiang Wang (*Harbin Eng Univ*), Chunyu Liu, Rafael Macián-Juan (*Technical Univ of Munich*)
- 8:30 am:** Multiphysics Study of the Draining Transients in the Molten Salt Fast Reactor, Mauricio Tano, Pablo Rubiolo (*Univ of Grenoble-Alpes*), Julien Giraud, Véronique Ghetta (*LPSC, CNRS/IN2P3*)
- 9:00 am:** Nu-HOPE: The Experimental Platform for Heat Transfer Characteristics of Molten Salt, Han Eol Park, Seok Bin Seo, In Cheol Bang (*UNIST*)

#### Probabilistic Risk and Hazard Analyses

Sponsored by OPD Cosponsored by THD

Session Organizer and Chair: Askin Guler (*ORNL*)

Location: Sharon

- 8:00 am:** Nuclear Power Plant Design Resilience against Hazard Combinations—A Multi-Discipline View, Diego Fernández Lisbona, Anastasios Alexiou, Tanya Macleod, Leslie Smith (*Office for Nuclear Regulation UK*)
- 8:30 am:** SFP PSA Development for UK ABWR, Daisuke Taniguchi, Yuki Ishiwatari, Naoki Hirokawa, Bumpei Fujioka, (*Hitachi-GE Nuclear Energy*)
- 9:00 am:** Probabilistic Risk Assessment of the Spent Nuclear Fuel Loading Process in Light Water Reactor Systems, Ibrahim Jarrah, Rizwan uddin (*Univ of Illinois*)
- 9:30 am:** Preliminary Hazard Assessment and Component Reliability Database for the Molten Salt Reactor Experiment, Brandon. Chisholm, Steven Krahn, Allen Croff, Paul Marotta (*Vanderbilt Univ*), Andrew Sowder (*EPRI*), Nick Smith (*Southern Co.*)

### TECHNICAL SESSIONS - 10:20-11:50 AM

#### General Thermal Hydraulics

Sponsored by THD

Session Organizer: Joseph Cambareri (*NCSU*)

Cochairs: Yu Song (*Tsinghua Univ*), Cameron S. Brown (*Corvid Technol*)

Location: Sharon

- 10:20 am:** Thermal Hydraulics Analysis of High Temperature Gas-Cooled Nuclear Reactor Using Multiphysics Software, Mofassir Ud Dowla, M. A. Rashid Sarkar (*Bangladesh Univ of Eng and Technology*)
- 10:50 am:** On the Use of Inverse Problem Methods in Nuclear Reactors Design Applications, Mauricio Tano, Pablo Rubiolo (*Univ of Grenoble-Alpes*), Julien Giraud, Véronique Ghetta (*LPSC, CNRS/IN2P3*)
- 11:20 am:** Study on the Relationship Between Flow Maldistribution and Heat Transfer Performance of Air-Cooled Heat Exchangers with Different Entrances and Exits, Song Yu, Zhao Jiaqing, Zhang Yiyang, Wu Xinxin (*Tsinghua Univ*)

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## TUESDAY, APRIL 10

### TECHNICAL SESSIONS - 10:20-11:50 AM

#### Fast Neutron Reactors: ASTRID Research and Development—I

Sponsored by OPD

Session Organizer: Didier J. De Bruyn (*SCK-CEN*)

Cochairs: Didier J. De Bruyn (*SCK-CEN*), Paolo Ferroni (*Westinghouse*)

Location: Tryon

**10:20 am:** ASTRID Project, General Overview and Status Progress, Frédéric Varaine, Gilles Rodriguez (*CEA*), Jean Marie Hamy (*Framatome*), Shigenobu Kubo (*JAEA*), Haruo Mochida (*MFBR*), Usui Kukinori (*MHI*), Jean-Philippe Helle (*NOX*), Alain Remy (*General Electric – Alstom Power*), Thomas Chauveau (*Bouygues*), Jean-Luc Mazel (*VELA*), Martin Libessart (*Ariane Group*), René-Paul Benard (*ALCEN SEIV*), Masaru Fukuie (*Toshiba*), David Settimo (*EDF*), Vincent Gautier (*CNIM*), Yvan Lhor (*ONET Technologie*), Michel Lefrancois (*TECHNETICS*)

**10:50 am:** Progress in the Design of the ASTRID Nuclear Island, Marie-Sophie Chenaud, Gilles Rodriguez (*CEA*), Jean-François Dirat, Alexandre Villedieu (*Framatome*)

**11:20 am:** ASTRID Nuclear Island Design: Update in French-Japanese Joint Team Development of Decay Heat Removal Systems, Edouard Hourcade (*CEA*), Takatsugu Mihara (*JAEA*), Alexandre Dauphin, Jean-François Dirat (*Framatome*), Akihiro Ide (*MFBR*)

#### Severe Accident Testing, Modeling and Analysis—II

Sponsored by THD

Session Organizer: Igor A. Bolotnov (*NCSU*)

Chair: Jarmo Kalillainen (*PSI*)

Location: Harris

**10:20 am:** Aerosol Depletion in Natural Circulation in Simplified Geometry, Jarmo Kalilainen, Haeseong Kim, Abdel Dehbi, Terttaliisa Lind (*PSI*)

**10:50 am:** Study on Melting Behavior and Related Influential Factors of Shroud and Basket of ACP1000 during a Severe Accident, Liqiang Hou, Dahuan Zhu, Qing Wu, Jian Deng, Xiao-li Wu (*Nuclear Power Inst of China*)

**11:20 am:** MAAP5 Simulation of PWR High-Pressure Core Melting Severe Accident due to Small-Break LOCA, Xiaoli Wu, Jian Deng, Liqiang Hou, Lili Liu, Dan Zhang, Hongsheng Yuan (*Nuclear Power Inst of China*)

#### Accident Tolerant Fuel Research and Development—I

Sponsored by OPD Cosponsored by THD

Session Organizer: Koroush Shirvan (*MIT*)

Cochairs: George Jacobsen (*General Atomics*), Mirco Karl Grosse (*KIT*)

Location: Trade

**10:20 am:** High Temperature Interaction of SiC and Zry-4, Mirco Karl Grosse (*KIT*), Teun van Duijnhoven (*KIT/Fontys Univ of Applied Sciences*), Martin Steinbrueck, Chongchong Tang, Sarfraz Ahmed, Uta Gerhards, Ingo Juergen Markel, Hans Juergen Seifert (*KIT*)

**10:50 am:** Quenching Test of SiC<sub>r</sub>-SiC<sub>m</sub> Composite Cladding, Luis Alva, Xinyu Huang (*Univ of South Carolina*), George Jacobsen (*General Atomics*)

**11:20 am:** Analysis of Thermal Creep for Uranium Silicide Fuel Using Bison, R. Austin Freeman, Thomas Martin, Elwyn Roberts, Travis W. Knight (*Univ of South Carolina*)

#### Waste Management

Sponsored by OPD Cosponsored by THD

Session Organizer and Chair: Charles W. Forsberg (*MIT*)

Location: Independence

**10:20 am:** Salt Cleanup and Waste Solidification into Iron Phosphate or Borosilicate Glass with Halide Recycle for Fission and Fusion Salt Reactors, Charles Forsberg (*MIT*)

**10:50 am:** Low Temperature Facile Sintering of Silica-Incorporated Calcium Hydroxyapatite for the Immobilization of Radioactive Waste, Sajid Iqbal, Muhmood ul Hassan, Ho Jin Ryu, Jong-II Yun (*KAIST*)

**11:20 am:** Multiscale Modeling of an Advanced Ceramic Waste Form Using MOOSE, Abdurrahman Ozturk, Jonathon Gardner (*Univ of South Carolina*), Kyle Brinkman, Lindsay Shuller-Nickles (*Clemson Univ*), Travis W. Knight (*Univ of South Carolina*)

## TUESDAY, APRIL 10

### TECHNICAL SESSIONS - 1:00-2:30 PM

#### Computational Fluid Dynamics Modeling and Analysis—III

**Sponsored by** THD

**Session Organizer:** Igor A. Bolotnov (*NCSU*)

**Cochairs:** Sama Bilbao y Leon (*Virginia Commonwealth Univ*), Nadish Saini (*NCSU*)

**Location:** Harris

- 1:00 pm:** High Fidelity Simulations for Characterizing Sauter Mean Diameter of Droplets in the DFFB Regime, Nadish Saini, Shrey Satpathy, Igor A. Bolotnov (*NCSU*)
- 1:30 pm:** Thermal Stratification Analysis for Sodium Fast Reactors, James Schneider, Mark Anderson (*Univ of Wisconsin, Madison*), Emilio Baglietto (*MIT*), Sama Bilbao y Leon (*Virginia Commonwealth Univ*), Matthew Bucknor (*ANL*), Sarah Morgan (*Virginia Commonwealth Univ*), Matthew Weathered (*ANL*), Liangyu Xu (*MIT*)
- 2:00 pm:** A Numerical Study for Applicability of Water Tests to the Sodium Pool Natural Circulation Analysis, Ji-Hwan Hwang (*Chung-Ang Univ*), Min Ho Lee, In Cheol Bang (*UNIST*), Dong-Wook Jerng (*Chung-Ang Univ*)

#### Fast Neutron Reactors: ASTRID Research and Development —II

**Sponsored by** OPD

**Session Organizer:** Didier J. De Bruyn (*SCK-CEN*)

**Cochairs:** Didier J. De Bruyn (*SCK-CEN*), Paolo Ferroni (*Westinghouse*)

**Location:** Tryon

- 1:00 pm:** A New Experimental R&D Program Associated with the Corium Jet Impingement on the ASTRID Core Catcher Sacrificial Material, F. Payot, C. Journeau, C. Suteau, F. Serre (*CEA*), M. Gradeck N., Rimbart A. Lecoanet (*Univ of Lorraine*), A. Miassoedov (*KIT*)
- 1:30 pm:** Seismic Isolation System in Civil Works Design of Generation IV Nuclear Power Plant Buildings, Pierre Saunier (*CEA*), Franck Peysson, Denis Etienne (*BOUYGUES Construction*), Vincent Le Talbodec, Laurent Dufrene (*CNIM*)
- 2:00 pm:** Steel Concrete Modules in Design of Generation IV Nuclear Power Plant Buildings, Pierre Saunier (*CEA*), Franck Peysson, Denis Etienne (*BOUYGUES Construction*), Julien Niepceron (*EDF*)

#### Accident Tolerant Fuel Research and Development—II

**Sponsored by** OPD **Cosponsored by** THD

**Session Organizer:** Koroush Shirvan (*MIT*)

**Cochairs:** Mirco Karl Grosse (*KIT*), George Jacobsen (*General Atomics*)

**Location:** Trade

- 1:00 pm:** Modelling RIA Experiments by FRAPCON with Advanced Cladding Materials, Joshua Stone, Hangbok Choi, Robert W. Schleicher (*General Atomics*)
- 1:30 pm:** Improvement of the High-Temperature Oxidation Resistance of Zr Alloy Cladding by Surface Modification with Aluminum-Containing Ternary Carbide Coatings, Chongchong Tang, Martin Steinbrueck, Mirco Grosse, Sven Ulrich, Michael Stueber, Hans Juergen Seifert (*KIT*)

#### Spent Fuel and Structural Monitoring

**Sponsored by** OPD **Cosponsored by** THD

**Session Organizer and Chair:** Stylianos Chatzidakis (*ORNL*)

**Location:** Independence

- 1:00 pm:** Muon-Computed Tomography Using POCA Trajectory for Imaging Spent Nuclear Fuel in Dry Storage Casks, Zhengzhi Liu (*Univ of Tennessee, Knoxville*), Stylianos Chatzidakis, John M. Scaglione (*ORNL*), Can Liao, Haori Yang (*Oregon State Univ*), Jason P. Hayward (*Univ of Tennessee, Knoxville*)
- 1:30 pm:** Health Monitoring on Medium Scale Structures Using Acoustic Emission Methods, Stephen H. Howden, Bin Lin (*Univ of South Carolina*), Poh-Sang Lam (*SRNL*), Travis Knight, Lingyu Yu (*Univ of South Carolina*)
- 2:00 pm:** Sensor Requirements for Detection and Characterization of Stress Corrosion Cracking in Welded Stainless Steel Canisters, S. Chatzidakis, S. Cetiner, H. Santos-Villalobos, J. J. Jarrell, J. M. Scaglione (*ORNL*)

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## TUESDAY, APRIL 10

### TECHNICAL SESSIONS - 1:00-2:30 PM

#### Reactor Physics and Analysis—II

Sponsored by OPD Cosponsored by THD

Session Organizer and Chair: Travis W. Knight (*Univ of South Carolina*)

Location: Sharon

- 1:00 pm:** A Semi-Analytical Matrix to Extract  $k_{\text{eff}}$  and/or Critical Parameters of Fissile Cores- as an Aid for Deterministic Calculations of Multi-Group Neutronics, Eric V. Steinfelds (*Western Kentucky Univ*), Barry D. Ganapol (*Univ of Arizona*), Keith Andrew (*Western Kentucky Univ*)
- 1:30 pm:** Development and Verification of the New Resonance Self-Shielding Module in the Lattice Physics Code cosLATC, Chenglin Zhu, Yuhang Yan, Shuo Li, Hui Yu (*SPICRI*)
- 2:00 pm:** Depletion and Lifetime Performance Analysis of Advanced Manufactured Control Elements in the High Flux Isotope Reactor (*HFIR*), Joseph R. Burns, David Chandler (*ORNL*), Bojan Petrovic (*Georgia Tech*), Kurt A. Terrani (*ORNL*)

### TECHNICAL SESSIONS - 3:00-5:00 PM

#### Code Development, Validation and Application—I

Sponsored by THD

Session Organizer: Shripad T. Revankar (*Purdue Univ*)

Cochairs: Ferry Roelofs (*NRG*), Jun Wang (*Univ of Wisconsin, Madison*)

Location: Kings

- 3:00 pm:** Contribution of the OECD PKL-3 Project to the Validation of the System Code ATHLET, H. Austregesilo, T. Hollands (*GRS*)
- 3:30 pm:** Accident Tolerant Fuels Benchmark Calculation by MELCOR and TRACE for a Simplified Generic Pressure Water Reactor, Jun Wang (*Univ of Wisconsin, Madison*), Anil Gurgen (*MIT*), Michael L. Corradini (*Univ of Wisconsin, Madison*), Koroush Shirvan (*MIT*)
- 4:00 pm:** Thermal Hydraulic Performance of the Decay Heat Removal System for the Integral Inherently Safe Light Water Reactor, Giovanni Maronati, Bojan Petrovic (*Georgia Tech*)
- 4:30 pm:** Implementation of Grid Spacer and Mixing Vane Model for Subchannel Scale Thermal-Hydraulic Analysis Using CUPID, Seul-Been Kim, Jaeho Lee, Goon-Cherl Park, Hyoung Kyu Cho (*Seoul National Univ*)

#### Molten Salt Reactors and Systems—II

Sponsored by OPD Cosponsored by THD

Session Organizer: Koroush Shirvan (*MIT*)

Chair: Travis W. Knight (*Univ of South Carolina*)

Location: Tryon

- 3:00 pm:** Investigation into Reactivity Feedback of FHR Designs with Alternative Coolants, Zhiyao Xing, Eugene Shwageraus (*Univ of Cambridge*)
- 3:30 pm:** Some Chemical Aspects of Molten-Salt Reactors Specifically in TRU Burning Applications, Yasuo Hirose (*Retired*)
- 4:00 pm:** Corrosion and Redox Condition Control of Molten  $\text{Li}_2\text{BeF}_4$  Salt for Molten Salt Reactors, W. H. Doniger, T. Chrobak, K. Dolan, K. Britsch, A. Couet, K. Sridharan (*Univ of Wisconsin, Madison*)
- 4:30 pm:** Hybrid Fission—Fusion System for Sustainable Tritium Production, Hao Wang, Zhiyao Xing, Eugene Shwageraus (*Univ of Cambridge*)

#### Heat Exchanger Testing, Modeling and Analysis

Sponsored by THD

Session Organizer: Xiaodong Sun (*Univ of Michigan*)

Cochairs: Paolo Ferroni (*Westinghouse*), Minghui Chen (*Univ of Michigan*)

Location: Harris

- 3:00 pm:** Design of a Compact Heat Exchanger and Heat Transfer Investigations of a Scaled Down sCO<sub>2</sub>-HeRo-System, Marcel Straetz, Rainer Mertz, Jörg Starflinger (*Univ of Stuttgart*)
- 3:30 pm:** Experimental Methods to Model and Validate Coiled Tube Gas Heater for Nuclear Brayton Cycles, Andrew Greenop, Jae Keun Choi, Bryant Phan, Per F. Peterson (*Univ of California, Berkeley*)
- 4:00 pm:** Numerical Investigation of Thermal Boundary Conditions of a High-Temperature PCHE with Zigzag Flow Channels, Minghui Chen, Xiaodong Sun (*Univ of Michigan*), Richard N. Christensen (*Univ of Idaho*)
- 4:30 pm:** Experimental Study on Condensation Heat Transfer for Air-Cooled Shell and Tube Heat Exchanger in Long Term Passive Cooling System, Seon Jeong Huh (*Kookmin Univ*), Joo Hyung Moon, Youngmin Bae, Young In Kim (*KAERI*), Hee Joon Lee (*Kookmin Univ*)

## TUESDAY, APRIL 10

### TECHNICAL SESSIONS - 3:00-5:00 PM

#### Nuclear Energy and Global Environment

**Sponsored by** OPD **Cosponsored by** THD

**Session Organizer:** Sama Bilbao y Leon (*Virginia Commonwealth Univ*)

**Chair:** Matthew George Shalloo, Jr. (*Univ of South Carolina*)

**Location:** Trade

**3:00 pm:** GreenHouse Gas Assessment for the Canadian Nuclear Fuel Life Cycle, H. Mazhar, C. Azih, R. David (*CNL*)

**3:30 pm:** The Global Energy Challenges of the 21st Century: Role of Nuclear Energy, R. A. Kadir, M. A. R. Sarkar (*BUET*)

**4:00 pm:** Energy and Nuclear Power Planning Study for Bangladesh Using WASP-IV, M. J. R. Chowdhury, M. A. R. Sarkar (*BUET*)

**4:30 pm:** MIT-Japan Study: Future of Nuclear Power in a Low-Carbon World: The Need for Dispatchable Energy, Charles Forsberg (*MIT*), Akira Omoto (*Tokyo Inst Technol*), Richard Lester (*MIT*), Ryoichi Komiyama, Yasumasa Fujii (*Univ of Tokyo*), Tomihiro Taniguchi (*Tokyo Inst Technol*), Nestor Sepulveda, Geoffrey Haratyk (*MIT*), Kazuaki Matsui (*Inst for Applied Energy*), Xing L. Yan (*JAEA*), Tomofumi Shibata, Tomoko Murakami (*Inst for Energy Economics Japan*)

#### Safety and Accident Analysis

**Sponsored by** OPD **Cosponsored by** THD

**Session Organizer:** George F. Flanagan (*ORNL*)

**Chair:** Curtis L. Smith (*INL*)

**Location:** Independence

**3:00 pm:** Bowtie Methodology in Nuclear Power Plant Safety, P. F. Ilizastigui (*Safety Case Consultant*)

**3:30 pm:** Evaluation of Loop Seal Clearance and Reformation during SBLOCA of APR1400, Chang Yong Jin, Young Seok Bang (*KINS*)

**4:00 pm:** Simulation of Steam Generator Tube Rupture Accident in a Pressurized Water Reactor, D. Shome, M. A. R. Sarkar (*BUET*)

**4:30 pm:** Experimental and Numerical Investigations on Hydraulics of Prototypical Porous Concretes for an Ex-vessel Bottom Cooling Concept, Özlem Yilmaz, Michael Buck, Jöoerg Starflinger (*Univ of Stuttgart*)

#### Design, Licensing and Safety Insights

**Sponsored by** OPD **Cosponsored by** THD

**Session Organizer:** George F. Flanagan (*ORNL*)

**Chair:** William D. Reckley (*NRC*)

**Location:** Sharon

**3:00 pm:** 60 Years of Contributing to Reactor Safety: Insights on ACRS Power Reactor Licensing Reviews, Hossein Nourbakhsh (*NRC*)

**3:30 pm:** The European Utility Requirements for Advanced LWR— Issue of EUR Revision E and Ongoing Assessments, Jean-François Vivier, Guillaume Jacquart (*EDF*), Olli Kymäläinen (*FORTUM*), Giovanni Ferraro (*EDF*)

**4:00 pm:** Application of Practical Elimination Methodology for Gen IV Reactors, Joel Guidez, Lurent Costes, Paul Gauthe, Pierre Lo Pinto (*CEA*), Stephane Beils, Bernard Carluéc, Etienne Courtin (*Framatome*), Lionel Bourgue (*EDF*)

**4:30 pm:** Literature Review on Knowledge Retention, Engineering Design Projects, and License Renewal in Support of the Subsistence of the U.S. Nuclear Power Industry, Pamela M. Torres-Jiménez (*Old Dominion Univ*)

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## WEDNESDAY, APRIL 11

TECHNICAL SESSIONS - 8:00-10:00 AM

### Code Development, Validation and Application—II

Sponsored by THD

Session Organizer: Koroush Shirvan (MIT)

Cochairs: In Cheol Bang (UNIST), Henrique Austregesilo (GRS)

Location: Kings

**8:00 am:** Numerical Simulations at Different Scales for the CIRCE Facility, K. Zwijsen, D. Dovizio, P. A. Breijder, F. Alcaro, F. Roelofs (NRG)

**8:30 am:** System Thermal Hydraulics and Multiscale Simulations of the Dissymmetric Transient in the Phénix Reactor, H. J. Uitslag-Doolaard, F. Alcaro, F. Roelofs, K. Zwijsen (NRG)

**9:00 am:** Pronghorn: A Porous Media Thermal Hydraulics Core Simulator and its Validation with the SANA Experiments, A. J. Novak (Univ of California, Berkeley), L. Zou, J. W. Peterson, R. C. Martineau (INL), R. N. Slaybaugh (Univ of California, Berkeley)

**9:30 am:** Phase Change Simulation of the Plasma Facing Material in Fusion Demo Reactor with Mesh Adaptation Technique, Hee Su Choe, Geon-Woo Kim, Hyoung Kyu Cho, Goon-Cheryl Park, Kihak Im (Seoul Natl Univ)

### Advanced Reactors: Economics Innovation

Sponsored by OPD

Session Organizer: Andrew G. Sowder (EPRI)

Chair: Cory Stansbury (Westinghouse)

Location: Tryon

**8:00 am:** Heat Storage for Variable Electricity Production from Base-Load Reactors with Sodium or Salt in the Secondary Loop, Charles Forsberg (MIT)

**8:30 am:** The Role of Advanced Nuclear in Future Energy Markets: Economic Drivers, Barriers, and Impacts in the U.S., John Bistline, Revis James, Andrew Sowder (EPRI)

**9:00 am:** Westinghouse Lead Fast Reactor Development: Safety and Economics Can Coexist, C. Stansbury, M. Smith, P. Ferroni, A. Harkness, F. Franceschini (Westinghouse)

### Environmental Compatibility at High Temperature

Sponsored by OPD Cosponsored by THD

Session Organizer: Celine J. Cabet (CEA)

Cochairs: Hiroyuki Fukuyama (Tohoku Univ), Jason Meng (TerraPower)

Location: Harris

**8:00 am:** Thermophysical Properties of Stainless Steel Containing 5mass%-B<sub>4</sub>C in the Solid Phase, Toshihide Takai, Tomohiro Furukawa, Hidemasa Yamano (JAEA)

**8:25 am:** Thermophysical Properties of Molten Stainless Steel Containing 5mass%-B<sub>4</sub>C, Hiroyuki Fukuyama, Hideo Higashi (Tohoku Univ), Hidemasa Yamano (JAEA)

**8:50 am:** Serrated Plastic Deformation Behavior in Alloy 709, Abdullah S. Alomari, N. Kumar, K. L. Murty (NCSU)

**9:15 am:** Critical Review on Molten Salt Corrosion for Nuclear Related Corrosion, Jinsuo Zhang, Shaoqiang Guo (Virginia Polytechnic Inst and State Univ)

**9:40 am:** Experiment on the Compatibility of Single and Bimetallic Alloys in a Subscale Flowing FLiBe Loop, David Weitzel, Youho Lee (Univ of New Mexico), Michael Short (MIT), Michael Laufer (Kairos Power), Sam Sham (ANL)

Technical  
Sessions:  
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## WEDNESDAY, APRIL 11

### TECHNICAL SESSIONS - 8:00-10:00 AM

#### Small Modular Reactors and Innovative Water Cooled Reactors

**Sponsored by** OPD **Cosponsored by** THD

**Session Organizer:** Mark W. Peres (*Fluor Corp*)

**Cochairs:** Mark W. Peres (*Fluor Corp.*), Tomofumi Yamamoto (*MHI*)

**Location:** Trade

- 8:00 am:** Production Learning in a Small Modular Reactor Supply Chain, Robbie E. Lyons, Anthony R. M. Roulstone (*Univ of Cambridge*)
- 8:30 am:** The Impact of Modularisation Strategies on Small Modular Reactor Construction Cost, Clara A. Lloyd, Anthony R. M. Roulstone, Campbell Middleton (*Univ of Cambridge*)
- 9:00 am:** Development of RBWR (Resource-Renewable BWR) for Recycling and Transmutation of Transuranium Elements (4) Radial Core Design Based on Radial Transport Effect, Junichi Miwa, Takeshi Mitsuyasu, Tetsushi Hino (*Hitachi, Ltd.*)
- 9:30 am:** Preliminary Design of Hybrid Small Modular Boiling Water Reactor with External Superheater, Anhdika F. Wibisono (*Univ of Cambridge*), Jeong Ik Lee (*KAIST*), Eugene Shwageraus (*Univ of Cambridge*)

#### Advanced Transmutation Systems and Modeling

**Sponsored by** OPD **Cosponsored by** THD

**Session Organizer and Chair:** Edward A. Hoffman (*ANL*)

**Location:** Independence

- 8:00 am:** The Belgian MYRRHA ADS Programme. Part 1: The New Phased Implementation Plan, Didier De Bruyn, Hamid Aït Abderrahim, Peter Baeten, Carmen Angulo (*SCK-CEN*)
- 8:30 am:** The Belgian MYRRHA ADS Programme. Part 2: Recent Developments in the Reactor Primary System, Didier J. De Bruyn, Rafaël Fernandez, Peter Baeten (*SCK-CEN*)
- 9:00 am:** MUFFSgenMC: An Open Source Muon Flexible Framework for Spectral Generation for Monte Carlo Applications, Christopher R. Greulich, James Baciak (*Univ of Florida*), Kaushik Banerjee, Stylianos Chatzidakis (*ORNL*)

#### Advanced Safety Models and Issues

**Sponsored by** OPD **Cosponsored by** THD

**Session Organizer and Chair:** George F. Flanagan (*ORNL*)

**Location:** Sharon

- 8:00 am:** The UK Nuclear R&D Programme on Digital Nuclear Reactor Design—Modelling, Simulation, and Virtual Engineering, Bruno Merk (*Univ of Liverpool*), Dennis Allen (*Amec Foster Wheeler*), Mark Bankhead (NNL), Andy Bowen (*Amec Foster Wheeler*), Dave Bowman (*Univ of Liverpool*), Siman de Haas (*Rolls-Royce Nuclear*), Jefri Draup (*EDF Energy*), Lynn Dwyer (*Univ of Liverpool*), Matt Eaton (*Imperial College London*), Erwan Galenne (*EDF-Energy*), Chris Jackson (*Rolls-Royce Nuclear*), Chi Kin Lai, Andrew Levers (*Univ of Liverpool*), Ben Lindley (*Amec Foster Wheeler*), Dzianis Litskevich (*Univ of Liverpool*), Luke Mason (*STFC*), Geoff Parks (*Univ of Cambridge*), Edoardo Patelli, Eann Patterson (*Univ of Liverpool*), Aiden Peakman (NNL), Eugene Shwageraus (*Univ of Cambridge*), Andy Smethurst, Paul Smith (*Amec Foster Wheeler*), Adrian Toland (*STFC*), Konstantin Vikhorev (*Univ of Liverpool*)
- 8:30 am:** ASTRID—Practical Elimination of “Brutal Failure of Supporting Core Structures”, L. Costes, P. Lo Pinto, Y. Lejeail, P. Quellien (*CEA*), B. Carluéc, S. Beils, P. Hauville (*Framatome*)
- 9:00 am:** Development of Molten Corium and Zirconia Refractory Material Interaction Model, Shinji Matsushita, Masafumi Nojima (*Hitachi*), Takeshi Sakai, Tadashi Fujii (*Hitachi-GE Nuclear*)
- 9:30 am:** Modeling of Coordinated Cyber and Physical Attacks at Nuclear Power Plants, Shannon Eggers, Andreas Enqvist (*Univ of Florida*)

Technical  
Sessions:  
Wednesday  
April 11

## WEDNESDAY, APRIL 11

TECHNICAL SESSIONS - 10:20-11:50 AM

### Computational Fluid Dynamics Modeling and Analysis—IV

**Sponsored by** THD

**Session Organizer:** Koroush Shirvan (MIT)

**Cochairs:** Igor A. Bolotnov (NCSU), Botros N. Hanna (NCSU)

**Location:** Harris

- 10:20 am:** Transient CFD Analysis of the Thermal Mixing of the Feedwater in the Downcomer of a BWR, Yann Le Moigne (*Westinghouse Electric Sweden AB*), Paul Smeekes (*Teollisuuden Voima Oyj*), Matthew Solmos (*Westinghouse*)
- 10:50 am:** Coarse-Grid Computational Fluid Dynamics (CG-CFD) Error Prediction via Random Forest Regression, Botros N. Hanna, Nam Dinh, Igor A. Bolotnov (NCSU)
- 11:20 am:** Sub-Channel Void Fraction Distribution in a 5X5 Mock-Up of PWR Fuel Assembly under Sub-Cooled Flow Boiling, Jun-Yi Zhang, Xiao Yan (*CNNC Key Laboratory on Reactor Thermal Hydraulics Technology*), Ze-Jun Xiao (*Hualong Pressurized Water Reactor Technology Corporation, Ltd.*), Yong-Ze Xu (*CD-adapco*)

### Light Water Reactors: Advanced Concepts and Technologies

**Sponsored by** OPD

**Session Organizer:** Koroush Shirvan (MIT)

**Cochairs:** Duane M. Twining (*South Carolina Electric & Gas*), Cory Stansbury (*Westinghouse*)

**Location:** Tryon

- 10:20 am:** Preliminary Core and Fuel Design of BWR with Multi-Axial Fuel Shuffling, Yudai Tasaki, Akifumi Yamaji (*Waseda Univ*)
- 10:50 am:** Discussion on Thermal Hydraulic Analysis for Low-Pressure Reactor HAPPY200, Canhui Sun, Zhaocan Meng, Yaodong Chen (*State Power Investment Corp. Research Inst*)
- 11:20 am:** Systematic Design of Passive In-Core Cooling System Based on Hybrid Control Rod-Heat Pipe for Small Modular Reactor, Kyung Mo Kim, In Guk Kim, Yeong Shin Jeong, In Cheol Bang (*UNIST*)

### High Temperature Reactors—II

**Sponsored by** OPD **Cosponsored by** THD

**Session Organizer:** Piyush Sabharwall (INL)

**Chair:** Matthew J. Memmott (*Brigham Young Univ*)

**Location:** Trade

- 10:20 am:** Feasibility Study of the Pebble Bed High Temperature Test Facility, Izabela Gutowska, Taylor N. Coddington, Brian G. Woods (*Oregon State Univ*)
- 10:50 am:** Cross Flow and Heat Transfer Characteristics of Tube Bundles with Neighboring Layers Having Opposite Sense Inclination, Weikai Gao, Xiaowei Li, Xinxin Wu, Jiaqing Zhao, Yiyang Zhang, Xiaowei Luo (*Tsinghua Univ*)
- 11:20 am:** Model Validation for the Thermal Hydraulic Behavior in Molten Salt Natural Circulation, Kai Wang, Xiaowei Jiao, Chuangxiong Cai, Zhaozhong He, Kun Chen (CAS)

### Operation, Performance and Reliability Management—II

**Sponsored by** OPD **Cosponsored by** THD

**Session Organizer and Chair:** Richard F. Wright (*Westinghouse*)

**Location:** Independence

- 10:20 am:** Evaluation of Feedback Reactivity Coefficients by Inverse Kinetics in Monju, Akihiro Kitano (JAEA), Ken Nakajima (*Kyoto Univ*)
- 10:50 am:** Estimation of the Radioactive Contamination Density from the Spatial Dose with Machine Learning, Genki Tanaka, Naoto Kume, Susumu Naito, Hirotada Hayashi, Ryuji Hirooka, Hideyuki Nisawa (*Toshiba Energy Systems & Solutions Corp.*)

Technical  
Sessions:  
Wednesday  
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## WEDNESDAY, APRIL 11

TECHNICAL SESSIONS - 10:20-11:50 AM

### Reactor Physics and Analysis of Fast Reactors

Sponsored by OPD Cosponsored by THD

Session Organizer and Chair: Travis W. Knight (*Univ of South Carolina*)

Location: Sharon

- 10:20 am:** Investigation of the Core Neutronics Analysis Conditions for Evaluation of Burn-up Nuclear Characteristics of Next-Generation Fast Reactors, Kazuo Takino, Kazuteru Sugino, Kenji Yokoyama (*JAEA*), Tomoyuki Jin (*NESI Inc.*), Shigeo Ohki (*JAEA*)
- 10:50 am:** Comparative Study on Prediction Accuracy Improvement Methods with the Use of Integral Experiments for Neutronic Characteristics of Fast Reactors, Kenji Yokoyama (*JAEA*), Takanori Kitada (*Osaka Univ*)
- 11:20 am:** Improvement of Sodium Fast Reactor Control Rods Calculations with APOLLO3®, H. Guo, G. Martin, L. Buiron (*CEA*)

Technical  
Sessions:  
Wednesday  
April 11



# Hotel Floorplan



Westin Charlotte Hotel  
601 S College St,  
Charlotte, NC 28202



# ANS Meetings

## 2018 ANS ANNUAL MEETING

JUN 17-21, 2018 | Philadelphia, PA | Marriott Philadelphia Downtown

**EMBEDDED TOPICAL: NUCLEAR FUELS & STRUCTURAL MATERIALS  
FOR NEXT GENERATION NUCLEAR REACTORS**

## UTILITY WORKING CONFERENCE AND VENDOR TECHNOLOGY EXPO

AUG 5-8, 2018 | Amelia Island, FL | Omni Amelia Island Plantation

## 20TH TOPICAL MEETING OF THE RADIATION PROTECTION AND SHIELDING DIVISION OF THE AMERICAN NUCLEAR SOCIETY

AUG 26-31, 2018 | Santa Fe, NM | Drury Plaza Hotel

## PLUTONIUM FUTURES - THE SCIENCE 2018

SEP 9-14, 2018 | San Diego, CA | Wyndham San Diego Bayside

## ADVANCES IN NUCLEAR NONPROLIFERATION TECHNOLOGY AND POLICY CONFERENCE 2018

SEP 23-27, 2018 | Wilmington, NC | Hilton Wilmington Riverside

## APPLICABILITY OF RADIATION-RESPONSE MODELS TO LOW DOSE PROTECTION STANDARDS

SEP 30-OCT 3, 2018 | Pasco, WA | Red Lion Hotel Pasco

## 2018 PACIFIC BASIN NUCLEAR CONFERENCE (PBNC 2018)

SEP 30-OCT 5, 2018 | San Francisco, CA | Hyatt Regency

## 2018 ANS WINTER MEETING AND NUCLEAR TECHNOLOGY EXPO

NOV 11-15, 2018 | Orlando, FL | Hilton Orlando Bonnet Creek

**EMBEDDED TOPICAL: 23RD TOPICAL MEETING ON THE TECHNOLOGY OF FUSION  
ENERGY (TOFE)**

**EMBEDDED TOPICAL: INTERNATIONAL TOPICAL MEETING ON ADVANCES IN THERMAL  
HYDRAULICS**

## CONTE 2019: CONFERENCE ON NUCLEAR TRAINING AND EDUCATION: A BIENNIAL INTERNATIONAL FORUM

FEB 5-7, 2019 | St. Augustine, FL | World Golf Village Renaissance St. Augustine Resort

## 11TH NUCLEAR PLANT INSTRUMENTATION, CONTROL AND HUMAN-MACHINE INTERFACE TECHNOLOGIES (NPIC&HMIT) 2019

FEB 9-14, 2019 | Orlando, FL

