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Advanced Reactor Power Conversion

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Richard B. Vilim, Alexander Heifetz (ANL)

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Cochairs: Koroush Shirvan (MIT), Jake Yang (GE-H)

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Y. S. Wang, F. L. Tsai, Min Lee (Nat'l Tsing Hua Univ)

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Ren He, Tan Hongwei, Weng Songfeng (Nuclear Power Inst of China)

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Cochairs: Shiro Takahashi (Hitachi, Ltd.), Frederic Damian (CEA)

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- Comparative Study of CASMO-5/SIMULATE-5 and nTRACER for EPR Core Analyses** 1436
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- A Multi-Physics PWR Model for the Load Following** 1446
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- Core Safety Calculations of the ALLEGRO Core** 1473
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- Adaptation and Assessment of In-Containment Source Term Oriented Models for Sodium Fast Reactors (SFR) within the ASTEC-Na Code** 1482
C. Spengler, N. Reinke (GRS)
- Toward a Mechanistic Source Term in Advanced Reactors: Characterization of Radionuclide Transport and Retention in a Sodium Cooled Fast Reactor** 1492
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Cochairs: Kurshad Muftuoglu (GE Hitachi Nuclear Energy), Xiaodong Sun (Ohio State)

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Angel Papukchiev (GRS)
- Design and Execution of the Test Campaign on the Bayonet Tube HERO-2 Component** 1518
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- Development of a Measurement Technique of Boric Acid Concentration in High Concentrated Aqueous Solutions** 1528
M. Childs, L. Kyffel, R. Vaghetto, Y. Hassan (Texas A&M)
- Experimental Studies on Thermal-Hydraulic Features in Tight Lattice Rod Bundles** 1533
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Cochairs: Nicholas R. Brown (ORNL), Adrien Bidaud (Inst Polytechnique de Grenoble)

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James J. Peltz (KIT), Madalina C. Badea, Dan G. Cacuci (Univ of South Carolina), Aurelian F. Badea (KIT)
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- Porous C@ETS-10 Sorbent for Capture of Krypton from Off-Gas Stream in Nuclear Power Plants** 1555
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Cochairs: Donald Grove (Excelsior College), Vivek Agarwal (INL)

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Donald L. Grove, Sr. (Excelsior College)
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Donald L. Grove, Sr. (Excelsior College)
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Sang-il Ahn, Yong Kim, Kang Hwa Soo (KHNP)
- Open-Phase Faults Studies on the Standard Nuclear Power Plants in Korea** 1576
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Richard Tilley, Sherry Bernhoft, Robin Dyle (EPRI)

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Cochairs: Raluca Scarlat (Univ of Wisconsin, Madison), Jinsuo Zhang (Ohio State)

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- Materials Corrosion and Electrochemistry in Molten FLiBe Salt for FHR Applications** 1594
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- Measurements of Fluoride Salt Intrusion in Matrix Graphite and High Purity Graphite** 1599
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Liquid Metal/Molten Salt TH—II

Cochairs: Raluca O. Scarlat (Univ of Wisconsin, Madison), Xiaodong Sun (Ohio State)

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Benchmark Analysis of EBR-II Shutdown Heat Removal Test-17 using of Plant Dynamics Analysis Code and Subchannel Analysis Code 1618

Norihiro Doda, Hiroaki Ohira, Hideki Kamide (JAEA)

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Y. Y. Vinogradova, N. I. Ryzhov, V. N. Semenov, E. V. Usov, R. V. Chalyy (Nuclear Safety Inst)

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Rui Hu, Tyler Sumner (ANL)

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Cochairs: Jacopo Buongiorno (MIT), Ed Pilat (MIT)

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Shih-Ping Kao (MIT)

Investigations on the Fundamental Transport Phenomena of Supercritical Fluids Applications in Nuclear Energy Systems 1657

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Implementation of the Lax-Wendroff Method in COBRA-TF for Solving Two-Phase Flow Transport Equations 1667

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Youho Lee (KAIST)

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Cochairs: Christine Poinot-Salanon (CEA), Christopher A. Edgar (Georgia Tech)

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Syed Bahauddin Alam, Hassan Mohamed, Benjamin A. Lindley, Geoffrey T. Parks (Univ of

Cambridge)

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Syed Bahauddin Alam, Hassan Mohamed, Benjamin A. Lindley, Geoffrey T. Parks (Univ of Cambridge)

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S. L. Morrison, B. A. Lindley, G. T. Parks (Univ of Cambridge)

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Mohd-Syukri Yahya, Yonghee Kim (KAIST), Hyeong Heon Kim (KEPCO E&C)

Development of RBWR (Resource-Renewable BWR) Fuel Assembly Components for Recycling and Transmutation of Transuranium Elements 1713

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ASTRID Nuclear Island Design: Advances in French-Japanese Joint Team Development of Decay Heat Removal Systems 1740

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I. Guénot-Delahaie, D. Lorenzo, B. Valentin, M. Zabiego, V. Soukphouangkhram, F. Biscarrat, T. Lambert, M. Phélip (CEA)

Passive Heat Transport—I

Cochairs: Wade R. Marcum (Oregon State Univ), Annalisa Manera (Univ of Michigan)

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Flow Visualization in a SMR Containment Simulated by a Glass Test Facility 1761

Fenglei Niu, Xiaowei Su, Weiqian Zhuo, Xingdi Cao (North China Electric Power Univ)

Thermal Hydraulic Performance of Large Water Pools with Shrouds Around Immersed 1766

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A Two-Stage Fast Spectrum Fuel Cycle Option for Optimum Resource Utilization and Waste Management 1800

Ching-Sheng Lin, Jacob S. Hader, Tongkyu Park, Wong Sik Yang (Purdue Univ)

Radioactive Waste Inventories in the Case of Different Nuclear Options for the French Reactor Fleet 1810

A. Saturnin, J.- F. Milot, J.-L. Giroto, C. Chabert (CEA), C. Garzenne, F. Laugier (EdF), G. Senentz, P. Forbes, M. Caron-Charles (AREVA)

Impact of Minor Actinides Recycling on Sodium-Cooled Fast Reactor Fuel Cycles 1818

F. Heidet, T. K. Kim, T. A. Taiwo (ANL)

Severe Accident TH

Chair: Kazuyuki Takase (JAEA), Haihua Zhao (INL)

MOCKA Experiments on LCS Concrete with and Without Rebars 1827

J. J. Foit (KIT)

The Ultimate Response Guideline Simulation and Analysis by using MELCOR2.1/SNAP for Chinshan BWR/4 Nuclear Power Plant 1832

Yu Chiang (NatI Tsing Hua Univ), Jonh-Rong Wang (NatI Tsing Hua Univ/ Nuclear and New Energy Education and Research Foundation), Ting-Yi Wang (NatI Tsing Hua Univ), Hao-Tzu Lin, Te-Chuan Wang (INER), Wen-Sheng Hsu (Nuclear Science and Technology Development Center), Jyh –Tong Teng (Chung Yuan Christian Univ), Shao-Wen Chen (NatI Tsing Hua Univ), Chunkuan Shih (NatI Tsing Hua Univ/Nuclear and New Energy Education and Research Foundation)

Simulation of QUENCH-LOCA Tests with ATHLET-CD 1840

Thorsten Hollands, Christine Bals (GRS)

Aspects of In-Core Blockage for Analysis of Post-LOCA Long Term Cooling 1848

Young Seok Bang, Sweng-Woong Woo, Tae-Suk Hwang (KINS)

Accident Management

Cochairs: Richard F. Wright (Westinghouse), Vivek Agarwal (INL)

Qualitative Analysis About Unsafe Act with Simulator Training Data	1854
Sun Yeong Choi, Wondea Jung (KAERI)	
Identification and Early Warning for NPP Accidents	1858
Jian-Lun Huang, Hwai-Pwu Chou (NatI Tsing Hua Univ)	
Accident Management Based on Computerized Emergency Operating Procedures	1863
Yen Chun Chiu, Hwai-Pwu Chou (NatI Tsing Hua Univ)	
Simulation of Severe Accident Management Measures for Selected LBLOCA Scenarios in a Generic PWR Konvoi Plant using ASTECV2.0	1870
I. Gómez García-Toraño, V. Sánchez, R. Stieglitz (KIT)	

Welding and Joining Methods

Cochairs: Kumar Sridharan (Univ of Wisconsin, Madison), Celene J. Cabet (CEA)

Fabrication of Diffusion Bonded 316L Stainless Steel Tube-to-Tube Sheet Joints for FHR Coil Tube Gas Heaters—An Overview	1879
Nils Haneklaus (Univ of California, Berkeley), Rony Reuven (Univ of California, Berkeley/N.R.C.N.), Cristian Cionea, Peter Hosemann, Per F. Peterson (Univ of California, Berkeley)	
Resistance Pressure Welding of HT9 Cladding Tubes	1884
Micah J. Hackett (TerraPower, LLC)	
Optimization and Development of the Manufacturing Process of Hexagonal Wrapper Tubes for ASTRID First Core Sub-Assemblies	1889
P.-F. Giroux, P. Olier (CEA)	

Wednesday, April 20, 2016, 3:00 pm

Kazimi Special Session—II

Cochairs: Jacopo Buongiorno (MIT), Ed Pilat (MIT)

The Implication of Solving Inverse Problem in Nuclear System Thermal-Hydraulic Analysis	1893
Jeong Ik Lee, Min-Gil Kim, Wonwoong Lee, (KAIST)	
Development of a New CHF Correlation for the CANDU Fuel Bundle	1900
Yüksel Parlatan, Haldun O. Tezel, (OPG), invited	
Phase 2 of the EBR-II SHRT-45R Benchmark Study—TerraPower’s COBRA-4i-MIT Results	1909
Ethan A. Bates, Bao Truong, Dustin Langewisch, Chris Gross, (TerraPower LLC)	
High Power Density Boiling Water Reactor Assembly Design for 500 and 5000 MWTH Designs	1919
Koroush Shirvan (MIT)	

LWR Modeling and Simulation—I

Cochairs: Youqi Zheng (UNIST), Christopher A. Edgar (Georgia Tech)

Thermohydraulics-Thermomechanics Best Estimate Coupled Approach in a Rod Ejection Accident Core Calculation 1926

A. Targa (Ecole Polytechnique/CEA), J.-C. Le Pallec, P. Le Tallec, K. Nkonga, N. Crouzet, S. Chemin (CEA)

Analysis of Monte Carlo Solutions to Stylized PWR Benchmark Problems 1936

Dingkang Zhang, Farzad Rahnema (Georgia Tech)

Research on Control Rod History Simulation Method in COSINE Code Package 1942

Su Wang, Changhui Wang, Tongrui Yang, Hui Yu, Yixue Chen (SNPTC)

Water Distribution in a Nordic BWR Containment during a LOCA 1946

Ignacio Gallego-Marcos, Walter Villanueva, Pavel Kudinov (KTH)

AR Safety and Licensing—III

Cochairs: Stefani Monte (IAEA), George F. Flanagan (ORNL)

Predictability of Source Term Behavior in SFR Containments 1955

L. E. Herranz, M. Garcia (CIEMAT), L. Lebel (IRSN), F. Mascari (ENEA), C. Spengler (GRS)

Scaling of the Chinese HTR-PM Reactor Design for Licensing and Testing at the Oregon State University High Temperature Test Facility 1965

Jordan Cox, Brian Woods (Oregon State Univ)

On the Question of Decay Heat Removal System Redundancy for Fluoride Salt-Cooled High-Temperature Reactors (FHR) 1973

Joel Hughes, Maolong Liu, Bryan Wallace, Amir F. Ali (Univ of New Mexico), Matthew R. Denman (SNL), Nicolas Zweibaum, Per Peterson (Univ of California, Berkeley), Edward D. Blandford (Univ of New Mexico)

Passive Heat Transport—II

Cochairs: Piyush Sabharwall (INL), Haihua Zhao (INL)

Comparison of RELAP5-3D Analyses to Experimental Data from the Natural Convention Shutdown Heat Removal Test Facility 1986

Matthew Bucknor, Rui Hu, Darius Lisowski, Adam Kraus (ANL)

Transient Performance of Air-Cooled Condensing Heat Exchanger in Long-Term Passive Cooling System during Decay Heat Load 1994

Myoung Jun Kim, Joo Hyung Moon, Youngmin Bae, Young In Kim (KAERI), Hee Joon Lee (Kookmin Univ)

Experimental Studies on Moderator Circulation Flow in the 1/4 Scaled Model of CANDU-6 Calandria 2001

Hyoung Tae Kim, Boo Wook Rhee (KAERI), Sunghyuk Im, Hyung Jin Sung (KAIST)

Analysis of Secondary Side Passive Heat Removal Experiments with RELAP5 Code 2008

Houjun Gong, Xi Zhao, Yanfeng Zan, Huang Yanping (CNNC)

Fuel Cycle Analysis—II

Cochairs: Taek Kyum Kim (ANL), Guillaume Martin (CEA)

Impacts of Extended Used Fuel Storage on Performance of Fuel Cycles with Continuous Recycle of U/Pu or U/TRU	2014
T. Fei, N. E. Stauff, T. K. Kim, T. A. Taiwo (ANL)	
Fuel Cycle Performance of Thermal Spectrum Small Modular Reactors	2024
Nicholas R. Brown, Andrew Worrall (ORNL), Michael Todosow (BNL)	
Study of Argentinian and Brazilian Nuclear Symbiotic Scenarios using CLASS	2032
Francisco Martin Alderete Tommasi (Univ Grenoble Alpes/Balseiro Inst), A. Bidaud (Univ Grenoble Alpes), B. Mougnot (Univ of Wisconsin, Madison), B. Leniau, N. Thiollière (Subatech), X. Dollingez (Univ d'Orsay), F. Courtin (Subatech), A. Sormani (Univ d'Orsay), J. B. Clavel (IRSN), Z. Issoufou, S. David (Univ d'Orsay)	
3D Activation Modeling of Reactor Internals, and In-Containment Structures for Reactor Plant Decommissioning	2040
Timothy M. Lloyd, Greg A. Fischer, Benjamin W. Amiri (Westinghouse)	
CHF/DNB—I	
Co-chairs: Bao-Wen Yang (Xian Jiao Tong Univ), In Cheol Bang (UNIST)	
Study on Critical Heat Flux for Subcooled Flow Boiling with Non-Uniform Axial Heat Flux Distribution	2047
Xirui Liu, Bao-Wen Yang, Sipeng Wang (Xi'an Jiaotong Univ)	
CHF Measurement for Downward-Facing Stainless Steel and Carbon Steel Flat Plates under Pool Boiling Condition	2054
Dong Hoon Kam, Young Jae Choi, Yong Hoon Jeong (KAIST)	
Conservatism, Provisions and Margins in DNB Analysis	2061
Christophe Herer (IRSN)	
Experimental Research of Critical Heat Flux on Pressure Lower Head External Surface under Severe Accident	2068
Zhen Zhang, Wan Yu Xiong, WenBin Zhuo, PengZhou Li, Xiong Wang, Xueqiang Liu (Nuclear Power Inst of China)	
Control Rooms and Simulators—I	
Co-chairs: Joseph Naser (EPRI), Ray Torak (EPRI)	
Development of an Engineering Simulator with Realistic Turbine Island Systems for NNP DCS Closed-Loop Test	2074
YanKai Li, Meng Lin, Yueshan Zhou, YanHua Yang (Shanghai Jiao Tong Univ)	
Development of Online Core Monitoring and Simulation System for OPR1000 and APR1400	2084
Hye Young Jun, Hae-Chan Lee, Wi-Soo Jeong, Young-Ho Park (KEPCO NF)	
Massive Update and Expansion of Human Factors Guidelines for Nuclear Power Plant Control Room and Other Human-System Interfaces	2088
Joseph Naser (EPRI), Robert Fink (CDF Services), Lewis Hanes (Consultant), Charles Killian (CDF Services)	
Results of Integrated Validation in a Hybrid Control Room	2097

Jose Enrique Cerezal Diez, Marita Garrido Sánchez, Pedro TruebaAlonso, Luis Rjas López
(Tecnatom)

LWR BDBE Clad Response (Joint with Track 1, 5)

Cochairs: Paolo Ferroni (Westinghouse), Keizo Ishii (Department of Quantum Science and Energy)

Influence of the Steam and Oxygen Flow Rate on the Reaction of Zirconium in Steam/Nitrogen and Oxygen/Nitrogen Atmospheres **2103**

Mirco Grosse, Martin Steinbrueck (KIT), Yunhwan Maeng, Joonyoung Sung (KIT/Handong Global Univ)

High Temperature Oxidation Behavior of Kanthal APM and D Alloys in Steam **2112**

Chongchong Tang, Martin Steinbrueck, Mirco Grosse, Adrian Jianu, Alfons Weisenburger, Hans Juergen Seifert (KIT)

High Temperature Oxidation of the Zr-1Nb-1Sn-0.1Fe Cladding Tube at the Temperatures of 1000 – 1200°C **2120**

Cheol Min Lee, Tae Won Cho, Gwan Yoon Jeong, Mi Jin Kim, Ji-Hyeon Kim, Hee-Jae Lee (UNIST), Yong-kyoon Mok (KEPCO NF), Dong-Seong Sohn (UNIST)

Development of Zirconium-Silicide Coatings for Accident Tolerant Zirconium-Alloy Fuel Cladding **2126**

Hwasung Yeom, Ben Maier (Univ of Wisconsin, Madison), Robert Mariani, David Bai (INL), Peng Xu (Westinghouse), Kumar Sridharan (Univ of Wisconsin, Madison)

Wednesday, April 20, 2016, 4:30 pm

Non-Proliferation and Physical Protection

Cochairs: Sama Bilbao y Leon (Virginia Commonwealth Univ), Alexander Chebeskov (Inst for Physics & Power)

Theoretical Investigation of Spent Nuclear Fuel Monitoring using Cosmic Ray Muons **2132**

S. Chatzidakis, L. H. Tsoukalas (Purdue Univ)

Examination of Challenges in Nuclear Proliferation Risk Modeling **2140**

Chul Min Kim, Man-Sung Yim, Hyeon Seok Park (KAIST)

LWR Modeling and Simulation—II

Cochairs: G. Ivan Maldonado (Univ of Tennessee), Deokjung Lee (UNIST)

Validation of the Nodal Drift Method on a CANDU LOCA and First Application to the TWIGL Seed-Blanket REA **2148**

A. Nuttin, P. Prévot, N. Capellan (LPSC), S. David, X. Doligez (IPNO), O. Meplan (LPSC)

Current Developments of the PWR Core Analysis Code RAST-K2.0 **2158**

Youqi Zheng (Xi'an Jiaotong Univ/UNIST), Minyong Park, Deokjung Lee (UNIST), Eunki Lee, Ho-Cheol Shin (KHNP-CRI)

- Eigenvalue Problem of the Neutron Diffusion Equation Discretized with the Finite Volume Method in a VVER** 2167
A. Bernal (ISIRYM), J. E. Roman (Univ Polit.cnica de Val.ncia), R. Miro, G. Verdu (ISIRYM)

AR Severe Accidents

Cochairs: Richard B. Vilim (ANL), Koroush Shirvan (MIT)

- R&D and Experimental Programs to Support the ASTRID Core Assessment in Severe Accidents Conditions** 2173

F. Serre, F. Payot, C. Suteau, L.Trotignon (CEA), E. Bartyrbekov, A. Vurim, A. Pakhnits, V. Vityuk (NNC-RK), S. Kubo, A. Katoh, Y. Tobita, K. Kamiyama, K. Matsuba, J. Toyooka (JAEA)

- A Study on the Thermal-Hydraulics in the Damaged Subassemblies under the Operation of Decay Heat Removal System** 2183

Ayako Ono, Takamitsu Onojima, Norihiro Doda (JAEA), Yasuhiro Miyake (NDD Corp), Hideki Kamide (JAEA)

- Particle Generation during Sodium Pool Fires in SFR Beyond Design Basis Accidents** 2193

Luis E. Herranz, Monica Garcia (CIEMAT), Martin P. Kissane (OECD)

CFD Advances

Cochairs: Emilio Baglietto (MIT), Elia Merzari (ANL)

- Coupling RELAP5-3D and STAR-CCM+ for Simulations of Steady and Transient Single Phase Flows** 2202

Antonello Palazzi, Michael J. Bluck (Imperial College London), Simon Lo, Sava Slijepcevic (CD-adapco)

- CFD Simulation of Fuel Rod Bundles for Advanced Nuclear Reactors** 2212

Krishna Podila, Yanfei Rao (CNL)

- Effect of Mixing Vane Grids on Temperature Field in Subchannel Analysis** 2222

Hu Mao, Bao-Wen Yang (Xi'an Jiaotong Univ)

CHF/DNB—II

Cochairs: Bao-Wen Wang (X'ian Jiao Tong Univ), Eung Soo Kim (Seoul National Univ)

- Design of Post-CHF Heat Transfer Experiments for High-Pressure and High-Flow Conditions** 2229

Qingqing Liu, Qiuping Lv, Shanbin Shi, Xiaodong Sun (Ohio State), Joseph Kelly (NRC)

- Experimental Study of Critical Heat Flux Enhancement with Nanofluid during In-Vessel Retention** 2246

Katsuki Ryoji, Akio Sayano, Chikako Iwaki, Hisaki Sato, Yasunobu Fujiki (Toshiba), Daisuke Kanamori (Kansai Electric Power Co., Inc.)

- Numerical Study on the Effect of Flow Instability in a 3 by 3 Channel** 2251

Sipeng Wang, Bao-Wen Yang, Xirui Liu (Xi.'an Jiaotong Univ)

- Experiment of CHF Enhancement by Fe₃O₄ Nanoparticle Coating in Subcooled Boiling Region** 2258

Young Jae Choi, Dong Hoon Kam, Yong Hoon Jeong (KAIST)

Control Rooms and Simulators—II

Cochairs: Ray Torok (EPRI), Joseph Naser (EPRI)

Development of an IAEA Sodium-Cooled Fast Reactor Basic Principles Simulator for Educational Purposes 2266

Stefano Monti, Chirayu Batra, Chad L. Painter (IAEA)

Establishment of a Training Plan for the Regulatory Body of Mexico using IAEA's SARCoN Methodology 2273

Christophe Herer (IRSN), Marianne Jelinski (GRS), Antonio Madonna (Consultant)

Managing Potential Vulnerabilities of Digital Instrumentation and Control Systems 2281

Ray Torok (EPRI), Bruce Geddes (Southern Eng Services), Dave Blanchard (Applied Reliability Eng)