

Program Schedule (Sunday-Monday)



Sunday May 19

16:20-19:30 Conference Registrations
Real Collegio

19:30-23:00 Reception Banquet
Real Collegio

Monday May 20

08:00-08:30 Conference Welcome

Room: Puccini
Session Chair: M. Cherubini (NINE, Italy)
Speakers:

- F. D'Auria (UNIPI, Italy): *BEPU History*
- K. Ivanov (NCSU, USA): *BEPU & Multiphysics*
- A. Petruzzi (NINE, Italy): *BEPU Applications*
- R. P. Martin (USNRC, USA): *BEPU and Regulators*
- T. Valentine (ORNL, USA): *Research Needs for BEPU*

08:30-10:30 PLENARY SESSIONS

Room: Puccini
Session Chair: R. Martin (USNRC, USA)

PL-01 THE IMPORTANCE OF BEST ESTIMATE ANALYSES AND MODELING FOR EFFECTIVE RISK INFORMED DECISION MAKING
Lecturer: J. A. Nakoski (OECD/NEA)

PL-02 NEW AND ADVANCED REACTOR ANALYSIS AND BEPU
Lecturer: S. M. Bajorek (USNRC, USA)

10:30-11:00 Coffee Break

11:00-12:40 A TECHNICAL AND REGULATORY REQUIREMENTS OF BEPU

A1 (1) Licensing and Regulatory Requirements for BEPU

Room: S. Maria
Session Chair: R. Mendizábal Sanz (CSN, Spain)
Session Co-Chair: A. Petruzzi (NINE, Italy)

KN-A1: CURRENT AND ANTICIPATED CHALLENGES AND OPPORTUNITIES FOR BEPU LICENSING APPLICATIONS
Lecturer: R. Martin (USNRC, USA)

318: Suitability of Probability Distributions for BEPU Methodologies in Reload Safety Analysis Licensing Applications, S. Krepel, N. Amini, B. Parks
Presenter: N. Amini (USNRC, USA)

322: Preferable Applications of Best-Estimate Plus Uncertainty under the U.S. Nuclear Industry's Licensing Modernization Project, R. Martin
Presenter: R. Martin (USNRC, USA)

378: The Application and Prospective of BEPU Methodology on Gen III Reactors, M. Hu, X. Zhang, C. Deng, J. Yang
Presenter: M. Hu (HUST, China)

11:00-12:40 D BEPU METHODOLOGY R&D

Room: S. Donato
Session Chair: J. M. Le Corre (Westinghouse, Sweden)
Session Co-Chair: L. Giaccardi (NINE, Italy)

KN-D: WHAT IS NEEDED FOR AN EVIDENCE-BASED BACKGROUND OF THE NEW GENERATION OF MODELS AND TOOLS
Lecturer: E. Ivanov (IRNS, France)

D2 (1) Bayesian Methods for Uncertainty Analysis

299: CASUALIDAD Predicting Modelling Methodology, an Application to OECD/NEA ATRIUM, K. Zeng, A. Petruzzi
Presenter: K. Zeng (NINE, Italy)

311: Addressing Model Inadequacy in Fuel Performance Model Calibration using MH-Within-Gibbs Sampling, G. Robertson, H. Sjöstrand, P. Andersson, A. Göök, P. Blair
Presenter: G. Robertson (Uppsala University, Sweden)

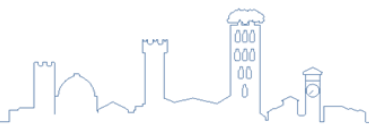
341: Estimation of Model Parameter Distribution for RBHT Steam Cooling and Level Swell Tests Through Parallel MCMC Simulations, J. Heo
Presenter: J. Heo (KAERI, South Korea)

11:00-12:40 E BEPU FOR MULTIPHYSICS (MP) & MULTISCALE (MS) APPLICATIONS

E3 Thermal-Hydraulics, Reactor Physics and Fuel Performance

Room: Elisa
Session Chair: T. Valentine (ORNL, USA)
Session Co-Chair: M. Cherubini (NINE, Italy)

KN-E: UNCERTAINTY ESTIMATION IN MULTI-PHYSICS/MULTI-SCALE/MULTI-FIDELITY SIMULATIONS
Lecturer: K. Ivanov (NCSU, USA)



Program Schedule (Monday)

269: Optimization of Coupled Multi-Physics Platform for Non-LOCA Accident Analyses, *G. Hobson, K. Maupin, R. Ellison*

Presenter: *G. Hobson (Famatome, USA)*

272: Sensitivity Analysis of a Flow Redistribution Model for a Multidimensional and Multifidelity Simulation of Fuel Assembly Bow in a Pressurized Water Reactor, *A. Abboud, J. Garnier, B. Leturcq, S. De Lambert*

Presenter: *A. Abboud (CEA, France)*

295: AGR-5/6/7 Capsule 1 Thermal Model with Offset Gas Gaps, *G. Hawkes, B. Pham, C. Otani*

Presenter: *G. Hawkes (INL, USA)*

12:40-14:10 Lunch

14:10-15:50 A TECHNICAL AND REGULATORY REQUIREMENTS OF BEPU

A2 (1) V&V and BEPU

Room: S. Maria

Session Chair: *R. P. Martin (USNRC, USA)*

Session Co-Chair: *D. De Luca (NINE, Italy)*

KN-A2: MODERN V&V FOR BEPU IN THE DIGITAL AGE

Lecturer: *C. Frepoli (FPoliSolutions, USA)*

291: Independent RELAP5 Validation Activities at NINE, *D. De Luca, A. Del Ferraro, M. Cherubini, A. Petruzzi*

Presenter: *D. De Luca (NINE, Italy)*

356: Assessment of COBRA-IE and RELAP5-3D Code Capabilities in Modeling Fluid Mixing and Multi-Dimensional Flow using Data from Scaled PWR Test Facilities Part I: Methodology, *C. Gosdin, M. Mankosa, C. Frepoli, M. Meholic, D. Aumiller, F. Buschman*

Presenter: *C. Gosdin (FPoliSolutions, USA)*

358: Assessment of COBRA-IE and RELAP5-3D Code Capabilities in Modeling Fluid Mixing and Multi-Dimensional Flow using Data from Scaled PWR Test Facilities Part II: Results, *C. Gosdin, M. Mankosa, C. Frepoli, M. Meholic*

Presenter: *C. Gosdin (FPoliSolutions, USA)*

14:10-15:50 D BEPU METHODOLOGY R&D

D1 (1) Statistical Methods for Uncertainty Analysis

Room: S. Donato

Session Chair: *T. Simeonov (Studsvik Scandpower, USA)*

Session Co-Chair: *M. Cherubini (NINE, Italy)*

262: Statistical Analysis and Verification for Evaluation on the Influence of Uncertainty Variables on LBLOCA Consequence, *D.G. Kang, J.Y. Park, Y.S. Choi*

Presenter: *D.G. Kang (KINS, South Korea)*

263: Application of Deterministic Sampling Methods for Uncertainty Quantification in a Steady-State Coupled Neutronic and Thermal-Hydraulic Simulation, *J. Bartos, B. Marcinkevicius, K. Routsonis, C. Fedon*

Presenter: *J. Bartos (NRG, Netherlands)*

264: Increasing Conservatism in BEPU LB LOCA Safety Studies using Complementary and Industrially Cost-Effective Statistical Tools, *V. Larget*

Presenter: *V. Larget (EDF, France)*

294: Development of a Statistical Model of Uncertainty in Time-Dependent Channel Power Distribution Predictions, *J. Rogers, Y. Parlatan*

Presenter: *J. Rogers (Kinectrics, Canada)*

14:10-15:50 E BEPU FOR MULTIPHYSICS (MP) & MULTISCALE (MS) APPLICATIONS

E1 Thermal-Hydraulics (including I&C simulators) and Reactor Physics

Room: Elisa

Session Chair: *J. Zhang (Tractebel, Belgium)*

Session Co-Chair: *A. Del Ferraro (NINE, Italy)*

386: The Box Series, a New Generation of AI Based Safety Automation I&C Systems, *M. Segond, L. Lefebvre, M.A. Dor, G. Mestrot, M. Allory, H. Haouaneb*

Presenter: *M. Segond (Framatome, France)*

417: System Code Simulation of a Spiral-Tube Innovative Steam Generator for LFR Application, *A. Lombardo, F. Giannetti, D. Tomatis, C. Ciurluini*

Presenter: *A. Lombardo (Newcleo, Italy)*

327: Development and Validation of a Multi-Physics APOLLO3®/THEDI Coupling for the Simulation of Power Transients in the CABRI Experimental Reactor, *C. Vaglio-Gaudard, J. Politello, T. Coissieux, K. Ammar*

Presenter: *C. Vaglio-Gaudard (CEA, France)*

Program Schedule (Monday)



364: Multi-Physics Simulation and Sensitivity Analysis of a Main Steam Line Break Transient in a Pressurized Water Reactor, *T. Croisette, P. Olita, C. Vaglio-Gaudard, P. Rubiolo, R. Prea*
Presenter: *T. Croisette (CEA, France)*

15:50-16:20 Coffee Break

16:20-18:25 A TECHNICAL AND REGULATORY REQUIREMENTS OF BEPU

A2 (2) V&V and BEPU

Room: S. Maria
Session Chair: *D. Novog (McMaster, Canada)*
Session Co-Chair: *A. Del Ferraro (NINE, Italy)*

357: Assessment of COBRA-IE and RELAP5-3D Code Capabilities in Modeling Multi-Dimensional Counter-Current Flow using Data from UPTF Test 6, *M. Mankosa, C. Gosdin, C. Frepoli, M. Meholic, D. Aumiller, F. Buschman*
Presenter: *M. Mankosa (FPoliSolutions, USA)*

372: Uncertainty Quantification and Sensitivity Analysis of DVI Pipeline Break Accident of ACME Test Facility, *C. Li, Y. Su, C. Deng*
Presenter: *C. Li (HUST, China)*

398: Development of a Generic API for Enterprise Data Management and Ontology of Large-Scale Simulation Sets, *C. Frepoli*
Presenter: *C. Frepoli (FPoliSolutions, USA)*

288: BEPU LB LOCA Safety Method Validation with Integral Experiment ROSA2-LSTF, *M. Gautier*
Presenter: *M. Gautier (Framatome, France)*

379: Uniform Approach to Validation of Codes for Design-Basis and Beyond Design-Basis Accidents Modeling, *E. Moiseenko, N. Mosunova, V. Strizhov*
Presenter: *E. Moiseenko (IBRAE RAN, Russia)*

16:20-18:25 D BEPU METHODOLOGY R&D

D2 (2) Bayesian Methods for Uncertainty Analysis

Room: S. Donato
Session Chair: *G. Perret (PSI, Switzerland)*
Session Co-Chair: *K. Zeng (NINE, Italy)*

351: Bayesian Model Calibration Methodology based on Markov Chain Monte Carlo for Fuel Performance Calculations, *S. Maccario, A. Scolaro, E. L. Brunetto, A. Vasiliev, M. Hursin*
Presenter: *S. Maccario (EPFL, Switzerland)*

362: Bayesian Inference using MCMC in OpenURNS, *E. Songo, J. Mure, M. Keller*
Presenter: *E. Songo (EDF, France)*

416: Uncertainty Quantitative Analysis of Subchannel Program by MCMC Methodology based on PSBT Benchmark, *M. Song*
Presenter: *M. Song (SJTU, China)*

406: Bayesian Calibration of Fiber Optic Distributed Temperature Sensing in Water, *L. Kohler, D. Lisowski, X. Wu, A. Heifetz*
Presenter: *L. Kohler (NCSSU, USA)*

373: Application of the Inverse Uncertainty Quantification Method to the Small Break Loss of Coolant Accident for the ACME Test Facility, *Y. Su, C. Li, C. Deng*
Presenter: *C. Deng (HUST, China)*

16:20-18:25 E BEPU FOR MULTIPHYSICS (MP) & MULTISCALE (MS) APPLICATIONS

E2 Reactor Physics and Fuel Performance

Room: Elisa
Session Chair: *G. Robertson (Uppsala Univ., Sweden)*
Session Co-Chair: *M. Cherubini (NINE, Italy)*

335: PyDrag, a Simple Approach to Dragon Deterministic Code, *V. Salino*
Presenter: *V. Salino (IRSN, France)*

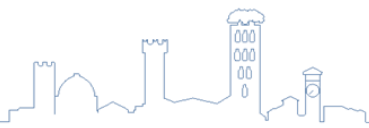
277: NINE R&D Approach for Fuel Temperature Doppler Effect Treatment, *S. Di Pasquale, A. Petruzzi*
Presenter: *S. Di Pasquale (NINE, Italy)*

343: Doppler Effective Temperature Database Based on Monte Carlo Simulations, *G. Delipei, P. Rouxelin, M. Avramova, E. Ivanov, K. Ivanov*
Presenter: *G. Delipei (NCSSU, USA)*

349: Multiobjective Optimization of Nuclear Fuel Multi-Cycle Management using Genetic Algorithms and Parallel Simulated Annealing, *W. Kubinski, G. Giorgi, M. Segond*
Presenter: *G. Giorgi (Framatome, France)*

435: Shape Optimization Under Uncertainty (Shape-OUU) through a DAKOTA/MOOSE Framework, *M. Altahhan, S. Schunert, K. Ivanov, Y. Azmy*
Presenter: *M. Altahhan (NCSSU, USA)*

19:30-23:00 Social Dinner
Real Collegio



Program Schedule (Tuesday)

Tuesday May 21

08:30-09:30 PLENARY SESSIONS

Room: Puccini
Session Chair: A. Petruzzi (NINE, Italy)

PL-03 BEPU LICENSING CONSIDERATIONS FOR BWR AND SODIUM FAST SMR APPLICATIONS
Lecturer: J. Zino (GEH, USA)

PL-04 APPLICATIONS OF BEPU APPROACHES IN INDUSTRY AND ACADEMIA
Lecturer: C. Queral (UPM, Spain)

10:30-11:00 Coffee Break

11:00-12:40 A TECHNICAL AND REGULATORY REQUIREMENTS OF BEPU

A3 Scaling Issue and BEPU

Room: S. Maria
Session Chair: C. Frepoli (FPoliSolutions, USA)
Session Co-Chair: A. Del Ferraro (NINE, Italy)

332: On some Ways to Improve BEPU Methodologies Part 1: Guidelines on PIRT - Transient Analysis - Scaling Analysis - IET and SET Design, D. Bestion, F. D'Auria, S. Carnevali, A. Ciechocki
Presenter: D. Bestion (Consultant, France)

396: On some Ways to Improve BEPU Methodologies Part 2: Guidelines on V&V&UQ and Code Scalability Demonstration, D. Bestion
Presenter: D. Bestion (Consultant, France)

325: Scaling Sensitivity Analysis of Small-Scale Integral Test to the ESBWR Bottom Drain Line Break, X. Zhang, J. Yang
Presenter: X. Zhang (HUST, China)

366: Simulation of Single-Phase Natural Circulation within the BEPU Framework: Sketching Scaling Uncertainty Principle by Multi-Scale CFD Approaches, H. Huang, N. Alpy, J. Perez, M. Medale
Presenter: J. Perez Manes (CEA, France)

11:00-12:40 D BEPU METHODOLOGY R&D

D1 (2) Statistical Methods for Uncertainty Analysis

Room: S. Donato
Session Chair: L. Tiborcz (GRS, Germany)
Session Co-Chair: M. Mankosa (FPoliSolutions, USA)

308: Uncertainty Quantification Decay Heat Power in Studsvik's System for Spent Fuel Analyses, T. Simeonov

Presenter: T. Simeonov (Studsvik Scandpower, USA)

309: Detecting Outlying Simulations in BEPU Approaches, A. Rollon de Pinedo, M. Couplet, N. Seiler, A. Marrel, E. Merle, R. Sueur, B. Iooss
Presenter: B. Iooss (EDF, France)

387: Recent Updates to the Analysis Tool SUSA, J. Soedingrekso, T. Eraerds, J. Scheuer
Presenter: J. Soedingrekso (GRS, Germany)

437: Equal-Tailed Tolerance Intervals and their Use in BEPU Analysis, R. Mendizábal Sanz
Presenter: R. Mendizábal Sanz (CSN, Spain)

11:00-12:40 E BEPU FOR MULTIPHYSICS (MP) & MULTISCALE (MS) APPLICATIONS

E4 Role of CFD and of Structural Mechanics for MP&MS BEPU

Room: Elisa
Session Chair: F. Terzuoli (NINE, Italy)
Session Co-Chair: G. Perret (PSI, Switzerland)

301: Application of Deterministic Sampling for Uncertainty Quantification of CFD Model of Wrapped Wire Fuel Bundle, O. Halim, A. Pucciarelli, N. Forgiione
Presenter: O. Halim (UNIPI, Italy)

329: Pressure Thermal Shock Analysis with Uncertainty Propagation - PSI Contribution to the APAL Project, G. Perret, I. Clifford, D. Mora Mendez
Presenter: G. Perret (PSI, Switzerland)

336: Uncertainty Quantification and Metamodeling of Multi-Fidelity CFD Computation of a Heated Fuel Assembly, J.F. Wald, B. Iooss
Presenter: J.F. Wald (EDF, France)

385: An Efficient Method for Input Uncertainty Propagation Applied to a Gas Mixing Process, R. Ji, S. Kelm, M. Klein
Presenter: R. Ji (Forschungszentrum Juelich, Germany)

12:40-14:10 Lunch

Program Schedule (Tuesday)



14:10-15:25 A TECHNICAL AND REGULATORY REQUIREMENTS OF BEPU

A1 (2) Licensing and Regulatory Requirements for BEPU

Room: S. Maria
Session Chair: J. L. Vacher (EDF, France)
Session Co-Chair: R. P. Martin (USNRC, USA)

- 397: On the Benefits of Risk-Informing the Safety Case of Operating LWR using Realistic Simulations of Events and Radiological Consequences, C. Frepoli**
Presenter: C. Frepoli (FPoliSolutions, USA)
- 457: Practical Considerations on the International Licensing Framework for Floating Nuclear Power Plants, G. Gennaro**
Presenter: G. Gennaro (1888 Gennaro Consulting Singapore)
- 350: Digital Twins for Safety Analysis - Removing Penalties, J. Kaizer**
Presenter: J. Kaizer (USNRC, USA)

14:10-15:50 D BEPU METHODOLOGY R&D

D3 (1) Machine Learning Methods for Uncertainty Analysis

Room: S. Donato
Session Chair: B. Iooss (EDF, France)
Session Co-Chair: K. Zeng (NINE, Italy)

- 305: Softmax-Based Deep Neural Network in Regression, J. Seo, H. Abdel-Khalik**
Presenter: J. Seo (Purdue University, USA)
- 367: Improvement of Radiological Waste Characterization with Bayesian Machine Learning, A. Hoefler, L. Coquard**
Presenter: A. Hoefler (Framatome GmbH, Germany)
- 404: Elucidating the Uncertainties Introduced by Data-Driven Machine Learning Models, X. Wu, L. Moloko, P. Bokov, G. Delipei, J. Kaizer, K. Ivanov**
Presenter: L. Moloko (NCSU, USA)
- 405: Uncertainty Quantification and Improved Neural Networks Predictions using Data Augmentation by Variational Autoencoders, F. Alsafadi, M. Yaseen, X. Wu**
Presenter: F. Alsafadi (NCSU, USA)

14:10-15:50 E BEPU FOR MULTIPHYSICS (MP) & MULTISCALE (MS) APPLICATIONS

E6 (1) Best-Estimate and Uncertainty Evaluation for Design Extension Condition (DEC) including Severe Accidents

Room: Elisa
Session Chair: L. E. Herranz (CIEMAT, Spain)
Session Co-Chair: H. Lopez (NINE, Italy)

- 304: An Example of Uncertainty Study of PWR Severe Accident using MELCOR Code, M. Malicki, T. Lind**
Presenter: M. Malicki (PSI, Switzerland)
- 340: GRS Results and Lessons Learned during the EC-MUSA Project, L. Tiborcz, S. Beck**
Presenter: L. Tiborcz (GRS, Germany)
- 434: Simulation and Uncertainty Analysis of TOSQAN Test using Lumped-Parameter Code PISAA, N. Zhang, X. Yang, H. Li, Y. Yuan, R. Ma**
Presenter: N. Zhang (CNPE, China)
- 456: U&SA Application in Severe Accidents Analysis: Challenges and Path Forward, L.E. Herranz**
Presenter: L. E. Herranz (CIEMAT, Spain)

15:50-16:20 Coffee Break

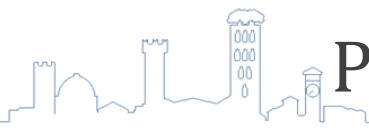
16:20-18:25 B BEPU IN SAFETY ANALYSIS AND LICENSING FRAMEWORK

B1 Light Water Reactor (PWR, WWER and BWR)

Room: S. Maria
Session Chair: S. Bajorek (USNRC, USA)
Session Co-Chair: M. Cherubini (NINE, Italy)

KN-B: BEPU AND LICENSING: THE ROLE OF I&C MODELING Lecturer: F. D'Auria (UNIPI, Italy)

- 293: Derivation of Uncertainty Distributions for Channel Flow Rate and Fuel Critical Heat Flux Predictions for Best Estimate Plus Uncertainty Analysis of Slow Loss of Reactor Power Regulation Accidents in CANDU Stations, Y. Parlattan, J. Rogers, M. Koivisto**
Presenter: J. Rogers (OPG, Canada)



Program Schedule (Tuesday-Wednesday)

312: The Uncertainty and Sensitivity Analysis of Small-Break Loss-Of Coolant Accident for HPR1000, *Y. Geng, J. Zhan, J. Liu, J. Fang, Q. Chen*
Presenter: *Y. Geng (CNPE, China)*

337: BEPU Application to Hot Leg LOCA in Two-Loop PWR, *A. Prosek*
Presenter: *A. Prosek (JSI, Slovenia)*

452: U&S Analyses in a BWR NPP LB-LOCA Transient with ATF, *B. Navarro, T. Barrachina, R. Miró, J. C. Garcia-Diaz*
Presenter: *B. Navarro (UPV, Spain)*

16:20-18:25 C OTHER BEPU APPLICATION RESULTS

C1 (1) BEPU Applications for Single Physics - Thermal-hydraulics

Room: S. Donato
Session Chair: *F. Di Maio (POLIMI, Italy)*
Session Co-Chair: *D. Dovizio (NINE, Italy)*

359: An Empirical Method for Inverse Uncertainty Quantification in Critical Flow Simulation, *A. Bersano, F. Di Maio, E. Zio, N. Pedroni, F. Mascari*
Presenter: *A. Bersano (ENEA, Italy)*

353: Adequacy Analysis of Critical Flow Experiments in the Framework of the OECD-NEA ATRIUM Project: CEA'S Contribution, *A. Ghione, L. Sargentini, G. Damblin, P. Fillion*
Presenter: *A. Ghione (CEA, France)*

413: Application of Quantification and Verification Methods for Thermal Hydraulic Inverse Uncertainty, *H. Qian*
Presenter: *H. Qian (HUST, China)*

446: Uncertainty Assessment of 3D Thermal Hydraulics and Heat Conduction Coupled Solver, *S.J. Lee, J. Heo*
Presenter: *S.J. Lee (KAERI, South Korea)*

439: Wall-to-Fluid Pressure Drop Phenomenon Impact on BEPU Investigations, *H. Yousefi, V. Zingales, S.A. Hosseini, Q. Yu, Q. Cai, F. D'Auria*
Presenter: *H. Yousefi (UNIPI, Italy)*

16:20-18:25 E BEPU FOR MULTIPHYSICS (MP) & MULTISCALE (MS) APPLICATIONS

E6 (2) Best-Estimate and Uncertainty Evaluation for Design Extension Condition (DEC) including Severe Accidents

Room: Elisa
Session Chair: *M. Malicki (PSI, Switzerland)*
Session Co-Chair: *M. Angelucci (UNIPI, Italy)*

445: MAAP5.03 ASSESSMENT OF TIME WINDOW FOR PERFORMING RCS DEPRESSURIZATION, *I. Bašić, I. Vrbanić*
Presenter: *I. Bašić (APOSS d.o.o, Croatia)*

360: Cross-Comparison of Different Techniques for Sensitivity Analysis in Severe Accidents: Application to A SBO in a PWR, *M. Angelucci, L. E. Herranz, S. Paci*
Presenter: *M. Angelucci (UNIPI, Italy)*

365: Application of the BEPU Methodology to Severe Accident Sequences in a Reference German PWR for the Assessment of Severe Accident Management Measures using the GRS Code Package AC2, *S. Palazzo, T. Steinrötter*
Presenter: *S. Palazzo (GRS, Germany)*

377: Numerical Simulation and Verification of Thermal Hydraulic Phenomena in the Passive Containment PASE Test Facility, *M. Ran, B. Yuan, Q. Wen*
Presenter: *M. Ran (Chongqing University, China)*

423: Best Estimate Plus Uncertainty Analysis of the Containment Passive Air-Cooling Experiment for ACP100 NPP, *J. Xu*
Presenter: *J. Xu (CNPE, China)*

Wednesday May 22

8:30-10:30 PANEL DISCUSSION SESSIONS

PD-A AN OVERVIEW OF ASME VVUQ STANDARD COMMITTEES AND OECD NEA ACTIVITIES

Room: Puccini

Moderator: *M. Dzodzo (Westinghouse, USA)*

Lectures & Lecturers:

An overview of all ASME VVUQ Committee activities. **Joshua Kaizer (US NRC, USA)**

An overview of ASME VVUQ 30 activities. **Yassin Hassan (Texas A&M Univ., USA)**

Presentation and an announcement of the ASME Standard "Scaling Methodologies for Nuclear Power System Responses."

Milorad Dzodzo (Westinghouse, USA)

Presentation of OECD activities to update the Scaling Analysis Document.

Francesco D'Auria (UNIPI, Italy)

Program Schedule (Wednesday)



PD-B OVERVIEW OF THE ACTIVITIES OF THE EXPERT GROUP ON REACTOR SYSTEMS MULTI-PHYSICS (EGMUP)

Room: Elisa

Moderator: *T. Valentine (ORNL, USA)*

Lectures & Lecturers:

Overview of the Expert Group on Reactor Systems Multi-Physics.

Timothy Valentine (ORNL, USA)

The Multi-Physics Pellet Cladding Mechanical Interaction Validation (MPCMIV) benchmark exercise. **Domenico De Luca (NINE, Italy)**

The TVA Watts Bar Unit 1 (TVA-WB1) multi-physics benchmark exercise.

Maria Avramova (NCSU, USA)

The LWR-UAM multi-physics benchmark exercise. **Kostadin Ivanov (NCSU, USA)**

Overview of EGMUP Task Forces.

Evgeny Ivanov (IRSN, France)

PD-C IMPORTANCE OF THE EXPERIMENTAL KNOWLEDGE PRESERVATION AND MANAGEMENT OF DATABASE

Room: S. Maria

Moderators: *C. Frepoli (FPoliSolutions, USA)*
M. Adorni (NEA)

Lectures & Lecturers:

Preserving and Managing Legacy Experimental Data: NRC Comments and Perspective.

Stephen Bajorek (USNRC, USA)

SCCRED Methodology, an approach for the preservation of experimental data

Alessandro Petrucci (NINE, Italy)

Preservation of key experimental data sets: NEA initiatives and future challenges.

Martina Adorni (NEA)

OGMA: a platform for preserving legacy and organizing new experimental data to support today modeling and simulation.

Cesare Frepoli (FPoliSolutions, USA)

10:30-11:00 Coffee Break

11:00-12:40 C OTHER BEPU APPLICATION RESULTS

C1 (2) BEPU Applications for Single Physics - Thermal-hydraulics

Room: S. Maria

Session Chair: *T. Kozlowski (UIUC, USA)*

Session Co-Chair: *A. Ghione (CEA, France)*

287: Large-Break LOCA BEPU Analysis against LP-02-6 Experiment with LOCUST Code, *G. Li, H. Yuan, C. Xu, D. He, T. Wang, J. Li*

Presenter: *D. He (CNPRI, China)*

428: Hierarchical Bayesian Inverse Uncertainty Quantification with Application to the ATRIUM Project, *Z. Xie, C. Wang, X. Wu*

Presenter: *Z. Xie (NCSU, USA)*

342: Data Assimilation of Critical Flow Model in SPACE Code under Activity of ATRIUM, *C. Choi, J. Heo, S. Lee*

Presenter: *C. Choi (KAERI, South Korea)*

352: Inverse Uncertainty Quantification for Critical Flow Calculations via Neural Network Surrogate Models, *M. Saito, A. Ui*

Presenter: *M. Saito (CRIEPI, Japan)*

11:00-12:40 B BEPU IN SAFETY ANALYSIS AND LICENSING FRAMEWORK

B2 Deterministic and Probabilistic Safety Analysis: beyond BEPU

Room: S. Donato

Session Chair: *F. Di Maio (POLIMI, Italy)*

Session Co-Chair: *J. Zhang (Tractebel, Belgium)*

334: Advanced Best-Estimate Plus Uncertainty Approach by Integrating Probabilistic and Deterministic Safety Assessments, *S. Yu, J. Zhang, P.E. Labeau*

Presenter: *S. Yu (TRACTEBEL, Belgium)*

424: Embedding BEPU Approach into Probabilistic Risk Assessment (PRA), *S.A. Hosseini*

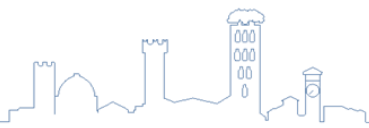
Presenter: *S.A. Hosseini (POLIMI, Italy)*

447: Loss of Cooling and Long-Term Heat Removal Using Probabilistic and Statistical Methods, *R. Duffey, E. Zio, L. Ward*

Presenter: *E. Zio (POLIMI, Italy)*

307: Sequence Selection Uncertainty on Radioactive Source Term Release Category after Severe Accident of NPP in Level 2 PSA, *J. Sun, N. Wang, Y. Shi*

Presenter: *Y. Geng (CNPE, China)*



Program Schedule (Wednesday)

11:00-12:40 D BEPU METHODOLOGY R&D

D4 Hybrid Methods for Uncertainty Analysis

Room: Elisa
Session Chair: A. Prošek (JSI, Slovenia)
Session Co-Chair: E. Ivanov (IRNS, France)

344: Characterization of the Limiting Loss Of Coolant Accident Scenario in a Best Estimate Plus Uncertainty Approach using ICSCREAM and RIPS Methods, L. Lefebvre, M. Gautier, M. Sulem, G. Mestrot, M. Segond
Presenter: L. Lefebvre (Framatome, France)

346: Multi-Physics Uncertainty Analysis Study using Single-Physics Modeling to Support Verification and Validation, Q. Faure, G. Delipei, M. Avramova, K. Ivanov
Presenter: G. Delipei (NCSU, USA)

354: Assessment of Performance of the Bayesian Based Uncertainty Analysis Approach vs. the Frequentist Statistics Approach in Application to Criticality Safety, A. Vasiliev, H. Lee, M. Frankl, M. Hursin, D. Rochman, H. Ferroukhi
Presenter: A. Vasiliev (PSI, Switzerland)

415: Soft Modeling to Comprehensive Uncertainty Quantification, E. Ivanov, A. Sargeni
Presenter: E. Ivanov (IRSN, France)

12:40-14:10 Lunch

14:10-15:50 D BEPU METHODOLOGY R&D

D5 Sensitivity Methods as supporting tools for Uncertainty Analysis

Room: S. Maria
Session Chair: B. Iooss (EDF, France)
Session Co-Chair: T. Kozłowski (UIUC, USA)

289: Impact of Irradiation History on Boltzmann/Bateman Coupled Sensitivities: Application to SFR Subassembly, V. Viallon, L. Buiron, E.Y. Garcia-Cervantes
Presenter: Laurent Buiron (CEA, France)

382: Development of the Adjoint Sensitivity Analysis Solver for Single Phase Subchannel Analysis Code CTF-R, K. Zeng, A. Petrucci
Presenter: K. Zeng (NINE, Italy)

432: Fission Product Yield Sampling with Lognormal Bayesian Updated Covariance Matrix, Y. Wang, C. Hao
Presenter: Y. Wang (Harbin Eng. University, China)

321: World's First Geological Disposal of Spent Nuclear Fuel to be Established in Finland, J. Huttunen
Presenter: J. Huttunen (TVO, Finland)

14:10-15:50 C OTHER BEPU APPLICATION RESULTS

C5 BEPU Methods and Results for GEN-IV & Other New Designs

Room: S. Donato
Session Chair: B. Calgaro (Newcleo, France)
Session Co-Chair: F. Terzuoli (NINE, Italy)

436: An Integrated Framework for Uncertainty Quantification in High Temperature Gas Cooled Reactors using the HCP Time-Dependent Multiphysics Code and DAKOTA Toolkit, W. Osman, A. Sadek, M. Altahhan, C. Liu, M. Avramova, K. Ivanov
Presenter: W. Osman (NCSU, USA)

330: Multiphysics Sensitivity Analysis with Advanced Codes for Existing and Innovative Reactors, B. Calgaro, B. Vezzoni
Presenter: B. Vezzoni (Newcleo, France)

448: An Integrated Multi-Physics Modeling and Uncertainty Quantification Framework for High Temperature Gas-Cooled Reactors using VSOP and DAKOTA, G. Delipei, M. Altahhan, P. Rouxelin, S. Sen, N. George, M. Avramova, K. Ivanov
Presenter: G. Delipei (NCSU, USA)

290: Status of the WPRS SEFOR Benchmark Phase I: Isothermal Tests, E. Garcia-Cervantes, L. Buiron, N. Garcia-Herranz, A. Jimenez-Carrascosa, Y. Cao, Z. Böröczki, I. Hill
Presenter: E. Garcia-Cervantes (CEA, France)

14:10-15:50 C OTHER BEPU APPLICATION RESULTS

C2 (1) BEPU Applications for Single Physics - Reactor Physics/Fuel Performance

Room: Elisa
Session Chair: M. Hursin (EPFL, Switzerland)
Session Co-Chair: S. Di Pasquale (NINE, Italy)

282: ANSWERS Tools for Uncertainty Quantification with Application to Criticality Assessment, P. Smith
Presenter: P. Smith (Jacobs, UK)

Program Schedule (Wednesday)



313: A Preliminary Uncertainty Analysis of PWR Depletion Numerical Test Problem on OECD/NEA/NSC LWR-UAM Benchmark Phase II Based on JENDL-5, T. Fujita

Presenter: T. Fujita (JAEA, Japan)

339: Industrial Constraints towards Few-Group Homogenized Cross-Section Representation with Statistical Learning Approaches, M.A. Dor, A. Brighenti, L. Graziano, L. Lefebvre, G. Mestrot, M. Segond

Presenter: M. A. Dor (Framatome, France)

399: Sensitivity and uncertainty analysis of the RITM200 reactor core inventory, K. Usheva, K. Zeng, M. Cherubini, N. Ul Syed, A. M. Blixt Buhr

Presenter: K. Usheva (NINE, Italy)

15:50-16:20 Coffee Break

16:20-18:20 PANEL DISCUSSION SESSIONS

PD-D SAFETY ASSESSMENT AND LICENSING IN ITALY: COMPETENCES, CAPABILITIES AND DEVELOPMENTS

Room: Puccini

Moderator: M. Cherubini (NINE, Italy)

Lectures & Lecturers:

Brief notes on international nuclear safety regulation and its applicability to innovative reactors. **Stefano Monti (AIN, ENS, Italy)**

ENEA Experience and Capabilities for Safety Assessment. **Federico Rocchi (ENEA, Italy)**

Experimental support at SIET for safety assessment of LWR and SMR.

Andrea Bersano (SIET, Italy)

Experience and competence for safety application in licensing frameworks

Marco Cherubini (NINE, Italy)

Ansaldo Nucleare and Nuclear Safety: a story of resilience

Michele Frignani (ANSALDO, Italy)

Implications on the licensing process of the intrinsic safety characteristics of the ceramic fuel developed by the Ultra Safe Nuclear.

Riccardo De Salvo (USNC, USA)

Technologies challenges and advances on ADS.

Massimo Morichi (TRANSMUTEX, Switzerland)

PD-E BEPU USING OPEN-SOURCE SOFTWARE FOR SENSITIVITY ANALYSIS AND UNCERTAINTY QUANTIFICATION

Room: Elisa

Moderator: K. Ivanov (NCSU, USA)

Lectures & Lecturers:

ONCORE Initiative and Other IAEA Activities to Support Open-Source Multi-Physics Simulation Tools for Nuclear Reactor Analysis.

Vladimir Kriventsev (IAEA)

Open Source Based Uncertainty and Sensitivity Analysis at NCSU. **Maria Avramova, NCSU**

Presenting the Platform OpenTURNS - An Open-Source Initiative for the Treatment of Uncertainties, Risks'N Statistics. **Bernard Iooss and Joseph Mure (EDF, France)**

Perspectives on Open-Source Codes and Libraries for Reactor Physics, Sensitivity Analysis, and Uncertainty Quantification.

Barbara Calgaro (Newcleo, France)

Embracing Uncertainty: Leveraging Open Source Software to Promote Uncertainty Quantification.

Joshua Kaizer (USNRC; USA)

Introduction to Uranie: an open-source software for uncertainty quantification tasks applied to computer experiments.

Guillaume Damblin (CEA, France)

PD-F STATUS AND PERSPECTIVES OF CODES AND EXPERIMENTATION IN NUCLEAR THERMAL-HYDRAULICS FOLLOWING FONESYS AND SILENCE NETWORKS

Room: S. Maria

Moderator: D. Bestion (CEA, France)

Lectures & Lecturers:

The FONESYS activities and achievements.

Dominique Bestion (CEA, France)

The SILENCE activities and achievements. **Jean Marie Le Corre (Westinghouse, Sweden)**

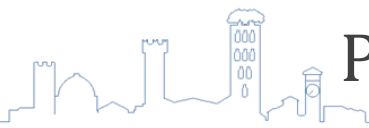
FONESYS and SILENCE: from founding motivations to perspectives.

Francesco D'Auria (UNIPI, Italy)

Advanced experimental methods for core 3D flow validation. **Yassin Hassan (TAMU, US)**

Needs, challenges and progress in boiling two-phase flow testing under LWR prototypical conditions.

Jean Marie Le Corre (Westinghouse, Sweden)



Program Schedule (Wednesday-Thursday)

Needs related to uncertainty analysis and contribution of the FONESYS activities in that field. **Jean Luc Vacher (EDF, France)**

Current main challenges to determine uncertainty of thermalhydraulic codes..
Livia Tiborcz (GRS, Germany)

19:30-23:00 Conference Dinner Banquet with Lucca Historical Representation
Real Collegio

Thursday May 23

8:30-10:30 PANEL DISCUSSION SESSIONS

PD-G WHY BEPU IS NOT SO SPREAD?

Room: Puccini

Moderator: F. D'Auria (UNIPI, Italy)

Lectures & Lecturers:

BEPU connection with worldwide experimental database. **Steve Bajorek (USNRC, USA)**

BEPU connection with Severe Accident
Luis Enrique Herranz (CIEMAT, Spain)

BEPU connection with Multiphysics
Kostadin Ivanov (NCSU, USA)

BEPU connection with licensing.
Joshua Kaizer (USNRC, USA)

BEPU connection with modeling and validation
Uwe Stoll (GRS, Germany)

BEPU connection with industry
Jean-Luc Vacher (EDF, France)

BEPU connection with PSA
Enrico Zio (POLIMI, Italy)

Why BEPU is not so spread?
Francesco D'Auria (UNIPI, Italy)

PD-H UNCERTAINTY ANALYSIS FOR MULTI-PHYSICS APPLICATIONS

Room: Elisa

Moderators: K. Zeng (NINE, Italy)
T. Kozlowski (UIUC, USA)

Lectures & Lecturers:

Development of the Deterministic Sensitivity and Uncertainty Analysis Method.

Kaiyue Zeng (NINE, Italy)

New Challenges in VVUQ: the Case of Fast Reactors. **Laurent Buiron (CEA, France)**

Lessons Learned from Recent Studies of Uncertainty Quantification in Multi-Physics Modelling and Simulation.
Evgeny Ivanov (IRSN, France)

Challenges in Uncertainty Propagation and Sensitivity Analysis for Multi-Physics Modeling and Simulation. **Gregory Delipei (NCSU, USA)**

Needs and Challenges in Multi-Physics Uncertainty Quantification for Lead-Cooled Fast Reactors. **Giacomo Grasso (ENEA, Italy)**

PD-I UNLEASHING THE POWER OF BEPU: A GLOBAL DIALOGUE ON BROADENING INDUSTRIAL APPLICATIONS

Room: S. Maria

Moderators: J. Zhang (TRACTEBEL, Belgium)
L. Sargentini (CEA, France)

Lectures & Lecturers:

BEPU methodology: Benefits, Limitations and Open Questions.

Jinzhao Zhang (TRACTEBEL, Belgium)

Advancing Uncertainty Analysis Methods at NEA.
Martina Adorni (NEA)

The Indispensable Role of IUQ in BEPU.
Alberto Ghione (CEA, France)

Industrial applications of a BEPU methodology: challenges and perspectives.
Vincent Larget (EDF DT, France)

Insights into BEPU Applications from the USA.
Robert Martin (USNRC ACRS, USA)

Development and application of BEPU methodology in Korea.
Dong Gu Kang (KINS, South Korea)

The NINE Approach to BEPU Framework and Applications.
Alessandro Petruzzi (NINE, Italy)

10:30-11:00 Coffee Break

11:00-11:50 C OTHER BEPU APPLICATION RESULTS

C2 (3) BEPU Applications for Single Physics - Reactor Physics/Fuel Performance

Room: S. Maria

Session Chair: *P. Smith (Jacobs, UK)*

Session Co-Chair: *K. Usheva (NINE, Italy)*

Program Schedule (Thursday)



333: Fuel Performance Code Validation for Reduction of Uncertainties, *L. Giaccardi, M. Cherubini*
Presenter: *L. Giaccardi (NINE, Italy)*

347: Assessment of the JEFF Nuclear Data Libraries,
M. Hursin, F. Xia, D. Rochman
Presenter: *M. Hursin (EPFL, Switzerland)*

11:00-11:50 **D BEPU METHODOLOGY R&D**

D3 (2) Machine Learning Methods for Uncertainty Analysis

Room: Elisa
Session Chair: *J. M. Le Corre (Westinghouse, Sweden)*
Session Co-Chair: *K. Zeng (NINE, Italy)*

427: Uncertainty Quantification of Long Short-Term Memory Autoencoder for Monitoring of Liquid Sodium Cold Trap, *A. Akins, A. Heifetz, X. Wu*
Presenter: *A. Akins (ANL-NCSU, USA)*

450: Flex Strategies Study Based on Best Estimate Plus Uncertainty Method and Machine Learning Algorithm, *H. Xu, Y. Duo*
Presenter: *H. Xu (IFCEN-SYSU, China)*

12:00-13:00 **PLENARY SESSIONS**

Room: Puccini
Session Chair: *M. Adorni (NEA)*

PL-05 VERIFICATION AND VALIDATION OF THE CHINA VIRTUAL REACTOR FOR/WITH BEST ESTIMATION PLUS UNCERTAINTY
Lecturer: *X. He (USTB, China)*

13:00-13:30 **Summary & Closing**

Room: Puccini
Session Chair: *M. Cherubini (NINE, Italy)*
Speakers:

- *M. Adorni (NEA): R&D Needs in BEPU*
- *C. Frepoli (FPoliSolutions, USA): Perspectives of new Licensing Applications with BEPU*
- *A. Petruzzi (NINE, Italy): Summary of BEPU 2024 & BEPU2028 Announcement*

13:30-14:30 **Lunch**
