International Topical Meeting on Probabilistic Safety Assessment and Analysis

(PSA 2015)

Sun Valley, Idaho, USA 26-30 April 2015

Volume 1 of 2

ISBN: 978-1-5108-0811-9

Printed from e-media with permission by:

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



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

Copyright© (2015) by the American Nuclear Society All rights reserved.

Printed by Curran Associates, Inc. (2015)

For permission requests, please contact the American Nuclear Society at the address below.

American Nuclear Society 555 North Kensington Avenue LaGrange Park, Illinois 60526

Phone: (800) 323-3044 (708) 352-6611 Fax: (708) 352-0499

www.ans.org

Additional copies of this publication are available from:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 USA Phone: 845-758-0400 Fax: 845-758-2634 Email: curran@proceedings.com Web: www.proceedings.com

Table of Contents

Monday, April 27, 2015

Human Factors and HRA— I

1 Blowing Up Safety Culture - The Lure and Trap of Accident Investigation and Continuous Improvement Harold S. Blackman (Boise State Univ)

5 Enhancing Employee Wellbeing by Shaping a Total

Safety Culture

NJF van Loggerenberg, Hester Nienaber (Univ of South Africa)

14 Determining Resilience Thresholds for Nuclear Power Plants

Pamela F. Nelson, Cecilia Martín del Campo (Universidad Nacional Autónoma de México)

Fire Analysis and NFPA 805— I

22 Development of a Hazard Curve Evaluation Method for

a Forest Fire as an External Hazard

Yasushi Okano, Hidemasa Yamano (JAEA)

32 Fire-Related Systems and Key Safety Functions Unavailability Matrix Development and Assessment

P. Díaz, E. Estruch, J. Dies, C. Tapia, A. De Blas, M. Asamoah (Technical Univ of Catalonia-Barcelona)

42 Implementing the NFPA 805 Process: Observations of a Technical Reviewer

Steve Short, Garill Coles, Karl Bohlander, Bob Layton, Bill Ivans, Fleur De Peralta, Pete Lowry (PNNL)

Data and Parameter Estimation—I

52 A Study on the Effect of the State-of-Knowledge Correlation on Interfacing System Loss-of-Coolant Accident Frequency

Dong-San Kim, Jin-Hee Park, Seung-Cheol Jang, Joon-Eon Yang (KAERI)

55 Component Repair Times Obtained from MSPI Data Steven A. Eide (Curtiss-Wright/Scientech), Lee C. Cadwallader (INL)

61 Development, Implementation, and Impact of Convolution Factors for Offsite Power Recovery in Dominion PRA Models

Christopher J. Sutton, Allen C. Moldenhauer, Thomas W. Jaeger (Dominion Resources Services, Inc.)

Accident Analysis Level 2

71 Improving the Level 2 PRA Modelling of Basemat Failure

Cilla Andersson (Ringhals AB), Jacob Christensen (Risk Pilot), Staffan Dittmer (Ringhals AB)

75 PSA Level 2 with Dynamic Event Trees: Lessons Learned and Perspectives

Valentin Rychkov (EDF R&D), Keisuke Kawahara (Univ of Toyko/Ecole de Mines de Nantes)

79 Assessment of Offsite Power Non-Recovery for Level 2

Carroll Trull (Westinghouse/Camanche Peak Nuclear Power Plant)

Risk-Informed Decision-Making—I

84 Knowledge Engineering Tools—Ready to Support Risk-Informed Decision Making? Nathan Siu, Margaret Tobin, Peter Appignani, Kevin Coyne, Gary Young (NRC), Scott Raimist (ECM Universe)

91 MSPI Driven Safer Nuclear Power Plant—Callaway Energy Center

Hongbing Jiang (TVA), Zhiping Li (Ameren Missouri)

97 The Development of Safety Function Capability Analysis Methodology to Enhance Defense-In-Depth

Jonathan Li, Gary Miller, Dennis Henneke, and Matthew Warner (GE Hitachi Nuclear Energy)

Seismic-I

106 Development of Seismic Probabilistic Safety Assessment Model for OPR-1000 Reactor in Korea Jin- Hee Park, In-Kil Choi, S. C. Jang (KAERI)

Risk-Informed Regulation—I

109 Use of Risk Information in French Technical Specifications

Mioara Georgescu, Fabienne Rousseaux, Laurent Gilloteau (Inst for Radiological Protection and Nuclear Safety)

114 Improving the Processes Associated with Establishing the Technical Adequacy of Probabilistic Risk Assessments— Status and Path Forward

Donnie Harrison (NRC)

120 Graded Approach in Supervision Program and Strategies at SSM

Per Hellström (Swedish Radiation Safety Authority)

129Recent and Future Activities of the OECD Working Group on Risk Assessment (WGRISK) Marina Roewekamp (Gesellschaft fuer Anlagen- und Reaktorsicherheit (GRS)), Vinh Dang (Paul Scherrer Institut), Jeanne-Marie Lanore (Institut de Radioprotection et de Sûreté Nucleaire (IRSN), Kevin Coyne (NRC), Neil Blundell (OECD NEA)

Dynamic PSA—I

134 Dynamic Reliability Modeling of Reactor Trip System Hua Hui, Wang Gong, Shi Jianmin, Fang Man, Wang Wei (Chinese Academy of Sciences)

140 ADAPT-MAAP4 Coupling for a Dynamic Event Tree Study

Valentin Rychkov (EDF R&D) and Keisuke Kawahara (Univ of Tokyo/Ecole de Mines de Nantes)

144 DYMS: A Monte Carlo Code for Dynamic Fault Tree Analysis on Nuclear Power Plants

Meng-Yun Liu, Ding She, Jing-Quan Liu (Tsinghua Univ)

Severe Wind PSA—I

154 High Wind PRA Development and Lessons Learned from Implementation

Artur Mironenko (Duke Energy) and Nicholas Lovelace (Jensen Hughes)

161 Tornado Missile Strike Calculator: An Excel-based Stochastic Model of Tornado-Driven Missile Behavior for Use in High Winds PRA

Kyle Hope, Nataliya Povroznyk, Ray Schneider (Westinghouse)

168 High Wind PRA Failure Calculations, Error Estimates and Use of CAFTA

Lawrence A. Twisdale, Jr. (Applied Research Associates, Inc.), Nicholas Lovelace (Jensen Hughes), Cory Slep (Applied Research Associates, Inc.)

Multi-Unit Risk

179 Multi-Unit Nuclear Plant Risks and Implications of the Quantitative Health Objectives

Mohammad Modarres (Univ of Maryland)

189 On the Risk Significance of Seismically Induced Multi-Unit Accidents

Karl N. Fleming (KNF Consulting Services, LLC)

195 A Framework for Addressing Site Integrated Risk Kenneth Kiper, Andrea Maioli

(Westinghouse)

199 Framework for Assessing Integrated Site Risk of Small Modular Reactors Using Dynamic Probabilistic Risk Assessment Simulation

Matthew Dennis, Mohammad Modarres, Ali Mosleh (Univ of Maryland), Zen Wang (GES Systems)

Tuesday, April 28, 2015

Human Factors and HRA—II

209 Estimating Time Information to Conduct a Seismic Human Reliability Analysis (HRA) Based on Human Performance Data Simulated Against Non-Seismic DBAs

Jinkyun Park, Yochan Kim, Wondea Jung, Seung Cheol Jang (KAERI)

214 Nuclear Power Plant Seismic Probabilistic Risk Assessment Human Reliability Analysis—A Practical Approach James K. Liming (ABSG Consulting Inc.), John E. Reddington (CJR Engineering) 223 Three HRA Case Studies on Plant Shutdown Following Main Control Room Abandonment Steve Odell, Clarence Worrell (Westinghouse)

Fire Analysis and NFPA 805–II

227 Statistical Characterization of the Advanced Notification in Detection Time for Very Early Warning Fire Detection in Nuclear Plant Electrical Enclosures

Gabriel J. Taylor, Raymond H.V. Gallucci, Nicholas B. Melly (NRC), Thomas G. Cleary (NIST)

236 Alternate Approach to Calculating LERF for Fire PRA Models

M. B. Hirt, R. C. Bertucio, J. A. Julius (Scientech)

241 Research on the Installation of VEWFDS in Passive NPP Based on Fire PSA

Li Zhaohua, Li Lin, Qiu Yongping, Zhang Qinfang (Shanghai Nuclear Engineering Research and Design Inst)

Common Cause Failures—I

245 Common Cause Failure Parameters Estimation with Coloured Petri Nets

Gilles Deleuze (EDF R&D), Nicolae Brinzei, Laurent Gérard (Université de Lorraine)

254 A Risk-Informed Approach to Address Diversity Requirements in the Design of New Reactors

Vincent Sorel, Boris Gonul (EDF Basic Design Department)

260 A New Approach for Estimation of Common Cause Failures Parameters in the Context of Incomplete Data Tu Duong Le Duy, Dominique Vasseur (EDF R&D)

Configuration Risk Management

269 Point Estimates for Components in 10 CFR 50.65(a)(1)

Ross C. Anderson, Joseph Lavelline (ENERCON Services, Inc.)

274 Evaluation of Fire Risk in the Configuration Risk Management Process for XCEL Energy's Monticello and Prairie Island Nuclear Generating Plants

Thomas A Morgan (ENERCON Services, Inc.

(Maracor)), John Biersdorf (Xcel Energy)

280 Nuclear Power Plant Configuration Risk Management: EPRI CRMF Research—Recent Shutdown Risk Management Research

Thomas A Morgan (ENERCON Services, Inc. (Maracor)), Doug Hance (EPRI), Diane M. Jones (ENERCON Services, Inc. (Maracor))

Computer Codes

286 Fuel Reliability Analysis Using BISON and RAVEN

C. Rabiti, J. Cogliati, G Pastore, R. J Gardner, A. Alfonsi (INL)

294 Multiple Models Support in Probabilistic Safety Assessment Program RiskA

Shanqi Chen, Jin Wang, Jiawen Xu Fang Wang, Liqin Hu (Chinese Academy of Sciences)

299 Design and Implementation of Probabilistic Safety Analysis Program Based on C/S Architecture

Jiawen Xu (Chinese Academy of Sciences/Univ of Science and Technology of China), Jin Wang (Chinese Academy of Sciences), Shanqi Chen, Liqin Hu (Chinese Academy of Sciences/Univ of Science and Technology of China)

Human Factors and HRA—III

304 Modeling Human Failure Event Dependencies in the Columbia PRA Update

Eric Jorgenson, Vicki Manning (Enercon Services Inc.)

309 Focusing the Scope of Human Error Dependency Analysis

Dave Blanchard (Applied Reliability Engineering), Steven Mongeau (Entergy), Wes Brinsfield (Applied Reliability Engineering, Inc.)

318 Extreme Events: Causes and Prediction Romney B. Duffey (DSM Associates Inc.)

325 How to Explain Post-Core-Damage Operator Actions for Human Reliability Analysis (HRA): Insights from a Level 2 HRA/PRA Application

Susan E. Cooper (NRC), John Wreathall (WreathWood Group), Stacey M. L. Hendrickson (SNL)

Data and Parameter Estimation—II

335 PRA Parameter Estimation for NPPs in Japan (I) Parameter Estimation Overview

Kazunori Hashimoto, Atsushi Nishikimi, Shinya Kamata (Japan Nuclear Safety Inst), Shota Soga, Tomoaki Yoshida, Yukihiro Kirimoto (Nuclear Risk Research Center, Japan), Masao Kasai (Akita Prefectural Univ) **339PRA Parameter Estimation for NPPs in Japan (II)** Parameter Estimation Methodology Shota Soga, Tomoaki Yoshida, Yukihiro Kirimoto (CRIEPI), Kazunori Hashimoto, Atsushi Nishikimi, Shinya Kamata (Japan Nuclear Safety Inst), Masao Kasai (Akita Prefectural Univ)

347 PRA Parameter Estimation for NPPs in Japan (III) Parameter Estimation Experience

Kei Oya, Takahiro Kuramoto (Nuclear Engineering, Ltd.), Chikahiro Satou (TEPCO Systems Corp.), Kazunori Hashimoto, Atsushi Nishikimi , Shinya Kamata (Japan Nuclear Safety Inst), Masao Kasai (Akita Prefectural Univ)

Severe Wind PSA-II

352 High Wind PRA Plant Walkdown Insights and Recommendations

J. C. Sciaudone, L. A. Twisdale, S. S. Banik, and D. R. Mizzen (Applied Research Associates, Inc.)

361 Experience with Implementing Part 7 of the ASME PRA Standard (High Wind): Canadian Perspective

S. Kaasalainen (AMEC NSS Ltd), L. Twisdale (Applied Research Associates, Inc.), W. Al-Sarraj (AMEC NSS Ltd), J. Sciaudone, P. Vickery, D. Mizzen, S. Banik (Applied Research Associates, Inc.)

366 Advances in Wind Hazard and Fragility Methodologies for HW PRAs

Lawrence A. Twisdale, Jr., P.J. Vickery, J. C. Sciaudone, S. S. Banik, and D.R. Mizzen (Applied Research Associates, Inc.)

Digital I&C Safety and Risk Analysis—I

378 Oconee Digital Protection System PSA Model

Jeremy S. Allen (Duke Energy), Robert S. Enzinna (AREVA NP Inc.)

384 Coupling Model Checking and PRA for Safety Analysis of Digital I&C Systems

Kim Bjorkman, Jussi Lahtinen, Tero

Tyrväinen (VTT, Technical Research Centre of Finland), Jan-Erik Holmberg (Risk Pilot AB)

393 NRC Research on Digital System Modeling for Use in PRA

Ming Li, Kevin Coyne (NRC)

399 Nordic Experience and Experiments of Modelling Digital I&C Systems in PSA

Jan-Erik Holmberg, Stefan Authén (Risk Pilot AB), Ola Bäckström (Lloyd Register Consulting), Tero Tyrväinen (VTT, Finland), Lisa Zamani (Risk Pilot AB)

Non-Nuclear PSA

406 Probability of Loss of Crew Achievability Studies for NASA's Exploration Systems Development

Roger L. Boyer, Mark Bigler (NASA Johnson Space Center), James H. Rogers (NASA Marshal Space Flight Center)

410 Dynamic Modeling of Ascent Abort Scenarios for Crewed Launches

Mark Bigler, Roger L. Boyer (NASA, Johnson Space Center)

Seismic-II

415 Seismic Margins Assessment Systems Analysis Insights for Seismic PRA

Richard Anoba (Jensen Hughes)

420 Seismic PRA Insights and Lessons Learned

Andrea Maioli, Josh Beckton, Erica Carson, Rachel Solano, Clarence Worrell (Westinghouse), Martin McCann (Jack Benjamin & Assoc), T. K. Ram (Stevenson & Assoc)

Risk-Informed Regulation—II

430 Risk-Informed Prioritization of Nuclear Power Plant Issues and Activities

D. A. Dube (ERIN Engineering and Research, Inc.), J. R. Chapman (Scientech Curtiss Wright Flow Control), K. R Austgen, J. C. Butler (NEI)

437 A New Regulatory (?) Direction for Level 3 PRAs: NRC Pilot and Beyond

Stanley H. Levinson (AREVA Inc.)

442 Subsequent License Renewal and PRA

Gary W. Hayner, Jr., Garrett W. Snedeker (ERIN Engineering and Research, Inc.)

Dynamic PSA-II

448 Symbiosis of Static and Dynamic Probabilistic Approaches to Support the Design Process and Evaluate the Safety of an SFR

F. Curnier, M. Marquès (CEA), R. Kumar (Royal Inst of Technology), Z. Bama (AREVA-NP), V. Rychkov (EDF R&D)

454 Modeling of a Flooding Induced Station Blackout for a Pressurized Water Reactor Using the RISMC Toolkit

D. Mandelli, S. Prescott, C. Smith, A. Alfonsi,

C. Rabiti, J. Cogliati, R. Kinoshita (INL)

464 An Integrated Physics-Based Risk Model for Assessing the Asteroid Threat

Samira Motiwala, Donovan Mathias, and Christopher Mattenberger (NASA Ames Research Center)

Passive System Safety and Reliability

473 Reliability Analysis of Passive Systems with Multiple Competing Failure Modes Involving Performance Degradation

Luciano Burgazzi (ENEA)

480 Results of a Demonstration Assessment of Passive System Reliability Utilizing the Reliability Method for Passive Systems (RMPS)

Matthew Bucknor, David Grabaskas, Acacia Brunett and Austin Grelle (ANL)

490 A Demonstration of Dynamic Methods for Addressing Passive Safety System Reliability

Acacia Brunett, David Grabaskas, Matthew Bucknor, and Austin Grelle (ANL)

499 Analyzing Non-Piping Location-Specific LOCA Frequency for Risk-Informed Resolution of Generic Safety Issue 191

Nicholas O'Shea, Zahra Mohaghegh, Seyed A. Reihani (Univ of Illinois at Urbana-Champaign), Ernie Kee (Univ of Illinois at Urbana-Champaign/YK Risk, LLC.), Karl Fleming (KNF Consulting), Bengt Lydell (SIGMA-PHASE, Inc.)

Open PSA

509 The Andromeda Shell and Scripting Interface to Efficiently Treat PSA Models

Friedlhuber Thomas (EdgeMind S.A.S), Mohamed Hibti (EDF R&D), Antoine Rauzy (Ecole Polytechnique)

520A Method to Compare PSA Models in a Modular PSA

Friedlhuber Thomas (EdgeMind S.A.S), Mohamed Hibti (EDF R&D), Antoine Rauzy (Ecole Polytechnique)

530 Use of PSA Model XML Standard Formats for V&V Enrique Meléndez Asensio, Roberto Herrero Santos (Consejo de Seguridad Nuclear)

Low Power and Shutdown PSA

537 AES-2006 PSA Level 1 Shutdown Modes Basic Approaches and Results at FSAR Stage

Andrei Kalinkin, Aleksandr Solodovnikov, Ekaterina Shilina (JSC Atomproekt)

543 Experience with the ANS Standard for Shutdown PRA Model Quality

Ross C. Anderson, Raymond Dremel (ENERCON Services, Inc.)

547 An Approach for Assessing Low Power and Shutdown Risk

Kenneth Kiper, Rupert Weston (Westinghouse)

External Events Analysis—I

551 Screening Analysis Approach Used in the Evaluation of External Flood and Other Hazards for the U.S. Nuclear Regulatory Commission Full-Scope Site Level 3 Probabilistic Risk Assessment

Anders F. Gilbertson (NRC)

557 Using Extreme Value Theory in External Event PSA of WWER440 Reactors

Zoltan Kovacs, Janka Macsadiova, Filip Osusky (RELKO Ltd, Engineering and Consulting Services)

563 Insights from IAEA Technical Meeting on Complementary Safety Assessment of NPP Robustness Against the Impact of Extreme Events: Challenges and Developments

Irina Kuzmina, Artur Lyubarskiy, Anthony Ulses (IAEA)

569 Application of the Fault Sequence Analysis Method for the Armenian NPP: Results and Insights from the Benchmarking Study Performed under an AIEA's Extra Budgetary Project

Shahen Poghosyan, Gurgen Kanetsyan (Nuclear and Radiation Safety Center, Armenia), Sos Sargsyan, Tigran Sargsyan, Artyom Avagyan (Armenian Nuclear Power Plant – Reliability Laboratory), Irina Kuzmina, Arthur Lyubarskiy (IAEA)

Fukushima Lessons Learned—I

579 Usage of MAAP5-Dose to Support Plant Habitability

Rebecca Kalfleish, Peter Maka, John Kennedy, Lisa Lam, Keith Dinnie, Michael Chai (AMEC NSS Ltd)

583 Analysis of Potential Risk Caused by Hydrogen and Carbon Monoxide in Buildings Attached to Containment for Ascó 1&2 and Vandellós II NPPs

James P. Burelbach, Sung Jin Lee, Martin G. Plys (Fauske & Assoc), Vicente Nos (Westinghouse Technology), Juan Carlos de la Rosa (Westinghouse Electric), Joan Fornós (Asociación Nuclear Ascó-Vandellós)

590 Usage of MAAP5-Dose to Support Equipment Survivability Assessments

Peter Maka, John Kennedy, Keith Dinnie, Michael Chai (AMEC NSS Ltd)

Accident Analysis Level 3

596 Overall Accident Consequence Estimation Using the PACE Code

N. A. Higgins, S. Field, K. Ramwell (Centre for Radiation, Chemical and Environmental Hazards, Public Health England)

606 Risk Metrics and Risk Ranking in PSA

Thomas Durin, Ludivine Pascucci-Cahen, Nadia Rahni, Jean Denis, Emmanuel Raimond, Vincent Tanchoux (IRSN)

616 Probability of Being in the Situation Where Does Assessment Software Would Promote Premature EAL/PAR Decisions at Callaway

Zhiping Li (Ameren Missouri)

619 Strategies for Mitigating Releases During a Severe Accident

Richard Wachowiak (EPRI), David L. Luxat, Alexander H. Duvall, Jeff R. Gabor, Doug E. True (ERIN Engineering and Research, Inc.)

Wednesday, April 29, 2015

Human Factors and HRA—IV

627 Advanced Investigation of HRA Methods for Probabilistic Assessment of Human Barriers Efficiency in Complex Systems for a Given Organisational and Environmental Context

A. De Galizia, C. Duval, E. Serdet (EDF R&D),P. Weber (CRAN), C. Simon, B. lung (Lorraine Univ)

640 On the Incorporation of Spatio-Temporal Dimensions into Socio-Technical Risk Analysis

Justin Pence, Zahra Mohaghegh (University of Illinois at Urbana-Champaign)

650 Quantifying Organizational Factors in Human Reliability Analysis Using the Big Data-Theoretic Algorithm

Justin Pence, Zahra Mohaghegh (Univ of Illinois at Urbana-Champaign), Cheri Ostroff (Univ of South Australia), Vinh Dang (Paul Scherrer Inst), Ernie Kee (Univ of Illinois at Urbana-Champaign/YK.risk, LLC.), Russell Hubenak, Mary Anne Billings (South Texas Project Nuclear Operating Company)

Fire Analysis and NFPA 805—III

660 Modeling Main Control Room Abandonment in Fire PRAs

Paul J. Amico, Erin P. Collins (Hughes Assoc, Inc.)

666 Focusing the Scope of Fire PRA Human Reliability Analysis Using Top Event Prevention (TEP)

Wes Brinsfield (Applied Reliability Engineering, Inc.), Jeffrey Voskuil (Entergy)

675 Fire Risk Trends and Contributions—A Heuristic Method to Extrapolate U.S. Nuclear Plant Fire Risk

Deepak Rao (Entergy Services, Inc.)

682 Fire PRA Maturity and Realism: A Discussion and Suggestions for Improvement

Nathan Siu, Kevin Coyne, Selim Sancaktar, Nicholas Melly (NRC)

Fukushima Lessons Learned—II

692 Feasibility Assessment of Coping Strategies for Beyond-Design-Basis External Events

Jaewhan Kim, Soo-Yong Park, Kwang-II Ahn (KAERI)

698 External Hazards in the PRA of Olkiluoto NPP Units 1 and 2 and Interim Storage for Spent Nuclear Fuel—Ongoing Actions in the Light of the Fukushima Accident Tiia Puukka, Jari Pesonen, Antti Tarkiainen, Hannu Tuulensuu (Teollisuuden Voima Oyj) 707 Overview of a System Reliability Study for the On-Site Electrical Distribution System in NPPs Gary Wang, John Nakoski (NRC)

Modeling and Simulation—I

711 Assessment of the Structural Importance Measure with Monte Carlo Sampling

Andrija Volkanovski (Jožef Stefan Inst)

718 Bayesian Calibration of Safety Codes Using Data from Separate- and Integral-Effects Tests

Joseph P. Yurko, Jacopo Buongiorno (MIT), Robert Youngblood (INL)

728 Quantifying Safety Margin Using the Risk-Informed Safety Margin Characterization (RISMC)

David Grabaskas, Matthew Bucknor, Acacia Brunett (ANL), Marvin Nakayama (New Jersey Inst of Technology)

Risk-Informed Decision-Making—II

736 From Risk Representation to Risk Acceptability: How Risk Representation Tools Shape Decision Making

Flauw Yann, Demeestere Marion, Mazri Chabane (INERIS)

743 The Seven Risk Paradoxes

Romney B. Duffey (DSM Associates Inc.)

749 The Relationship Between CDF and LERF in Risk-Informed Regulations

Yan Wang, Zhijian Zhang (Harbin Engineering Univ), John C. Lee (Univ of Michigan)

Seismic—III

755 Status and Path Forward on Near-Term Task Force Recommendation 2.1—Seismic Donnie Harrison (NRC)

761 Advanced Seismic Probabilistic Risk Assessment Using Nonlinear Soil-Structure Interaction Analysis

Justin Coleman (INL), Mohamed Talaat, Philip Hashimoto (Simpson Gumpertz & Heger, Inc.), Curtis Smith (INL)

765 On Modeling the Risk from Seismically Induced Fires and Floods

G. Martinez-Guridi, J. Lehner (BNL), S. Sancaktar (NRC)

Risk-Informed Regulation—III

772 Risk-Informed Determinism: An Alternative to Risk-Informed Regulation for Establishing New or Totally Replacing Existing Licensing Bases

Raymond H. V. Gallucci (NRC)

782 Overview of Significant Probabilistic Risk Assessment Research Activities at the U.S. Nuclear Regulatory Commission

Kevin Coyne (NRC)

791 Approaches for Making New PRA Methods Available For Regulatory Application

Paul Amico (Jensen-Hughes, Inc.), Victoria Anderson (NEI), Ashley Lindeman (EPRI), Roy Linthicum (Exelon Corp.), Bob Rishel (Duke Energy)

PSA Standards

794 Taking a Trial Use Approach to Issuing New Probabilistic Risk Assessment Standards

Barry Sloane (ERIN Engineering and Research, Inc.)

798 Screening of External Hazards per Part 6 of the PRA Standard for the AP1000[®] Plant

David S. Teolis, Rachel A. Solano, Nataliya Povroznyk, Raymond E. Schneider (Westinghouse)

807 Low Power Shutdown Probabilistic Risk Assessment Lessons Learned and Industry Issues with Draft Standard Implementation

John J. Haugh, Mark A. Wilk (Westinghouse), Michael J. Wittas (Palo Verde Nuclear Generating Station)

Risk-Informed Maintenance

817 Assessing the Suitability of MR Performance Criteria Using the Sensitivity Method

Joseph Lavelline (ENERCON Services, Inc.), Ashley Peterman (XCEL Energy, Inc.)

822 Staggering Testing for the Refueling Surveillance Requirements

Gerald R. Andre, Andrea Maioli, and Rachel Solano (Westinghouse)

829 Availability-Based Inspection, Testing, and Maintenance Requirements for Fire Protection Systems

Kaushik Chatterjee, Kumar Bhimavarapu (FM Global)

Human Factors and HRA—V

838 Workload Measurement and Balancing Strategy for Operators in Advanced Main Control Room

Seunghwan Kim, Yochan Kim and Wondea Jung (KAERI)

845 The Importance of Operator Input to Human Reliability Analysis

Claire Taylor (OECD Halden Reactor Project) 851 CAP1000 Human Reliability Analysis and Application in Plant Operating Procedure Optimization Qiu Yongping, Zhuo Yucheng (Shanghai Nuclear Engineering Research and Design Inst)

Data and Parameter Estimation—III

855 Eliciting Expert Judgment—Peer Review Observations from a Recent Exercise and Future Plans

Nathan Siu, Jing Xing, Gabriel Taylor (NRC), Rob Cavedo (Exelon Generation)

864 Using Generic Data to Establish Dormancy Failure Rates for Space Missions

Bruce C. Reistle, Roger L. Boyer (NASA, Johnson Space Center)

867 Techniques for Managing Growing Datasets in PRA Mark B. Wishart, Jacob R. True, Steven D.

Collins (ERIN Engineering & Research, Inc.)

875 Insights from the Estimation of RPS/ESFAS Component Demand Failure Probabilities Based on Performance Monitoring Data after a Risk Informed Surveillance Test Interval Extension

Young G. Jo (Southern Nuclear Operating Co.)

Dynamic PSA-III

880 Dynamic Simulation Probabilistic Risk Assessment Model for an Enceladus Sample Return Mission

Christopher J. Mattenberger, Donovan L. Mathias, and Ken Gee (NASA Ames Research Center)

890 Conditional Modeling for Variable Success Criteria Nathan Larson (Westinghouse: Comanche Peak Nuclear Power Plant)

896 Hybrid Dynamic Event Tree Sampling Strategy in RAVEN Code

A. Alfonsi, C. Rabiti, D. Mandelli, J. Cogliati, R. Kinoshita (INL)

Digital I&C Safety and Risk Analysis—II

905 AES-2006. Results and Main Approaches to ESFAS Function Modeling During PSA Level 1 Performing at FSAR Stage

Ekaterina Shilina, Aleksandr Solodovnikov (JSC «Atomproekt»)

909 Development of a Bayesian Belief Network Model for Quantifying Software Failure Probability of a Protection System

T. L. Chu, A. Varuttamaseni, M. Yue (BNL), S. J. Lee, H. S. Eom (KAERI), H. G. Kang (KAIST), M. C. Kim (Chung-Ang Univ), H. S. Son (Joongbu Univ), S. Yang (NUV Technology, LLC)

918 Software and Human Reliability: Error Reduction and Prediction

Lance Fiondella (Univ of Massachusetts), Romney B. Duffey (DSM Assoc Inc.)

Human Factors and HRA—VI

925 Development and Application of a Methodology to Apply Human Reliability Analysis to an Independent Spent Fuel Storage Installation

P. Díaz, D. Lomeña, J. Dies, C. Tapia, A. De Blas, M. Asamoah (Technical University of Catalonia-Barcelona Tech)

932 Estimation of Human Error Probabilities Based on Operating Experience of Loviisa Nuclear Power Plant

Rasmus Hotakainen (Fortum Power and Heat Oy)

942 Upgrade of the PSA for NPP Paks to Model the Effects of New Low Power and Shutdown Emergency Operating Procedures

Attila Bareith, David Hollo, Tamas Javor, Zoltan Karsa (NUBIKI Nuclear Safety Research Inst), Tibor Kiss, Laszlo Nagy, Peter Ruckert (Paks Nuclear Power Plant Ltd), Peter Siklossy, Tamas Siklossy (NUBIKI Nuclear Safety Research Inst), Eva Tothne Laki, Zoltan Vida (Paks Nuclear Power Plant Ltd)

External Events Analysis—II

949 A Unique Method for Prioritizing Spatial Analysis Scenario Refinements

Mark B. Wishart, Gregory T. Zucal (ERIN Engineering & Research, Inc.)

955 Assessing the Zone of Vulnerability of a Nuclear Plant to External Events

J. Roy, A. Del Rosso, A. Lindeman (EPRI), F. Rahn (Whitney Research Services)

963 Approaches, Illustrative Findings and
Recommendations in Tsunami Risk and Fragility Modeling
Robert T. Sewell (R.T. Sewell Assoc), Biswajit
Dasgupta, Ron Janetzke, Debashis Basu,
Kaushik Das, John Stamatakos (CNWRA,
Southwest Research Inst)

PSA Studies and Applications

974 Creating an Effective Technical Infrastructure for Efficient Risk-Informed Performance-Based Applications and Implementation

James K. Liming (ABSG Consulting Inc.) 981 Heavy Load Movement Risk Evaluation and Management during the Prairie Island Unit 2 Steam Generator Replacement Outage Thomas A. Morgan (ENERCON Services, Inc. (Maracor)), Jayne E. Ritter (Xcel Energy)
986 EPRI PRA Documentation Assistant (PRA DocAssist)
Status – Current Use and Future Plans

Joe Edom, Sarah Zafar (ERIN Engineering
and Research, Inc.), Aaron Young
(Scientech), Jeff Riley (EPRI)

989 Using PRA DocAssist and SYSIMP to Enhance PRA

Model Rollout Tasks

Joe Edom (ERIN Engineering and Research, Inc.)

Thursday, April 30, 2015

Human Factors and HRA—VII

994 Methodology for System Reliability Analysis during the Conceptual Phase of Complex System Design Considering Human Factors

Marcelo Ramos Martins (Escola Politécnica, Universidade de São Paul), Paulo Fernando F. Frutuoso e Melo (COPPE, Universidade Federal do Rio de Janeiro), Marcos Coelho Maturana (Escola Politécnica, Universidade de São Paul)

1004 A Case Study of Human Error Probability in Commercial Aviation

Y. James Chang (NRC), Anita Cheng (Wootton High School)

1011 Insights on Human Error Probability from Cognitive Experiment Literature

Jing Xing, James Chang, and Nathan Siu (NRC)

Fire Analysis and NFPA 805—IV

1019 A Method for Explicit Modeling of Barrier Failures in Multi-Compartment Fire Scenarios

Greg Rozga, Eric Jorgenson (Enercon Services Inc.)

1023 Probabilistic Concept for Modeling Early Stages of Fire Growth and Progression Using Fire Event Data

Patrick W. Baranowsky (ERIN Engineering and Research, Inc.)

1033 Multicompartment Analyses: Limitations and Recommendations

Francisco Joglar, Susan LeStrange (Jensen Hughes)

Common Cause Failures—II

1041 Common Cause Failures Exceeding CCF Groups

J. C. Stiller, M. Leberecht, G. Gänßmantel, A. Wielenberg, A. Kreuser, C. Verstegen (GRS)

1048 Modeling Common Cause Failures of Thrusters on the International Space Station (ISS) Visiting Vehicles

Megan Haught (ARES Technical Services), Bruce Reistle (NASA)

Modeling and Simulation—II

1053 Incorporating Dynamic 3D Simulation into PRA Steven Prescott, Curtis Smith, Ramprasad Sampath (INL)

1063 Comparing Simulation Results with Traditional PRA Model on a Boiling Water Reactor Station Blackout Case Study

Zhegang Ma, Diego Mandelli, Curtis Smith (INL)

1070 Dynamic and Classical PRA:A BWR SBO Case Comparison

Diego Mandelli, Zhegang Ma, Curtis Smith (INL)

Seismic—IV

1080 On Relay Chatter Circuit Analysis
James C. Lin (ABSG Consulting Inc.)
1090 An Approach to Seismic Probabilistic Risk
Assessment Systems, Structures, and Components
Screening
Donald J. Wakefield, Farzin R. Beigi (ABSG
Consulting Inc.,), K. Raymond Fine

(FirstEnergy Nuclear Operating Co.) 1099 A Preliminary Approach to PRA for Seismically-

Induced Internal Fires and Floods

Paul J. Amico, Pierre Macheret (Hughes Assoc, Inc.), Robert P Kassawara (EPRI)

Risk-Informed Regulation—IV

1109 Overview and Comparison of Risk-Informed Efforts to Resolve Generic Safety Issue 191

C. J. Fong (NRC)

1116 Concepts for Demonstrating Compliance with Safety Limits

Richard Denning (Former faculty The Ohio State Univ) Tunc Aldemir, Ji Hyun Lee (Ohio State Univ), David Grabaskas (ANL)

1126 Assessing Fire Risk for the Significance Determination Process

Michelle Kichline, George T. MacDonald, Antonios M. Zoulis (NRC)

Next Generation Reactor PSA

1134 Anticipated Analysis of Flamanville 3 EPR Operating License - Status and Insights from Level 1 PSA Review Gabriel Georgescu, Dupuy Patricia, Francois Corenwinder (IRSN)

1142 Consideration of Physical Behavior and Possibility of Repair in the Long Term Reliability Evaluation of Decay Heat Removal Systems

Michel Marquès, Florence Curnier, Paul Gauthé (CEA, DEN, DER)

1152 Benefits and Challenges of Performing Fire PRA on a Pre-Operational Plant

Michele Osterrieder, Clarence Worrell (Westinghouse)

1155 Preliminary Level 1 Probabilistic Safety Assessment for China LEAd-based Research Reactor

Jiaqun Wang, Yazhou Li, Jin Wang, Fang Wang, Liqin Hu (Chinese Academy of Sciences)

Flooding PSA

1159 Modeling of Internal Flood Scenarios Using Mathcad Robert J. Wolfgang (Erin Engineering and Research, Inc.)

1167 External Flooding in Regulatory Risk-Informed Decision-Making for Operating Nuclear Reactors in the United States

Fernando Ferrante (NRC)

1178 First Set of Methodological Elements for Graded Probabilistic Assessment of External Flooding at EdF

C. Luzoir, M. Gallois, E. Serdet, D. Vasseur,

S. Peron (EDF R&D)