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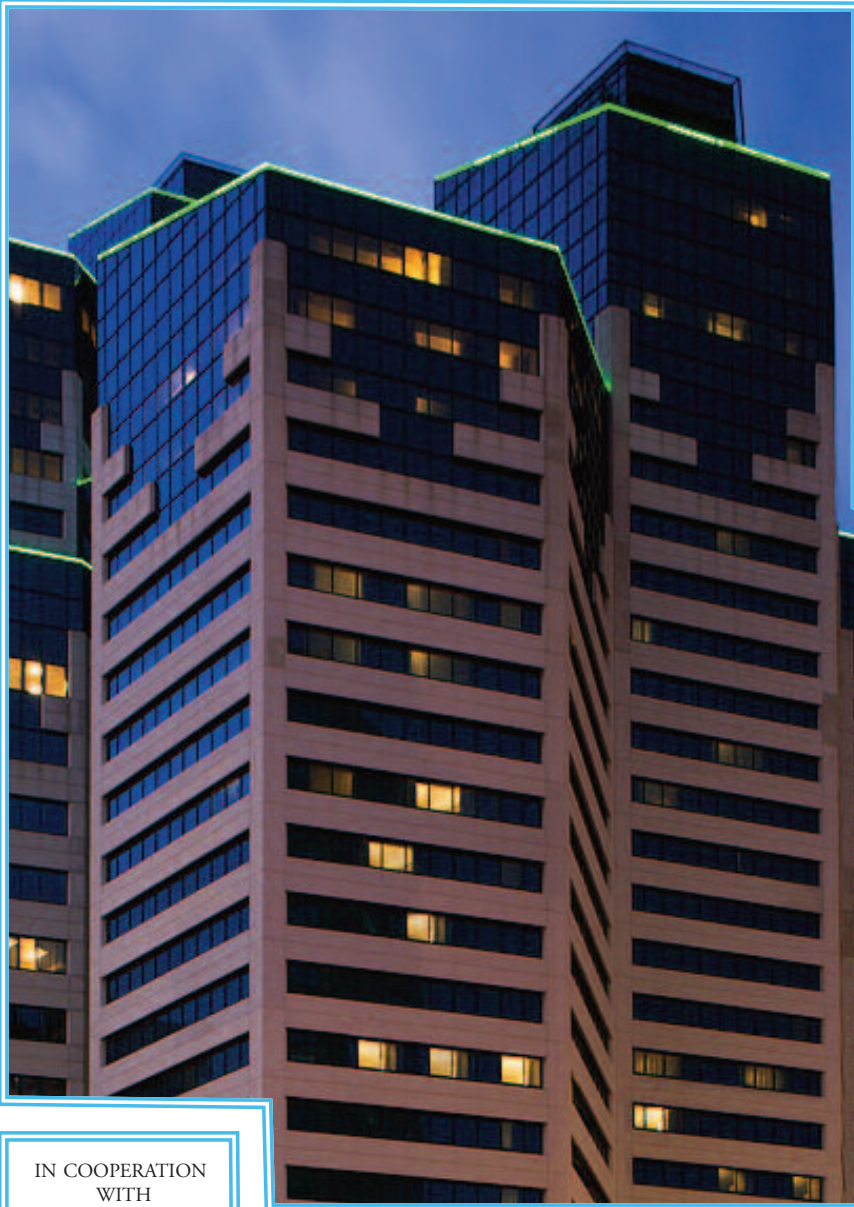
AMERICAN NUCLEAR SOCIETY

8th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human Machine Interface Technologies

NPIC & HMIT 2012

“Enabling the Future of Nuclear Energy”

JULY 22-26, 2012 • SAN DIEGO, CALIFORNIA • WESTIN SAN DIEGO



IN COOPERATION WITH



Official Program

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2012 NPIC & HMIT

**8th International Topical Meeting on Nuclear
Plant Instrumentation, Control and Human
Machine Interface Technologies**

“Enabling the Future of Nuclear Energy”

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Thank You!

- 3-4** **Conference Officials And Conference Information**
Take a peek at who is planning at the sessions for this successful conference, as well as finding out important information about hotel accommodations, meeting registration, the conference proceedings, and the social events that are scheduled.
- 5** **Professional Development Workshop**
DIGITAL INSTRUMENTATION AND CONTROL WORKSHOP
- 6-7** **Meeting Schedule**
Take a look at the listing of sessions by day.
- 8-23** **Technical Sessions by Day**
Catch a glimpse of a listing of the sessions by day– a comprehensive list of the technical papers/presentations for 2012 NPIC & HMIT.
- 24-26** **Technical Exhibitors**
See which company's are exhibiting in the 2012 NPIC & HMIT Vendor Technology Expo.

Meeting Officials

NPIC & HMIT 2012 Meeting Officials

General Co-Chair:

Bruce Hallbert
Idaho National Laboratory

Administrative Chair:

Theresa A. Flores
Idaho National Laboratory

Technical Program Chair:

HMIT:
David Desaulniers
USNRC

General Co-Chair:

J. J. Persensky
Idaho National Laboratory

Technical Program Chair:

I&C:
Sacit M. Cetiner
Oak Ridge National Laboratory

Technical Program Chair:

HMIT:
Ron Boring
Idaho National Laboratory

Assistant General Chair/

Fundraising Chair/
Sponsorship Chair:
Ted Quinn
Technology Resources

Technical Program Chair:

HMIT:
Julie I. Reed
Westinghouse Electric Company

Exhibit Chair:

Tighe W. Smith
Thermo Scientific

NPIC Track Leaders:

Joseph Naser (*EPRI*)
Edward (Ted) Quinn (*Technology Resources*)
Chris Wiegand (*Invensys*)
Ken Thomas (*INL*)
Richard T. Wood (*ORNL*)
David E. Holcomb (*ORNL*)
Steven Arndt (*NRC*)
Alireza Haghighat (*Virginia Tech*)
J. Wes Hines (*Univ of Tennessee*)
Sacit Cetiner (*ORNL*)

HMIT Track Leaders:

Scott Malcolm (*Candu Energy*)
John O'Hara (*BNL*)
Poong Hyun Seong (*KAIST*)
Carol S. Smidts (*Ohio State*)
Genevieve Filippi (*EDF R&D*)
Daniel Tasset (*IRSN*)

Conference Information

The **NPIC & HMIT 2012 International Topical Meeting** will be held at the Westin San Diego, located at 400 West Broadway, San Diego, California, 92101.

SPONSOR

Sponsor: American Nuclear Society in cooperation with IAEA
Cooperation is expected from numerous professional and technical societies, national laboratories, federal agencies and commercial organizations throughout the world.

CONFERENCE REGISTRATION

Registration is required for all attendees and presenters. Badges are required for admission to all events.

- The Full Conference Registration Fee includes admission to all technical sessions, the Opening Reception and the conference proceedings (CD-Rom).
- The Student Registration Fee includes admission to all technical sessions and the conference proceedings (CD-Rom). A full-time student i.d. is required.

NOTE: Additional tickets can be purchased at the ANS Registration Desk for the Opening Reception and the Tuesday Banquet.

REGISTRATION HOURS

The ANS registration and message desks will be located in the second floor Ballroom Foyer of the Westin San Diego Hotel. You may register, purchase tickets for events, or pick up your registration packet during the following hours:

Sunday, July 22, 2012	1:00 p.m. - 4:00 p.m.
Monday, July 23, 2012	7:00 a.m. - 7:00 p.m.
Tuesday, July 24, 2012	7:00 a.m. - 5:00 p.m.
Wednesday, July 25, 2012	7:00 a.m. - 5:00 p.m.
Thursday, July 26, 2012	7:00 a.m. - 2:00 p.m.

CONFERENCE PROCEEDINGS

This year's conference proceedings is available on CD-ROM. Copies of the conference proceedings will be available on-site. Each registrant will receive a copy of the proceedings as part of the registration fees. Additional copies may be purchased at the conference registration desk for \$195.00. To purchase copies following the conference, you may contact the ANS Accounting Department at 708-579-8210 (phone); 708-579-8314 (fax); accounting@ans.org (email); or submit your request in writing to: American Nuclear Society, 97781 Eagle Way, Chicago, IL 60678-9770. Payment information must accompany all orders.



SPEAKER REGISTRATION AND PREPARATION ROOM

All speakers are required to register for the conference and to submit a registration fee. A Speakers' Preparation Room, located in the **Coral Room** of the Westin San Diego Hotel, will be in operation for the duration of the conference to service the needs of speakers and moderators. Speakers and session chairs are requested to check-in at the speakers' desk located at the Ballroom Foyer of the Westin San Diego Hotel at least one day prior to their presentation.

SOCIAL FUNCTIONS

OPENING RECEPTION

Sunday, July 22, 2012
6:00 p.m. – 8:00 p.m.
Location: Emerald Ballroom

Each full conference registrant will receive a ticket for the Opening Reception. Additional tickets may be purchased at the ANS Registration Desk for \$95.00.

EVENING EVENT • TUESDAY BANQUET

Tuesday, July 24, 2012
6:00 p.m. – 8:00 p.m.
Location: Pool Deck (third floor)
Tickets may be purchased at the ANS Registration Desk for \$35.00.

NOTE: Spouses and guests are welcome to attend any of the scheduled activities at an additional cost. Casual or resort attire is suggested for all conference events. During registration hours, messages for meeting attendees will be taken at the ANS Registration Desk. To leave a message, call the hotel's main switchboard at 619-239-4500 and ask for the American Nuclear Society Registration Desk. Faxes for attendees may be sent to: 619-239-3274. Don't forget to pick up your badge, function tickets and meeting materials at the Registration Desk.

DIGITAL INSTRUMENTATION AND CONTROL WORKSHOP

Sunday, July 22, 2012 — 8:00 a.m.- 5:00 p.m. • Location: Opal Room

Purpose of Workshop: This course addresses the latest developments on the use of software-based equipment on nuclear plant applications, both for existing and new plants. This has become increasingly important as plants move into License Renewal, and in consideration of Obsolete Equipment Upgrades and replacements at existing facilities. Speakers will provide the perspectives of the Nuclear Regulatory Commission, the Electric Power Research Institute, industry and international participation, with emphasis on most recent developments and ongoing activities including the new plant Combined Operating License (COL) application process in the U.S. and the NRC Interim Staff Guidance (ISG) on digital ICHMI.

Tickets for **ANS Members** \$400, **Non-members** \$500 (See registration form to sign up)

Sunday, July 22, 2012

8:00-8:15 a.m.

- Introduction of Participants by Co-Chairs (T. Quinn and R. Wood) and Executive Overview – John Thorp (*NRC NRR Branch Chief*)

8:15-8:45 a.m.

- New Reactor Digital I&C Licensing Reviews, Status, and Issues – D. Santos (*NRC NRO*)

8:45-9:15 a.m.

- NRC Research Update – R. Sydnor (*NRC RES*)

9:15-9:45 a.m.

- Security of Digital Systems Including Cyber Security – E. Lee (*NRC NSIR*)

9:45-10:00 a.m.

- Break

10:00-10:30 a.m.

- SNEI Lessons Learned/Next Steps – G. Clepton (*NEI*)

10:30-11:00 a.m.

- LWR Sustainability Program – K. Thomas (*INL*)

11:00-11:30 a.m.

- EPRI Programs – R. Torok

11:30-12:30 p.m.

- Lunch

12:30-1:00 p.m.

- International efforts (*IAEA, MDER, IEEE/IEC*) – T. Quinn (*IEC SC45A WG Chair*)

1:00-1:30 p.m.

- Licensing Reviews of Existing Reactor Digital Upgrades – S. Arndt (*NRC NRR*)

1:30-2:00 p.m.

- Vendor Perspectives – **Westinghouse** – S. Seaman

2:00-2:15 p.m.

- Break

2:15-2:45 p.m.

- Vendors perspectives – **Invensys** – C. Scott

2:45-3:15 p.m.

- Vendor Perspectives – **AREVA** – P. Paris

3:15-3:45 p.m.

- Vendors perspectives – **GEH** – R. Miller

4:45-5:00 p.m.

- Panel Discussion – ALL

Meeting Schedule

Sunday, July 22, 2012

8:00a.m.-5:00 p.m.

- Professional Development Workshop

6:00-8:00 p.m.

- Vendor Technology Exhibit

6:00-8:00 p.m.

- Opening Reception in Vendor Technology Exhibit

Monday, July 23, 2012

8:30 a.m.-12:00 p.m.

- NPIC & HMIT Opening Plenary

11:00a.m.-5:00 p.m.

- Vendor Technology Exhibit

12:00-1:30 p.m.

- Walk-Around Luncheon in the Vendor Technology Exhibit

3:00-3:30 p.m.

- Afternoon Break

Monday, July 23, 2012 • NPIC

1:30-3:00 p.m.

- Digital I&C System Upgrades in Research Reactors
- Nuclear Energy Research and Development in I&C

1:30-5:00 p.m.

- Licensing Digital Upgrade—A Status Report
- Advanced Sensors and Instrumentation—DOE/NE Nuclear Energy Enabling Technologies Program—Panel

3:30-5:00 p.m.

- Knowledge Management and Workforce Development

Monday, July 23, 2012 • HMIT

1:30-3:00 p.m.

- Human Factors and Technology Issues Common to Nuclear Power and Healthcare Technology Communities—I—Panel
- Human Performance Modeling and Simulation
- PRA/PSA-HRA Applications in HFE—I

3:30-5:00 p.m.

- Control Room Design and Evaluation Case Studies
- Human Factors and Technology Issues Common to Nuclear Power and to Healthcare Technology Communities—II—Discussion Session
- Root Cause, Corrective Actions and Lessons Learned—Panel

Tuesday, July 24, 2012

9:30 a.m.-5:00 p.m.

- Vendor Technology Exhibit

9:30-10:00 a.m.

- Mid-Morning Refreshment Break

12:00-1:30 p.m.

- Walk-Around Luncheon in the Vendor Technology Exhibit

3:00-3:30 p.m.

- Afternoon Break

Tuesday, July 24, 2012 • NPIC

8:30-10:00 a.m.

- Common Issues with Digital I&C Systems—I
- Experience with I&C System Modernization—I
- In-Pile Instrumentation
- Modeling Risk in Digital I&C Systems—I
- Surveillance, Diagnostic and Prognostic Technologies and Applications—I

10:30 a.m.-12:00 p.m.

- Common Issues with Digital I&C Systems—II
- Experience with I&C System Modernization—II
- General Topics in Nuclear Plant Controls—I
- Modeling Risk in Digital I&C Systems—II
- Surveillance, Diagnostics and Prognostics Technologies and Applications—II

1:30-3:00 p.m.

- Cyber Security and Digital I&C Systems
- Equipment and Process Condition Monitoring—I
- Experience with I&C System Modernization—III
- General Topics in Nuclear Plant Controls—II
- Modeling Risk in Digital I&C Systems—III

3:30-5:00 p.m.

- EMI/RFI Issues with Digital I&C Systems
- Equipment and Process Condition Monitoring—II
- Experience with I&C System Modernization—IV
- General Topics in Nuclear Plant Controls—III
- Modeling Risk in Digital I&C Systems—IV

Tuesday, July 24, 2012 • HMIT

8:30-10:00 a.m.

- Control Room Modernization
- Innovative Control Room Design Tools—I
- International Collaboration and Experiences in Human and Organizational Factors—I

10:30 a.m.-12:00 p.m.

- Beyond Design Basis/ Severe Accident Management—Panel
- HFE Verification and Validation—I
- Human Factors Issues in Oil and Chemical Processing—Lecture

1:30-3:00 p.m.

- Applications of Technology to Enhance Maintenance and Operations—I
- Innovative Control Room Design Tools—II
- Knowledge Management in the Nuclear Industry

3:30-5:00 p.m.

- Information Presentation Techniques to Improve Decision Making
- International Collaboration and Experiences in Human Organizational Factors—II
- The HFE of SMRs

Wednesday, July 25, 2012

9:30a.m.-12:00 p.m.

- Vendor Technology Exhibit

9:30-10:00 a.m.

- Mid-Morning Refreshment Break

Wednesday, July 25, 2012 • NPIC

8:30-10:00 a.m.

- Equipment and Process Condition Monitoring—III
- General Topics in Nuclear Plant Instrumentation—I
- Experience with I&C System Modernization—V
- Regulatory Aspects of I&C—I
- Wireless Technology Applications in Nuclear Power Plants

10:30 a.m.-12:00 p.m.

- Digital I&C Technologies Available for Immediate Application—I
- General Topics in Nuclear Plant Instrumentation—II
- I&C Needs for Small Modular Reactors
- Regulatory Aspects of I&C—II

1:30-3:00 p.m.

- Advanced Sensors and Measurement Technologies—I
- Digital I&C Technologies Available for Immediate Application—II
- I&C Standards and Guidelines
- Advanced Instrumentation and Control System Technologies

3:30-5:00 p.m.

- Advanced Sensors and Measurement Technologies—II
- Digital I&C Technologies Available for Immediate Application—III

Wednesday, July 25, 2012 • HMIT

8:30-10:00 a.m.

- Challenges to Licensed Operator Training and Licensing—Panel
- PRA/PSA-HRA Applications in HFE—II
- HFE Verification and Validation—II

10:30 a.m.-12:00 p.m.

- Applications of Technology to Enhance Maintenance and Operations—II
- Human Performance Measurement Methods and Tools—I
- Multilevel Flow Modeling

1:30-3:00 p.m.

- Computerized Procedure Systems and Operator Decision Support Systems
- Fitness for Duty—What Is It, Why Do We Need It, and How Do We Analyze It?—Panel

3:30-5:00 p.m.

- Advances in HMI Technology
- Estimating and Crediting Response Times for Safety Critical Operator Actions—Panel

Thursday, July 26, 2012 • NPIC

8:30-10:00 a.m.

- Digital I&C Technologies Available for Immediate Application—IV
- Software Verification and Validation (V&V) Issues—I
- I&C Systems for Next-Generation Power Plants—I

8:30 a.m.-12:00 p.m.

- Experience with Licensing Digital I&C Systems—Panel

10:30 a.m.-12:00 p.m.

- I&C Systems for Next-Generation Power Plants—II
- Software Verification and Validation (V&V) Issues—II

Thursday, July 26, 2012 • HMIT

8:30-10:00 a.m.

- HFE Standards
- Human Performance Measurement Methods and Tools—II
- Team Performance in Computerized Control Rooms

10:30 a.m.-12:00 p.m.

- Alarm System Development and Analysis
- HFE Issues in LWR Sustainability and Control Room Simulation
- HFE Program Development

Technical Sessions: Monday

MONDAY, JULY 23, 2012, 8:30 A.M.

NPIC & HMIT Opening Plenary

Crystal Ballroom

8:30 a.m.

Opening Remarks and Welcome

- Bruce Hallbert (*Idaho National Laboratory*)
- J. J. Persensky (*Idaho National Laboratory*)

Speakers:

- William C. Ostendorff (*Commissioner, NRC*)
- Matthew Weinger (*Professor and Vice-Chair at Vanderbilt University School of Medicine*)
- Sal Golub (*Associate Deputy Assistant Secretary for Nuclear Reactor Technologies, Office of Nuclear Energy, U.S. Department of Energy*)

Walk-Around Luncheon in the Vendor Technology Exhibit

Emerald Ballroom

12:00 p.m. - 1:30p.m.

MONDAY, JULY 23, 2012, 1:30 P.M. • NPIC

Digital I&C System Upgrades in Research Reactors

Chair: D. A. Hardesty (*NRC*)

Diamond II Room

1:30 p.m.

I&C Improvements at VR-1 Training Reactor, Martin Kropik, Jan Rataj, Michal Sunka (*Czech Technical Univ*)

1:50 p.m.

Lessons Learned While Updating NUREG-1537, M. D. Muhlheim, T. L. Wilson, Jr. (*ORNL*), L. A. Hardin, Jr., D. A. Hardesty, A. Adams, N. Carte (*NRC*)

2:10 p.m.

Optimizing Research Reactor Licensing Basis to Allow for Effective 10 CFR 50.59 Screening on Extensive Reactor Changes, Jason Lewis, Geoffrey Bickford, Kelly A. Jordan (*Univ of Florida*), *invited*

2:30 p.m.

Implementation of Digital Upgrades to the University of Florida Training Reactor (*UFTR*) Protection and Control Systems, Geoffrey Bickford, Jason Lewis, Kelly A. Jordan (*Univ of Florida*), *invited*

Nuclear Energy Research and Development in I&C

Chair: Richard Wood (*ORNL*)

Topaz Room

1:30 p.m.

Formal Verification of Software Important to Safety Using the Frama-C Tool Suite, Pascal Cuq, Florent Kirchner, Boris Jakobowski (*CEA*), Sebastien Labbé, Thuy Nguyen (*EDF Research & Development*), Philippe Hilsenkopf (*AREVA NP SAS*)

2:00 p.m.

A Distributed Hardware-in-the-Loop Test Setup for the Validation of a Steam Generator Control System, Michael Pietrykowski, Mike Brink, Qingti Guo (*Ohio State*), Edward (Ted) L. Quinn (*Technology Resources*), Tunc Aldemir, Don Miller, Carol Smidts (*Ohio State*)

2:30 p.m.

High Reliability Digital I&C System Design: Triple Modular Redundant Controller Approach, Shian-Shing Shyu, Chung-Lin Lee, Hsin-Kai Liao, Chang-Kuo Chen (*INER*)

Knowledge Management and Workforce Development

Chair: Alireza Haghighat (*Virginia Tech*)

3:30 p.m.

Education and Training of I&C Professionals for Project Design from the Perspective of the EPC Contractor, Bradley Laing, Jim Benkert, David A. Toy (*Fluor*)

4:00 p.m.

Equipping Instrumentation and Control Engineers with the Right Knowledge to Address EMI Problems in Their Plants, Philip F. Keebler (*EPRI*), Kermit O. Phipps (*AMS Technology Center*)

4:30 p.m.

IAEA Technical Workshops and Training on Digital Instrumentation and Control for Nuclear Power Plants around the World, Edward L. Quinn (*Technology Resources*), Oszvald Glöckler (*EC-JRC*), János Eiler (*IAEA*), Richard Wood (*ORNL*)

Note: *This session will follow the preceding session, which will begin at 1:30 p.m.*

Licensing Digital Upgrades—A Status Report

Cochairs: William Kemper (*NRC*), Edward (Ted) Quinn (*Technology Resources*)

Crystal I Ballroom

1:30 p.m.

Analog technology is rapidly becoming obsolete and difficult to maintain. Operators of nuclear facilities are replacing obsolete safety and control systems with digital, computer-based systems. Over the past several years, NRC staff has worked to establish regulatory requirements, standards, and guidelines that allow licensees to forward-fit digital enhancements without unnecessary regulatory burden.

This panel session will provide a forum to exchange the latest experiences with implementing digital upgrades in nuclear facilities based on NRC regulations including the recent Interim Staff Guidance (ISG) documents (ISG-06, Licensing Digital Systems, and others). Speakers will address key challenges and lessons learned in all phases of these important digital upgrades from owner, vendor, and regulator's perspectives. Speakers from NRC, vendors, and industry will provide their overview and lessons learned to date.

Panelists:

- John Thorp (*NRC*)
- Richard Stattel (*NRC*)
- John Hefler (*Altran*)
- Scott Patterson (*PG&E*)
- Kenneth Schrader (*PG&E*)
- John Rengepis (*Altran*)
- Steven A. Hilmes (*TVA*)
- Roman Shaffer (*Invensys*)

Advanced Sensors and Instrumentation—DOE/NE Nuclear Energy Enabling Technologies Program—Panel

Cochairs: Suibel Schuppner (DOE), Bruce P. Hallbert (INL)

Crystal II Ballroom

1:30 p.m.

The Nuclear Energy Enabling Technology (NEET) program was recently authorized and will lend vital technical support to each of the U.S. Department of Energy, Office of Nuclear Energy Objectives. The mission of the NEET program is to conduct R&D to deliver new or improved technologies that directly support and enable a broad range of DOE-NE's R&D activities and to encourage the development of transformative, creative innovations in nuclear energy science and engineering.

This panel session will consist of presentations, short reports, and questions and answers (Q&A) regarding the recently initiated Advanced Sensors and Instrumentation subprogram of the NEET Crosscutting Technologies Development program. Panelists will represent various parts of the subprogram and discuss the status and plans of ongoing work.

Panelists:

- Richard T. Wood (ORNL)
- David E. Holcomb (ORNL)
- Dwight Clayton (ORNL)
- Chris Grandy (ANL)
- Richard Vilim (ANL)
- Joy Rempe (INL)
- Jacques Hugo (INL)
- Leonard Bond (PNNL)

MONDAY, JULY 23, 2012, 1:30 P.M. • HMIT

Human Performance Modeling and Simulation

Chair: Christopher Plott (*Alion Science & Technology*)

Opal Room

1:30 p.m.

The Use of Computational Human Performance Modeling as Task Analysis Tool, Jacques Hugo, David Gertman (INL)

1:50 p.m.

Computational Human Performance Modeling for Alarm System Design, Jacques Hugo (INL)

2:10 p.m.

Using Modeling and Simulation Tools to Support Performance in Robotic Automation Systems, Angelia Sebok, Christopher Wickens, A. Marquis Gacy (*Alion Science and Technology*), *invited*

2:30 p.m.

Human Performance Modeling as a Complement to Other Human Factors Engineering Analyses, Christopher Plott (*Alion Science & Technology*)

Control Room Design and Evaluation Case Studies

3:30 p.m.

Safety Assessment of the Human and Organisational Factors in the Design Process of the New French Reactor EPR in Flamanville, Daniel Tasset, Isabelle Pichancourt (IRSN)

4:00 p.m.

The Incorporation of the Utilities Input into the Design of the AP1000 Main Control Room, James Flowers (*Southern Nuclear*)

4:30 p.m.

Conceptual Human-System Interface Studies for the Modernization of Control Rooms at Paks NPP, Csaba Major, Csaba Horváth, Sándor Lipcsei, János Véghe (*Hungarian Academy of Sciences*)

Note: This session will follow the preceding session, which will begin at 1:30 p.m.

PRA/PSA-HRA Applications in HFE—I

Chair: Gary Munley (*Health and Safety Executive*)

Diamond I Room

1:30 p.m.

Development of a Human Reliability Analysis Tool for Conventional and Advanced Main Control Rooms in Nuclear Power Plants, Seung Jun Lee, Jaewhan Kim, Seung-Cheol Jang (KAERI)

2:00 p.m.

Improvement and Application of HRA Methods for the Nuclear Power Plants with Digital I&C Systems, Xiufeng Tian, Jinggong Liu, Yu Zhou (*China Nuclear Power Eng Co., Ltd*)

Root Cause, Corrective Actions and Lessons Learned—Panel

Chair: Kay Gallogly (*The 42 Group, LLC*)

3:30 p.m.

This session will include a panel discussion of industry root cause evaluation experts. The session will begin with a series of questions to the panelists that will initiate a dialogue on current industry philosophy on the approach to conducting thorough root cause evaluations and best practices with regard to the determination of effective corrective actions with appropriate reviews. The dialogue will include the lessons that have been learned as well as the future look at emerging standards for the industry. The second half of the session will be open to questions from the attendees. This will be an opportunity for an interactive discussion between panelists and attendees on the current industry issues.

Panelists: to be determined

Note: This session will follow the preceding session, which will begin at 1:30 p.m.

Technical Sessions: Tuesday

Human Factors and Technology Issues Common to Nuclear Power and Healthcare Technology Communities—I–Panel

Chair: Matthew B. Weinger (*Vanderbilt Univ*)

Pearl Room

1:30 p.m.

Prior to the NPIC & HMIT 2012 meeting, a select group of stakeholders from the nuclear and healthcare technology communities will hold a workshop titled “RISK, RELIABILITY, AND HUMAN FACTORS IN HEALTHCARE AND NUCLEAR POWER: LEARNING FROM EACH OTHER.” Participants will discuss issues faced by both communities and identify opportunities to collaborate or leverage each other’s work. The following issues will be discussed:

- Dependability of safety critical software;
- Technologies that provide diagnostic and prognostic capabilities;
- Human factors and human reliability;
- Event analysis and corrective actions

The intent of the NPIC & HMIT panel and discussion session is to share the findings of the workshop and to continue those discussions with a broader audience of both I&C and Human Factors practitioners. The panel will include both nuclear power industry and healthcare technology stakeholders. Ample time will be allowed for audience participation.

Panelists:

- Ken Thomas (*INL*)
- David Desaulniers (*NRC*)
- Emilie Roth (*Roth Cognitive Engineering*)
- Carol Herman (*AAMI*)

Human Factors and Technology Issues Common to Nuclear Power and to Healthcare Technology Communities—II–Discussion Session

Chair: Matthew B. Weinger (*Vanderbilt Univ*)

3:30 p.m.

This time is reserved for audience Q&A regarding the preceding panel session on this subject.

Note: This session will follow the preceding session, which will begin at 1:30 p.m.

TUESDAY, JULY 24, 2012, 8:30 A.M. • NPIC

Experience with I&C System Modernization—I

Cochairs: Janos Eiler (*Parks Nuclear Power Plant*), Edward (Ted) L. Quinn (*Technology Resources*)

Diamond II Room

8:30 a.m.

Reliability and Accuracy Data for a Modern Analog Signal Processor, Tighe W. Smith, Dan Gaskill (*Thermo Fisher Scientific*)

8:50 a.m.

Obsolescence Management for New and Aging Designs, Kelli Chou (*Lockheed Martin*)

9:10 a.m.

In sights Gained for Updating an Analog I&C System to a Digital System, M. D. Muhlheim, T. L. Wilson (*ORNL*), L. A. Hardin, Jr., D. A. Hardesty, A. Adams, N. Carte (*NRC*)

9:30 a.m.

Fuqing NPP Digital I&C System Design, Chen Rigang (*China Nuclear Power Eng Co Ltd.*)

Experience with I&C System Modernization—II

Cochairs: Janos Eiler (*Parks Nuclear Power Plant*), Edward (Ted) L. Quinn (*Technology Resources*)

10:30 a.m.

Implementing Digital Technologies in Nuclear Utilities, Christophe M. Wiegand (*Invensys Nuclear*), Michael Phillips (*Invensys*)

11:00 a.m.

Understanding Guardianship, Nathan Robert Romine (*Siemens Energy Inc.*)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

Common Issues with Digital I&C Systems—I

Chair: W. Dean Crumpacker (*Sargent & Lundy*)

Topaz Room

8:30 a.m.

Design of Long Life Digital I&C Systems for 1E Safety Related Applications, Joseph P. Fowler, William J. Herrity, Paul M. Stankiewicz (*DRS Consolidated Controls, Inc.*)

9:00 a.m.

Challenges and Lessons Learned in I&C Design and Licensing for Four New Nuclear Plants in China, Christopher Wiegand (*Invensys*)

9:30 a.m.

Digital I&C Equipment: Safety and Security, Ewald Liebhart (*Mirion Technologies*)

Common Issues with Digital I&C Systems—II

Chair: W. Dean Crumpacker (*Sargent & Lundy*)

10:30 a.m.

Data Model Based Engineering of Computer-Based Instrumentation and Control, Markus Göering (*Vattenfall Europe Nuclear Energy GmbH*), Alexander Fay (*Helmut Schmidt Univ/Univ of the Federal Armed Forces Hamburg*)

11:00 p.m.

Computerized Surveillance Requirements Procedures for Technical Specification Monitoring Applications, Sergey S. Anikanov, Nicholas J. Marangoni (*Westinghouse*), Igor V. Stolyetnyi, Vladimir N. Kononov, Igor M. Tregubov (*Westron LLC*)

11:30 a.m.

Reliability Analysis of Network Data Communication for Lungmen NPS, Teng-Chieh Hsu, Hwai-Pwu Chou (*Nat'l Tsing Hua Univ*)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

Modeling Risk in Digital I&C Systems—I

Cochairs: Carol Smidts (*Ohio State*), Raymond C. Torok (*EPRI*)

Crystal I Ballroom

8:30 a.m.

Diablo Canyon Power Plant Digital Process Protection System Replacement Diversity and Defense-in-Depth, Scott B. Patterson (*PG&E*), John W. Hefler (*Altran*), Edward (Ted) L. Quinn (*Technology Resources*)

8:50 a.m.

Development of a Diversity and Defense-In Depth Strategy for the CNNC Fuqing and Fangjiashan Nuclear Plants, Gershon Shamay (*Invensys*), Jerry Mauck (*JLM Eng and Technology Resources*), Craig Peterson (*CSA*), Edward L. Quinn (*Technology Resources*)

9:10 a.m.

Top-Down Versus Bottom-Up: Failure Analysis Methods for Digital Systems, Ray Torok (*EPRI*), Bruce Geddes (*Southern Eng Services*), David Blanchard (*Applied Reliability Eng*), Thuy Nguyen (*EdF*)

9:30 a.m.

Risk-Informed Design Issues of Digital Instrumentation and Control System in Nuclear Power Plant, Danying Gu, Ming Hu, Binbin Zhang, Shuhui Zhang (*Shanghai Nucl Eng Research Design Inst*)

Modeling Risk in Digital I&C Systems—II

Cochairs: Carol Smidts (*Ohio State*), Raymond C. Torok (*EPRI*)

10:30 a.m.

Nordic Experience and Experiments of Modeling Digital I&C Systems in PSA, Jan-Erik Holmberg (*VTT*), Stefan Authen (*Risk Pilot AB*), Johan Gustafsson (*KTH*)

10:50 a.m.

Discussion on Definitions of Terms in Reliability Analysis of Digital I&C Systems, Man Cheol Kim (*KAERI*), Jan C. Stiller (*GRS*), Carol S. Smidts (*Ohio State*)

11:10 a.m.

Applying Bayesian Belief Network Method to Quantifying Software Failure Probability of a Protection System, T. L. Chu, M. Yue, A. Varuttamaseni (*BNL*), M. C. Kim, H. S. Eom (*KAERI*), H. S. Son (*Joongbu Univ*), A. Azarm (*Innovative Eng & Safety Solutions*)

11:30 a.m.

A Reliability Estimation Method for Dynamic Systems Which have Various Operation Modes Varying with Time, Seung Ki Shin, Inseok Jang, Poong Hyun Seong, Hyun Gook Kang (*KAIST*)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

Surveillance, Diagnostics and Prognostics Technologies and Applications—I

Cochairs: J. Wes Hines (*Univ of Tennessee*), Leonard Bond (*PNNL*)

Crystal II Ballroom

8:30 a.m.

Monitoring and Prognostics of Hydraulically Operated Butterfly Valves, B. Jeffries (*Univ of Tennessee*), N. Propes, A. Thakker (*Global Technology Connection*), B. R. Upadhyaya, J. W. Hines (*Univ of Tennessee*)

9:00 a.m.

Transient Operation Prognostic Modeling: Utilizing the Full Spectrum of Available Information, Michael E. Sharp, J. Wesley Hines (*Univ of Tennessee*), Robert Austin (*EPRI*)

9:30 a.m.

Application of Prognostic Methods for Predicting Remaining Useful Life of Nuclear Plant Equipment and Components, B. D. Shumaker, R. D. O'Hagan, J. B. Ledlow, D. E. McCarter, H. M. Hashemian (*AMS*)

Surveillance, Diagnostics and Prognostics Technologies and Applications—II

Cochairs: J. Wes Hines (*Univ of Tennessee*), Leonard Bond (*PNNL*)

10:30 a.m.

Comparison of Transient Startup and Steady-State Order Domain Analysis for Degraded Induction Motors, Eric Strong, J. Wesley Hines, Michael Sharp, Matthew Weeks (*Univ of Tennessee*)

11:00 a.m.

Sources of Uncertainty on a Linear Degradation General Path Model, Matthew Tong, Eric Strong, Michael Sharp, J. Wesley Hines, Belle R. Upadhyaya (*University of Tennessee*)

11:30 a.m.

Bayesian Methods for Successive Transitioning Between Prognostic Types: Lifecycle Prognostics, Alan Nam, Michael Sharp, J. Wesley Hines, Belle R. Upadhyaya (*Univ of Tennessee*)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

Technical Sessions: Tuesday

In-Pile Instrumentation

Cochairs: Joshua E. Daw (INL), Joy L. Rempe (INL)

Ivory Room

8:30 a.m.

Enhanced In-Pile Instrumentation for Materials and Test Reactors, Joy Rempe, Darrell Knudson, Joshua Daw, Troy Unruh, Benjamin Chase, Kurt Davis, Robert Schley (INL)

8:50 a.m.

Use of Silicon Carbide Monitors in ATR Irradiation Testing, K. L. Davis, B. Chase, T. Unruh, D. L. Knudson, J. Rempe, H. Chichester (INL), K. Sridharan (Univ of Wisconsin–Madison)

9:10 a.m.

Update on Ultrasonic Thermometry Development at Idaho National Laboratory, Joshua Daw, Joy Rempe (INL), John Crepeau (Univ of Idaho)

9:30 a.m.

Melt Wire Sensors Available to Determine Peak Temperatures in ATR Irradiation Testing, K. L. Davis, D. L. Knudson, J. E. Daw, J. L. Rempe, A. J. Palmer, (INL)

General Topics in Nuclear Plant Controls—I

Cochairs: Tunc Aldemir (Ohio State), Sacit M. Cetiner (ORNL)

10:30 a.m.

Development and Hardware-in-the-Loop Analysis of Commercial Marine-Nuclear Propulsion Plant Programmable Logic Controller-Based Control, Marie A. Lawson, James A. Turso (Northrop Grumman Marine Systems)

11:00 a.m.

Instrumentation and Control Design of the Tokamak Cooling Water System, Kofi Korsah (ORNL), Steve Black, Michael Smith, Brad Crotts, Derek Pastwick (AREVA Federal Services, LLC)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

TUESDAY, JULY 24, 2012, 8:30 A.M. • HMIT

Control Room Modernization

Chair: Hanna Koskinen (VTT Technical Research Centre of Finland)

Opal Room

8:30 a.m.

Application of HFE to Support Turbine Control System (TCS) Upgrade, Julia Forbes, Matt Gibson, Jay Pritchett (Progress Energy), Lewis F. Hanes (Consultant)

9:00 a.m.

Systems Usability Concerns in Hybrid Control Rooms, Paula Savioja, Iina Aaltonen, Hannu Karvonen, Hanna Koskinen, Jari Laarni, Marja Liinasuo, Leena Norros (VTT Technical Research Centre of Finland), Leena Salo (Fortum)

9:30 a.m.

I&C Modernization Project of Loviisa NPP—Identical Digital Safety Human-System Interfaces for Main and Safety Control Rooms, Leena Salo, Mika Lehtonen, Jarmo Korhonen (Fortum Power & Heat Ltd)

HFE Verification and Validation—I

Chair: Douglas Hill (Hill Engineering Consultants GmbH)

10:30 a.m.

Preparations for Integrated System Validation of the AP1000 Main Control Room and Human System Interface Design, Zhonghai Li, Julie I. Reed, Robert B. Fuld (Westinghouse)

11:00 a.m.

Human Factors Engineering Integrated System Validation in a Hybrid Control Room, Fei Song, Danying Gu, Shuhui Zhang, Juntao Hu (Shanghai Nuclear Eng Research & Design Inst)

11:30 a.m.

Human Factors Engineering Verification and Validation of Human System Interface Design of the Main Control Room in CPR1000 Nuclear Power Plants, Yanzi Liu, Jianbo Zhang, Ming Jia, An Gu, Shi Ji, Yonbin Sun (China Nuclear Power Eng Co, Ltd.)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

Innovative Control Room Design Tools—I

Chair: John Wood (CCD Design & Ergonomics Ltd.)

Diamond I Room

8:30 a.m.

Supporting Human Factors Engineering Design Review Activities Using Virtual Control Room Mockups, Morten A. Gustavsen, Michael N. Louka (OECD)

9:00 a.m.

The Development of Human Systems Simulation Laboratory: Strategic Direction, Jacques Hugo, Katya le Blanc, David Gertman (INL)

9:30 a.m.

Development of an Advanced Control Room: From Virtual to Reality, Craig Pfladderer (Lockheed Martin)

Human Factors Issues in Oil and Chemical Processing—Lecture

Chair: Dave Strobhar (Beville Eng)

Oil refineries and chemical plants have been using distributed control systems with VDT based interfaces since the early 1980s to control processes with volatile or hazardous materials. This lecture will address

some of the key issues with which this industry has struggled, particularly alarm management, display system design, and staffing of the console positions. Recent research by the industry through the Center for Operator Performance will be highlighted.

Lecturer:

10:30 a.m.

Human Factors Issues in Oil and Chemical Processing, David A. Strobhar (*Beville Eng/Center for Operator Performance*)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

International Collaboration and Experiences in Human and Organizational Factors—I

Chair: Daniel Tassett (*IRSN*)

Pearl Room

8:30 a.m.

International Collaboration in the Development of a Reactor Protection System, Irene Siedlarczyk (*Lockheed Martin*), ZengHai (*State Nuclear PowerAutomation System Eng Co*)

9:00 a.m.

The Regulatory Experiences and Activities of Human Factors Engineering at Korea Nuclear Power Plants, Nam Choi Seong, Heui Jeong Choong, Dong Hoon Lee (*KINS*)

Beyond Design Basis/ Severe Accident Management—Panel

Chair: Ho Nieh (*NRC*)

10:30 a.m.

The accident at Fukushima highlights the importance of having plant operators who are well prepared and well supported by technically sound and practical procedures, guidelines, and strategies, as well as a preplanned approach to command and control and decision-making. Each of the onsite emergency action programs (abnormal operating procedures, alarm response procedures, EOPs, SAMGs, and EDMGs) contributes to overall emergency response capability of the plant and operators to mitigate accidents. Integration of these accident support functions in a logical and coherent manner and with appropriate regulatory treatment to ensure the effectiveness of operator actions during events would substantially increase the effectiveness of the overall event mitigation. This session will discuss how various organizations are addressing onsite emergency action programs, in a post-Fukushima world.

Panelists:

- Jack McHale (*NRC*)
- Toshihiro Bannai (*NISA*)
- Roy Harter (*Duane Arnold/FPL*)
- Daniel Tasset (*IRSN*)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

Walk-Around Luncheon in the Vendor Technology Exhibit

Emerald Ballroom

12:00 p.m. - 1:30 p.m.

TUESDAY, JULY 24, 2012, 1:30 P.M. • NPIC

Experience with I&C System Modernization—III

Cochairs: Janos Eiler (*Parks Nuclear Power Plant*), Edward (Ted) L. Quinn (*Technology Resources*)

Diamond II Room

1:30 p.m.

Development of a DSP-Based Platform for Safety I&C Systems, Yong Suk Suh, Jong Yong Keum, Kwang Il Jeong, Joon Ku Lee, Je Yun Park, Young Ki Kim (*KAERI*)

2:00 p.m.

Strategy of NPP I&C Systems Modernization in Ukraine, Mikhail Yastrebenetsky, Yuri Rozen, Alexander Klevtsov (*SSTC NRS*), Mikhail Gashev (*State Nuclear Regulatory Inspectorate of Ukraine*)

2:30 p.m.

Implementation of Time Sensitive Applications in Distributed Control and Information Systems (*DCIS*), Sergey S. Anikanov, Nicholas J. Marangoni (*Westinghouse*), Vladimir N. Konovalov (*Westron, LLC*)

Experience with I&C System Modernization—IV

Cochairs: Edward (Ted) L. Quinn (*Technology Resources*), Janos Eiler (*Parks Nuclear Power Plant*)

3:30 p.m.

Specifics of Implementation of the RCS Leak Rate Monitoring Application Based on PWROG Recommendations, Sergey S. Anikanov, Nicholas J. Marangoni (*Westinghouse*), Igor V. Stolyetnyy, Tetyana V. Bushenyova (*Westron LLC/Kharkov, Ukraine*)

3:50 p.m.

The Replacement of Rod Control System in the Korean Nuclear Power Plants, Hyeong-Soon Yim, Hyeong-Pyo Hong, Hae-Gon Shin, Seung-Min Baek (*KEPCO*), Deong Min Seo, Hyun-Ju Kim, Woo-Sik Shin, Cheol-Ha An, Chan-Joong Kim (*Korea Hydro and Nuclear Power*)

4:10 p.m.

Inadequate Core Cooling Mitigation System for Crystal River Unit 3, Robert M. Queenan (*Sciencetech*)

4:30 p.m.

Good Practices of Control Rod Control System to Eliminate the Single Point Vulnerabilities in PWR, Chae-Ho Nam, Soo-Am Kim, Kook-Hun Kim (*Doosan Heavy Industries & Construction Co*)

Note: This session will follow the preceding session, which will begin at 1:30 p.m.

Technical Sessions: Tuesday

Cyber Security and Digital I&C Systems

Cochairs: George Simonds (NRC), Bill Gros (NEI)

Topaz Room

1:30 p.m.

Development of a New IEC Standard—Requirements for Security Programs for Computer-Based Systems, Edward L. Quinn (*Technology Resources*), Leroy Hardin (NRC), Ludovic Pietre-Cambacédes (*EdF*),

2:00 p.m.

Cyber Security Procurement Methodology for Digital Instrumentation and Control Systems, Bradley Geddes (*Southern Engineering Services*), Aaron Hussey, Robert Austin, (EPRI)

EMI/RFI Issues with Digital I&C Systems

Chair: Hashem Hashemian (AMS)

3:30 p.m.

Eliminating the Need for Exclusion Zones in Nuclear Power Plants: What are the New Boundaries?, Philip F. Keebler, Frank D. Sharp (EPRI)

3:50 p.m.

Interconnecting the Elements of an Effective EMC Management Program for Nuclear Power Plants, Philip F. Keebler, Jeff Dols (EPRI), Stephen Berger (*TEM Consulting*)

4:10 p.m.

Brief Overview on Regulations and Guidance Pertaining to EMI/RFI in Digital I&C Systems in Operating Reactors, and in New Reactor Reviews, D. W. Spaulding-Yeoman (NRC)

4:30 p.m.

Addressing Electromagnetic Compatibility Concerns for Digital Upgrades, Chad J. Kiger (AMS)

Note: This session will follow the preceding session, which will begin at 1:30 p.m.

Modeling Risk in Digital I&C Systems—III

Cochairs: Carol Smidts (Ohio State), Raymond C. Torok (EPRI)

Crystal I Ballroom

1:30 p.m.

Reliability Analysis of Digital I&C System in Nuclear Power Plants Based on GO-FLOW Methodology, Jun Yang, Ming Yang (*Harbin Engineering Univ*)

2:00 p.m.

Dynamic Reliability: Towards Efficient Simulation of the Availability of a Feedwater Control System, Huilong Zhang, Benoîte de Saporta, François Dufour (*Univ Bordeaux*), Gilles Deleuze (*EDF R&D*)

Modeling Risk in Digital I&C Systems—IV

Cochairs: Carol Smidts (Ohio State), Raymond C. Torok (EPRI)

3:30 p.m.

Best Practice Guidelines on Failure Modes Taxonomy for Reliability Assessment of Digital I&C Systems for PRA, Jan-Erik Holmberg (*VTT*), Stefan Authén (*Risk Pilot AB*), Abdallah Amri (*OECD/NEA*), Jiri Sedlak (*Nuclear Research Inst*), Thuy Nguyen (*EdF R&D*)

4:00 p.m.

Regulatory Perspectives and Lessons Learned from USNRC New Reactor Instrumentation and Control Licensing Reviews, Ian Jung (NRC)

Note: This session will follow the preceding session, which will begin at 1:30 p.m.

Equipment and Process Condition Monitoring—I

Cochairs: Leonard Bond (PNNL), J. Wes Hines (Univ of Tennessee)

Crystal II Ballroom

1:30 p.m.

Intelligent Distributed Condition Monitoring for Nuclear Power Plants, C. J. Wallace, G. M. West, S. D. J. McArthur, (*Univ of Strathclyde*), M. Coghlan (*EDF Energy*)

2:00 p.m.

Investigation of Gas Circulator Response to Load Transients in Nuclear Power Plant Operation, Jason J. A. Costello, Graeme M. West, Stephen D. J. McArthur, (*Univ of Strathclyde*), Graeme Campbell (*EDF Energy*)

2:30 p.m.

Faulty Measurement Substitution and Control Reconfiguration Using a Multivariate Flow Control Loop, Sergio R. P. Perillo, Belle R. Upadhyaya, J. Wesley Hines (*Univ of Tennessee*)

Equipment and Process Condition Monitoring—II

Cochairs: Leonard Bond (PNNL), J. Wes Hines (Univ of Tennessee)

3:30 p.m.

Leak Detection, Isolation and Characterization Using a Pressure Sensing Line Frequency Response Function, Keith E. Holbert, Ryan M. Wilding (*Arizona State Univ*)

3:50 p.m.

A Study on Distributed Condition Monitoring in Nuclear Power Plants, Tan Xiang, Zhu Rong-xu, Mu Tie-gang, Gong Cheng, Peng Min-jun (*Harbin Engineering Univ*)

4:10 p.m.

Implementation of On-Line Condition Monitoring Technologies in Research Reactors, E. T. Riggsbee, R. D. O'Hagan, M. S. Pruitt, H.M. Hashemian (AMS)

4:30 p.m.

PWR Virtual Monitoring System Based on Digital Filtering and Signal Integration, Lv Yang, Xia Hong (*Harbin Engineering Univ*)

Note: This session will follow the preceding session, which will begin at 1:30 p.m.

General Topics in Nuclear Plant Controls—II

Cochairs: Tunc Aldemir (*Ohio State*), Sacit M. Cetiner (*ORNL*)

Ivory Room

1:30 p.m.

Analytically Compensated Physical Model of a Steam Generator with Non-Minimum Phase Level Response, Drew J. Rankin, Kyle P. van Hoof, Jin Jiang (*Univ of Western Ontario*)

1:50 p.m.

A Methodology for Detection of Failures in Floating Point Calculations in Safety I&C, Arndt Lindner, Christian Gerst (*Institut für Sicherheitstechnologie (ISTec) GmbH*)

2:10 p.m.

“Guideline on Configuration Management for Digital Instrumentation and Control Equipment and Systems” EPRI Product 1022991 (*December 2011*), Ray Torok (*EPRI*), Bruce Geddes (*SES*), *invited*

2:30 p.m.

FPGA Technology Used at Temelin Nuclear Power Plant, Herbert Waage (*EZ*)

General Topics in Nuclear Plant Controls—III

Cochairs: Tunc Aldemir (*Ohio State*), Sacit M. Cetiner (*ORNL*)

3:30 p.m.

Assessment of Automatic Power Regulating System Using Full-Scope Simulator for Lungmen NPP, Jun-Jen Lu, Hsuan-Han Huang H. P. Chou, (*National TsingHuaUniv*)

3:50 p.m.

Pressurizer Pressure Control in Pressurized Water Reactors: Performance Study of the Control Systems in the Presence of a Turbine Trip, Mauro Cappelli, Massimo Sepielli (*ENEA*), Bernardino Castillo-Toledo (*CINVESTAV del IPN*), Stefano Di Gennaro (*Univ of L'Aquila*), Nikolaus Muellner (*Univ of Pisa*)

4:10 p.m.

Nuclear Power Plant Safety Systems Against Earthquakes—ASTS (*Automatic Seismic Trip System*), Eunsol Ha, Daehyung Lee, Jungam Yoo, Youngho Koo, Sungjin Lee (*Doosan Heavy Industries & Construction*)

4:30 p.m.

Feedwater Control System Design for Boiling Water Reactors Using the Coefficient Diagram Method, Günyaz Ablay, Tunc Aldemir (*Ohio State*)

Note: This session will follow the preceding session, which will begin at 1:30 p.m.

TUESDAY, JULY 24, 2012, 1:30 P.M. • HMIT

Applications of Technology to Enhance Maintenance and Operations—I

Chair: Johanna Oxstrand (*INL*)

Opal Room

1:30 p.m.

Innovative Uses of Advanced Technologies for Productivity Improvements, Joseph A. Naser (*EPRI*)

2:00 p.m.

Business Drivers for Nuclear Plant Operations and Maintenance Automation, Ken D. Thomas (*INL*)

2:30 p.m.

Configuration of Risk Monitor System by Plant Defense-in-Depth Monitor and Reliability Monitor, Hidekazu Yoshikawa, Morten Lind, Ming Yang, Muhammad Hashim, Zhijian Zhang (*Harbin Eng Univ*)

The HFE of SMRs

Chair: Amy D'Agostino (*NRC*)

3:30 p.m.

Multi-Unit Operations in Non-Nuclear Systems: Lessons Learned for Small Modular Reactors, John O'Hara, James Higgins (*BNL*), Amy D'Agostino (*NRC*)

4:00 p.m.

Considerations for a Small Modular Reactor Multi-Modular Control Room Computer Based Procedure System, Charles Weaver, Steve Blomgren, Aaron Pascoe (*NuScale Power*)

4:30 p.m.

Small Modular Reactor Issue Identification and Ranking Program Control Room Staffing—Final Report, John Smith, Ross Moore (*NRC*)

Note: This session will follow the preceding session, which will begin at 1:30 p.m.

Innovative Control Room Design Tools—II

Chair: John Wood (*CCD Design & Ergonomics Ltd*)

Diamond I Room

1:30 p.m.

A Main Control Room Simulation Facility for NPP Human Performance, Human Machine Interface Research, Carl Elks, Stephanie Guerlain, Nathan Lau, Barry Johnson (*Univ of Virginia*), Bob Bailey (*CAER*), Abbe Macbeth (*Noldus Technology*), Robert Boire, Greg Zakaib (*L-3 Communication MAPPS Inc*)

2:00 p.m.

Intelligent Algorithm Based Functional Unit Sequence Priority in Human Machine Interface on Backup Panel, Yan Shengyuan, Yu Chen, Wang Shuaiqi, Nouredine El Guefri (*Harbin Eng Univ*), Xu Lin (*Harbin Eng Univ/Beihua Univ*)

Technical Sessions: Wednesday

2:30 p.m.

HFE Analysis: A Practical Approach to the Allocation of Functions, Hector Martinez-Pinna, Luis Rejas, Fernando Ortega (*Tecnatom*)

Information Presentation Techniques to Improve Decision Making

Chair: Jacques Hugo (*INL*)

3:30 p.m.

Development of Technical Improvements for CPR1000 Advanced Main Control Room in China, Shi Ji (*China Nuclear Power Design Co., LTD*)

3:50 p.m.

Decision-Centered Design Guidelines for the Electric Power Industry's Human System Interfaces, James Gualtieri, William Elm, James Easter (*Resilient Cognitive Solutions*), Lewis F. Hanes (*Consultant*), Joseph Naser (*EPRI*)

4:10 p.m.

Use of a Handheld Device as a Tool for Process Information Updates in Nuclear Power Plants, Magnhild Kaarstad, Stine Strand, Christer Nihlwing (*IFE/HRP*)

4:30 p.m.

Interfaces for Nuclear Power Plant Overview, François Chériaux, Dominique Galara, Marion Viel (*EdF R&D*)

Note: *This session will follow the preceding session, which will begin at 1:30 p.m.*

Knowledge Management in the Nuclear Industry

Chair: Jacques Hugo (*INL*)

Pearl Room

1:30 p.m.

The US Nuclear Utility Effort in Knowledge Transfer: Nuclear Uniform Curriculum Program and Center for Nuclear Education and Training Excellence, Bruce Meffert (*Linn State Technical College*)

2:00 p.m.

Educating a Nuclear Workforce, Tanya Parwani-Jaimes (*NRC*)

International Collaboration and Experiences in Human and Organizational Factors—II

Chair: Helen Rycraft (*Energy Solutions Magnox*)

3:30 p.m.

International Collaboration in Nuclear Safety— Contribution of the NEA/CSNI Working Group on Human and Organisational Factors, Daniel Tasset (*IRSN*), Albert Frischknecht (*ENSI*), Greg Lamarre (*OECD/NEA*), Benito Gil-Montes (*CSN*)

4:00 p.m.

Assessing Nuclear Safety from a Human and Organizational Factors Perspective: Lessons Learned from an International Benchmarking, Grégory Rolina (*Mines Paris Tech*), François Jeffroy (*IRSN*)

4:30 p.m.

Safety Assessment of Organizational Factors in French Fuel Cycle Facilities, Lise Menuet, Sophie Beauquier (*IRSN*)

Note: *This session will follow the preceding session, which will begin at 1:30 p.m.*

WEDNESDAY, JULY 25, 2012, 8:30 A.M. • NPIC

Experience with I&C System Modernization—V

Cochairs: Edward (Ted) L. Quinn (*Technology Resources*), Janos Eiler (*Parks Nuclear Power Plant*)

Diamond II Room

8:30 a.m.

Design and Implementation of Advanced Diverse Protection System for APR1400, Choon-yong Lee, Soo-Am Kim, Hyung-Hyun Byun (*Doosan Heavy Industries & Construction*)

8:50 a.m.

Increasing Reliability of Nuclear Reactor Emergency Diesel Generators Through the Use of Intelligent Digital Control Systems, Sergey Aleksanin, Kirill Lopatsky Edward Petit de Mange (*Diakont*), *invited*

9:10 a.m.

Modernization of the 900 MW Nuclear Power Plants at EdF: Which Strategies and Solutions?, Patrick Salaün (*EdF R&D*), Alexander Wigg, Dominique Bourgeois (*EDF DIN SEPTEN*), Philippe Touzet (*EDF DPN/UNIE*)

9:30 a.m.

Approach to Use of Models in Support of I&C Upgrades Design and Test, Vaughn M. Thomas, Steve D. Whaley, Jason H. Karns (*Westinghouse*)

Digital I&C Technologies Available for Immediate Application—I

Cochairs: Joseph Naser (*EPRI*), Joe Murray (*Mission Technical*)

10:30 a.m.

Digital Controls for Emergency Diesel Generators in a Post Fukushima World, Joseph P. Fowler, Robert Weber (*DRS Consolidated Controls, Inc.*)

11:00 a.m.

Simple Adaptive Filters for Data Pre-Processing, Sergey S. Anikanov, Nicholas J. Marangoni (*Westinghouse*), Igor V. Stolyetnyy (*Westron LLC*)

11:30 a.m.

HFC-6000 Triple Modular Redundant (TMR) System and TÜV SIL3 Certification Process, Allen Hsu, Gregory Rochford, Steve Yang, Ivan Chow (*Doosan HF Controls Corp*)

Note: *This session will follow the preceding session, which will begin at 8:30 a.m.*

Wireless Technology Applications in Nuclear Power Plants

Chair: Hashem Hashemian (AMS)

Topaz Room

8:30 a.m.

Wireless Transmission for Non-Safety Power Distribution Monitoring System, Jorge V. Carvajal, Fred H. Bednar, Michael D. Heibel (Westinghouse)

8:50 a.m.

Wireless Acoustic Emission Monitoring of In Situ Decommissioning for Nuclear Structures, Mohamed K. ElBatanouny, Aaron Larosche, Paul H. Ziehl, Lingyu Yu (Univ of South Carolina)

9:10 a.m.

Wireless: Its Advantages and Disadvantages—Future Connectivity in Nuclear Power Plants, Philip F. Keebler (EPRI), Stephen Berger (TEM Consulting)

9:30 a.m.

Wireless Sensors for Condition Monitoring of Equipment Within the Containment of Pressurized Water Reactors, C. J. Kiger, W. S. Johnson, H. M. Hashemian (AMS), Ed Hudson (Entergy)

I&C Needs for Small Modular Reactors

Cochairs: Belle Upadhyaya (Univ of Tennessee), Richard T. Wood (ORNL)

10:30 a.m.

Key Design Challenges in Next Generation Instrumentation & Control (I&C) Systems for Small Modular Reactor Nuclear Power Plants, Troy V. Nguyen, Ken D. Leidy, David P. Keene (Northrop Grumman Corp), Brian K. Arnholt (Babcock & Wilcox Nuclear Energy, Inc.)

10:50 a.m.

Low Power Feedwater Control in Helical Steam Generators, Andrew J. Petrarca, J. Michael Doster (NCSU)

11:10 a.m.

Small Modular Reactor (SMR) Instrumentation and Control (I&C) Functional and Structural Requirements and Considerations, Baofu Lu, Matthew Memmott, Alex Harkness (Westinghouse)

11:30 a.m.

Benefits of Small Modular Reactors for Challenging Electric Grid Operation, Alan S. Rominger, J. Michael Doster (NCSU)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

Regulatory Aspects of I&C—I

Cochairs: Terry Jackson (NRC), Gary Johnson (IAEA)

Crystal I Ballroom

8:30 a.m.

Experiences and Lessons Learned on Licensing Instrumentation and Control Systems in the United Kingdom, C. Daniel Stiffler, Warren Odess-Gillett (Westinghouse)

8:50 a.m.

Diablo Canyon Power Plant Digital Process Protection System Replacement Licensing Experience Using ISG-06, Kenneth J. Schrader, Scott B. Patterson (PG&E), John W. Hefler (Altran), Edward L. Quinn (Technology Resources)

9:10 a.m.

Qualifying Software Based Tools for the Development of Nuclear Safety Related Applications, Richard Stattel (NRC)

9:30 a.m.

Multinational Design Evaluation Program—Digital I&C Working Group Status Report, Daniel J. Santos, Deanna Zhang (NRC)

Regulatory Aspects of I&C—II

Cochairs: Terry Jackson (NRC), Gary Johnson (IAEA)

10:30 a.m.

Safety Evaluation on Fail-Safe Design in Digital Plant Protection System of SKN 3&4 in Korea, Jung-Soo Koh, Young-Mi Kim, Yeong-Jin Yu, Yong-il Kwon (KINS)

10:50 a.m.

Proposed Alternative Request to IEEE Std 603-1991 Clause 5.6.1, "Independence between Redundant Portions of a Safety System" in Accordance with 10CFR50.55(a)(3)(i), Chris Doyel (AREVA)

11:10 a.m.

Lessons Learned from Instrumentation and Controls Licensing Reviews of Combined License Applications that Use Earlier Certified Designs, Eugene O. Eagle, Jr. (NRC)

11:30 a.m.

Safety Justification Frameworks: Integrating Rule-Based, Goal-Based, and Risk-Informed Approaches, Peter Bishop, Robin Bloomfield, Sofia Guerra (Adelard), Thuy Nguyen (EdF R&D)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

Equipment and Process Condition Monitoring—III

Cochairs: Leonard Bond (PNNL), J. Wes Hines (Univ of Tennessee)

Crystal II Ballroom

8:30 a.m.

Intelligent Condition-Based Maintenance Using Plant Health Index, Rizwan Ahmed, Gyunyoung Heo (Kyung Hee Univ), Sang Ha An (KAIST)

8:50 a.m.

On-Line Condition Monitoring and Diagnostics for Rod Control and Rod Position Indication Systems in Nuclear Reactors, G. W. Morton, S. D. Caylor, J. R. McCulley, H. M. Hashemian (AMS)

Technical Sessions: Wednesday

9:10 a.m.

On-Line Monitoring Implementation in Boiling Water Reactors, B. D. Shumaker, G. W. Morton, S. D. Caylor, H. M. Hashemian (*AMS*)

9:30 a.m.

An Assessment of Uncertainty in Remaining-Life Estimation for Nuclear Structural Materials, Pradeep Ramuhalli, Jeffrey W. Griffin, Jacob Fricke, Leonard J. Bond (*PNNL*)

General Topics in Nuclear Plant Instrumentation—I

Chair: Sacit M. Cetiner (*ORNL*)

Ivory Room

8:30 a.m.

Cyber Security of FPGA-Based NPP I&C Systems: Challenges and Solutions, Vyacheslav Kharchenko, Andriy Kovalenko (*Centre for Safety Infrastructure-Oriented Research and Analysis*), Anton Andrashov, Alexander Siora (*Research and Production Corporation Radium*)

9:00 a.m.

Software Qualification Experiences for Safety-Critical Software in Programmable Logic Controller, Jang-Yeol Kim, Kee-Choon Kwon (*KAERI*)

9:30 a.m.

Core Knowledge on Instrumentation and Control Systems in Nuclear Power Plants, Janos Eiler (*IAEA*)

General Topics in Nuclear Plant Instrumentation—II

Chair: Sacit M. Cetiner (*ORNL*)

10:30 a.m.

Fukushima Accident Lessons for I&C Systems (*Ukrainian Experience, First Steps*), Mikhail Yastrebenetsky, Yuri Rozen, Alexander Klevtsov, Sergiy Trubchaninov (*State Scientific Center of Nuclear and Radiation Safety*), Vladimir Lebedynskiy, Vladimir Martinenko, Sergiy Lebedynskyy (*Manometr-Kharkiv*)

11:00 a.m.

Modeling the Aging Effects of Nuclear Power Plant Resistance Temperature Detectors, Di Yun, Abdellatif M. Yacout, Richard B. Vilim (*ANL*)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

WEDNESDAY, JULY 25, 2012, 8:30 A.M. • HMIT

HFE Verification and Validation—II

Chair: Douglas Hill (*Hill Engineering Consultants GmbH*)

Opal Room

8:30 a.m.

Beyond Integrated System Validation: Use of a Control Room Training Simulator for Proof-of-Concept Interface Development, Ronald Boring, Vivek Agarwal (*INL*)

9:00 a.m.

Human Factors Verification and Validation of Advanced Power Reactor 1400: Regulatory Activities and Issues During the Operating License, Dhong-Hoon Lee, Choong-Heui Chung (*KINS*)

Multilevel Flow Modeling

Chair: Poong Hyun Seong (*KAIST*)

10:30 a.m.

Graphic Interface Toolkit Based on MFM and Its Application to Operating Support for Monju Plant, Zhou Yangping, Dong Yujie, Huang Xiaojing (*Tsinghua Univ*), Yoshikawa Hidekazu (*Harbin Engineering Univ*)

11:00 a.m.

Modeling Operating Modes for the MONJU Nuclear Power Plant, M. Lind (*Technical Univ of Denmark*), H. Yoshikawa (*Harbin Engineering Univ*), S. B. Jørgensen (*Techn Univ of Denmark*), M. Yang (*Harbin Engineering Univ*), K. Tamayama, K. Okusa (*JAEA*)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

Challenges to Licensed Operator Training and Licensing—Panel

Chair: Richard Pelton (*NRC*)

Diamond I Room

8:30 a.m.

Current nuclear power plant operators use switches, pushbuttons, and paper-based procedures to operate the plant. It is expected that in highly integrated controls rooms, automation to operate the plant will increase significantly. In this session, the panelists will discuss challenges to training and licensing operators including control room HSIs, control room conduct of operations, training program accreditation, simulator availability and certification, licensed operator examiner training and resources; licensed operator instructor training and certification; and international training and licensing experiences.

Panelists:

- Richard Pelton (*NRC*)
- Michael Junge (*NRC*)
- Charles Sawyer (*Duke Energy*)
- Michael Llewellyn (*INPO*)
- Charles Sizemore (*NEXTERA Energy/FPL*)

Applications of Technology to Enhance Maintenance and Operations—II

Chair: Johanna Oxstrand (INL)

10:30 a.m.

I&C Modernization Project of Loviisa NPP—Process Clearance Management in a Digitalized Control Room, Mika Heikkilä, Mikko Martinsuo (Fortum Power and Heat Ltd)

11:00 a.m.

Technology Integration Initiative in Support of Outage Management, Gregory Weatherby, David Gertman (INL)

Note: This session will follow the preceding session, which will begin at 8:30 a.m..

PRA/PSA-HRA Applications in HFE—II

Chair: Gary Munley (Health and Safety Executive)

Pearl Room

8:30 a.m.

PSA-HRA Application in HFE Design, Xingwei Jiang, Yu Zhou, Jinggong Liu (CNNC)

8:50 a.m.

Human Reliability Assessment Using Systems Modeling Language and Tasks Based Systemic-Structural Activity Theory, Waldemar Karwowski (Univ of Central Florida), Ben Amaba (IBM), Tareq Z. Ahram (Univ of Central Florida), Gregory Z. Bedny (Essex County College), *invited*

9:10 a.m.

Considerations for the Treatment of Computerized Procedures in Human Reliability Analysis, Ronald L. Boring, David I. Gertman (INL)

9:30 a.m.

Mermos: Expansion and Improvements as Answers to Industrial Need, Pierre Le Bot, Helene Pseme (EDF R&D), Ronald Laurids Boring (INL)

Human Performance Measurement Methods and Tools—I

Chair: Emilie M. Roth (Roth Cognitive Eng)

10:30 a.m.

A Method for Operator Action Time of an Emergency Procedural Task, Wondea Jung, Jinkyun Park (KAERI)

10:50 a.m.

Human Actions in Safety Analysis—Regulatory Review Approach for New Builds, Alice Salway (Canadian Nucl Safety Comm)

11:10 a.m.

Situation Awareness in Process Control: A Fresh Look, Nathan Lau (Univ of Virginia), Greg A. Jamieson (Univ of Toronto), Gyrd Skraaning, Jr. (OECD Halden Reactor Project)

11:30 a.m.

How Will Be the Situation Awareness of Operating Team in an Advanced MCR?, Seung Woo Lee, Ar Ryum Kim, Poong Hyun Seong (KAIST), Hyun Gook Kang, (KAIST/Khalifa Univ of Science, Technology & Research), Jin Kyun Park (KAERI).

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

WEDNESDAY, JULY 25, 2012, 1:30 P.M. • NPIC

Digital I&C Technologies Available for Immediate Application—II

Cochairs: Joseph Naser (EPRI), Joe Murray (Mission Technical)

Diamond II Room

1:30 p.m.

HFC-6000 Automatic Seismic Trip System (ASTS), Allen Hsu, Jongmin Kim, Steve Yang, Ivan Chow (Doosan HF Controls)

1:50 p.m.

FPGA Applications in HFC-6000 Systems, Allen Hsu, William Luo, Ivan Chow, Steve Yang (Doosan HF Controls)

2:10 p.m.

FPGA Based System's Impact on I&C Architectures, Stephen G. Seaman, Thomas W. Tweedle (Westinghouse)

2:30 p.m.

Use of Library Components in FPGA Designs, Adam J. White Stephen G. Seaman (Westinghouse)

Digital I&C Technologies Available for Immediate Application—III

Cochairs: Joe Murray (Mission Technical), Joseph Naser (EPRI)

3:30 p.m.

Comparing of Licensing Approaches for FPGA-Based Safety I&C Platforms, Vladimir Sklyar, Ievgenii Bakhmach, Vyacheslav Kharchenko (RPC Radiy)

4:00 p.m.

IV&V of FPGA Based Nuclear Plant Applications, Michael T. Berty (Westinghouse)

4:30 p.m.

Simplification of Digital Safety Systems Through the Use of Distributed Logic FPGA-Based Systems, Richard A. Copley (Lockheed Martin), Richard G. Ewing (SCE)

Note: This session will follow the preceding session, which will begin at 1:30 p.m.

Technical Sessions: Thursday

Advanced Sensors and Measurement Technologies—I

Crystal I Ballroom

1:30 p.m.

Comparative Tests of Two Hydrogen-Meter Technologies in the Phenix Reactor, K. Paumel, J.-P. Jeannot (*CEA*), J.-M. Augem (*EDF*), T. Gnanasekaran, R. Sridharan (*IGCAR*), C. Mauget (*AREVA*)

2:00 p.m.

Alternate Transmitter Technology Enhances Performance Capabilities and Enables Longer Life Cycle, Elias C. David, Frederick A. Marino (*DRS Consolidated Controls, Inc.*)

2:30 p.m.

The Preliminary Study on Using Gallium Nitride for In-core or Ex-core Neutron Detection, Lei Cao, Jinghui Wang, Praneeth Kandlakunta, Don W. Miller (*Ohio State*)

Advanced Sensors and Measurement Technologies—II

Cochairs: David E. Holcomb (*ORNL*), Sacit M. Cetiner (*ORNL*)

3:30 p.m.

Collaboration Plan for the Development of Diagnostics and Prognostics and Self-Powered Sensing Techniques for Sustainability of Nuclear Power Plant Safety Critical Functions, Jung-Taek Kim, Seop Hur (*KAERI*), Belle R. Upadhyaya (*Univ of Tennessee*), Sang-Jung Lee (*Chung-Nam National Univ*), Gyun young Heo (*Kyung Hee Univ*)

4:00 p.m.

Improved Sensor Performance Through Advanced Modeling, Richard B. Vilim, Abdellatif M. Yacout, Di Yun (*ANL*)

Note: This session will follow the preceding session, which will begin at 1:30 p.m.

I&C Standards and Guidelines

Cochairs: Edward (Ted) L. Quinn (*Technology Resources*), Gary Johnson (*IAEA*)

Crystal II Ballroom

1:30 p.m.

Independence as a Contribution to Demonstrate Software-Based I&C Dependability, Freddy V. Seidel (*Federal Office for Radiation Protection*)

1:50 p.m.

Elements of an Instrumentation and Control Regulatory Framework, Terry W. Jackson (*NRC*)

2:10 p.m.

Lessons Learned from the Implementation of Regulatory Guide 1.152, Revision 3 and Needs for Future Work in This Area, Tim Mossman Steven Arndt (*NRC*)

2:30 p.m.

Commercial Grade Dedication of Digital I&C Products, Dinesh Taneja (*NRC*)

WEDNESDAY, JULY 25, 2012, 1:30 P.M. • HMIT

Computerized Procedure Systems and Operator Decision Support Systems

Chair: Stephen Fleger (*NRC*)

Opal Room

1:30 p.m.

An Operator Support System for Online Maintenance in Nuclear Power Plant, Fangqing Yang, Ming Yang (*Harbin Eng Univ*), Yongyue Chu (*Nuclear and Radiation Safety Center*)

1:50 p.m.

The Automation of People: Context Management in the Next Generation Nuclear Power Plant, Kara A. Schmitt, Guy A. Boy (*Florida Inst of Technology*)

2:10 p.m.

A Philosophical Perspective and Summary of IEEE's Human Factors Standard on Computerized Operating Procedure Systems (*COPS*), Stephen A. Fleger (*NRC*).

2:30 p.m.

Application of Computer-Based Operating Procedure to the US-APWR Human-System Interface, Satoshi Hanada, Koji Ito (*Mitsubishi Heavy Industries, Ltd.*), Kenji Mashio (*Mitsubishi Nuclear Energy Systems*), Masashi Hirahatake (*Mitsubishi Electric*), Timothy Clouser (*Luminant Power*), Robert E. Hall (*REH Technology Solutions*)

Advances in HMI Technology

Chair: Morten Lind (*Technical Univ of Denmark*)

3:30 p.m.

Challenges in the Development of Virtual Controls for Class 1E Safety Applications, Joseph P. Fowler, William J. Herrity, Paul M. Stankiewicz, (*DRS Consolidated Controls, Inc.*)

3:50 p.m.

Nonlinear Force Profile Used to Increase the Performance of a Haptic User Interface for Teleoperating a Robotic Hand, Anthony L. Crawford (*INL*)

4:10 p.m.

From Analogue to Digital in Training Simulator: The Design and Implementation of a New Interactive Panel System, Hanna Koskinen, Jari Laarni (*VTT Technical Research Centre of Finland*), Pentti Markkanen (*Fortum Power and Heat Oy*), Jussi Näveri (*Fennovoima*), Ari Paananen, Kalle Torkkeli (*Fortum Power and Heat Oy*)

4:30 p.m.

Revolutionary Technologies for the Next Generation Control Room, Daniel A. Zinzow, John N. Van Fossen, Aaron F. Steffy (*Westinghouse*)

Note: This session will follow the preceding session, which will begin at 1:30 p.m.

Fitness for Duty—What Is It, Why Do We Need It, and How Do We Analyze It?—Panel

Chair: Barb Stevens (*Exelon*)

Diamond I Room

1:30 p.m.

Historically, fitness for duty in the nuclear industry was perceived as being free from a drug or alcohol induced state. The reality, however, is that worker fitness for duty is also affected by fatigue, nutrition, stress, and other factors that can affect an individual's physical or mental ability to perform. This broader perspective was recently emphasized through revisions to the U.S. Nuclear Regulatory Commission's requirements pertaining to worker fitness for duty. A panel of nuclear industry experts will discuss new developments related to fitness for duty in the nuclear industry and provide their insights from the medical, regulatory, and root cause analysis perspectives.

Panelists:

- Barbara Stevens (*Exelon Business Services*)
- Hironori Peterson (*NRC*)
- Kay Gallogly (*The 42 Group, LLC*)

Estimating and Crediting Response Times for Safety Critical Operator Actions—Panel

Chair: Patrick Salkeld (*Westinghouse*)

3:30 p.m.

Manual actions performed by plant operators have played, and will likely continue to play, important roles in nuclear power plant protection schemes, including actions credited for accident mitigation in the plant's accident analysis. As a consequence, designers and regulators require valid methods for assessing the feasibility and reliability of proposed manual actions. The validity of these estimation methods rely on important assumptions including: the types of procedures to be followed, the conduct of operations practices that are employed, and the human-systems interfaces (HSIs) that will be available. In this session, 4 panelists will discuss currently available guidelines for crediting operator actions in nuclear power plant applications, lessons learned from recent efforts to credit operator actions, and current initiatives to develop or revise methods for crediting operator actions.

Panelists:

- David Desaulniers (*NRC*)
- Patrick Salkeld (*Westinghouse*)
- Zhonghai Li (*Westinghouse*)
- Ken Scarola (*Nuclear Automation Engineering*)

Note: This session will follow the preceding session, which will begin at 1:30 p.m.

THURSDAY, JULY 26, 2012, 8:30 A.M. • NPIC

Digital I&C Technologies Available for Immediate Application—IV

Cochairs: Joe Murray (*Mission Technical*), Joseph Naser (*EPRI*)

Diamond II Room

8:30 a.m.

Current Issues Associated with the Implementation of Field Programmable Gate Arrays in the Nuclear Power Industry, Steven A. Arndt, Bernard F. Dittman (*NRC*), Paul DaCruz (*Invensys Corp*), Oszvald Glockler (*European Commission*), Joseph Naser (*EPRI*), Thuy Nguyen, Patrick Salaun (*EdF*)

9:00 a.m.

Guidelines and Design Criteria for Application of FPGAs in Nuclear Power Plant I&C Systems, Bob Fink, Charles D. Killian (*CDF Services Inc.*), Thuy Nguyen (*EdF*), Joseph Naser (*EPRI*)

9:30 a.m.

Justification of a FPGA-Based System Performing a Category C Function: Development of the Approach and Application to Case Study, Sofia Guerra, Daniel Sheridan (*Adelard LLP*)

I&C Systems for Next-Generation Power Plants—I

Cochairs: Belle Upadhyaya (*Univ of Tennessee*), David E. Holcomb (*ORNL*)

Topaz Room

8:30 a.m.

Instrumentation and Control Technologies for Refueling the AHTR, David E. Holcomb, Venugopal K. Varma (*ORNL*)

9:00 a.m.

Resilient Control for Critical Infrastructures and Systems, Yaguang Yang, Russell Sydnor (*NRC*)

9:30 a.m.

The Key Characteristics and Architecture New Generation FPGA Based Reactor Protection System for Nuclear Power Plant, Zeng Hai (*State Nuclear Power Automation System Eng Co*), Irene Siedlarczyk (*Lockheed Martin Nuclear Systems and Solutions*)

Technical Sessions: Thursday

I&C Systems for Next-Generation Power Plants—II

Cochairs: Belle Upadhyaya (*Univ of Tennessee*), David E. Holcomb (*ORNL*)

10:30 a.m.

A Serial Bus Structure for the Application of Nuclear Safety Systems in FPGA-Based Controller, Bong Seok Kim, Sung Jin Lee (*Doosan Heavy Industries & Construction*)

11:00 a.m.

HTGR Measurements and Instrumentation Systems, D. E. Holcomb, S. J. Ball, S. M. Cetiner (*ORNL*)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

Software Verification and Validation (V&V) Issues—I

Cochairs: Carol Smidts (*Ohio State*), Kee-Choon Kwon (*KAERI*)

Crystal I Ballroom

8:30 a.m.

Model Checking Reveals Hidden Errors in Safety-Critical I&C Software, Antti Pakonen, Teemu Mätäsniemi, Janne Valkonen (*VTT Technical Research Centre of Finland*)

8:50 a.m.

HARMONICS—EU FP7 Project on the Reliability Assessment of Modern Nuclear I&C Software, Jan-Erik Holmberg (*VTT*), Sofia Guerra (*Adelard*), Thuy Nguyen (*EdF R&D*), Josef März (*ISTec*), Bo Liwång (*SSM*)

9:10 a.m.

The Development of Integrated Engineering Tool (*SafeCASE-PLC*) for Safety Grade PLC, Young-Jun Lee, Jang-Soo Lee, Dong-Young Lee (*KAERI*), Young-Kuk Kim (*ChungNam National Univ.*)

9:30 a.m.

Approaches Utilized When Developing I&C Verification and Validation Processes, William Roggenbrodt (*NRC*)

Software Verification and Validation (V&V) Issues—II

Cochairs: Raymond C. Torok (*EPRI*), Kee-Choon Kwon (*KAERI*)

10:30 a.m.

IEEE Std 1012 Current Revision Update—System, Software, and Hardware V&V, Steve Yang (*Altran*), Robert Moniri (*AREVA NP, Inc.*), *invited*

11:00 a.m.

Software Verification and Validation Plan Generation for Digital Safety Systems in NPPs Under Chinese Nuclear Standards System, Zhicheng Zhang, Zhen Wang, Ronghua Zhang, Shuhui Zhang (*Shanghai Nuclear Eng Research & Design Inst*)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

Experience with Licensing Digital I&C Systems—Panel

Cochairs: Steve Seaman (*Westinghouse*), Edward (Ted) L. Quinn (*Technology Resources*)

Crystal II Ballroom

8:30 a.m.

In the past, national regulatory authorities have independently developed practices to review design. Different standards and guidance have been developed. In the current environment, standard plants and the use of new technology are providing a challenge to regulators, utilities and vendors. Several initiatives are ongoing to provide common positions in several areas. This panel brings experts from regulators and vendors from different countries. The panel will discuss their experience in licensing systems that are planned to be deployed in different countries. The challenges that have been experienced and effectiveness of the current initiatives to standardize regulatory guidance will be explored.

Panelists:

- Thuy Nguyen (*EdF*)
- Feddy Seidel (*BFS*)
- Dan Santos (*NRC*)
- Bo Liwang (*Swedish Radiation Safety Authority, Sweden*)
- Pierre-Jacques Courtois (*Federal Agency for Nuclear Control Subsidiary*)
- Gary Johnson (*IAEA*)

THURSDAY, JULY 26, 2012, 8:30 A.M. • HMIT

Team Performance in Computerized Control Rooms

Chair: Michael Junge (*NRC*)

Opal Room

8:30 a.m.

Peer-Checking in a Nuclear Power Plant Digital Main Control Room, Paris F. Stringfellow, Michael P. Gibson (*AREVA*)

9:00 a.m.

Team Transparency in Computerised NPP Control Rooms, Stine Strand, Magnhild Kaarstad, Håkan Svengren, Tommy Karlsson, Christer Nihlwing (*Institute for Energy Technology, OECD Halden Reactor Project*)

9:30 a.m.

The Effect of Computer-Based Procedures on Team Performance and Situation Awareness in Nuclear Power Plants Main Control Room, Tsung-Ling Hsieh (*INE*), Chiuhsiang Joe Lin (*National Taiwan University of Science and Technology*), Chih-Wei Yang, Hui-Wen Huang (*INER*)

Alarm System Development and Analysis

Chair: Zhonghai Li (*Westinghouse*)

10:30 a.m.

The Development and Usability Test of a State Based Alarm System for a Nuclear Power Plant Simulator, Christer Nihlwing, Magnhild Kaarstad (*IFE/HRP*)

11:00 a.m.

Hybrid Alarm Systems: Combining Spatial Alarms and Alarm Lists for Optimized Control Room Operation, Ronald L. Boring, J. J. Persensky (*INL*)

11:30 a.m.

Alarm Strategy and Complexity: Predictions of Operator Response, Austin Ragsdale, Roger Lew, Brian Dyre (*Univ of Idaho*), Ronald Boring, David Gertman (*INL*)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

HFE Standards

Cochairs: Julia Forbes (*Progress Energy*), James Flowers (*Southern Nuclear*)

Diamond I Room

8:30 a.m.

Human Factors Engineering Program Review Model (NUREG-0711) Revision 3: Update Methodology and Key Revisions, John O'Hara, James Higgins (*BNL*), Stephen Fleger (*NRC*)

8:50 a.m.

ISO 11064 It's Structure and Application in the UK Nuclear Industry and Norwegian Petroleum Industry, John Wood (*CCD Design & Ergonomics Ltd*)

9:10 a.m.

IEEE SC-5 HFE Standards: Present Status / Future Plans, Robert Fuld, (*Westinghouse*)

9:20 a.m.

A Review of the Current Activities of ISO TC 159, Ergonomics: its Organisation and Work Items, John Wood (*CCD Design & Ergonomics Ltd*)

HFE Program Development

Chair: Greg A. Jamieson (*Univ of Toronto*)

10:30 a.m.

Towards a Unified HFE Process for the Nuclear Industry, Jacques Hugo (*INL*)

11:00 a.m.

Development of a Site HFE Program, Bob Fink, Charles Killian (*CDF Services Inc.*), Janardan Amin (*Luminant Generation*), Joseph Naser (*EPRI*)

11:30 a.m.

Adapting the Human Factors Program Review Model in Fuel-Cycle Facilities, Greg A. Jamieson (*Univ of Toronto*)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

Human Performance Measurement Methods and Tools—II

Chair: Emilie M. Roth (*Roth Cognitive Eng*)

Pearl Room

8:30 a.m.

Inter-Rater Reliability of Expert-Based Performance Measures, Nathan Lau (*Univ of Virginia*), Greg A. Jamieson (*Univ of Toronto*), Gyrð Skraaning, Jr. (*OECD Halden Reactor Project*)

9:00 a.m.

Analysis of Communications During the Haiti Relief Effort to Understand Cognitive Processes used During Team Collaboration, Susan G. Hutchins (*Naval Postgraduate School*), *invited*

9:30 a.m.

Function Allocation Metrics Applied to Multi-Agent Aerospace Example, Karen M. Feigh, Amy R. Pritchett, Sébastien Mamessier, Gabriel Gelman (*Georgia Tech*)

HFE Issues in LWR Sustainability and Control Room Simulation

Chair: Ken Thomas (*INL*)

10:30 a.m.

Commercial Utility Perspectives on Nuclear Power Plant Control Room Modernization, Jeffrey C. Joe, Ronald L. Boring, Julius J. Persensky (*INL*)

11:00 a.m.

Model of Procedure Usage—Results from a Qualitative Study to Inform Design of Computer-Based Procedures, Katya Le Blanc, Johanna Oxstrand (*INL*), Thomas Waicosky (*Duke Energy Carolinas*)

11:30 a.m.

Integrating Human Performance into Technology, Ronald K. Farris, Heather Medema (*INL*)

Note: This session will follow the preceding session, which will begin at 8:30 a.m.

Technical Exhibitors

2012 NPIC & HMIT: VENDOR TECHNOLOGY EXPO Exhibit Hours

Sunday 6:00 PM - 8:00 PM

(Opening Reception • 6:00 PM - 8:00 PM)

Monday 11:00 AM - 5:00 PM

(Walk-Around Luncheon • 12:00 PM - 1:30 PM)

(Afternoon Break • 3:00 PM - 3:30 PM)

Tuesday 9:30 AM - 5:00 PM

(Mid-Morning Refreshment Break • 9:30 AM - 10:00 AM)

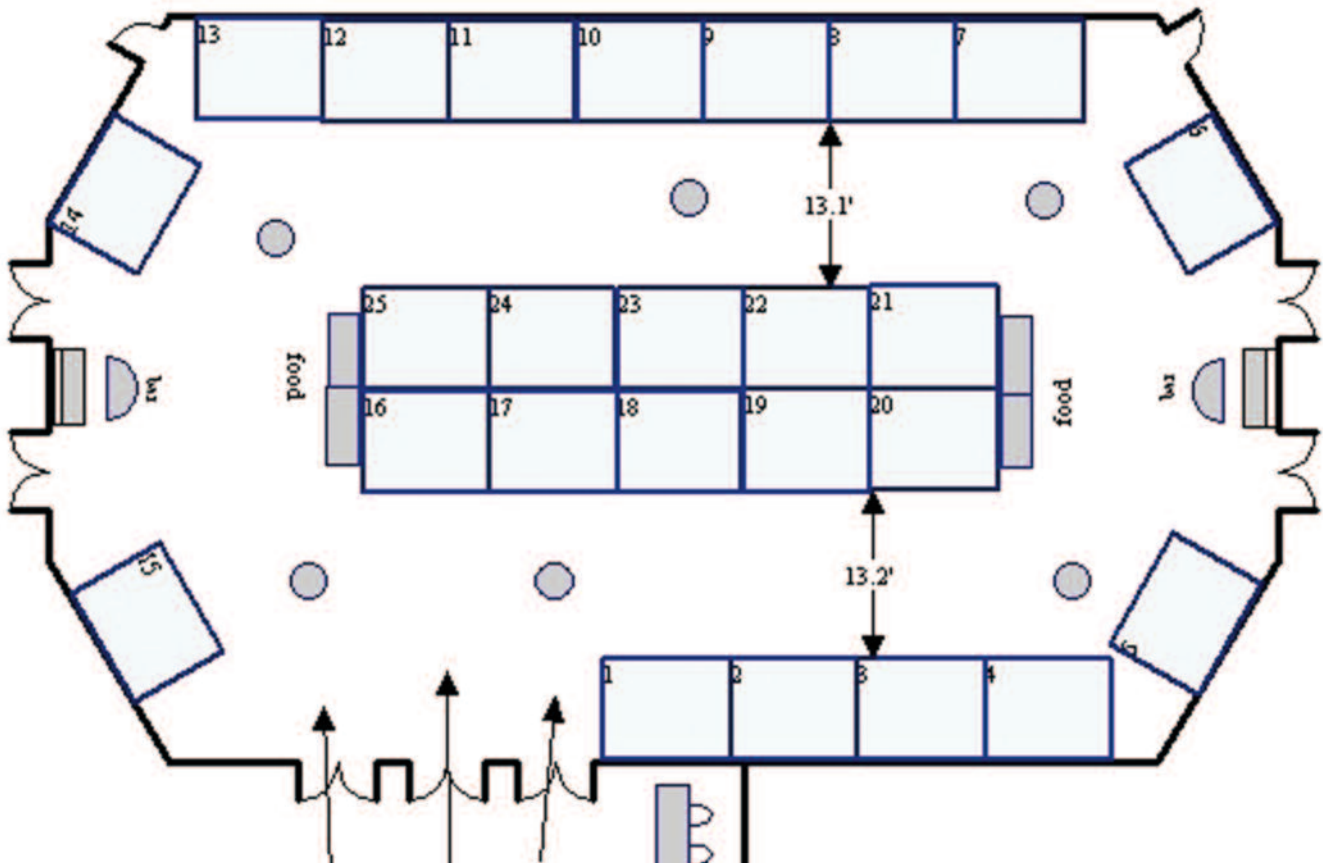
(Walk-Around Luncheon • 12:00 PM - 1:30 PM)

(Afternoon Break • 3:00 PM - 3:30 PM)

Wednesday 9:30 AM - 12:00 PM

(Mid-Morning Refreshment Break • 9:30 AM - 10:00 AM)

Technical Exhibitors Hall: Emerald Ballroom



*We would like to extend a special thanks to the following organizations
who have made an outstanding contribution to the success of the
2012 NPIC & HMIT: VENDOR TECHNOLOGY EXPO*

Altran, Cranbury, NJ (Booth 25)

Altran is an engineering firm founded in 1986 to provide high quality engineering to the Power Industry. Altran provides services in I&C, Electrical, Civil/Structural, and Mechanical engineering, Material Science, Failure Analysis, Aging Management Trainings, FAC, Buried Piping and AOV/MOV Programs. Altran currently employs 260 highly qualified professionals in 7 offices across the country and 17,000 people worldwide.

AMS Corporation, Knoxville, TN (Booths 23 & 24)

Analysis and Measurement Services Corporation (AMS) specializes in testing of process instrumentation and development of specialized test equipment and software products for power and process industries. Since 1977, AMS has been the leading supplier of equipment, training, and services for in-situ response time testing and on-line calibration of temperature and pressure instrumentation in nuclear power plants. In addition, AMS provides automated equipment for predictive maintenance and performance testing of a variety of components and systems in operating processes. AMS has also performed high technology research and development projects for the U.S. Department of Energy (DOE), U.S. Nuclear Regulatory Commission (NRC), U.S. Department of Defense (DOD), National Aeronautics and Space Administration (NASA), utilities, manufacturers, and vendors. AMS has a worldwide list of clientele and has worked closely with a number of international organizations such as the International Atomic Energy Agency (IAEA) and the International Electrotechnical Commission (IEC). AMS's headquarters are located in the United States with representatives in Europe and Asia.

AREVA, Bethesda, MD (Booth 11)

AREVA supplies solutions for power generation with less carbon. Its expertise and unwavering insistence on safety, security, transparency and ethics are setting the standard, and its responsible development is anchored in a process of continuous improvement. Ranked first in the global nuclear power industry, AREVA's unique integrated offering to utilities covers every stage of the fuel cycle, nuclear reactor design and construction, and related services. The group is also expanding in renewable energies - wind, solar, bioenergies, hydrogen and storage - to be one of the top three in this sector worldwide. With these two major offers, AREVA's 48,000 employees are helping to supply ever safer, cleaner and more economical energy to the greatest number of people. www.areva.com

AZZ | N L I, Fort Worth, TX (Booth 6)

NLI is a supplier of equipment, service, and engineering support to the nuclear industry. Headquartered in Ft. Worth, TX, with sales offices throughout North America, NLI offers products and services that minimize the engineering impact to nuclear plants. With a 200,000 sq.ft. manufacturing facility and roughly 35 vendor alliances, NLI provides a wide array of electrical, I&C, and mechanical products under its 10CFR50 Appendix B QA Program and ASME III N-Stamp.

Diakont, San Diego, CA (Booth 16)

Diakont is a full-cycle engineering and manufacturing company. For over 20 years, our mission has been to provide high-tech solutions that enhance the safety and economy of the nuclear power industry. Our global team of more than 800 employees is dedicated to providing our customers with products and services of the highest quality.

Doosan HF Controls, Carrollton, TX (Booth 21)

Doosan HF Controls supplies nuclear-grade safety and non-safety digital instrumentation and control system solutions to both nuclear and non-nuclear customers world-wide. Our platform has received approval from the US NRC, Korean KINS, and TUV-Rheinland and used extensively in major international I&C programs.

DRS Consolidated Controls, Danbury, CT (Booth 19)

DRS Consolidated Controls, Inc. (DRS-CCI) has been a premier supplier of Class 1E and non-1E Instrumentation and Control (I&C) systems to the nuclear industry for more than fifty years. DRS-CCI designs, qualifies, and manufactures both safety critical and non-safety I&C systems for commercial nuclear power plants and the U.S. Navy. Our reactor and plant control systems have been installed worldwide in more than thirty commercial nuclear power plants and in every Navy nuclear vessel since the USS Nautilus. Our commitment to long term product support includes installation, training, start-up, field service, spare components and assemblies, and commercial grade dedication programs. DRS-CCI is an ISO-9001 certified facility and has continuously maintained a 10 CFR Part 50 Appendix B Nuclear Quality Assurance program since 1974.

EXCEL Services Corporation Rockville, MD (Booth 2)

EXCEL Services Corporation specializes in providing operations, Engineering, safety and regulatory services for energy and environmental projects world-wide. These specialized services include: License Renewal, Power Uprate, 24 Month Fuel Cycle Conversions, Licensing and Operations Support, Improved Technical Specifications Conversions, Quality Assurance Solutions, Training, Spent Fuel Storage Licensing, New Plant Site Permitting (ESP), and Combined License (COL) Support. EXCEL has worked with almost every nuclear power plant and many other nuclear facilities in the U.S., and has worked with many international nuclear facilities and organizations for more than 26 years.

GE Energy North America (Booth 3)

GE Energy, Control Solutions has over 40 years of BWR - PWR experiences and activity working with customers on interim analog system support and long term digital conversions. Digital conversion includes turbine, generator, and plant controls upgrades, while addressing critical digital asset compliance aspects, mechanical interfaces, and service installation methods.

Hurst Technologies Corp., Angleton, TX (Booth 13)

Hurst Technologies Corp. provides independent and objective design, engineering, and field support services focused on instrumentation, control, monitoring, diagnostics, automation, software, asset management, computer networks, and physical and cyber-security.

Technical Exhibitors

IBM Corporation - Rational, Armonk, NY (Booth 5)

Rational software enables system delivery as part of a comprehensive application lifecycle management framework, allowing you to:

- Develop workflows that align with new business objective.
- Meet new business, regulatory, and customer requirements for product and devices for network and enterprise IT transformation.
- Develop complex systems of systems.
- Meet stringent security requirements.
- Manage assets and resources by efficiently integrating them into product and services portfolio.

Invensys Operations Management, Plano, TX (Booth 7 & 8)

Invensys Operations Management is an alliance of Invensys brands including Avantis, Foxboro, Wonderware, Skelta, Eurotherm, IMServ, InFusion, SimSci-Esscor and Triconex, all with a strong nuclear presence. Leveraging the power of one organization, Invensys consistently collaborates in development, integrated design, and execution of Safety and Non-safety related solutions proven to maximize the availability and utilization of nuclear plant assets. Invensys will be displaying groundbreaking Team Training technology, the updated SER for the TRICON V10, Cyber Security solutions, and the latest advancements in Turbine Control, Feedwater Digital Upgrades. Invensys continues to raise the bar with evolving products and unmatched reliability in the nuclear industry.

Lockheed Martin, Archbald, PA (Booth 17 & 18)

Lockheed Martin Nuclear Systems & Solutions provides total systems solutions and services for civil nuclear power applications. Lockheed Martin is a systems integrator and provider of discrete and digital safety-critical instrumentation and control (I&C) systems for civil and DoD customers for over 50 years. Lockheed Martin is also a leader in Homeland Security, Information Technology, Net-Centric Solutions, Technology Research, Training and Simulation, and Engineering Services. Products and services include Human Factors Engineering (HFE); Safety Critical Digital I&C; Independent Verification & Validation (V&V); Hardware-in-the-Loop (HWIL) Testing; Automated Test Equipment (ATE) Design; System Level Environmental Testing; and Tool Design and Fabrication.

Mirion Technologies, Smyrna, GA (Booth 201)

Mirion Technologies is a global radiation detection, measurement and analysis company with products that span the nuclear fuel cycle. Exhibiting in Booth 20, the Radiation Monitoring Systems Division offers a range of class 1E safety and non-safety radiation monitoring systems including Area/Process/Liquid and Neutron Flux Monitoring Systems (MGP/MGPI-H&B) for nuclear facilities worldwide.

Northrop Grumman Corporation, Sykesville, MD (Booth 1)

Northrop Grumman provides innovative I&C solutions. We focus on applications involving Nuclear Reactor Control, Electronic Power Conversion and Machinery Control. Our heritage in I&C design, manufacture and support dates back to the birth of the industry. You can rely on our engineering and production capabilities to develop affordable solutions tailored to your specific requirements.

Oak Ridge National Laboratory Oak Ridge, TN (Booth 10)

ORNL is the Department of Energy's largest science and energy laboratory with over 4,600 staff from more than 80 countries, 3,000 guest researchers, 12 user facilities and a budget of approximately \$1.65 billion. The Lab supports the Department of Energy's mission through six major scientific competencies in energy, neutron sciences, high-performance computing, complex biological systems, materials research and national security.

OTTEK Corp. Tucson, AZ (Booth 4)

OTTEK designs and manufactures electronic instrumentation for process control and monitoring in Nuclear Power Plants. We work very closely with each of our clients to determine the course of action that best meets their instrumentation and control needs, supplying an end product that exceeds every prerequisite and requirement.

Radiy Research & Production Corporation Kirovograd, Ukraine (Booth 9)

Established in 1954, Radiy designs, develops, manufactures and installs digital instrumentation and control (I&C) systems for safety and process control of nuclear facilities and industries with high level of safety requirements. For over 15 years Radiy has been using its safety designs to offer advanced technical solutions to meet the challenges of aging NPPs and New Build projects.

Rolls-Royce Huntsville, AL (Booth 12)

Rolls-Royce offers a broad range of civil nuclear expertise, including work related to licensing and safety reviews, engineering design, supply chain management, manufacturing, installation and commissioning of nuclear island systems and equipment, as well as operational management and through life support. The company's involvement in the nuclear industry spans over half a century in the design and supply of equipment for both civil and military reactors. We also provide technical services in the UK and US civil nuclear markets, as well as safety critical instrumentation, monitoring, and control systems in Europe, the US and many other international markets, including all 58 operating nuclear facilities in France.

Thermo Scientific, San Diego, CA (Booth 14)

Thermo Fisher Scientific is a leading provider of Class 1E Safety-Related Instrumentation and Control Systems to the global commercial nuclear power industry. The company offers reactor power (neutron flux) monitoring systems, radiation measurement and water analysis systems, radiation hardened cameras, level measurement instruments, and a full complement of services.

Westinghouse Electric Company, Cranberry Township, PA (Booth 15)

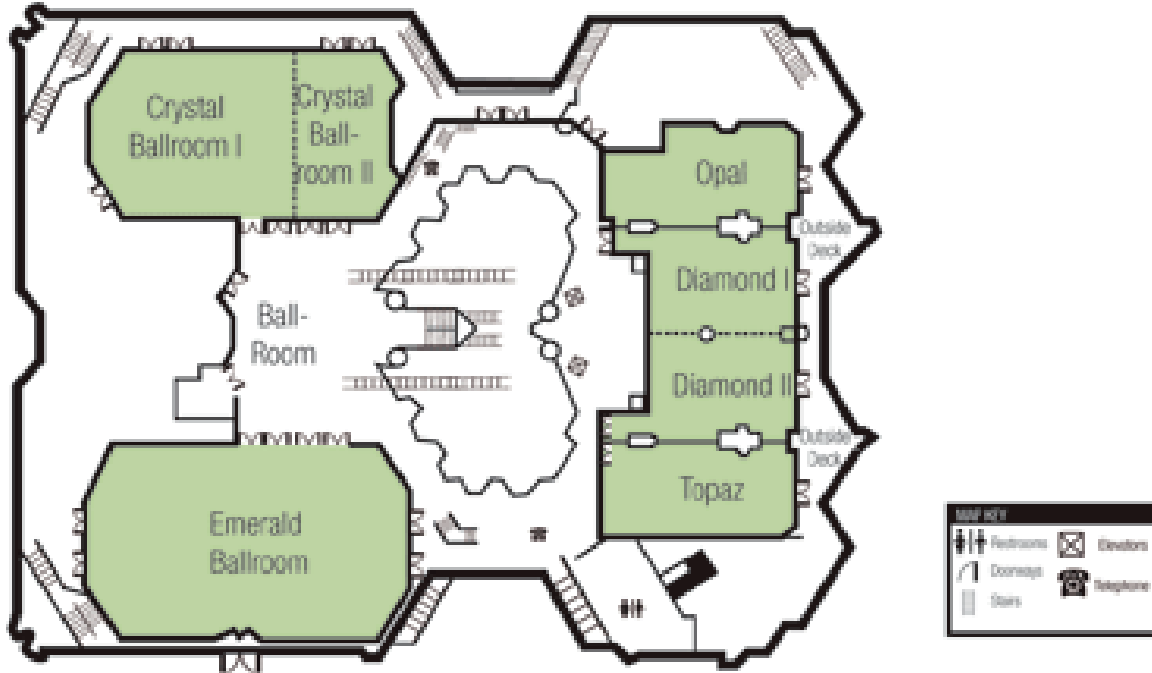
Westinghouse Electric Company is the only company with a single focus on nuclear power, providing a wide range of nuclear plant products and services to utilities throughout the world. Our more than 14,000 employees worldwide provide fuel, spent fuel management, service and maintenance, instrumentation and control, and advanced nuclear plant designs. With the world's largest base of installed plants, no company has more nuclear experience.

With the combined resources of Westinghouse and Toshiba, an even broader range of products and services will be available to our customers, furthering our commitment to providing solutions that help achieve reduced outage times, reduced operating costs, and clean, efficient plant operations.



FLOOR MAP

Second Floor



Third Floor



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