



# ANS Conference

International High-Level Radioactive Waste Management

## IHLRWM 2017 Official Program

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April 9-13, 2017  
Westin Charlotte  
Charlotte, NC

*Creating a Safe and Secure Energy Future for Generations to Come—Driving Toward Long-Term Storage and Disposal*





# ANS

# IHLRWM 2017

International High-Level Radioactive Waste Management

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International High-Level Radioactive Waste Management Conference*

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Thursday Drawing at the Closing Plenary

(Must be present to win gift basket)



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# Meeting Officials

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## Creating a Safe and Secure Energy Future for Generations to Come – Driving Towards Long-Term Storage and Disposal

*2017 International High-Level Radioactive Waste Management*



HONORARY CHAIR  
Dr. Jiří Slovák  
Správa úložišť radioaktivních odpadů  
*(Radioactive Waste Repository Authority)*



HONORARY CHAIR  
Dr. Piet Zuidema  
NAGRA



GENERAL CO-CHAIR  
Mr. Pierre P. Oneid  
*Holtec International*



GENERAL CO-CHAIR  
Mr. Rod Baltzer  
*Waste Control Specialists*



TECHNICAL PROGRAM CO-CHAIR  
Dr. Brady Hanson  
*Pacific NW National Laboratory*



TECHNICAL PROGRAM CO-CHAIR  
Dr. Christi Leigh  
*Sandia National Laboratories*

### TECHNICAL COMMITTEE

Hatice Akkurt	Electric Power Research Institute (EPRI)
Mick Apted	INTERA Inc.
Sven Bader	AREVA Federal Services
Evaristo J. (Tito) Bonano	Sandia National Laboratories (SNL)
Daniel Bullen	Defense Nuclear Facilities Safety Board (DNFSB)
Barry Butterfield	Consultant
Pat Brady	Sandia National Laboratories (SNL)
Ray Clark	USEPA
George Danko	University of Nevada - Reno
Bjorn Dverstorp	Swedish Radiation Safety Authority (SSM)

# Meeting Officials

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Leif Eriksson	Nuclear Waste Dispositions
Jean-sebastien Flinois	ANDRA
Frank Garisto	Nuclear Waste Management Organization (NWMO)
Brady Hanson	Pacific Northwest National Laboratory (PNNL)
Kathryn Huff	FCWMD
Hundal (Andy) Jung	AREVA
John Kessler	J. Kessler Associates, LLC.
Erik Kremer	Nuclear Waste Management Organization (NWMO)
Patrick Landais	ANDRA
Christina Leggett	U.S. Nuclear Regulatory Commission (USNRC)
Christi Leigh	Sandia National Laboratories (SNL)
Sitakanta Mohanty	System-View International, LLC
Kaname Miyahara	Japan Atomic Energy Agency (JAEA)
Steve Nesbit	Duke Energy
Robert Quinn	Westinghouse Electric Co, LLC
David Pickett	Southwest Research Institute (SWRI)
Rob Rechard	Sandia National Laboratories (SNL)
Vincenzo Rondinella	Joint Research Centre, Institute for Transuranium Elements (JRC-ITU)
Jim Rubenstone	U.S. Nuclear Regulatory Commission (USNRC)
Budhi Sagar	Consultant
Graham Smith	GMS Abingdon
Karen Smith	RadEcol Consulting Ltd
Andrew Sowder	Electric Power Research Institute (EPRI)
Eileen Supko	Energy Resources International (ERI)
Peter Swift	Sandia National Laboratories (SNL)
Sylvia Saltzstein	Sandia National Laboratories (SNL)
Stephen L. Turner	Leidos
Hiroyuki Umeki	NUMO
Stratis Vomvoris	NAGRA
Ruth Weiner	Boston Government Services
Shulan Xu	Swedish Radiation Safety Authority (SSM)

# Daily Schedule

## Sunday, April 9

1:00 – 5:00 pm	Meeting Registration Hours	Stonewall Promenade
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## Monday, April 10

6:30 am – 6:00 pm	Meeting Registration Hours	Providence Promenade
7:00 – 8:00 am	Continental Breakfast	Providence Promenade
8:00 – 10:10 am	Plenary I: Creating a Safe and Secure Energy Future for Generations to Come—Driving Toward Long-Term Storage and Disposal—I	Providence Ballroom III
10:10 – 10:25 am	Morning Break	Providence Promenade
10:25 am – 12:30 pm	Plenary I: Creating a Safe and Secure Energy Future for Generations to Come—Driving Toward Long-Term Storage and Disposal—II	Providence Ballroom III
12:30 – 2:00 pm	Attendee Luncheon	Providence Ballroom I&II
2:00 – 3:40 pm	Technical Sessions: <ul style="list-style-type: none"> <li>• International, National and Sub-National Regulations, Requirements and Guidance</li> <li>• Near-Field Environment Modeling</li> <li>• Engineered Barriers (e.g., Waste Package, Backfill, etc.)—I</li> <li>• Transportation (Rail, Road, and Marine)—I</li> <li>• Defining Generic and Site-Specific Biosphere Characteristics</li> </ul>	Tryon Harris Trade Independence Sharon
3:40 – 4:00 pm	Afternoon Break	Providence Promenade
4:00 – 5:40 pm	Technical Sessions: <ul style="list-style-type: none"> <li>• Modeling Near Field and Far Field Interactions—I</li> <li>• Engineered Barriers (e.g., Waste Package, Backfill, etc.)—II</li> <li>• Cask Integrity Analysis and Testing—I</li> <li>• Estimating Impact on Environment</li> <li>• Waste Disposal Options for Small Volumes of Waste Requiring Disposal at Depth—Panel</li> </ul>	Tryon Harris Trade Independence Sharon
6:00 – 8:00 pm	Opening Reception	Providence Ballroom I&II

# Daily Schedule

## Tuesday, April 11

6:30 am – 6:00 pm	Meeting Registration Hours	Providence Promenade
7:00 – 8:00 am	Continental Breakfast	Providence Promenade
8:00 – 10:10 am	Plenary II: A New Path—and an Old Path—For the U.S. High-Level Waste Program	Providence Ballroom III
10:10 – 10:30 am	Morning Break	Providence Promenade
10:30 am – 12:10 pm	Technical Sessions: <ul style="list-style-type: none"> <li>• Post-Closure Safety Assessment—I</li> <li>• Modeling Near Field and Far Field Interactions—II</li> <li>• Engineered Barriers (e.g., Waste Package, Backfill, etc.)—III</li> <li>• Transportation (Rail, Road, and Marine)—II</li> <li>• Sensitivity Analyses</li> </ul>	Tryon Harris Trade Independence Sharon
12:10 – 1:40 pm	Attendee Luncheon	Providence Ballroom I&II
1:40 – 3:20 pm	Technical Sessions: <ul style="list-style-type: none"> <li>• Post-Closure Safety Assessment—II</li> <li>• Storage Facility Licensing</li> <li>• Surface and Underground Facilities—I</li> <li>• Transportation (Rail, Road, and Marine)—III</li> <li>• Approaches to Dealing with Uncertainty-Panel</li> </ul>	Tryon Harris Trade Independence Sharon
3:20 – 3:40 pm	Afternoon Break	Providence Promenade
3:40 – 5:20 pm	Technical Sessions: <ul style="list-style-type: none"> <li>• Post-Closure Safety Assessment—III</li> <li>• NDE Methods for Detecting Dry Storage Canister Corrosion</li> <li>• Surface and Underground Facilities—II</li> <li>• Design and Performance—I</li> <li>• Cost Prediction and Generational Funding for Storage/Disposal—Panel</li> </ul>	Tryon Harris Trade Trade Independence
5:30 – 7:00 pm	Special Evening Session—Student Panel	Providence Ballroom III

# Daily Schedule

## Wednesday, April 12

6:30 am – 5:00 pm	Meeting Registration Hours	Providence Promenade
7:00 – 8:00 am	Continental Breakfast	Providence Promenade
8:00 – 10:10 am	Plenary III: Influence of Trust and Respect in Implementing Consent-Based Siting	Providence Ballroom III
10:10 – 10:25 am	Morning Break	Providence Promenade
10:25 am – 12:30 pm	Technical Sessions: <ul style="list-style-type: none"> <li>• Mitigation Techniques for Dry Storage Canister Corrosion</li> <li>• In Memoriam: Celebrating Professor Joonhong Ahn's Contributions to Radioactive Waste Management</li> <li>• Design and Performance—II</li> <li>• Developing Consent Based Approaches for Siting</li> </ul>	Tryon Harris  Independence Trade
12:30 – 2:00 pm	Attendee Luncheon	Providence Ballroom I&II
2:00 – 3:40 pm	Technical Sessions: <ul style="list-style-type: none"> <li>• Performance Demonstration, Confirmation and Safety Research—I</li> <li>• High Burn-Up and Mixed Oxide Spent Nuclear Fuel Transportation and Storage, Dry and Wet Storage, Including Long-Term (&gt;60 years)—I</li> <li>• Pre-Closure Operational Issues (Safety, QA/QC, Constructability)</li> <li>• Stakeholder Confidence Building/Techniques of Public Involvement</li> </ul>	Tryon Harris  Trade Independence
3:40 – 4:00 pm	Afternoon Break	Providence Promenade
4:00 – 5:40 pm	Technical Sessions: <ul style="list-style-type: none"> <li>• Performance Demonstration, Confirmation and Safety Research—II</li> <li>• High Burn-Up and Mixed Oxide Spent Nuclear Fuel Transportation and Storage, Dry and Wet Storage, Including Long-Term (&gt;60 years)—II</li> <li>• Site Characterization Techniques</li> <li>• Beyond Stakeholder Confidence, Stakeholder Involvement in Decision Making—Panel</li> </ul>	Tryon Harris  Independence Sharon



# Daily Schedule

## Thursday, April 13

6:30 – 10:00 am	Meeting Registration Hours	Providence Promenade
7:00 – 8:00 am	Continental Breakfast	Providence Promenade
8:00 – 10:10 am	Plenary IV: WIPP—Pilot Plant to Operating Repository and Back Again	Providence Ballroom III
10:10 – 10:25 am	Morning Break	Providence Promenade
10:25 am – 12:30 pm	Technical Sessions: <ul style="list-style-type: none"> <li>• National Programs and Policies</li> <li>• High Burn-Up and Mixed Oxide Spent Nuclear Fuel Transportation and Storage, Dry and Wet Storage, Including Long-Term (&gt;60 years)—III</li> <li>• Waste Handling, Storage, and Emplacement at Disposal Facility</li> <li>• Repository Licensing</li> </ul>	Tryon Harris Trade Independence
12:15 – 1:30 pm	Technical Program Committee Conference Wrap-Up/Lessons Learned	Providence Ballroom III

# General Information

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## REGISTRATION

Meeting registration is required for all attendees and speakers. Badges are required for admission to all plenaries, technical sessions and events.

## REGISTRATION HOURS

Sunday, April 9	1:00 pm – 5:00 pm
Monday, April 10	6:30 am – 6:00 pm
Tuesday, April 11	6:30 am – 6:00 pm
Wednesday, April 12	6:30 am – 5:00 pm
Thursday, April 13	6:30 am – 10:00 am

## NOTICE FOR SPEAKERS:

All Speakers and Session Chairs must check in at the ANS Registration Desk during registration hours.

## ATTENDEE MEAL FUNCTIONS

Breakfast and Breaks will be provided to all registered meeting attendees, Monday – Thursday. Lunch will be provided to all registered meeting attendees, Monday - Wednesday. Your badge is required for entry to these events. Additional tickets are available for purchase.

Opening Reception: Heavy hors d'oeuvres and open bar are included with a full meeting registration. Your badge is required for this event.

Tickets for lunches and reception are available for purchase for guests.

## ABOUT ANS

### Mission

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

### Code of Ethics

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

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

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

# General Information

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## ABOUT ANS

### Statement on Diversity

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

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

### Respectful Behavior Policy (Abbreviated)

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

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

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

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

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# Plenary, Special Sessions & Events

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## MONDAY, APRIL 10

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### Plenary I: Creating a Safe and Secure Energy Future for Generations to Come—Driving Toward Long-Term Storage and Disposal—I

**Session Organizers:** Brady Hanson (*PNNL*) Christi Leigh (*SNL*), Stratis Vomvoris (*NAGRA*), **Cochairs:** Brady Hanson (*PNNL*), Christi Leigh (*SNL*), Rod Baltzer (*WCS*), Pierre Oneid (*Holtec International*)

**Location:** Providence Ballroom III **Time:** 8:00-10:10 am

Invited speakers will highlight the progress and success in different countries in storage, transportation, and disposal of spent fuel and HLW.

#### Speakers:

Welcome and Introductions, Brady Hanson (*PNNL*), Christi Leigh (*SNL*)  
Rod Baltzer (*WCS*)  
Pierre Oneid (*Holtec International*)  
Piet Zuidema (*NAGRA*)  
Jiří Slovák (*RWPA*)

### Plenary I: Creating a Safe and Secure Energy Future for Generations to Come—Driving Toward Long-Term Storage and Disposal—II

**Session Organizers:** Brady Hanson (*PNNL*) Christi Leigh (*SNL*), Stratis Vomvoris (*NAGRA*), **Cochairs:** Brady Hanson (*PNNL*), Christi Leigh (*SNL*), Rod Baltzer (*WCS*), Pierre Oneid (*Holtec International*)

**Location:** Providence Ballroom III **Time:** 10:25 am-12:30 pm

Invited speakers will highlight the progress and success in different countries in storage, transportation, and disposal of spent fuel and HLW.

#### Speakers:

Joowan Park (*KORAD*)  
John Corderoy (*Radioactive Waste Management Limited*)  
Patrick Landais (*ANDRA*)  
Saida Laârouchi Engström (*SKB*)  
Hiroyuki Umeki (*NUMO*)

#### Opening Reception

**Time:** 6:00 – 8:00 pm

This event is included in the full meeting registration fee. Your name badge is required for entry. Additional tickets can be purchased on-site at the ANS Registration Desk.

## TUESDAY, APRIL 11

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### Plenary II: A New Path—and an Old Path—For the U.S. High Level Waste Program

**Session Organizers:** Brady Hanson (*PNNL*), Christi Leigh (*SNL*), Ruth Weiner (*BGS*), **Cochairs:** Brady Hanson (*PNNL*), Ruth Weiner (*BGS*)

**Location:** Providence Ballroom III **Time:** 8:00-10:10 am

The United States, post 2016 election, has the potential to witness a much altered political landscape from what it has witnessed since 2008. This begs the question “What Now for Used Fuel Management in the United States?” Invited speakers will discuss this question.

#### Speakers:

William Boyle (*DOE*)  
Eric Knox (*AECOM*)  
Bill Pitesa (*Duke Energy*)  
Joe Ziegler (*Nye County*)

# Plenary, Special Sessions & Events

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## TUESDAY, APRIL 11

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### Special Evening Session—Student Panel

**Session Organizers:** Christi Leigh (SNL), Brady Hanson (PNNL), **Cochairs:** Christi Leigh (SNL), Brady Hanson (PNNL)

**Location:** Providence Ballroom III **Time:** 5:30-7:00 pm

#### Panelists

Alex Salazar (Univ of California, Berkeley)

Xudong Liu (Univ of California, Berkeley)

Milos Atz (Univ of California, Berkeley)

HeeHo Park (Univ of Illinois)

Other panelists to be announced.

## WEDNESDAY, APRIL 12

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### Plenary III: Influence of Trust and Respect in Implementing Consent-Based Siting

**Session Organizers:** Brady Hanson (PNNL), Christi Leigh (SNL), **Chair:** Christi Leigh (SNL)

**Location:** Providence Ballroom III **Time:** 8:00-10:10 am

Consent-based siting has been embraced by a number of countries as an approach for siting both deep geologic repositories and interim storage facilities. Yet, an implicit basis of a successful siting effort is trust in the implementing and oversight institutions and respect for various stakeholders. Invited speakers will discuss both successes and failures in obtaining and maintaining trust and respect under a consent-based siting approach.

#### Speakers:

Andrew Griffith (DOE)

Hank Jenkins-Smith (Univ of Oklahoma)

Lucy Bailey (RWM)

Saida Laârouchi Engström (SKB)

Andrew Orrell (IAEA)

## THURSDAY, APRIL 13

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### Plenary IV: WIPP—Pilot Plant to Operating Repository and Back Again

**Session Organizers:** Brady Hanson (PNNL), Christi Leigh (SNL), Tim Runyon (DOE-CBFO), **Cochairs:** Christi Leigh (SNL), Tim Runyon (DOE-CBFO)

**Location:** Providence Ballroom III **Time:** 8:00-10:10 am

The Waste Isolation Pilot Plant in southeast New Mexico is not only the first operating deep geological repository in the world, it is the first to recover from an accident and resume operations. Invited speakers will discuss the challenges faced over a two-year period during WIPP's recovery as well as lessons learned from the experience.

#### Speakers:

Todd Schrader (CBFO)

Jim Blankenhorn (NWP)

John VanderKraats (NWP)

Todd Zeitler (SNL)

**MONDAY, APRIL 10**  
**TECHNICAL SESSIONS - 2:00 PM**

**International, National and Sub-National Regulations, Requirements and Guidance**

**Session Organizer:** Ray Clark (*EPA*), **Cochairs:** Ray Clark (*EPA*), Christina Leggett (*NRC*)

**Location:** Tryon **Time:** 2:00-3:15 pm

**2:00 pm**

Developments in the Regulatory Framework of Interim Storage of Spent Nuclear Fuel (SNF) in Germany, Christoph Gastl, Julia Palmes (*Federal Office for the Regulation of Nuclear Waste Management*)

**2:25 pm**

Sooner or Later Disposal of HLW?—Economic Appraisal of Different Decisions, Phuong Hoai Linh Doan (*CEA*), Thierry Duquesnoy (*Paris Saclay Univ*)

**2:50 pm**

Risk Minimization across the Entire Back End of the Nuclear Fuel Cycle—Challenges and Opportunities, John Kessler (*J. Kessler and Associates, LLC*)

**Near-Field Environment Modeling**

**Session Organizer:** Kathryn D. Huff (*Univ of Illinois*), **Cochairs:** Kathryn D. Huff (*Univ of Illinois*), Liange Zheng (*LBNL*)

**Location:** Harris **Time:** 2:00-3:15 pm

**2:00 pm**

Coupled THMC Models for Bentonite in a Clay-Host Rock Repository for Nuclear Waste: Illitization and its Effect on Stress under High Temperature, Liange Zheng, Jonny Rutqvist, Hao Xu, Jens T. Birkholzer (*LBNL*)

**2:25 pm**

Reactive Transport Modeling of Sulfide Cycling in the Nearfield and its Impact on Copper Canister Corrosion, Paul Wersin, Marek Pękala, Peter Alt-Epping (*Univ of Bern*), Petteri Pitkänen (*Posiva Oy*), Veerle Cloet (*NAGRA*)

**2:50 pm**

Using TOUGH2-GRS for Modelling C-14 Transport in a Repository, Holger Seher, Guido Bracke, Gerd Frieling, Ingo Kock (*GRS*)

**Engineered Barriers (e.g., Waste Package, Backfill, etc.)—I**

**Session Organizer:** George Danko (*Univ of Nevada, Reno*), **Cochairs:** Craig Imrie (*Hatch*), George Danko (*Univ of Nevada, Reno*)

**Location:** Trade **Time:** 2:00-3:40 pm

**2:00 pm**

Logistic Simulation of Underground Operation of Future Belgian Geological Disposal Facility, H.-J. Engelhardt, B. Haverkamp, R. Gasull (*DBE Technology GmbH*), D. Raymaekers (*ONFRAF/NIRAS*)

**2:25 pm**

HLW Disposal Package for Cigéo: Design Basis and Development Timeline, Jean-Michel Bosgiraud, Christophe Baroux, Frédéric Bumbieler, Didier Crusset (*Andra*)

**2:50 pm**

Durability of the Canadian Used Fuel Container, E. P. Kremer (*NWMO*)

**3:15 pm**

Solubility of  $\text{Nd}(\text{OH})_3$  at High pH, Jonathan P. Icenhower, Charlotte N. Sisk, Leslie M. Kirkes, Jandi Knox, Cassandra Marrs (*SNL*)

Technical  
Sessions:  
Monday  
April  
10

## MONDAY, APRIL 10

### TECHNICAL SESSIONS - 2:00 PM

#### Transportation (Rail, Road, and Marine)—I

**Session Organizer:** Ruth F. Weiner (*BGS*), **Cochairs:** Barry Butterfield (Retired), Ruth Weiner (*BGS*)

**Location:** Independence **Time:** 2:00-3:40 pm

#### 2:00 pm

ENSA/DOE Full Scale Transport Cask (ENSA ENUN 32P) Shock and Vibration Testing, David Garrido (*ENSA*), Steven Ross (*PNNL*), Paul E. McConnell, Willaim Uncapher (*SNL*), Philip Jensen, Nicholas Klymyshyn (*PNNL*), Sylvia Saltzstein, Ken Sorenson (*SNL*), Brady Hanson, Ralph Best (*PNNL*), William Shust (*Objective Engineers*), Jeff L. England (*SRNS*), Russ Walker, Ruben Pena (*Transportation Technology Center, Inc.*)

#### 2:25 pm

Rail Package Transportation Loads Transmitted to Spent Nuclear Fuel Assemblies, Nicholas Klymyshyn, Philip J. Jensen (*PNNL*), David Garrido (*ENSA*)

#### 2:50 pm

Spent Nuclear Fuel Transportation: Rail Conveyance Transmissibility, Philip J. Jensen, Nicholas Klymyshyn, Steven B. Ross (*PNNL*), David Garrido (*ENSA*)

#### 3:15 pm

U.S. DOE Spent Nuclear Fuel Storage and Transportation R&D Activities, Sylvia Saltzstein, Ken Sorenson (*SNL*), Brady Hanson (*PNNL*), Peter Swift (*SNL*)

#### Defining Generic and Site-Specific Biosphere Characteristics

**Session Organizer:** Graham Smith (*GMS Abingdon Ltd*), **Cochairs:** Graham Smith (*GMS Abingdon Ltd*), Shulan Xu (*SSM*)

**Location:** Sharon **Time:** 2:00-3:40 pm

#### 2:00 pm

Confidence Building in Biosphere Assessment Involving Environmental Change—A Regulatory Perspective, Shulan Xu, Björn Dverstorp, Maria Nordén (*Swedish Radiation Safety Authority*)

#### 2:25 pm

Latest International Developments and Practice in Addressing Climate Change and Landscape Evolution in Post Closure Safety Assessments, Tobias Lindborg (*SKB/Swedish Univ of Agricultural Sciences*), Graham Smith (*GMS Abingdon Ltd.*), Mike Thorne (*Mike Thorne and Assoc Ltd*)

#### 2:50 pm

Non-Human Biota Dose Assessments for Repositories in Crystalline and Sedimentary Rock, Chantal Medri (*NWMO*), Glen Bird (*GBird Environmental Ltd*)

#### 3:15 pm

BIOPROTA: International Collaboration in Addressing Key Issues in Biosphere Aspects of Post-Closure Assessment, Koen Mannaerts (*Federal Agency for Nuclear Control*), Graham Smith (*GMS Abingdon Ltd.*), Karen Smith (*RadEcol Consulting Ltd.*)

Technical  
Sessions:  
Monday  
April  
10

**MONDAY, APRIL 10**  
**TECHNICAL SESSIONS - 4:00 PM**

**Modeling Near Field and Far Field Interactions—I**

**Session Organizer:** Kathryn D. Huff (*Univ of Illinois*), **Cochairs:** Kathryn D. Huff (*Univ of Illinois*), Teklu Hadgu (*SNL*)

**Location:** Tryon **Time:** 4:00-5:40 pm

**4:00 pm**

Conceptual Representations of Fracture Networks and their Effects on Predicting Groundwater Transport in Crystalline Rocks, Elena Kalinina, Teklu Hadgu, Yifeng Wang (*SNL*)

**4:25 pm**

Numerical Modeling of Flow and Transport in Fractured Crystalline Rock, Teklu Hadgu, Elena Kalinina, Katherine Klise, Yifeng Wang (*SNL*)

**4:50 pm**

Modeling Coupled Reactive Flow Processes in Fractured Crystalline Rock, Emily R. Stein, Jennifer M. Frederick, Glenn E. Hammond, Kristopher L. Kuhlman, Paul E. Mariner, S. David Sevougian (*SNL*)

**5:15 pm**

Hydrogeological Performance of the Planned French Geological Radioactive Wastes Repository —Cigéo, Hakim Benabderrahmane (*Andra*), Johan Holmen (*Golder Associates*), Olivier Stab (*Ecole Nationale des Mines de Paris*), Jacques Brulhet (*Andra*)

**Engineered Barriers (e.g., Waste Package, Backfill, etc.)—II**

**Session Organizer:** Patrick Vane Brady (*SNL*), **Chair:** Mark Rigali (*SNL*)

**Location:** Harris **Time:** 4:00-5:15 pm

**4:00 pm**

Development of NWMO Buffer Program—From Concept to Full Scale Demonstrations, K. Birch, M. Mielcarek (*NWMO*)

**4:25 pm**

Application of Copper Coatings to Used Nuclear Fuel Containers, J. D. Giallonardo, P. G. Keech, D. Doyle (*NWMO*)

**4:50 pm**

Absence of Colloids Related to Engineered Barrier (MGO): Experimental Determination, Yongliang Xiong, Leslie Kirkes, Sungtae Kim, Cassie Marrs, Justin Dean, Jandi Knox, Haoran Deng, Martin Nemer (*SNL*)

**Cask Integrity Analysis and Testing—I**

**Session Organizer:** Andy Jung (*AREVA*), **Cochairs:** Andy Jung (*AREVA*), Hatice Akkurt (*EPRI*)

**Location:** Trade **Time:** 4:00-5:15 pm

**4:00 pm**

Update on the German Approach of Storing Spent Nuclear Fuel in Dual Purpose Casks until Final Disposal, Holger Völzke, Dietmar Wolff (*BAM*)

**4:25 pm**

PRA—Radial Hydride Embrittlement in Spent PWR Nuclear Fuel Cladding, E. Eidelpes, L. F. Ibarra (*Univ of Utah*), R. A. Medina (*Univ of New Hampshire*)

**4:50 pm**

Extended Storage Considerations for Dry Cask Storage Systems Using Welded Stainless Steel Canisters, Shannon M. Chu, Jeremy Renshaw, Richard D. Reid (*EPRI*)

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## MONDAY, APRIL 10

### TECHNICAL SESSIONS - 4:00 PM

#### Estimating Impact on Environment

**Session Organizer:** Erik Kremer (*NWMO*), **Chair:** Mark Gobien (*NWMO*)

**Location:** Independence **Time:** 4:00-5:15 pm

#### 4:00 pm

Transuranic Management Using Thorium and Uranium-233 Recycle in Heavy Water Reactors, Timothy Ault, Steven Krahn (*Vanderbilt Univ*), Andrew Worrall (*ORNL*), Allen Croff (*Vanderbilt Univ*)

#### 4:25 pm

Prospects for Near-Term Implementation of a Thorium Fuel Cycle, Steven Krahn, Timothy Ault, Bethany Burkhardt (*Vanderbilt Univ*), Andrew Sowder (*EPRI*)

#### 4:50 pm

The Current State of Nuclear Fuel Cycle Simulation Tools, Bethany Burkhardt, Steven Krahn, Timothy Ault, Brandon Chisholm, Steven Lemasters, Kevin Adams (*Vanderbilt Univ*), Andrew Sowder (*EPRI*)

#### Waste Disposal Options for Small Volumes of Waste Requiring Disposal at Depth—Panel

**Session Organizers:** Christi Leigh (*SNL*), Stefan Mayer (*IAEA*), **Cochairs:** Christi Leigh (*SNL*), Stefan Mayer (*IAEA*)

**Location:** Sharon **Time:** 4:00-5:40 pm

This panel will explore the issue of radioactive waste disposal for countries having a comparatively small inventory requiring disposal in a geological formation. What are the perceived and actual obstacles towards disposal? And indeed what constitutes a “small” inventory, given that Finland received a license to construct a mined repository for spent fuel from 2 PWRs (510 MW) and 2 BWRs (880 MW)? Would greater cooperation help overcome the obstacles; or a more cost-effective way in implementing the disposal project; or are alternative disposal concepts the answer to the “small inventory” problem? To further explore the issue, the panel will also place this in the context of disposal needs for “very small inventories”, such as research reactor spent fuel; as well as potentially specific and separate disposal needs for waste streams whose properties prevent them from disposal in the minded geological disposal.

#### Panelists:

Stefan Mayer (*IAEA*)

Ernie Hardin (*SNL*)

Jiří Slovák (*RWPA*)

Other panelists to be announced.

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**TUESDAY, APRIL 11**  
**TECHNICAL SESSIONS - 10:30 AM**

**Post-Closure Safety Assessment—I**

**Session Organizer:** Stratis Vomvoris (*NAGRA*), **Cochairs:** Irina Gaus (*NAGRA*), Stratis Vomvoris (*NAGRA*)  
**Location:** Tryon **Time:** 10:30 am-12:10 pm

**10:30 am**

Postclosure Safety Assessment of a Canadian Used Fuel Repository, E. P. Kremer, N. G. Hunt (*NWMO*), J. D. Avis (*Geofirma Eng Limited*), F. Garisto, P. J. Gierszewski, M. Gobien, R. Guo, C. L. D. Medri (*NWMO*)

**10:55 am**

RepoTREND—A Program Package for Safety Analysis of Radioactive Waste Repository Systems, Tatiana Reiche (*GRS*)

**11:20 am**

Determining Well and Source Locations for Safety Assessments of a Deep Geologic Repository, John Avis (*Geofirma Eng*), Erik Kremer (*NWMO*)

**11:45 am**

Probabilistic Assessment of Postclosure Safety for a Canadian Used Fuel Repository in Crystalline Rock, M. Gobien, R. Guo (*NWMO*)

**Modeling Near Field and Far Field Interactions—II**

**Session Organizer:** Kathryn D. Huff (*Univ of Illinois*), **Cochairs:** Kathryn D. Huff (*Univ of Illinois*), Jennifer Mary Frederick (*SNL*)

**Location:** Harris **Time:** 10:30 am-12:10 pm

**10:30 am**

Development of a Waste Form Process Model in PFLOTRAN, Jennifer M. Frederick, Glenn E. Hammond, Paul E. Mariner, Emily R. Stein, S. David Sevougian (*SNL*)

**10:55 am**

Modelling Colloid-Facilitated Americium Transport at Grimsel Test Site, Switzerland, Benjamin E. Harvey (*Univ of Birmingham*), Lindsay McMillan (*Univ of Birmingham/Mott MacDonald*), Alan W. Herbert (*Univ of Birmingham*)

**11:20 am**

The Chemical State of <sup>79</sup>Se in Spent Nuclear Fuel: Implications for the Performance Assessment, Enzo Curti, Matthias Krack, Daniel Grolimund (*Paul Scherrer Inst*), Sergey V. Churakov (*Paul Scherrer Inst/Univ of Bern*)

**11:45 am**

Revisiting the WIPP Humic Colloid Model for Tetravalent Actinides, Paul E. Mariner (*SNL*)

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**TUESDAY, APRIL 11, 2017**  
**TECHNICAL SESSIONS - 10:30 AM**

**Engineered Barriers (e.g., Waste Package, Backfill, etc.)—III**

**Session Organizer:** Erik Kremer (*NWMO*), **Cochairs:** Scott A Briggs (*York University*), Christi Leigh (*SNL*)

**Location:** Trade **Time:** 10:30 am-12:10 pm

**10:30 am**

Experimental Demonstration of Mechanisms for Effective Near-Borehole Crack Plugging with Bentonite, Mohammad Nurul Islam, Rachel Asit Upadhyay, Carolyn Wehner, Andrew P. Bunger (*Univ of Pittsburgh*)

**10:55 am**

Constitutive Equations for Two-Phase Flow in Compacting Crushed Salt, Klaus-Peter Kröhn (*GRS*)

**11:20 am**

CHM-Coupled Long-Term Evolution of Seals in Rock Salt Repositories, Kyra Jantschik, Oliver Czaikowski, Helge C. Moog, Klaus Wieczorek (*GRS*)

**11:45 am**

Temperature Dependent Sulphide Transport in Highly Compacted Bentonite, Scott Briggs (*York Univ*), Jennifer McKelvie (*Canadian Inst for Advanced Research*), Magdalena Krol (*York Univ*)

**Transportation (Rail, Road, and Marine)—II**

**Session Organizer:** Ruth Weiner (*BGS*), **Cochairs:** Ruth Weiner (*BGS*), Christina Leggett (*NRC*)

**Location:** Independence **Time:** 10:30-11:45 am

**10:30 am**

Preliminary Evaluation of Removing SNF from Shutdown Sites—2016 Update, Steven J. Maheras, Ralph E. Best, Steven B. Ross (*PNNL*), Jeffery L. England (*SRNL*), Lawrence M. Massaro (*Federal Railroad Administration*), Philip J. Jensen (*PNNL*)

**10:55 am**

Lessons Learned from the Nevada Rail Project, Barry L. Butterfield (Retired), Daniel B. Bullen (*DNFSB*)

**11:20 am**

Compiling a Historical Record of Spent Nuclear Fuel Shipments Worldwide, Kevin J. Connolly (*ORNL*), Ronald B. Pope (*ANL*)

**Sensitivity Analyses**

**Session Organizer:** Peter N. Swift (*SNL*), **Cochairs:** Peter N. Swift (*SNL*), Todd Zeitler (*SNL*)

**Location:** Sharon **Time:** 10:30-11:45 am

**10:30 am**

RepoSTAR— Framework for Statistic Runs Regarding Uncertainty and Sensitivity Analysis, Dirk-Alexander Becker, Tatiana Reiche (*GRS*)

**10:55 am**

Probabilistic Sensitivity Analysis of Final Repository Performance Assessment Models, Dirk-A. Becker, Sabine M. Spiessl (*GRS*)

**11:20 am**

Minimizing the Impact of Software Evolution on Radioactive Waste Management, Glenn E. Hammond, Jennifer M. Frederick (*SNL*)

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## TUESDAY, APRIL 11

### TECHNICAL SESSIONS – 1:40 PM

#### Post-Closure Safety Assessment—II

**Session Organizer:** Daniel B. Bullen (*DNFSB*), **Cochairs:** Daniel B. Bullen (*DNFSB*), John H. Kessler (*J. Kessler & Associates, LLC*)

**Location:** Tryon **Time:** 1:40-3:20 pm

#### 1:40 pm

A Metric for Transient Groundwater Transport from a Deep Geological Repository, John Avis, Nicola Calder (*Geofirma Eng Ltd*), Erik Kremer (*NWMO*)

#### 2:05 pm

Setting Performance Assessment Parameters for Safety Case Development, Takafumi Hamamoto, Takanori Kunimaru, Sanae Shibutani, Susumu Kurosawa, Masaki Tsukamoto (*NUMO*), Ian McKinley (*McKinley Consulting*)

#### 2:30 pm

Identification of Key Parameters Driving Geologic Repository Performance at Meuse/Haute Marne Inferred from Probabilistic Radionuclide Transport Evaluations, Gregory Mathieu, Amélie de Hoyos, (*Inst de Radioprotection et de Sûreté Nucléaire*), Sitakanta Mohanty, Stuart Stothoff, Michael Muller (*CNWRA*)

#### 2:55 pm

Research and Development in the Context of the Swiss Disposal Programmes, I. Gaus (*NAGRA*)

#### Storage Facility Licensing

**Session Organizer:** Steven P. Nesbit (*Duke Energy*), **Cochairs:** Steven P. Nesbit (*Duke Energy*), Alyse Scurlock (*Duke Energy*)

**Location:** Harris **Time:** 1:40-3:20 pm

#### 1:40 pm

Spent Nuclear Fuel Dry Packaging Facility—Design Concept, Cost and Throughput Analysis, Abiodun Adeniyi, Bret van den Akker (*ORNL*), Halim Alsaed (*Enviro Nuclear Services*), Jim Blink (*Beckman & Assoc*), Joe Carter, Tom Severynse, Bob Jones (*SRNL*)

#### 2:05 pm

Wet Repackaging Facility Design Concept and Cost and Throughput Analysis, Bret van den Akker, Abiodun Adeniyi (*ORNL*), Halim Alsaed (*Enviro Nuclear Services*), Jim Blink (*Beckman & Assoc*), Joe Carter, Tom Severynse, Bob Jones (*SRNL*)

#### 2:30 pm

Spent Fuel Dry Storage Aging Management—Development of the Managing Aging Process in Storage (MAPS) Report, David Pickett, Yiming Pan (*CNWRA*), John Wise, Ricardo Torres, Darrell Dunn (*NRC*)

#### 2:55 pm

Example of Integration of Safety, Security, and Safeguard Using Dynamic Probabilistic Risk Assessment under a System-Theoretic Framework, Elena Kalinina, Brian Cohn, Doug Osborn, Jeffrey Cardoni, Adam D. Williams, M. Jordan Parks, Katherine Jones, Nathan Andrews, Emma Johnson, Ethan Parks, Amir Mohagheghi (*SNL*)

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## TUESDAY, APRIL 11

### TECHNICAL SESSIONS – 1:40 PM

#### Surface and Underground Facilities—I

**Session Organizer:** Asadul Chowdhury (*CNWRRA*), **Cochairs:** Ernie Hardin (*SNL*), Emily Stein (*SNL*)

**Location:** Trade **Time:** 1:40-3:20 pm

##### 1:40 pm

APM DGR Vehicle Fire Sizing and Smoke Clearing Scenarios, J. N. Noronha, S. S. Shaikh (*NWMO*), J. O. C. Imrie (*Hatch*)

##### 2:05 pm

Ventilation and Traffic Study for a Proposed Deep Geological Repository in Crystalline Geosphere, J. O. C. Imrie, D. Witow (*Hatch*), A. Lee, A. Živković (*NWMO*)

##### 2:30 pm

Evaluation of an Adaptive Deep Geologic Repository Layout in Crystalline Geosphere, J. L. Carvalho (*Golder Associates*), A. Ž. Živković, A. Lee (*NWMO*)

##### 2:55 pm

Repository Design in Safety Case Development, Yoichi Yamamoto, Shigeru Kubota, Satoru Suzuki (*NUMO*)

#### Transportation (Rail, Road, and Marine)—III

**Session Organizer:** Ruth Weiner (*BGS*), **Cochairs:** Ruth Weiner (*BGS*), Barry Butterfield (Retired)

**Location:** Independence **Time:** 1:40-2:55 pm

##### 1:40 pm

AREVA UNF Management Activities in the U.S., Sven Bader, Don McGee, Mark Denton, Paul Murray (*Areva Federal Services, LLC*)

##### 2:05 pm

Assessment Approaches of Mechanical Behavior of SNF under Transport Package Test Conditions, Frank Wille, Konrad Linnemann, Viktor Ballheimer, Annette Rolle (*BAM*)

##### 2:30 pm

German Concept to Ensure Transportability of SNF Packages after Interim Storage, Steffen Komann, Frank Wille, Thorsten Schöenfelder (*BAM*)

#### Approaches to Dealing with Uncertainty—Panel

**Session Organizer and Chair:** Christi Leigh (*SNL*)

**Location:** Sharon **Time:** 1:40-3:20 pm

Decisions regarding storage, transportation and disposal of high-level waste are complicated by inherent uncertainties. There are a number of methods for dealing with uncertainties; some methods are most applicable to certain types of uncertainties. This panel will discuss the nature of uncertainty in their programs and approaches to dealing with uncertainty so that sound decisions can be made.

##### Panelists:

Todd Zeitler (*SNL*)

Lucy Bailey (*RWM*)

David Sevougian (*SNL*)

Dirk-Alexander Becker (*GRS*)

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## TUESDAY, APRIL 11

### TECHNICAL SESSIONS – 3:40 PM

#### Post-Closure Safety Assessment—III

**Session Organizer:** John H. Kessler (*J Kessler and Associates, LLC*), **Cochairs:** John H. Kessler (*J. Kessler and Associates, LLC*), Daniel B. Bullen (*DNFSB*)

**Location:** Tryon **Time:** 3:40-5:20 pm

#### 3:40 pm

Thermal and Mechanical Influence of a Deep Geological Repository in Crystalline Rock on the Ground Surface, Ruiping Guo (*NWMO*)

#### 4:05 pm

Effects of Glaciation on Radionuclide Transport in Sedimentary Rocks, Jianming Chen (*NWMO*), John Avis, Nicola Calder (*Geofirma Eng*)

#### 4:30 pm

Criticality and Shielding Assessment of Canister Concepts for the Disposal of Spent Nuclear Fuel, Miguel Morales Gutierrez, Stefano Caruso, Nikitas Diomidis (*NAGRA*)

#### 4:55 pm

Identification and Formation of Carbon-14 Containing Organic Compounds during Anoxic Corrosion of Activated Steel in Alkaline Conditions, Erich Wieland, Benjamin Z. Cvetković, Dominik Kunz (*Scherrer Inst*), Gary Salazar, Söenke Szidat (*Univ of Bern*)

#### NDE Methods for Detecting Dry Storage Canister Corrosion

**Session Organizer:** Andy Jung (*AREVA*), **Cochairs:** Jeremy Renshaw (*EPRI*), Andy Jung (*AREVA*)

**Location:** Harris **Time:** 3:40-5:20 pm

#### 3:40 pm

Detecting Water in Dry Storage Canisters for Used Fuel, Ryan M. Meyer, Samuel W. Glass, Gerges Dib, Morris S. Good, Surajit Roy, Judith M. Cuta (*PNNL*), Ash Thakker (*Global Technology Connection, Inc.*)

#### 4:05 pm

High-Resolution Ultrasound Imaging Using Model-Based Iterative Reconstruction for Canister Degradation Detection, S. Chatzidakis, J. J. Jarrell, J. M. Scaglione (*ORNL*)

#### 4:30 pm

Robotic Inspection and Delivery Systems for Dry Cask Storage Systems, Jeremy Renshaw (*EPRI*), Jamie Beard, Shannon Chu (*Robotic Technologies of Tennessee*), Paul Plante, Neil Fales (*3 Yankees*), Matt Keene (*Duke Energy Corp*), Jay Wellwood (*NAC International*), Steve Glovsky, Andrew Bryant (*Robotic Technologies of Tennessee*), Joe Mahal, Jim Stadler (*GE Inspection Technologies*)

#### 4:55 pm

Correlation of Simulated to Experimental NDE Inspections of Copper Coatings on Used Fuel Containers, T. Liyanage (*NWMO*), J.-F. Martel, O. Marcotte (*Nucleom Inc.*), D. Doyle (*NWMO*)

#### Surface and Underground Facilities—II

**Session Organizer:** Robert Quinn (*Westinghouse*), **Cochairs:** Robert Quinn (*Westinghouse*), Teklu Hadgu (*SNL*)

**Location:** Trade **Time:** 3:40-4:30 pm

#### 3:40 pm

Large Diameter Deep Borehole Disposal Concept for HLW Glass, Mark J. Rigali, Ernest L. Hardin, Emily R. Stein, Jiann-Cheng Su (*SNL*)

#### 4:05 pm

Feasibility of Direct Disposal of Salt Waste from Electrochemical Processing of Spent Nuclear Fuel, Rob P. Rechar, Teklu Hadgu, Yifeng Wang, Larry C. Sanchez (*SNL*), Patrick McDaniel, Corey Skinner, Nima Fathi (*Univ of New Mexico*), Steven Frank, Michael N. Patterson (*INL*)

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## TUESDAY, APRIL 11

### TECHNICAL SESSIONS – 3:40 PM

#### Design and Performance—I

**Session Organizer:** Eileen M. Supko (*Energy Resources International, Inc*), **Cochairs:** Charlotte Sisk-Scott (*SNL*), Paola Leon Vargas (*SNL*)

**Location:** Trade **Time:** 4:35-5:25 pm

#### 4:35 pm

Corrosion Studies of the Canadian Used Fuel Container, David S. Hall (*NWMO*), Thalia Standish (*NWMO/Western Univ*), Sridhar Ramamurthy, David W. Shoesmith (*Western Univ*), Peter G. Keech (*NWMO*)

#### 5:00 pm

Copper Corrosion in Pure Water—Scientific and Post-Closure Safety Aspects, Allan Hedin, Adam Johannes Johansson, Christina Lilja (*SKB*)

#### Cost Prediction and Generational Funding for Storage/Disposal—Panel

**Session Organizers:** Christi Leigh (*SNL*), Stratis Vomvoris (*NAGRA*), **Chair:** Stratis Vomvoris (*NAGRA*)

**Location:** Independence **Time:** 3:40-5:20 pm

It has become clear that in many countries high-level waste storage/disposal programs will be multi-generational. That is, the issue of high-level waste storage/disposal will be an issue ultimately solved by future generations. This panel will discuss approaches to cost prediction for large storage/disposal programs and perspectives regarding the funding of such programs through the generations.

#### Panelists:

Piet Zuidema (*NAGRA*)  
Patrick Landais (*ANDRA*)  
John Corderoy (*RWM*)  
Eileen Supko (*ERI*)  
Stefan Mayer (*IAEA*)

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## WEDNESDAY, APRIL 12

### TECHNICAL SESSIONS - 10:25 AM

#### Mitigation Techniques for Dry Storage Canister Corrosion

**Session Organizer:** Sven O. Bader (AREVA), **Cochairs:** Andy Jung (AREVA), Hatice Akkurt (EPRI)

**Location:** Tryon **Time:** 10:25 am-11:40 am

#### 10:25 am

Dry Transfer System Revisited, Sven Bader (AREVA), Collin Dolan, Dmytro Zaytsev, Daniel Gryder, Nicholas Cesmat, Qutaiba Enaya, Michael Segura (Univ of North Carolina at Charlotte)

#### 10:50 am

An Efficient Corrosion Proof Solution for Long Term Dry Storage Canisters, Hundal Jung, Jianqing Xue (AREVA TN)

#### 11:15 am

Developing a Re-Inspection Evaluation Method for CI-SCC in Chinshan ISFSI, Yung-Shin Tseng, Chu Ching Hau, Jong-Rong Wang (NTHU), Po-Hsiu Lee, Chih-Tien Liu (Atomic Energy Council), Chunkuan Shih (NTHU)

#### In Memoriam: Celebrating Professor Joonhong Ahn's Contributions to Radioactive Waste Management

**Session Organizer:** Christina Leggett (NRC), **Cochairs:** Bob Borrelli (Univ of Idaho), Bret van den Akker (ORNL)

**Location:** Harris **Time:** 10:25 am-12:30 pm

#### 10:25 am

Effects of Random Geometry on Post-Closure Repository Criticality Safety, Xudong Liu, Massimiliano Fratoni, Joonhong Ahn (Univ of California, Berkeley), Fumio Hirano (JAEA/International Research Inst of Nuclear Decommissioning)

#### 10:50 am

Uncertainty Analysis of Far-Field Precipitation from Used Nuclear Fuel, Alex Salazar, Massimiliano Fratoni, Joonhong Ahn (Univ of California, Berkeley), Fumio Hirano (JAEA/International Research Inst for Nuclear Decommissioning)

#### 11:15 am

Material Composition Effects on Far-Field Fissile Deposition Minimum Critical Mass, Milos Atz, Xudong Liu, Massimiliano Fratoni, Joonhong Ahn (Univ of California, Berkeley), Fumio Hirano (JAEA)

#### 11:40 am

Laplace Transformed Analytical Solution of Aqueous Radionuclide Transport via Heterogeneous Geological Formations for Arbitrary Length Decay Chain, Bret Patrick van den Akker (ORNL)

#### 12:05 pm

Towards a New Regulation, 10 CFR Part 7X for Reprocessing: Recent NRC Activities, Christina J. Leggett (NRC)

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## WEDNESDAY, APRIL 12

### TECHNICAL SESSIONS - 10:25 AM

#### Developing Consent-Based Approaches for Siting

**Session Organizer:** Bjorn Anders Dverstorp (*Swedish Radiation Safety Authority*), **Cochairs:** Bjorn Anders Dverstorp (*Swedish Radiation Safety Authority*), Mick Apted (*INTERA*)

**Location:** Trade **Time:** 10:25 am-11:40 am

#### 10:25 am

Site Selection in Switzerland: Stepwise Narrowing-Down Methodology and its Application, P. Zuidema, S. Vomvoris (*NAGRA*)

#### 10:50 am

Standardized Canisters and Their Potential Impact on an Integrated Waste Management System, J. J. Jarrell, R. A. Joseph III, R. M. Cumberland, G. M. Petersen (*ORNL*), E. A. Kalinina (*SNL*)

#### 11:15 pm

Use of Multi-Attribute Utility Analyses to Assess Transportation Routes from Independent Spent Fuel Storage Installations (*ISFIs*), Sven Bader, Ashley Spry (*AREVA Federal Services, LLC*)

#### Design and Performance—II

**Session Organizer:** Brady Hanson (*PNNL*), **Cochairs:** H. Umeki (*NUMO*), Charlotte Sisk-Scott (*SNL*)

**Location:** Independence **Time:** 10:25 am-12:05 pm

#### 10:25 am

Incremental Development in the Design for Cigéo: Managing a Robust and Reversible Development from the Licensing to the Closure of the Disposal, P. Landais, F. Launeau, J. M. Krieger, G. Ouzounian (*Andra*)

#### 10:50 am

Design of Underground and Closure Structures for the Cigéo Project, J.-M. Krieger, G. Armand, O. Ozanam, P. Landais (*Andra*)

#### 11:15 am

Thermal Impact in the Geometrical Settings in Deep Geological Repositories for HLW with Retrievalability and Monitoring, Rocio Paola León Vargas, Joachim Stahlmann, Volker Mintzlaff (*TU Braunschweig*)

#### 11:40 am

Applying the Concept of Resilience to Geological Disposal in Japan, H. Umeki, T. Fujiyama, S. Suzuki (*NUMO*), I. G. McKinley (*McKinley Consulting*)

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**WEDNESDAY, APRIL 12**  
**TECHNICAL SESSIONS - 2:00 PM**

**Performance Demonstration, Confirmation and Safety Research—I**

**Session Organizer:** David Picket (*CNWR/SwRI*), **Cochairs:** Todd Zeitler (*SNL*), David Picket (*CNWR/SwRI*)

**Location:** Tryon **Time:** 2:00-3:40 pm

**2:00 pm**

Technology Readiness Assessment Process Adapted to Geologic Disposal of HLW/SNF, S. David Sevougian, Robert J. MacKinnon (*SNL*)

**2:25 pm**

RD&D Activities at Grimsel Test Site and Mont Terri Underground Rock Laboratory—To Support Nagra's Site License Application, S. Vomvoris, I. Blechschmidt, O. X. Leupin (*NAGRA*)

**2:50 pm**

Underground Generic Laboratory Experimental Program for Safety Assessment Purposes, Lukáš Vondrovic, Ilona Pospíšková, Antonín Vokál, J. Augusta, J. Slovák (*SURAO*)

**3:15 pm**

Site Selection of Underground Research Laboratory for Geological Disposal in China—The Application of a New Rock Mass Classification System QHLW, L. Chen, J. Liu, H. Y. Zhang, Z. H. Zong, J. Wang (*Beijing Research Inst of Uranium Geology*)

**High Burn-Up and Mixed Oxide Spent Nuclear Fuel Transportation and Storage, Dry and Wet Storage, Including Long-Term (>60 years)—I**

**Session Organizer:** Christina Leggett (*NRC*), **Cochairs:** Vincenzo Rondinella (*ER-JTC-ITU*), Bob Einziger (*NWTRB*)

**Location:** Harris **Time:** 2:00-3:15 pm

**2:00 pm**

Cladding Considerations at BAM Regarding Extended Storage of Spent Fuel, Teresa Orellana Pérez, Holger Voelzke, Dietmar Wolff, Uwe Zencker (*BAM*)

**2:25 pm**

Destructive Tests for Determining Mechanical Integrity of Spent Nuclear Fuel Rods, Efsthios Vlassopoulos (*EPFL*), Ramil Nasyrow, Dimitrios Papaioannou, Vincenzo V. Rondinella (*EC-JRC*), Stefano Caruso (*NAGRA*), Andreas Pautz (*EPFL/Scherrer Inst*)

**2:50 pm**

Mechanical Integrity Studies on Spent Nuclear Fuel Rods, V. V. Rondinella, R. Nasyrow, D. Papaioannou (*EC-JRC*), E. Vlassopoulos (*EPFL*), F. Cappia, O. Dieste-Blanco, T. A. G. Wiss (*EC-JRC*)

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## WEDNESDAY, APRIL 12

### TECHNICAL SESSIONS - 2:00 PM

#### Pre-Closure Operational Issues (Safety, QA/QC, Constructability)

**Session Organizer:** Robert Quinn (*Westinghouse*), **Cochairs:** Robert Quinn (*Westinghouse*), Ernest Hardin (*SNL*)

**Location:** Trade **Time:** 2:00-3:40 pm

#### 2:00 pm

Pre-Closure Safety Assessment in Safety Case Development, K. Yamashina, S. Suzuki, S. Kubota (*NUMO*)

#### 2:25 pm

Preliminary Hazard Identification for a Canadian Used Fuel Repository, Kelly Liberda, Helen Leung (*NWMO*), Heini Reijonen (*GTK*), Taina Karvonen (*Saario & Riekkola Oy*)

#### 2:50 pm

Emplacement and Retrieval Concepts for German SF/HLW Repositories in Claystone, Philipp Herold, Michael Jobmann (*DBE Technology GmbH*)

#### 3:15 pm

Modeling of Temperature Variations during Ventilation in Deep Geologic Repositories, George Danko, Davood Bahrami (*Univ of Nevada, Reno*), Craig Imrie (*Hatch*)

#### Stakeholder Confidence Building/Techniques of Public Involvement

**Session Organizer:** Erik Kremer (*NWMO*), **Cochairs:** Erik Kremer (*NWMO*), Stefan Myer (*IAEA*)

**Location:** Independence **Time:** 2:00-3:15 pm

#### 2:00 pm

Interdisciplinary Perspectives on Disposal of High-Level Radioactive Waste—The German Case, Clemens Walther (*LU Hannover*), Klaus Jürgen Röehlig (*TU Clausthal*)

#### 2:25 pm

Choosing among Nuclear Fuel Cycles Using Multi-Attribute Utility Theory, Stephen Clement, Sama Bilbao y León (*Virginia Commonwealth Univ*)

#### 2:50 pm

Re-Branding the Nuclear Fuel Cycle: Examining Infographic Effects, Melanie A. Kulesz, Kenneth B. Kahn, Sama Bilbao y León (*Virginia Commonwealth Univ*), invited

### TECHNICAL SESSIONS - 4:00 PM

#### Performance Demonstration, Confirmation and Safety Research—II

**Session Organizer:** Sylvia J. Saltzstein (*SNL*), **Cochairs:** Ernest Hardin (*SNL*), Patrick Brady (*SNL*)

**Location:** Tryon **Time:** 4:00-5:40 pm

#### 4:00 pm

Is Deep Borehole Disposal a Technical Option for Germany?, Guido Bracke (*GRS GmbH*), Frank Charlier (*RWTH*), Axel Liebscher (*GFZ Potsdam*), Frank Schilling (*KIT-AGW*), Thomas Roeckel (*Piewak & Partner*)

#### 4:25 pm

Deep Borehole Disposal for Countries with Small Nuclear Power Programs, John R. Cochran, Patrick V. Brady, Ernest L. Hardin (*SNL*)

#### 4:50 pm

Conceptual Design for Waste Packaging and Emplacement in Deep Boreholes, Ernest Hardin (*SNL*), Fred Peretz (*ORNL*), Abiodun Adeniyi, Paul Nogradi (*ORNL*), Jiann Su, John Cochran (*SNL*)

#### 5:15 pm

Permeability Measurements from a Potential Deep Geological Repository Site, Katherine A. Daniels, Jon F. Harrington (*British Geological Survey*), Mark Jensen (*NWMO*)

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**WEDNESDAY, APRIL 12**  
**TECHNICAL SESSIONS - 4:00 PM**

**High Burn-Up and Mixed Oxide Spent Nuclear Fuel Transportation and Storage, Dry and Wet Storage, Including Long-Term (>60 years)—II**

**Session Organizer:** Brady Hanson (*PNNL*), **Cochairs:** Hatice Akkurt (*EPRI*), Bob Einziger (*NWTRB*)

**Location:** Harris **Time:** 4:00-5:15 pm

**4:00 pm**

Comparison of Neutron Absorber Panels from Zion Spent Fuel Pool against Zion Coupons, Hatice Akkurt (*EPRI*)

**4:25 pm**

Optimization of New Glass Matrices for Conditioning of High Level Radioactive Wastes, Margit Fábíán, Csaba Aracki (*Centre for Energy Research*)

**4:50 pm**

Non-Proliferation and Accountancy of Spent Fuel Storage of Pebble Bed Reactors, Xia Bing, Jiong Guo, Chunlin Wei, Ding She, Jian Zhang, Fu Li (*Tsinghua Univ*)

**Site Characterization Techniques**

**Session Organizer:** Patrick Landais (*ANDRA*), **Cochairs:** Patrick Landais (*ANDRA*), Liang Chen (*Beijing Research Inst of Uranium*)

**Location:** Independence **Time:** 4:00-5:40 pm

**4:00 pm**

Development of Site Descriptive Models—Strategy and Methodology for the Qualification of Data Collected from the Literature, T. Kunimaru, K. Ota (*NUMO*), N. Giroud, S. Vomvoris (*NAGRA*), S. Yamada (*NWMO*)

**4:25 pm**

Data Integration Through the Development of 3-Dimensional Geosphere Models, Eric Sykes (*NWMO*), Stefano D. Normani (*Univ of Waterloo*), Lorrie Fava, Darren Janeczek (*MIRARCO*)

**4:50 pm**

Drilling and Testing in the Deep Borehole Field Test, Kristopher L. Kuhlman, David C. Sassani, Geoff A. Freeze, Ernest L. Hardin, Patrick V. Brady (*SNL*)

**5:15 pm**

Benefits of Siting a Borehole Repository on Non-Operating Nuclear Facility, Jin Whan Bae, William Roy, Kathryn Huff (*Univ of Illinois*)

**Beyond Stakeholder Confidence, Stakeholder Involvement in Decision Making—Panel**

**Session Organizers:** Christi Leigh (*SNL*), Stratis Vomvoris (*NAGRA*), **Chair:** Christi Leigh (*SNL*)

**Location:** Sharon **Time:** 4:00-5:40 pm

It appears that some programs for high-level waste storage/disposal are ardently seeking to improve stakeholder confidence but is confidence, by itself enough to push storage/disposal programs forward? This panel will explore the benefit of moving beyond confidence building into the realm of stakeholder involvement in decision making. Is this ultimately the key to a successful outcome.

**Panelists:**

Wendy Lowe (*P2 Solutions*)

Kuhika Gupta (*Univ of Oklahoma*)

Joe Ziegler (*Nye County*)

Other panelists to be announced.

Technical  
Sessions:  
Wednesday  
April  
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## THURSDAY, APRIL 13

### TECHNICAL SESSIONS - 10:25 AM

#### National Programs and Policies

**Session Organizer:** Ray Clark (*EPA*), **Cochairs:** Ray Clark (*EPA*), Christina Leggett (*NRC*)

**Location:** Tryon **Time:** 10:25 am-12:05 pm

#### 10:25 am

Nuclear Infrastructure Council Recommendations for Nuclear Waste Management Reform, Steven Nesbit (*Duke Energy*), David Blee (*U.S. Nuclear Infrastructure Council*), Edward Davis (*Pegasus Group*), Alexander Hoppes (*Areva*)

#### 10:50 am

Algorithms and Methods for Optimizing a Used Nuclear Fuel Allocation Strategy, G. M. Petersen, S. E. Skutnik (*Univ of Tennessee*), R. A. Joseph III (*ORNL*)

#### 11:15 am

Sensitivity Study of Indepth for Verification of Facility Spent Nuclear Fuel Declarations, Scott M. Richards (*Univ of Tennessee*), Brandon R. Grogan (*ORNL*)

#### 11:40 am

Status of Spent Nuclear Fuel Storage, Transportation, and Disposal in the Republic of Korea, Donghak Kook (*KAERI*), Yongdeog Kim (*KHNP*), John Kessler (*J. Kessler and Associates, LLC*)

#### High Burn-Up and Mixed Oxide Spent Nuclear Fuel Transportation and Storage, Dry and Wet Storage, Including Long-Term (>60 years)—III

**Session Organizer:** Andrew G. Sowder (*EPR*), **Cochairs:** Robert Einziger (*NWTRB*), Keith Waldrop (*EPR*)

**Location:** Harris **Time:** 10:25 am-12:05 pm

#### 10:25 am

Dry Cask Storage Systems Thermal Analysis Project, Alyse Scurlock, Jocelyn Petty, Scott Woodbury, William Murphy (*Duke Energy*), Jay Wellwood (*NAC International*), Brady Hanson (*PNNL*), John Scaglione (*ORNL*)

#### 10:50 am

Effect of Rarefaction on Cladding Temperatures within a Used Nuclear Fuel Canister Filled with Dry Helium, Corey Trujillo, Mustafa Hadj-Nacer, Miles Greiner (*Univ of Nevada, Reno*)

#### 11:15 am

Comparison of Cask Loader versus ORIGEN Decay Heat Calculation Results, Brandon Distler, Steve Baker, Jordan Gladden (*Transware Enterprises*), Hatice Akkurt (*EPR*)

#### 11:40 am

Effect of Pellet-Cladding Bonding on the Vibration of Surrogate Fuel Rods, Shokoufeh Zargar, Ricardo A. Medina (*Univ of New Hampshire*), Luis Ibarra (*Univ of Utah*)

Technical  
Sessions:  
Thursday  
April  
13

**THURSDAY, APRIL 13**  
**TECHNICAL SESSIONS - 10:25 AM**

**Waste Handling, Storage, and Emplacement at Disposal Facility**

**Session Organizer:** Frank Garisto (*NWMO*), **Cochairs:** Travis W. Knight (*Univ of South Carolina*)  
Mark Gobien (*NWMO*)

**Location:** Trade **Time:** 10:25-11:40 am

**10:25 am**

Experimental Determination and Modeling of Used Fuel Vacuum and Gas Circulation for Dry Cask Storage, Travis W. Knight, Jamil Khan, Tanvir Farouk (*Univ of South Carolina*), James Tulenko (*Univ of Florida*), Joshua Tarbutton (*Univ of North Carolina, Charlotte*)

**10:50 am**

Plasma Optical Emission Spectroscopy for Water Vapor Quantification and Detection, Malik M. Tahiyat, Travis W. Knight, Tanvir I. Farouk, (*Univ of South Carolina*)

**11:15 am**

Waste Management for Decommissioning of Nuclear Power Plants, Richard D. Reid (*EPRI*)

**Repository Licensing**

**Session Organizer:** Karen Smith (*RadEcol Consulting Ltd*), **Cochairs:** Shulan Xu (*SSM*), Graham Smith (*GMS Abingdon Ltd*)

**Location:** Independence **Time:** 10:25-11:40 am

**10:25 am**

Regulatory Oversight of Spent Nuclear Fuel Encapsulation Plant and Disposal Facility Construction, Kai Hämäläinen, Päivi Mäenalanen, Jouko Mononen, Jussi Heinonen (*STUK*)

**10:50 am**

License Review of the KBS-3 Concept- Assessment of Hydrogeological Analysis, Georg A. Lindgren (*SSM*)

**11:15 am**

Spent Fuel Management at the Andreeva Bay Site for Temporary Storage in the Kola Peninsula, Malgorzata Karpow Sneve, Katarzyna Siegien-Iwaniuk (*Norwegian Radiation Protection Authority*), Natalya Shandala (*Federal Medical Biological Agency of Russia*), Anatoly Grigoriev (*ROSATOM*), Graham Smith (*GMS Abingdon Ltd.*)

**Technical Program Committee Conference Wrap-Up/Lessons Learned**

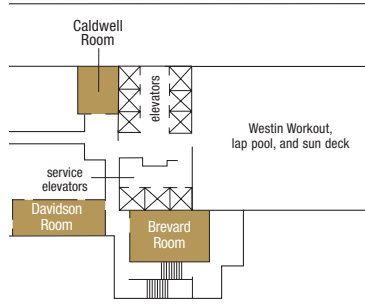
**Cochairs:** Brady Hanson (*PNNL*), Christi Leigh (*SNL*)

**Location:** Providence Ballroom III **Time:** 12:15-1:30 pm

Technical  
Sessions:  
Thursday  
April  
13

# Hotel Map

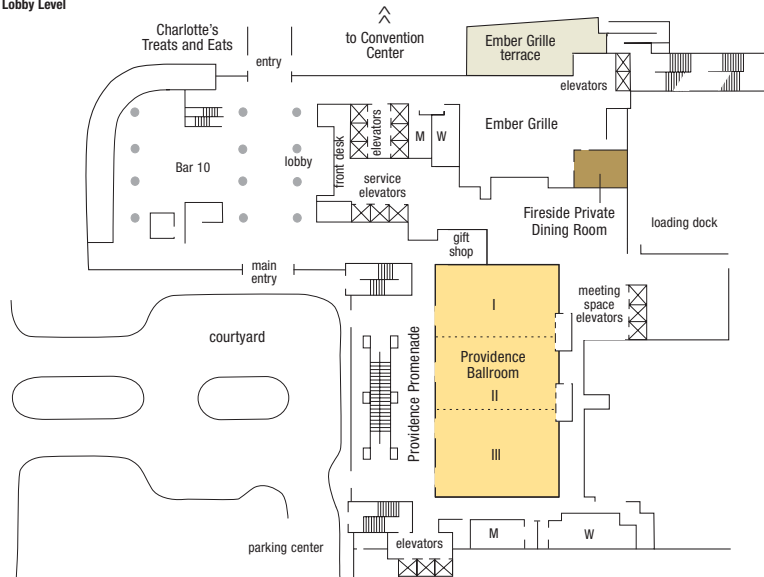
Level Three



Level Two



Lobby Level





# ANS Conference

## IHLRWM 2017


International High-Level Radioactive Waste Management

*Creating a Safe and Secure Energy Future for Generations to Come –  
Driving Towards long-Term Storage and Disposal*

April 9 – 13, 2017

Westin Charlotte

Charlotte, NC

A large, stylized white graphic of an atomic symbol, consisting of three intersecting elliptical orbits and three circular nuclei, positioned in the lower-left and bottom-center of the page.

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