

# ASME AIM-CI 2024

Asset Integrity Management of Critical Infrastructure

> CONFERENCE February 5-6, 2024

> > Delta Marriot Orlando Celebration Orlando, FL

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# Program

https://event.asme.org/AIM-CI



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# Welcome from the Conference Chair

On behalf of ASME and the organizing committee, it is with great pleasure to welcome you to the conference on **Asset Integrity Management of Critical Infrastructure (AIM-CI)** with a focus on concepts, processes and technologies that are critical to integrity management of critical systems in both power generation and oil & gas industries. This conference is the third in ASME conference series that focuses on Asset Integrity Management (AIM). The 4th AIM conference is being planned for 2026.

The main objective of this conference is to present in one venue the regulatory, current industry practices, and technologies associated with ensuring the safe operation of critical infrastructure throughout their life cycle. In addition to the technical program that includes 23 presentations covering the scope of the conference, we have arranged for a workshop at the end of the conference to discuss the remaining gaps in integrity management systems. While the papers and the presentations in the conference are available to the participants, the official publication of the final papers will be produced by ASME as an edited book that will be published mid-2024 and it will be provided to the participants in the conference. This means that any author who wants to update his/her paper based on the discussion in this conference can still do so. The results of the workshop session will also be included in the book.

The organization of this conference was not possible without the support of the conference co-chairs Dr. Jovica R. Riznic and Dr. Dragan Komljenovic and ASME staff Colleen Seaver and her team. We would like to express our sincere thanks to the authors, the reviewers, the session chairs, the panel members, and all the participants.

I sincerely hope that you enjoy both the technical presentation and the discussions. Please feel free to contact Colleen or I if there is anything we can do to make your experience an enjoyable one.

Dr. Mamdouh M. Salama AIM-CI 2024 Conference Chair

# Contents

WELCOME FROM THE AIM-CI CONFERENCE CHAIR
CONTENTS
GENERAL INFORMATION
SCHEDULE AT A GLANCE
ORGANIZING COMMITTEE
KEYNOTES
TECHNICAL SESSIONS
AUTHOR INDEX12
SPONSOR
2024 ASME OFFICERS14
HOTEL FLOOR PLANS

# **General Information**



# REGISTRATION INFORMATION

# LOCATION:

The Preserve Ballroom Pre-function area, Lobby Level

# HOURS:

Monday, February 5 7:30 AM - 5:00 PM

Tuesday, February 6 8:00 AM - 4:00 PM

# **BADGE REQUIRED FOR ADMISSION**

All conference attendees must have an official ASME AIM-CI 2024 badge at all times in order to gain admission to technical sessions, keynotes, lunches, and other conference events. Without a badge, you will not be granted admission to conference activities. Your badge also provides a helpful introduction to other attendees.

# AUDIOVISUAL EQUIPMENT IN SESSION ROOM

The meeting room at the Delta Hotels Orlando Celebration where all technical sessions will be held, is equipped with a screen, LCD projector, and podium. Speakers should have a copy of their presentation loaded onto a memory stick and arrive before their assigned session time to upload their presentation. It is recommended that authors/speakers bring all visual aids with them.

# **ASME EVENTS APP**

AIM-CI will utilize a mobile event app in place of a printed program to enhance the conference experience for attendees and speakers.

- Connect with Attendees
- View Speaker Profiles
- Search and Access Session Information
- And More!

All features may not be available at all events.

Keep an eye on your email for more information on how to access and navigate the ASME Events App!

# **CONFERENCE MEALS**

Osprey/Swan

Breakfast will be served on Monday and Tuesday between 8:00AM and 9:00AM.

Lunch will be served on Monday and Tuesday between 12:30PM and 1:30PM.

# **OPENING RECEPTION**

Monday, February 5 5:30PM–6:30PM

All Conference registrants are invited to join their colleagues for light refreshments during the Monday evening event. Remember to bring your badge! In a casual atmosphere, greet friends, and meet the thinkers from around the world who are shaping the future of integrity management systems.

# **General Information**

# **BEVERAGE BREAKS**

The Preserve Ballroom Pre-function II Monday & Tuesday 10:45AM–11:00AM 3:30PM–3:40PM

Come join your fellow attendees for a few minutes of networking and discussion.

# PHOTOGRAPHS/VIDEO/AUDIO RECORDINGS

Unless otherwise agreed to in a separate document, participants are reminded that material presented at ASME conferences is under copyright of ASME. As a result, ANY recording of the presentations is prohibited.

# LIMITATION OF LIABILITY

You agree to release and hold harmless ASME from any and all claims, demands, and causes of action arising out of or relating to your participation in this event.

# **POST CONFERENCE PUBLICATION**

Each registered attendee will receive a digital copy of the AIM-CI E-Book when the publication becomes available.

# Schedule at a Glance

MONDAY, FEBRUARY 5				
TIME	SESSION			
7:30AM-5:00PM	Registration			
8:00AM-9:00AM	Breakfast			
9:00AM-10:45AM	Introduction and Keynote Speeches			
10:45AM-11:00AM	Break			
11:00AM-12:30PM	Asset Integrity Management Systems			
12:30PM-1:30PM	Lunch			
1:30PM-3:30PM	Asset Integrity Under Extreme and Disruptive Events			
3:30PM-3:40PM	Break			
3:40PM-5:10PM	Integrity Management of Critical Systems			
5:30PM- 6:30PM	Reception			

TUESDAY, FEBRUARY 6				
TIME	SESSION			
8:00AM-4:00PM	Registration			
8:00AM-9:00AM	Breakfast			
9:00AM-10:45AM	Risk Assessment and Validation Tools			
10:45AM-11:00AM	Break			
11:00AM-12:30PM	Integrity Management in the Presence of Corrosion and Cracks			
12:30PM-1:30PM	Lunch			
1:30PM-3:30PM	Pipeline Integrity Management and Risk Assessment			
3:30PM-3:40PM	Break			
3:40PM-5:10PM	Workshop: Remaining Technical Gaps			

# **KEYNOTES**

"Sustainability from a Nuclear Regulator's perspective", by Melanie Rickard, Director General, Directorate of Assessment and Analysis, Canadian Nuclear Safety Commission

"Integrity Management for Federally Regulated Pipelines: PHMSA's Data Update", by AJ McKean, Operations Supervisor at Pipeline and Hazardous Materials Safety Administration (PHMSA)

6

"Asset Management at Hydro-Québec as a Mean Towards a Decarbonized and Prosperous Québec", by Isabelle Chartier, Director of Research and Innovation, Hydro-Quebec's Research Institute (IREQ)

# **Organizing Committee**

# **ORGANIZING COMMITTEE**

Mamdouh M. Salama, Ph.D. MMS4AIM LLC

**Dragan Komljenovic, Ph.D.** Hydro-Quebec's Research Institute (IREQ)

**Jovica R. Riznic, Ph.D.** Canadian Nuclear Safety Commission

# TECHNICAL PROGRAM COMMITTEE

Mamdouh M. Salama, Ph.D. MMS4AIM LLC

**Dragan Komljenovic, Ph.D.** Hydro-Quebec's Research Institute (IREQ)

**Jovica R. Riznic, Ph.D.** Canadian Nuclear Safety Commission

Jack Dempsey Asset Management Partnership

**Derrick Rogers** PillarInnovations.Com

Georges Abdul-Nour, Ph.D. Université du Québec à Trois-Rivières (UQTR)

Damjan Maletic. Ph.D. Universa v Mariboru | University of Maribor

**P. Freeman Katina, Ph.D.** University of South Carolina Upstate

Agnes Marie Horn DNV AS

Said Ali Ibrahim. Ph.D. Al Azhar University

# **SESSION ORGANIZERS**

**Opening Session Session Co-Chairs:** Jovica Riznic, Ph.D. and Dragan Komljenovic, Ph.D.

Session 1. Asset Integrity Management Systems Chair: Dragan Komljenovic, Ph.D.

Session 2. Asset Integrity Under Extreme and Disruptive Events Chair: Jovica Riznic, Ph.D.

Session 3. Integrity Management of Critical Systems Chair: Mamdouh Salama, Ph.D.

Session 4. Risk Assessment and Validation Tools Chair: Jovica Riznic, Ph.D.

Session 5. Integrity Management in the Presence of Corrosion and Cracks Chair: Mamdouh Salama, Ph.D.

Session 6. Pipeline Integrity Management and Risk Assessment Chair: Mamdouh Salama, Ph.D.

Session 7. Workshop: Remaining Technical Gaps Facilitator: Jovica Riznic, Ph.D.

Panelists: Georges Abdul-Nour Vito Deluca Jason Goldberg Mahesh Pandey Mamdouh Salama

# **Keynotes**



**Melanie Rickard** 

Director General Directorate of Assessment and Analysis

Canadian Nuclear Safety Commission

# SUSTAINABILITY FROM A NUCLEAR REGULATOR'S PERSPECTIVE

# Abstract:

As a lifecycle nuclear regulator, the CNSC plays a role in energy sustainability by ensuring that nuclear projects are carried out safely, at all stages, from cradle to grave. For nuclear power plants, there are several aspects of regulation that enable, with proper management and oversight, plants to operate for well over 60 years. The role of the Canadian Nuclear Safety Commission (CNSC) in its oversight of major component replacement and/or Refurbishment activities, as supported by CNSC REGDOC 2.3.1, *Conduct of Licensed Activities: Construction and Commissioning Programs*, as well as the linkages to the conduct of a Periodic Safety Review, will be discussed. Aging Management and Fitness for Service play an important role in terms of integrity management of systems and structures. Some recent experiences with the refurbishment of the Darlington Nuclear Generating Station carried out between 2016 and 2023 will be provided. Additionally, Canadian experience with the discovery of elevated Hydrogen concentrations within regions of the pressure tube will be highlighted as an ongoing area of investigation and research regarding the extended operation of pressure tubes in certain CANDU plants in Canada.

# **Biography:**

Melanie Rickard is the Director General of the Directorate of Assessment and Analysis at the Canadian Nuclear Safety Commission, Canada's nuclear regulator.

She leads a team that performs safety assessments (design, engineering and safety analysis) of existing CANDU reactors and advanced nuclear/small modular reactors in Canada. Her team produces technical assessments related to licensing and compliance; plans and reacts to nuclear events and emergencies; represents the CNSC as leading experts in various nuclear safety fields and influences and contributes to the development of the regulatory framework. With 23 years at the CNSC, she has had a variety of experience in numerous facets of nuclear regulation.

Melanie holds a Masters degree in Chemistry from the University of New Brunswick.

When not at work Melanie is busy with her husband, her 15 year old son and their dog, Lochlan. She and her family love to stay active together, biking, skiing, cooking and travelling.



AJ McKean

Operations Supervisor

Pipeline and Hazardous Materials Safety Administration (PHMSA)

# INTEGRITY MANAGEMENT FOR FEDERALLY REGULATED PIPELINES: PHMSA'S DATA UPDATE

# Abstract:

PHMSA will provide insight into the overall categorization by incidents for Gas Distribution, Gas Transmission, and Hazardous Liquid pipelines. This presentation will communicate the overall reporting by the leading cause of failure for these systems for the last 20 years.

# **Biography:**

Amy Jo "AJ" McKean began in 2018 at PHMSA as a General Engineer (Inspector) in the Central Region and now serves as an Operations Supervisor in the Central Region.

AJ has 27 years in the pipeline industry as an operator and consultant to the industry. She has worked for Williams, Southern Star and TransCanada (Keystone XL) in engineering/operations/project management.

AJ holds a bachelor of science degree in Civil Engineering from the University of Missouri – Rolla (S&T).

# **Keynotes**

# ASSET MANAGEMENT AT HYDRO-QUÉBEC AS A MEAN TOWARDS A DECARBONIZED AND PROSPEROUS QUÉBEC

# Abstract:

With the challenges related to the energy transition, the impact of climate change and the decarbonization objectives of Quebec by 2050, Hydro-Québec has an ambitious action plan for 2035. In a context of asset sustainability and strong growth in demand, asset management appears to be an essential subject to enable our managers to make informed decisions based on reliability and inherent risk. It is in this context that we decided last year to set up a corporate innovation program in asset management and reliability in order to join forces to address short- and long-term issues. The presentation outlines the contribution of asset management in general at Hydro-Québec and its innovation program in asset management in particular in achieving the ambitious action plan 2035 aiming at decarbonization objectives of Quebec by 2050.

# **Biography:**

Isabelle Chartier is director of research and innovation assets at the Hydro-Québec research center. She has 20 years of service within Hydro-Québec with experience in the fields of energy efficiency and R&D. For 10 years now, she has been responsible for managing research teams and a research portfolio for production, transmission and distribution assets.

Isabelle has a Master's degree in business administration from the University of Quebec in Montreal and is passionate about outdoor sports.



**Isabelle Chartier** 

Director of Research and Innovation

Hydro-Quebec's Research Institute (IREQ)

# **Technical Sessions**

# **MONDAY, FEBRUARY 5**

# **MONDAY, FEBRUARY 5**

SESSION 1. ASSET MANAGEMENT SYSTEMS	
Heron	11:00AM - 12:30PM

Chair: Mamdouh Salama, *MMS4AIM LLC* Co-Chair: Tacoma Zach, *MentorAPM* Co-Chair: Dragan Komljenovic, *Hydro-Quebec Research Institute* Co-Chair: Jack Dempsey, *Asset Management Partnership LLC* Co-Chair: Jovica Riznic, *Canadian Nuclear Safety Commission* 

### Asset Management Through Lens of Complex System Governance

### Technical Paper Publication: AIM-CI2024-118758

Polinpapilinho Katina, University of South Carolina Upstate, Adrian Gheorghe, Old Dominion University, Charles Keating, Old Dominion University, Dragan Komljenovic, Hydro-Québec Research Institute, James Pyne, Old Dominion University

Evaluating Hydro-Québec's Decarbonization Pathways Using Integrated Asset-Centric Electrical Power System Evolution Modeling

### Technical Paper Publication: AIM-CI2024-118983

Vito De Luca, Hydro-Québec, Olivier Poupart-Raiche, Hydro-Québec, Jean-François Hamel, Hydro-Québec, Rémi Dumoulin, Hydro-Québec, Bannour Souilah, Hydro-Québec, Laurent Morissette, Hydro-Québec, Stéphane Pelletier, Hydro-Québec

The Role of Fitness for Service Methodologies as a Key Part of Nuclear Plant Asset/Life Cycle Management Programs

Technical Presentation Only: AIM-CI2024-118574

Jason Goldberg, Bruce Power

# SESSION 2. ASSET INTEGRITY UNDER EXTREME AND DISRUPTIVE EVENTS Heron 1:30PM - 3:30PM

Chair: Mamdouh Salama, MMS4AIM LLC

The System-Theoretic Process Analysis: An Innovative Top-Down Hazard Assessment Method for Industrial Asset Management

### Technical Paper Publication: AIM-CI2024-110532

**Issa Diop,** University of Quebec in Trois-Rivieres, **Georges Abdul-Nour,** University of Quebec in Trois-Rivieres, **Dragan Komljenovic,** Hydro-Quebec Research Institute Combining Asset Integrity Management and Resilience in Coping With Extreme Climate Events in Electrical Power Grids

### Technical Paper Publication: AIM-CI2024-108756

Dragan Komljenovic, Hydro-Quebec Research Institute, Marc Morissette, Hydro-Québec, Benoît Robert, Polytechnique Montréal, Jean-François Gravel, Hydro-Québec, Nathalie Benoît, Hydro-Québec, Simon Lebeau, Hydro-Québec, William Fortin, Hydro-Québec, Salami-Jean Yaacoub, Hydro-Québec, Patrick Leduc, Hydro-Québec, Pierre-Jean Rioux, Hydro-Québec, Billy Lamour, Hydro-Québec, Dany Michaud, Hydro-Québec, Denis Valiquette, Hydro-Quebec Research Institute, Jean-Marc Meango, Hydro-Quebec Research Institute, Alain Côté, Hydro-Quebec Research Institute, Georges Loiselle, Hydro-Québec, Éric Moisan, Hydro-Québec

Falling Structures: Risk Associated to "Non-Conventional" Connections of Tertiary Components

Technical Paper Publication: AIM-CI2024-118542

Morten Andre Langøy, Petroleum Safety Authority, Brit Graver, DNV

Integrated Asset Management for Extreme Disasters: Assessing the 2023 Flood Events and Resilience of Critical Infrastructures

### Technical Presentation Only: AIM-CI2024-122538

Oscar Nkwazema, China University of Geosciences, Emilia Dokuchits, China University of Geosciences, Emuesiri Ejairu, Bowling Green State University

SESSION 3. INTEGRITY MANAGEMENT OF CRITICAL SYSTEMS Heron 3:40PM - 5:10PM

Chair: Mamdouh Salama, MMS4AIM LLC

A Generalized Advanced Digital Technologies Framework for Fixed Foundation Offshore Wind Applications

Technical Paper Publication: AIM-CI2024-118871

William Walker, Stress Engineering Services Inc., Curtiss Fox, Electric Power Research Institute

**Reliability Analysis of Steam Generator Level Control Valves** 

### Technical Paper Publication: AIM-CI2024-119693

Mahesh Pandey, University of Waterloo, Mark Goodchild, Ontario Power Generation, Ahmad Sherzad, Ontario Power Generation, Rui Wang, University of Waterloo

### **Darlington Steam Generator Life Extension Scope**

Technical Presentation Only: AIM-CI2024-120648

Pejman Asgaripour, Ontario Power Generation

10

# **Technical Sessions**

# **TUESDAY, FEBRUARY 6**

# **TUESDAY, FEBRUARY 6**

### **SESSION 4. RISK ASSESSMENT AND VALIDATION TOOLS** Heron 9:00AM - 10:45AM

Chair: Mamdouh Salama, MMS4AIM LLC Co-Chair: Mark Avila, ASME Co-Chair: Dragan Komljenovic, Hydro-Quebec Research Institute Co-Chair: Jack Dempsey, Asset Management Partnership LLC Co-Chair: Jovica Riznic, Canadian Nuclear Safety Commission

A Rapid Tool for Risk-Based Post-Cyclonic Integrity Assessment of **Flexible Risers** 

### Technical Paper Publication: AIM-CI2024-118836

Rasoul Hejazi, The University of Western Australia, Elizabeth White, Woodside Energy Group Limited, Ruth Boardman, Woodside Energy Group Limited, Alessio Mariani, Woodside Energy Group Limited, Ian Milne, The University of Western Australia, Andrew Grime, The University of Western Australia, Phillip Watson, The University of Western Australia

### Probabilistic Approaches for Analysis of Inspection Data of Pipelines

Technical Paper Publication: AIM-CI2024-119036

Marc A. Maes, Aleatec Advisory Services Inc., Mamdouh M. Salama, MMS4AIM LLC

Large-Scale Material Property and Attribute Verification on Oil and Gas **Pipelines** 

Technical Paper Publication: AIM-CI2024-119266

Sean Knight, ROSEN, Austin Guerrero, ROSEN, Simon Slater, ROSEN

### **SESSION 5. INTEGRITY MANAGEMENT IN THE PRESENCE OF CORROSION AND CRACKS** Heron 11:00AM - 12:30PM

Chair: Mamdouh Salama, MMS4AIM LLC Co-Chair: Mark Avila, ASME Co-Chair: Dragan Komljenovic, Hydro-Quebec Research Institute Co-Chair: Jack Dempsey, Asset Management Partnership LLC Co-Chair: Jovica Riznic, Canadian Nuclear Safety Commission Optimizing the Inspection of Corrosion Under Insulation in Badak LNG Plant by the Implementation of Risk-Based Method

Technical Paper Publication: AIM-CI2024-120629

Integrity Management of Selective Seam Weld Corrosion on Oil and Gas **Pipelines** 

Technical Paper Publication: AIM-CI2024-119267

Cameron Cooper, ROSEN, Chris Davies, ROSEN, Simon Slater, ROSEN

**Evolutions of the Stress-Induced Magnetic Fields of Steel Samples With** Cracks

Technical Paper Publication: AIM-CI2024-119126

Sheng Bao, Zhejiang University, Yan Li, Zhejiang University, Liu Liu, Zhejiang University

# SESSION 6. PIPELINE INTEGRITY MANAGEMENT AND RISK ASSESSMENT Heron

1:30PM - 3:30PM

Chair: Mamdouh Salama, MMS4AIM LLC Co-Chair: Mark Avila, ASME Co-Chair: Dragan Komljenovic, Hydro-Quebec Research Institute Co-Chair: Jack Dempsey, Asset Management Partnership LLC Co-Chair: Jovica Riznic, Canadian Nuclear Safety Commission

# **Responses of Pipelines Impacted by Geohazards and Effective Integrity Management Strategies**

Technical Paper Publication: AIM-CI2024-119506

Yong-Yi Wang, Center for Reliable Energy Systems, LLC, Dan Jia, Center for Reliable Energy Systems, LLC, Banglin Liu, Center for Reliable Energy Systems, LLC, David Warman, Center for Reliable Energy Systems, LLC

Key Elements of Risk-Based Integrity Management Strategy

Technical Paper Publication: AIM-CI2024-119322

Mohammad Salama, Coosa Consulting Corporation

**Pipeline Strain Monitoring in Hazardous Classified Areas** 

Technical Paper Publication: AIM-CI2024-119242

Brett Dugan, Pillar Innovations, LLC, Jonathan Bell, Williams

**Dig Effectiveness and Repair Criteria for Dents in Gas Pipelines** 

Technical Paper Publication: AIM-CI2024-119011

Mady Mojarad, TC Energy, Isabella Uzcategui, TC Energy

# **Author Index**

AUTHOR LAST NAME	AUTHOR FIRST NAME	PAPER NO.	PAPER TITLE	SESSION
ASGARIPOUR	PEJMAN	120648	DARLINGTON STEAM GENERATOR LIFE EXTENSION SCOPE	SESSION 3. INTEGRITY MANAGEMENT OF CRITICAL SYSTEMS
BAO	SHENG	119126	EVOLUTIONS OF THE STRESS-INDUCED MAGNETIC FIELDS OF STEEL SAMPLES WITH CRACKS	SESSION 5. INTEGRITY MANAGEMENT IN THE PRESENCE OF CORROSION AND CRACKS
DAVIES	CHRISTOPHER	119267	INTEGRITY MANAGEMENT OF SELECTIVE SEAM WELD CORROSION ON OIL AND GAS PIPELINES	SESSION 5. INTEGRITY MANAGEMENT IN THE PRESENCE OF CORROSION AND CRACKS
DE LUCA	VITO	118983	EVALUATING HYDRO-QUÉBEC'S DECARBONIZATION PATHWAYS USING INTEGRATED ASSET-CENTRIC ELECTRICAL POWER SYSTEM EVOLUTION MODELING	SESSION 1. ASSET MANAGEMENT SYSTEMS
DIOP	ISSA	110532	THE SYSTEM-THEORETIC PROCESS ANALYSIS: AN INNOVATIVE TOP-DOWN HAZARD ASSESSMENT METHOD FOR INDUSTRIAL ASSET MANAGEMENT	SESSION 2. ASSET INTEGRITY UNDER EXTREME AND DISRUPTIVE EVENTS
DUGAN	BRETT	119242	PIPIPELINE STRAIN MONITORING IN HAZARDOUS CLASSIFIED AREAS	SESSION 6. PIPELINE INTEGRITY MANAGEMENT AND RISK ASSESSMENT
FOX	ИНОС	118871	A GENERALIZED ADVANCED DIGITAL TECHNOLOGIES FRAMEWORK FOR FIXED FOUNDATION OFFSHORE WIND APPLICATIONS	SESSION 3. INTEGRITY MANAGEMENT OF CRITICAL SYSTEMS
GOLDBERG	JASON	118574	THE ROLE OF FITNESS FOR SERVICE METHODOLOGIES AS A KEY PART OF NUCLEAR PLANT ASSET/LIFE CYCLE MANAGEMENT PROGRAMS	SESSION 1. ASSET MANAGEMENT SYSTEMS
GUERRERO	AUSTIN	119266	LARGE-SCALE MATERIAL PROPERTY AND ATTRIBUTE VERIFICATION ON OIL AND GAS PIPELINES	SESSION 4. RISK ASSESSMENT AND VALIDATION TOOLS
HEJAZI	RASOUL	118836	A RAPID TOOL FOR RISK-BASED POST-CYCLONIC INTEGRITY ASSESSMENT OF FLEXIBLE RISERS	SESSION 4. RISK ASSESSMENT AND VALIDATION TOOLS
AIL	DAN	119506	RESPONSES OF PIPELINES IMPACTED BY GEOHAZARDS AND EFFECTIVE INTEGRITY MANAGEMENT STRATEGIES	SESSION 6. PIPELINE INTEGRITY MANAGEMENT AND RISK ASSESSMENT
KATINA	POLINPAPILINHO	118758	ASSET MANAGEMENT THROUGH LENS OF COMPLEX SYSTEM GOVERNANCE	SESSION 1. ASSET MANAGEMENT SYSTEMS
KOMLJENOVIC	DRAGAN	108756	COMBINING ASSET INTEGRITY MANAGEMENT AND RESILIENCE IN COPING WITH EXTREME CLIMATE EVENTS IN ELECTRICAL POWER GRIDS	SESSION 2. ASSET INTEGRITY UNDER EXTREME AND DISRUPTIVE EVENTS
LANGØY	MORTEN	118542	FALLING STRUCTURES: RISK ASSOCIATED TO "NON- CONVENTIONAL" CONNECTIONS OF TERTIARY COMPONENTS	SESSION 2. ASSET INTEGRITY UNDER EXTREME AND DISRUPTIVE EVENTS
MAULANA	IRWIN	120629	OPTIMIZING THE INSPECTION OF CORROSION UNDER INSULATION IN BADAK LNG PLANT BY THE IMPLEMENTATION OF RISK-BASED METHOD	SESSION 5. INTEGRITY MANAGEMENT IN THE PRESENCE OF CORROSION AND CRACKS
NKWAZEMA	OSCAR	122538	INTEGRATED ASSET MANAGEMENT FOR EXTREME DISASTERS: ASSESSING THE 2023 FLOOD EVENTS AND RESILIENCE OF CRITICAL INFRASTRUCTURES	SESSION 2. ASSET INTEGRITY UNDER EXTREME AND DISRUPTIVE EVENTS
PANDEY	MAHESH	119693	RELIABILITY ANALYSIS OF STEAM GENERATOR LEVEL CONTROL VALVES	SESSION 3. INTEGRITY MANAGEMENT OF CRITICAL SYSTEMS
SALAMA	MAMDOUH	119036	PROBABILISTIC APPROACHES FOR ANALYSIS OF INSPECTION DATA OF PIPELINES	SESSION 4. RISK ASSESSMENT AND VALIDATION TOOLS
SALAMA	MOHAMMAD	119322	KEY ELEMENTS OF RISK-BASED INTEGRITY MANAGEMENT STRATEGY	SESSION 6. PIPELINE INTEGRITY MANAGEMENT AND RISK ASSESSMENT
UZCATEGUI	ISABELLA	119011	DIG EFFECTIVENESS AND REPAIR CRITERIA FOR DENTS IN GAS PIPELINES	SESSION 6. PIPELINE INTEGRITY MANAGEMENT AND RISK ASSESSMENT

12



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Mark Avila ASME New York, NY

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