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Dear VVUQ Symposium Attendee,

On behalf of the Organizing Committee, I want to welcome you to the Verification, Validation, and Uncertainty Quantification symposium! We are happy to have you join us for this important event. VVUQ is essential to ensure that the results of these methods are reliable and accurate, as it provides a systematic approach to assess and reduce uncertainties associated with these methods. In today’s world, where computational models are widely used in engineering, science, and technology, the need for VVUQ has never been more critical. This symposium provides a platform for experts from academia, industry, and government agencies to exchange ideas, discuss challenges, and present solutions related to VVUQ. We hope you enjoy the symposium and take away valuable insights on this important topic.

Joshua Kaizer
VVUQ 2023 Conference Chair

VVUQ 2023 Symposium Organizing Committee
Jeff Bischoff    Gregory Banway
Jeff Bodner    Luis Eca
Yassin Hassan    Marc Horner
    Kevin Dowding
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<td>Keynote&lt;br&gt;Chris Stanek&lt;br&gt;Presentation title: Integrating VVUQ in to Nuclear Energy Advanced Modeling and Simulation&lt;br&gt;Athens Ballroom&lt;br&gt;Lobby Level&lt;br&gt;9:15 AM-10:15 AM</td>
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ACKNOWLEDGEMENT
The Verification, Validation, and Uncertainty Quantification Symposium is sponsored by ASME. All technical sessions and conference events will take place at Kimpton Hotel Monaco Baltimore. Please check the schedule for event times and locations.

REGISTRATION FEES
Full Registration Fee includes:
• Admission to all technical sessions.
• All scheduled meals.
• Symposium program with abstracts.
One-day Registration Fee includes Admission to events above for that day.

NAME BADGES
Name badges should be worn always during the conference. You will need it for admission to all conference functions unless otherwise noted. Your badge also provides a helpful introduction to other attendees.

FREE ASME MEMBERSHIP
Non-ASME Members who pay the non-Member conference registration fee, including students who pay the non-Member student fee, will be offered a 4-month trial ASME Membership (complimentary) following the conference. Please allow approximately 4 weeks after the conclusion of the conference for your membership to become active. Visit www.asme.org/membership for more information about the benefits of ASME Membership.
INTERNET ACCESS IN THE HOTEL
Complimentary Wi-Fi is available in your sleeping room and in the meeting space at the Kimpton Hotel Monaco Baltimore. To access the Wi-Fi in the meeting space, open a browser and look for the SSID - ASME and the Password - VVUQ2023.

EMERGENCY
In case of an emergency in the hotel, pick up any house phone which rings directly at the operator, and they can dispatch help.

ACCESSIBILITY AND GENERAL QUESTIONS
Whenever possible, we are pleased to accommodate attendees with special needs. Advance notice may be required for certain requests. For on-site assistance related directly to the conference events and for general conference questions, please visit the ASME registration desk located in the Athens Foyer. For special needs related to your hotel stay, please visit the hotel front desk.

ONSITE REGISTRATION HOURS
Location: Athens Ballroom Foyer
Tuesday, May 16, 2023 1:00 PM - 5:00 PM
Wednesday, May 17, 2023 8:00 AM - 5:00 PM
Thursday, May 18, 2023 8:00 AM - 5:00 PM

Breakfast & Lunch will be in the Paris Ballroom on the third floor
Keynotes

May 17, 2023, 9:00 AM ET

Dr. Barna Szabó
Engineering Software Research and Development, Inc

Presentation Title: Simulation Governance: An Idea Whose Time Has Come

Dr. Barna Szabó is Co-Founder and Chairman of Engineering Software Research and Development, Inc. a company whose mission is to create and market software tools for the advancement of the quality, reliability and timeliness of information that serves engineering decision-making processes.

Dr. Szabó was a full-time member of the faculty of the School of Applied Science and Engineering at Washington University in St. Louis from 1968 until his retirement as the Albert P. and Blanche Y. Greensfelder Professor of Mechanics. His areas of expertise include mathematical modeling techniques, error estimation and quality control procedures in finite element analysis, methods for controlling modeling errors in numerical simulation and assurance of the reliability of engineering decisions based on computed information.

Dr. Szabó is the principal author of three textbooks on finite element analysis (John Wiley & Sons, 1991 2011, 2021) and has published over two hundred technical papers, mostly on the finite element method.

Dr. Szabó is an external member of the Hungarian Academy of Sciences, Fellow of the St. Louis Academy of Sciences, holds an honorary doctorate and is a founding member and fellow of the US Association for Computational Mechanics. He is a registered Professional Engineer in the State of Missouri.
May 18, 2023, 9:00am ET

Chris Stanek
U.S. DOE, Office of Nuclear Energy, Nuclear Energy Advanced Modeling and Simulation (NEAMS) program and Los Alamos National Laboratory

Presentation Title: Integrating VVUQ into Nuclear Energy Advanced Modeling and Simulation

Chris Stanek is the National Technical Director of the U.S. DOE, Office of Nuclear Energy, Nuclear Energy Advanced Modeling and Simulation (NEAMS) program and a staff scientist at Los Alamos National Laboratory. He was previously the focus area lead of Materials Performance Optimization for the Consortium for Advanced Simulation of LWRs (CASL) Energy Innovation Hub. Stanek received his B.S. in Materials Science and Engineering at Cornell University and his Ph.D. in Materials from Imperial College London. His research focuses on multiscale simulation of nuclear fuel performance, and he has published over 120 papers on this and related topics.
Scott Sidener
Chief Engineer of Digital Technology, Westinghouse Electric Company

Presentation Title: Can VVUQ keep up with AI/ML? Practical Application

Needs for ML Models

Scott Sidener is the Chief Engineer of Digital Technology for Westinghouse Electric Company. He has 27 years of experience in the nuclear industry innovating and applying probabilistic modeling and simulation, V&V, data science, machine learning and artificial intelligence, statistical analysis, and materials science. He leads the Westinghouse digital enablement, digital twin, and data science strategies.
5/17/2023

04-01 Verification Methods
10:30 AM to 12:10 PM - Caracas, Lobby Level
Chair: Luis Eca - IST
Chair: Yassin Hassan - Professor, Texas A&M

  Brian Freno - Sandia National Laboratories
  Neil Matula - Sandia National Laboratories

New Verification Method for Deterministic and Stochastic Codes, [VVS2023-109542] Technical Presentation Only
  Aaron Krueger - Sandia National Laboratories
  Casey Jelsema - Sandia National Laboratories
  Timothy Smith - Sandia National Laboratories
  Andy Huang - Sandia National Laboratories

Attaining the Asymptotic Range in RANS Simulations, [VVS2023-108745] Technical Paper Publication
  Maarten Kerkvliet - Maritime Research Institute Netherlands
  Serge Toxopeus - Maritime Research Institute Netherlands
  Luis Eça - IST

Self-Similarity as a Tool for Verification, [VVS2023-110569] Technical Presentation Only
  Jim Ferguson - Los Alamos National Laboratory
  Steven Anderson - Los Alamos National Laboratory

5/17/2023

05-01 Validation Methods
10:30 AM to 11:45 AM - Vienna South, Lobby Level
Chair: Aaron Koskelo - Los Alamos National Laboratory

  Bryan Kaiser - Los Alamos National Laboratory
  Kyle Hickmann - Los Alamos National Laboratory
Methodology for Validation of Finite Element Analysis Utilizing Strain Gauge Measurements, [VVS2023-108749]
Technical Paper Publication
Rafal Sulwinski - T.D. Williamson
Rusty Johnston - T.D. Williamson

Experimental Measurement and Analysis Techniques for Validation, [VVS2023-109704]
Student Presentation
Blake Maher - Texas A&M University
Noah Sutton - Texas A&M University
Yassin Hassan - Texas A&M University

5/17/2023
07-01 VVUQ for Fluid Dynamics and Heat Transfer
1:15 PM to 2:55 PM - Vienna South, Lobby Level
Chair: Brandon M. Wilson - Los Alamos National Laboratory

Validation and Verification Analyses of Turbulent Forced Convection of Na and NaK in Miniature Heat Sinks, [VVS2023-108819]
Technical Paper Publication
Mahyar Pourghasemi - Mechanical Eng Dep, University of New Mexico
Nima Fathi - Texas A&M University

An Uncertainty Quantification Practice of Discretization Errors in Unsteady Rans Simulations of Bluff Body Aerodynamics: Grid Convergence Index Approach vs. Least Square Approach, [VVS2023-109492]
Technical Presentation Only
Donghun Yeo - National Institute of Standards and Technology
Tarak Nandi - National Institute of Standards and Technology

Code Verification of a Hypersonic Boundary Layer Code by the Method of Manufactured Solutions, [VVS2023-109552]
Technical Presentation Only
Jared Kirsch - Texas A&M University
Matthew Bopp - Sandia National Laboratories
Aaron Krueger - Sandia National Laboratories
Blake Lance - Sandia National Laboratories

Solution Verification of Materials Mixing Turbulent Flow Simulations, [VVS2023-109649]
Technical Presentation Only
Filipe Pereira - Los Alamos National Laboratory
Luis Eca - Instituto Superior Tecnico
09-01 VVUQ for Solid Mechanics, Structures, Impact, and Blast
1:15 PM to 2:55 PM - Caracas, Lobby Level
Chair: David Moorcroft - Federal Aviation Administration

Impact Limiter Computer Simulation and Verification by Drop Tests, [VVS2023-108557]
Technical Paper Publication
Kalyan K. Niyogi - Holtec International
Xuejun Zhai - Holtec International

Variational Bayesian Calibration of a PTW Material Strength Model for OFHC Copper, [VVS2023-108829]
Technical Paper Publication
Stephen A. Andrews - Los Alamos National Laboratory
Brandon M. Wilson - Los Alamos National Laboratory

Use of Validation Suites to Enhance Communication: Example of Ejecta From Shocked Metal Surfaces, [VVS2023-109383] Technical Presentation Only
Joanne Budzien - Los Alamos National Laboratory

Pierre Baudoin - EikoSim
Nicolas Swiergiel - ArianeGroup
Florent Mathieu - EikoSim

06-01 Methods for Uncertainty Quantification, Sensitivity Analysis, and Prediction
3:15 PM to 4:30 PM - Caracas, Lobby Level
Chair: Joshua Kaizer - U.S. Nuclear Regulatory Commission

Michael Du - SLB
Fei Song - SLB
Ke Li - SLB

Ian Carr - US Food and Drug Administration
Kenneth Aycock - US Food and Drug Administration
Harshad Paranjape - Confluent Medical Technologies
Craig Bonsignore - First Article Services LLC
Jason Weaver - US Food and Drug Administration
Brent Craven - US Food and Drug Administration
Extension of Error Transport Equations to Domains With Curved Boundaries, [VVS2023-109486]
Student Presentation
Will Jordan - Virginia Tech
Chris Roy - Virginia Tech

5/17/2023
07-02 VVUQ for Fluid Dynamics and Heat Transfer
3:15 PM to 4:55 PM - Vienna South, Lobby Level
Chair: Brandon M. Wilson - Los Alamos National Laboratory

Allyson Leffler - Los Alamos National Laboratory
Jasper Thrussell - Los Alamos National Laboratory
Jim Ferguson - Los Alamos National Laboratory
Steven Anderson - Los Alamos National Laboratory

Numerical Assessment of Transition to Turbulent Regime in Triply Periodic Minimal Surfaces, [VVS2023-109714]
Technical Presentation Only
Eleonora Gajetti - Politecnico di Torino
Antonio Buffo - Politecnico di Torino
Gianluca Boccardo - Politecnico di Torino
Luca Marocco - Politecnico di Milano
Laura Savoldi - Dipartimento Energia, Politecnico Di Torino

Code-to-Code Benchmark for Laminar and Turbulent Flows in Triply Periodic Minimal Surfaces, [VVS2023-109731]
Technical Presentation Only
Marco Carbotta - Politecnico di Torino
Eleonora Gajetti - Politecnico di Torino
Luca Marocco - Politecnico di Milano
Laura Savoldi - Politecnico di Torino

Error Transport Equations for Unsteady Problems With Shock Discontinuities, [VVS2023-109496]
Student Presentation
Michael Ganotaki - Virginia Tech
Will Jordan - Virginia Tech
Christopher Roy - Virginia Tech
5/18/2023

**08-01 VVUQ for Nuclear and Industrial Applications**
10:30 AM to 12:35 PM - Caracas, Lobby Level
Chair: **Aaron Krueger - Sandia National Laboratories**

Numerical Assessment of Hydraulic Properties of Triply Periodical Minimal Surfaces Structures, [VVS2023-108794]
Technical Paper Publication
   Cecilia Piatti - Politecnico di Torino
   Laura Savoldi - Politecnico di Torino
   Nima Fathi - Texas A&M University

Technical Paper Publication
   Richard R. Schultz - Idaho State University
   George L. Mesina - Idaho National Laboratory

Validation of Internal Nozzle Fuel Spray Simulations Under Flashing and Non-Flash Boiling Conditions, [VVS2023-110089]
Student Presentation
   Aman Kumar - University of Massachusetts Lowell
   Noah Van Dam - University of Massachusetts Lowell

The Differences Between Statistical and Spatial Monte Carlo Sampling, [VVS2023-109785]
Technical Presentation Only
   Joshua Kaizer - U.S. Nuclear Regulatory Commission

Experimental Validation Methodology of a Prototypical Helical Coil Steam Generator Undergoing Flow-Induced Vibrations, [VVS2023-109745]
Student Presentation
   Noah Sutton - Texas A&M University
   Blake Maher - Texas A&M University
   Yassin Hassan - Texas A&M University

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5/18/2023

**11-01 VVUQ for Biomedical Engineering**
10:30 AM to 12:35 PM - Vienna South, Lobby Level
Chair: **Marc Horner - ANSYS, Inc.**
Chair: **Kenneth Aycock - US Food and Drug Administration**

Digital Image Correlation Validation of Finite Element Strain Analysis of Dental Implant Insertion for Two Implant Designs, [VVS2023-107659]
Technical Paper Publication
   Baixuan Yang - Queen's University
   Ainara Irastorza-Landa - Nobel Biocare Services AG
   Peter Heuberger - Nobel Biocare Services AG
   Heidi-Lynn Ploeg - Queen's University
A Tiered Validation of a Sapien-3 Tavi Fem-Model Considering Mixed Epistemic/aleatoric Uncertainty, [VVS2023-109183] Technical Presentation Only
Nils Götzén - 4RealSim Services BV
Tahir Turgut - 4RealSim Services BV
Omar Zahalka - 4RealSim Services BV
Vincent Bouwman - 4RealSim Services BV

Towards Full-Field Strain Measurements for Validating Medical Device Computational Solid Mechanics Simulations, [VVS2023-109685] Technical Presentation Only
Hadi Mirmohammad - Food and Drug Administration
Jacob Hochhalter - University of Utah
Andrew Cannon - 1900 Engineering
Daniel Porter - Food and Drug Administration
Jason Weaver - Food and Drug Administration
Brent Craven - Food and Drug Administration
Kenneth Aycock - Food and Drug Administration

Validation of a Bone Analog Virtual Model for the Prediction of Screw Pullout Forces According to Astm F543 Standard, [VVS2023-109733] Technical Presentation Only
David Benoit - Numalogics
Franck Le Navéaux - Numalogics
Amy Posch - Pacific Research Laboratories
Julien Clin - Numalogics

A Multi-Patient Study for Correlation of Growth-Rod Fracture Data With Predicted High Stress Regions in Pediatric Scoliosis Using a Patient-Specific Finite Element Approach, [VVS2023-109737] Technical Presentation Only
Vivek Palepu - US Food and Drug Administration
Daksh Jayaswal - University of Toledo
Amey Kelkar - University of Toledo
Manoj Kodigudla - University of Toledo
Vijay Goel - University of Toledo

5/18/2023
14-01 VVUQ for Artificial Intelligence and Machine Learning Models
1:45 PM to 3:00 PM - Caracas, Lobby Level
Chair: Gregory Banyay - APPLIED RESEARCH LABORATORY

Solution Verification of Neural Network-Based Regression Models, [VVS2023-108210] Technical Presentation Only
Alexander Mace - Westinghouse Electric Company
Mario Buczkowski - Westinghouse Electric Company
Scott Sidener - Westinghouse Electric Company

Kyle Hickmann - Los Alamos National Laboratory
5/18/2023

11-02 VVUQ in Biomedical Engineering
1:45 PM to 3:25 PM - Vienna South, Lobby Level
Chair: Gurpreet Singh - NuVasive
Chair: Chris Basciano - BD

A Closer Look at the Gradation Descriptions for Risk-Informed Credibility Assessment of an Astm F2077 Computational Model, VVS2023-105942 Technical Presentation Only
Gurpreet Singh - NuVasive
Niloufar Shekouhi - NuVasive
Michael Jekir - NuVasive

Credibility of a Computational Model to Predict Modular Junction Dissociation, VVS2023-117650 Technical Presentation Only
Mehul Dharia - Zimmer Biomet
Maged Awadalla - Zimmer Biomet
Kimberly Mimnaugh - Zimmer Biomet
Saandeep Mani - Zimmer Biomet
Philippe Favre - Zimmer Biomet
Jeffrey Bischoff - Zimmer Biomet

Code Verification and Sensitivity Analysis on Flows Through Isotropic, Capillary-Tube Porous Media Relevant to Medical Devices, VVS2023-110149 Technical Presentation Only
Siva Balasubramanian - BD
Christopher Basciano - BD
Shelby Bieritz - BD
Nathan Spangenberg - BD
Siddharth Nagarajan - bd

Asme V&v 40 Tibial Tray Example: Assessing the Applicability of the Validation Activities to the Context of Use for Non-Identical Quantities of Interest, VVS2023-117990 Technical Presentation Only
Brandon Lurie - W. L. Gore & Associates

5/18/2023

03-01 Topics in Verification, Validation & Uncertainty Quantification
3:45 PM to 5:00 PM - Vienna South, Lobby Level
Chair: Yassin Hassan - Professor, Texas A&M University
Takahiro Yamada - Yokohama National University

Application of VVUQ Concepts to ASME Codes and Standards for Pressure Vessels, (VVS2023-108506)
Technical Paper Publication
Bart Kemper - Kemper Engineering Services, LLC

An Extension to the Predictive Capability Maturity Model to Assess Model Credibility Using Dempster-Shafer Theory, (VVS2023-108590) Technical Presentation Only
Oliver Stover - Vanderbilt University
Sankaran Mahadevan - Vanderbilt University

5/18/2023
14-02 VVUQ for Artificial Intelligence and Machine Learning Models
3:45 PM to 5:50 PM - Caracas, Lobby Level
Chair: Noah Van Dam - UMass Lowell

Quantifying Data Uncertainty in Scientific Machine Learning, (VVS2023-109300) Technical Presentation Only
Kyle Neal - Sandia National Laboratories
Erin Acquesta - Sandia National Laboratories

Uncertainty Quantification of Physics-Informed Neural Network Models of Advection-Diffusion Equations, (VVS2023-109421) Technical Presentation Only
Babajide Kolade - Fitila Technologies

Optimal Design Verification, (VVS2023-109701) Technical Presentation Only
Gregory Banyay - APPLIED RESEARCH LABORATORY

Evaluation of Chemical Kinetics Dnn Time Stepping Errors, (VVS2023-110193) Student Presentation
Ahmed Almeldein - Francis College of Engineering, University of Massachusetts Lowell
Noah Van Dam - Francis College of Engineering, University of Massachusetts Lowell

Interpretability Methods for Deep Neural Networks as Applied to Tepla Damage Calibration in Copper, (VVS2023-109730) Technical Presentation Only
Skylar Callis - Los Alamos National Lab
5/18/2023

01-01 Challenge Problems
5:00 PM to 5:50 PM - Vienna South, Lobby Level
Chair: Yassin Hassan - Professor, Texas A&M University

Virginia Tech-Nasa Cfd Turbulence Model Validation Challenge, [VVS2023-109675]
Technical Presentation Only
Chris Roy - Virginia Tech
Aldo Gargiulo - Virginia Tech
Daniel Binu - Virginia Tech
Agata Grzyb - Virginia Tech
K. Todd Lowe - Virginia Tech
William Devenport - Virginia Tech
Aurelien Borgoltz - Virginia Tech

Flow Visualization and Temperature Measurement With Single Non-Isothermal Jet in a Hemispherical Upper Plenum for Benchmark Problem 3, [VVS2023-118738]
Technical Presentation Only
Blake Maher - Texas A&M University
Noah Sutton - Texas A&M University
Yassin Hassan - Texas A&M University

FRIDAY, MAY 19, 2023

5/19/2023

03-02 Topics in Verification, Validation & Uncertainty Quantification
10:30 AM to 12:10 PM - Athens Ballroom, Lobby Level
Chair: Nima Fathi - Texas A&M University

Thoughts on Certification by Analysis, [VVS2023-109747] Technical Presentation Only
William Oberkampf - W L Oberkampf Consulting
Martin Pilch - MPilch Consulting

Flexible Adaptation of the Pcmm (Predictive Capability Maturity Model) to Other Simulation Technologies, [VVS2023-109533] Technical Presentation Only
William Rider - Sandia National Laboratories
Erin Acquesta - Sandia National Laboratories
Jason Verley - Sandia National Laboratories

Uncertainty Aggregation Through Model Development and Assessment Towards Prediction, [VVS2023-109695]
Technical Presentation Only
Andrew White - Rolls-Royce Corporation
Sankaran Mahadevan - Vanderbilt University

Vicente Romero - Sandia National Laboratories
EikoSim is a software company that aims at enabling its customers to establish a strong link between numerical simulations and physical tests. Our mission is to democratize validation practices in structural mechanics, by providing software tools that improve our customers' confidence in simulation to accelerate development through simulation. By leveraging large amounts of test data, EikoSim's customers build simulation credibility.

Women in Standards & Certification (WiSC)
Within ASME Standards & Certification (S&C), the Women in Standards & Certification (WiSC) initiative was established in Spring 2019 with a goal of enhancing the culture of ASME Standards and Certification by providing an inclusive and supportive environment for women. More information is located at WiSC.
There are Many Ways to Contribute, Lead, Learn, and Connect - Be a Part of the Latest in VVUQ with ASME

Share best practices among the VVUQ technical community and foster the development of state-of-the-art products and events.

Volunteer for the ASME VVUQ Subcommittees – For a Rewarding Experience. Join today!

**Apply consensus based standards that are the essential resources for verification, validation and uncertainty quantification (VVUQ) in computational modeling and simulation.**

**ASME VVUQ 10 Verification, Validation, and Uncertainty Quantification in Computational Solid Mechanics**
Provides procedures for assessing the correctness and credibility of modeling and simulation in computational solid mechanics.

**ASME VVUQ 20 Verification, Validation, and Uncertainty Quantification in Computational Fluid Dynamics and Heat Transfer**
Provides procedures for quantifying the accuracy of modeling and simulation in computational fluid dynamics and heat transfer.

**ASME VVUQ 30 Verification, Validation, and Uncertainty Quantification in Computational Simulation of Nuclear System Thermal Fluids Behavior**
Provides the practices and procedures for verification and validation of software used to calculate nuclear system thermal fluids behavior. The software includes system analysis and computational fluid dynamics, including the coupling of this software.

**ASME VVUQ 40 Verification, Validation, and Uncertainty Quantification in Computational Modeling of Medical Devices**
Provides procedures to standardize verification and validation for computational modeling of medical devices.

**ASME VVUQ 50 Verification, Validation, and Uncertainty Quantification of Computational Modeling for Advanced Manufacturing**
To provide procedures for verification, validation, and uncertainty quantification in modeling and computational simulation for advanced manufacturing.

**ASME VVUQ 60 Verification, Validation, and Uncertainty Quantification of Computational Modeling in Energy Systems**
To develop and establish best practice procedures for uncertainty quantification in computational and simulations as applied in non-nuclear energy systems.

**ASME VVUQ 70 Verification, Validation, and Uncertainty Quantification of Machine Learning**
Coordinate, promote, and foster the development of standards that provide procedures for assessing and quantifying the credibility of machine learning algorithms applied to mechanistic and process modeling.

**ASME VVUQ 80 Verification, Validation, and Uncertainty Quantification in Computational Modeling of Pharmaceutical Products**
Provide procedures to standardize verification, validation, and uncertainty quantification in Computational Modeling of Pharmaceutical process development, manufacturing, and drug delivery.

**VVUQ 90 Verification, Validation, and Uncertainty Quantification in Computational Modeling of Airframe Structures**
Coordinate, promote, and foster the development of standards that provide procedures for assessing and quantifying the accuracy and credibility of computational models and simulations.

To learn more, visit: go.asme.org/ParticipateInStandards

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To Learn More, visit

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Check the event webpage for the schedule of meetings [Committee Meeting Schedule](https://www.asme.org/codes-standards/publications-information/verification-validation-uncertainty)