ICEMM Working Group 1: Integrated Monitoring & Modeling

2018 ICEMM Annual Public Meeting
Nuclear Regulatory Commission
Rockville, MD
April 24-25, 2018

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Office of Environmental Management
U.S. Department of Energy

WG1 Proposed Objectives

Coordinate ongoing and new research conducted by U.S. Federal agencies that focus on *the integration of monitoring activities and modeling approaches to reduce uncertainties and lifecycle costs of environmental cleanup and closure projects*

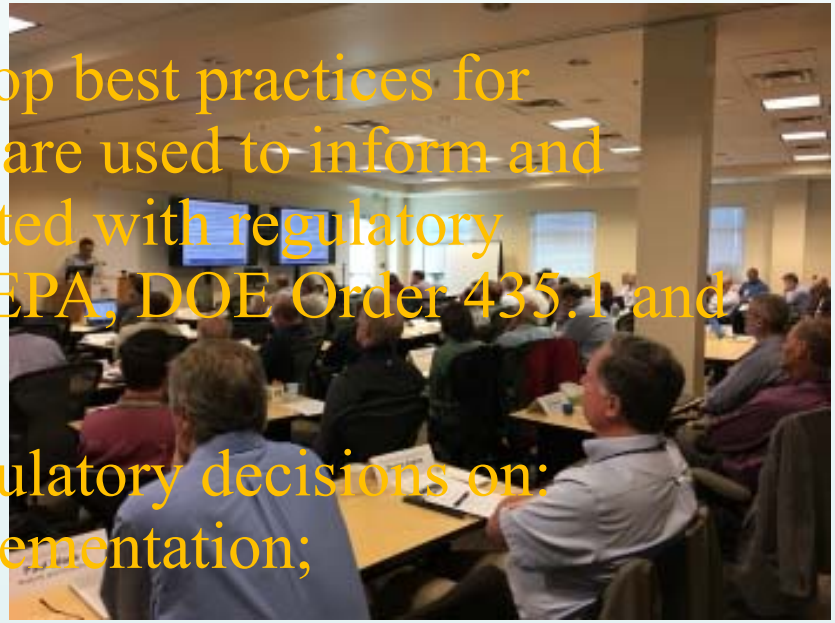
WG1 Proposed Goals

- Evaluate integrated, multi-media, multi-phase, multi-component, multi-scale coupled process models for environmental cleanup and closure applications
- Identify conditions for using multiple sets of different types testing/monitoring data of varying pedigree to identify and quantity sources of uncertainties of the integrated model
- Develop approaches for incorporating multiple sets and types of data into integrated, multi-scale environmental models, to assess and reduce estimation uncertainties
- Develop strategies for using integrated, multi-scale models to prioritize data acquisition and model improvement throughout the lifecycle of environmental cleanup projects, including:
  - Optimize monitoring programs for minimal cleanup time and/or total project costs
  - Develop strategies for validating integrated performance assessment/risk assessment (PA/RA) models using post-PA/RA testing/monitoring data

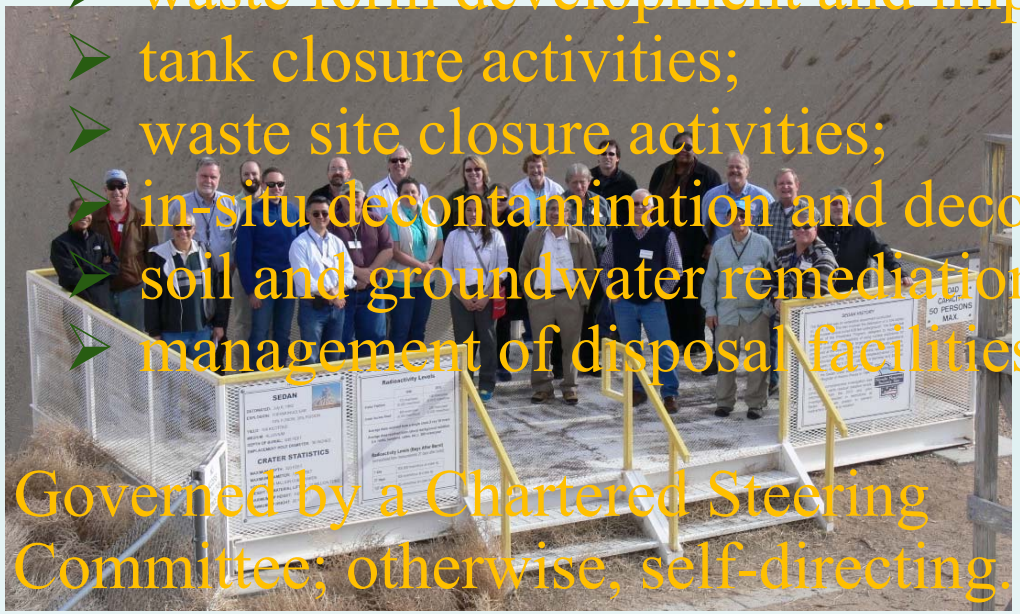
WG1 Participants

- George Alexander, NRC
- Matthew Bates, USACE
- Richard Bush, DOE LM
- Carol Eddy-Dilek, SRNL
- David Esh, NRC
- Boris Faybishenko, LBNL
- Mark Fuhrmann, NRC
- Pierre Glynn, USGS
- Mary Hill, U. Kansas
- Susan Hubbard, LBNL
- Gerry Laniak, EPA
- David Lesmes, DOE SC
- Joshua Linard, DOE LM
- Igor Linkov, USACE
- Justin Marble, DOE EM
- Tom Nicholson, NRC
- Feng Pan, U. Utah
- Sherri Ross, DOE EM
- Andy Ward, DOE EM
- Haruko Wainwright, LBNL
- Steve Yabusaki, PNNL
- Charley Yu, ANL
- Ming Zhu, DOE EM

Interagency Performance & Risk Assessment Community of Practice



- Promote technical exchange and develop best practices for performance and risk assessments that are used to inform and support management decisions associated with regulatory compliance with CERCLA, RCRA, NEPA, DOE Order 435.1 and NDAA Section 3116.
- Provide technical inputs to support regulatory decisions on:
  - waste form development and implementation;
  - tank closure activities;
  - waste site closure activities;
  - in-situ decontamination and decommissioning;
  - soil and groundwater remediation; and
  - management of disposal facilities



- Governed by a Chartered Steering Committee; otherwise, self-directing.

http://www.energy.gov/em/services/site-facility-restoration/performance-risk-assessment-community-practice-pra-cop

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7 Technical Exchange Meetings since 2009:

- July 13-14, 2009: Salt Lake City (http://www.cresp.org/education/workshops/pacop/)
  Theme: Engineered Systems for Closure and Near-Surface Disposal
- April 13-14, 2010: Richland, WA (http://srnl.doe.gov/copexchange/2010_pacop.htm)
  Theme: ASCEM, CBP, and examples of modeling applications
- May 25-26, 2011: Atlanta. GA (http://srnl.doe.gov/copexchange/2011_pacop.htm)
  Theme: 10 CFR 61 Update, Software QA, PA updates
- December 11-12, 2014: Las Vegas, NV (http://www.energy.gov/em/downloads/december-11-12-2014-technical-exchange-meeting-las-vegas-Nevada)
  Theme: Risk-Informed, Cost-Effective Environmental Management Decisions
- December 15-16, 2015: Richland, WA (http://www.energy.gov/em/december-15-16-2015-technical-exchange-meeting-richland-Washington)
  Theme: Interpretation of Performance and Risk Assessment Results
- October 19-20, 2016: Germantown, MD (http://www.energy.gov/em/october-19-20-2016-technical-exchange-meeting-germantown-maryland)
  Theme: Probabilistic Risk Assessments; Release and Transport of Key Radionuclides
- October 18-19, 2017: Albuquerque, New Mexico (https://www.energy.gov/em/october-18-19-2017-technical-exchange-meeting-albuquerque-new-mexico)

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2017 Annual Technical Exchange Meeting Highlights:

- **LANL Site Field Trip: Technical Area G PA & CA; Mortandad Canyon Chromium Project; Technical Area 21 Material Disposal Area (MDA)-T**
- **Recent Developments in Disposal of the High Level Waste and Spent Nuclear Fuel, Peter Swift (SNL)**
- PFLOTRAN Code Development for Waste Isolation Pilot Plant Performance Assessment, Glenn Hammond & Todd Zeitler (SNL)
- **Erosion Analysis for Los Alamos National Laboratory Material Disposal Area G, Philip Stauffer (LANL)**
- **Cliff Retreat Monitoring at Technical Area 54, Los Alamos National Laboratory, Elizabeth Miller (LANL)**
- Central Plateau Vadose Zone Geoframework for the Hanford Site Composite, Analysis Revision Scope, Alaa Aly (INTERA),
- Modeling of Resuspension: Prediction and Validation of Radioactive Dust Emissions from Contaminated Areas, Jeff Whicker (LANL)
- **Performance of Landfill Covers at Grand Junctions and Monticello Sites, Craig Benson (UVA)**
- **Cover System Differential Settlement Modeling, Te-Yang Soong (CTI)**
- **Environmental Monitoring and Modeling at Former Mill Tailing Sites, Josh Linard (DOE LM)**
- **Define End-State and Optimize Monitoring Program Using High-Performance Computing, Haruko Wainwright (LBNL)**
- **Machine Learning, Uncertainty Quantification, and Decision Analyses related to the LANL Groundwater Contaminant Remediation Projects, Monty Vesselinov (LANL)**
- Technology Readiness Assessment Process Adapted to Geologic Disposal of HLW/SNF, Dave Sevougian (SNL)

http://www.energy.gov/em/services/site-facility-restoration/performance-risk-assessment-community-practice-pra-cop

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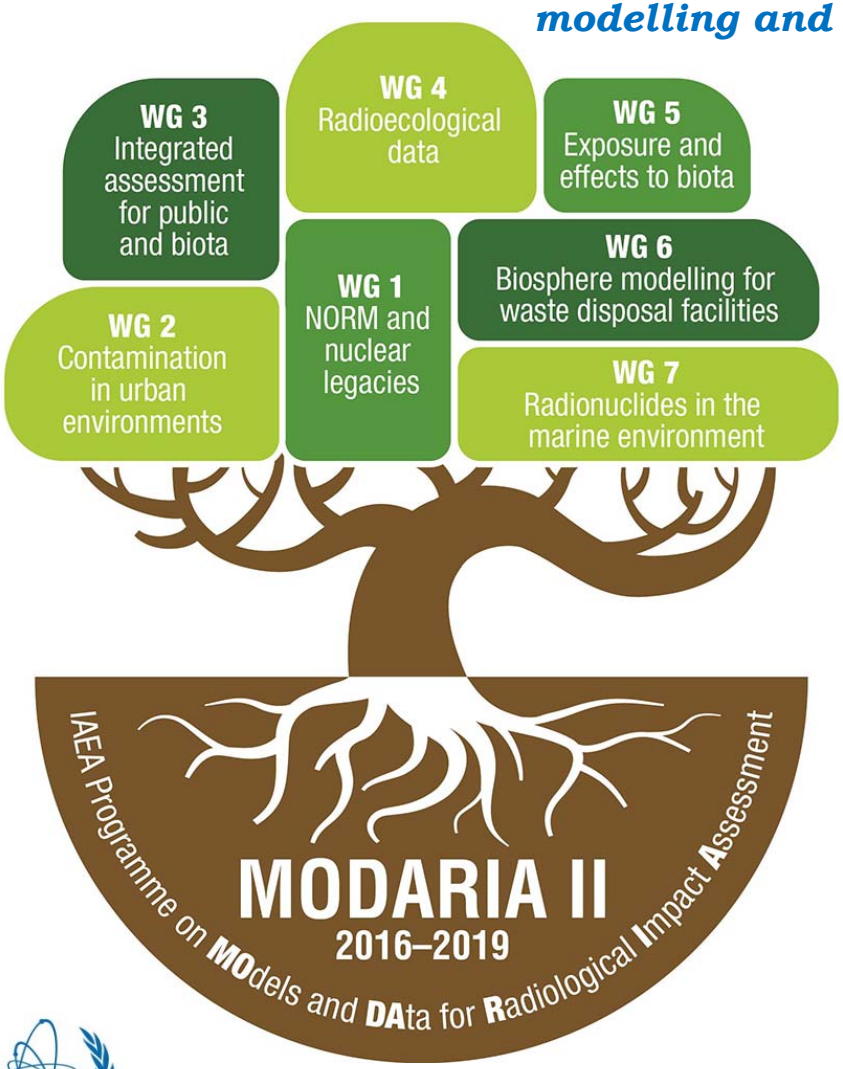
Position Papers:

- SERVICE LIFE OF ENGINEERED BARRIERS: MAKING THE CASE FOR LOW LEVEL AND MIXED WASTE FACILITIES, By Craig H. Benson, University of Virginia/CRESP (Under Development)
- STRUCTURED DECISION MAKING THAT ENGAGES STAKEHODERS, By Paul Black, Neptune & Company, Inc. (Under Development)
- MANAGING UNCERTAINTY, By Roger Seitz, SRNL (In review)

IAEA MODARIA II: Working Groups

MODARIA II WG1 will further strengthen the linkage between mathematical modelling and decision-aiding tools .



- **Working Group 1** - *Assessment and Decision Making of Existing Exposure Situations for NORM and Nuclear Legacy Sites*
- **Working Group 2** - *Assessment of Exposures and Countermeasures in Urban Environments*
- **Working Group 3** - *Assessments and Control of Exposures to the Public and Biota for Planned Releases to the Environment*
- **Working Group 4** - *Transfer Processes and Data for Radiological Impact Assessment*
- **Working Group 5** - *Exposure and Effects to Biota*
- **Working Group 6** - *Biosphere Modelling for Long Term Safety Assessments of High Level Waste Disposal Facilities*
- **Working Group 7** - *Assessment of Fate and Transport of Radionuclides Released in the Marine Environment*

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http://www-ns.iaea.org/projects/modaria/default.asp?l=116

IAEA MODARIA II Working Group 1: Member State Participation

Country	# of Reps
IAEA	1
Argentina	1
Australia	3
Azerbaijan	1
Belarus	1
Belgium	5
Brazil	1
Bulgaria	2
Canada	7
China	6
Denmark	1
Egypt	1
France	5
Gabon	1
Ghana	1
Indonesia	2
Iran	1
Italy	1
Lithuania	1
Madagascar	1
Morocco	1
Netherlands	2
Norway	1
Russia	1
Singapore	2
Slovenia	2
South Africa	3
Spain	2
Sweden	2
Switzerland	1
Thailand	1
Ukraine	2
United Kingdom	17
United States	10
Vietnam	1

WG1 IAEA Scientific Secretary: Tamara Yankovich

WG1 Leader: Ming Zhu (USA)

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IAEA MODARIA II Working Group 1: Tasks for Risk Assessment

- Develop improved methodologies for radiological impact assessments
- Improve assessment models
- Conduct model–model and model–data comparisons
- Apply methodologies to selected sites and facilities
- Train end users (regulators, operators, other stakeholders)

Tessenderlo Phosphate Processing Site
Belgium

Zapadnoe Uranium Tailings Site
Ukraine

Former NORM Facility in São Paulo
Brazil

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IAEA MODARIA II Working Group 1: Tasks for Decision Analyses

- Document decision making process for lessons learned
  - MDA-B land transfer after completion of cleanup at the LANL site, USA
  - Closure of mine Zirovskivrh, Slovenia
  - Closure of the Beaverlodge uranium mine and mill tailings site, Canada
- Develop lists of "prevailing circumstances" and site specific situations
  - Review non-nuclear (mining, chemical, oil/gas, construction) best practices
  - List of contributing factors
- Develop methodologies and toolsets for formalized decision analysis
  - Consider application of the DA methodologies to case studies
  - Define end-state and optimize monitoring program using high-performance computing codes
  - Develop structured decision making framework with participation of interested parties

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IAEA Publication (in review)

Mathematical Models for Assessing Remediation of Radioactively Contaminated Sites:

TABLE OF CONTENTS

INTRODUCTION
USE OF MODELS IN ENVIRONMENTAL REMEDIATION PROJECTS
MODELLING PROCESS
SOURCE TERM MODELS
SUBSURFACE FLOW AND TRANSPORT
ATMOSPHERIC TRANSPORT
RADIONUCLIDE TRANSPORT IN SURFACE RUNOFF
CURRENT PRACTICE AND RECENT DEVELOPMENTS IN ENVIRONMENTAL MODELING FOR REMEDIATION APPLICATIONS
SUMMARY AND CONCLUSIONS

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Upcoming Events

May 5-11, 2018, Ljubljana, Slovenia:

IAEA MODARIA II WG1 Second Interim Meeting

October 2018, Aiken, SC (Tentative):

2018 P&RA CoP Annual Technical Exchange Meeting