



AUGUST 16-18, 2016 • PITTSBURGH

MASTERING THE SUBSURFACE THROUGH TECHNOLOGY INNOVATION AND COLLABORATION

**CARBON STORAGE AND OIL AND NATURAL GAS
TECHNOLOGIES REVIEW MEETING**

Sponsored by:
U.S. Department of Energy
Office of Fossil Energy
National Energy
Technology Laboratory



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A MESSAGE FROM THE DIRECTOR



Grace M. Bochenek, Ph.D.,
Director,
National Energy
Technology Laboratory



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As Director of the National Energy Technology Laboratory (NETL), the U.S. Department of Energy's (DOE) dedicated fossil energy research laboratory, I'm excited to welcome each of you to the 2016 Carbon Storage and Oil and Natural Gas Technologies Review Meeting.

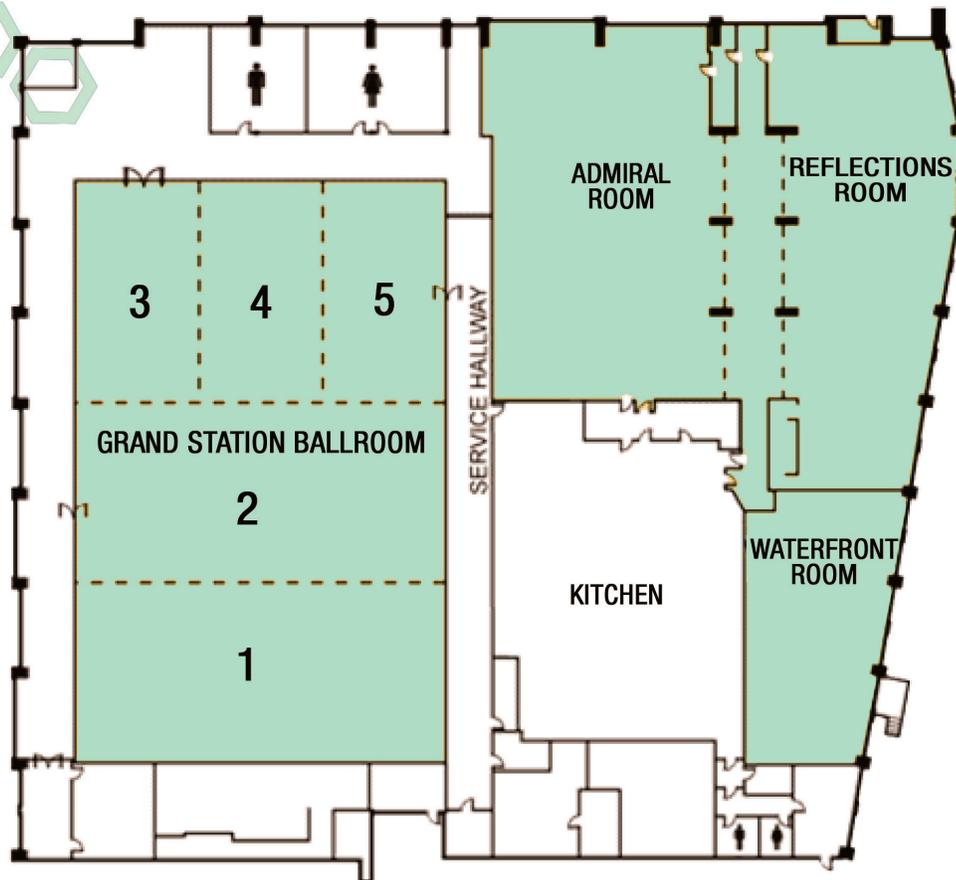
We have assembled here to participate in a three-day forum designed to review technologies being developed in more than 100 DOE-sponsored projects from NETL's Carbon Storage portfolio, Oil and Natural Gas portfolios, and the Subsurface Technology and Engineering Research (SubTER) initiative—work conducted under the guidance of DOE.

This year, we will explore the theme of “Mastering the Subsurface through Technology Innovation and Collaboration” and focus on program updates, relevant national and international topics, and the Regional Carbon Sequestration Partnerships’ large-scale field projects. Combining two technology areas—Carbon Storage and Oil and Natural Gas—will provide a more holistic approach to developing a mastery of the subsurface through integrated collaborative research.

Over the next three days, you will have the opportunity to engage in an exciting dialogue about the current and future state of Carbon Storage and Oil and Natural Gas Technologies. Through plenaries, parallel sessions, and poster sessions, we hope to provide you with an in-depth look at some of the promising research being conducted by DOE-sponsored teams across the nation.

I am honored to play a part in these efforts and I look forward to continued collaboration with the talented members of such a diverse research community. Thank you for attending and for enriching this review meeting with your expertise and acumen. Your ongoing commitment to technology development is truly the greatest asset that we have in our enduring efforts to address clean energy challenges.

SHERATON STATION SQUARE FLOOR PLAN



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FIRST FLOOR

DETAILED PROGRAM

TUESDAY, AUGUST 16TH

GRAND STATION BALLROOM

7:00 a.m. Meeting Registration/Continental Breakfast

WELCOME - PLENARY SESSION

Moderator: *Traci Rodosta, U.S. Department of Energy, National Energy Technology Laboratory*

8:00 a.m. **Introductions**
Traci Rodosta, U.S. Department of Energy, National Energy Technology Laboratory

8:05 a.m. **Welcoming Remarks**
*Dr. Sean Plasyanski, Acting Deputy Director, Laboratory Operations and Chief Operating Officer
National Energy Technology Laboratory*

8:40 a.m. **Subsurface Technology and Engineering Research, Development, and Demonstration
(SubTER) Crosscut Initiative**
Douglas Hollett, Principal Deputy Assistant Secretary, Office of Fossil Energy

9:15 a.m. **DOE's Clean Coal R&D Program**
Mark Ackiewicz, Office of Fossil Energy, U.S. Department of Energy

9:35 a.m. **BREAK – Grand Station III – IV**

PLENARY SESSION

Moderator: *Darin Damiani, Office of Fossil Energy, U.S. Department of Energy*

9:50 a.m. **DOE's Oil and Natural Gas R&D Program**
*Elena Melchert, Director, Upstream Research Division, Office of Fossil Energy,
U.S. Department of Energy*

10:10 a.m. **International Offshore Carbon Storage Panel Discussion**
Panel Chair: *Tim Dixon, IEAGHG Manager Technical Program, and CCS
and Regulatory Affairs*
Panel: *Melissa Batum, U.S. Department of Interior - Bureau of Ocean Energy
Management; Jun Kita, Research Institute of Innovative Technology for the Earth;
Tip Meckel, University of Texas - Bureau of Economic Geology; Owain Tucker, Shell*

10:55 a.m. **IEAGHG Monitoring Network Panel Discussion**
Panel Chair: *Tim Dixon, IEAGHG Manager Technical Program, and CCS and Regulatory Affairs*
Panel: *Tom Daley, Lawrence Berkeley National Laboratory; Simon O'Brien, Shell;
Katherine Romanak, University of Texas - Bureau of Economic Geology*

11:40 a.m. **LUNCH – Reflections and Waterfront**

PARALLEL SESSIONS

TUESDAY, AUGUST 16TH

Room		Brighton 3 & 4		Ellwood 1 & 2	
Session Moderator	Haselton 1 & 2 Geomechanics 1 Joshua Hull	SubTER 1 Andrea Dunn	Monitoring 1 William Aljoe		
12:40 PM	P1 Geomechanical Properties of Mesozoic Rift Basins: Applications for Geosequestration - Geostock Sandia LLC - Daniel Collins	P1 Novel 3D Acoustic Borehole Integrity Monitoring - LANL - Cristian Pantea	P1 Methods for Monitoring Migration of CO ₂ /Brine Plumes and Groundwater Impacts - National Energy Technology Laboratory - Christina Lopano		
1:05 PM	P2 Development of Geomechanical Screening Tools to Identify Risk: An Experimental and Modeling Approach - University of Texas at Austin - Mary Wheeler	P2 Ultrasonic Phased Arrays and Interactive Reflectivity Tomography - Oak Ridge National Laboratory - Hector Santos-Villalobos	P2 Monitoring of Geological CO ₂ Sequestration using Isotopes and PF Tracers - Oak Ridge National Laboratory - David Graham		
1:30 PM	P3 Integrated Characterization of CO ₂ Storage Reservoirs on the Rock Springs Uplift Combining Geomechanics, Geochemistry, and Flow Modeling - University of Wyoming - Vladimir Alvarado	P3 Imaging Fracture Networks using Joint Seismic and Electrical Change Detection - Sandia National Laboratory - Hunter Knox	P3 Science of CO ₂ Sequestration - Los Alamos National Laboratory - Rajesh Pawar		
1:55 PM	P4 A Probabilistic Assessment of the Geomechanical Response to CO ₂ Injections in Large Igneous Provinces - Virginia Polytechnic Institute and State University - Ryan Pollyea	P4 Multi Variate Examination of the Cause of Increasing Induced Seismicity - National Energy Technology Laboratory - Kelly Rose	P4 Surface and Airborne Monitoring Technology for Detecting Geologic Leakage in a CO ₂ -Enhanced Oil Recovery Pilot, Anadarko Basin, Texas - Oklahoma State University - Jack Pashin		

PARALLEL SESSIONS

TUESDAY, AUGUST 16TH

2:20 PM	P5	A Coupled Geomechanical, Acoustic, Transport and Sorption Study of Caprock Integrity in Carbon Dioxide (CO ₂) Sequestration - Colorado School of Mines - Manika Prasad	P5	SLAC National Accelerator Laboratory Coupling of Geochemical and Geomechanical Processes in the Manipulation of Fracture Systems in Subsurface Formations used for Carbon Sequestration - SLAC National Accelerator Laboratory - Andrew Kiss	P5	Field Testing of Emerging Technologies - The Otway Project - Lawrence Berkeley National Laboratory - Barry Freifeld
2:45 PM	P6	Quantitative Characterization of Impacts of Coupled Geomechanics and Flow on Safe Permanent Geological Storage of Carbon Dioxide (CO ₂) in Fractured Reservoirs - Colorado School of Mines - Philip Winterfeld	P6	Borehole Muon Detector for 4D Density Tomography - Pacific Northwest National Laboratory - Alain Bonneville	P6	Nonlinear Acoustic Methods for the Detection and Monitoring of CO ₂ /Brine Leakage Pathways in Wellbore Systems - Los Alamos National Laboratory- Pierre-Yves Le Bas

3:10 p.m.

Break – Grand Station III-IV

Room	Haselton 1 & 2		Brighton 3 & 4		Elwood 1 & 2	
Session Moderator	Hydraulic Fracturing I Adam Tew		SubTER 2 Angel Nieto		Geologic Storage I Jerry Carr	
3:25 PM	P1	Laboratory and Numerical Investigations of Hydraulic Fracture Propagation and Permeability Evolution in Heterogeneous and Anisotropic Shale - Lawrence Berkeley National Laboratory – Jens Birkholtzer	P1	Luminescence Spect Stress Sensor In Situ Measurement - Oak Ridge National Laboratory - Yarom Polsky	P1	Small-Scale Field Test Demonstrating CO ₂ Sequestration in Arbuckle Saline Aquifer and by CO ₂ -EOR at Wellington Field, Sumner County, Kansas - University of Kansas Center for Research - Lynn Watney
3:50 PM	P2	Understanding Water Controls on Shale Gas Mobilization into Fractures - Lawrence Berkeley National Laboratory - Tetsu Tokunaga	P2	Evaluating the State of Stress Beyond the Borehole - Los Alamos National Laboratory - Andrew Delorey	P2	CO ₂ Utilization in Unconventional Reservoirs - Pacific Northwest National Laboratory - Peter McGrail
4:15 PM	P3	Development of Nanoparticle-stabilized Foams To Improve Performance of Waterless Hydraulic Fracturing - University of Texas at Austin - Masa Prodanovic	P3	Hydraulic Fracture and Stimulation in a Deep Mine Investigation - Lawrence Berkeley National Laboratory - Curtis Oldenburg/Patrick Dobson	P3	Sequestration in Basalt Formations - Pacific Northwest National Laboratory - Peter McGrail

PARALLEL SESSIONS

TUESDAY, AUGUST 16TH

4:40 PM	P4	Advanced Hydraulic Fracturing - Gas Technology Institute - Jordan Ciezobka	P4	Development of microBayesloc Location Method - Lawrence Livermore National Laboratory - Eric Matzel	P4	Exploring the Behavior of Shales as Seals and Storage Reservoirs for CO ₂ - National Energy Technology Laboratory - Ernest Lindner
				Offshore Systems Albert Yost		
5:05 PM	P5	A Geomechanical Analysis of Gas Shale Fracturing and its Containment - Texas A&M - Jihoon Kim	P1	Risk Assessment for Offshore Systems - National Energy Technology Laboratory - Kelly Rose	P5	Central Appalachian Basin Unconventional (Coal/Organic Shale) Reservoir Small Scale CO ₂ Injection Test - Virginia Tech - Mike Karmis
5:30 PM	P6	Fracture Design, Placement, and Sequencing In Horizontal Wells - University of Texas at Austin - Mukul Sharma	P2	Metal-based systems in Extreme Environments - National Energy Technology Laboratory - Jeff Hawk		

6:15 p.m.

Poster Session – Grand Station III-V

DETAILED PROGRAM

WEDNESDAY, AUGUST 17TH

REGISTRATION

7:00 a.m. Meeting Registration/Continental Breakfast

8:00 a.m. **WELCOME – OPENING PLENARY SESSION**

Moderator: *Kylee Rice, U.S. Department of Energy, National Energy Technology Laboratory*

8:05 a.m. **Microseismicity Panel Discussion**

Panel Chair: *Grant Bromhal, U.S. Department of Energy, National Energy Technology Laboratory*
Panel: *Josh White, Lawrence Livermore National Laboratory; Bill Leith, United States Geological Survey; Bob Busby and Danielle Sumy, Incorporated Research Institutions for Seismology*

8:55 a.m. **National Risk Assessment Partnership Panel Discussion**

Panel Chair: *George Guthrie, Los Alamos National Laboratory*
Panel: *Grant Bromhal, National Energy Technology Laboratory; Brian McPherson, University of Utah; Alain Bonneville, Pacific Northwest National Laboratory; Subhash Thakur, BP; and Tim Dixon, IEAGHG*

9:35 a.m. **Water Nexus, Water Treatment Technologies**

Jessica Mullen, National Energy Technology Laboratory

9:55 a.m. BREAK – Grand Station III – IV

PLENARY SESSION – RESEARCH UPDATES

Moderator: *Albert Yost, U.S. Department of Energy, National Energy Technology Laboratory*

10:10 a.m. **Oil and Natural Gas Program Update**

Jared Ciferno, U.S. Department of Energy, National Energy Technology Laboratory

10:30 a.m. **Overview of NETL Subsurface Intramural Research**

Grant Bromhal, U.S. Department of Energy, National Energy Technology Laboratory

PLENARY SESSION – REGIONAL CARBON SEQUESTRATION PARTNERSHIP LARGE-SCALE FIELD PROJECTS

10:50 a.m. **Kevin Dome, Big Sky Regional Carbon Sequestration Partnership**

Lee Spangler, Energy Research Institute, Montana State University

11:25 a.m. **LUNCH – Reflections and Waterfront**

PARALLEL SESSIONS

WEDNESDAY, AUGUST 17TH

Room	Haselton 1 & 2	Brighton 3 & 4	Ellwood 1 & 2	Offshore Resource Assessments
Session Moderator	Monitoring 2 William Aljoe	Fracture Diagnostics William Fincham	Pressure Management Brian Dressel	Mary Sullivan
12:30 PM	P1 MVA Field Activities - National Energy Technology Laboratory - Hank Edenborn	P1 Fracture Diagnostics Using Low Frequency Electromagnetic Induction And Electrically Conductive Properties - University of Texas at Austin - Mukul Sharma	P1 Phase II Field Demonstration at Plant Smith Generating Station: Assessment of Opportunities for Optimal Reservoir Pressure Control, Plume Management and Produced Water Strategies - Electric Power Research Institute - Robert Trautz	P1 Offshore CO ₂ Storage Resource Assessment of the Northern Gulf of Mexico - University of Texas at Austin - Tip Meckel
12:55 PM	P2 Field Testing of Emerging Technologies - The Aquistore Project - Lawrence Berkeley National Laboratory - Tom Daley	P2 Injection and Tracking of Micro Seismic Emitters to Optimize UOG Development - Paulsson Inc. - Bjorn Paulsson	P2 Developing and Validating Pressure Management and Plume Control Strategies in the Williston Basin Through a Brine Extraction and Storage Test (BEST) - Phase II - University of North Dakota Energy & Environmental Research Center - John Hamling	P2 Mid-Atlantic U.S. Offshore Carbon Storage Resource Assessment Project - Battelle Memorial Institute - Neeraj Gupta
		Geophysics 1 William Fincham	Capacity/Storage Efficiency Brian Dressel	
1:20 PM	P3 Pressure-Based Inversion and Data Assimilation System (PIDAS) for CO ₂ Leakage Detection - University of Texas at Austin - Alexander Sun	P1 Relationship between Microseismicity and Rock Properties: Not all Marcellus is the Same - National Energy Technology Laboratory - Erich Zorn	P1 Enhanced Analytical Simulation Tool for CO ₂ Storage Capacity Estimation and Uncertainty Quantification - University of Texas at Austin - Seyyed Hosseini	P3 Assessment of CO ₂ Storage Resources in Depleted Oil and Gas Fields in the Ship Shoal Area, Gulf of Mexico - Geomechanics Technologies, Inc. - Nicky White

PARALLEL SESSIONS

WEDNESDAY, AUGUST 17TH

1:45 PM	P4	Optical Spectroscopy and Microseismicity tools for EOR and Coal Bed MVA Analyses - Los Alamos National Laboratory - Sam Clegg	P2	Improved Microseismic Monitoring - Lawrence Livermore National Laboratory - Eric Matzel/Josh White	P2	Optimizing and Quantifying CO ₂ Storage Resource in Saline Formations and Hydrocarbon Reservoirs - University of North Dakota - Charles Gorecki	P4	Offshore Storage Resource Assessment - NITEC LLC - Bill Savage
2:10 PM	P5	Real-Time In-Situ Carbon Dioxide Monitoring Network for Sensitive Subsurface Areas in Carbon Capture and Storage - Intelligent Optical Systems Inc. - Jesus Delgado-Alonso	P3	Scalable Automated, Semipermanent Seismic Method for Detecting CO ₂ Plume Extent During Geological CO ₂ Injection - University of North Dakota - John Hamling	P3	Commercial Scale CO ₂ Injection and Optimization of Storage Capacity in the Southeastern United States - Advanced Resources International, Inc. - George Koperna	P5	Southeast Offshore Storage Resource Assessment - Southern States Energy Board - Ken Nemeth, Ellen Grilliland, Jim Knapp and Jack Pashin
2:35 PM	P6	Understanding Impacts to Air Quality from Unconventional Natural Gas Development - National Energy Technology Laboratory - Natalie Pekney			P4	Resource Assessment - National Energy Technology Laboratory - Angela Goodman		

3:00 p.m. **BREAK**

Room	Haselton 1 & 2	Brighton 3 & 4	Ellwood 1 & 2
Session Moderator	Mitigation Kylee Rice	Geomechanics 2 Andrea McNemar	Associated Storage Gary Covatch
3:15 PM	P1 Programmable Sealant-Loaded Mesoporous Nanoparticles for Gas/Liquid Leakage Mitigation - C-Crete Technologies, LLC - Rouzbeh Shahsavari	P1 Pressure Management and Geomechanical Behavior at Industrial Partner Projects - Lawrence Livermore National Laboratory - Josh White	P1 Improved Characterization and Modeling of Tight Oil Formations for CO ₂ Enhanced Oil Recovery Potential and Storage Capacity Estimation - University of North Dakota - James Sorensen
			Wellbore Integrity Robert Vagnetti
			Integrated Wellbore Integrity Analysis Program for CO ₂ Storage Applications - Battelle Memorial Institute - Mark Moody

PARALLEL SESSIONS

WEDNESDAY, AUGUST 17TH

3:40 PM	P2	Wellbore Leakage Mitigation using Advanced Mineral Precipitation Strategies - Montana State University - Adrienne Phillips	P2	Characterizing and Interpreting the In Situ Strain Tensor During CO ₂ Injection - Clemson University - Larry Murdoch	P2	Identification of Residual Oil Zones in the Williston and Powder River Basins - University of North Dakota - Wesley Peck	P2	Wellbore and Seal Integrity - Los Alamos National Laboratory - Bill Carey
4:05 PM	P3	Methods to Enhance Wellbore Cement Integrity with Microbially-induced Calcite Precipitation (micp) - Montana State University - Adrienne Phillips	P3	Impact of Thermal Stress on Wellbore Integrity - Lawrence Livermore National Laboratory - Pratanu Roy	P3	Optimizing CO ₂ Sweep Based on Geochemical and Reservoir Characterization of the Residual Oil Zone of the Hess Seminole Unit - University of Texas at Austin - Ian Duncan	P3	Improving Science-Based for Wellbore Integrity, Barrier Interface Performance - National Energy Technology Laboratory - Nick Huerta
4:30 PM	P4	Targeted Mineral Carbonation to Enhance Wellbore Integrity - University of Virginia - Andres Clarens	P4	Geomechanics of CO ₂ Reservoir Seals - University of Texas at Austin - Peter Eichhubl	P4		P4	Development of Methods to Prohibit and Remediate Loss of Annular Isolation in Shale Gas Wells: Prevention and Remediation of Sustained Casing Pressure and Other Isolation Breaches - CSI Technologies, LLC - Jeff Watters/Kyle Combs
					Improved Recovery Gary Covatch			
4:55 PM	P5	Nanoparticle Injection Technology for Remediating Leaks of CO ₂ Storage Formation - University of Colorado - Yunping Xi	P5	Geophysical and Mineralogical Controls on the Rheology of Fracture Slip and Seal Breaching - Pennsylvania State University - Derek Elsworth	P1	Simulation of the Shale Oil System: from Molecular Fluid Dynamics to Reservoir Scale - Lawrence Berkeley National Laboratory - Matthew Reagan	P5	Nxis Well Integrity Inspection in Unconventional Gas Wells - General Electric Company - Matthias Kasten

PARALLEL SESSIONS

WEDNESDAY, AUGUST 17TH

5:20 PM	P6	Statistical Analysis of CO ₂ Exposed Wells to Predict Long Term Leakage through the Development of an Integrated Neural-Genetic Algorithm - University of Louisiana at Lafayette - Boyan Guo	P6	Geomechanical Framework for Secure Carbon Dioxide CO ₂ Storage in Fractured Reservoirs and Caprocks for Sedimentary Basins in the Midwest United States - Battelle Memorial Institute - Joel Sminchak	P2	Maximize Liquid Oil Production from Shale Oil and Gas Condensate Reservoirs by Cyclic Gas Injection - Texas Tech University System - James Sheng	Wellbore Integrity and Mitigation - National Energy Technology Laboratory - Barbara Kutchko
5:45 PM	P7	Wellbore Seal Repair Using Nanocomposite Materials - University of New Mexico - John Stormont	P7	Results from the In Situ Fault Slip Experiment at Mont Terri - Lawrence Berkeley National Laboratory - Jens Birkholzer	P3	Nano-scale and Laboratory-scale Investigations of Shale Oil Systems - Lawrence Berkeley National Laboratory - Timothy Kneafsey	Nanite For Better Wellbore Integrity and Zonal Isolation - Oceanit Laboratories - Vinod Veedu

DETAILED PROGRAM

THURSDAY, AUGUST 18TH

- 7:00 a.m. Meeting Registration/Continental Breakfast
- 8:00 a.m. **WELCOME – PLENARY SESSION – REGIONAL CARBON SEQUESTRATION PARTNERSHIP LARGE-SCALE FIELD PROJECTS**
- Moderator:** *William Aljoe*, U.S. Department of Energy, National Energy Technology Laboratory
- 8:05 a.m. **Farnsworth Unit, Southwest Regional Partnership on Carbon Sequestration**
Robert Balch, New Mexico Institute of Mining and Technology and *Brian McPherson*, University of Utah
- 8:40 a.m. **Michigan Basin, Midwest Regional Carbon Sequestration Partnership**
Neeraj Gupta, Battelle Memorial Institute
- 9:15 a.m. **Citronelle Project, Southeast Regional Carbon Sequestration Partnership**
Rob Trautz, Electric Power Research Institute; *Dave Riestenberg* and *George Koperna*, Advanced Resources International, Inc.
- 9:50 a.m. **Cranfield Project, Southeast Regional Carbon Sequestration Partnership**
Katherine Romanak and *Seyyed Hosseini*, University of Texas at Austin
- 10:25 a.m. **BREAK – Grand Station III – IV**
- 10:40 a.m. **Bell Creek Field Project, Plains CO₂ Reduction Partnership**
Charles Gorecki, Energy & Environmental Research Center
- 11:15 a.m. **Illinois Basin - Decatur Project, Midwest Geological Sequestration Consortium**
Sallie Greenberg, Illinois State Geological Survey
- 11:50 a.m. **Carbon Storage Program Future Direction**
Traci Rodosta, U.S. Department of Energy, National Energy Technology Laboratory
- 12:00 p.m. **LUNCH – Reflections and Waterfront**

PARALLEL SESSIONS

THURSDAY, AUGUST 18TH

Room	Haselton 1 & 2	Brighton 3 & 4	Ellwood 1 & 2
Session Moderator	Geophysics 2 William O'Dowd	Energy Data eXchange Erik Albenze	Modeling Mary Sullivan
1:00PM	Deep Controlled Source Electro-Magnetic Sensing: A Cost Effective, Long-Term Tool for Sequestration Monitoring - Multi Phase Technologies LLC - Douglas LaBrecque	P1 Big Data Computing for Advanced Processing & Data Discovery Using the Energy Data eXchange (EDX) - National Energy Technology Laboratory - Kelly Rose and Vic Baker	P1 Model Complexity and Choice of Model Approaches for Practical Simulations of CO ₂ Injection, Migration, Leakage, and Long-term Fate - Trustees of Princeton University - Karl Bandilla
1:25 PM	Methods for Locating Legacy Wells - National Energy Technology Laboratory - Garret Veloski	Hydraulic Fracturing 2 Ray Boswell	Optimal Model Complexity in Geological Carbon Sequestration: A Response Surface Uncertainty Analysis - University of Wyoming - Ye Zhang
1:50 PM	Field Testing of Emerging Technologies - The CMC Containment and Monitoring Field Station - Lawrence Berkeley National Laboratory - Tom Daley and Barry Freifeld	P1 Hydraulic Fracturing Test Sites Institute of Gas Technology - Jordan Ciezobka	P2 Enhanced Simulation Tools to Improve Predictions and Performance of Geologic Storage Coupled Modeling - Massachusetts Institute of Technology - Ruben Juanes
2:15 PM	Distributed Fiber Optic Arrays: Integrated Temperature and Seismic Sensing for Detection of CO ₂ Flow, Leakage and Subsurface Distribution - Electric Power Research Institute Inc. - Robert Trautz	P2 Utica Shale Energy and Environment Laboratory Ohio State University - Jeff Daniels	P3 Evolution of Carbonate CO ₂ Storage Reservoirs - Lawrence Livermore National Laboratory - Susan Carroll
2:40 PM	Geologic Storage 2 William O'Dowd	P3 Chemical Control of Fluid Flow and Contaminant Release in Shale Microfractures SLAC National Accelerator Laboratory - John Bargar	P4 Multiscale Modeling of Carbon Dioxide Migration and Trapping in Fractured Reservoirs with Validation by Model Comparison and Real-Site Applications - Princeton University - Karl Bandilla
	Reservoir Performance - National Energy Technology Laboratory - Johnathan Moore	P4 Development and Field Testing Novel Natural Gas Surface Process Equipment for Replacement of Water as Primary Hydraulic Fracturing Fluid - Southwest Research Institute - Griffin Beck and Sandeep Verma	P5

PARALLEL SESSIONS

THURSDAY, AUGUST 18TH

3:05 PM	P2	Impact of Microstructure on the Containment and Migration of CO ₂ in Fractured Basalts - Washington University - Daniel Giammar	P5	Geochemical Evolution of Hydraulically-Fractured Shales - National Energy Technology Laboratory - Ale Hakala	
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3:30 p.m. **BREAK - Grand Station III – IV**

Room	Session Moderator	Haselton 1 & 2	Brighton 3 & 4	Ellwood 1 & 2
		Associated Storage (EOR) Jerry Carr	Hydraulic Fracturing 2 (cont.) Ray Boswell	Intelligent Monitoring Systems Erik Albenze
3:45 PM	P1	A Nonconventional CO ₂ -Enhanced Oil Recovery Target in the Illinois Basin: Oil Reservoirs of the Thick Cypress Sandstone - University of Illinois - Nathan Webb	Mechanistic Approach to Analyzing and Improving Unconventional Hydrocarbon Production - Los Alamos National Laboratory - Satish Karra	P1 Development of a Framework for Data Integration, Assimilation, and Learning for Geological Carbon Sequestration - University of Texas at Austin - Alexander Sun
4:10 PM	P2	Carbon Life Cycle Analysis of CO ₂ -EOR for Net Carbon Negative Oil (NCNO) Classification - University of Texas at Austin - Vanessa Nunez Lopez	Marcellus Shale Energy and Environment Laboratory (MSEEL) West Virginia University - Tim Carr	P2 Development of Intelligent Monitoring System (IMS) Modules for the Aquisstore CO ₂ Storage Project - University of North Dakota - John Hamling
4:35 PM	P3	Development of Swelling-Rate-Controllable Particle Gels to Enhance CO ₂ Flooding Sweep Efficiency and Storage Efficiency - Missouri University of Science and Technology - Baojun Bai	Conductivity of Complex Fracturing in Unconventional Shale Reservoirs - Texas A&M - Ding Zhu	P3 Intelligent Monitoring Systems and Advanced Well Integrity and Mitigation - Archer Daniels Midland Corporation - Barry Freifeld

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