

2016 NETL CO₂ Capture Technology Project Review Meeting
Sheraton Station Square, Pittsburgh, PA
August 8 – August 12, 2016

PRELIMINARY AGENDA

Monday, August 8, 2016 – Grand Station I & II

7:00 a.m. **Registration** – Grand Station Foyer
 Continental Breakfast – Grand Station III

GRAND STATION I AND II

Opening Session

Moderator: *Lynn Brickett, U.S. Department of Energy, National Energy Technology Laboratory*

8:00 a.m. **Welcoming Remarks**
Lynn Brickett, U.S. Department of Energy, National Energy Technology Laboratory

8:05 a.m. **DOE's CCS and Power Systems R&D**
*Angelos Kokkinos, Director, Office of Advanced Fossil Technology Systems
Office of Fossil Energy, U.S. Department of Energy*

8:25 a.m. **TBD**
Abhoyjit Bhowan, Electric Power Research Institute

International Perspectives

8:45 a.m. **Pre-Feasibility Study for Establishing a Carbon Capture Pilot Plant for NGCC Applications in Mexico**
Haoren Lu, Nexant

9:05 a.m. **A Global Perspective on the Status of Carbon Capture**
John Gale, IEA Greenhouse Gas R&D Programme

9:25 a.m. **Demonstration of US-Norway Joint Projects**
Bjørn-Erik Haugan, Gassnova SF, and Espen Steinseth Hamborg, TCM DA

9:45 a.m. **Carbon Capture R&D in Australia**
Paul Feron, Commonwealth Scientific and Industrial Research Organisation (CSIRO)

10:05 a.m. BREAK – Grand Station III

National Carbon Capture Center

Moderator: *Elaine Everitt, U.S. Department of Energy, National Energy Technology Laboratory*

10:25 a.m. **National Carbon Capture Center**
Tony Wu/Justin Anthony and John Carroll, Southern Company Services, Inc.

NETL Research & Innovation Center

Moderator: *Elaine Everitt, U.S. Department of Energy, National Energy Technology Laboratory*

10:50 a.m. **Computational Modeling of Carbon Capture Materials**
Jan Steckel, U.S. Department of Energy, National Energy Technology Laboratory

11:15 a.m. **Comprehensive Exergy Analysis and Comparison of Three IGCC Power Plants with CO₂ Capture**
Nicholas Siefert, U.S. Department of Energy, National Energy Technology Laboratory

11:40 a.m. **Automated Lab-Scale Flue Gas Permeation Membrane Testing System at the National Carbon Capture Center**
Victor Kusuma, U.S. Department of Energy, National Energy Technology Laboratory

12:05 p.m. LUNCH – Waterfront Room

CO₂ Compression

Moderator: *Andrew O’Palko, U.S. Department of Energy, National Energy Technology Laboratory*

1:35 p.m. **Pilot Proposal for Reducing the Cost of CO₂ Capture and Compression-Advanced CO₂ Compression with Supersonic Technology (FE0026727)**
Kirk Lupkes, Dresser-Rand Company

Carbon Capture Small Pilot-Scale Research

Moderator: *Andrew O’Palko, U.S. Department of Energy, National Energy Technology Laboratory*

2:00 p.m. **Pilot-Scale Silicone Process for Low-Cost Carbon Dioxide Capture (FE0013755)**
Benjamin Wood, GE Global Research

2:25 p.m. **Pilot Test of a Nanoporous, Super-Hydrophobic Membrane Contactor Process for Post-Combustion Carbon Dioxide Capture (FE0012829)**
Shiguang Li, Gas Technology Institute

2:50 p.m. **Integrated Testing of a Membrane Carbon Dioxide Capture Process with a Coal-Fired Boiler (FE0026414)**
Tim Merkel, Membrane Technology & Research, Inc.

3:15 p.m. BREAK – Grand Station III

Moderator: *Andrew O’Palko, U.S. Department of Energy, National Energy Technology Laboratory*

3:35 p.m. **Pilot Test of Novel Electrochemical Membrane System for Carbon Dioxide Capture and Power Generation (FE0026580)**
Hossein Ghezeli-Ayagh, FuelCell Energy, Inc.

4:00 p.m. **CO₂ Capture from IGCC Gas Streams Using the AC-ABC Process (FE0000896)**
Anoop Nagar, SRI International

4:25 p.m. **Pilot Scale Evaluation of Pre-Combustion Carbon Capture Process (FE0013105)**
Gokhan Alptekin, TDA Research, Inc.

Systems Studies and Modeling

Moderator: *Andrew O’Palko, U.S. Department of Energy, National Energy Technology Laboratory*

4:50 p.m. **Guidelines for Parameter Measurements in Laboratory-Scale Research Efforts**
Timothy Fout, U.S. Department of Energy, National Energy Technology Laboratory

5:30 p.m. ADJOURN

Tuesday, August 9, 2016 - Grand Station I & II

7:00 a.m. **Registration** – Grand Station Foyer
Continental Breakfast – Grand Station III

GRAND STATION I AND II

Carbon Capture Small Pilot-Scale Research

Moderator: *Andrew Jones, U.S. Department of Energy, National Energy Technology Laboratory*

8:00 a.m. **Slipstream Pilot-Scale Demonstration of a Novel Amine Based Post-Combustion Process Technology for CO₂ Capture from Coal-Fired Power Plant Flue Gas (FE0007453)**

Krish R. Krishnamurthy, Linde, LLC

8:25 a.m. **Application of a Heat Integrated Post-Combustion Carbon Dioxide Capture System with Hitachi Advanced Solvent into Existing Coal-Fired Power Plant (FE0007395)**

Kunlei Liu, University of Kentucky Center for Applied Energy Research

8:50 a.m. **Sorbent Based Post-Combustion CO₂ Slipstream Testing (FE0012870)**

Jeannine Elliott, TDA Research, Inc.

9:15 a.m. **Ion Advanced Solvent CO₂ Capture Pilot Project (FE0013303)**

Nathan Brown, Ion Engineering, LLC

9:40 a.m. BREAK – Grand Station III

Carbon Capture Simulation Initiative 2

Moderator: *Andrew Jones, U.S. Department of Energy, National Energy Technology Laboratory*

10:00 a.m. TBD

10:30 a.m. **CCSI2 Overview and Key Capabilities**

David C. Miller, U.S. Department of Energy, National Energy Technology Laboratory

12:00 p.m. LUNCH – Waterfront Room

Carbon Capture Large Pilot-Scale Research

Moderator: *Steve Mascaro, U.S. Department of Energy, National Energy Technology Laboratory*

1:30 p.m. **Improvement of Alstom's Chilled Ammonia Process Large Pilot with the Use of Membrane Technology (FE0026589)**

David Muraskin, Alstom Power, Inc.

1:55 p.m. **Large Pilot-Scale Carbon Dioxide (CO₂) Capture Project Using Aminosilicone Solvent (FE0026498)**

Philip DiPietro, GE Global Research

2:20 p.m. **NRG CO₂NCEPT - Confirmation of Novel Cost-Effective Emerging Post-Combustion Technology (FE0026581)**

David Greeson, NRG Energy Inc.

2:45 p.m. **Waste Heat Integration with Solvent Process for More Efficient CO₂ Removal from Coal-Fired Flue Gas (FE0007525)**
Jerrad Thomas, Southern Company Services, Inc.

3:10 p.m. **BREAK – Grand Station III**

Moderator: *Steve Mascaro, U.S. Department of Energy, National Energy Technology Laboratory*

3:30 p.m. **Large Pilot Scale Testing of Linde/BASF Post-Combustion CO₂ Capture Technology at the Abbott Coal-Fired Power Plant (FE0026588)**
Kevin O'Brien, University of Illinois

3:55 p.m. **Large Pilot CAER Heat Integrated Post-Combustion CO₂ Capture Technology for Reducing the Cost of Electricity (FE0026497)**
Kunlei Liu, University of Kentucky Center for Applied Energy Research

4:20 p.m. **Advanced Solvent-Based Carbon Capture Technology Development (FE0026590)**
Jerrad Thomas, Southern Company Services, Inc.

Systems Studies and Modeling

Moderator: *Steve Mascaro, U.S. Department of Energy, National Energy Technology Laboratory*

4:45 p.m. **Update on CO₂ Capture Related Systems Analysis Activities**
Timothy Fout and Eric Grol, U.S. Department of Energy, National Energy Technology Laboratory

5:20 p.m. ADJOURN

5:30 p.m. **Poster Session – Grand Station III**

Wednesday, August 10, 2016 - Grand Station I & II and Reflections Room

7:00 a.m. **Registration** – Grand Station Foyer
Continental Breakfast – Grand Station III

GRAND STATION I AND II

Carbon Capture Lab/Bench-Scale Research

Moderator: *David Lang, U.S. Department of Energy, National Energy Technology Laboratory*

8:00 a.m. **Evaluation of Piperazine with Advanced Flash Regeneration for CO₂ Capture from Coal-Fired Flue Gas (FE0005654)**

Gary Rochelle, University of Texas at Austin

8:25 a.m. **CO₂ Capture by Cold Membrane Operation (FE0013163)**
Trapti Chaubey, Air Liquide

8:50 a.m. **Bench-Scale Process for Low-Cost Carbon Dioxide (CO₂) Capture Using a Phase-Changing Absorbent (FE0013687)**
Tiffany Westendorf, GE Global Research

9:15 a.m. **Bench-Scale Development of a Hybrid Membrane-Absorption CO₂ Capture Process (FE0013118)**
Brice Freeman, Membrane Technology & Research, Inc.

9:40 a.m. BREAK – Grand Station III

Moderator: *David Lang, U.S. Department of Energy, National Energy Technology Laboratory*

10:00 a.m. **Supersonic Post-Combustion Inertial CO₂ Extraction System (FE0013122)**
Vladimir Balepin, Alliant Techsystems Operations LLC

10:25 a.m. **An Advanced Catalytic Solvent for Lower Cost Post-Combustion CO₂ Capture in a Coal-Fired Power Plant (FE0012926)**
Kunlei Liu, University of Kentucky Center for Applied Energy Research

10:50 a.m. **Bench Scale Development and Testing of Aerogel Sorbents for CO₂ Capture (FE0013127)**
Redouane Begag, Aspen Aerogels, Inc.

11:15 a.m. **Hybrid Encapsulated Ionic Liquids for Post-Combustion Carbon Dioxide Capture (FE0026465)**
Joan Brennecke, University of Notre Dame

11:40 a.m. **High Temperature Polymer-Based Carbon Dioxide Capture Membrane Systems for Pre-Combustion CO₂ Capture (FWP-FE-308-13)**
Kathryn A. Berchtold, Los Alamos National Laboratory

12:05 p.m. LUNCH – Waterfront Room

Carbon Capture Lab/Bench-Scale Research

Moderator: *Jose Figueroa, U.S. Department of Energy, National Energy Technology Laboratory*

1:35 p.m. **Robust and Energy Efficient Dual-Stage Membrane-Based Process for Enhanced Carbon Dioxide Recovery (FE0013064)**
Paul Liu, Media and Process Technology, Inc.

- 2:00 p.m. **Development of a Pre-Combustion CO₂ Capture Process Using High-Temperature PBI Hollow Fiber Membranes (FE0012965)**
Indira S. Jayaweera, SRI International
- 2:25 p.m. **A High Efficiency, Ultra-Compact Process for Pre-Combustion CO₂ Capture (FE0026423)**
Theodore Tsotsis, University of Southern California
- 2:50 p.m. **Combined Sorbent/WGS-Based CO₂ Capture Process with Integrated Heat Management for IGCC Systems (FE0026388)**
Andrew Lucero, Southern Research Institute

3:15 p.m. BREAK – Grand Station III

Carbon Capture Lab/Bench-Scale Research

Moderator: *Jose Figueroa, U.S. Department of Energy, National Energy Technology Laboratory*

3:35 p.m. **Zeolite Membrane Reactor for Pre-Combustion Carbon Dioxide Capture (FE0026435)**
Jerry Lin, Arizona State University

4:00 p.m. **Sorption Enhanced Mixed Matrix Membranes for Hydrogen Purification and Carbon Dioxide Capture (FE0026463)**
Haiquin Lin, The Research Foundation of State University of New York

4:25 p.m. **Microencapsulation and Advanced Manufacturing to Enable New Solvents for Carbon Capture (FWP-FEW0194)**
Joshua Stolaroff, Lawrence Livermore National Laboratory

4:50 p.m. **Novel CO₂-Selective Membranes for CO₂ Capture from less than 1% CO₂ Sources (FE0026919)**
Winston Ho, Ohio State University

5:15 p.m. **ADJOURN**

Thursday, August 11, 2016 - Grand Station I & II

7:00 a.m. **Registration** – Grand Station Foyer
Continental Breakfast – Grand Station III

GRAND STATION I AND II

Carbon Capture Lab/Bench-Scale Research

Moderator: *Bruce Lani, U.S. Department of Energy, National Energy Technology Laboratory*

8:00 a.m. **Bench Scale Testing of Next Generation Hollow Fiber Membrane Modules (FE0026422)**
Alex Augustine, American Air Liquide, Inc.

8:25 a.m. **Accelerating the Development of "Transformational" Solvents for CO₂ Separations (FWP-65872)**
David Heldebrant, Pacific Northwest National Laboratory

8:50 a.m. **Development of a Novel Biphasic CO₂ Absorption Process with Multiple Stages of Liquid-Liquid Phase Separation for Post-Combustion Carbon Capture (FE0026434)**
Yongqi Lu, University of Illinois

9:15 a.m. **Large Bench Scale Development of Non-Aqueous Solvent Carbon Dioxide Capture Process for Coal Fired Power Plants Utilizing Real Coal Derived Flue Gas (FE0026466)**
Marty Lail, Research Triangle Institute

9:40 a.m. **Lab-Scale Development of a Hybrid Capture System with Advanced Membrane, Solvent System, and Process Integration (FE0026464)**
David Luebke, Liquid Ion Solutions LLC

10:05 a.m. BREAK – Grand Station III

Moderator: *Bruce Lani, U.S. Department of Energy, National Energy Technology Laboratory*

10:25 a.m. **Energy Efficient Go-Peek Hybrid Membrane Process for Post-Combustion Carbon Dioxide Capture (FE0026383)**
Shiguang Li, Gas Technology Institute

10:50 a.m. **Evaluation of Amine-Incorporated Porous Polymer Networks (APPNS) as Sorbents for Post-Combustion CO₂ Capture (FE0026472)**
Hong Cai Zhou, Texas A&M University

11:15 a.m. **Novel Process that Achieves 10 MOL/KG Sorbent Swing Capacity in a Rapidly Cycled Pressure Swing Adsorption Process (FE0026433)**
Ryan Lively, Georgia Tech Research Corporation

11:40 a.m. **Lab-Scale Development of a Solid Sorbent for CO₂ Capture Process for Coal-Fired Power Plants (FE0026432)**
Mustapha Soukri, Research Triangle Institute

12:05 p.m. LUNCH – Brighton 1, 2, and 3

Carbon Capture Lab/Bench-Scale Research

Moderator: *Andrew Aurelio, U.S. Department of Energy, National Energy Technology Laboratory*

- 1:35 p.m. **Bench-Scale Development of a Non-Aqueous Solvent (NAS) CO₂ Capture Process for Coal-Fired Power Plants (FE0013685)**
Marty Lail, Research Triangle Institute
- 2:00 p.m. **Novel Flow Sheet for Low Energy CO₂ Capture Enabled by Biocatalyst Delivery System (FE0012862)**
Alex Zaks, Akermin, Inc.
- 2:25 p.m. **Development of Mixed-Salt Technology for Carbon Dioxide Capture from Coal Power Plants (FE0012959)**
Indira Jayaweera, SRI International
- 2:50 p.m. **Bench-scale Development of an Advanced Solid Sorbent-based CO₂ Capture Process for Coal-fired Power Plants (FE0007707)**
Thomas Nelson, Research Triangle Institute
- 3:15 p.m. **ADJOURN**
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Friday, August 12, 2016 - Grand Station I & II

- 7:00 a.m. **Registration** – Grand Station Foyer
Continental Breakfast – Grand Station III

CO₂ Reuse

Moderator: *Andrew Aurelio, U.S. Department of Energy, National Energy Technology Laboratory*

- 8:00 a.m. **A Microalgae-Based Platform for the Beneficial Reuse of CO₂ Emissions from Power Plants (FE0026396)**
Mark Crocker, University of Kentucky Research Foundation
- 8:25 a.m. **Microalgae Commodities from Coal-Fired Power Plant Flue Gas CO₂ (FE0026490)**
John Benemann, MicroBio Engineering, Inc.

Oxy-Combustion and Chemical Looping

Moderator: *Douglas Straub, U.S. Department of Energy, National Energy Technology Laboratory*

- 8:50 a.m. **Commercialization of the Iron Based Coal Direct Chemical Looping Process for Power Production with in situ Carbon Dioxide Capture (FE0009761)**
Luis Velazquez-Vargas, Babcock & Wilcox
- 9:15 a.m. **Alstom's Chemical Looping Combustion Technology with CO₂ Capture for New and Existing Coal-Fired Power Plants (FE0009484)**
Armand Levasseur, GE Power
- 9:40 a.m. **Improvement of Alstom's Limestone Chemical Looping Combustion Process for Higher Purity Flue Gas Production (FE0025073)**
Frederic Vitse, GE Power
- 10:05 a.m. **Integrated Oxygen Production and CO₂ Separation Through Chemical Looping Combustion with Oxygen Uncoupling (FE0025076)**
Kevin Whitty, University of Utah
- 10:30 a.m. BREAK – Grand Station III**
- 10:50 a.m. **Advanced Oxy-Combustion Technology Development and Scale Up for New and Existing Coal-Fired Power Plants (FE0009702)**
Richard Axelbaum, Washington University, St. Louis
- 11:15 a.m. **Integrated Flue Gas Purification and Latent Heat Recovery for Pressurized Oxy-Combustion (FE0025193)**
Richard Axelbaum, Washington University, St. Louis
- 11:40 a.m. **Enabling Technologies for Oxy-Fired Pressurized Fluidized Bed Combustor Development (FE0025160)**
Mark Fitzsimmons, Aerojet Rocketdyne of DE, Inc.
- 12:05 p.m. **Advanced Oxy-Combustion Technology Development and Scale Up for New and Existing Coal-Fired Power Plants (FE0009448)**
Mark Fitzsimmons, Institute of Gas Technology
- 12:30 p.m. **Flue Gas Water Vapor Latent Heat Recovery for Pressurized Oxy-Combustion (FE0025350)**
Dexin Wang, Institute of Gas Technology
- 12:55 p.m. **Characterizing Impacts of High Temperatures and Pressures in Oxy-Coal Combustion Systems (FE0025168)**
Andrew Chiodo, Reaction Engineering International
- 1:20 p.m. **ADJOURN**