

Program

CO2 Summit III: Pathways to Carbon Capture, Utilization, and Storage Deployment

May 22-26, 2017

Grand Hotel San Michele, Cetraro (Calabria), Italy

Conference Chairs:

Jen Wilcox, Colorado School of Mines

Holly Krutka, Tri-State Generation and Transmission Association

Conference Co-Chairs:

Simona Liguori, Colorado School of Mines

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Monday, May 22, 2017

17:30 - 19:00	Conference Check-in
19:00 - 19:30	Welcome reception
19:30 - 21:00	Dinner

NOTES

- Audiotaping, videotaping and photography of presentations are prohibited.
- Speakers – Please ensure your talk adheres to your given time allotment. Talks that go over their allotment reduce time for valuable discussion and can disrupt the conference program.
- Turn your cellular telephones to vibrate or off during technical sessions.
- After the conference, ECI will send an updated participant list to all participants. Please check your listing now and if it needs updating, you may correct it at any time by logging into your ECI account.
- Please do not smoke at any conference functions.
- Please write your name in the front of this program booklet so it can be returned if misplaced.

Tuesday, May 23, 2017

07:30 - 08:30 Breakfast

08:30 - 08:50 **Conference welcome and opening ceremony**
Introduction to conference format and goals –
Jen Wilcox and Niall Mac Dowell

Plenary 1

08:50 - 09:30 **The Role of CCS for Attaining Long-term Climate Stabilization**
Massimo Tavoni, Politecnico Milano, Italy

Plenary 2

09:30 - 10:10 **Research Opportunities for Negative Emissions and CO₂ Utilization at the Gigatonne Scale**
Arun Majumdar, Stanford University, USA

10:10 - 10:30 Open discussion

10:30 - 11:00 Coffee Break

Technical Session 1: Communication, Policy, and Economics Around CCUS Deployment

11:00 - 11:20 **A Preliminary Political Economy of Net-negative Emissions Technologies**
David M. Reiner, University of Cambridge, United Kingdom

11:20 - 11:40 **Manufacturing our Future: Industries, European Regions and Climate Action**
Jonas Helseth, Bellona Europa, Belgium

11:40 - 12:00 **Towards Industry, Policy, and Civil Society Action on Carbon Removal**
Noah Deich, Center for Carbon Removal, USA

12:00 - 12:30 **Pathways to CCS Commercialization**
Wilfried Maas, Shell, Netherlands

12:30 - 12:50 Open discussion

12:50 - 14:20 Lunch and open time

Plenary 3

14:20 - 15:00 **Carbon Dioxide Removal**
Howard J. Herzog, Massachusetts Institute of Technology, USA

Plenary 4

15:00 - 15:40 **Land Use Implications of Negative Emissions from BECCS**
Sabine Fuss, Mercator Research Institute on Global Commons and Climate Change, Germany

Tuesday, May 23, 2017 (continued)

15:40 - 16:00 Open discussion

16:00 - 16:30 Coffee break

Technical Session 2: Opportunities and Examples of CDR

16:30 - 16:50 **The Transition of CCS from Fossil Fuel CO₂ Control to Negative Emissions**

Roger D. Aines, Lawrence Livermore National Laboratory, USA

16:50 - 17:10 **Can BECCS Deliver Sustainable and Resource-efficient Negative Emissions?**

Mathilde Fajardy, Imperial College London, United Kingdom

17:10 - 17:30 **Sustainable BECCS Pathways Evaluated by an Integrated Assessment Model**

Etsushi Kato, Institute of Applied Energy, Japan

17:30 - 17:50 **Negative Emissions on South East Asia: Renewable Energy Optimization with BECCS for Indonesia**

Florian Kraxner, International Institute for Applied System Analysis, Austria

17:50 - 18:10 **Slicing the Pie: How Big Could Carbon Dioxide Removal Be?**

Peter Psarras, Colorado School of Mines, USA

18:10 - 18:30 Open discussion

18:30 - 19:30 Reception and poster session (5-minute presentations by poster presenters)
Wine, beer, and light snacks

19:30 - 21:00 Dinner

Wednesday, May 24, 2017

07:30 - 08:30 Breakfast

Plenary 5

08:30 - 09:10 **Adsorption Processes for CO₂ Capture: An Overview**
Paul Webley, The University of Melbourne, Australia

Plenary 6

09:10 - 09:50 **A Membrane Approach to CO₂ Capture**
Richard W. Baker, Membrane Technology Research, USA

09:50 - 10:10 Open discussion

10:10 - 10:40 Coffee break

Technical Session 3: Advanced Conversion and CO₂ Separation Processes

10:40 - 11:00 **Membrane Condenser: Direct and Indirect Support to CO₂ capture**
Enrico Drioli, ITM-CNR, Italy

11:00 - 11:20 **Advanced Membrane Operations in CO₂ Capture**
Giuseppe Barbieri, ITM-CNR, University of Calabria, Italy

11:20 - 11:40 **Designing Materials and Processes for CO₂ Capture with Solid Sorbents**
Adam H. Berger, Electric Power Research Institute, USA

11:40 - 12:00 **Carbon Dioxide Reforming with Natural Gas and Coal using Chemical Looping**
Andrew Tong, The Ohio State University, USA

12:00 - 12:20 Open discussion

12:20 - 13:40 Lunch and open time

Plenary 7

13:40 - 14:20 **International Efforts of the National Carbon Capture Center**
Roxann Laird, Southern Company Services, USA

Plenary 8

14:20 - 15:00 **Carbon Management at Shenhua – R&D Initiatives and CCUS Demonstrations**
Anthony Ku, National Institute of Clean-and-Low-Carbon Energy, China

15:00 - 15:20 Open discussion

15:20 - 15:50 Coffee break

Wednesday, May 24, 2017 (continued)

Technical Session 4: System Integration Approaches

Sponsored by Beijing-based National Institute of Clean and Low-Carbon Energy (NICE)

15:50 - 16:10

On the Operation of CCS Within a Diverse Energy System

Niall Mac Dowell, Imperial College London, United Kingdom

16:10 - 16:30

Carbon Capture and Geologic Sequestration from Intermittent Use of Fossil Fuels

Susan D. Hovorka, University of Texas at Austin, USA

16:30 - 16:50

Reversible Solid Oxide Cells as a Flexible, Dispatchable Resource for Grid-Energy Storage and Natural Gas Production Using CO₂ and CH₄

Robert Braun, Colorado School of Mines, USA

16:50 - 17:10

Integration of carbon capture with renewable energy in power generation and steel manufacturing

Ali Abbas, The University of Sydney, Australia

17:10 - 17:30

A bio-physical and net-energy comparison of CCS and renewable energy baseload systems

Sgouris Sgouridis, Masdar Institute, United Arab Emirates

17:30 - 18:00

Open discussion

18:00 - 19:30

Reception and poster session (5-minute presentations by poster presenters)
Wine, beer, and light snacks

19:30 - 21:00

Dinner

Thursday, May 25, 2017

07:30 - 08:30 Breakfast

Plenary 9

08:30 - 09:10 **Cement, CCS and CO₂ Uptake, Including an Update on the EU LEILAC Project**
Paul Fennell, Imperial College London, United Kingdom

Plenary 10

09:10 - 09:50 **To Utilize or Not to Utilize? A Life-Cycle Assessment Perspective on Carbon Dioxide Utilization**
Andre Bardow, Aachen University, Germany

09:50 - 10:10 Open discussion

10:10 - 10:40 Coffee break

Technical Session 5: CO₂ Capture from Industrial Sources and CO₂ Utilization

10:40 - 10:55 **What We Talk About When We Talk About CCUS: New Tactics for Communicating the Opportunities and Risks**
Marcius H. T. Extavour, XPRIZE, USA

10:55 - 11:15 **CO₂ Capture from Industrial Sources by High-temperature Sorbents**
Matteo C. Romano, Politecnico di Milano, Italy

11:15 - 11:35 **Lifecycle CO₂ emissions from US bioethanol production with CCS**
Sean T. McCoy, Lawrence Livermore National Laboratory, USA

11:35 - 11:55 **CCUS as a Regional Economic Development Tool: Planning and Design Considerations**
Kevin O'Brien, Illinois Sustainable Technology Center, USA

11:55 - 12:15 **Metastable hydrated carbonates for algae biofuel production**
Valentina Prigiobbe, Stevens Institute of Technology, USA

12:15 - 12:35 **Catalyzing a CO₂-neutral Society**
Mark Saeys, Ghent University, Belgium

12:35 - 12:50 **Maximizing the Mitigation Potential of Curtailed Wind: A Comparison Between Carbon Capture and Utilization, and Direct Air Capture Processes for the UK**
Habiba A. Daggash, Imperial College London, United Kingdom

12:50 - 13:10 Open discussion

Thursday, May 25, 2017 (continued)

13:10 - 15:30 Lunch and open time

Plenary 11

15:30 - 16:10 **Harnessing Peridotite Alteration for Carbon Capture and Storage**
Peter Kelemen, Columbia University, USA

Plenary 12

16:10 - 16:50 **Status, Challenges, and Potential Capacity of Reliable Geologic Storage of CO₂**
Susan D. Hovorka, University of Texas at Austin, USA

16:50 - 17:10 Open discussion

17:10 - 17:40 Coffee break

Technical Session 6: Reliable CO₂ Storage Technologies

17:40 - 18:00 **The Potential of Carbon Storage in the Ocean as Bicarbonate**
Phil Renforth, Cardiff University, United Kingdom

18:00 - 18:20 **Pathways to Accelerated Carbon Mineralization in Mine Tailings**
Gregory M. Dipple, University of British Columbia, Canada

18:20 - 18:40 **Carbonation of Industrial Residues for CCUS: Fundamentals, Energy Requirements and Scale-up Opportunities**
Renato Baciocchi, University of Rome Tor Vergata, Italy

18:40 - 19:00 Open discussion

19:00 - 21:30 Conference banquet and award ceremony

Friday, May 26, 2017

07:30 - 08:30	Breakfast
08:30 - 09:00	Closing remarks and next steps - Jen Wilcox and Niall Mac Dowell
09:00 - 10:30	<u>Technical Session 7: Frontiers Special Issue Development</u>
10:30 - 11:00	Coffee break
11:00 - 12:00	<u>Technical Session 7 continued: Frontiers Special Issue Development</u>
12:00 - 13:30	Lunch
13:30	Conference conclusion

Poster Presentations

1. **Cost-effective, near-term deployment of carbon capture and storage from biorefineries in the United States**
Daniel L. Sanchez, Carnegie Institution for Science, USA
2. **Opportunities for industrial CO₂ capture and utilization in the US**
Peter Psarras, Colorado School of Mines, USA
3. **Analysis of reversible solid oxide cell technology for grid-energy storage and synthetic natural gas production with CO₂**
Evan P. Reznicek, Colorado School of Mines, USA
4. **What are the key processes of CO₂ storage to represent in energy systems models? A dynamic model of CO₂ storage in the UK Bunter Sandstone**
Clea Kolster, Imperial College London, United Kingdom
5. **Can BECCS efficiently and sustainably remove CO₂ from the atmosphere?**
Mathilde Fajardy, Imperial College London, United Kingdom
6. **Power-to-transport: Using curtailed wind to run CCU processes**
Habiba A. Daggash, Imperial College London, United Kingdom
7. **CO₂ capture from the industry sector**
Praveen Bains, Stanford University, USA
8. **Design and operations optimization of membrane separation for flexible carbon capture from natural gas combined cycle systems**
Mengyao Yuan, Stanford University, USA
9. **Geospatial analysis of BECCS deployment potential in the U.S.**
Ejeong Baik, Stanford University, USA
10. **Applying potential BECCS solutions to the US coal sector: New coal boom or bust?**
Florian Kraxner, International Institute for Applied Systems Analysis (IIASA), Austria
11. **The water-energy-carbon-land nexus: Optimising the BECCS supply chain**
Solène Chiquier, Imperial College London, United Kingdom
12. **Photocatalytic membrane reactor for CO₂ conversion**
Giuseppe Barbieri, ITM-CNR, Italy
13. **H₂ production in Palladium-based Membrane Reactor**
Nora Buggy, Colorado School of Mines, USA
14. **Mineral carbonation opportunities in the western United States**
Christopher M. Caskey, Colorado School of Mines, USA