

*Program*

# **CO<sub>2</sub> Summit II: Technologies and Opportunities**

**April 10–14, 2016**

**Santa Ana Pueblo, New Mexico, USA**

**Conference Chair**

**Holly Krutka**

**Formerly Shenhua Science and Technology Research Institute  
Tri-State Generation & Transmission Association, Inc.**

**Conference Co-Chair**

**Frank Zhu**

**UOP/Honeywell**



**Engineering Conferences International**

**32 Broadway, Suite 314**

**New York, NY 10004, USA**

**Phone: 1-212-514-6760**

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**Hyatt Regency Tamaya Resort and Spa**  
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**Tel: +1 505 867 1234**

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**Sunday, April 10, 2016**

- |               |   |
|---------------|---|
| 16:00 - 18:00 | Conference Check-in (Mountain View Foyer) |
| 18:00 - 19:00 | Opening Reception (Tamaya Veranda)        |

***NOTES***

- Technical sessions will be held in the Tamaya ABC Rooms.
- Poster sessions will be in the Wolf Room.
- Breakfasts and lunches will be in the Hawk Room.
- Dinners on Monday and Wednesday will be in the Puma Room. Dinner on Tuesday will be in the Hawk Room.
- Speakers – Please leave at least 5 minutes for questions and discussion.
- Please do not smoke at any conference functions.
- Turn your cellular telephones to vibrate or off during technical sessions.
- Please write your name in the front of this booklet in case it is misplaced.
- Be sure to check the participant list in this booklet to confirm that your listing is correct. If there are changes or updates, please login to the ECI website and update your listing so that the list that ECI will send to all participants after the conference will be correct.

## **Monday, April 11, 2016**

- 07:00 - 08:30 Breakfast
- 08:30 - 08:40 Opening Remarks - Conference Chair and ECI Liaison
- 08:40 - 09:30 **Conference Plenary**  
Robin Batterham, University of Melbourne and Former Chief Scientist of Australia  
**CO<sub>2</sub>: The good, the bad and the ugly** [[Presentation](#)] [[Abstract](#)]
- Keynote panel: Reducing CO<sub>2</sub> emissions from the US electricity sector**  
Chair: Holly Krutka, Tri-State Generation and Transmission Association, Inc.
- 09:30 - 10:00 Brad Crabtree, Great Plains Institute, USA  
**The critical role of CCS and EOR in managing US carbon emissions**  
[[Presentation](#)] [[Abstract](#)]
- 10:00 - 10:30 Coffee Break
- 10:30 – 11:30 **Keynote panel (continued)**  
Barbara Walz, Tri-State Generation and Transmission Association, Inc., USA  
**Managing CO<sub>2</sub> in rural America** [[Presentation](#)] [[Abstract](#)]
- Matt Usher, AEP Generation  
**AEP perspectives on 21<sup>st</sup> century power generation** [[Presentation](#)] [[Abstract](#)]
- 11:30 – 11:45 Discussion
- 11:45 – 12:00 **Invited presentation: Catalyzing the carbon utilization industry through the NRG COSIA Carbon XPRIZE** [[Presentation](#)] [[Abstract](#)]  
Paul Bunje, XPRIZE
- 12:00 - 13:30 Lunch
- 13:30 - 14:45 Networking / Free time
- Carbon capture and storage - processes – I**  
Chair: Carl Bozzuto, Global Resources Development & Management Company  
Co-Chair: Debangsu Bhattacharyya, West Virginia University
- 14:45 - 15:10 **Invited presentation: CCS cost trends and outlook** [[Presentation](#)] [[Abstract](#)]  
Edward S. Rubin, Carnegie Mellon University, USA
- 15:10 – 15:35 **U.S. DOE carbon capture program: Advancing multiple generations of carbon capture solutions laboratory to pilot scale development**  
[[Presentation](#)] [[Abstract](#)]  
José Figueroa, US Department of Energy, National Energy Technology Lab
- 15:35 - 16:00 **Assessment of the CO<sub>2</sub> capture potential from irreplaceable industrial sources** [[Presentation](#)] [[Abstract](#)]  
Peter C. Psarras, Stanford University, USA

**Monday, April 11, 2016 (continued)**

- 16:00 - 16:25      **Iron-based chemical looping processes** [[Presentation](#)] [[Abstract](#)]  
Cheng Lung Chung, Ohio State University, USA
- 16:25 - 16:50      **Novel advanced solvent-based carbon capture pilot demonstration**  
[[Presentation](#)] [[Abstract](#)]  
Erik Meuleman, ION Engineering, USA
- 16:50 - 17:15      **Cryogenic carbon capture** [[Presentation](#)] [[Abstract](#)]  
Larry Baxter, Sustainable Energy Solutions, USA
- 17:15 - 17:45      Coffee Break
- CO<sub>2</sub> utilization – I**  
Chair: Peng Pei, University of North Dakota  
Co-chair: Steve Carpenter, University of Wyoming, Enhanced Oil Recovery  
Institute
- 17:45 - 18:15      **Update on the status and development of issues surrounding enhanced oil  
recovery (EOR) in the state of Wyoming** [[Presentation](#)] [[Abstract](#)]  
Steven M. Carpenter, EORI at University of Wyoming, USA
- 18:15 - 18:45      **Geologic CO<sub>2</sub> storage using pre-injection brine production in tandem  
reservoirs: A strategy for improved storage performance and enhanced  
water recovery** [[Presentation](#)] [[Abstract](#)]  
Thomas A. Buscheck, Lawrence Livermore National Lab, USA
- 18:45 - 19:15      **Electrochemical carbon dioxide reduction as an alternative source of fuels  
and chemicals** [[Presentation](#)] [[Abstract](#)]  
Kendra P. Kuhl, Opus 12, USA
- 19:15 - 19:30      Discussion
- 19:30 - 21:00      Dinner
- 21:00 - 22:00      Poster Session / Social Hour



**Tuesday, April 12, 2016**

07:00 - 08:30 Breakfast

08:30 - 09:15 **Keynote:** Hans-Wilhelm Schiffer, World Energy Council, London and Consultant and Advisor to the Executive Board of RWE AG, Germany  
**Successes and challenges of renewables deployment in the EU power sector** [[Presentation](#)] [[Abstract](#)]

09:15 - 10:00 **Keynote:** Chuck Kutscher, National Renewable Energy Laboratory, USA  
**Fulfilling the promise of the Paris Agreement: The role of efficiency and renewable energy** [[Presentation](#)] [[Abstract](#)]

10:00 - 10:30 Coffee Break

**Energy efficiency and renewable energy**

Chair: Robin Batterham, The University of Melbourne  
Co-chair: Bill Steen, AECOM

10:30 - 10:55 **Sunshine to petrol: Thermochemistry for solar fuels**  
[[Presentation](#)] [[Abstract](#)]  
James E. Miller, Sandia National Laboratories, USA

10:55 - 11:20 **The value of CO<sub>2</sub>-geothermal bulk energy storage to CO<sub>2</sub>**  
[[Presentation](#)] [[Abstract](#)]  
Jonathan D. Ogland-Hand, The Ohio State University, USA

11:20 - 11:45 **Factors that impact the CO<sub>2</sub> mitigation potential of cogeneration**  
[[Presentation](#)] [[Abstract](#)]  
Carl Bozzuto, Consultant, USA

11:45 - 12:10 **Electrochemical membrane technology for carbon dioxide capture from flue gas** [[Presentation](#)] [[Abstract](#)]  
Stephen Jolly, FuelCell Energy, Inc., USA

12:10 - 13:40 Lunch

13:40 - 14:00 Networking / Free time

**Carbon capture and storage - processes – II**

Chair: Debangsu Bhattacharyya, West Virginia University  
Co-chair: Carl Bozzuto, Global Resources Development & Management Company

14:00 - 14:25 **Mist injection causes high CO<sub>2</sub> capture in wastewater stream**  
[[Presentation](#)] [[Abstract](#)]  
Sanjeev Jolly, Enviro Ambient Corporation, USA

**Tuesday, April 12, 2016 (continued)**

14:25 - 14:50      **Zerronox Corporation: Using pulsed electron beams for the removal of carbon dioxide, nitrogen oxides and other emissions from power plants**  
[\[Presentation\]](#) [\[Abstract\]](#)  
Stephen Kennedy, Zerronox Corporation, USA

14:50 - 15:15      **Update on the NET Power 50 MW<sub>th</sub> zero emission power station**  
[\[Presentation\]](#) [\[Abstract\]](#)  
David Freed, 8 Rivers, USA

15:15 - 15:40      **Baysian uncertainty quantification and calibration of a clean-coal design code** [\[Presentation\]](#) [\[Abstract\]](#)  
Troy M. Holland, Brigham Young University, USA

15:40 - 16:05      **Predictive models of carbon capture systems and their validation using bench scale and pilot scale data** [\[Presentation\]](#) [\[Abstract\]](#)  
Debangsu Bhattacharyya, West Virginia University, USA

16:05 - 16:30      **Integration of high-fidelity CO<sub>2</sub> sorbent models at the process scale using dynamic discrepancy** [\[Presentation\]](#) [\[Abstract\]](#)  
Joel D. Kress, Los Alamos National Laboratory, USA

16:30 - 17:00      Coffee Break

**CO<sub>2</sub> utilization – II**

Chair: Steve Carpenter, University of Wyoming, Enhanced Oil Recovery Institute  
Co-chair: Peng Pei, University of North Dakota

17:00 - 17:25      **Development of the first internationally accepted standard for geologic storage of carbon dioxide utilizing enhanced oil recovery (EOR) under the international standards organization (ISO) technical committee TC-265**  
[\[Presentation\]](#) [\[Abstract\]](#)  
Steven Carpenter, EORI - University of Wyoming, USA

17:25 - 17:50      **Using geologic CO<sub>2</sub> storage for enhanced geothermal energy and water recovery and energy storage** [\[Abstract\]](#)  
Thomas A. Buscheck, Lawrence Livermore National Lab, USA (Presentation by Jimmy Randolph, TerraCOH)

17:50 - 18:15      **Monitoring CO<sub>2</sub> at an enhanced oil recovery and carbon capture and storage project, Farnsworth unit, Texas** [\[Presentation\]](#) [\[Abstract\]](#)  
Robert Balch, New Mexico Tech / Petroleum Recovery Research Center, USA

18:15 - 18:40      **Introduction to the Wyoming Integrated Test Center** [\[Presentation\]](#) [\[Abstract\]](#)  
Jason Begger, Wyoming Infrastructure Authority, USA

18:40 - 20:00      Dinner

20:00 - 21:00      Poster Session / Social Hour

## Wednesday, April 13, 2016

- 07:00 - 08:30 Breakfast
- 08:30 - 09:20 **Keynote:** Wayne Xu, Chief Technology Officer, National Institute of Clean and Low-Carbon Energy, China  
**CO<sub>2</sub> mitigation opportunities in China** [[Presentation](#)] [[Abstract](#)]
- 09:20 - 09:50 Coffee Break
- Carbon capture and storage - materials – I**  
Chair: Jennifer Wilcox, Stanford University  
Co-chair: Simona Liguori, Stanford University
- 09:50 - 10:15 **Evaluation of physical adsorbents for post-combustion CO<sub>2</sub> capture**  
[[Presentation](#)] [[Abstract](#)]  
Youssef Belmabkhout, KAUST, Saudi Arabia
- 10:15 - 10:40 **Design and testing of sorbents for CO<sub>2</sub> separation of post-combustion and natural gas sweetening applications** [[Presentation](#)] [[Abstract](#)]  
Jen Wilcox, Stanford University, USA
- 10:40 - 11:05 **CO<sub>2</sub> capture using nanoporous TiO(OH)<sub>2</sub>/tetraethylpentamine** [[Abstract](#)]  
Mohammed Assiri, University of Wyoming, USA
- 11:05 - 11:30 **Optimal molecular design of poly (ionic liquids) for CO<sub>2</sub> capture from the atmosphere** [[Presentation](#)] [[Abstract](#)]  
Kun Ge, Zhejiang University, China
- 11:30 - 13:00 Lunch
- 13:00 - 14:15 Networking / Free time
- Carbon capture and storage - materials - II**  
Chair: Jennifer Wilcox, Stanford University  
Co-chair: Peter Psarras, Stanford University
- 14:15 - 14:45 **Metallic membranes for N<sub>2</sub> separation & post-combustion CO<sub>2</sub> capture improvement** [[Presentation](#)] [[Abstract](#)]  
Simona Liguori, Stanford University, USA
- 14:45 - 15:15 **Metal oxides with ionic-electronic conductivity for thermochemical energy storage** [[Presentation](#)] [[Abstract](#)]  
Eric N. Coker, Sandia National Laboratories, USA
- 15:15 - 15:45 **Nitrogen-functionalized porous carbons for enhanced CO<sub>2</sub> capture**  
[[Presentation](#)] [[Abstract](#)]  
Peter C. Psarras, Stanford University, USA
- 15:45 - 16:15 Coffee Break

**Wednesday, April 13, 2016 (continued)**

**Negative emissions and air capture of CO<sub>2</sub>**

Chair: Klaus Lackner, Arizona State University

Co-chair: Antti Arasto, VTT Technical Research Centre of Finland

- 16:15 - 16:40      **Pathway to achieve negative CO<sub>2</sub> emissions - combining biomass with CCS**  
[\[Presentation\]](#) [\[Abstract\]](#)  
Antti Pekanpoika Arasto, VTT Technical Research Centre of Finland, Finland
- 16:40 - 17:05      **Techno-economic challenges associated with biomass energy utilization and CCS** [\[Presentation\]](#) [\[Abstract\]](#)  
Carl Bozzuto, Global Resources Development & Management Company, LLC, USA
- 17:05 - 17:30      **Direct air capture versus post combustion capture for coal fired power plants: Energy balance and life cycle environmental assessment**  
[\[Abstract\]](#)  
Christoph J. Meinrenken, Columbia University, USA (Presentation by Klaus Lackner)
- 17:30 - 17:55      **CarbonCycle and other profitable strategies for air capture of CO<sub>2</sub>**  
[\[Presentation\]](#) [\[Abstract\]](#)  
Deane Little, New Sky Energy, USA
- 17:55 - 18:20      **Kinetic enhancement of adsorbent for CO<sub>2</sub> capture from atmosphere by porous material** [\[Presentation\]](#) [\[Abstract\]](#)  
Tao Wang, Zhejiang University, China
- 18:20 - 21:00      Conference Banquet

**Thursday, April 14, 2016**

07:00 - 08:30

Breakfast and departures

## List of Posters

- 1. The production of water from saline aquifers through carbon dioxide capture and storage operations** [[Abstract](#)]  
Kelsey A. Hunter, The Ohio State University, USA
- 2. Development and planning for carbon dioxide (CO<sub>2</sub>) capture, utilization, and storage (CCUS) infrastructure in geothermal reservoirs** [[Abstract](#)]  
Julie K. Langenfeld, The Ohio State University, USA
- 3. Optimal Geothermal Heat Extraction using CO<sub>2</sub>** [[Abstract](#)]  
Iti H. Patel, The Ohio State University Main Campus, USA
- 4. Emissions and Deforestation Associated with Household Energy Use: A Case of the Thulamela Local Municipality, South Africa** [[Abstract](#)]  
Solomon Uhunamure, University of Venda, South Africa, South Africa
- 5. Minimizing the energy and economic penalty of CCS power plants through waste heat recovery systems** [[Presentation](#)] [[Abstract](#)]  
Vaclav Novotny, Czech Technical University in Prague, Czech Republic
- 6. Chemical Utilization of CO<sub>2</sub> for grid-scale energy storage: a prospective scenario of China and global energy connection** [[Abstract](#)]  
Pengxiang Song, State Grid Corporation of China, China
- 7. Perspectives of pre-combustion CCS systems for central Europe** [[Presentation](#)] [[Abstract](#)]  
Monika Vitvarova, Czech Technical University in Prague, Czech Republic
- 8. Techno-economic evaluation of retrofitting CCS in an integrated pulp and board mill - Case studies** [[Abstract](#)]  
Antti Arasto, VTT Technical Research Centre of Finland, Ltd., Finland
- 9. Combined magnesium oxide/water gas shift-based CO<sub>2</sub> capture process** [[Abstract](#)]  
Santosh K. Gangwal, Southern Research, USA
- 10. Development of chemical looping combustion technology for bio-CCS application** [[Abstract](#)]  
Antti Arasto, VTT Technical Research Centre of Finland Ltd., Finland
- 11. Poly(4-vinylpyridine) as a platform for robust CO<sub>2</sub> electroreduction** [[Abstract](#)]  
Ponisseril Somasundaran, Columbia University, USA