CCUS STUDENT WEEK 2018

“Whole Value Chain Carbon Capture, Utilization, and Storage (CCUS)”

Venue: Golden Hotel, 800 11th St, Golden, CO 80401, USA
Time: Monday Oct. 15th - Friday Oct.19th, 2018

Provided by: Petroleum Research School of Norway (NFIP), International Energy Cluster (IEC), The ColNor Clean Energy Research and Educational Collaboration, NorTex Petroleum Cluster and co-hosted by Colorado School of Mines and Royal Norwegian Consulate General in Houston.

Sponsored by: Norwegian Research Council Research School Funding Program and NRC/Climit.

Conference Objectives:
1. Accelerate CO₂ research collaboration between Norway, China, Brazil, and USA
2. Provide opportunity for experts in industry and academia to collectively discuss CCUS research
3. Provide PhD students with current CCUS research status and the way forward
4. Provide oil industry an opportunity to communicate needs to the next generation engineers
5. Emphasize CO₂ as mean to mitigate negative climate effects in oil production utilizing CCUS
6. Provide a Whole Value Chain Approach Overview for students within CCUS

Scientific Program:
Day 1: Climate Perspectives and CO₂ Capture
Day 2: CO₂ Capture and CO₂ Transport
Day 3: CO₂ Storage
Day 4: CO₂ Utilization in Hydrates and in Enhanced Oil Recovery (EOR)
    - Tour of CSM CCUS and EOR Laboratories
Day 5: CO₂ EOR and Whole Value Chain CCUS Future Development

Social Program:
Day 1: - Reception at Table Mountain Inn
Day 4: - Tour of the Coors Brewery
Day 4: - Conference Dinner at The Golden Hotel
Day 1: Monday Oct. 15th
Climate Perspectives and CO2 Capture

08:30  Registration and Coffee

09:00  Welcome and Symposium Objectives
       Arne Graue, Prof. of Physics, University of Bergen, Norway;
       Chair of the Boards: Petroleum Research School of Norway and NorTex Petroleum Cluster
       Dag Nummedal, Former Director of CERI, Colorado School of Mines

Climate Perspectives

09:30  CCUS Assessment: CCUS in the US - Global Importance of CCUS
       Arne Graue, Prof. of Physics, University of Bergen, Norway;
       Chair of the Boards: Petroleum Research School of Norway and NorTex Petroleum Cluster

10:00  Reflections on IPCC Perspectives
       Klaus Lackner, Arizona State University

10:30  Coffee

11:00  Global Climate Concerns – The Air We Breathe: It Is Not What it Used To Be
       Russ Schnell, National Oceanic and Atmospheric Administration (NOAA)

11:30  Economic Determinants of Success in CCS Installation
       Ian Lange, Colorado School of Mines

12:00  Lunch

CO2 Capture

13:00  The New IPCC agreement Issued in Seoul, South Korea, October 8th, 2018: Actions to Remove CO2
       Dag Nummedal, Colorado School of Mines

13:30  The Business Case for Carbon Capture, Utilization, and Storage
       Matt Lucas, Carbontech and David Smaldone, CDG Engineers

14:30  CO2 Capture Technologies – An Overview
       Robert Braun, Colorado School of Mines

15:00  Coffee

15:30  Findings of a Colorado Multi-Institutional Research Project to Reduce Methane Emissions from
       Natural Gas Operations
       Dag Nummedal, CSM
16:00  **CO₂ Capture from the Air**
Klaus Lackner, Arizona State University

17:00  **Aerosols and Radiation Balance: From Uncertainty in Future Climates to Albedo Modification**
James Wilson, University of Denver

17:30  End of Day

19:00 - 21:00  **Reception at Table Mountain Inn**

**Day 2: Tuesday Oct. 16^{th}**

**CO₂ Capture and CO₂ Transport**

**CO₂ Capture**

09:00  **Post Combustion Capture**
Christopher Romans, Mitsubishi Heavy Industries

09:30  **Oxyfuel Capture Technologies**
Greg Jackson, Colorado School of Mines

10:00  Coffee

10:30  **Pre-Combustion**
Raghbir Gupta, Susteon Inc.

11:00  **North American Projects and Policy Landscape**
Christopher Romans, Mitsubishi Heavy Industries

12:00  Lunch

**CO₂ Transport**

13:00  **Pipelines – The Safest Way for CO₂ to Travel**
Ken Havens, Kinder Morgan

13:45  **The Intersection of Environment and EOR, How Carbon Capture is Changing Tertiary Recovery**
Bob Balch, PRRC, New Mexico Tech

14:30  **Natural CO₂ Sources in the USA and Possible Anthropogenic Opportunities**
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15:00  Coffee
15:30 Offshore Challenges - Ships or Pipeline

16:00 Panel Debate: USA and the World on CCUS – Economy or Climate as Drivers?
    Moderator: Arne Graue, Univ. of Bergen, Norway

17:00 End of Day

**Day 3: Wednesday Oct. 17th**

**CO₂ Storage**

09:00 Overview of CO₂ Storage Options
    Manika Prasad, Colorado School of Mines

09:30 Regulatory Challenges in CO₂ Storage
    Michael Moore, East-West Strategic Advisors

10:00 Coffee

10:30 Geomechanics in CO₂ Storage
    Manika Prasad, Colorado School of Mines

11:30 Computational Modeling of Fault Poromechanics for Storage-Induced Seismicity and CO₂ Leakage
    Birendra Jha, University of Southern California

12:00 Lunch

13:00 Integration of Geophysical and Geomechanical Modeling to Monitor Integrity of Carbon Storage
    Birendra Jha, University of Southern California

13:40 Large Scale CCUS in the North Sea Can Handle All EU Coal Power CO₂ Emissions
    Erik Lindeberg, SINTEF

14:20 Tertiary CO₂ EOR in 23 North Sea Oil Fields - Combined CO₂ Storage Based in Industrial CO₂ Sources
    Erik Lindeberg, SINTEF

15:00 Coffee

15:30 Numerical Simulation of CO₂ Storage in Saline Aquifers
    Yu-Shu Wu, Colorado School of Mines

16:15 CO₂ Storage, Monitoring, Verification and Accounting
    Erik Lindeberg, SINTEF

17:00 End of Day
Day 4: Thursday Oct. 18th

CO₂ Utilization in Hydrates and in Enhanced Oil Recovery (EOR)
- Tour of CSM CCUS and EOR Laboratories
- Tour of Coors Brewery

09:00  *Fundamentals of Hydrates, Climate Perspectives, and Energy Potentials*
       Luis Zerpa, Colorado School of Mines

09:30  *CO₂ Storage in Hydrates with Associated Methane Production*
       Arne Graue, University of Bergen

10:00  *Coffee*

10:30  *Field Experiences from CO₂ Injections in Hydrates: North Slope CO₂-CH₄ Exchange Project*
       Arne Graue, University of Bergen

11:00  *CO₂ EOR Assessment*
       Wayne Rowe, Schlumberger Carbon Services

12:00  *Lunch*

CO₂ Utilization in EOR as CCUS

13:00  *CO₂ for EOR – Historical Perspectives, Current State of the Art Technology Status, and Technological Challenges*
       Ganesh C. Thakur, Univ. of Houston, Director of Energy Industrial Partnerships & Distinguished Professor of Petroleum Engineering U. of Houston, 2012 SPE President & Former VP Chevron and Ramanan Krishnamoorti, University of Houston.

14:00  *Utilizing CO₂ in Beer Manufacturing, Tour of Coors Brewery for Group 1/CSM Lab Tour for Group 2*

15:00  *Utilizing CO₂ in Beer Manufacturing, Tour of Coors Brewery for Group 2/CSM Lab Tour for Group 1*

16:00  *CO₂ EOR, CCUS, and the Horizontal Revolution in the Permian Basin*
       Steve Melzer, Melzer Consulting

16:30  *Current CO₂ EOR Perspectives*
       Hossein Kazemi, Colorado School of Mines

17:30  End of Day

19:00 to 22:00  *Conference Dinner at the Golden Hotel*
Day 5: Friday Oct. 19th
CO₂ EOR and Whole Value Chain CCUS Future Development

09:00  Surfactant Selection for Foam EOR
George Hirasaki, Rice University

10:00  CO₂ Foam EOR for Mobility Control
Arne Graue, University of Bergen

10:30  Coffee

11:00  Historical Overview of CO₂ EOR Field Applications
David Schechter, Texas A&M University

12:00  Lunch

13:00  CO₂ Foam EOR Field Pilots in Texas
Zachary Alcorn, University of Bergen

13:30  CCUS Policy
Morgan Bazilian, Payne Institute, Colorado School of Mines

14:00  Coffee

14:30  Future Solutions for Whole Value Chain CCUS
- 10 min summaries: Manika Prasad, Arne Graue and Dag Nummedal
- Discussion

15:30  Synthesize Student Learning and Discussion
Manika Prasad, Colorado School of Mines

16:00  End of Conference