NETL Carbon Utilization Project Review Meeting

International Test Center Network

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Southern Company

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International Test Center Network

Purpose

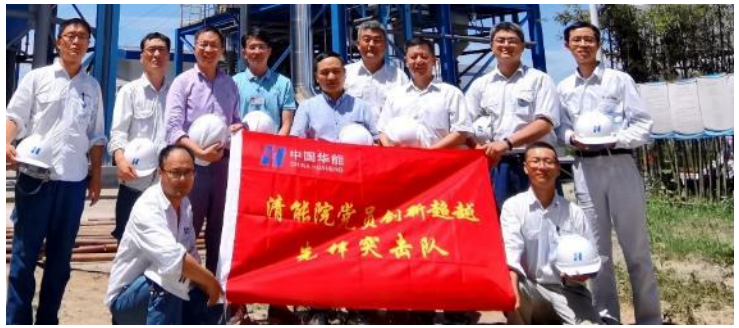
- ITCN shares knowledge on operating test facilities
- Facilitate collaboration on technology development and proposal response
- One technical focus are per year
  - Analytical techniques
  - Amine carry-over
  - Support of CCSI
  - Open access technology
  - Alternative baselines to MEA

Framework for Collaboration

- Since the ITCN is a network of neutral test facilities, the emphasis is on optimizing the capture processes of technology developers
- Since deployment of technologies will depend on successes in marketing, policy and investment strategy, all the facilities can support a wide range of collaboration such as FEED studies, knowledge sharing, road maps, policy development
- A brief summary of the 12 facilities will be given which will only touch the surface of their capabilities. Each facility encourages you to propose working together. A collaboration is possible no matter how specialized your project becomes.

Clean Energy Research Center
Beijing, China

Overview
- China's first power plant PCC (3000 t/a)
- Transportable PCCC test platform
- China's first gas-fired capture pilot plant
- Technology demonstration, application research, theoretical research



CO2CRC
Melbourne, Australia

Overview
- Supply of CO2 and different storage options for research and testing
- State of the art Monitoring & Verification
- Capture Skid for testing adv capture technologies
- Future focus includes utilization and H2
- Multiple collaboration pathways available for national and international collaboration

CSIRO
Brisbane, Australia

Learning by Doing - Pilots
- AGL Loy Yang
- China Huaneng (Beijing and Chanchun)
- Delta Energy
- Stanwell

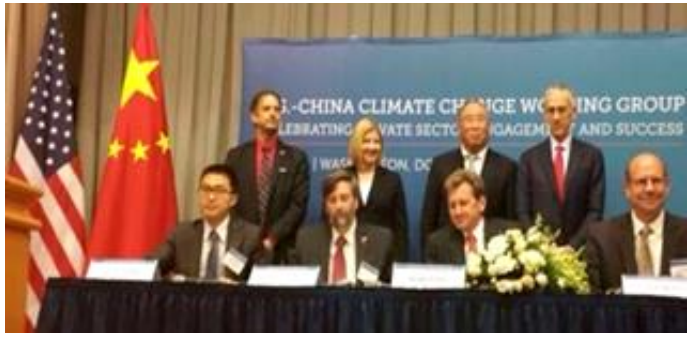
Learning by Searching – R&D
- Amines, sorbents, membranes
- Novel Process
- Environmental Impacts
- PICA solvent program with IHI and AGL

Guangdong CCUS Centre
Guangzhou, China

中英（广东）CCUS 中心
UK–China (Guangdong) CCUS Centre

Test Center

- Phase 1 – solvent and membrane units are built. 20,000 t/a CO2.
- Additional test interface is available for advanced capture processes.
- In 2021, a six-month Open Access MEA Testing Campaign is planned
- GCCT is committed to jointly explore innovated ways of CO2 utilization with domestic and foreign partners.



KIER
Daejeon, South Korea

KIER

KIER dry sorbent bench unit (15 kW)

- Sorbent CO2 capture tech developed
- Tested various potassium-based sorbents.
- Tested PEI-based sorbents of Univ. of Nottingham and KAIST.

KOSPO dry CO2 capture pilot (10 MW)

- 10 MW dry CO2 capture process operated and optimized since 2014
- CO2 compression and liquefaction facility installed.

CCS Knowledge Center
Shand, Canada

INTERNATIONAL CCS KNOWLEDGE CENTRE

Overview

- Demonstration-scale test facility at Shand Power Station
- Enables long-term technology evaluation utilizing up to 120T/day of CO2
- TRL 4 to 7 may be tested
- Hitachi and Cansolv solvent tested and Boundary Dam process dev ongoing
- Available for 3rd party use next year

NICE
Beijing, China

Focus: CCUS role for coal power in China
- Validate emerging tech under field conditions
- Understand dynamic operating requirements
- Clarify cost distributions in Chinese context

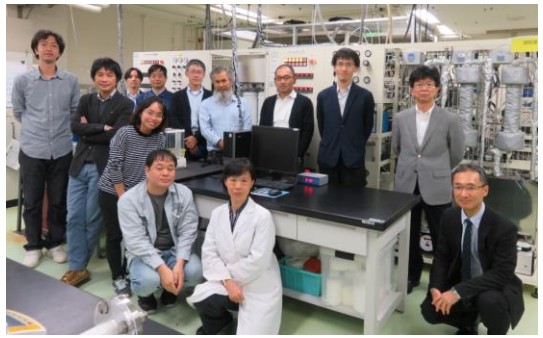
Facilities
- 0.1 MW_e (400 to 500 kg/hr) slipstream
- 3 test pads (solvent skid + 2 open bays)
- MEA baselining complete
- Evaluation of 3rd party solvent and membrane technologies in progress

RITE
Kyoto, Japan

Research Institute of Innovative Technology for the Earth

Overview
- Developing solvents, sorbents, membranes, processing tech, systems.

Technologies
- Developed high perf sorbents; one being chosen for commercial use in Japan
- Developing energy eff solid sorbents and large-scale synthesis technology
- Long-term program advancing pre-combustion membranes



SINTEF
Trondheim, Norway

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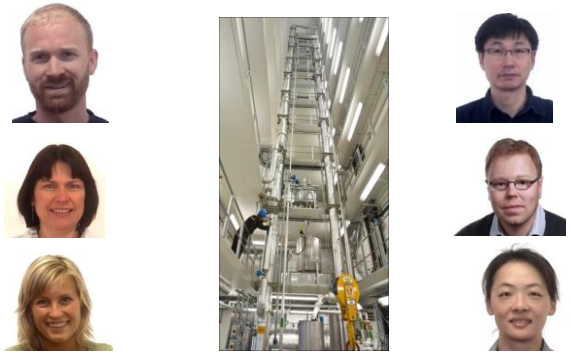

TCM
Kyoto, Japan

TECHNOLOGY CENTRE MONGSTAD

Overview
- Vendor proprietary campaign (20,000 hrs)
- Non-proprietary campaign (14,000 hrs)
- Advisory to project development

Benefits
- Comprehensive open-access datasets and industrial-scale baseline
- Close partnerships with the industry.
- No claims to intellectual property rights

UK Center of Advanced Energy
Lexington, Kentucky

Center for Applied Energy Research

Accomplishments
- 5,500 operation hours and 20+ campaigns at bench scale
- 4,580 operational hours at pilot scale and 8 solvents

Planned Testing
- Packing evaluation
- Absorption process intensification
- 3rd generation solvent development
- Feed-forward process control
- Large pilot CCS demonstration at Wyoming ITC

UK PACT
Sheffield, England

UKCCSRC PACT FACILITIES

Overview
- 1 tonne per day amine PCC plant

Accomplishments
- Novel solvent development
- BECCS development
- Solvent oxidative degradation and mitigating strategies R&D
- PACT has in excess of 11000 hours of testing from 10 countries
- 4 technologies have scaled up
- Involvement in: Align, Newest-CCUS, Launch and Member ECCSEL

Wyoming Integrated Test Center
Gillette, Wyoming

- Can deliver 20 MWe of coal derived flue gas from power plant.

Current developers

- Carbon Upcycling UCLA, Dimensional Energy and TDA Research

Future developers

- GTI
- Kawasaki – Partnership with JCOAL
- GreenOre – Partnership with JCOAL
- MTR
- University of Kentucky CAER

Thank You

More information:
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NATIONAL CARBON CAPTURE CENTER

U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY