

# THE INTERNATIONAL CCS TEST CENTRE NETWORK

Presentation at CSLF technical Group  
Meeting, Regina,  
16 July 2015

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- **Launched in 2012 to accelerate CCS technology development, official start November 2013**
- **The United States and Norway announced their commitment to support the Carbon Capture and Storage (CCS) Test Centre Network at the CSLF Ministerial Meeting in Washington DC November 7, 2013.**
- **Sharing knowledge oo developments, construction and operational experience**
- **Analysis and problem solving will be the focus of the network, not data collection**
- **The network will share non-confidential information.**





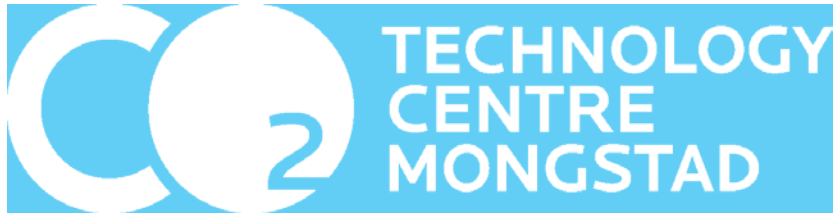
# FUNDING

- The United States and Norway agreed to provide resources for chairing the network in the first four-year period of the CCS Test Centre Network, including a technical expert
- The chairmanship will be held by either of the two countries initially (two years each) and will subsequently rotate amongst the member test centers
- Additional funds for workshops etc is provided through a membership fee

# Criteria for membership

- Operating on real flue gas, i.e. connected to a power or industrial plant
- Aiming to be neutral in technology decisions
- Willing to share information and receive visitors
- Willing to pay a fee
- Size (not explicitly stated)

# Members of the International CCS Test Center Network as of June 2015



Left network as of March 01, 2015,  
due to suspended CCS activities

Member as of February 01, 2015





## Workshops:

- Mongstad, Norway, 7 - 8 May 2014
  - Initial discussions around amine-based post-combustion capture
- Austin, Texas 4 - 5 October 2014,
  - Exchange of experiences on how best to measure and model amine emissions
- Wilhelmshaven, Germany, 28 – 29 April 2015.
  - Focus on aerosols and mist formations
- Regina, Canada, 11 – 18 September 2015 (during PCCC3).
  - Topics to be decided

## Status knowledge sharing:

Members have shared experiences on measuring emissions from post-combustion capture in three workshops:

- Amines and amine degradation products
  - the sampling train set-up
  - the sampling locations; and
  - the preservation of the samples until they are analysed
  - Uncertainties
  - Permits
- Aerosols and mist formation
  - Under what circumstances does mist form
  - How to measure particle size and distributions
  - Mitigation
- Report on lessons learned from measurement of emissions of amine and amine degradation products in preparation

# OTHER POTENTIAL KNOWLEDGE SHARING TOPICS

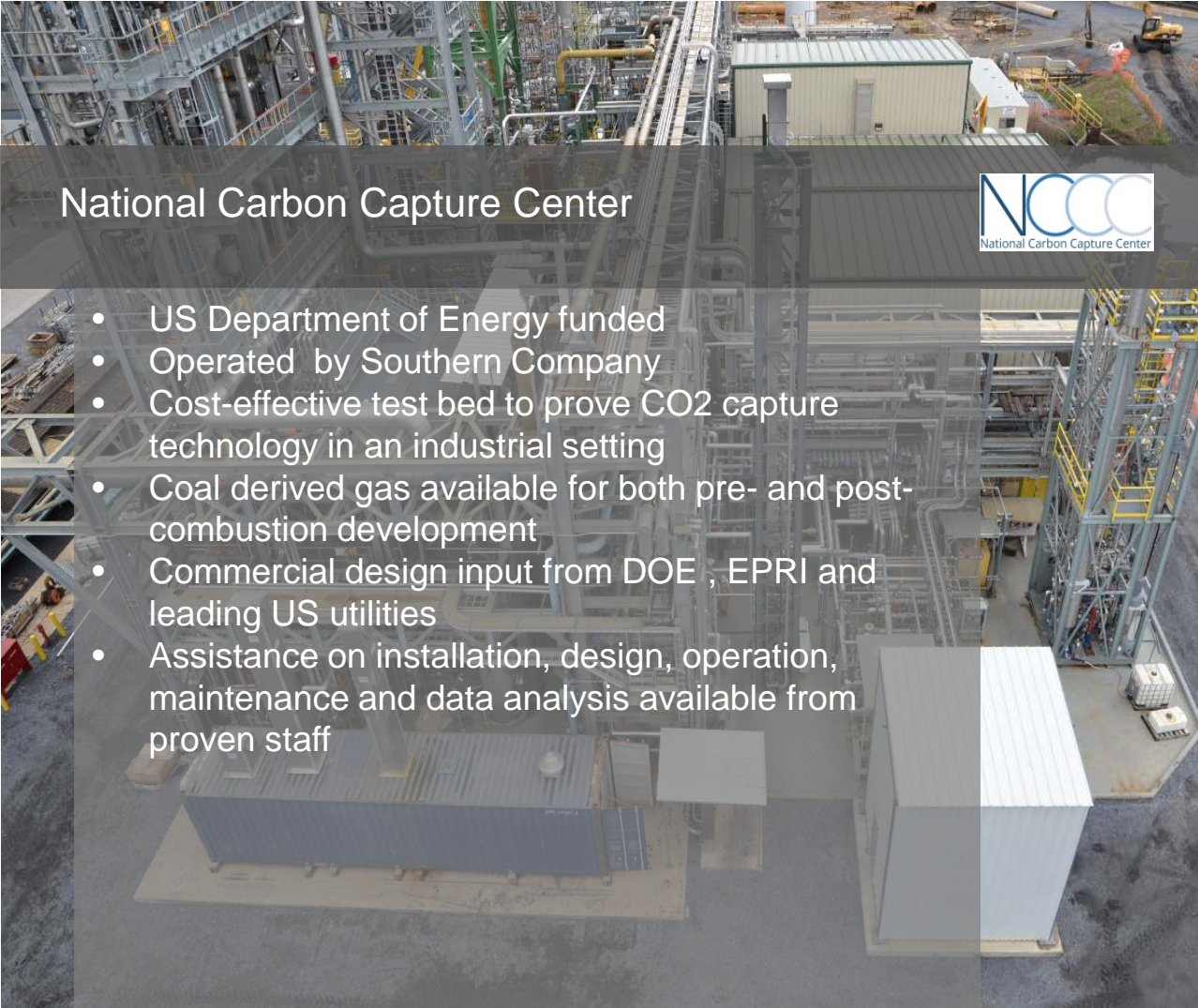
- Important activities
  - Health, safety and environment (HSE)
  - Instrumentation and monitoring
  - Waste management
  - Comparing baselines
  - Promoting technology certification and standardization
- The Network will
  - Actively pursue new members
  - Establish liaison/interface with other networks



Thank you for the  
attention

Questions?





## National Carbon Capture Center



- US Department of Energy funded
- Operated by Southern Company
- Cost-effective test bed to prove CO<sub>2</sub> capture technology in an industrial setting
- Coal derived gas available for both pre- and post-combustion development
- Commercial design input from DOE, EPRI and leading US utilities
- Assistance on installation, design, operation, maintenance and data analysis available from proven staff



## TECHNOLOGY CENTRE MONGSTAD

- Three sites: amine, chilled ammonia, other technologies
- Two flue gas sources, flexible CO<sub>2</sub> content
- 100 000 tonnes of CO<sub>2</sub> per year (20 000 + 80 000)
- State of the art on-site laboratory, workshop and central control rooms
- All required utility systems with built-in flexibility
- Fully manned 24/7 and multi-disciplinary technical staff



# Carbon Capture Pilot Plant Wilhelmshaven, Germany

Based on Fluor Econamine FG plus Technology / located at E.ON Power Plant

- ⇒ Amine-based CO<sub>2</sub> capture process
- ⇒ Capacity of 25,000 t CO<sub>2</sub> per year
- ⇒ Treating real coal-fired Power Plant flue gas
- ⇒ Integrated into Power Plant operation control
- ⇒ Automated start-up and shut-down sequences
- ⇒ All required utility systems implemented (incl. heat recovery, intercooling, reclaiming)
- ⇒ Build-in flexibility i.e. for emission control
- ⇒ Sophisticated on-site lab and more capabilities for gas and liquid phase online and off-line analytics
- ⇒ Own personnel for shift operation 24/7



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in association with:



# SASKPOWER CCS

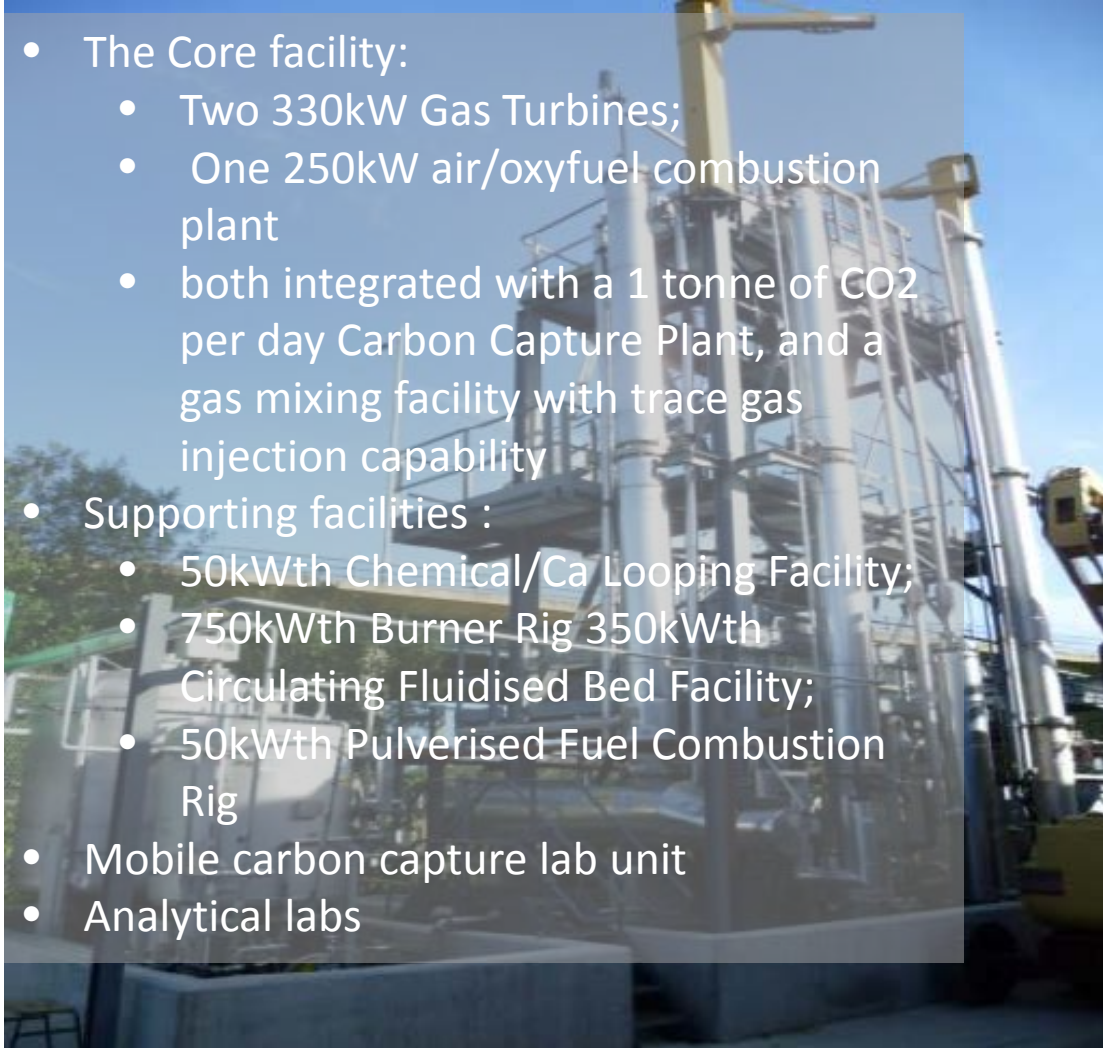
## CARBON CAPTURE TEST FACILITY

- Located at the SaskPower Shand Power Station
- Flue gas from 298 MW coal fired thermal power station
- Post-combustion with capacity 120 t CO<sub>2</sub>/day
- Mitsubishi Hitachi Power Systems will test for the first 1-2years
- Once this is complete, CCTF will be turned over to SaskPower for testing by other vendors
- May evolve into testing other types of capture technologies
- Technical support in terms of laboratory and engineering capacity



# UKCCSRC Pilot-scale Advanced Capture Technology (PACT)

- The Core facility:
  - Two 330kW Gas Turbines;
  - One 250kW air/oxyfuel combustion plant
  - both integrated with a 1 tonne of CO<sub>2</sub> per day Carbon Capture Plant, and a gas mixing facility with trace gas injection capability
- Supporting facilities :
  - 50kWth Chemical/Ca Looping Facility;
  - 750kWth Burner Rig 350kWth Circulating Fluidised Bed Facility;
  - 50kWth Pulverised Fuel Combustion Rig
- Mobile carbon capture lab unit
- Analytical labs





# CCS Brindisi CO<sub>2</sub> Capture Pilot Plant



- Post-combustion capture with amine
- Slip stream from 2640 MW coal fired power station
- Capture rate 8000 t CO<sub>2</sub>/year
- Large range to change the composition of flue gas
- High flexibility in fact of solvent flow rate; flue gas flow rate,  
DCS control system, solvent inventory

# STRUCTURE AND ROLES

STEERING COMMITTEE

CHAIR

Technical expert/  
coordinator

Knowledge sharing process and systems  
Meetings, events, webinars, newsletters etc

Promote the network  
Attracting/recruiting new members

# SHARING CARBON CAPTURE KNOWLEDGE

Kick-off meeting Brussels, Belgium, 25  
November 2013

## Attendance:

- Southern Company Services/NCCC
- SaskPower
- E.On
- ENEL
- TCM
- RWE
- EnBW
- CIUDEN
- DOOSAN
  
- DG ENER, European Commission
- GCCSI
- Gassnova

## Topics

- Charter
- Knowledge sharing (mist by TCM)
- Brief presentation of activities (ENEL and CIUDEN)





## Mongstad Workshop:

- Getting to know each other
- Presentation of activities and facilities by NCCC and TCM
- Introduction to knowledge sharing
- Sign contract and formalize the network
- KEPCO RI was present part of the workshop

## Austin Workshop outcomes:

### Gas sampling set-ups and procedures:

- There are differences amongst members' approaches that can have impacts on final results, even though the methods are very similar
- Differences are caused by
  - the materials used
  - the sampling train set-up
  - the sampling locations; and
  - the preservation of the samples until they are analysed.
- Emission permits are subject to decisions by local authorities and do not appear to have been a challenge other than in Norway

## Wilhelmshaven Workshop outcomes:

- Discussions and experience exchange on mist formation:
  - Under what circumstances does mist form
  - How to measure particle size and distributions
  - Mitigation
- Agreement to prepare a publication on lessons learned from measurement of emissions of amine and amine degradation products
- Business models for tests centres put on the agenda