US DOE National Carbon Capture Center

Cost Reduction for Carbon Capture
CSLF Meeting – Seoul

March 26, 2014

DOE National Carbon Capture Center

CO_2 Capture Test Facilities

Power Systems Development Facility (PSDF) started combustion testing June 1996 and gasification September 1999.

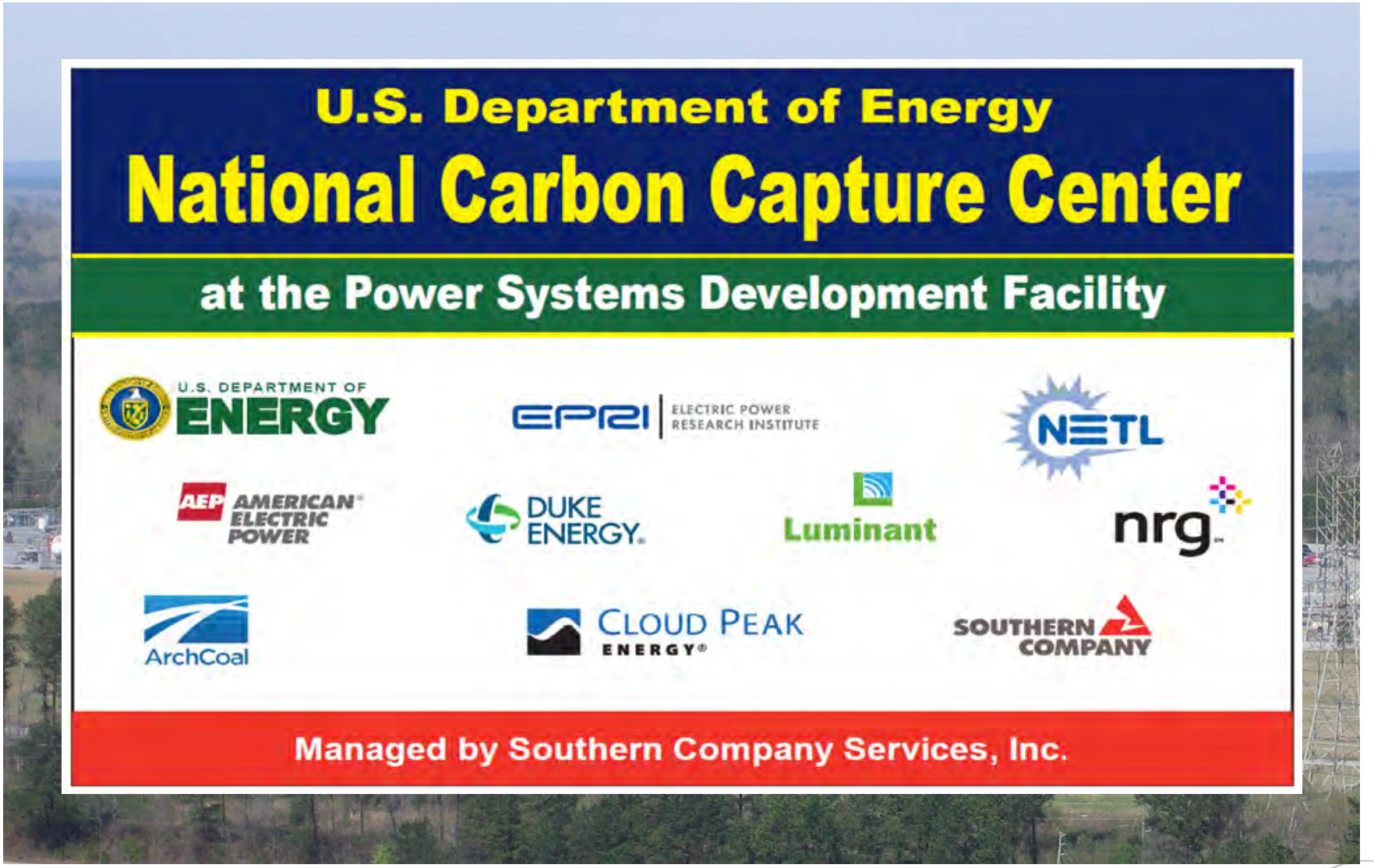
In May 2009, PSDF transitioned to the National Carbon Capture Center (NCCC).

Existing facilities used to support development of pre-combustion CO_2 capture and gasification technologies.

Additional facility, the Post-Combustion CO_2 Capture Center (PC4) built and started testing March 2011.

Located at adjacent power plant, Alabama Power's Plant Gaston, which provides commercially representative flue gas for testing (hot ESP, SCR, and wet FGD).

National Carbon Capture Center



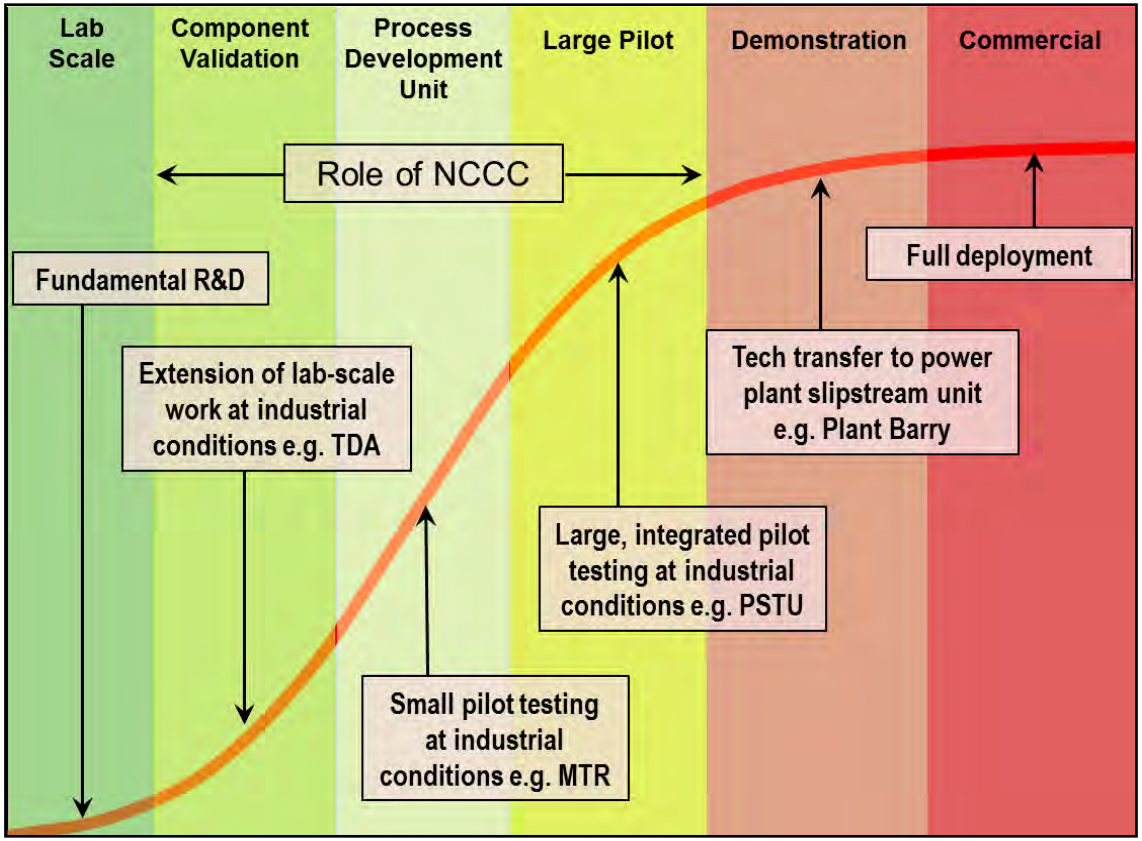
http://www.nationalcarboncapturecenter.com

Role of NCCC in CO_2 Capture Technology Development

First-class facilities to test developer's technologies for extended periods under commercially representative conditions with coal-derived flue gas and syngas. Simultaneous testing at a range of sizes to accelerate development of cost-effective technologies.

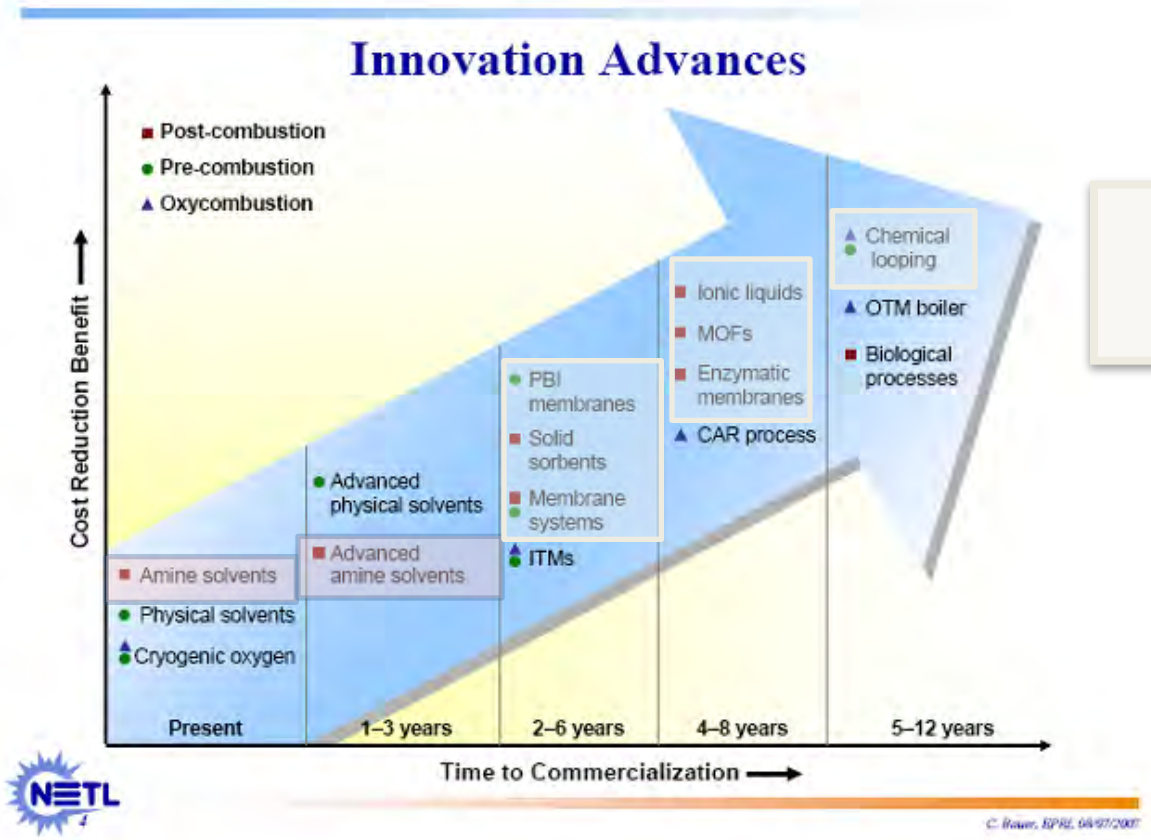
- Independent test facility to advance developer's technologies.
- Full support for testing of developer's technology.
- Experienced operators and maintenance staff.
- Comprehensive data collection and analysis capability.
- Local access to advanced analytical techniques.
- Flexible facilities for scale-up from bench- to pilot-scale.

Testing support to advance developer's technologies is top priority.



Progression of a Technology with Time

Both Near Term and Long Term Pathways



<u>Long Term Solutions</u>:
Innovative Concepts

<u>Near Term Solutions</u>:
Solvent selection, process performance, integration of solvent and process

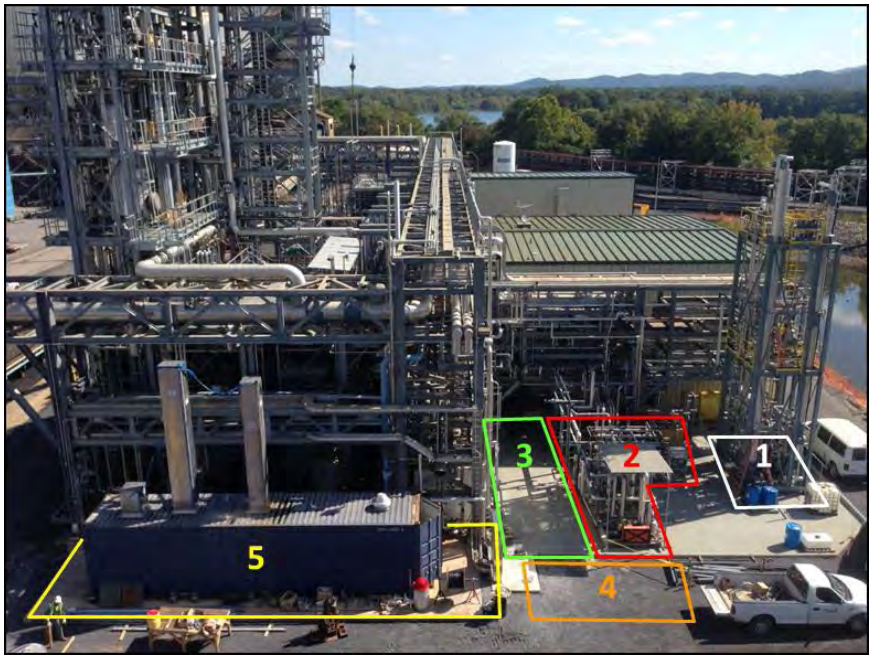
Examples of Environmental Control Technology Development – "Learn by Doing"

Research < 0.1 MWe	Development 1-10 MWe	Demonstration 10-100+ MWe	Commercial 250 MWe +
SCR systems	Crist Clean Coal Project 1992-1995 9 MW →		SEI Birchwood 1996 250 MW → 100,000 MW 11,000 MW
FGD systems	Scholz 1978 23 MW →	Yates Clean Coal 1992 100 MW →	18,000 MW 8,000 MW
Baghouse w/ activated carbon	Miller 1995 1 MW →		Gaston 2&3 1996 & 2001 2*250 MW → 8,000 MW* 1,600 MW
Carbon Dioxide (Capture & Storage)	Daniel 2009 SECARB II 3000 tons → National Carbon Capture Center	Barry 500 tpd 2011 - 2014 25MW → Citronelle 2009 - 2020 SECARB III 100k tpy	Future DemonstrationPlants? Citronelle 2009 - 2023 SECARB III 1M tpy Industry Southern

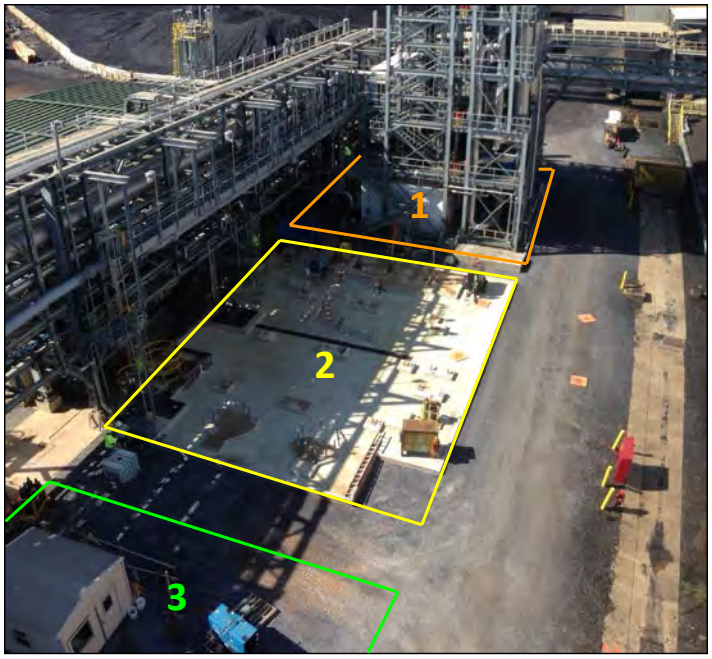
* Denotes estimate provided by EPRI

Eight Test Bays for Technologies from 0.01 MW to 1.2 MW

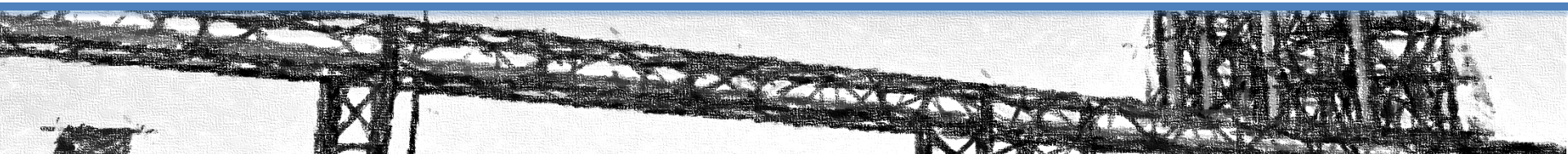
Bench-Scale Test Bays



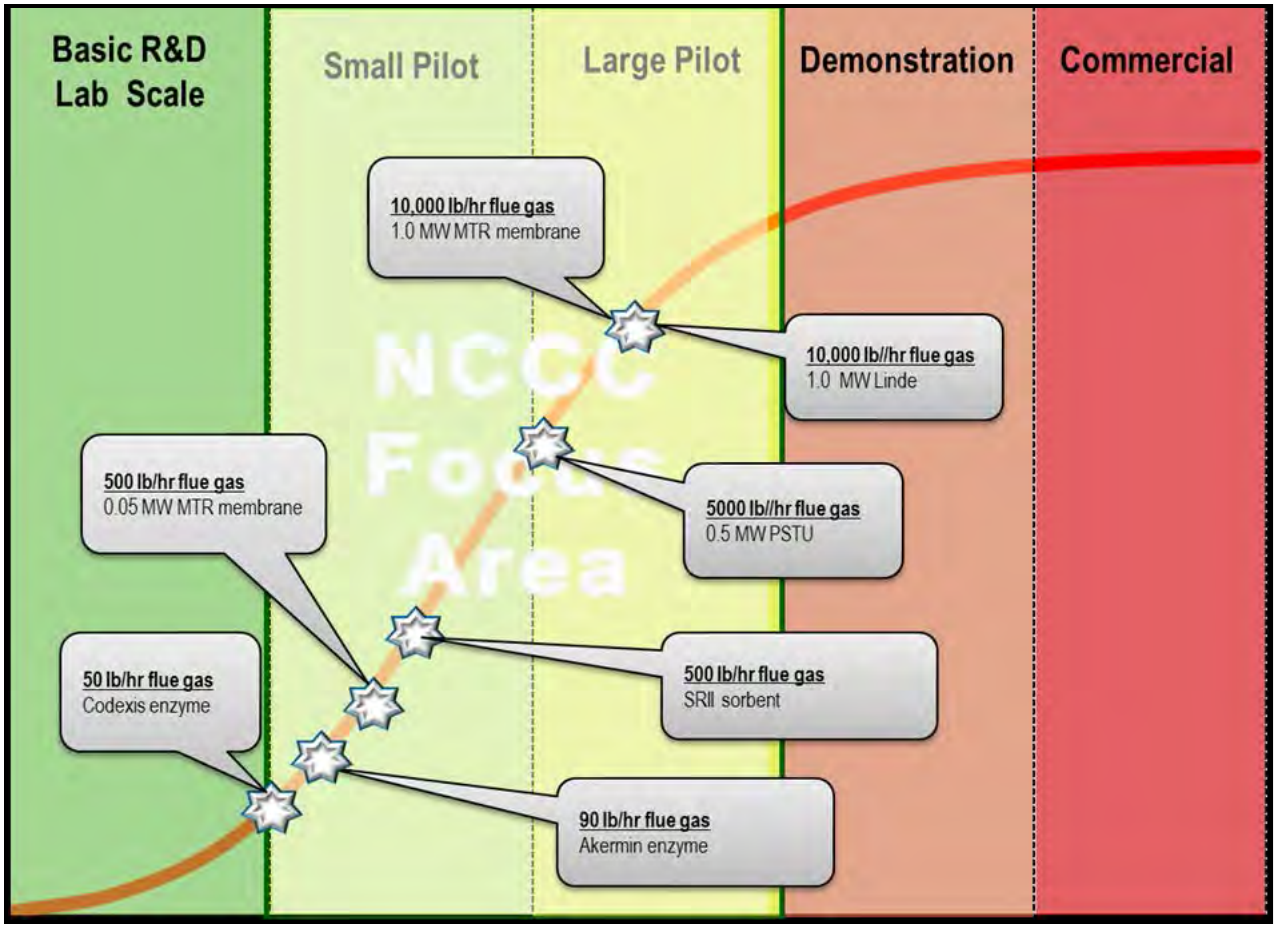
Pilot-Scale Test Bays



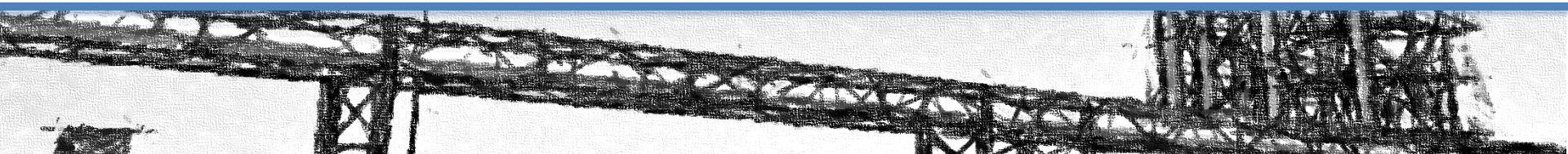
Each Bay complete with foundations, services, and gas connections to accept future technologies with limited modification.



Summary of Progress on PC4 Technology Development

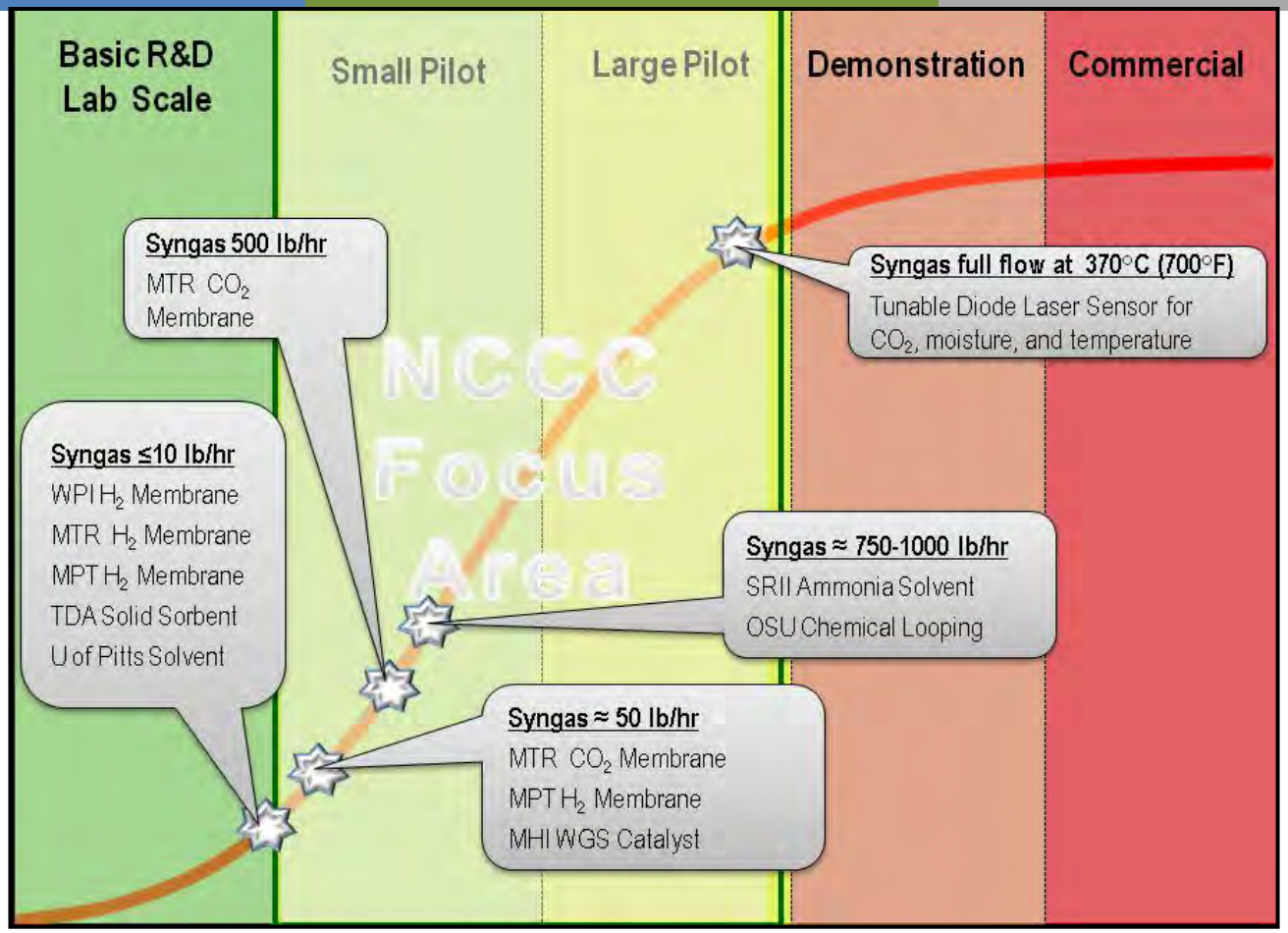


Test facilities increased in size supporting developers in progressing their technologies to commercialization



Pre –Combustion Capture Test Modules

Summary of Progress on SCU Technology Development



Test facilities increased in size supporting developers in progressing their technologies to commercialization

Developer’s flue gas supply

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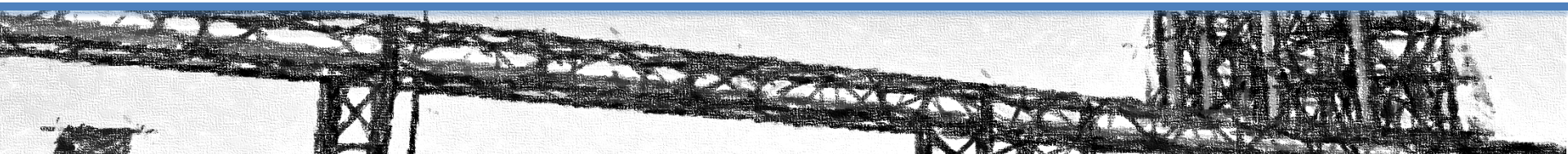
The real thing

Results revealed importance of testing at commercially-representative conditions



Reduction of Cost for Carbon capture

- Collaboration – across disciplines and across countries
- Develop expertise in fundamental principles, process engineering, power plant operation and project execution. Hold tight to this expertise.
- Maintain support of 2nd and 3rd generation innovative technologies. R&D is expensive. Leveraged testing with collaboration.
- Maintain focus on a commercial product. Industrial advisors are important.
- CCUS, large demos are essential with continued support from R&D centers, R&D responsive to political reality, all-of-above policy, public education