NATIONAL CARBON CAPTURE CENTER

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CMTC – Houston
July 17, 2019
Frank Morton

What's New at the NCCC

- Small-scale testing
- Capture from NG flue gas
- Active international collaboration

Safety First
Unquestionable Trust
Superior Performance
Total Commitment

National Carbon Capture Center

- **Sponsors:** U.S. Department of Energy and its National Energy Technology Laboratory
- **Partners:** Electric Power Research Institute, power and energy industry leaders
- **Managed and operated by:** Southern Company
- **Location:** Wilsonville, Alabama, USA

U.S. DEPARTMENT OF ENERGY

NATIONAL ENERGY TECHNOLOGY LABORATORY

Southern Company

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

CLEARPATH

EPRI ELECTRIC POWER RESEARCH INSTITUTE

ExxonMobil

NRECA America's Electric Cooperatives

Peabody

TOTAL

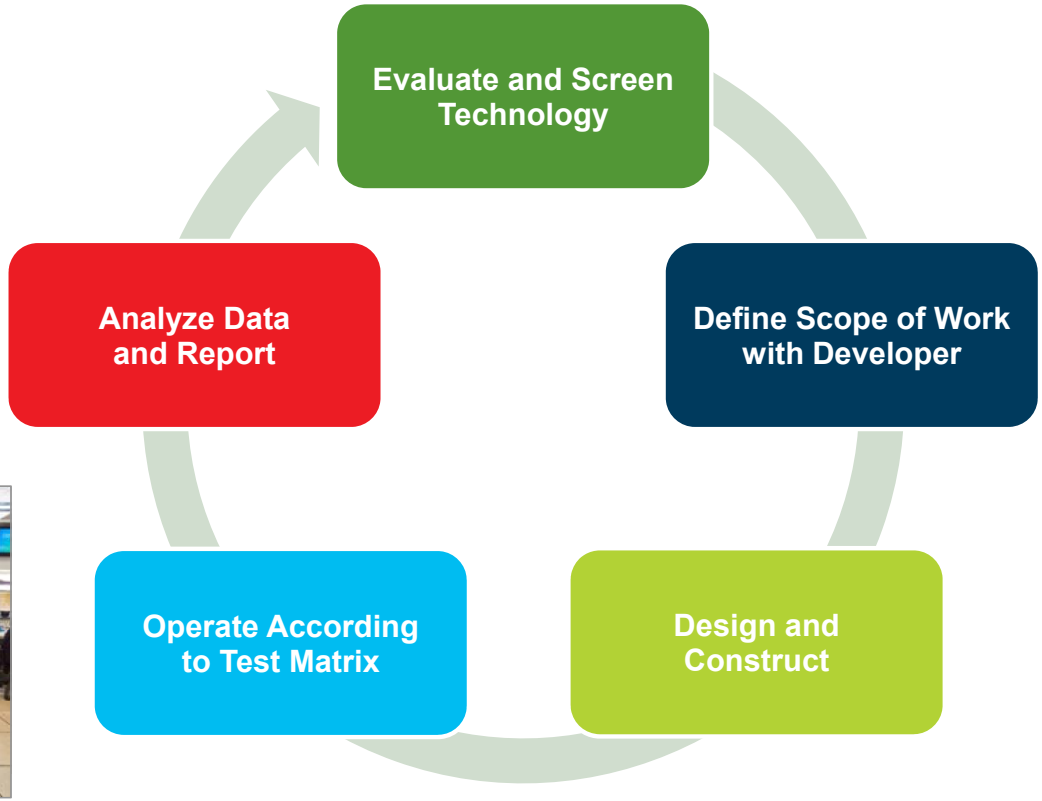
TVA

Wyoming INFRASTRUCTURE AUTHORITY

Major Accomplishments

- More than 100,000 test hours for post- and pre-combustion carbon capture and gasification projects
- Post-combustion operation about 50,000 hours and over 6,000 hours under natural gas conditions
- 30+ post-combustion projects: enzymes, membranes, sorbents, solvents and associated systems
- Supported commercial developers to scale-up and DOE's Carbon Capture Simulation Initiative
- Technology developers from the U.S. and six countries

Technology Development Process



Post-Combustion Pilot-Scale

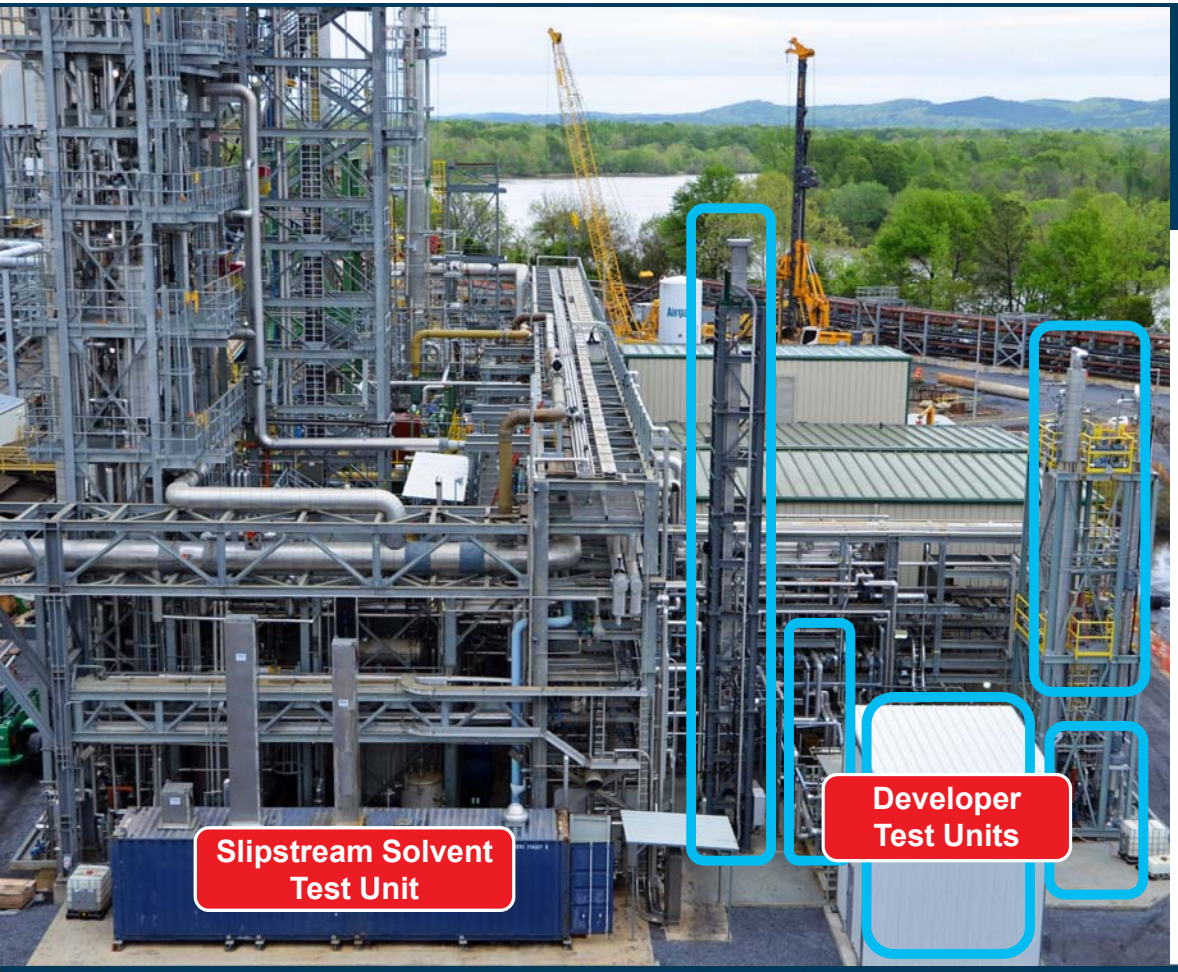
Simultaneous operation of developer test units and Pilot Solvent Test Unit (PSTU)

Three test bays from 0.5 MW up to 1.2 MW

PSTU offers flexible operation to match developers' planned commercial configuration

PSTU also supports solvent emissions and degradation studies

Post-Combustion Bench-Scale



Simultaneous operation of up to five developer test units

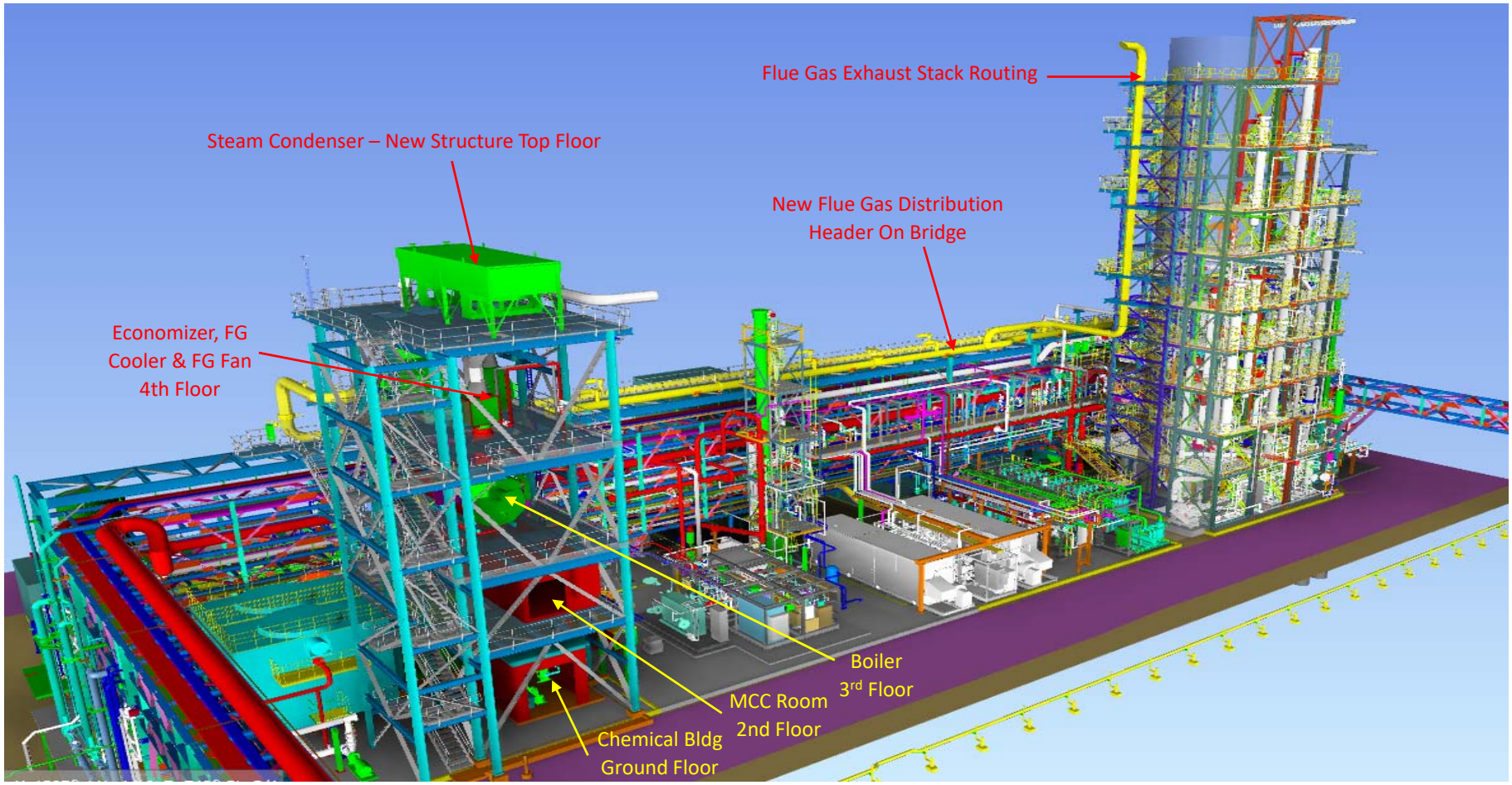
Slipstream Solvent Test Unit (SSTU) for testing of innovative solvents in early development

SSTU also used for solvent emissions studies and emission mitigation processes

Flue gas/utilities and gas analysis systems operate independently of post-combustion pilot-scale area

Lab Scale Tests

Addition of a Natural Gas Boiler



Accommodating Divergent Interests

- Commercial operations and R&D
- Tech development for near commercial processes and low TRL step-change processes
- Domestic and international goals

NCCC International Collaboration

Carbon capture R&D is an international issue that requires international collaboration

- Support DOE goal of international cooperation
- Multiple paths for involvement; partners, developers, network members, consulting services and workshops
- Offer carbon capture support to budding commercial projects
- Broad NCCC effort China, India, Middle East, Korea, Japan, EU, Australia, Canada, Norway

International Test Center Network Members

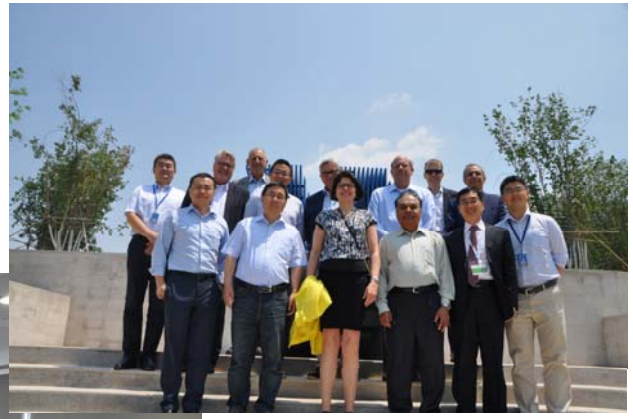
U.S. DEPARTMENT OF ENERGY

NATIONAL ENERGY TECHNOLOGY LABORATORY

International Test Center Network

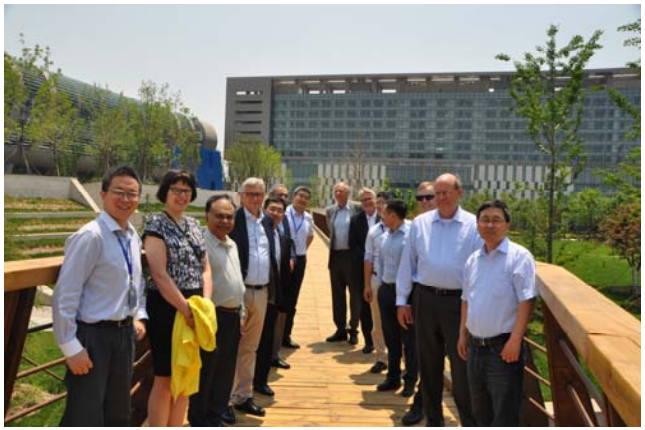
- Share pubic knowledge with carbon capture test facilities.
  - Facility operations
  - Facility funding
  - Safety
  - Analytical techniques
- Collaborate on one technical item per year.
  - Amine carry-over and measurement techniques
  - Support advanced simulations and model development with a focus on reducing capital and operating cost and minimizing scale-up risks
  - Open access solvents

Share CO_2 Capture Knowledge
to encourage global collaboration and accelerate technology development of cost-effective carbon capture processes



ITCN Benefits

- **CCUS R&D support is inconsistent**. Maintain strong international cooperation to attenuated this swing.
- **Technology solutions** need to develop input for wider application
- **Support international initiatives** – CSLF, IPCC, Bi-laterals, Conferences, Studies, White Papers, Policy Groups
- Support each other in **funding proposals**
- Facilitate **partnerships** for demos and commercial projects
- **Encourage passionate participants in CCUS development to stay in the field.**



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