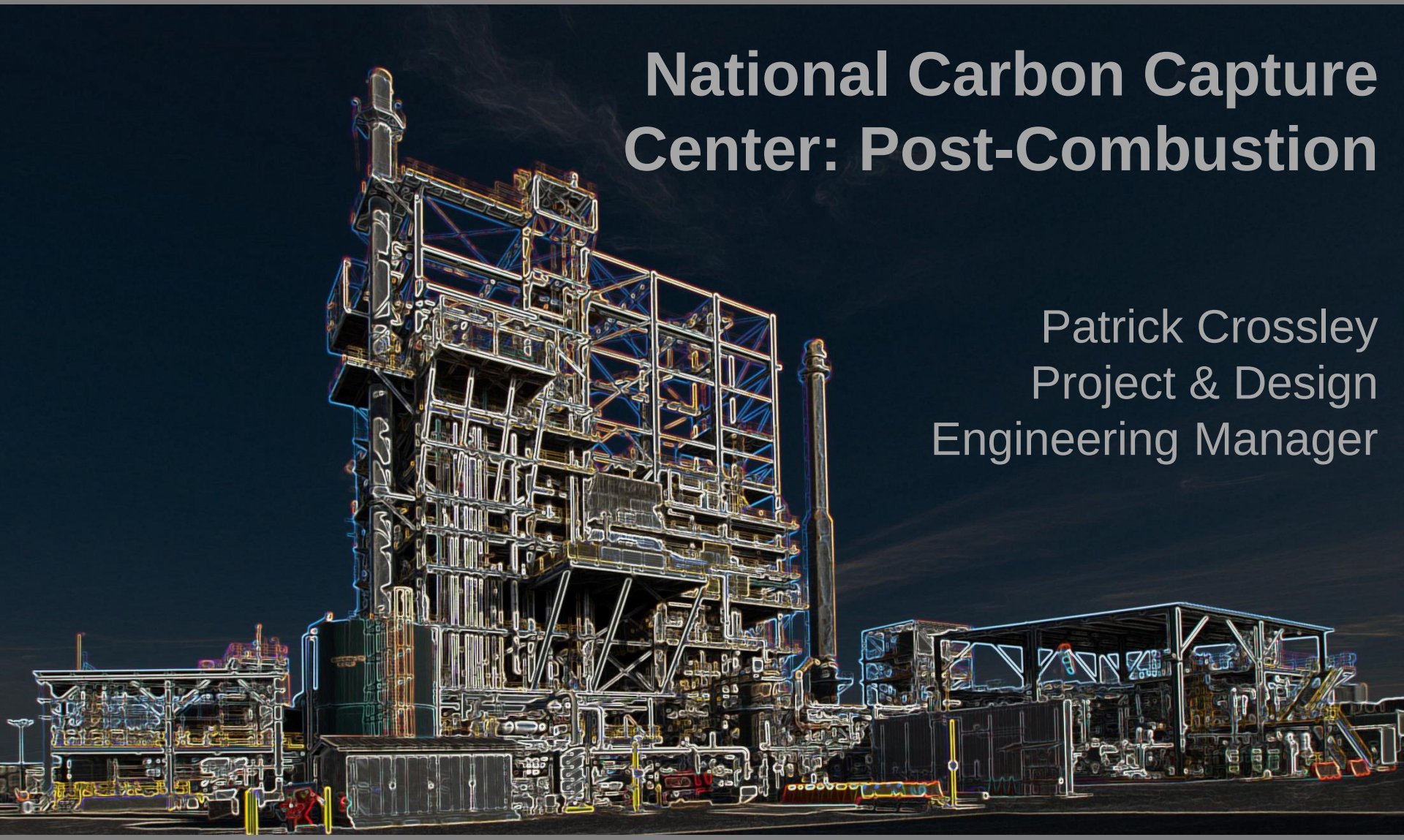
National Carbon Capture Center: Post-Combustion



Patrick Crossley
Project & Design
Engineering Manager

SOUTHERN COMPANY

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Project Facts

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10/08 to 9/14
Project Value $251M

6/14 to 5/19
Project Value $188M

Industry Partners

SOUTHERN COMPANY

EPRI ELECTRIC POWER RESEARCH INSTITUTE

CLOUD PEAK ENERGY®

Luminant

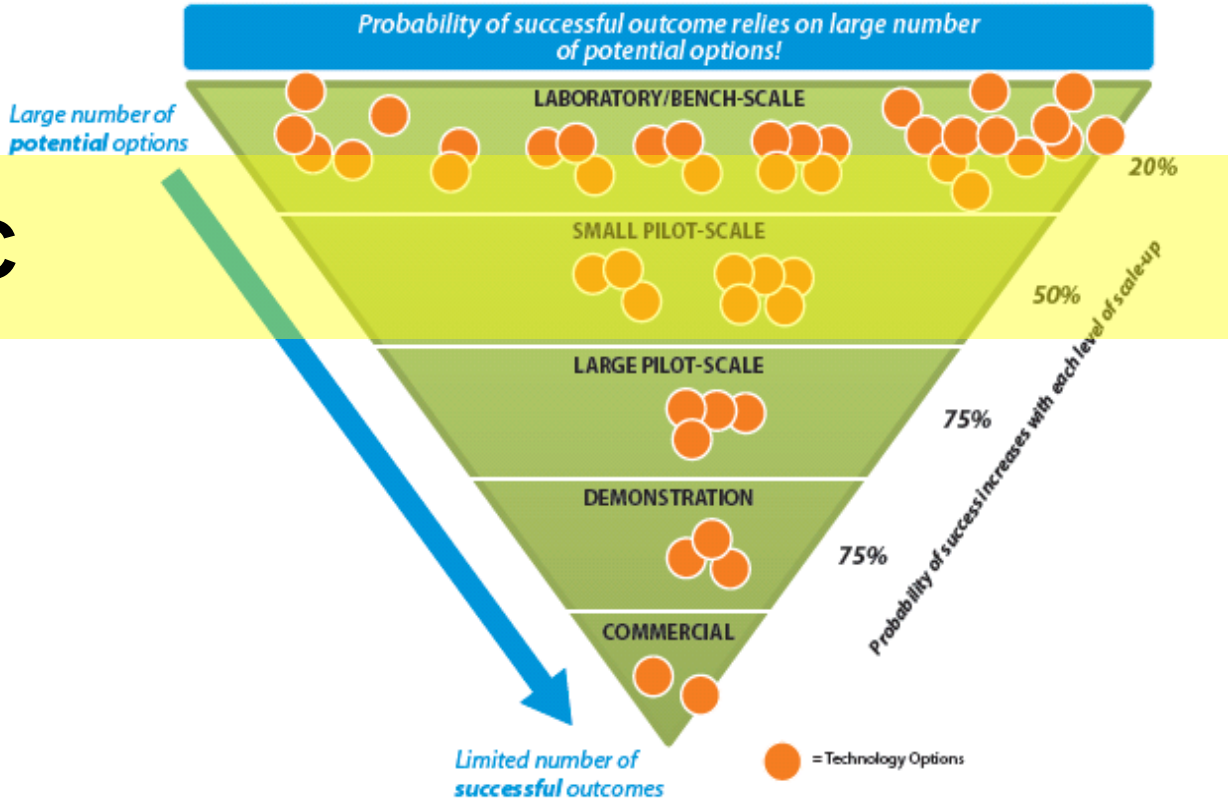
AEP AMERICAN® ELECTRIC POWER

DUKE ENERGY®

ArchCoal

Offering a **world-class neutral** test facility and a highly specialized staff, to **accelerate the commercialization** of advanced technologies and enable coal based power plants to achieve **near-zero emissions (low cost CO_2)**.

NCCC



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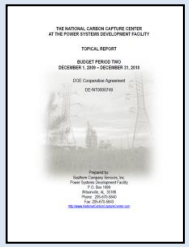
Technology Development Process



Evaluate and Screen Technologies

Define Scope of Work with Technology Developer

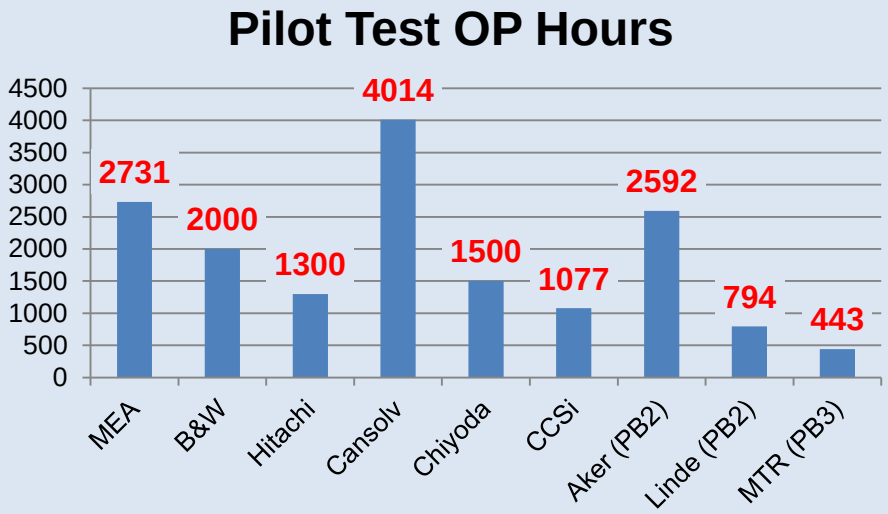
Design and Construct

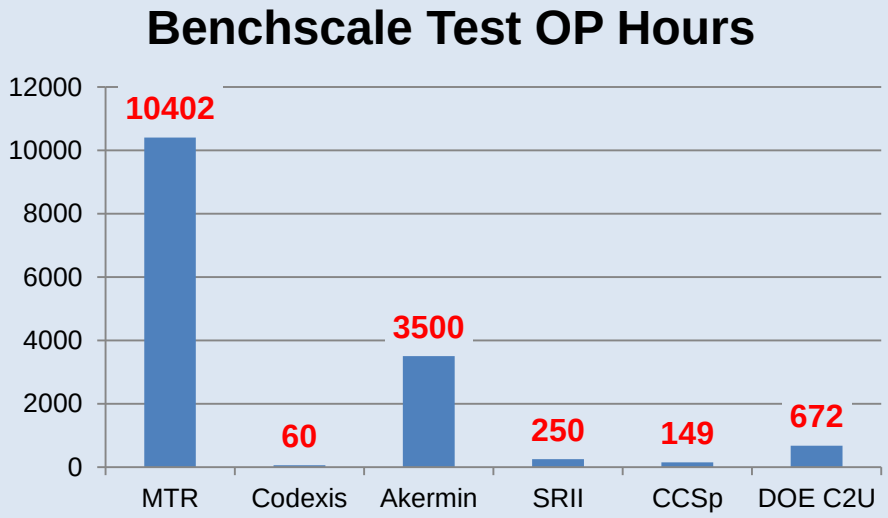
Operate according to Test Matrix

Analyze Data and Report

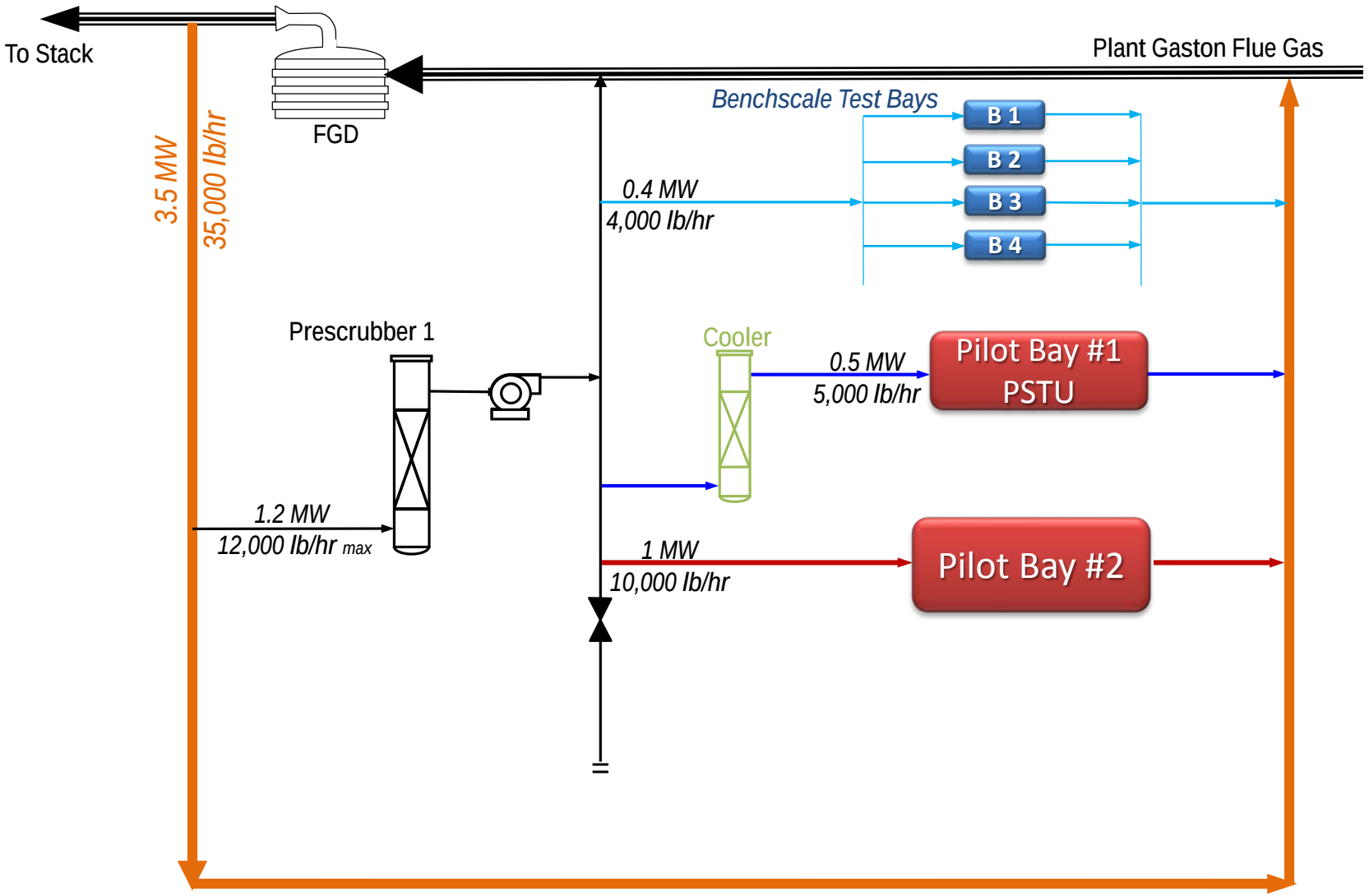
Post Combustion Results

- Developers
  - 8 pilot-scale (0.2 – 1.0 MW)
  - 6 bench-scale (0.001-0.05 MW)
- Operating hours since 3/2011
  - Pilot 15,213 hrs
  - Bench 15,032 hrs
  - Cansolv & Carbon Clean Solutions of India (CCSi) tested with natural gas simulated flue gas
- Technologies
  - 10 amine-based solvent
  - 1 carbonate-based solvent
  - 2 catalytically assisted (enzymes)
  - 2 solid sorbents
  - 1 CO_2 membrane
- Others:
  - Amine carryover and aerosols
  - Trace metals accumulation in solvent
  - Analytical methods development & verification

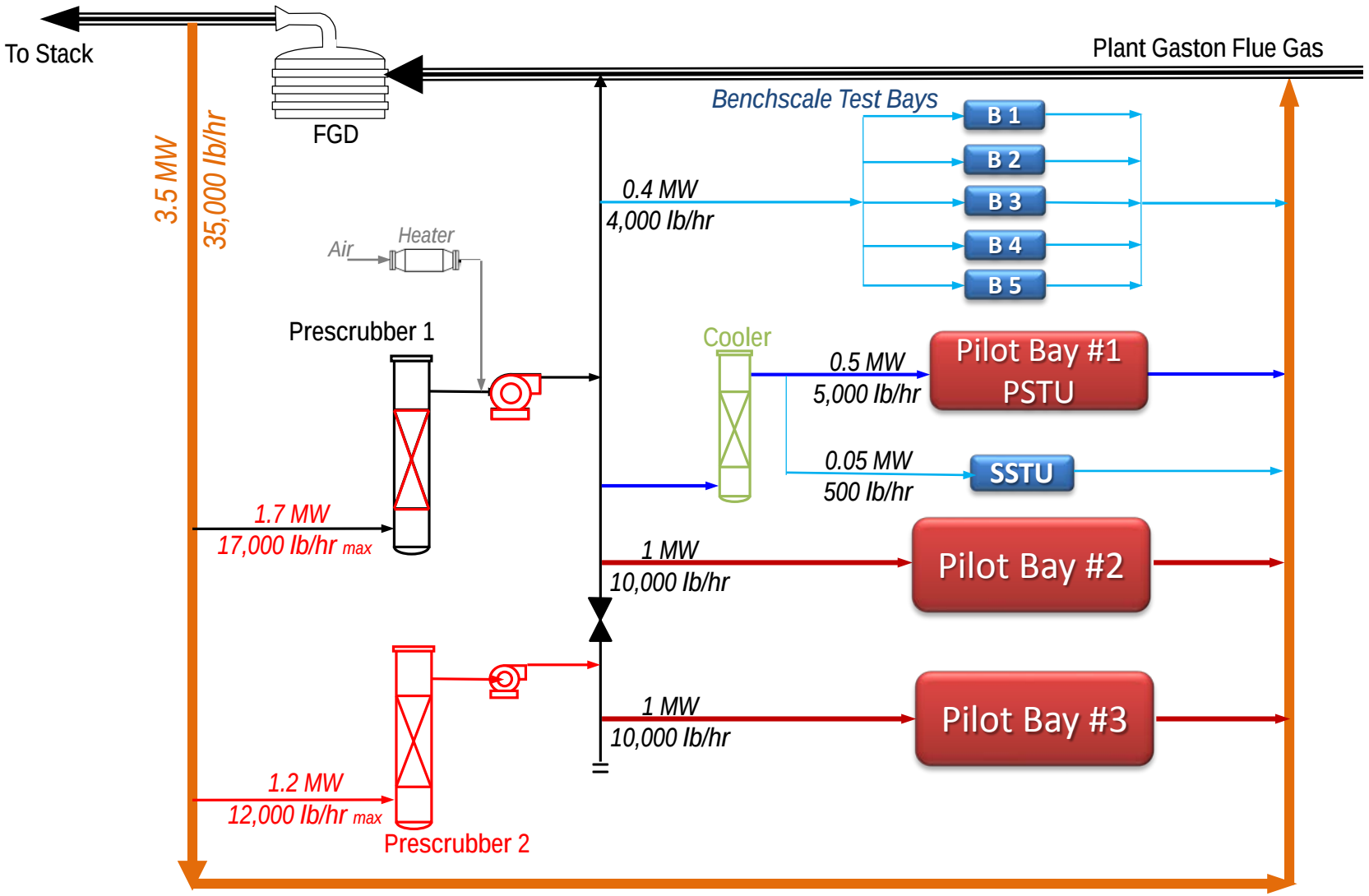




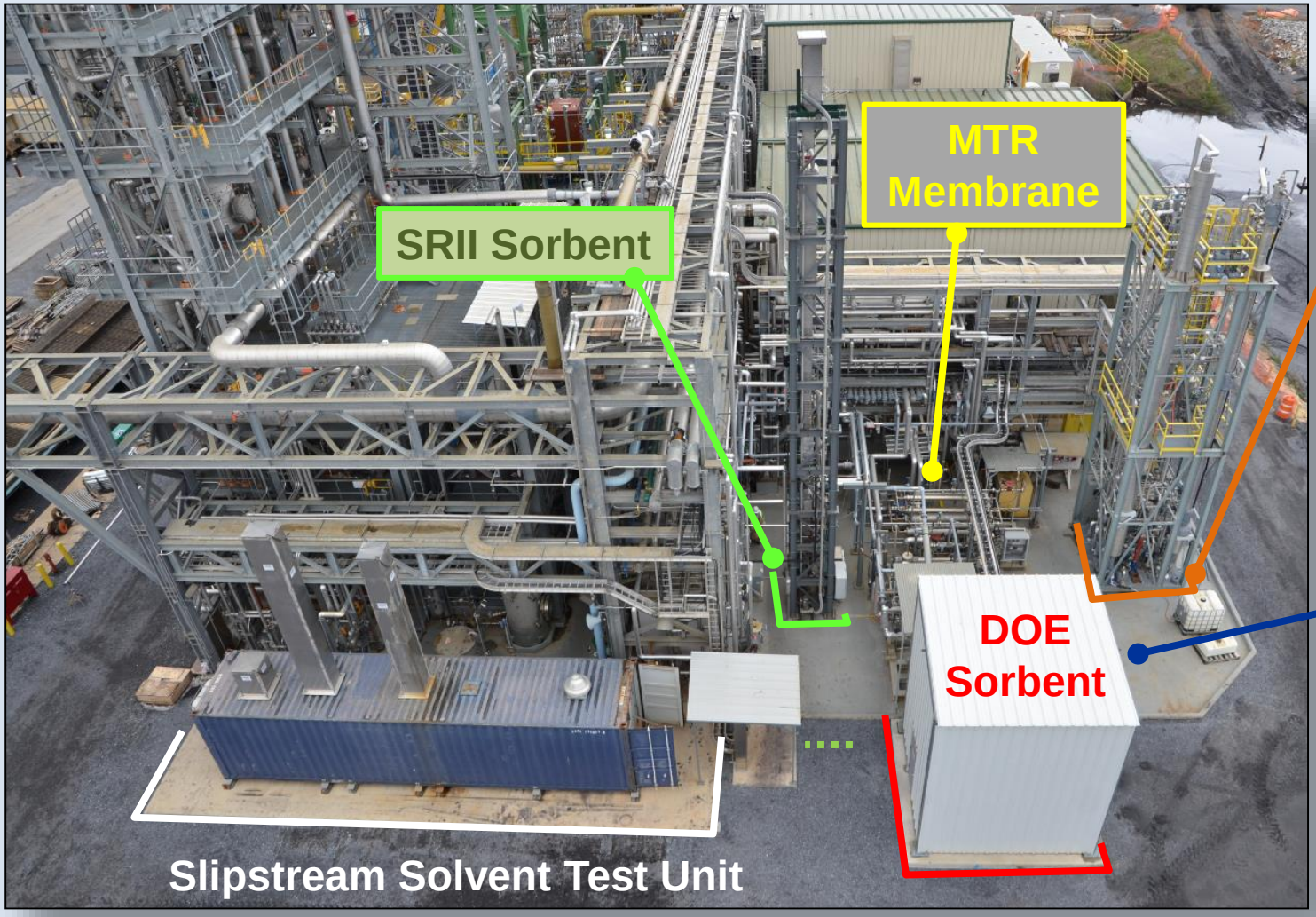
Expanded PC4 Configuration



Expanded PC4 Configuration



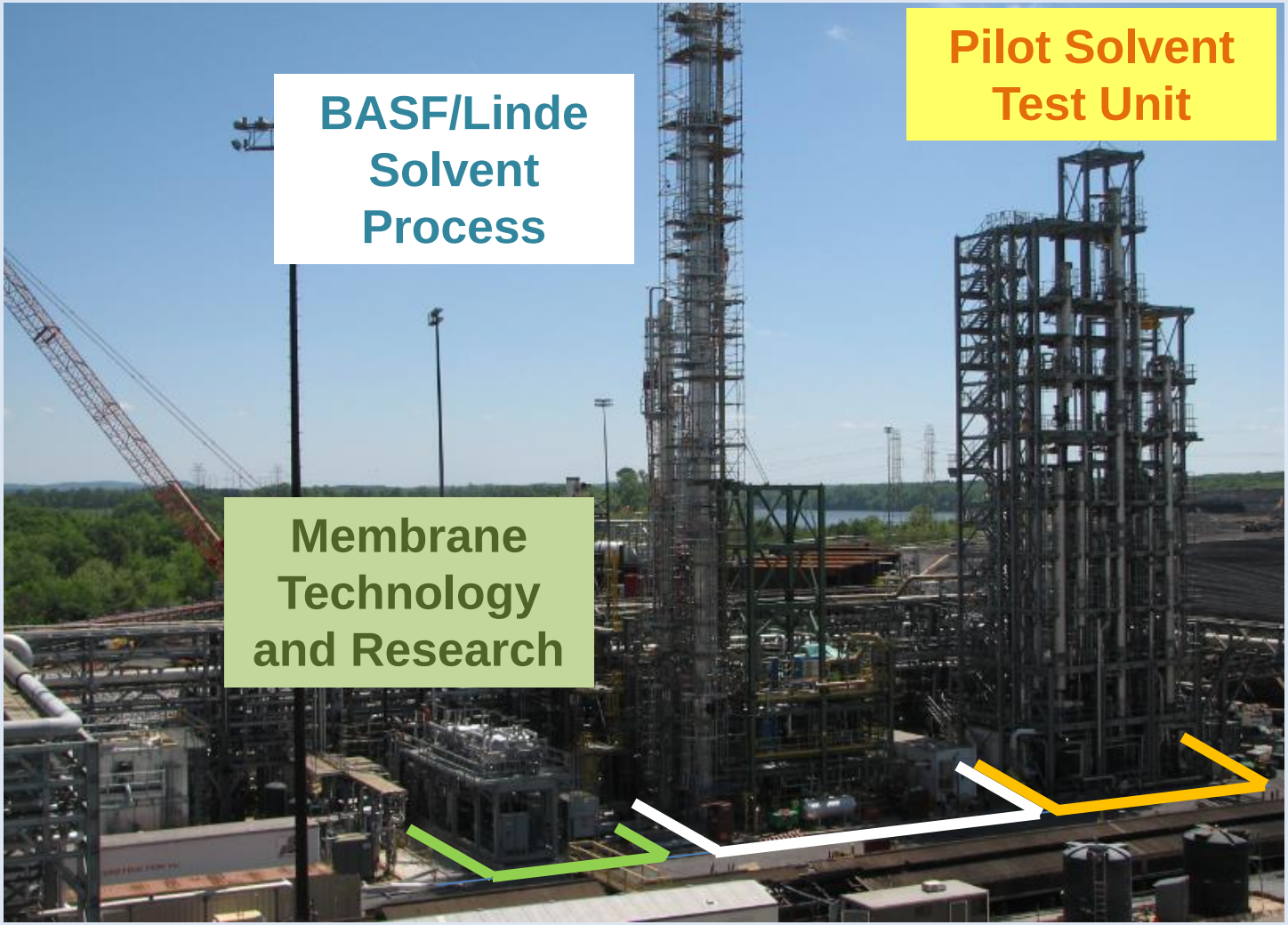
Post Combustion Bench Scale



Akermin Enzyme Enhanced Solvent

CCSp Solvent (Carbon Capture Scientific)

Post Combustion Small Pilot Scale



Current Performance Period

Tested

Solvents
*Carbon Clean Solutions
*Linde/BASF
Cansolv DC103/DC201
MEA baseline to support CCSI
*Carbon Capture Scientific

Membranes
*MTR 20 TPD
*MTR Plate/Frame Sweep
Air module
*MTR 1 TPD
*OSU membrane

Sorbents
*SRI International

Planned

Solvents
*Linde/BASF
*Carbon Capture Scientific
MEA baseline in SSTU
Green Technology
*ION Engineering
*GE Global
*Univ. of Texas - Austin

Membranes
*MTR 1 TPD
*Air Liquide
*NETL Membrane
*GTI HFMC

Enzymes
*Akermin Biocatalyst
Delivery System

Sorbents
*SRII 0.5 MW
*TDA Sorbent

PSTU/SSTU Research Program

Improve the understanding of solvent processes according to:

Physical Properties

- Utilize new instrumentation to compare measured physical property data to simulation values

Hydraulic Characteristics

- Utilize AFT Fathom to create a hydraulic model to improve understanding of pressure and flow distribution in the system
- Beneficial for viscous materials or slurries
- Extended time simulations can model dynamic system behavior

PSTU/SSTU Research Program

Improve the understanding of solvent processes according to:

Amine Emissions

- Utilize PDI/ELPI to analyze impact of process conditions on aerosol formation
- Examine SO_3 influence on aerosol formation (before and after baghouse installation)

Comparison of Analytical Methods

- Determine the variability in samples arising from the analytical procedure used (sample tube versus wet chemical technique)
- Determine the variability in samples arising from the extraction technique used (materials, temperature, etc.)

Acknowledgements

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