Maturing 2nd Generation Technologies
Fluor/PNNL Water-Lean Solvent Process

DOE/FE/NETL has sponsored highly successful second-generation technologies that will dramatically reduce CO_2 capture costs. Fluor/Pacific Northwest National Laboratory's Water-Lean Solvent Process is one of those technologies.


Technology Centre Mongstad (TCM)

BACKGROUND

CHALLENGE:

- Current Fluor capture technologies use mixtures of 60-65% water and 35-40% amines to absorb CO_2
- The water has negative energy impacts and does not capture any of the CO_2 —unlike the amines— but controls the corrosivity and viscosity of the amines

FLUOR/PNNL'S SOLUTION:

- Reduce water content to 40-50%
- Leverage Fluor's extensive process and materials expertise with PNNL's unique analytical and assessment capabilities to provide significant cost and performance improvements

SIGNIFICANT RESULTS

Techno-economic analyses indicate:

- **Reduced Capital Costs**
  Enhanced solvent performance results in smaller columns, heat exchangers, and footprint
- **Reduced Operating Costs**
  Lower energy requirements

Lab/Bench-Scale Development
2016

- Fluor's self-funded water-lean solvent process development improved cost and performance of their MEA-based process
- Fluor's collaboration with PNNL took advantage of DOE-funded analytical capabilities including:
  - Wetted-wall column, PPVT cell and mobile-bench cart, and viscometers
- Solvent degradation testing conducted at SINTEF

Scale-up Testing
2017

- Self-funded testing by Fluor generated data to support scale-up
  - Thermodynamic and kinetic data developed
  - Solvent composition optimized
  - Energy requirement of 2.7 GJ/tonne CO_2 improved over 3.1 GJ/tonne CO_2 for DOE base case
- PNNL collaboration leveraged modeling capabilities and development of techno-economic analysis

Large Pilot-Scale Testing
Initiated 2018

- Initial testing conducted at ~12 MWe scale at Technology Centre Mongstad (TCM); over 2,000 hours of testing completed by May 2019
- Additional testing at TCM in 2019 to evaluate absorber emissions and regenerator performance under extended operation
- Both CAPEX and OPEX reductions targeted through a combination of solvent performance enhancements and process improvements

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MAY 2019