DOE/FE/NETL has sponsored highly successful second-generation technologies that will dramatically reduce CO₂ capture costs. Fluor/Pacific Northwest National Laboratory’s Water-Lean Solvent Process is one of those technologies.

**BACKGROUND**

**CHALLENGE:**
- Current Fluor capture technologies use mixtures of 60-65% water and 35-40% amines to absorb CO₂
- The water has negative energy impacts and does not capture any of the CO₂—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 CO₂ improved over 3.1 GJ/tonne CO₂ 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