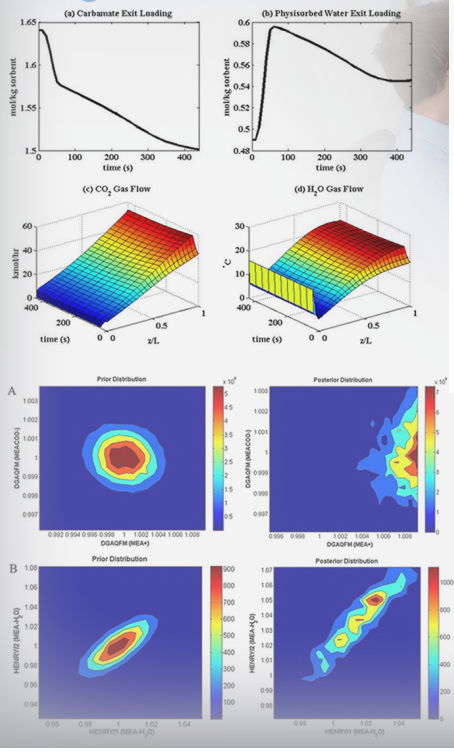
CARBON CAPTURE SIMULATION FOR INDUSTRY IMPACT (CCSI²)

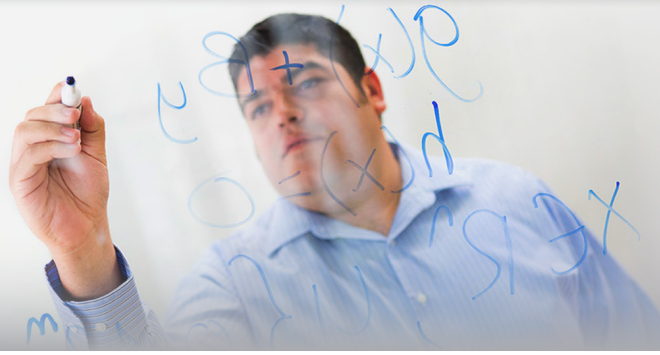
CCSI²

Carbon Capture Simulation for Industry Impact



BACKGROUND

Near-term and large-scale reduction of carbon dioxide (CO_2) emissions from fossil-based electricity sources is critical for mitigating climate change. The Carbon Capture Simulation for Industry Impact (CCSI²) program is focused on developing a fundamental understanding of CO_2 capture technology, which will reduce those emissions. CCSI² collaborates with industrial, academic and government partners to disseminate a rigorously quantified understanding of CO_2 capture systems, manage risk and reduce the barriers to technology commercialization. The results are well-informed, accelerated technology transfer processes for timely implementation of technologies that benefit the world.



NETL

NATIONAL ENERGY TECHNOLOGY LABORATORY

PROJECT DESCRIPTION

CCSI² is led by the National Energy Technology Laboratory (NETL), partnering with Lawrence Livermore National Laboratory, Lawrence Berkeley National Laboratory, Los Alamos National Laboratory, Pacific Northwest National Laboratory, West Virginia University, and University of Texas at Austin.

CCSI² develops, validates, and applies advanced computational techniques for technology simulation, optimization, uncertainty quantification (UQ), and process control. Computational products are consolidated in the CCSI Toolset software for developing rigorous understanding of CO_2 capture technologies that enable efficient Research and Development (R&D). CCSI² develops a detailed multi-scale understanding of the most effective pathways to minimize the cost to capture CO_2. In FY17, CCSI² directly supported seven projects in the Capture Program Portfolio while also providing industry-wide benefit by developing a general Design of Experiments (DoE) framework that optimizes large- and small-scale test programs as well as highly accurate benchmark CO_2 solvent system modeling tools.

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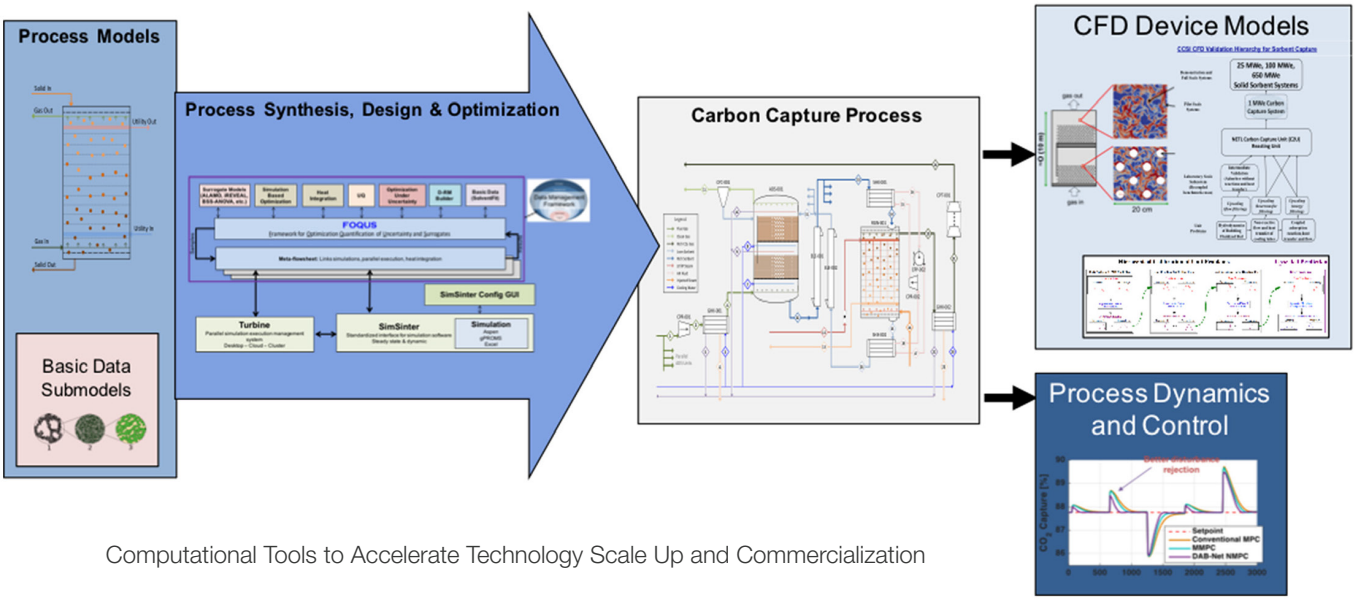

Computational Tools to Accelerate Technology Scale Up and Commercialization

The primary goal of CCSI² is to provide a fundamental and interdependent understanding of CO_2 capture material, device, and system level performance leading to more informed R&D guidance on CO_2 capture technology development and reduced risks during commercialization. To achieve this goal, CCSI² will:

- Provide R&D support that reduces risk and increases rate of CO_2 capture technology commercialization
- Generate accurate understanding and quantified uncertainty in CO_2 capture system performance
- Continue to validate, apply and disseminate the CCSI Computational Toolset

PROJECT BENEFITS

CCSI² is focused on simultaneously accelerating and de-risking research and development of CO_2 capture technologies. Efforts in CCSI² reduce the timeline and cost to commercialize technologies capable of cost-effectively achieving deep CO_2 reduction from the fossil fuel power generation industry. Rooted in mathematical optimization frameworks, the computational methods employed by CCSI² ensure the best operation, configuration and minimized costs for low carbon fossil fuel generated electricity.

ACCOMPLISHMENTS/SUCCESSES

CCSI² is currently developing a standard solvent-based CO_2 capture system modeling framework with fundamental, multi-hierarchical characterization that will be used by the international CO_2 capture industry to inform technology testing and development.

Leveraging this fundamental modeling approach, a general framework for optimal steady state and dynamic design of experiments is being developed to streamline large and small scale testing requirements for most efficient and informative experimental data generation. This approach simultaneously improves model uncertainty and maximizes impact of test programs at all scales and technology readiness levels.

CCSI² is performing multi-scale optimization of several CO_2 capture systems under development by the Fossil Energy Carbon Capture Program. Projects include: Ion Engineering (Ion)—Low-Aqueous Solvent-based CO_2 Capture; University of Texas at Austin—Advanced Flash CO_2 Regeneration; Lawrence Livermore National Laboratory—1) Micro-Encapsulated CO_2 Sorbent (MECS) and 2) Device Scale Advanced Manufacturing; University of Kentucky–CO_2 Capture Pilot Process Control; Lawrence Berkeley National Laboratory–Metal Organic Frameworks (MOFs); Pacific Northwest National Laboratory–Low-Aqueous Solvents.

Research Partners

AECOM | Lawrence Berkeley National Laboratory | Lawrence Livermore National Laboratory | Los Alamos National Laboratory
Pacific Northwest National Laboratory | West Virginia University | University of Texas at Austin

Contacts

Benjamin Omell
Technical Project Lead
Research Engineer
benjamin.omell@netl.doe.gov

Michael Matuszewski
Associate Technical Director
Carbon Capture Simulation for Industry Impact (CCSI²)
michael.matuszewski@netl.doe.gov

David Miller
Technical Director, CCSI²
Senior Fellow
Process Systems Engineering
david.miller@netl.doe.gov