CO_2 Capture Process Using Phase-Changing Absorbents

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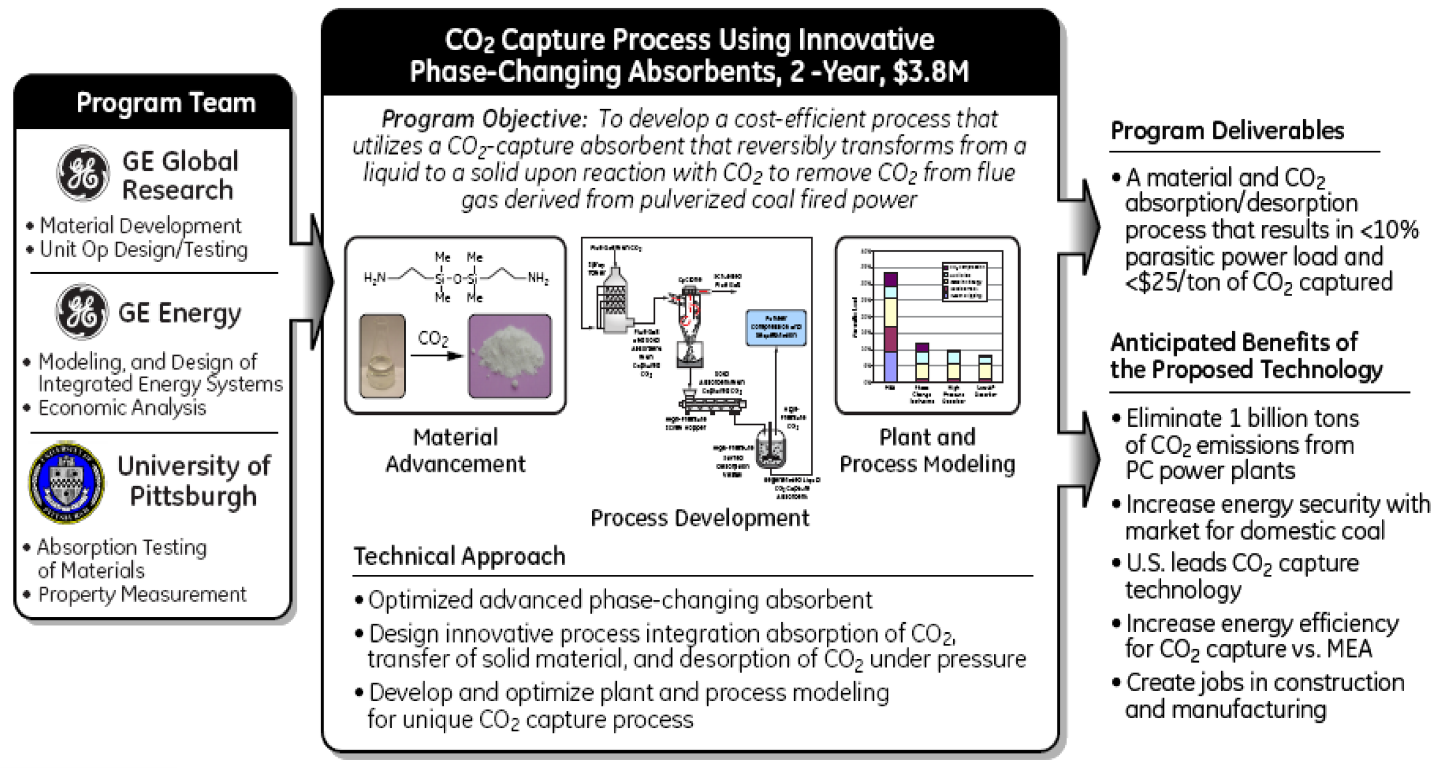
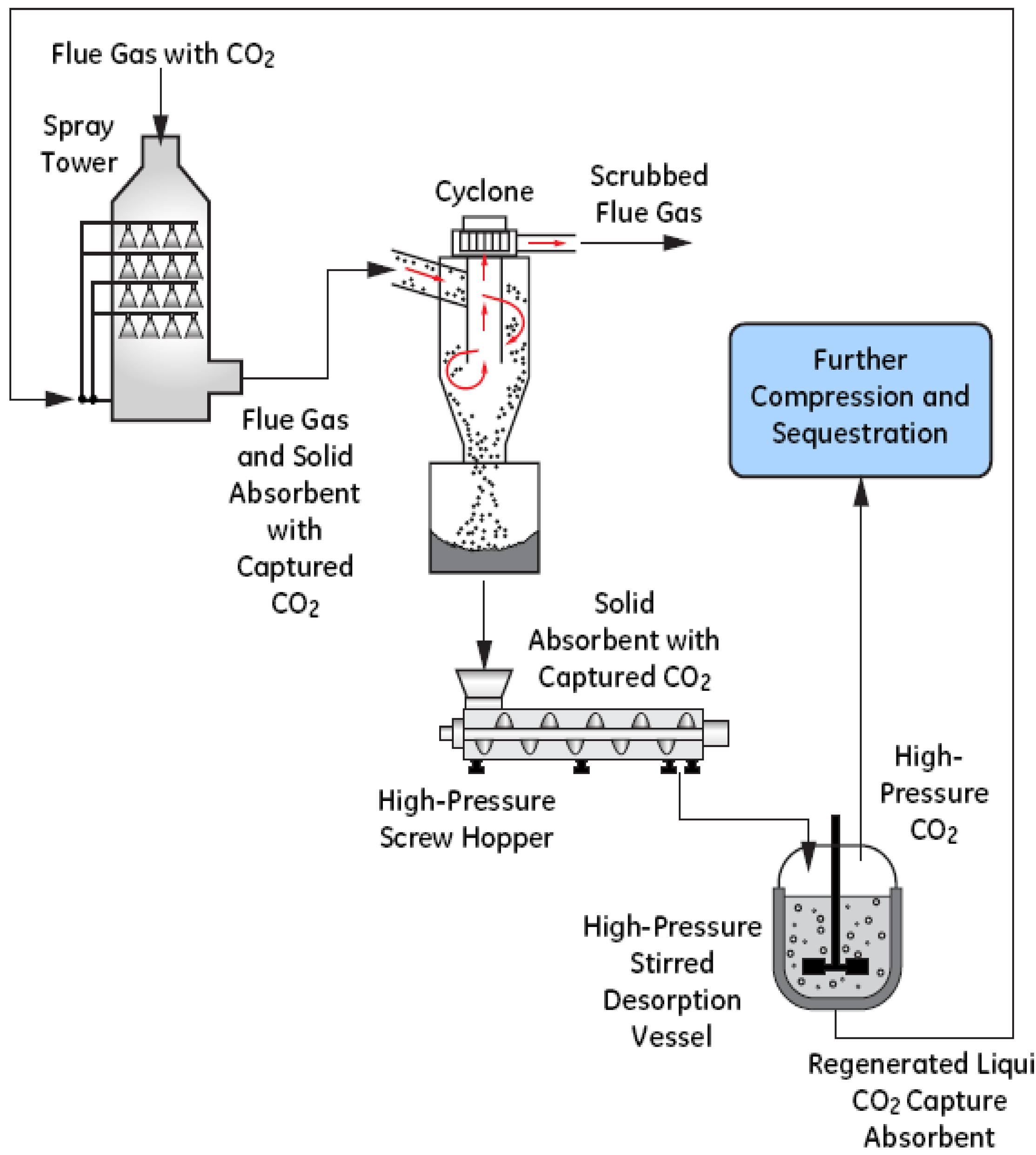
Bob Perry, Terri Grocela-Rocha, Sarah Genovese, Ben Wood, Tiffany Westendorf, Mike O'Brien, Matt Meketa (GRC), Sam Draper, Ravi –Kumar Vipperla (GEE), Bob Enick, Deepak Tapriyal. (U Pitt)

Program Strategy





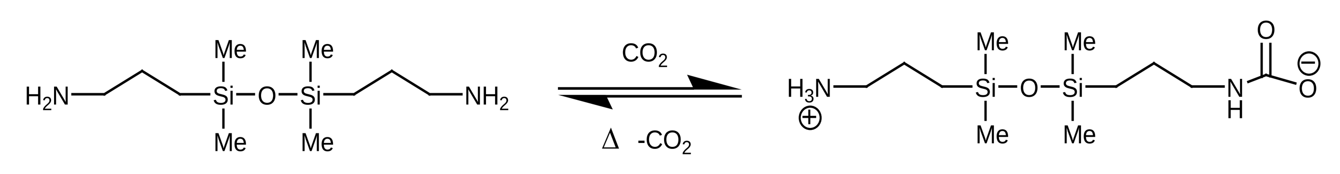
Exemplary process flow diagram of proposed CO_2 capture system using phase-changing absorbents

Technology Summary

GE and the University of Pittsburgh will develop a CO2 capture process in which a liquid absorbent, upon reaction with CO2, changes to a solid. Subsequent to CO2 capture, the solid is transported to a desorption unit where the CO2 is released for sequestration and the absorbent is regenerated to a liquid state and recycled back to the absorption unit.

Absorbent Development

A series of aminosilicone and organic liquid amines will be appraised for their solidifying ability as well as their reaction rates, capacity, volatility, and thermal stability. To accelerate reaction of the absorbent with CO_2, known catalysts will be investigated. Selective removal of SO_2 through the addition of an SO_2 absorbent will also be investigated.



Reversible formation of GAP-0 carbamate

Core and Functional Options for Phase-Changing Absorbent

Entry	Type	Structural Example
1	Linear Alkyl	
2	Branched Alkyl	
3	Etheralkyl	
4	Aminoalkyl	
5	Aryl	
6	Cyclic	

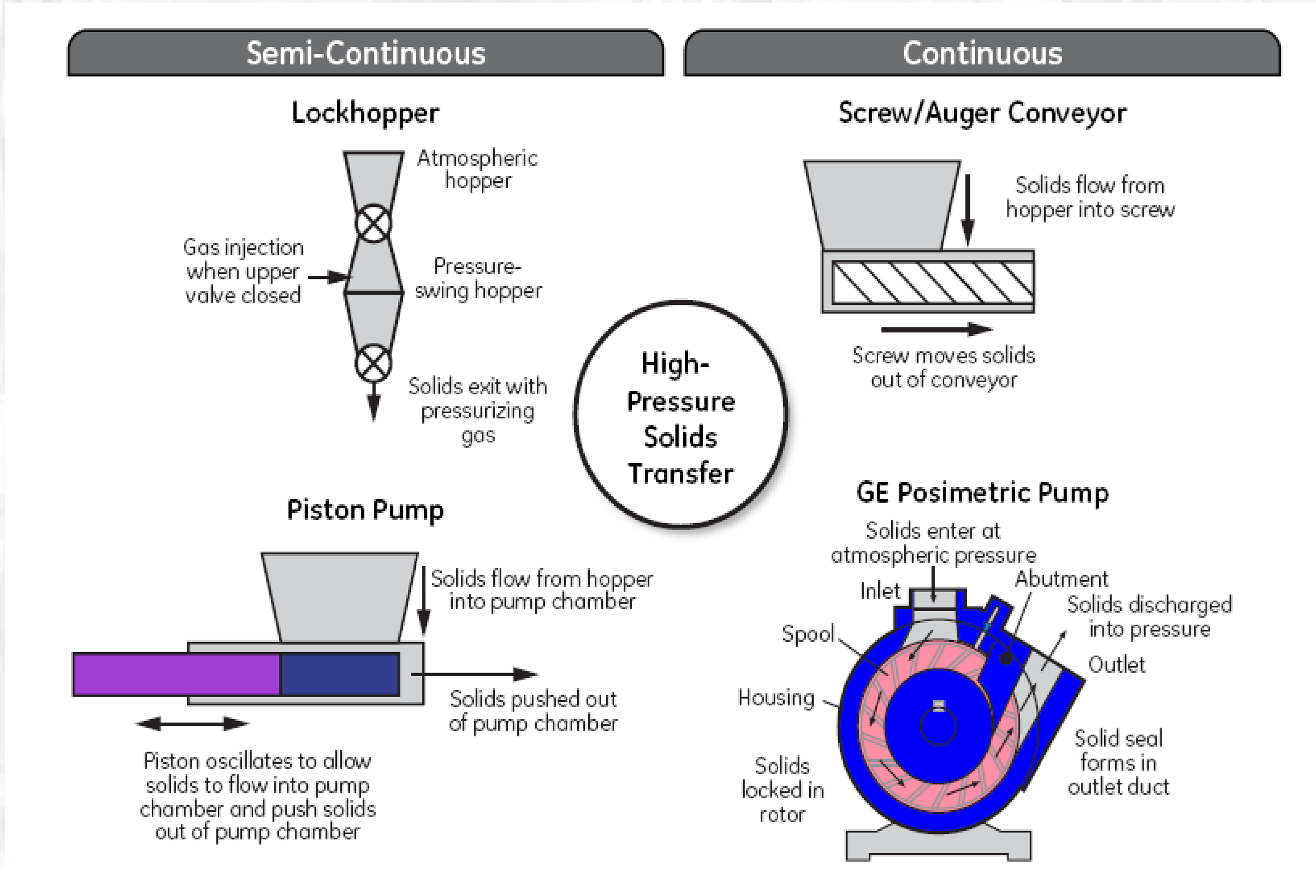
Entry	Type	Structural Example
1	Linear	
2	Branched	
3	Star	
4	Cyclic	
6	Oligomeric	

Entry	Type	Structural Example
1	Amino	
2	Aminomethyl	
3	Aminopropyl	
4	Aminoethy-laminopropyl	
5	Aminoethy-laminomethyl	
6	Piperdinyl	

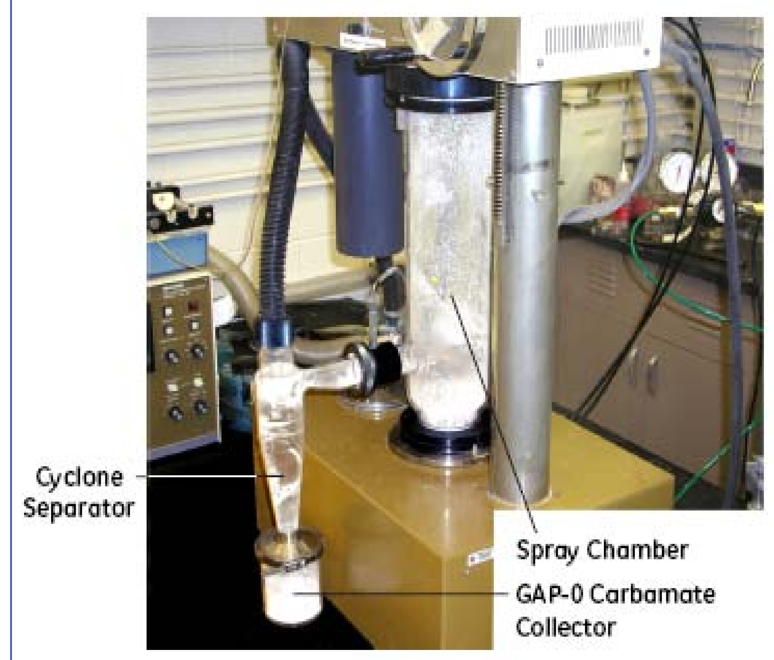
Technology Impact

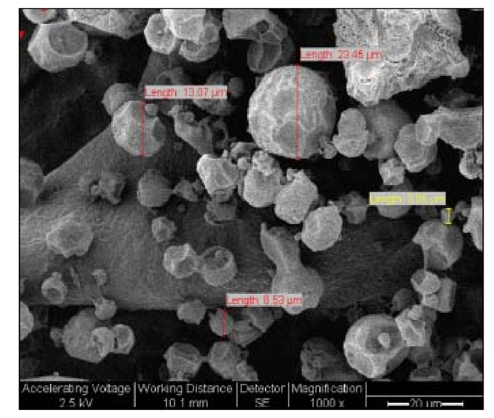
Phase changing absorbents with high CO2 capture capacity (17%) allow for reduced compression cost, lower capital cost, and low process energy, reducing parasitic power load to <10% ($24/ton) at 90% capture. Retrofitted capture at low COE promotes domestic coal use across 310 GW of current power production.

Options for Solids Transfer



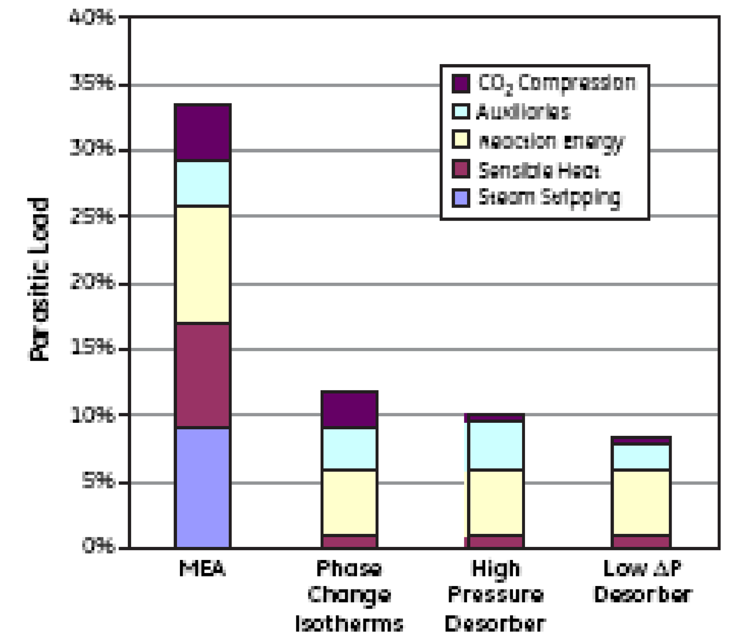
Preliminary Results



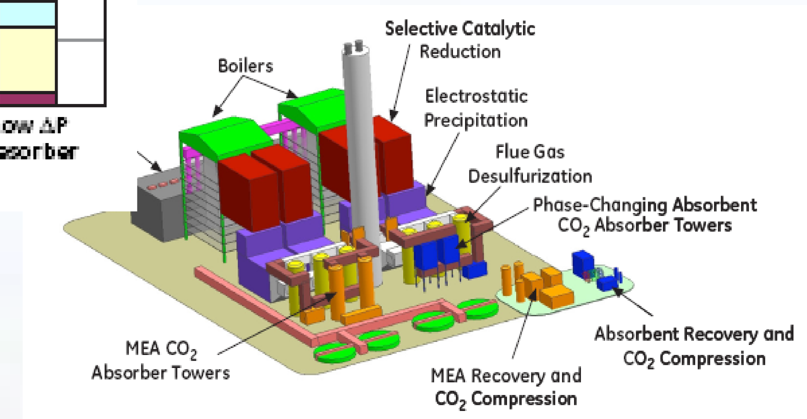


GAP-0 carbamate power

Plant Models



Advanced technology in plant designs include details of unit operations as well as optimization of energy usage and cost of capture



Team

Joint development between GE and University of Pittsburgh