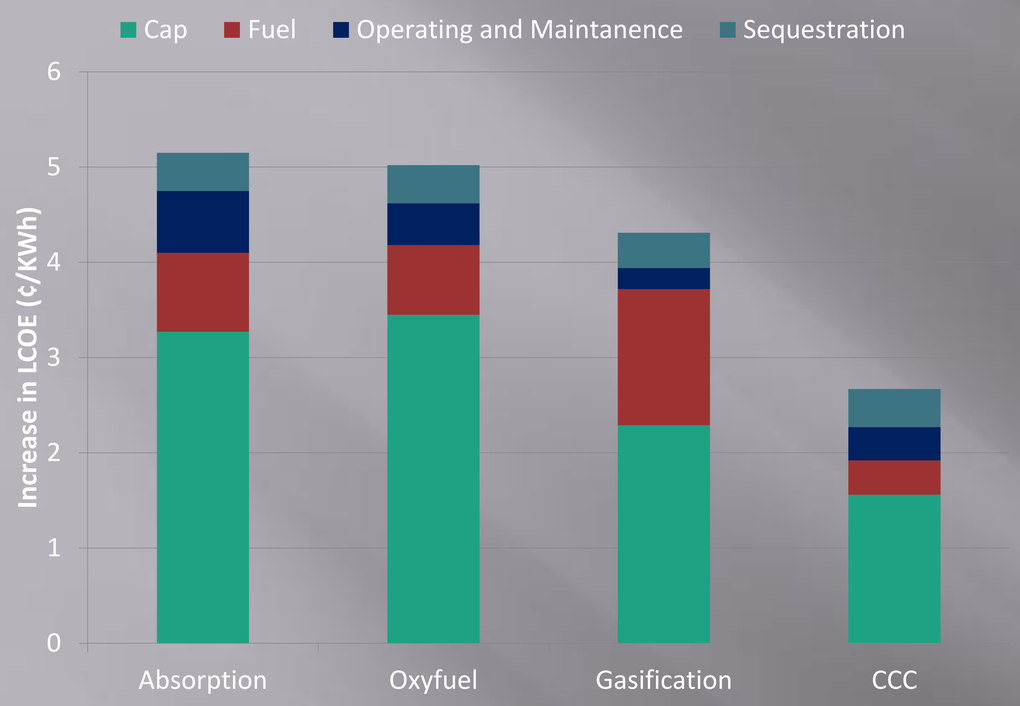
Cryogenic Carbon Capture

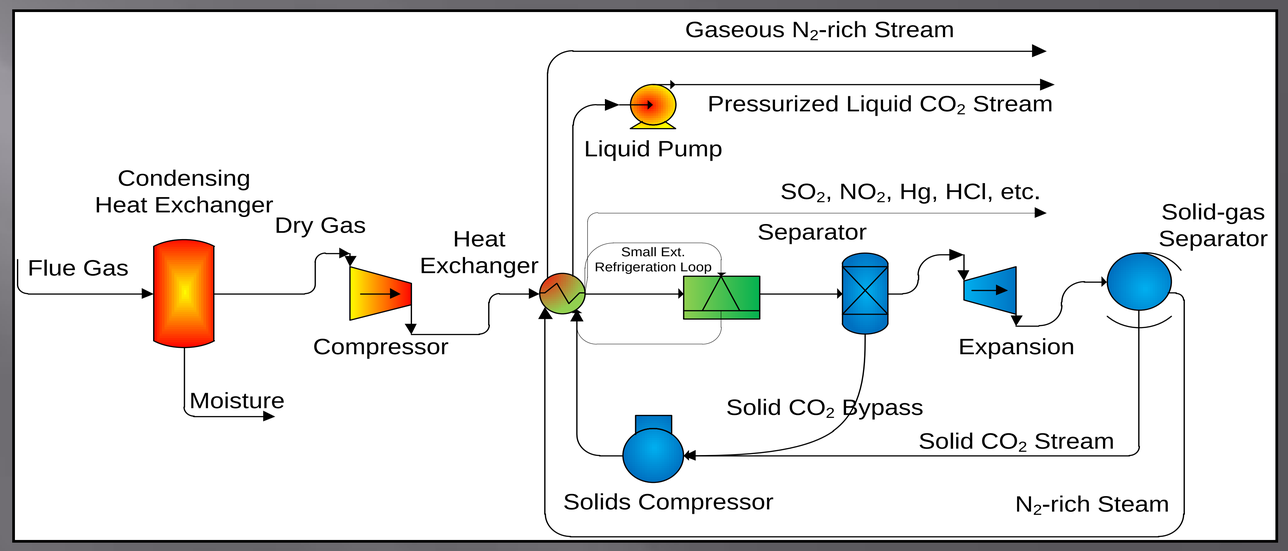
Sustainable Energy Solutions



Cost comparison showing the increase in the levelized cost of electricity for four carbon capture technologies. (non-CCC numbers from DOE 2008)

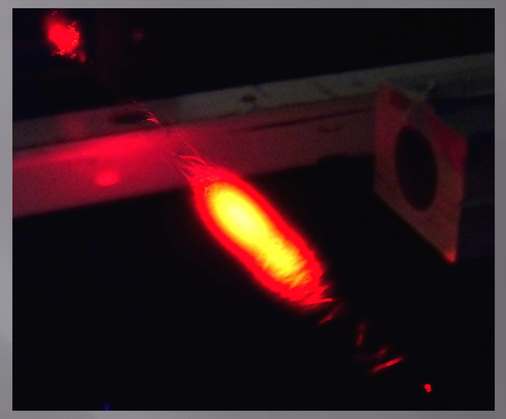
Innovative carbon capture technology that promises to separate 90%+ of the CO_2 in a flue gas and prepare it for storage

- 40% lower cost of electricity
- 50% lower parasitic load when compared to traditional processes
- Pollutant removal (SO_x, NO_x, HCl, Hg)
- Flue gas water recovery (10-25% cooling water demand reduction)
- Retrofits with no modifications to plant required



CCC process using flue gas compression

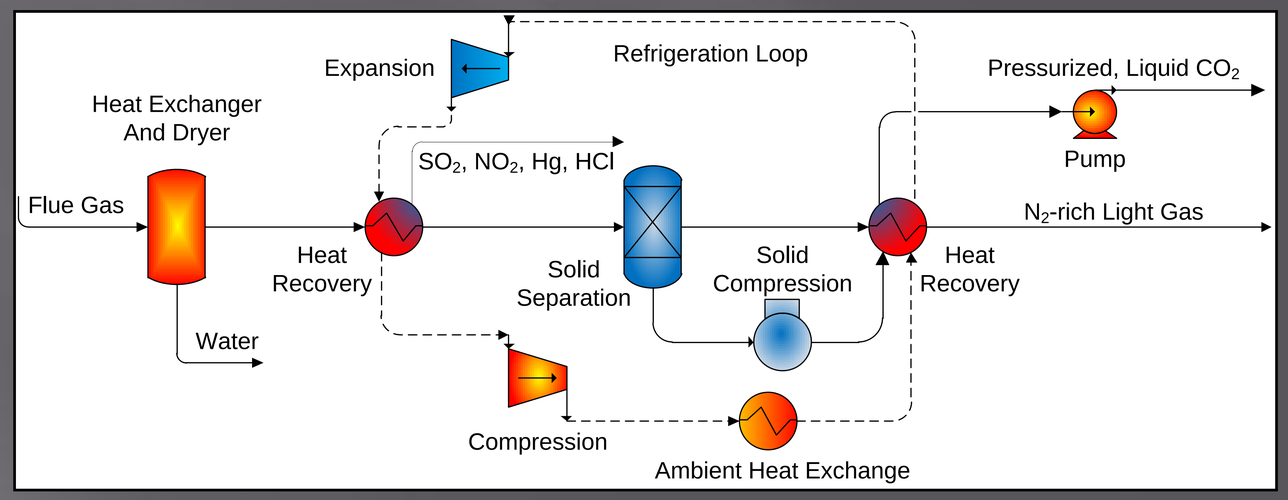
CO_2 captured from the CCC process



CO_2 particle size measurements

Species	Concentration (ppm)
CO_2	1220
SO_2	9.67
SO_3	0.000285
NO_2	0.0325
NO	Initial Concentration
Hg	3.76E-08
H_2O	6.38E-05

Predicted pollutant concentrations



CCC process using external refrigeration

SES ENERGY INNOVATION

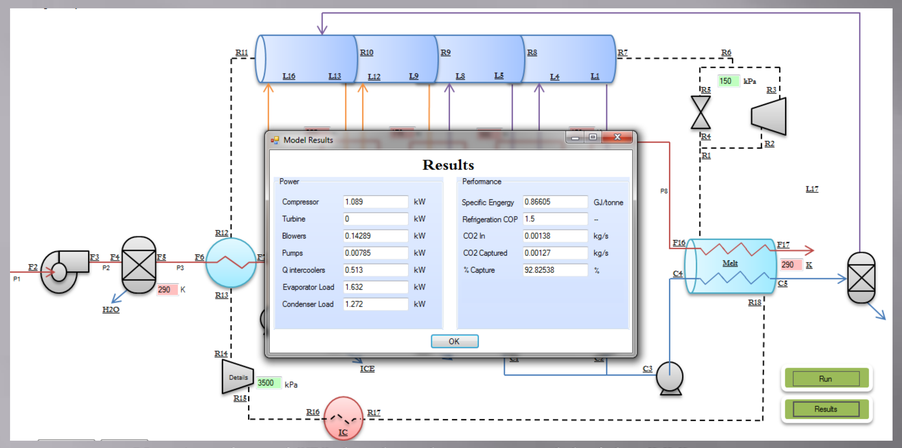
ARPA-e Project

Sustainable Energy Solutions, American Air Liquide, GE Global Research, Brigham Young University

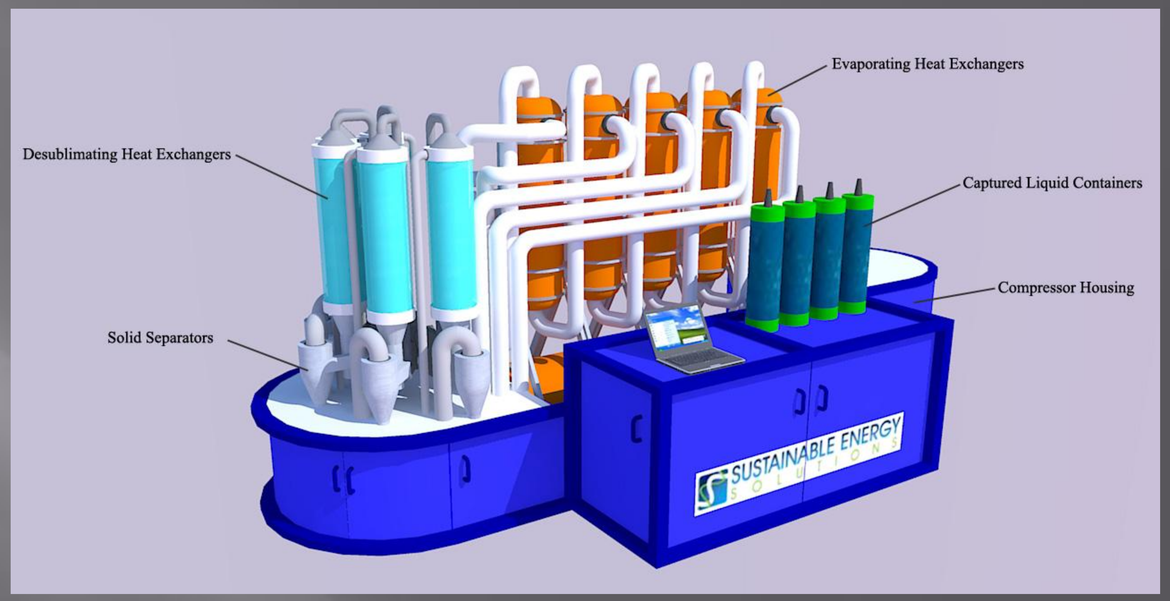
Objectives

- Detailed systems analysis
- Cost of electricity estimates
- Operational prototypes of key components
- Provide a conceptual design for a skid-scale demonstration

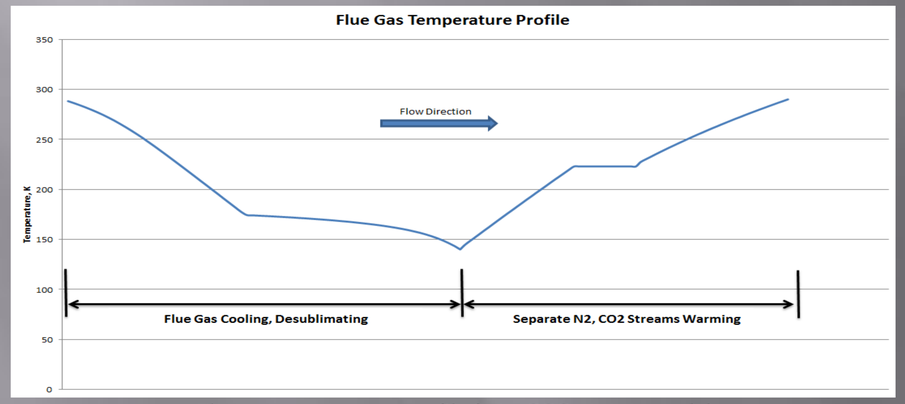
Some Sustainable Energy Solutions, American Air Liquide, and Brigham Young University team members



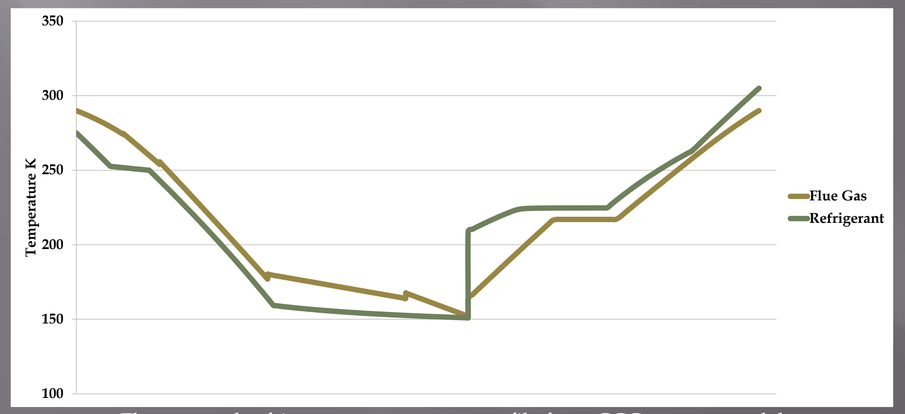
User interface of SES developed process model of the CCC process



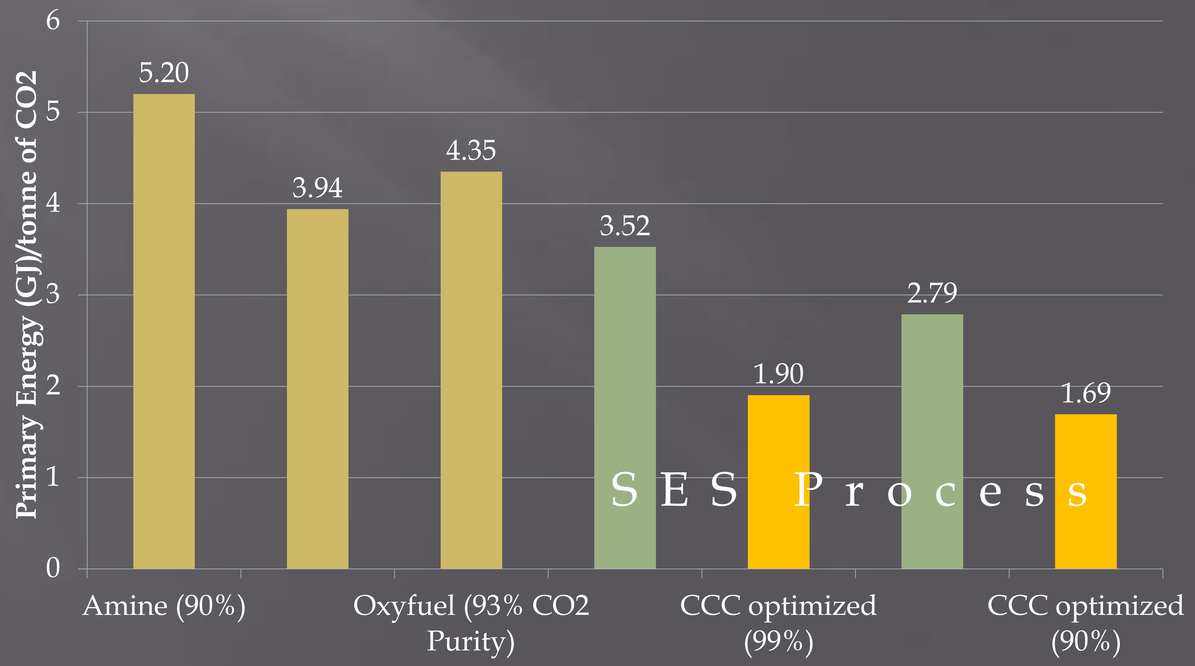
3D depiction of possible skid-scale design



Flue gas temperature profile from CCC process model



Flue gas and refrigerant temperature profile from CCC process model



Primary energy consumption comparison showing four scenarios for CCC process