CO_2 Co-location for National Resource Analysis Studies

Algae Cultivation for Carbon Capture and Utilization
U.S. Department of Energy, Bioenergy Technologies Office
May 23 - 24, 2017
Orlando, FL

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122 West

Pacific Northwest NATIONAL LABORATORY

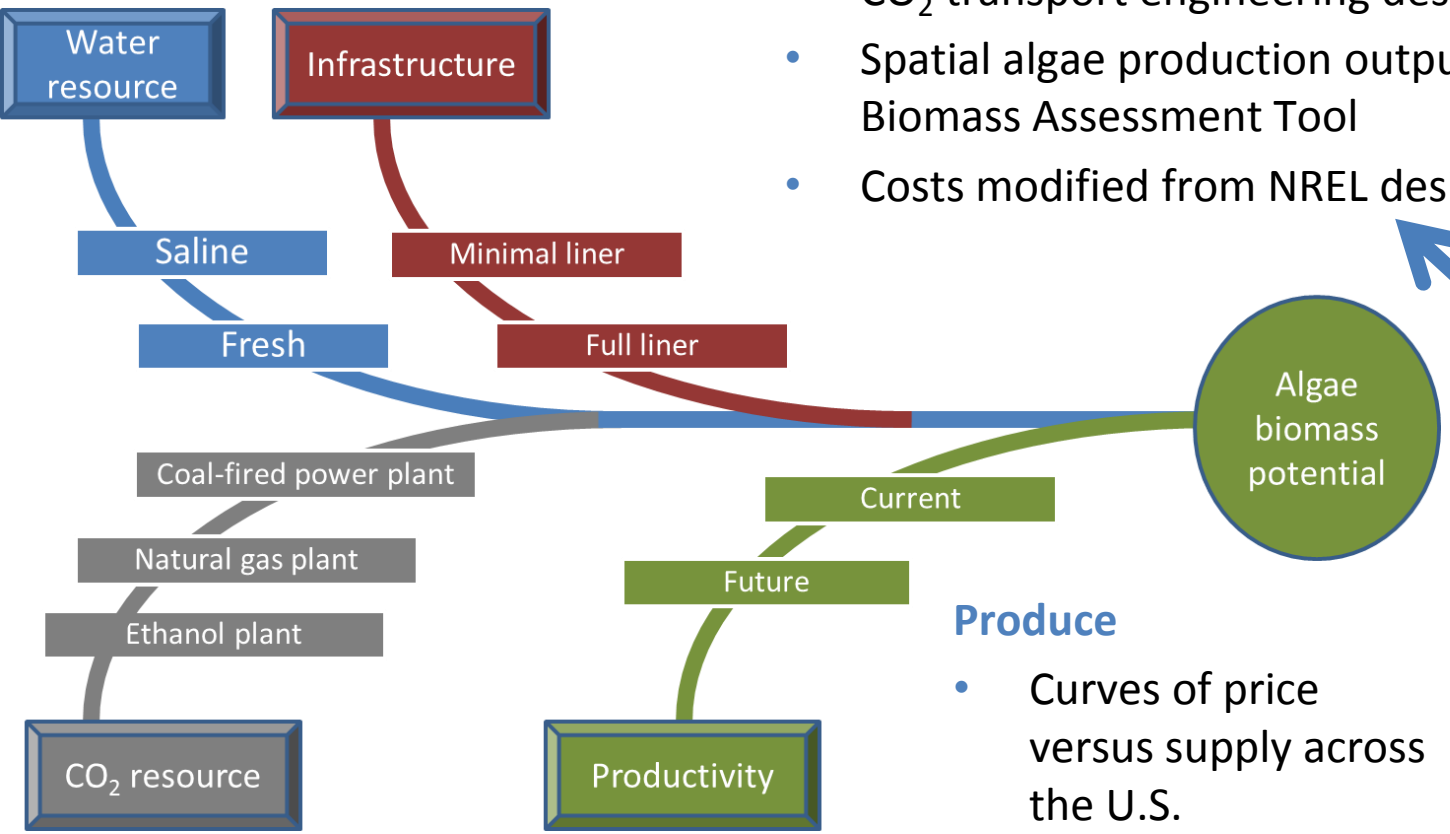
OAK RIDGE National Laboratory

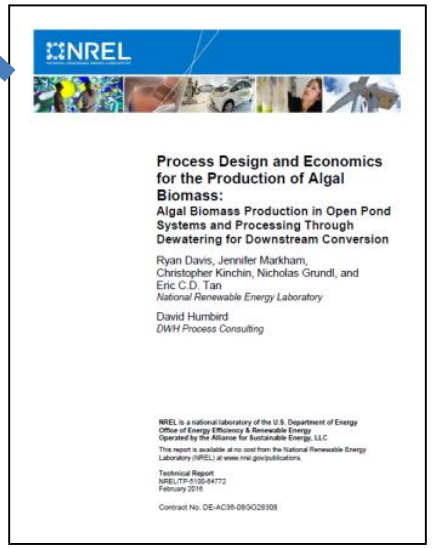
Billion Ton Study and Resources for Algae

- Use CO_2 flue gas instead of purchase
- Assume 100 10-acre ponds
- Strains: *Chlorella sorokiniana, Nannochloropsis salina*
- Productivities: ~13 g/m^2/d or ~25 g/m^2/d

Integrate

- CO_2 transport engineering design and costs
- Spatial algae production output from PNNL Biomass Assessment Tool
- Costs modified from NREL design case report




NREL

Process Design and Economics for the Production of Algal Biomass:
Algal Biomass Production in Open Pond Systems and Processing Through Dewatering for Downstream Conversion

Ryan Davis, Jennifer Markham, Christopher Kinchin, Nicholas Grundl, and Eric C.D. Tan
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NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

This report is available at no cost from the National Renewable Energy Laboratory (NREL) at www.nrel.gov/publications.

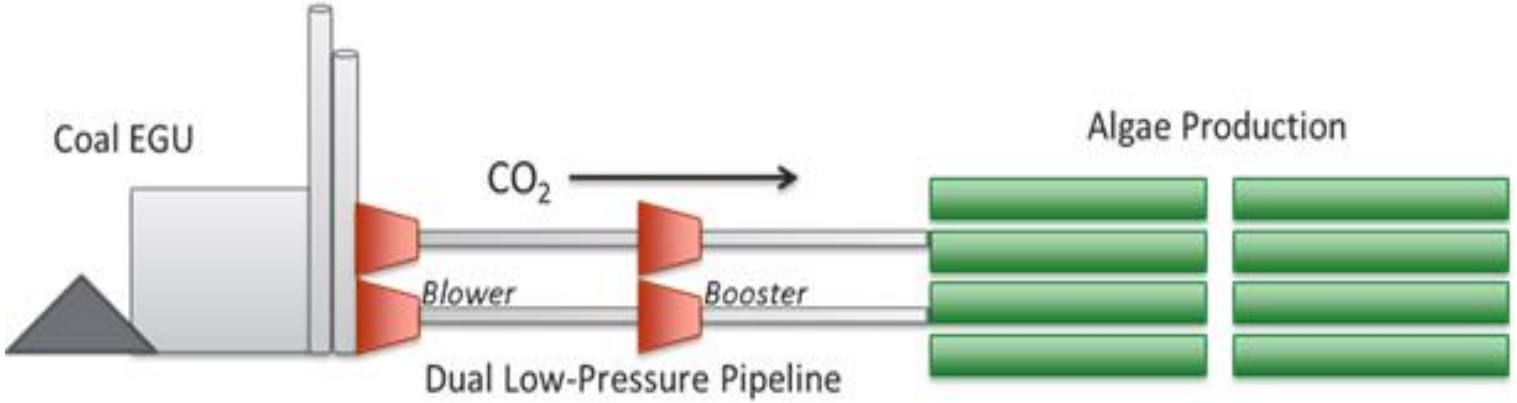
Technical Report
NREL/TP-5100-64772
February 2016

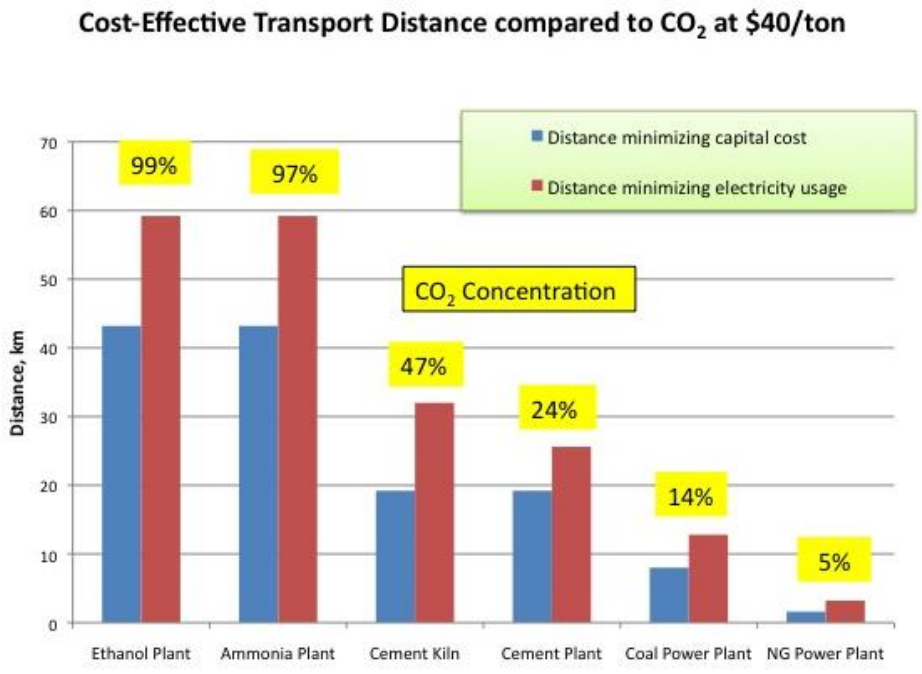
Contract No. DE-AC36-08GO28308

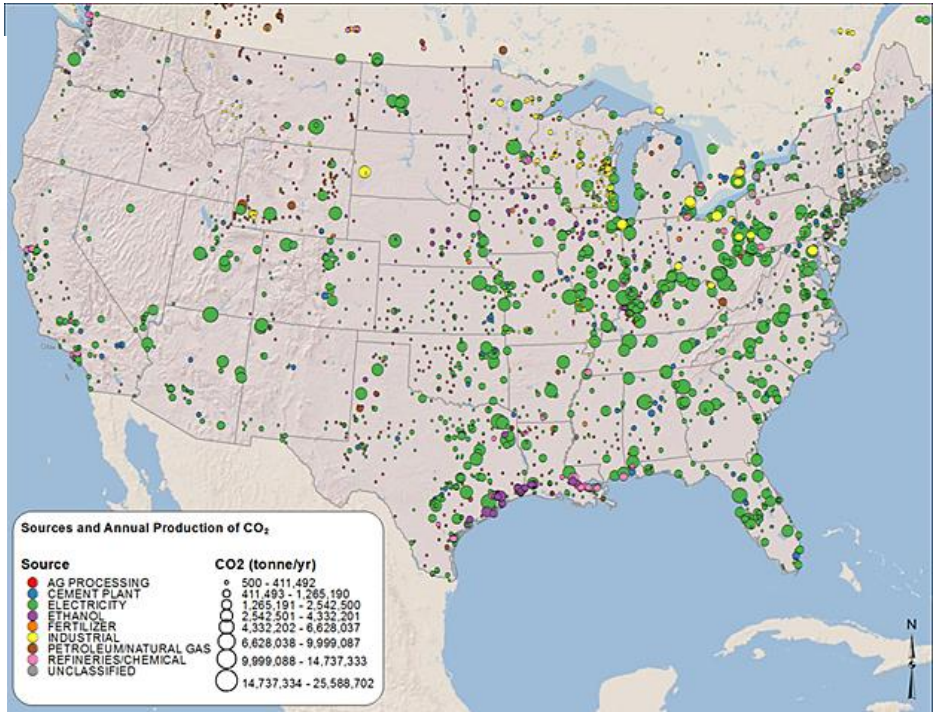
Produce

- Curves of price versus supply across the U.S.

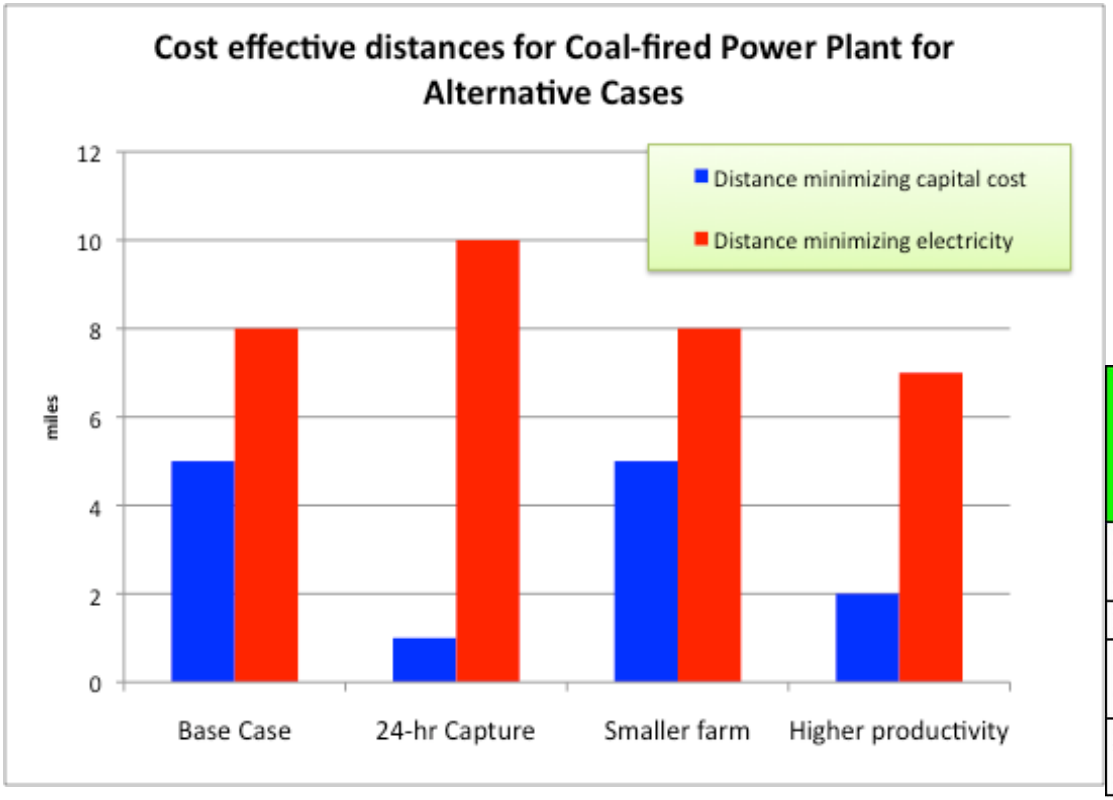
Cost-effective distance for CO_2 transport is dependent on CO_2 purity and availability







Coal-fired power plant cost-effective distance results



Alternative Scenarios:

- Base Case
- Smaller farm – 500 acres
- Higher Productivity – 25 g/m^2/d
- **24-hr flue gas capture** and storage (similar to GAI)

Case	Productivity g/m^2/day	Algae farm size, acres	Average hours of waste gas capture/day
Base case (defined)	13.2	1000	12
Smaller farm	13.2	500	12
Higher productivity	25	1000	12
24-hr CO_2 capture	13.2	1000	24

Conclusions:

- The greater the concentration of CO_2 in the waste stream, the greater the opportunity.
- Tens of millions of tons of algae could be available nationally for each of several CO_2 co-location scenarios.
- 24-hr capture and storage is a good option if the CO_2 concentration is high enough or the distance is short.