

Introduction

- The BECCS Screening Tool V2 is an Excel-based tool that aims to provide an update to the 2021 version by examining the performance, environmental impact, and economics of co-firing biomass and pulverized coal in power plants.
- When combined with carbon capture, co-firing of biomass with coal can produce a system with zero or even negative greenhouse gas (GHG) emissions.

Methods

- Biomass unit processes were created for nine biomass types*, 10 U.S. farming regions**, rain-fed/irrigated farming, and various post-harvest pretreatment options.
- Includes Aspen-simulated results for a 650-MW power plant with an 85% capacity factor, various biomass co-firing percentages (20, 35, 49, 100%), and carbon capture percentages (0, 90, 99%).

Dashboard tab selections

White cells represent values that cannot be adjusted			
Blue cells represent drop down menus			
Green cells represent user defined values			
Inputs	BECCS Scenario 1	BECCS Scenario 2	Default Value
Coal Type	Bituminous	Bituminous	
Biomass Moisture Content	50.0%	70.0%	
Carbon Storage	Saline Aquifer	Saline Aquifer	
Biomass Type	Hybrid Poplar	Energy Cane	
Region	Delta States	Southeast	
Processing	Chipped & Torrefied	Chipped, Dried & Pelletized	SRWC: Chipped & Dried Herbaceous: Raw & Dried
Biomass Mass % (Co-Firing)	49%	49%	
Carbon Capture (%)	99%	99%	
Global Warming Potential Method	AR6 100-yr		
Do you want to input biomass?	No	No	No
Annual Biomass Yield (kg/acre-year)	9533	4808	Hybrid Poplar, Delta States: 4808.08 kg/acre-year Energy Cane, Southeast: 9533.46 kg/acre-year
Do you want to input Biomass Harvest Loss Rate?	No	No	No
Biomass Harvest Loss Rate	0.05	0.05	0.05
Biomass Transport Distance (miles)	100	100	100
CO2 Transport Distance (mile)	50	50	50
Do you want to include irrigation?	No	No	No

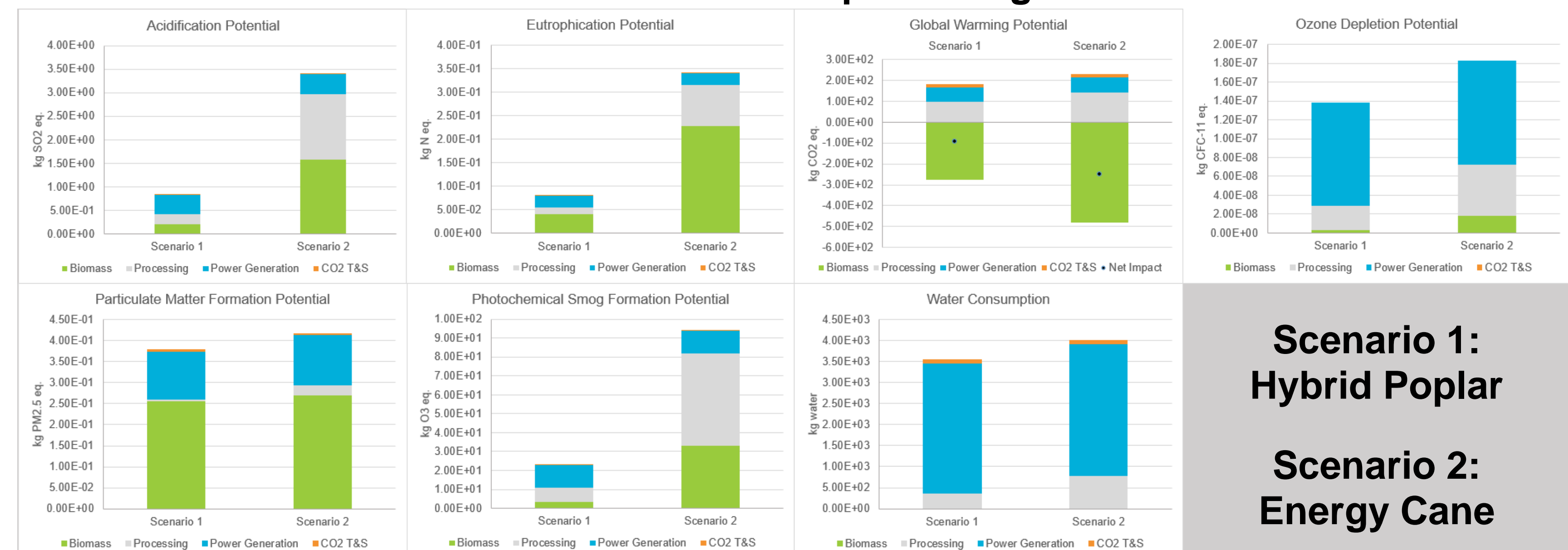
- Environmental impacts are evaluated using TRACI 2.1 factors and eight different Global Warming Potential (GWP) methods combining AR4, AR5, and AR6 for 20-yr or 100-yr time horizons.
- Water consumption is evaluated using the Available Water Remaining (AWARE) factors.
- Land use by each biomass type is shown in a map.

* Biomass types include Biomass Sorghum, Corn Stover, Eucalyptus, Energy Cane, Forest Thinnings, Hybrid Poplar, Southern Yellow Pine, Switchgrass, and Willow
 ** U.S. farming regions include Appalachia, Corn Belt, Delta States, Lake States, Mountain, Northeast, Northern Plains, Pacific, Southeast, Southern Plains

Results

Comparison of Hybrid Poplar and Energy Cane shows that the latter has a greater environmental impact than the former in most categories.

LCA Results for 7 impact categories



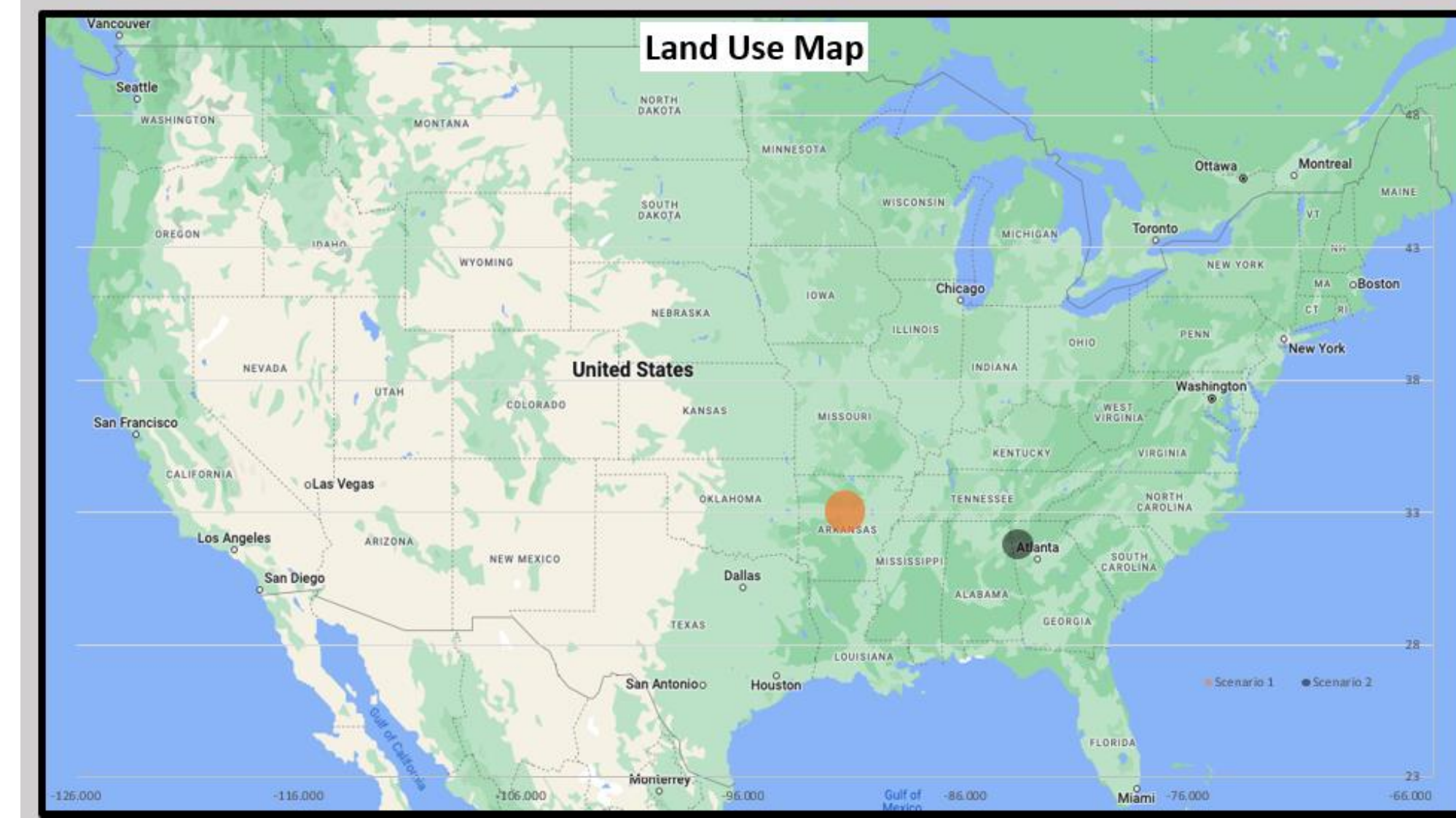
Scenario 1:
Hybrid Poplar

Scenario 2:
Energy Cane

Water Consumption/Scarcity and Land Use Results

Process	Scenario 1		Scenario 2	
	Net Consumption (m3/month)	Regional Water-Scarcity Footprint (m3 eq./month)	Net Consumption (m3/month)	Regional Water-Scarcity Footprint (m3 eq./month)
Biomass production	8.85E+02	2.10E+02	3.49E+03	1.37E+03
Biomass processing	1.71E+05	4.06E+04	3.71E+05	1.45E+05
Power generation	1.50E+06	3.56E+05	1.53E+06	8.00E+05
CO2 transport and storage	4.69E+04	1.11E+04	4.49E+04	1.78E+04
Total	1.72E+06	4.08E+05	1.95E+06	7.65E+05

Land Use for Biomass Production	Scenario 1	Scenario 2
Area (m ²)	7.14E+08	4.03E+08
Area (acres)	1.78E+05	9.95E+04



Scenario 1:
Hybrid Poplar

Scenario 2:
Energy Cane

Conclusion

The BECCS Screening Tool V2 allows users to compare various emissions potentials, water consumption and scarcity, and land use for nine biomass types in multiple U.S. farming regions for a co-firing application with coal and biomass in a 650 MW power plant with a saline aquifer for carbon storage.

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