

GranBio BioFlex Pathway

Input Changes to the CA-GREET Model

CA-GREETv.1.8b (Dec. 2009)

http://www.arb.ca.gov/fuels/lcfs/ca_greet1.8b_dec09.xls

Pursuant to title 17, section 95486 (b)(1) of the California Code of Regulations, an alternative model was utilized to compute the life cycle GHG emissions impacts of this pathway. The applicant has conducted its analysis of direct effects on carbon intensity for this pathway using the GREET Version 1_2013¹ model (“GREET1”). The standard inputs and parameters specified in GREET1 remain unchanged except as noted in the input table below. The input table below specifies the spreadsheet location of the GREET1 inputs and other parameters that were claimed as confidential business information or trade secret by the applicant, but it does not disclose the actual value of such inputs and parameters because they are claimed to be confidential business information or trade secret.

¹ GREET Version 1_2013 was developed and released by the Systems Assessment Section, Center for Transportation Research, Argonne National Laboratory (ANL) in October 2013.

GranBio BioFlex Pathway Input Data Table 1

(Locations of cells containing Confidential Business Information are shown, but the actual values of such confidential information are not disclosed)

Parameters	GREET1 Cell Location	GREET1 or CA-GREET Default Value	GranBio BioFlex Pathway Value
Biomass Feedstock			
Fuel Inputs			
- Diesel	EtOH!H18	192,500 Btu/dry ton	Proprietary
Fertilizer Inputs			
- Total N	EtOH!CJ332	4,495 g/dry ton	Proprietary
- P2O5	EtOH!CK332	1,633 g/dry ton	Proprietary
- K2O	EtOH!CL332	8,346 g/dry ton	Proprietary
Direct Field Emissions			
- N Content of Crop Residue Removed	Inputs!H316	0.77%	0.37%
Straw Transport			
- Field to BioFlex	T&D!Flowcharts!AC1406	12 miles	12 miles
- Cargo Payload	T&D!AD7	24.0 tons	33.5 tons

GranBio BioFlex Pathway Input Data Table 2

(Locations of cells containing Confidential Business Information are shown, but the actual values of such confidential information are not disclosed)

Parameters	GREET1 Cell Location	GREET1 or CA-GREET Default Value	GranBio BioFlex Pathway Value
Ethanol Production			
Yields	Inputs!F431	80 gal / dry ton	Proprietary
Energy Inputs			
- Biomass Consumption	EtOH!BJ164	0.01053 dry ton/gal	Proprietary
- BFB Boiler CH4 Emissions Factor	EF!AT12	3.834 g/mmBtu	2.1 g/mmBtu
- BFB Boiler N2O Emissions Factor	EF!AT1	11.000 g/mmBtu	3.2 g/mmBtu
Chemical Inputs			
- Alpha Amylase	EtOH!H216	0.00 t/dry t feedstock	Proprietary
- Gluco Amylase	EtOH!H217	0.00 t/dry t feedstock	Proprietary
- Cellulase	EtOH!H218	0.01 t/dry t feedstock	Proprietary
- Yeast	EtOH!H219	0.0025 t/dry t feedstock	Proprietary
- Proprietary	N/A	0.00 t/dry t feedstock	Proprietary
- Sulfuric Acid	EtOH!H220	20.00 t/dry t feedstock	Proprietary
- Proprietary	N/A	0.00 t/dry t feedstock	Proprietary
- Proprietary	N/A	0.00 t/dry t feedstock	Proprietary
Net Electricity Export	EtOH!G139	-2.563 kWh/gal	-2.89 kWh/gal
Ethanol Transport			
- BioFlex to Port	T&D_Flowcharts!F1512	80 miles	37 miles
- Ocean Transport	T&D_Flowcharts!M1508	7,416 miles	7,458 miles