Western Plains Energy Application

Response to Comments

Comment: Sorghum and corn are crops related to food production. They should not be diverted to fuel production at a time when food production could fall short of meeting future needs.

Response: The greenhouse gas (GHG) emissions impacts of diverting cropland from food and feed production to fuel feedstock production are captured in the indirect land use change (ILUC) portion of the pathway carbon intensity (CI). The ILUC estimate captures the GHG emissions associated with the agricultural expansion that is necessary to keep the food and feed markets supplied with the commodities they demand. Our ILUC model is an economic model that considers price impacts across all affected markets, including food and feed markets. The ILUC increment in the corn and sorghum ethanol carbon intensities is currently 30 grams of CO_2-equivalent emissions per megajoule of fuel energy. The impact on the food supply of diverting agricultural land to feedstock production is therefore considered, insofar as food prices are affected. Otherwise, changes in food supplies have no quantified GHG emissions impacts and are not considered.

Comment: Corn is one of the most irrigated crops grown in the U.S. U.S. aquifers and surface waters, particularly those used for industrial agriculture, have been depleted to the point where future agricultural production for food is in jeopardy.

Response: The GHG emissions impacts of irrigation are currently not included in the carbon intensities of corn or sorghum ethanol. However, staff is considering accounting for those impacts as it updates its life cycle analysis methodology. Irrigation is known to generate GHG-emissions through pumping and the construction and operation of water storage and conveyance facilities. Otherwise, changes in the supply of water have no quantified GHG emissions impacts.

Comment: Corn is a heavily fertilized crop. The environmental impacts of producing the phosphorus fertilizers applied to corn are particularly high. One source of the phosphorus in the fertilizer applied to the U.S. corn crop is phosphate rock mined in Florida. The mining process produces a range of environmental impacts:

- Diesel emissions
- Mining dust consisting of particulate matter
- Consumption of large volumes of water
- The creation of open pits several acres in size

- Dewatering of the regional aquifer as groundwater fills the pits and subsequently evaporates.

The application did not account for these air quality and water supply impacts.

Response: The GHG emissions impacts of fertilizer production, transport, and use are accounted for in in all LCFS life cycle analyses of crop-based fuels. The following table quantifies the fertilizer production emissions that were included in the carbon intensity of the corn pathway in this application. For comparison, the table also shows more recent factors being evaluated by staff. Please note that the greenhouse gases emitted by the production of fertilizers include volatile organic compounds (VOCs), carbon monoxide (CO), methane (CH_4), nitrous oxide (N_2O) and carbon dioxide (CO_2). Particulate emissions are not GHGs and are therefore not included. Although the GHG emissions impacts from the production of phosphate fertilizer are accounted for in these pathways, aquifer dewatering has no quantified GHG emissions impacts.

GHG Emissions Impacts of Fertilizer Production and Transport

Phosphoric Rock						
	LCFS GHG Emissions			Current GHG Emissions		
	Production	Transport	Total	Production	Transport	Total
VOC	4.89	34.33	39.22	78.08	36.44	114.52
CO	47.49	91.36	138.85	328.56	99.98	428.54
CH4	67.34	45.83	113.17	655.96	55.44	711.40
N2O	0.49	0.98	1.47	6.32	1.06	7.38
CO2	53,971.22	42,706.27	96,677.49	286,550.91	46,912.41	333,463.32
Ammonia						
	LCFS GHG Emissions			Current GHG Emissions		
	Production	Transport	Total	Production	Transport	Total
VOC	79.44	38.53	117.96	4,617.18	53.20	4,670.38
CO	319.06	117.74	436.80	4,492.70	168.63	4,661.33
CH4	1215.20	72.15	1,287.35	7,485.79	117.37	7,603.16
N2O	5.74	1.50	7.24	48.75	1.81	50.56
CO2	1,689,972.59	59,266.46	1,749,239.05	2,091,894.62	95,522.00	2,187,416.62
Potassium						
	LCFS GHG Emissions			Current GHG Emissions		
	Production	Transport	Total	Production	Transport	Total
VOC	62.46	42.92	105.38	59.59	57.80	117.38
CO	244.24	128.25	372.49	258.03	178.98	437.01
CH4	634.90	77.76	712.66	798.94	123.15	922.09
N2O	5.73	1.61	7.34	6.26	1.93	8.18
CO2	350,519.06	63,976.05	414,495.11	348,657.00	100,647.0	449,304.00
Lime						
	LCFS GHG Emissions			Current GHG Emissions		
	Production	Transport	Total	Production	Transport	Total
VOC	62.46	4.509	66.97	93.01	5.8	98.81
CO	244.24	20.393	264.63	410.6	20.1	430.70
CH4	634.90	13.069	647.96	613.4	17.5	630.9
N2O	5.73	0.262	5.99	1.02	0.2	1.22
CO2	350,519.06	10,623.91	361,142.97	1,136,434	15,980	1,152,414

Sources: Two versions of the Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model. The LCFS emissions are from CA-GREET 1.8b, available at http://www.arb.ca.gov/fuels/lcfs/software.htm, and the current emissions are from Argonne National Laboratory's GREET 2013 (http://greet.es.anl.gov/greet/index.htm). CA-GREET is based on an earlier version of the Argonne GREET model.