

Method 2B Application
Element Markets Renewable Energy
Michigan Landfill Gas to Liquefied Natural Gas and
Liquefied-Compressed Natural Gas (LNG017 and CNG014)

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Pathway Summary

Element Markets Renewable Energy, LLC (hereinafter Element Markets), a marketer of renewable natural gas and environmental asset management services, has applied for Low Carbon Fuel Standard (LCFS) fuels pathways for the production of Liquefied and Liquefied-Compressed Natural Gas (LNG and L-CNG) from landfill gas (LFG) originating in Michigan.

Element Markets purchases the LFG from Blue Skies Energy (BSE), an operator of LFG processing facilities at the Richfield landfill in the town of Davison in eastern Michigan. BSE began operating an LFG processing facility at Richfield in 2008. Element Markets takes title to the resulting biomethane after it is injected into the interstate pipeline system by BSE. This system primarily collects and conveys natural gas from North American wells in the region. Gas is withdrawn from the interstate pipeline system in Topock Arizona—located at a distance of 2,250 miles from the point of biogas injection—where it is liquefied to LNG. LNG is then transported by truck to customers as well as two refueling stations in Ontario and Barstow, California. Some LNG is re-gasified and compressed to L-CNG at both stations.

Carbon Intensity of LNG and L-CNG Produced

The BSE facility collects, processes, and compresses LFG to pipeline quality biomethane. The resulting biomethane is transmitted by pipeline from the landfill to a central collection point, from which it is injected into a primary interstate pipeline and subsequently withdrawn at the ANGF plant in Topock, Arizona. The carbon intensities (CIs) of the LFG extraction, processing, and pipeline injection phases of this pathway were calculated using data for the U. S. EPA's eGRID electrical energy generation database. BSE operations are located in northeastern Michigan which is within the RFCM eGRID region. The liquefaction CI was calculated using data from the WECC eGRID region¹. The eGRID database reports *average* electrical energy generation mixes when *marginal* electricity is more appropriate. eGRID average mixes are converted to marginal mixes because additional demand would be met primarily by new natural gas rather than hydroelectric or nuclear generation capacity.

¹ The U.S. Environmental Protection Agency's Emissions and Generation Resource Integrated Database (eGRID) can be found at: http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2012V1_0_year09_SummaryTables.pdf.

The biomethane Element Markets purchases from BSE is commingled with fossil natural gas when it enters both the regional and the interstate pipeline systems. Further commingling occurs at the ANGF liquefaction plant. As such, Element Markets will be obligated to retain records that unequivocally demonstrate that the credits it earns under the pathway described in this summary correspond directly with the volumes of biomethane it purchased from BSE.

The CIs of this pathway, as calculated by Element Markets, are 24.90 gCO₂e/MJ of LNG produced and 25.30 gCO₂e/MJ for L-CNG produced. These CIs are based on energy consumption records covering 2011 and 2012 at BSE and ANGF. By comparison, the Lookup Table CIs for North American LFG liquefied in California are 26.31 gCO₂e/MJ (LNG006) and 15.56 (LNG007)² for 80 percent and 90 percent liquefaction efficiencies, respectively. The Element Markets pathway CIs are higher than the LNG006 and LNG007 CIs due to a longer pipeline transmission distance, transport of LNG via heavy duty diesel truck, and regional electricity generation mixes characterized by higher GHG emissions.

² Landfill Gas (Biomethane) to LNG in California (LNG006 and LNG007):
http://www.arb.ca.gov/fuels/lcfs/092309lcfs_lfg_lng.pdf

Table 1: Proposed Lookup Table Entry

Fuel	Pathway Identifier	Pathway Description	Carbon Intensity in gCO ₂ e/MJ (Including Indirect Effects)		
			Direct Emission	Land Use or Other Indirect Effect	Total
LNG from LFG	LNG017	2B Application: (Specific Conditions Apply) Michigan Landfill gas to pipeline-quality biomethane, delivered to Topock, AZ via pipeline for liquefaction; transported by truck to CA	24.90	0	24.90
L-CNG from LFG	CNG014	2B Application: (Specific Conditions Apply) Michigan Landfill gas to pipeline-quality biomethane, delivered to Topock, AZ via pipeline for liquefaction; transported by truck to CA; re-gasified and compressed to L-CNG	25.30	0	25.30

Operating Conditions

1. Actual pathway energy consumption (both thermal and electrical) shall remain at or below the levels specified in Element Markets' application. In addition, the recovery and processing efficiency levels at the landfill, the liquefaction efficiency at ANGF plant, and the compression efficiency level at the L-CNG stations shall remain at or above the levels specified in the application. This condition applies to the BSE landfill gas processing and

compression plant in Michigan, and the ANGF-owned LNG and L-CNG dispensing stations in California. Energy consumption values for these facilities are classified by the applicant as confidential business information.

2. Because the biomethane supplied under this pathway is commingled with fossil NG when it enters the interstate pipeline system and at the LNG plant, Element Markets must maintain an accounting system that will enable it to demonstrate unequivocally at any time that every unit of biomethane-based transportation fuel sold and reported under the LCFS can be associated with an equal unit of biomethane purchased and injected into the interstate pipeline system.

Staff Analysis and Recommendation

Staff has reviewed the Element Markets application for the Michigan LFG to LNG and L-CNG, and has replicated, using the CA-GREET spreadsheet, the CI values calculated by Element Markets (24.90 gCO₂e/MJ for LNG and 25.30 gCO₂e/MJ for L-CNG). Element Markets has provided documentation of the BSE plant's energy use, LFG production, and LFG transportation, as well as ANGF's energy use, LNG production, and LNG transportation for 2011 and 2012. Staff therefore recommends that Element Markets' application for a Method 2B LNG and L-CNG pathways be approved, subject to the operating conditions stipulated above.