

January 5<sup>th</sup> 2018

Michael J. Rensing, Ph.D.  
Director, Low Carbon Fuels  
Electricity and Alternative Energy Division  
British Columbia Ministry of Energy, Mines and Petroleum Resources

**RE: British Columbia Low Carbon Fuels Compliance Pathway Assessment**

Dear Sir,

LanzaTech applauds British Columbia's leadership on renewable and low carbon fuel policy. Low carbon fuels policies deliver energy security and reduce greenhouse gas (GHG) emissions through the increased use of lower carbon fuels and alternative technologies. We believe that a broad array of sustainable, low carbon feedstocks will play a key role in lowering emissions in the transport sector and that leveraging the full range of technology options will enable British Columbia to meet its carbon intensity targets.

LanzaTech is revolutionizing the way the world thinks about carbon. By turning waste carbon from a liability to an opportunity, we are accelerating the reduction of harmful emissions while creating new economic opportunities for companies, communities and countries around the world. At the heart of LanzaTech's biological process are our microbes that produce transport fuels and chemicals from carbon rich wastes and residues. The microbes are used in a continuous process called "gas fermentation", a form of "biological carbon capture and utilization". In gas fermentation, the microbes produce low carbon fuels by consuming the carbon monoxide, carbon dioxide and hydrogen in waste gases from industries such as steel manufacturing, oil refining and chemical production, as well as gases generated by gasification of forestry and agricultural residues and municipal waste. These waste resources don't compete with land, food or water, offering a local source of wholly sustainable low carbon fuels.

We welcome the opportunity to provide comments on the 2017 Pathway Assessment referenced above. Our specific comments to individual sections are summarized below.

## **Section 9. Renewable or Low Carbon Gasoline and Diesel Fuel.**

Section 9 correctly states that Hydrogenation Derived Renewable Diesel (HDRD) is the only form of renewable gasoline or diesel commercially available today. While several emerging pathways are cited in Section 9.2 under “thermal treatment of biomass” and “biocrude’ refinery co-processing”, we would like to point out that renewable or low carbon gasoline and diesel fuel can also be produced from alcohol intermediates such as ethanol or butanol. Alcohol-to-Jet (ATJ) processes convert alcohols into the same array of hydrocarbons as the Hydroprocessed Esters and Fatty Acids (HEFA) process which also makes HDRD, e.g. synthetic paraffinic kerosene (SPK) and synthetic paraffinic diesel (SPD). Any source of ethanol is suitable for ethanol-based ATJ, which means that, in the future, renewable and low carbon diesel (ATJ-SPD) can be made from a wide variety of sustainable, low carbon resources and no longer limited to HDRD feedstocks. ATJ technologies are being rapidly commercialized in response to the aviation sector’s demand for sustainable alternative jet fuel, driven in part by the upcoming ICAO CORSIA obligations, which will come into effect in 2021. Therefore, we recommend that the Pathway Assessment include ATJ-SPD in its projections.

## **Section 11. Ethanol**

In Section 11, the Pathway Assessment identifies a need for increased quantities of low carbon intensity ethanol in the B.C. market to meet the expectations of the carbon reduction model. First, we would like to point out that, although not required by statute, in regions where both renewable and low carbon fuel regulations exist, market realities dictate that fuels must satisfy both sets of regulations, limiting the availability of fuel which only satisfies one regulation. An example here is ethanol produced by biological carbon capture and utilization of industrial gases, which would satisfy the carbon reduction criteria but is currently not recognized as a renewable fuel. A number of industrial operations produce carbon-rich waste gases as an inevitable byproduct of manufacturing. Prime examples in Canada are steelmaking, nickel manufacturing and refining; in principle, these industries produce sufficient waste gas to make ~2 billion litres of ethanol through gas fermentation. Today, these gases must be combusted, with or without energy recovery, leading to local emissions of both GHGs and other air pollutants. Gas fermentation offers the opportunity to produce fuels from these gases instead.

In order to meet B.C.’s demand for low carbon ethanol, we recommend expanding the definition of renewable ethanol to include the ethanol produced by biological carbon capture and utilization of such industrial waste gases. Biological carbon capture and utilization via gas fermentation simply shortens the traditional plant-based carbon cycle by directly converting these carbon-containing gases into ethanol rather than processing the carbon after it has been emitted and fixed in plants via photosynthesis. The microbes in a gas fermentation process perform the same function as traditional plants, also growing on a continuous basis but on a shorter time scale. Therefore fuels from such processes can be

properly included as renewable fuels. In addition, this type of biological carbon capture and utilization reduces the need for land, water and the time needed to grow, harvest and process traditional plants. The GHG intensities of ethanol produced from industrial waste gases from third-party life cycle assessments are 60 to 80%, depending upon the specific waste gas and production location, offering a significant opportunity to meet B.C.'s demand for renewable and low carbon ethanol.

I thank you for your consideration of these comments and look forward to productive discussions at the upcoming workshop.

Sincerely,



Laurel Harmon  
Vice President, Government Relations

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