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Margaret Chu, PhD
CARB Staff Lead on Refinery Allocation
California Air Resources Board

Paul Blinde
Project Manager
Ecofys

Sent Via Email

Dear Dr. Chu and Mr. Blinde:

The following comments are submitted from Praxair¹ in regards to the August 20, 2012 preliminary work product titled *Development of GHG efficiency benchmarks for the distribution of free emissions allowances in the California Cap and Trade Program – Refineries*. As discussed below, Praxair encourages staff to continue to evaluate the distinctions between gaseous and liquefied hydrogen products. They are separate products with differing production and delivery requirements and each should have its own emissions benchmark and leakage analysis. In addition, Praxair encourages staff to ensure that merchant-owned gaseous hydrogen production is not disadvantaged compared to refinery-owned gaseous hydrogen production through the benchmarking and allowance distribution rules.

Comment 1 Section 5.9.3 – Gaseous versus Liquid Hydrogen Plants

Section 5.9.3 states the following

5.9.3 Gaseous versus Liquid Hydrogen

The Cap-and-Trade Regulation defines two product-based benchmarks with the same value for liquid and gaseous hydrogen. The production of liquid hydrogen involves compressing as an additional production step leading to increased consumption of electricity. Compensation for indirect emissions will be given to electricity utilities, which in turn will compensate rate payers such as hydrogen producers.

Praxair has been engaged in continuing discussions with staff of the California Air Resource Board in regard to the material differences that liquid hydrogen plants have with gaseous hydrogen plants. As noted in Praxair's comments on the cap-and-trade, it is not appropriate to use the same data set and assign the same allowance and the leakage risk factors to liquefied hydrogen and gaseous hydrogen.² Liquefied hydrogen is distinct product and should be treated as such in CARB's regulation and benchmarking activities. .

¹ Praxair was founded in 1907 and became an independent publicly traded company in 1992. Praxair is a supplier of atmospheric gases and coating services business, and is globally recognized for its sustainability efforts (2011 Dow Jones Sustainability World Index, and 2011 World Carbon Disclosure Leadership Index). In California, Praxair has 1000 employees at 80 locations and five production facilities: two atmospheric, two carbon dioxide, and one hydrogen.

² See Praxair's comments during the cap-and-trade regulation rulemaking (December, 10, 2011, August 11, 2011, and September 27, 2011), available at:

<http://www.arb.ca.gov/lispub/comm/bccommlog.php?listname=capandtrade10>

While liquefied hydrogen is a much more electricity intensive product than gaseous hydrogen, there are also direct emissions attributable to the liquefaction process (i.e., converting gaseous hydrogen to liquefied hydrogen). Typically, the hydrogen plants manufacturing the liquefied product are smaller than plants producing gaseous hydrogen, and as such, the products have different energy intensities. There are also differences associated with the liquefaction process and in the handling of liquefied hydrogen after liquefaction that should be reflected in the benchmark. Finally, liquefied hydrogen is easily transported, placing it at a higher risk of leakage from outside California competition than pipeline delivered gaseous hydrogen.

The final cap-and-trade regulation purposefully established a distinction between liquefied and gaseous hydrogen products, but assigned the same benchmark value to both products: 8.85 Allowances / metric ton (See Table 9-1 in the rule). During the rulemaking, staff said this distinction was made to enable reconsideration of technical details with respect to production (e.g., production efficiency factors) that may result in different allowance assignments for the two products.

Because liquefied hydrogen is a distinct product that is “atypical” to a gaseous hydrogen plant production, its benchmark and leakage characterization should not be equivalent to the gaseous hydrogen benchmark. Rather, staff should develop independent benchmarks and leakage analyses for gaseous and liquid hydrogen.

It is interesting to note Section 6.3 which states the following:

6.3 Exclusion of Atypical Refineries

It is observed that some of the California refineries with the lowest capacity are found at either end of the benchmark curve. Since it is known that the CWT approach is not suitable for smaller refineries, it may be speculated that the CWT approach is not suited for some of the smaller, “atypical” refineries in California. For these atypical refineries it may be more appropriate to use alternative allocation methodologies such as energy benchmarking.

These statements and conclusions made in Section 6.3 are also very applicable to the liquid hydrogen plant and gaseous hydrogen plant comparison. A liquid hydrogen plant is generally much smaller than a typical gaseous hydrogen plant (~10% the size) and requires additional energy-intensive processing steps to make the final product, as mentioned above. Therefore trying to apply the CWT that was developed from gaseous hydrogen production data to a “small” “atypical” liquid hydrogen plant is not appropriate.

Since liquid hydrogen plants are “atypical” when compared to gaseous hydrogen plants, it is more appropriate to use an alternate allocation methodologies such as energy benchmarking for liquid hydrogen plants, as is suggested for small refineries in Section 6.3.

Comment 2 – Merchant Gaseous Hydrogen Plants

Sections 5.9.1 and 5.9.2 mention that gaseous hydrogen plants can be either owned/operated by the refinery or by a third party. Praxair owns and operates many gaseous hydrogen plants across the country as a third party owner/operator. Our experience has been that these third party plants



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are just as integrated into the refinery operations (e.g., sharing steam flows, feedstock, flare systems. etc) as a refinery-owned facility would be. It is appropriate that both the refinery owned and the third party gaseous hydrogen plants be evaluated the same in terms of benchmarking the emissions intensity associated with gaseous hydrogen. However, staff should continue to provide for independent allocation to the hydrogen producers to avoid disadvantaging merchant owned, gaseous hydrogen production.

If you have any questions or comments please feel free to contact me at anytime

Sincerely,

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Cc:
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