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Clerk of the Board
California Air Resources Board
1001 I Street
Sacramento, California 95814

Subject: Comments of Praxair, Inc. on the July 25, 2011 Revisions to the Cap-and-trade Regulation

Dear Clerk:

Praxair, Inc. ("Praxair") submits these comments to the California Air Resources Board ("CARB") in response to the July 25, 2011 public notice of modified text to CARB's Proposed California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation, Including Offset Protocols ("cap-and-trade"). Praxair's comments primarily focus on five issues: (1) the need to characterize liquid hydrogen production as a high leakage risk activity; (2) the appropriate manner to establish a benchmark for liquefied hydrogen production; 3) importance of the distinction between carbon dioxide producers and suppliers; (4) CARB should freely allocate allowances to operators of self-generation plants that are not owned by an industrial process that receives free allocation; (5) the importance of ensuring that publicly owned utilities use allowance revenue for the benefit of their customers, as independently owned utilities are required to do.

1. **Liquid Hydrogen Production Should Be Characterized as a High Leakage Risk Activity.**

Praxair is encouraged that the revised cap-and-trade regulation now recognizes the leakage risk for liquid and gaseous hydrogen production. Praxair believes that further analysis of the leakage risk and benchmarks for hydrogen production are necessary to ensure that Praxair is not unfairly placed at a disadvantage in relation to in-state and out-of-state competitors.

CARB's documentation for the July 25, 2011 cap-and-trade regulations notes that "stakeholders have commented that the market for liquid hydrogen is different from that of gaseous hydrogen produced in large quantities for sale to refineries (or other co-located stationary sources). The leakage risk for this product might therefore be different than that of gaseous hydrogen. Staff seeks stakeholder comment on this issue." Praxair agrees that the leakage risk for liquefied hydrogen is different than gaseous hydrogen. Liquefied hydrogen

should be characterized as a high leakage risk because it is an energy-intensive product that accounts for significant CO2 emissions and is readily transportable across California's borders.

Liquefied hydrogen faces both direct and indirect GHG compliance costs, which magnify the impact of the cap-and-trade program on a liquefied hydrogen producer's ability to compete with out-of-state competitors in supplying in-state and out-of-state customers. The liquefaction process (i.e. converting gaseous hydrogen to liquefied hydrogen) is highly energy-intensive, and Praxair anticipates that it will face indirect compliance costs associated with the carbon obligation in the electricity sector. The liquefaction process also produces additional CO2 emissions on site, for which a liquefied hydrogen producer will face a direct compliance obligation. Finally, additional processing steps are required to purify liquefied hydrogen, which results in increased emissions.

Under the medium leakage risk approach that is currently proposed for the cap-and-trade, Praxair would be required to purchase half of its allowances in the third triennial compliance period. In 2003, Praxair made significant capital improvements in its hydrogen production facilities to make its facilities among the most efficient in the industry. Praxair's facilities are already highly efficient. Consequently, given the direct and indirect emissions intensity of hydrogen production, Praxair is very concerned that the cost of GHG compliance cannot be passed onto its customers. When faced with these costs, liquefied hydrogen customers will seek out-of-state sources of supply that do not carry costs of GHG compliance.

Dislocation of California's liquefied hydrogen production is problematic not just because of the in-state economic and jobs impact. Dislocation will also be counterproductive to the State's GHG emissions goals. For example, existing out-of-state liquefied hydrogen producers in the Gulf Coast, the Midwest, and Canada are not currently subject to similar GHG compliance obligations, other than the EPA's reporting requirements. Further, new hydrogen production facilities could be built in Nevada to avoid California's GHG compliance obligation. To make matters worse, GHG emissions associated with transporting liquefied hydrogen to California and elsewhere throughout the United States will result in a significant emissions increase beyond what would have been emitted if dislocation did not occur.

To illustrate the emissions leakage impact *solely* attributable to increased vehicle emissions, Praxair prepared Table 1 to estimate CO2 emissions attributable to transportation of Liquid Hydrogen when in-state production is displaced by out-of-state production. (Please see Table 1 on the following page)

Table 1

CO2 Emissions from the Transportation of Liquid Hydrogen

Assumptions
CO2 in fuel = 22.4 lbs CO2/gallon
Truck mileage = 5 miles/gallon
H2 Product per trailer = 3 tons per load
CO2 from producing liquid hydrogen is 14.92 ton CO2 per ton of H2 produced[1]
CO2 released to make one trailer load of H2 = 44.76 tons/load

Calculations
CO2 emission factor = (22.4 lbs CO2/gallon)/(5 mpg) = 4.48 lbs CO2/mile

CO2 emissions per load = (miles driven one way) x (2 (there and back trip)) x (4.48 lbs CO2/mile)
= lbs CO2/load

Results:

Case	lbs CO2/ Load	ton CO2/load	% CO2 overall increase	Annual CO2 increase assuming 10 loads/day (tons/year)
500 miles one way	4,480	2.24	5.0%	8,176
1,000 miles one way	8,960	4.48	10.0%	16,352
2,000 miles one way	17,920 lbs	8.96	20.0%	32,714

Praxair's analysis concludes that transportation emissions could increase between 8,176 and 32,714 metric tons / year by competitors at a distance of 500 to 2,000 miles away (respectively) displacing in-state liquid hydrogen production. Moreover, these transportation emissions will be *additional* to any increased emissions attributable to out-of-state production generating more CO2 emissions than would have resulted from in-state production. Given the potential for increased emissions and the risk to out-of-state competition when liquid hydrogen is classified as medium leakage, Praxair strongly urges CARB to classify liquefied hydrogen production as a "high leakage risk". Praxair continues to offer its technical assistance in providing CARB with information it may need to support this classification.

[1] This assumption for CO2 attributable to liquid hydrogen was taken from publicly available data and GREET model GHG emission factor

2. CARB Should Utilize Verified Production Data and the GREET Model to Establish a Benchmark for Liquefied Hydrogen Production.

As noted above, liquefied hydrogen is a more energy and emissions intensive product. Consequently, CARB notes that liquefied hydrogen should have its own efficiency benchmark. Given the relatively small number of liquefied hydrogen production facilities in California, establishing a benchmark for an "efficient facility" is impractical. Praxair therefore suggests that CARB allocate emissions allowances to liquefied hydrogen production facilities on the basis of an individual facility's verified emissions associated with liquid hydrogen product output reported pursuant to the Mandatory Reporting Rule ("MRR"). The MRR directs hydrogen producers to separately report the quantity of liquefied and gaseous hydrogen produced. Praxair notes that both liquefied hydrogen and gaseous hydrogen are often produced at the same facility. Given Praxair's comments above about the differing emissions intensities of gaseous and liquefied hydrogen, Praxair believes that it will be important to apply two benchmarks to a facility that produces both gaseous and liquefied hydrogen. As noted above, the liquefied output should receive allocations based on the facility's verified emissions that are attributable to liquefied hydrogen. The gaseous output should receive allocations based on the gaseous hydrogen efficiency benchmark.

Praxair also believes CARB should integrate the Greenhouse Gas, Regulated Emissions, and Energy use in Transmission ("GREET") Model as a method for encouraging hydrogen fuel cell technologies. The GREET Model was commissioned in 1996 by the U.S. Department of Energy ("DOE"). DOE developed GREET to evaluate energy and emission impacts of advanced vehicle technologies and new transportation fuels. Subsequently, the GREET Model was modified by CARB to create a California-specific model. The GREET Model contains certain assumptions about the efficiencies of fuel production processes and allows users to evaluate the life cycle emissions impacts of different fuel types. Praxair believes the use of the GREET Model in the cap-and-trade would create new incentives for the hydrogen fuel industry. CARB should therefore use the GREET Model to establish a liquefied hydrogen benchmark, but only for liquefied hydrogen that is sold to fuel cell customers that is verified under the MRR.

3. Only CO2 Producers, not CO2 Suppliers Should be Covered Entities.

The provision defining CO2 suppliers (Section 95802(a)(45)) should be clarified. Praxair was concerned that all entities involved in the industrial CO2 gas supply chain would be subject to a cap-and-trade compliance obligation. Praxair appreciates CARB staff's informal clarification that regulating all entities in the supply chain was not CARB's intent. Praxair requests CARB modify Section 95802(a)(45) to remove entities that are not engaged in producing CO2 from procuring emissions allowances, and reporting under the MRR (see Praxair's comments on the July 25, 2011 version of the MRR). This clarification will also achieve greater consistency with the U.S. EPA reporting regulations and avoid concerns that multiple entities in the same supply chain would be regulated for the same activity.

Currently, Section 95802(a)(45) defines Carbon dioxide suppler to include:

(a) facilities with production process units that capture a CO2 stream for purposes of supplying CO2 for commercial applications or that capture the CO2 stream in order to utilize it for geologic sequestration where capture refers to the initial separation and removal of CO2 from a manufacturing process or any other process,

(b) facilities with CO2 production wells that extract or produce a CO2 stream for purposes of supplying CO2 for commercial applications or that extract a CO2 stream in order to utilize it for geologic sequestration, and

(c) importers or exporters of bulk CO2.

This provision of the cap-and-trade regulation is similar to the US EPA definition of CO2 suppliers, but differs in one significant respect: CARB's definition does not include the language in 40 C.F.R. Section 98.420(b), which clarifies that the definition of CO2 supplier is focused on upstream supply and excludes entities that purchase raw CO2 gas from producers.

Praxair appreciates CARB staff's recent informal clarification on this issue. Praxair was concerned that without clarification, multiple entities along the same supply chain would be subject to the regulation (i.e. "pancaking" the compliance obligation). Praxair was concerned that pancaking the compliance obligation would be counterproductive to CARB's GHG emission reduction goals. Praxair exports CO2 outside of California, and without staff's clarification, Praxair may have a compliance obligation despite the fact that it is not the original supplier. The effect of this export would be a double counting of the CO2 molecules and thus a double compliance obligation – the first obligation falling on the producer and the second obligation falling on the supplier. This result would place Praxair at a competitive economic disadvantage, with respect to the CO2 it processes in California and CO2 that is sourced by competitors from other states' markets. This disadvantage would also result in emissions leakage.

One real life example of leakage that can occur if exports are required to have allowances is as follows. A few years ago Praxair was involved with a promising CO2 reduction project in which CO2 recycled from a refinery was shipped out-of-state to a customer that previously generated their own CO2 from an on-site lime kiln operation. By changing from CO2 production to purchase of recycled and purified refinery off-gas, this project resulted in a "net" CO2 emissions reduction. If under the Proposed Rule this exported CO2 would now be subject to a compliance burden, there is a strong likelihood that the economics of this transaction will erode, and the customer will revert to producing their own CO2. Thus, the "pancaked" compliance obligation would not only increase costs to CO2 suppliers, leading to emissions leakage, but also, emissions benefits that are no longer cost-effective to undertake.

To effectuate CARB's intent, ensure consistency with the US EPA's reporting requirements and ensure that the cap-and-trade compliance obligation is not "pancaked" on multiple entities for the same activity, Praxair requests CARB include the following language

from 40 C.F.R Section 98.420(b) in Section 95802(a)(45) of the cap-and-trade. The following language contains the same language as 40 C.F.R Section 98.420(b), as well as additional clarifications which are identified in underline text. CARB should add the following language to Section 95802(a)(45):

(b) This source category is focused on upstream supply. It does not cover:

(1) Storage of CO2 above ground or in geologic formations.

(2) Use of CO2 in enhanced oil and gas recovery.

(3) Transportation or distribution of CO2, unless such transport or distribution involves the import or export of bulk CO2.

(4) Purification, compression, or processing of CO2.

(5) Capture of CO_2 from a production process unit at an upstream facility under separate ownership and control;

(6) On-site use of CO2 captured on site.

In sum, Praxair's proposed revisions will achieve greater consistency with the US EPA regulation and explicitly address concerns that the compliance obligation for CO2 could be pancaked on multiple entities in the same supply chain.

4. CARB Should Freely Allocate Allowances to Operators of Self-generation Plants that Are Not Owned by an Industrial Process that Receives Free Allocation.

The AB 32 Scoping Plan sets "a target of an additional 4,000 MW of installed CHP capacity by 2020, enough to displace 30,000 GWh of demand from other power generation sources." However, the cap-and-trade program does not account for the reductions in GHG emissions attributable to CHP facilities. As currently structured, the cap-and-trade program will undermine the Scoping Plan's CHP goal by placing significant, additional direct compliance costs on new and existing cogeneration facilities, regardless of the efficiency of a particular facility. The impact of the regulation is especially problematic for a facility that is sized to meet on-site loads and does not make substantial quantities of electric power for wholesale sales. If a CHP facility sells thermal energy to an industrial facility that is eligible for industrial assistance, the industrial facility may choose to discontinue its purchase of thermal energy from the CHP facility. To avoid this counterproductive result, emissions associated with CHP facilities should be characterized as industrial sector emissions.

5. **CARB Should Specifically Direct Publicly Owned Utilities (POUs) to Use Allowance Revenue for the Benefit of Their Customers, As Independently Owned Utilities (IOUS) Are Required to Do.**

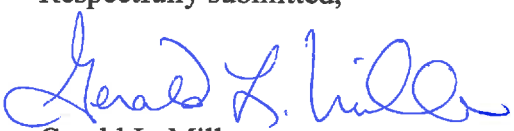
Praxair suggests that CARB provide greater guidance to the POUs with respect to the application of allowances to benefit their customers. Praxair is concerned that similar facilities located within different service areas—one IOU and one POU—could potentially face different economic impacts in their electricity costs due to different applications of value from the CARB-allocated allowances. While true parity in the compliance burden between the different types of utilities is unlikely, potential differences to customer costs should not be exacerbated from vastly different applications of the allocated allowances. To avoid this inequitable result, Praxair requests providing more explicit direction to POUs that they are to use any revenue they receive from selling allowances in the auctions for the benefit of their customers.

Conclusion

In conclusion, Praxair first requests that CARB classify liquefied hydrogen production as a high leakage activity because it is highly energy and emissions intensive. Characterizing liquefied hydrogen as a medium leakage risk will impose a significant CO2 compliance obligation, which will provide a strong competitive advantage to out-of-state competition that can easily truck or rail liquefied hydrogen into California and elsewhere in the United States. Such displacement of hydrogen production would create economic and jobs impacts in California and would increase overall CO2 emissions levels due to increased vehicle traffic. Second, in addition to characterizing liquid hydrogen as a high leakage risk, CARB should establish an allocation benchmark for liquid hydrogen by utilizing verified liquid hydrogen production data and the GREET Model to establish a benchmark for liquefied hydrogen production. Third, Praxair believes that CARB should clarify the distinction between carbon dioxide producers and suppliers to avoid subjecting multiple entities along the same supply chain to duplicative regulation. Fourth, CARB should freely allocate allowances to self-generation facilities that are not owned by an industrial host that is eligible for free allocation. Finally, CARB should specifically direct publicly owned utilities to use allowance revenue for the benefit of their customers, as independently owned utilities are required to do.

Praxair appreciates the opportunity to provide these comments and thanks staff for their hard work, accessibility, and receptiveness to stakeholder feedback. Praxair looks forward to continuing to work with staff towards the successful implementation of California's cap-and-trade program.

Respectfully submitted,



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