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**Air Products Canada, Ltd.**  
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March 29, 2019

Honourable Rod Phillips  
Minister of the Environment, Conservation and Parks  
Climate Change Policy Branch  
Ferguson Block, 11th Floor  
77 Wellesley Street West  
Toronto, ON M7A 2T5

RE: Comments regarding Made-in-Ontario Environmental Plan – *Making Polluters Accountable: Industrial Emission Performance Standards*

Minister Phillips:

Air Products is a world-leading industrial gases company, in operation for over 75 years. The company's core industrial gases business provides atmospheric and process gases and related equipment to manufacturing markets, including refining and petrochemical, metals, electronics, food and beverage and healthcare. Approximately 16,000 employees globally work to make Air Products the world's safest and best performing industrial gases company, providing sustainable offerings and excellent service to all customers. Among other Canadian operations, Air Products Canada Ltd. operates two world-scale hydrogen facilities in Ontario, supplying gaseous hydrogen through a dedicated pipeline system and liquid hydrogen via bulk transport to customers across Canada and the United States.

Specifically, Air Products' merchant supply of gaseous hydrogen to refineries is materially impacted by the proposed Emission Performance Standards and the focus of these comments.

Air Products secures long-term contracts to supply hydrogen to multiple refineries in place of hydrogen production the refinery could undertake themselves. By aggregating this hydrogen demand, Air Products can build a larger production facility and, through its economy of scale, incorporate extensive energy integration/recovery design features that enable world-class efficiency. The Air Products' plant is then sited near a host refinery that can beneficially utilize very efficiently co-produced steam. The hydrogen and steam are then delivered via pipeline to meet the multiple refineries' operating demand.

This "outsourcing" of hydrogen and steam production is essentially equivalent to producing hydrogen and steam within the refinery and this alternative supply model should be seen as interchangeable under all regulatory treatment of hydrogen production.

It is within this construct that Air Products offers the following comments regarding the February 12, 2019 proposal titled "*Making Polluters Accountable: Industrial Emission Performance Standards*" (Proposal).

## **DISCUSSION of COMMENTS:**

### **1. Consistent Hydrogen Output-Based Standard across Petroleum Refining and Merchant (“Dedicated”) Hydrogen Production Sectors**

In principle, Air Products believes that a single Emission Performance Standards (EPS) should be assigned for each commercial product – regardless of technology, feedstock, ownership or industry sector producing the product. Currently, this foundational principle has not realized for hydrogen within the Proposal. Specifically, under the proposed regulation:

- Hydrogen produced by the petroleum refining sector would earn its EPS allocation through the calculated product of the refining Sector Average emission intensity value, a technology/feedstock-dependent Complexity Weighted Barrel (CWB) factor (steam methane reforming, steam naphtha reforming or partial oxidation), and the relevant Stringency Factor.
- Hydrogen produced in the standalone “hydrogen” sector would earn its EPS allocation through a Facility-Specific Emission Intensity and the appropriate, but possibly different, Stringency Factor.

These two approaches result in materially different EPS allocations, depending on which sector produces the same hydrogen product. The EPS program should provide a fair and consistent allocation, regardless of the sector producing the product.

Air Products’ concern is two-fold:

- 1) The first inconsistency is due to the different Emission Intensity values assigned to hydrogen depending on the producing “sector”:
  - a. Refinery Hydrogen Production – The Proposal indicates the emission intensity for refined petroleum products would be defined by a “Sector Average” (Appendix A, Table 1). The proposed emission intensity was determined from a population of multiple refineries, using the Canadian Complexity Weighted Barrel (CAN-CWB) production metric. Hydrogen produced within a refinery contributes to the refinery’s overall “production”, calculated as the actual hydrogen produced multiplied by a “CWB Factor” to convert the volumetric or mass hydrogen production into the CAN-CWB production metric. The current refinery production reporting methodology applies different CWB Factors depending on the hydrogen production technology and feedstock: steam methane reforming, steam naphtha reforming, and partial oxidation. While refineries will earn their EPS allocation based upon their total CAN-CWB production, the specific contribution from hydrogen production can be calculated separately and serves as a comparative benchmark for merchant hydrogen production.
  - b. Merchant Hydrogen Production – The Proposal indicates the emission intensity for hydrogen production (“Chemical-Hydrogen Sector”) would be determined through an individual “Facility-Specific Emission Intensity” (Appendix B, Table 1), using actual emissions and production for each individual facility from the operating period 2015-2017. The resulting facility-specific EPS will be lower than the refinery emission intensity if the merchant facility is more efficient than the refinery-sector average; the facility-specific EPS will be higher than the refinery emission intensity if the merchant facility is less efficient than the refinery-sector average.

The broad range of possible EPS values for the production of the same commercial product results in a perverse outcome – a more efficient producer is penalized by receiving a more stringent emission limit, and a less efficient producers is rewarded by receiving a more generous emission limit. This is contrary to the intention of performance-based regulatory systems to incentivize investment in more efficient designs and operation.

- 2) The second (potential) inconsistency is due to different Stringency Factors being applied in the calculation of the EPS allocation. The EPS allocation is the calculated product of the Emission Intensity and the Stringency Factors, one for Fixed Process Emissions and another for Non-Fixed Process Emissions. The Proposal indicated two alternative sets of Stringency Factors (Table 1) for calculating the EPS of a product based on its determined “Energy Intensive and Trade Exposure (EITE) Level”, or “Carbon Leakage Risk Category”. Section 6.1 of the EPS proposal describes the assessment method to be used to establish the EITE Level for products. When petroleum refining is considered “on the whole”, it has a very different EITE Level than hydrogen, when hydrogen is evaluated as a discrete product. For this reason, Air Products anticipates the proposed assessment methodology and metrics could result in different EITE Levels and subsequently, the assignment of different Stringency Factors for hydrogen produced by different sectors. The EITE designations and hence the Stringency Factors should be the same regardless of the sector producing the product; the EITE designation of both hydrogen supply options should be based on the EITE designation of the refinery end-product.

These two discrepancies distort the hydrogen supply market, favoring refinery production and penalizing merchant production. To maintain an equitable treatment of producers and to adhere to the “one product, one benchmark” principle, two changes to the proposed EPS are required: 1) The Emission Intensity, and 2) the EITE Level designation for hydrogen production, must be consistent for refinery-produced hydrogen and merchant-produced hydrogen.

Air Products represents that fair and consistent regulation of both hydrogen supply options furthers Ontario’s environmental and economic interests. Fair and consistent regulatory treatment, with incentives to maximize efficient production, reduces all air emissions, including CO<sub>2</sub>, economizes energy resources, and lowers the cost of hydrogen – helping maintain the economic competitiveness of Ontario manufacturers.

During the March 6, 2019 “Emission Performance Standards Consultation with the Chemicals Sector”, MECP staff shared their current preferred approach for the hydrogen EPS. Specifically, the meeting’s presentation included the statement “Sector average performance standard proposed for hydrogen from steam methane reforming, consistent with the standard for steam methane reforming in petroleum refining (using complexity weighted barrel as production metric)”.

Applying this principal, the Proposal indicated a Sector Average Emission Intensity for Petroleum Refining of 0.0046 tonnes CO<sub>2e</sub> per Complexity-Weighted Barrel (Table 1). Further, from the emission and production reporting regulations for refineries, the Solomon CAN-CWB Factor for hydrogen production via steam methane reforming is 5.7 CWB/kSCF of H<sub>2</sub>; converting from volume to mass units for hydrogen product, this

yields a refinery-produced hydrogen intensity of 10.89 tonnes CO<sub>2e</sub> per tonne H<sub>2</sub>. This derivation has been confirmed by MECP staff and Air Products recommends that this emission intensity value be assigned to all hydrogen production.

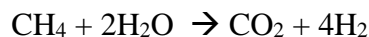
## 2. Recognizing the Irreducible Fixed Process Emissions from Hydrogen Production

Air Products strongly endorses the proposed approach of assigning a Stringency Factor of 100% to fixed process emissions. The stoichiometry of hydrocarbon-based reactions to produce hydrogen (i.e. steam methane reforming) is responsible for approximately 50% of the total CO<sub>2</sub> generation from efficient process configurations.

The EPS program is intended to incentivize the most efficient design and operation of industrial processes. Fixed process emissions represent the unavoidable emissions to convert raw materials/feedstocks into finished products. Imposing a stringency factor less than 100%) just applies a tax that facilities cannot mitigate.

Ontario appropriately recognized the need to protect fixed process emissions under its cap and trade program. In that instance, two separate benchmarks were assigned to hydrogen production: the first reflecting the irreducible fixed process emissions and the second reflecting combustion emissions. The planned year-on-year reduction in the free allocation of allowances under the cap and trade program reduced only that portion of the allocation attributed to the combustion emissions; there was no planned reduction in the allocation attributed to process emissions.

The fixed process emission benchmark was calculated directly from the stoichiometry of the chemical reactions for converting methane to hydrogen...



...or 5.5 tonnes CO<sub>2e</sub>/tonne H<sub>2</sub>.

During the March 6, 2019 “Emission Performance Standards Consultation with the Chemicals Sector”, MECP staff acknowledged the significance of fixed process emissions from hydrogen production and suggested the same intensity cited above. Air Products strongly supports defining a Fixed Process Emission – Emission Performance Standard of 5.5 tonnes CO<sub>2e</sub>/tonne H<sub>2</sub>.

### **RECOMMENDED APPROACH:**

All the elements of the hydrogen emission intensity and EITE Level must be coordinated to ensure the same EPS is applied for both refinery-produced and merchant-produce hydrogen, regardless of technology, feedstock, or ownership of the production process.

This requires:

- The merchant hydrogen total emission intensity to be derived from the refinery Sector Average emission intensity and the steam methane reforming CWB factor;

- The refinery production metric calculation for hydrogen production to use only the Solomon CWB Factor for Steam Methane Reforming, regardless of the technology or feedstock used. The other commercially practiced production technologies - steam naphtha reforming, and partial oxidation/gasification, generate more CO<sub>2</sub> emissions per unit of hydrogen produced. While there are higher CWB factors for these less efficient technologies, limiting all producers to using the CWB factor for steam methane reforming, the most efficient commonly practiced technology, will prevent rewarding producers using less efficient processes; and
- The application of a 100% Stringency Factor to fixed process emissions.

This approach will guarantee all hydrogen producers are assigned the same emission intensity of 10.89 tonnes CO<sub>2</sub>e per tonne H<sub>2</sub>, comprised of a Fixed Process Emission Intensity of 5.5 tonnes CO<sub>2</sub>e per tonne H<sub>2</sub> and a Non-Fixed Emission Intensity of 5.39 tonnes CO<sub>2</sub>e per tonne H<sub>2</sub>.

And,

- The same EITE Level designation to Petroleum Refining and Hydrogen Production, based on the EITE assessment of refined petroleum products. This will achieve consistent Stringency Factors for all hydrogen production regardless the sector producing the product.

**RECOMMENDED REGULATORY LANGUAGE REVISIONS:**

- Table 1 of Appendix A modified to include an additional row as:

Item	Specified GHG activity or component of a specified GHG activity	Product produced or process parameter	Units	Sector Average Emission Intensity for fixed process emissions (BMp <sub>i</sub> )	Sector Average Emission Intensity for Non-fixed process emissions (BMc <sub>i</sub> )	Intensity units
7	Hydrogen	H <sub>2</sub> Gas	Tonnes	5.5	5.39	Tonnes CO <sub>2</sub> e per tonne H <sub>2</sub>

- Remove the “Chemical - Hydrogen” sector row from Table 1 of Appendix B
- Revise Ontario Regulation 452/09, section 4(1). Specifically, within the “Guideline for Quantification, Reporting, and Verification of Greenhouse Gas Emissions” section providing guidance for petroleum refining (Standard Quantification Method ON.200-ON.205), add to ON.203(n) an additional sub-bullet “7” as:

*7. If a Hydrogen Generation unit is present, all calculation of CAN-CWB will only use the CWB Factor for steam methane reforming (5.7 CWB/kSCF H<sub>2</sub>), regardless of the production technology or feedstock employed.*

Air Products believes these recommended revisions to the proposed EPS regulation will create fair and consistent compliance requirements for all hydrogen produces and establish a program which incentivizes hydrogen production in the most energy and emission efficient manner. Air Products appreciates the diligent efforts by MECP staff, and we stand ready to actively participate in the ongoing stakeholder engagement on the EPS program. Please feel free to contact me by phone (610-909-7313) or email kadams@climeco.com.

Respectfully,

A handwritten signature in black ink that reads "Keith Adams, P.E." in a cursive style.

Keith Adams, P.E.  
Climate Change Regulatory Advisor – on behalf of Air Products Canada Ltd.  
ClimeCo Corporation

c: Jeff Hurdman, Sheri Beaton, Eric Loi, Craig Golding – MECP  
Eric Guter, Rachel Smith, Peter Snyder, Raymond Bailey – Air Products  
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