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Oregon Legislature
Joint Committee on Carbon Reduction
900 Court St. NE
Salem Oregon 97301

RE: The HB 2020 Oregon Climate Action Program Must Apply to All Emissions of Fluorinated Gases

I write on behalf of the Legislative Team of 350PDX. We want to thank Co-chairs Dembrow and Powers for the HB 2020-31 amendment. Importantly, it removes the original bill's temporary exclusion for fluorinated gas emissions from the Oregon Climate Action Program. See Section 9(2). This is the right thing to do. Please ensure that the final bill retains this approach. Below for your reference we provide research and analysis to explain why it is critically important that no exclusion of fluorinated gas emissions be allowed.

Section 11(a) of the original HB 2020 provided for a temporary exclusion of emissions of fluorinated greenhouse gases generated during the manufacture of semiconductors and other related devices (F-Gases) from the Oregon Climate Action program.¹ Only after the program had been in effect for five years would F-Gases become subject to its restrictions.² This five-year period would be *half* of the period the IPCC has advised is available to avoid climate chaos – time we do not have. In contrast, HB 2020-31 would subject F-Gases to the Oregon Climate Action program at inception.

Oregon F-Gas Emissions at Stake

Intel Corporation reported to the Oregon Department of Environmental Quality (DEQ) that its 2017 greenhouse gas emissions (GHG) were 259,593 metric tons CO₂e. That makes Intel the largest emitter of GHG in Oregon's semiconductor industry.³ Intel's

¹ These gases include hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, nitrogen trifluoride or other fluorinated greenhouse gases.

² Pursuant to Section 12 of the original bill, the F-Gas exclusion would be repealed on January 2, 2026.

³ See <https://www.oregon.gov/deq/aq/programs/Pages/GHG-Emissions.aspx>.

| Row | Firm | Metric Tons CO ₂ e |
|-----|--|-------------------------------|
| 16 | Intel Corporation | 259,593 |
| 34 | Jireh Semiconductor, Inc. | 95,538 |
| 36 | Semiconductor Components Industries, LLC | 92,890 |
| 37 | Microchip Technology, Inc. | 92,043 |
| 52 | Orovo US | 55,218 |
| 62 | Maxim Integrated Products, Inc. | 43,523 |
| 117 | Lam Research Corporation | 10,890 |
| 193 | Siltronic Corporation | 3,850 |

most recent report to DEQ, on March 14, 2019, disclosed that it had emitted 43.6 metric tons of F-Gases. That translates to 129,399.2738 metric tons CO₂e over a rolling 12-month period. See Appendix B for more detail. Other Oregon semiconductor companies likely emit F-Gases as well.

Brief Overview of F-Gases

- F-Gases can be classified into three major groups:
 - Hydrofluorocarbons (HFCs),
 - Perfluorocarbons (PFCs) and
 - Sulphur Hexafluoride (SF₆).
- Some F-Gases, especially HFCs, are relatively short-lived. The average lifetime of the mix of HFCs, weighted by usage, is 15 years. Other F-Gases, in particular PFCs and SF₆, can remain in the atmosphere for thousands of years.⁴
- HFCs are the fastest growing greenhouse gases in many countries. In the US, CO₂eq emissions grew 6% between 2010 and 2011 compared to carbon dioxide, which shrank by almost 2% over the same period.⁵

Why HB 2020's Climate Action Program Must Apply to Emissions of All F-Gases

For the reasons provided below, it is urgent that all F-Gases be subject to the Climate Action program (not be excluded for five years).

First, mitigation of both carbon dioxide and short-lived climate pollutants such as HFC's, is critical for climate safety. Carbon dioxide emissions are responsible for 55-60% of anthropogenic radiative forcing. Although fast and aggressive CO₂ mitigation is essential to combat climate change, it is not enough. It must be combined with fast and aggressive reductions of the pollutants causing the other 40-45% of forcing. By the end of the century, cutting short-lived climate pollutants can prevent as much as 1.1°C of warming.⁶

Second, regardless of their lifetime, F-Gases are generally much more potent than carbon dioxide. The warming effect of F-Gases on the atmosphere is up to 23,000 times more potent than carbon dioxide. Thus, restrictions on the emission of a single metric ton of F-Gas would have an exponentially greater benefit to the climate, compared to restrictions on the same amount of carbon dioxide.

Third, the lifetime of carbon dioxide may be thousands of years, depending on environmental factors. In contrast, the lifetime of many F-Gases is much less – in some cases merely a day. This means the benefit of reducing F-Gas emissions can be much

⁴ https://ec.europa.eu/clima/policies/f-gas_en

⁵ Institute for Governance & Sustainable Development (2013), *Primer on Short-Lived Climate Pollutants - Slowing the rate of global warming over the near term by cutting short-lived climate pollutants to complement carbon dioxide reductions for the long run*, page 16.

<http://igsd.org/documents/PrimeronShort-LivedClimatePollutantsFeb192013.pdf>

⁶ *Ibid.*, page 5.

more immediate, whereas it could take several generations -- time we do not have -- before the reduction of carbon dioxide emissions could have a significant impact.

Fourth, the availability of climate-friendly alternatives to F-Gases has been thoroughly assessed in studies carried out for the EU Commission and for the California Air Resources Board. See, e.g., (a) https://ec.europa.eu/clima/policies/f-gas/legislation_en#tab-0-2; (b) <https://www.arb.ca.gov/cc/shortlived/shortlived.htm>; (c) <https://ww2.arb.ca.gov/our-work/programs/stationary-hydrofluorocarbon-reduction-measure>; (d) https://static1.squarespace.com/static/5a4cfbfe18b27d4da21c9361/t/5b9a9cc1758d466394325454/1536859334343/USCA+SLCP+Roadmap_final+Sept2018.pdf

For additional resources, see Appendix A below.

Thank you for considering these concerns. If you have any questions, I can be reached at llr4100@yahoo.com or 314.757.4100

Respectfully submitted,

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Appendix A Additional Resources

A. General

- Semiconductor Industry, see “Technical Papers and Reports” tab, <https://www.epa.gov/f-gas-partnership-programs/semiconductor-industry>
- United States Climate Alliance (2018), *From SLCP Challenge to Action: a roadmap for reducing short-lived climate pollutants to meet the goals of the Paris Agreement*, see page 19, https://static1.squarespace.com/static/5a4cfbfe18b27d4da21c9361/t/5b9a9cc1758d466394325454/1536859334343/USCA+SLCP+Roadmap_final+Sept2018.pdf
- Carbon dioxide and climate impulse response functions for the computation of greenhouse gas metrics: a multi-model analysis, <https://www.atmos-chem-phys.net/13/2793/2013/acp-13-2793-2013.html>

B. European Union Regulation

- European Union, *Fluorinated Greenhouse Gases: Legislation, Data Reporting, and Climate-Friendly Alternatives*, https://ec.europa.eu/clima/policies/f-gas_en
- EFCTC - *Representing the European Fluorocarbon Manufacturers* <https://www.fluorocarbons.org>
- Environmental Investigation Agency (2015) *F-Gas Regulation Handbook* https://drive.google.com/viewerng/viewer?url=https://eia-international.org/wp-content/uploads/eia_euf-gas_eng_medrez.pdf
- European Union (2016) *EU Phasedown on Track as Fluorinated Greenhouse Gas Use Falls*, https://ec.europa.eu/clima/news/articles/news_2016121301_en

C. California Regulation

- 17 CA ADC § 95323. Standards, Regulations to Achieve Greenhouse Gas Emission Reductions, Subarticle 2. Semiconductors and Related Devices, [https://govt.westlaw.com/calregs/Document/IFD6BBFD08B1711DF8121F57FB716B6E8?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=\(sc.Default\)](https://govt.westlaw.com/calregs/Document/IFD6BBFD08B1711DF8121F57FB716B6E8?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default))
- shecco (2016), *F-Gas Regulation Shaking up the HBAC&R Industry*, https://issuu.com/shecco/docs/f-gas_impact_shecco_october2016
- Kuwayama, T.; Blake, D. R.; Gupta, P.; Gallagher, G.; Herner, J.; Vijayan, A. (2016) *Long-term trends of Fluorinated Gas Emissions in Los Angeles, California*, <http://adsabs.harvard.edu/abs/2016AGUFM.A51K0237K>
- Rhodium Group (2018) *Taking Stock*, <https://rhg.com/research/taking-stock-2018/>
- Climate & Clean Air Coalition, *Short-Lived Climate Pollutants*, “Science” tab, <http://www.ccacoalition.org/en/science-resources>