

January 17, 2017

California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Chemours Comments on the Short-Lived Climate Pollutants Reduction Strategy

Chemours Fluorochemicals appreciates the opportunity to provide comments regarding the California Air Resources Board (CARB) Proposed Short-Lived Climate Pollutant Reduction Strategy ("Proposed Strategy"). Chemours is a global leader in the production and sales of numerous products that could be affected by this draft strategy, and the strategy when finalized could have significant impact on Chemours fluorochemical business, as well as on our customers.

Chemours recognizes the need for concerted action to avoid significant future growth in the greenhouse gas emissions (GHGs) associated with the use of hydrofluorocarbons (HFCs) in different applications. That is why we are bringing low global warming potential (low-GWP), energy efficient products to market across various end uses. We believe it is critical that all stakeholders work to meet these goals in a manner that ensures that the world still has access to the critical societal value that HFCs provide today including safe and energy efficient refrigeration, air conditioning, foam insulation, fire suppression, propellants and waste heat recovery without impeding global trade of these important products essential to achieving our goals in a cost effective manner. This is also why Chemours supports the concept of a GWP-based amendment to the Montreal Protocol; the Protocol provides a proven, consistent, and well understood framework that allows the global community to both reduce GHGs associated with the use of HFCs while ensuring that consumers experience smooth transitions to newer, more sustainable products.

The nature of the regulatory approach taken to avoid these future emissions will impact how successfully we achieve these goals. Coordinated efforts will provide a much more effective model especially if they include viable, cost effective options that deliver significant reductions in direct and indirect GHGs through superior energy efficiency.

We commend CARB on the significant stakeholder outreach during the development of its Strategy and CARB's openness to the views of all stakeholders. We also commend California on the significant progress made in reducing emissions from fluorinated gases through CARB's Refrigerant Management Program, the use of self-sealing valves in small cans of refrigerants, and low-GWP requirements in consumer product aerosols. CARB's outreach has been vital to the success of these efforts, especially in cases where CARB has been able to coordinate with the U.S. Environmental Protection Agency (EPA) as in the light-duty vehicle GHG emission standards and mobile vehicle air conditioning (MVAC) leakage standards for heavy-duty vehicles. Coordination with the EPA makes implementation easier for the many businesses impacted by the changes needed to support GHG reductions.

As CARB notes, there is a significant effort globally as well as by the EPA (as directed by the President's Climate Action Plan) and by the governments of other countries to reduce GHGs in general and high-GWP fluorochemicals, in particular. In addition to governmental efforts, individual companies have invested hundreds of millions of dollars in the development of low-GWP alternatives and blends that

can replace high-GWP products while providing the same critical societal benefits at the same or better energy efficiency and efficacy as existing products today. Equipment manufacturers are developing equipment that can utilize low-GWP alternatives and companies are re-formulating foams and other products to replace existing higher GWP products with low-GWP solutions and working to increase energy efficiency of low-GWP alternatives.

Chemours believes that there are some very effective ways that California can continue to complement national and international efforts to reduce HFC based GHG emissions while maintaining some of its long-term key principles such as maintaining technology and chemical neutrality and not sacrificing indirect GHG emissions due to less energy efficient solutions. The recommended actions and comments below seek to balance near term opportunity to address short-lived climate pollutants (SLCP) while not causing additional long-term issues by sacrificing energy efficiency. The recommendations also offer thoughts around removing barriers to transitions to low-GWP solutions and ways to minimize multiple impacts to California businesses all while supporting California's Clean Energy and Pollution Reduction Act of 2015 (Senate Bill 350 (SB 350)) which requires a doubling of energy efficiency savings by January 1, 2030.

General Comments

- Chemours concurs that additional measures may more effectively be addressed at the Federal level, include managing high-GWP F-gases in the following sectors: consumer product aerosol propellants, insulation spray foam, fire suppression, heavy-duty MVAC, transport refrigeration units (TRUs), and refrigerated shipping containers. Furthermore, Chemours agrees that stationary refrigeration in particular offers the most significant opportunity to address GHGs in California as "aerosol propellants (consumer and medical dose inhalers) comprise thirteen percent of F-gas emissions, and insulating foam expansion agents contribute only eight percent of F-gas emissions. Solvents and fire suppressant F-gas emissions contribute one percent of all F-gas emissions" and have largely been addressed through EPA's July 2015 Significant New Alternatives Program ("SNAP") rule as well as potentially addressed in EPA's SNAP proposed Rule 21.
- Climate change must be addressed in a way that does not create a persistently damaging legacy. Overall, there is not a single metric that describes the comparative climate effects of various short-lived and long-lived climate pollutants perfectly. However, the majority of nations use the 4th Assessment Report (AR4) 100 year GWP values since it is recognized that the climate change issue must be addressed for the long term. 20 year GWP provides an imbalanced view, as agreed upon by nearly all countries. CARB should also consider the inclusion of the impacts of radiative forcing in modeling in its regulatory development process.
- Although a national phase down would be preferable to a statewide only phase down due to the complexity of implementation and enforcement, if CARB does decide to implement a state-wide phase down, Chemours suggests investigating other statewide commercial control systems like those used for gasoline, liquor and cigarettes as potential models for controlling interstate commerce of HFCs. Also, Chemours recommends implementing at the producer/importer level to reduce the number of participants, and therefore the complexity, in the system.

- Chemours agrees that it is important to continue the work to reduce energy consumption. The benefits of cutting SLCP emissions in California will accrue in the most disadvantaged parts of the State, where pollution levels and their health impacts are often highest, and where further economic development may be most needed. CARB also notes that switching to low-GWP refrigerants can also improve the energy efficiency of certain appliances and systems, which can help to cut electricity bills throughout the State.

Stationary Refrigeration and Air Conditioning

- Chemours concurs with CARB that the replacement of hydrochlorofluorocarbon (HCFC)-22 with higher GWP products will create a need for an additional transition and is less effective than replacements with more energy efficient solutions that have a 1400 GWP or lower. Taking the latter action would provide clear direction to industry to drive conversion to <1400 GWP (when options are available) but it does not negatively impact early converters to low-GWP or Zero ODP alternatives, and encourages lower GWP solutions rather than options that may only be interim solutions.
- If CARB does prohibit the sale/distribution of refrigerants with “very high” GWPs, excluding certified recycled refrigerants, to begin Jan 1, 2020; Chemours recommends that there be an exclusion for very low temperature refrigeration (e.g. <-50C refrigeration) or other high-value, low-volume specialty-use applications without at least two available solutions especially if the only alternative is a flammable refrigerant limited in use due to the charge size required for that application. Chemours understands that CARB intends to develop those limits after additional research and stakeholder meetings and also after considering EPA SNAP-approved alternatives.
- Chemours agrees that if CARB includes prohibitions in new stationary systems, that certain exceptions may be needed to any maximum GWP limit if there are not low-GWP refrigerant solutions that are technically feasible solutions and/or commercially available. Further, if CARB includes a GWP limit for refrigeration, multiple solutions should be allowed and energy efficient solutions should be made available, especially in the hotter climate zones in California. As CARB noted in the Draft Strategy Plan on this topic in 2015, “Using 100 percent CO₂ refrigeration may not be as energy-efficient as HFC refrigerants. For these hotter climates, manufacturers are currently developing blends of HFC refrigerants combined with a new class of very-low-GWP synthetic refrigerants known as hydrofluoroolefins (HFOs). The HFO-HFC blends have 100-year GWPs between 400 and 1400”. For example, hybrid systems using CO₂ (low temperature loop) and a low-GWP HFO-HFC blend (medium temp loop) in a cascade system can be used effectively without negatively impacting energy efficiency unlike a limitation of 150 GWP in the overall commercial refrigeration system.
- Chemours recommends a clear definition of “new equipment” to include not only new store installations, but any equipment installation in an existing store that increases the system capacity (i.e. greater number of cases, addition of a compressor, increase in compressor capacity, higher refrigerant charge size in the system, etc.) If a change is made to a store that meets this definition of “new equipment”, the system should then be converted to a lower GWP alternative.
- Chemours recommends that CARB make every effort to keep at least two solutions available for end uses. This allows users to select from multiple solutions to best meet their unique technical

challenges (e.g. high ambient temperatures, unique designs). It also encourages continued efforts by solution providers to improve energy efficiency.

- Chemours notes that low GWP, non-flammable solutions are available today at less than 750 GWP for domestic refrigerators and proposes this limit for this market space.
- Incentives should be used for transition to all potential alternative products, including fluorinated gases that will provide both direct benefits in GWP reduction and indirect benefits through maintaining or improving energy efficiency especially in the high ambient temperatures experienced in much of California. Many of the parties to the Montreal Protocol have identified energy efficiency at high ambient temperatures as a critical technical issue to be resolved when selecting low-GWP refrigerants for stationary uses. This will support rather than create additional challenges to meet the aggressive SB 350 goals regarding energy consumption.
- CARB should consider supporting some of the testing needed for mildly flammable stationary air conditioning refrigerants, classified as A2L by the American Standard of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standard 34, to facilitate the approval process for these low-GWP alternatives either through some of the consortiums funding necessary testing or independently. This will hasten the conversion of comfort cooling to refrigerants with GWP lower than 750 as soon as the Uniform Mechanical Code is updated.
- Chemours recommends that CARB continue and enhance its Refrigerant Management Program and consider extending it to non-fluorinated solutions. This will eliminate inadvertent long-duration leaks and venting of anthropogenic CO₂, which has a very long atmospheric lifetime. This could also reduce indirect emissions of CO₂ from under-charged systems that are less energy efficient (as well as being unable to provide sufficient cooling compared to a properly charged unit).
- Finally, Chemours notes that there are lower GWP products available for refrigeration that can provide improvements in energy efficiency. Transition to the lower GWP products now can support SB 350 and other state energy conservation goals like those at the California Energy Commission rather than waiting for longer term very, very low-GWP products to become available.

Mobile Air Conditioning

- High-GWP Emissions from transportation are largely from mobile vehicle air-conditioning (MVAC). As MVAC credit programs are implemented under California and EPA light-duty vehicle GHG emission standards, and as the MVAC leakage standards are implemented under their heavy-duty vehicle GHG emission standards, the share of F-gas emissions from the transportation sector will decline. However, we believe that California has an opportunity to encourage transition to low-GWP solutions in MVAC in medium and heavy-duty vehicles with a mechanism similar to that utilized in the light-duty vehicle GHG emissions standards.
- In addition, CARB should:
 - Require refresher training for California service technicians so they become familiar with handling mildly flammable refrigerants like HFO-1234yf
 - Create incentives to encourage conversion in the Mobile Air Conditioning space especially for medium and heavy-duty vehicles

Conclusion

Chemours agrees with CARB that, just like the Montreal Protocol, achieving success will require integrated planning, coordination, and collaboration among agencies, users and producers of alternatives, and other stakeholders. Chemours, however, has several concerns regarding the current direction of the Draft Strategy, including as itemized above, the use of 20 year GWP values and the need for certain exceptions where low-GWP refrigerants may not be technical feasible, may be less energy efficient and/or may not be commercially available. We look forward to continuing to work with CARB and other stakeholders in this important effort.

Sincerely,

Helen Walter-Terrinoni

Helen Walter-Terrinoni
The Chemours Company