DuPont Chemicals & Fluoroproducts
Chestnut Run Plaza 702
P.O. Box 80702
Wilmington, DE 19880-0702

April 28, 2014

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

Subject: Climate Change Scoping Plan, First Update

We congratulate the California Air Resources Board for its leadership in addressing global climate change and appreciate the opportunity to comment on the Proposed First Update to the Climate Change Scoping Plan: Building on the Framework. Our comments are restricted to a specific aspect of the Scoping Plan; the next steps to further address emissions of high global warming potential (GWP) hydrofluorocarbons (HFCs).

DuPont has long been involved with fluorinated refrigerant gases, and has been a policy and technology leader in the progression to fluorinated refrigerant gases with lower environmental footprints. We supported the development of the Montreal Protocol, which led to the initial phaseout of CFCs. HFCs, now widely in use in the developed world, are not regulated by the Montreal Protocol because they do not have the potential to deplete stratospheric ozone. However, many of them have elevated GWPs and their use is slated to grow significantly, especially in developing countries, absent some intervention and a new generation of substitutes. Accordingly, we are actively supporting efforts to bring HFCs under the Protocol to address their GWP. Along the way we have consistently delivered innovative new products to the market to help our customers make the transitions to environmentally preferable, lower GWP alternatives for use as refrigerants, foam expansion agents and other applications. We continue that innovation today with products such as our automobile air conditioning refrigerant HFO-1234yf, with a global warming potential less than that of carbon dioxide and superior Life Cycle Climate Performance. Automobile producers across the globe are adopting HFO-1234yf to help reduce the greenhouse gas intensity of motor vehicle transportation. We are further extending these new technologies to deliver low GWP alternatives for a variety of other applications such as refrigeration, waste heat recovery and foam expansion. HFCs and the new generation of technologies such as HFOs continue to deliver important societal services such as refrigeration and air conditioning, and programs to reduce their environmental footprint need to ensure that they can continue to do so. We are also working with the EPA to effectively implement the HFC actions called for in the President's Climate Action Plan.

Below we address your potential approaches to addressing the global warming effects of HFCs in the order in which they appear in the Scoping Plan.

High-GWP F-gas Phasedown

DuPont has consistently advocated a broad cap and reduction of HFCs on a GWP-weighted basis as the most flexible, market driven approach to achieve both environmental goals and economic efficiency, and are pleased that the North American Proposal to the Montreal Protocol embraces such a policy approach. We are seeing similar policy models in the EU and Japan to address HFCs. A reduction schedule that is both aggressive and achievable will send the market signals to minimize emissions of refrigerants, to recover and recycle refrigerants and to switch to lower GWP alternatives where safe, energy efficient and cost effective options are available. We believe such an approach is most effectively done at the national level, and we recommend that California work with the U.S. EPA in the development of such a regulatory program as an appropriate model for the U.S. to implement an amended Montreal Protocol. There has been sufficient movement in international discussions regarding an amendment to the Protocol that it is reasonable to believe that an agreement can be reached within a few years with a concerted effort. We think that California can utilize its unique relationship with nations like China and India to encourage those nations to work towards the timely negotiation and adoption of an amendment to the Montreal Protocol. We believe such efforts have the opportunity to deliver greater environmental benefits than efforts to develop a complex cap and reduction program just within California.

DuPont has consistently supported the efforts of the U.S. government to promote the proposed amendment and has worked with a variety of other governments to encourage their engagement. We have supported this effort because we believe such an amendment would provide a structure for a needed degree of uniformity in national HFC regulations, important for these globally applied and traded products. We also believe that a cap and reduction of HFCs on a GWP-weighted basis, rather than product by product and application by application regulations, is the most flexible and cost effective form of regulation, allowing the industry to serve its markets in the most flexible manner while ensuring the desired environmental benefits. We also note that HFCs are employed globally, requiring a global agreement to effectively address the issue.

Low-GWP Requirements

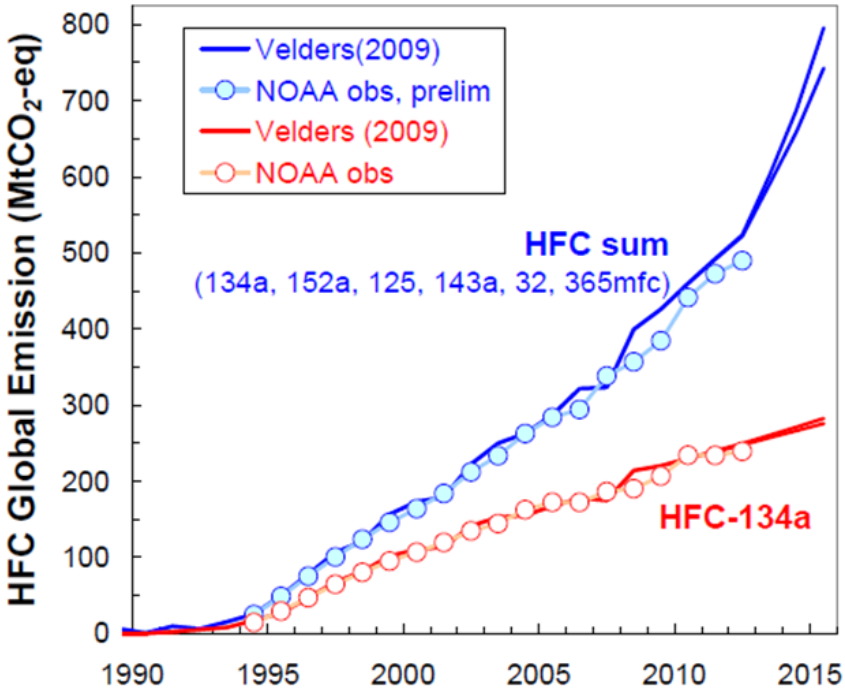
While we believe that a cap and reduction of HFCs on a GWP-weighted basis is the best method of addressing the contribution of high GWP HFCs to global climate change, we recognize that regulation of high GWP HFCs through actions to restrict specific uses can, if done carefully, constructively encourage environmentally beneficial market transitions already underway and pave the way for future reductions under the Montreal Protocol and national implementation. Near term restrictions of HFCs in specific applications can be constructive where:

1. There are multiple low-GWP, technically and economically viable alternatives for a current high-GWP compound. For the U.S., this means that there should be at least two lower-GWP alternatives currently SNAP listed or expected to be listed for the high-GWP HFC for the application in which a restriction is considered.
2. The affected industry has identified and demonstrated technologies necessary for the transition.

3. The demonstrated technologies would provide appropriate performance, safety, and energy efficiency.
4. The change would result in significant reductions in overall greenhouse gas emissions.

There are a variety of regulatory activities underway across the globe to both implement a broad HFC cap and reduction as well as to take limited regulatory actions consistent with a longer term cap and reduction. Those include the Scoping Plan, revision of the European f-gas regulation, regulatory efforts that are underway in Japan and the recent activities by the U.S. EPA under the President's Climate Action Plan to address certain high-GWP HFCs under the SNAP program.

In reviewing these programs and trends already underway in the marketplace that could be reasonably accelerated it appears that there are three applications of high GWP HFCs that may merit consideration: motor vehicle air conditioning, commercial refrigeration and foam expansion. Analysis of atmospheric concentration data for HFCs from NOAA suggests that, on a global basis, leaks from motor vehicle air conditioning using HFC-134a account for about one-third of total GWP-weighted HFCs emissions and leaks from commercial refrigeration using R-404A or R-507A contribute about another one-third (personal communication from Stephen Montzka).



Note: NOAA data for HFC-134a are based on the extension of a published record. NOAA data for other HFCs are unpublished and preliminary, provided courtesy of S. Montzka, NOAA.

In the case of motor vehicle air conditioning, three low-GWP options are SNAP listed, meeting the first criteria: HFO-1234yf, carbon dioxide and HFC-152a. As pointed out in the Scoping Plan, there are large numbers of cars on the U.S. market today using HFO-1234yf. In addition, the EU MAC directive requires that all cars sold in Europe in 2017 use a refrigerant with a GWP of less than 150 meaning that there will

be widespread adoption of low-GWP refrigerants for auto by that date. Finally, the auto industry has demonstrated that HFO-1234yf technology can meet performance, safety and energy efficiency standards. ARB should consider working to align with the U.S. EPA on their intent to propose to remove HFC-134a from the list of SNAP approved refrigerants for new and retrofit applications. Such a regulation should be in addition to the current carbon dioxide equivalent credit scheme to accelerate the transition to low-GWP refrigerants for autos as those credits have been incorporated into long term auto industry planning and design.

The GWPs of the standard refrigerants used for commercial refrigeration are the highest of the commonly used refrigerants; (3922 for R-404A and 3985 for R-507A, with both GWPs calculated using values from the IPCC fourth assessment report). Furthermore, commercial refrigeration systems are among the most emissive of all refrigerant applications. A number of viable refrigerant and system options are becoming available in the marketplace to replace R-404A and R-507A and reduce the direct GWP contribution to climate change of the refrigeration system. There are multiple SNAP listed lower GWP HFC options that can be used today to replace R-404A and R-507A for both retrofit of existing systems and for new systems. These options include commoditized refrigerants already in use such as R-407A (GWP 2107) applicable for both retrofit and new systems. Also cascade CO_2/HFC-134a systems are in common use for new systems in the EU and are starting to be used in the U.S. In addition, various HFO/HFC blends are being developed and commercialized to offer cost-effective and easy transitions from R-404A, 507A and R-134a in existing systems and for new system design. DuPont's Opteon® XP40 (GWP 1397) is one such product, which is a very close match in properties and performance to R-404A. Fields tests are underway in the EU and are showing improved energy performance with the use of Opteon® XP40 vs. R-404A. Commercialization in the EU is planned for 2014 and plans are underway to secure necessary registrations and approvals to offer this product to the US market. Our Opteon® XP10 (GWP 631), another lower GWP HFO/HFC blend, is virtually a direct match for R-134a with a GWP of less than half that of R-134a. There are a variety of secondary loop/HFC combination system designs being offered in the US market that significantly reduce the HFC charge size of the total system and can employ the lower GWP replacements for R-404A and 507A. The EU f-gas revision addressed R-404A and R-507A systems by prohibiting as of 1 January 2022: "Multipack centralized refrigeration systems for commercial use with a capacity of 40kW or more that contain, or that rely upon for their functioning, fluorinated greenhouse gases with GWP of 150 or more, except in the primary circuit of cascade systems where fluorinated greenhouse gases with a GWP of less than 1500 may be used." The exception will allow for systems with the medium temperature system running on HFC-134a and a cascade to a low temperature system running on carbon dioxide. Such systems are already in use in Europe and have shown superior energy efficiency to standard DX systems. To address servicing of commercial refrigeration equipment currently operating on R-404A or R-507A, the revised EU f-gas regulation includes an additional prohibition: "The use of fluorinated gases, with a global warming potential of 2500 or more, to service or maintain refrigeration equipment with a charge size of 40 tonnes of CO_2 equivalent or more, shall be prohibited from 1 January 2020." There are exceptions for low temperature (<50^{o}C) equipment, military equipment and, until 1 January 2030, use of reclaimed or recycled refrigerants with GWPs greater than 2500. The ability to move commercial refrigeration to lower GWP options has been demonstrated with multiple options already approved and in use that

meet all performance, safety and efficiency standards, and additional lower GWP options are being introduced to the market.

The U.S. EPA has recently announced intentions to propose a rule that would remove R-404A and R-507A from the list of SNAP approved refrigerants for new and retrofit commercial refrigeration applications. Options that ARB might consider are to work with the U.S. EPA to align on time frame for removal of these refrigerants from the SNAP list and to implement a prohibition on service of existing equipment with these refrigerants as has been done in the EU. We also note that a new generation of lower GWP options for commercial refrigeration are coming in to the market that will provide an alternative to the still relatively high GWP 400 series refrigerants that are the current alternatives for R-404A and R-507A.

Lastly, high-GWP HFCs remain in use as foam expansion agents (FEAs). Multiple lower-GWP alternatives exist or will soon be commercialized for these applications, including HFC-152a, hydrocarbons, water CO_2, HFOs, and an HCFO. In fact, many polyurethane foam manufacturers have been working to develop systems with low GWP products for several years, and in many cases, the lower GWP alternatives listed above provide improved thermal performance in the insulating foams offering the ability to further reduce climate change potential directly through the GWP in the FEA and indirectly through reduced energy consumption needs of the finished building or product. Japan is developing and Europe has developed strategies and timing to transition away from high-GWP FEA products in the next years, and ARB should consider aligning with those schedules to help insure a successful transition as solutions will be available to meet those deadlines. Our Formacel® 1100 foam expansion agent provides a 99% reduction in GWP vs. current products and has improved energy efficiency.

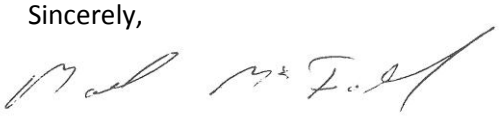
ODS Recovery and Destruction

DuPont fully supports efforts to enhance recovery and destruction of ODSs through incentive programs.

High-GWP Fee

DuPont believes that imposition of a fee on high-GWP HFCs is a less effective policy tool than those we have discussed above, and can create economic burdens for low income consumers. Environmental goals associated with control of HFCs can much more effectively be dealt with through cap and reduction programs or specific prohibitions that meet the four criteria as discussed above.

Sincerely,



Mack McFarland