

**Statement of Mack McFarland, Ph.D.**  
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**E.I. DuPont de Nemours and Company, Inc**  
**before the**  
**Committee on Oversight and Government Reform**  
**U.S. House of Representatives**  
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Good morning Chairman Waxman, Mr. Davis, and members of the committee. My name is Mack McFarland, and I am the Global Environmental Manager for DuPont's fluorochemicals business. In that role I advise our worldwide operations on a range of environmental and business matters. Prior to joining DuPont in 1983 I was an atmospheric scientist with the National Oceanic and Atmospheric Administration studying processes that control atmospheric ozone. While employed by DuPont I was on loan to the United Nations Environment Programme for two years and to a Technical Support Unit of the Intergovernmental Panel on Climate Change (IPCC) for one year. During this time I worked at the science/policy interface on the issues of ozone depletion and global climate change. I appreciate this opportunity to share our experiences regarding stratospheric ozone protection and the positive impact the management of ozone depleting substances has and can have on climate protection. In my testimony I will discuss DuPont's experiences, our views of the effectiveness of the Montreal Protocol and suggest ways in which the Protocol can be enhanced and, as focus shifts specifically to climate protection, national implementation can be improved.

DuPont is a science driven company with a commitment to safety, health and environmental protection. We use science to derive products and services that improve the quality and safety of people's lives. We also use science to drive how we develop, manufacture and manage our products throughout their life cycle. As a 200 year old company we take the long view, and strive for sustainable growth that benefits our shareholders, the societies in which we operate and the global environment. It is that commitment to sustainable growth and dedication to science that underpins our approach to protection of stratospheric ozone and the climate.

It was our vision of Sustainable Growth that led us to set goals and reduce our global greenhouse gas emissions 72% between 1990 and 2004, and set additional goals for another 15% reduction by 2015. It is also this vision that led us to co-found the US Climate Action Partnership (USCAP) and call for US leadership on reducing greenhouse gas emissions. The members of the USCAP believe that with a properly designed mandatory program we can harness the power of the market to achieve environmentally effective and economically sustainable greenhouse gas emissions reductions.

DuPont introduced the first fluorochemical refrigerant gases, chlorofluorocarbons, or CFCs, in the 1930s. They were developed as safer alternatives to the more dangerous refrigerants then in use, such as ammonia. In 1988, based on the scientific consensus presented in the International Ozone Trends Panel Report, and our evaluation of that science, we voluntarily and unilaterally committed to phase out CFCs; this was done over two years ahead of the London Amendment to the Montreal Protocol where countries adopted such a phase-out. We also used our science capabilities to lead in the development of alternative products to meet

the growing societal need for air conditioning and refrigeration. This experience with the CFC/ozone issue provided us with a keen understanding of the implications of environmental issues that are global in scope and decades to centuries in duration.

The Montreal Protocol, ratified by 191 countries, is widely recognized as a model for addressing global environmental issues. Progress was rapid under the Protocol. It took a mere four-and-one-half years to phase out developed world consumption of halon fire extinguishants and six-and-one-half years for CFCs, the two classes of compounds with the highest ozone depleting potentials. To avoid unwarranted market disruptions the Protocol provides minor uses under “essential use” exemptions. The developing world phase-out date of 1 January 2010 for these classes of compounds is rapidly approaching. The phase-out of the lower ozone depleting CFC replacements, the hydrochlorofluorocarbons (HCFCs), is already underway in developed countries. Other ozone depleting compounds such as methyl chloroform, carbon tetrachloride and methyl bromide also have been addressed under the Montreal Protocol. The actions under the Protocol have led to significant reductions in the current and future risk of both ozone depletion and climate change while allowing the market to bring forward safe, efficient, cost effective substitutes with lower or no ozone depleting potential. We would like to recognize the tremendous leadership that both the Department of State and EPA have shown in developing, implementing and improving the Protocol.

This extraordinary success is the result of unprecedented cooperation among stakeholders; scientists, regulators, environmental groups and industry. This cooperation resulted in a regulatory framework that accounted for the global dimensions of the issue, was environmentally effective, and provided the flexibility for industry to develop cost effective solutions that continued to meet societal needs. At the international level, clear, prioritized targets were set for the phase-out of ozone depleting compounds, addressing those classes of compounds with the highest potential to deplete ozone first. Phase-outs for developing countries lagged those in developed countries to allow new, more ozone friendly technologies to be developed and deployed in order to reduce economic burden and societal disruption. Assistance was also provided to developing countries through the Multilateral Fund of the Protocol. These efforts led to progressive generations of refrigerant gases, from the original CFCs, the second generation HCFCs, the third generation non-ozone depleting hydrofluorocarbon (HFC) products as well as non-fluorocarbon based technologies. Similarly, progressive generations of products have been developed and implemented for other applications including foaming agents for insulating panels, cleaning agents, and medical devices. Today DuPont and others are developing the next generation of high performance non-ozone depleting compounds with low global warming potentials (GWPs).

A key aspect of the Protocol was its allowance for individual governments to determine the form of regulations to best meet the phase-out targets under their circumstances. U.S. implementation of the Protocol under the Clean Air Act Amendments of 1990 has, for the most part, provided incentives for innovation and allowed the flexibility for companies to develop and deploy technologies to continue to meet consumer needs.

As the original inventor and, at that time, the largest supplier of fluorocarbons, DuPont played an active role in resolving the global environmental concerns posed by CFCs. We helped advance the environmental goals of the Protocol, seeking scientific understanding of the potential impact of the existing CFC technology, responding to the rapid advances in the science, and developing alternative products. In recognition of these accomplishments

DuPont was awarded the 2002 National Medal of Technology for “CFC Policy and Technology Leadership.”

We have continued to provide a broad range of non-ozone depleting fluorochemicals to meet market needs. We produce a range of single component and blended products to facilitate safe, efficient and cost effective refrigeration, air conditioning, medical, insulation and other new products. Our Isceon® 9 series of products allows easy, cost effective retrofit of existing equipment that currently uses HCFC-22 and the remaining uses of CFCs. In February of 2006 we announced that we had identified low GWP, non-ozone depleting alternatives for HFC-134a used in mobile air conditioning. The leading candidates have GWPs on the order of only 3% that of HFC-134a and can meet the requirements of the European Union fluorinated gases directive that will phase out the use of HFC-134a in new car models beginning in 2011. It is our intent to leverage these non-ozone depleting, low GWP technologies to other applications that currently rely on higher GWP products, including other refrigerant applications and foam expansion agents for insulating materials. Our goal is to provide ever more environmentally sound products to the market. In fact, as part of our Sustainable Growth goals DuPont has pledged to double our research and development (R&D) investments in programs with direct, quantifiable environmental benefits for our customers and consumers by 2015, while growing our annual revenue from products that create energy efficiency and/or significant greenhouse gas emissions reductions for our customers by \$2 billion during the same period. Additionally, we estimate these products will contribute at least 40 million tonnes of additional CO<sub>2</sub> equivalent reductions annually by our customers and consumers. In essence we intend to do well for our shareholders and the environment simultaneously.

While the Montreal Protocol has been a clear success, we believe it can be improved. Several actions could enhance the effectiveness of the international agreement and its national implementation and provide additional protection of stratospheric ozone and climate.

At the international level, we believe the phase-out schedule for HCFCs should be accelerated. The U.S. played a leading role in the initial development and ongoing enhancement of the Protocol. It is continuing that leadership through its proposals to adjust the phase-out schedule for HCFCs in this, the twentieth anniversary year of the Montreal Protocol. The existing schedule has no controls on HCFC use in developing countries until 2015 and then their allowable consumption is frozen at the 2015 level until it suddenly drops to zero on 1 January 2040. Recent data and reports prepared by the Montreal Protocol Technical and Economic Assessment Panel suggest that this schedule is allowing very large growth and emissions of HCFCs in these countries. We believe a gradual ramp down in HCFC consumption in the developing world, rather than the current “full speed until you stop” approach, is both more manageable and environmentally effective by significantly reducing the net quantity of ozone depleting and climate warming compounds emitted into the atmosphere. With more environmentally sound alternatives already developed and deployed in both developed and developing countries, more can be done for protection of the ozone layer, as has been proposed by the U.S Government. DuPont fully supports a significant acceleration of this phase-out of HCFCs in developing countries through a gradual ramp down and accelerated timetable. We also believe that the U.S. and other developed countries can and should accelerate their phase-out schedule.

When the Montreal Protocol was first agreed and implemented, the technologies to move away from ODSs were only beginning to be developed and deployed. Thus the Protocol provided for a delay in implementation in the developing world and for the Multilateral Fund to assist in their conversion away from ODSs. The situation is now much different. Alternatives to HCFCs are developed and deployed for virtually all applications. In fact, the alternative chemicals and goods are currently being produced in developing countries for both their use and for sale in developed countries. Furthermore, the major advances in energy efficient equipment are, for the most part, occurring for equipment that uses non-ozone depleting alternatives. Thus, more rapid transitioning away from HCFCs in developing countries should be far less costly than the transition away from CFCs and, in fact, could save money in some instances where there are significant energy efficiency advantages of non-ODS technologies. Deployment of more energy efficiency equipment will also reduce energy use, and, hence, carbon dioxide emissions, providing further climate protection. An earlier HCFC phase-out would also serve to limit the amount of equipment using HCFCs that is put on the market and, hence, limit future needs for HCFC refrigerants for equipment servicing.

An additional advantage of an acceleration of the HCFC phase-out is the avoidance of additional HCFC-22 production and use and the potential emission of an unintended manufacturing by-product, HFC-23, that has a quite high GWP of 11,700. Unless specific actions are taken, such as DuPont has, to capture and destroy the incidental HFC-23 that is created during HCFC-22 production, it is emitted to the atmosphere. Under the Kyoto Protocol, the Clean Development Mechanism (CDM) allows entities in regulated economies to finance greenhouse gas reducing projects in non-regulated economies and receive greenhouse gas reduction credits. CDM is a very positive aspect of the Kyoto Protocol, allowing capital to flow to the lowest cost greenhouse gas emissions available in the world economy in a market sensible manner.

Projects to destroy HFC-23 emissions from HCFC-22 plants in developing countries are allowed under the CDM for facilities that were in operation by 1 January 2001. DuPont fully supports these types of projects as meeting all the criteria of CDM and providing real climate benefits. However, China is requesting that CDM credits be granted for HFC-23 destruction projects at HCFC-22 facilities that have begun operation more recently. We are concerned that any such decision could unfortunately create incentives for HCFC-22 production beyond normal market demand and the construction of additional HCFC-22 production facilities. This could occur largely for the purpose of generating HFC-23 destruction credits, which have more market value than does the HCFC-22 product, rather than to satisfy HCFC-22 market demand. This would serve to impede the phase-out, with the HFC-23 CDM project becoming the product and HCFC-22 becoming the byproduct. An acceleration of the HCFC phase-out in developing countries under the Montreal Protocol would help to address this potential problem. Countries will also need to address this issue under the CDM process under the Kyoto Protocol in a manner that prevents such consequences. These actions under the two regimes would provide additional climate protection by avoiding unnecessary emissions of greenhouse gases.

To ensure that the HCFC phase-out provides climate as well as ozone protection, there needs to be special attention to reducing emissions of their replacements, especially in refrigerant applications. The currently preferred choices of the refrigeration and air conditioning industry for non-ODS refrigerants are HFCs or blends of HFCs. These compounds generally

have GWPs that are lower than CFCs but about the same as or higher than HCFCs. These HFCs are chosen because of their superior safety characteristics and contribution to efficiency and reliability of equipment. Thus, to take advantage of these desirable properties and achieve additional climate protection, care must be taken to reduce emissions from equipment employing HFCs through improved equipment, better maintenance and servicing practices and recovery of the refrigerant at the end of equipment life. Current information suggests that about 20% of the amount of HCFC-22 contained in refrigeration and air conditioning systems escapes to the atmosphere each year through leaks, at servicing or at end of life. In addition, the draft report: “The U.S. Phase-out of HCFCs: Projected Servicing needs in the U.S. Air-Conditioning and Refrigeration Sector: Revised Draft Report, September 2006” (see: [http://www.epa.gov/ozone/title6/phaseout/ServicingNeedsRevisedDraftReport\\_September.2006.pdf](http://www.epa.gov/ozone/title6/phaseout/ServicingNeedsRevisedDraftReport_September.2006.pdf)) suggest that the amount of HCFC-22 actually reclaimed in the U.S. is only a fraction of what could be reclaimed.

The Montreal Protocol Multilateral Fund has played a constructive role by providing training and equipment to reduce equipment related emissions of refrigerants and could continue to play a role under an accelerated HCFC phase-out. In addition, there could be a role for CDM to provide incentives for more efficient equipment with either lower GWP refrigerants or certified reduced refrigerant emissions over the life of the equipment. Of course, where other low GWP refrigerants can be used safely, efficiently and in compliance with local regulations they should be chosen. In this regard DuPont intends to extend our innovative low GWP technologies under development to other applications currently using HFCs, including other refrigerant applications and foam expansion agents for insulating materials.

At the national level DuPont believes that both the environmental effectiveness and the flexibility for industry to meet consumer needs in the most cost effective manner could be enhanced through more reliance on market-based mechanisms. There are two areas in particular where we believe significant environmental benefits could be cost-effectively derived through new policies. There are significant amounts of high ODP and GWP CFCs and halons contained in existing equipment and products that are likely to escape to the atmosphere during their life cycle. In addition, there continue to be significant emissions of HCFC-22 used in refrigeration and air conditioning due to equipment leakage, poor service practices and/or lack of recovery at end of life. This suggests the need for incentives for better management of refrigerant in equipment and the capture and destruction of material at the end of equipment life

The Special Report, jointly developed by the Intergovernmental Panel on Climate Change and the Technology and Economic Assessment Panel, “Safeguarding the Ozone Layer and the Global Climate System” (see [http://arch.rivm.nl/env/int/ipcc/pages\\_media/SROC-final/SpecialReportSROC.html](http://arch.rivm.nl/env/int/ipcc/pages_media/SROC-final/SpecialReportSROC.html)) brought to the attention of policymakers the significant amounts of CFCs and halons that are still contained in equipment. In the U.S., consumption and emissions of these compounds were controlled in three ways:

1. A limit was placed on the amount of new material that could be placed on the market through allocation of consumption allowances to producers and importers;
2. “No-venting” and other restrictions were put in place to reduce emissions of the compounds during service and at end of life of equipment; and
3. An escalating tax was placed on new material.

Of these, the first and third place an environmental value on the products to encourage appropriate market behavior; reduce leaks, and provide incentive for recovery during servicing and at end of equipment life for recycling into the market. However, when the material is too contaminated for economical recycle or market demand for recycled material is too low to place a sufficient value on recycling, then the material should be destroyed for optimal environmental benefit. Yet none of these controls provides a market driver for such destruction, suggesting a need for an additional market based incentive.

Looking forward to regimes for climate protection, we suggest two potential market-based regulatory approaches. In both cases, there could be special consideration for low GWP alternatives and applications with very low emissions.

We believe improved stewardship could be achieved by establishing a cap, on a carbon equivalency basis, of high GWP HFCs placed on the market, as was done on ODP equivalency for CFCs, halons and HCFCs. This could be combined with appropriate market based incentives (e.g., generation of carbon credits) for capture and destruction of the material at the end of its useful life. In fact, such a market based incentive program could be included in a GHG cap and trade system in the U.S. to encourage better management and eventual destruction of CFCs, halons and HCFCs by making such behavior economically beneficial. Destruction under such a program would provide both climate and ozone benefits.

Including HFCs in a GHG cap and trade system on a carbon equivalent basis would also create market incentives for environmental benefits. Under such a program carbon equivalent allowances would be required to be surrendered to place the compounds on the market, and carbon equivalent credits would be generated for destruction of the compounds. This would in essence imbue the “cost of carbon” in the value of these products, creating market incentives for improved stewardship.

In both cases the “environmental costs” associated with emissions of the compounds to the atmosphere would be incorporated into the market price. The result would be a flexible market-based system that would ensure that atmospheric emissions were reduced through limiting of leaks and increasing recovery at servicing and at end of equipment life; and would provide an incentive for development and deployment technology with lower environmental impact. Such an approach would also allow industry the flexibility to meet the environmental target in the most cost effective manner. Of course, as with any such market program, transparency and sound accounting would be important elements.

In summary, the Montreal Protocol has been an unprecedented success protecting both stratospheric ozone and the global climate system. That success could be enhanced through an acceleration of the current HCFC phase-out schedule in both developed and developing countries. Domestically, environmental effectiveness of implementation of international agreements could be increased by use of market based systems for the ozone depleting fluorochemical gases and, in the future under any climate change legislation, for HFCs.

Thank you for the opportunity to share our thoughts on this important subject with the Committee.