



Hearing on “Achievements and Opportunities for Climate Protection under the Montreal Protocol”, US House Committee on Oversight and Government Reform, May 23, 2007

## **Statement of Dr. Guus Velders (The Netherlands) on “Dual benefits of the Montreal Protocol: protecting Ozone layer *and* Climate”**

The 1987 Montreal Protocol – restricting the production and use of ozone-depleting substances – has helped to both reduce global warming and protect the ozone layer. Without this protocol, the amount of heat trapped due to ozone-depleting substances would be twice as much as it is today. The benefits to the climate achieved to date by the Montreal Protocol and its amendments alone greatly exceed the current target of the Kyoto Protocol. Potential future effects of a strengthening of the Montreal Protocol on climate are still significant, but will decrease in the future, while future emission reductions of the Kyoto gases will potentially have a much larger effect on the climate.

### **Depletion of the ozone layer**

Chlorofluorocarbons (CFCs) and other ozone-depleting substances are now globally recognized as the main cause of the observed depletion of the ozone layer. In 1974, Molina and Rowland provided an “early warning”, when they first recognized the potential of CFCs to deplete stratospheric ozone. Concern was further heightened in 1985 by the discovery of the ozone hole over Antarctica. The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer formally recognized the significant threat of ozone-depleting substances to the ozone layer and provided a mechanism to reduce and phase out global production and use of these compounds. As a consequence, the production, use, and emissions of the major ozone-depleting substances have decreased significantly. The concentrations in the atmosphere of the major ozone-depleting substances are also decreasing<sup>1</sup>. An exception is formed the hydrochlorofluorocarbons (HCFCs), with increasing concentrations in the atmosphere.

There is emerging evidence that the ozone layer is currently starting to recover. Full recovery is expected around 2050-2075. Future emissions of ozone-depleting substances and climate change may delay or accelerate the recovery of the ozone layer by several years<sup>1</sup>.

### **Greenhouse gases and climate change**

Ozone-depleting substances also contribute to the radiative forcing of climate change. Their current contribution is about 20% of that of carbon dioxide (CO<sub>2</sub>). The Kyoto Protocol of 1997 is a treaty for reducing the emission of CO<sub>2</sub>, the leading greenhouse gas, and five other gases. These gases do not deplete the ozone layer, but include hydrofluorocarbons (HFCs) which are produced as alternatives for ozone-depleting substances. Substances that do deplete the ozone layer, are not included in the UN Framework Convention of Climate Change (UNFCCC) and its Kyoto Protocol, because they were already covered by the Montreal Protocol.

The Montreal Protocol has helped both to protect the ozone layer, and to reduce global warming. My research<sup>2</sup> shows that without the reductions achieved under this protocol, the amount of heat trapped due to ozone-depleting substances may have been about twice as much as it is today.

This is equivalent to a gain of about 10 years in CO<sub>2</sub> reductions. The climate benefits which have already been achieved by the Montreal Protocol alone, are, according to my research, 5 to 6 times greater than the current reduction target, for 2008-2012, of the Kyoto Protocol, assuming full compliance. It is estimated that the Montreal Protocol may have avoided emissions of about 11 GtCO<sub>2</sub>-eq/yr (11 billion tonnes of CO<sub>2</sub>-equivalent emissions) by 2010. However, these climate benefits attributed to the Montreal Protocol will decrease further and further as ozone-depleting substances are being phased out.

### **Future benefits**

New measures under a strengthened Montreal Protocol can result in additional benefits for both the ozone layer and climate. IPCC<sup>3</sup> assessed the potential and cost-effectiveness of such measures. Removing CFCs present in existing applications (refrigerators, foams) can reduce emissions by about 0.12 GtCO<sub>2</sub>-eq/yr by 2015. An accelerated phase-out of the production of HCFCs in developed and developing countries could be achieved with instruments similar to those currently in the Montreal Protocol. This can reduce emissions by about 0.34 GtCO<sub>2</sub>-eq/yr by 2015 and potentially by 0.8-0.9 GtCO<sub>2</sub>-eq/yr by 2030.

Associated additional reductions of about 0.30 GtCO<sub>2</sub>-eq/yr by 2015 can be achieved in HFC emissions, which are released as a byproduct of HCFC production. HFCs do not deplete the ozone layer and are therefore not covered by the Montreal Protocol, but are greenhouse gases and covered by the UNFCCC.

These possible emission reductions would derive mainly from better containment in refrigeration and destruction of ozone-depleting substances present in existing applications (refrigerators and foams). Detailed scientific and technical assessments could provide policymakers with information necessary to fine-tune an accelerated HCFC phase-out to allow specific uses of HCFCs. Examples are use of HCFCs as feedstock for fluoropolymers and in other applications where emissions are near zero or where over-riding energy efficiency benefits are present. Thus, plausible scenarios that could achieve reductions in CO<sub>2</sub>-equivalent emissions of ozone-depleting substances and alternative gases both exist and have been considered. These reductions are considerable compared to the reduction target of the first commitment period of the Kyoto Protocol of about 2 GtCO<sub>2</sub>-eq/yr, but relatively small compared to the current global CO<sub>2</sub> emissions of about 30 GtCO<sub>2</sub>-eq/yr.

It is widely acknowledged that emission reductions exceeding those laid down for the first commitment period of the Kyoto Protocol will be needed to achieve the UNFCCC objective, namely, "stabilization of greenhouse gases concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". While emissions reductions under the Montreal Protocol have played an important role in the past, and future amendments can still have some additional benefits for climate, reductions of greenhouse gases not covered by the Montreal Protocol have a potentially much larger effect on the climate.

In conclusion, I think the success of the Montreal Protocol is important, for it shows the effectiveness of an international agreement.

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1. WMO, Scientific assessment of ozone depletion: 2006, *World Meteorological Organization, Global ozone research and monitoring project, Report no. 50*, Geneva, 2007.

2. Velders, G.J.M., S.O. Andersen, J.S. Daniel, D.W. Fahey, M. McFarland, The importance of the Montreal Protocol in protecting climate, *Proceedings of the National Academy of Sciences*, 104, 4814-4819, 2007.

3. IPCC-TEAP, Safeguarding the ozone layer and the global climate system, Issues related to hydrofluorocarbons and perfluorocarbons, *Intergovernmental Panel on Climate Change*, Cambridge, UK, 2005.