

## ***Interactive comment on* “Growth of climate change commitments from HFC banks and emissions” by G. J. M. Velders et al.**

### **Anonymous Referee #2**

Received and published: 30 January 2014

#### General Comments

The paper raised an important issue regard to HFC’s contribution to future climate change. Normally, the calculation of the greenhouse gases (e.g. CO<sub>2</sub>) contribution to climate change starts with annual emission, which then leads to increase of atmospheric concentration and consequently radiative forcing. The unique aspect of HFC’s contribution, as properly pointed out by this paper, is that the production/consumption of HFCs may not cause emission immediately; instead, HFC production are stored in the “bank” and only released after the market lifetime of the products (e.g. A/C equipment). This “time bomb” effect of HFC production is a point worth conveying to mitigation policy community.

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I recommend publication when the following specific comments are addressed.

### Specific Comments

#### (1) Background: Why is the bank issue for CFC not as serious as HFCs?

In the introduction, a brief historical background of CFC use and its ban under Montreal Protocol is given. But it is still unclear to me why CFC is mostly used in rapidly-released application (also shown in the pie chart of Fig 1), and therefore the bank issue is not significant? Is it because the CFC chemical properties are more suitable for rapidly-released applications? Or is it because the A/C and refrigeration use (medium time scale) demand was low that the time of 1980s? Maybe the authors can provide some more information on my question in section 2.

#### (2) Methodology: How to estimate emission vs size of bank?

Regard to CFC and HCFC bank, the method of estimating the bank size is not properly described. If I understand correctly, in a given year, production = emission+ addition to the bank. The emission is derived using top-down approaches, while bank term is derived using bottom-up approaches instead of taking the difference between production term and emission term.

The authors stated “Emission factors, which represent the fraction of the individual banks that are released each year, are derived from the ratio of the top-down derived emissions and the bank estimates over the period 1999 to 2008”. But the top-down derived emissions (based on observed atmospheric concentration) are total emission-how did the authors partition the total emission into emission immediately after production and emission slowly released from the bank?

To make this clear, could the authors provide an example of estimates of banking time (or emission factor) for individual applications (AC vs foams) or individual chemicals?

#### (3) Previous estimates.

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Why did previous estimates not consider the buildup in the bank? Were they only considering the yearly emissions? Page 33001. Line 17. Could the authors give an example here or somewhere else in the paper of previous estimates that only considered the concentration/radiative forcing and ignore bank contribution?

#### Technical Corrections

Page 32996. Line 1. What information is provided in RCP? Just mixing ratio and radiative forcing?

Fig 2. In the last sentence of figure caption. I don't think radiative forcing is presented in this figure.

Please also note in Fig 2 caption (and maybe in some following figures) that "constant past 2050" means the demand and consumption is held as constant.

Fig 2. In The panel C, label for Y-axis misspelled "emission", label for X-axis misspelled "year".

Page 32991. Line 26. "GWPs are one type of measure of the relative impact of a gram of a greenhouse gas compared to carbon dioxide over one hundred years". This sentence does not read well. Please edit.

Page 32992. Line 2. Please give an example of low-GWP HFCs.

Page 32994. Line 2. "These use observed..." This sentence is too long and not well structured. I don't understand what is the constraint for what? Please rephrase.

Page 33001. Line 1. "INCREASING importance of the bank ...compared with cumulative production". This statement seems to be contradicting with the statement of "The relatively greater importance of the production phaseout by 2100." from the last page and with the Figure 3. From what I see, the importance of the bank is not increasing with time.

Page 33001. Line 5. ODSs is not defined.

Fig 3. Y-axis label. The author used “GtCO2-eq” in the figures but “GtCO2eq” in the text. I think they need to be consistent

Fig 4. Would it be better to reverse the sign of Y-axis to be negative and actually show the radiative forcing “reduction” following the measures of collecting and destroying the banks? I leave the choice to the authors.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 32989, 2013.

ACPD

13, C11653–C11656,  
2014

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